



# Communication Skills Requirements of Junior Software Engineers – Analysis of Job Ads

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**Abstract.** Software engineering (SE) profession requires various technical and non-technical skills. The skills required are influenced by the changes in the field, industry, and global trends. The changes are also reflected in the recruitment. To understand the current situation and expectations from jobseekers, this study investigates how language, intercultural, and communication skills are presented in the job ads applicable to junior software engineers. The study is based on job ads published in the Vacancies job seeking service maintained by Public Employment and Business Service in Finland. Data contained 166 job ads of which 60% were published in Finnish and 40% in English. Data analysis was based on content and thematic analysis. Based on the job ads, language, both Finnish and English, and communication skills were largely presented and required from junior software engineers, but intercultural skills and multiculturalism were almost missing. The job ads described a multifaceted, multidisciplinary communication environment where junior software engineers work. Moreover, Finnish SE labor markets have needs for fluent Finnish and English speakers; Finnish SE working environment is almost bilingual in practice. Intercultural aspects of communication were not generally visible. The peculiarities of intercultural communication are either not understood or not been aware of in designing the job ads. Moreover, the language of the ad indicates the needs and awareness. The job ads written in English highlight English skills, present Finnish skills mainly as an advantage, and emphasize communication and intercultural skills.

**Keywords:** Software engineering · Junior software engineer · Job ads · Skill requirements · Language proficiency · Communication · Multiculturalism

## 1 Introduction

Software engineering (SE) profession requires various technical and non-technical knowledge and skills. Those skills are expected from the jobseekers when they are applying for jobs and hired by companies. The knowledge and skills should be taught, learned, and practiced in SE education.

SE discipline is international, and very often SE work is conducted in international teams. English is the de facto language. In many countries, such as in Finland, significant

part of employees is non-Finnish, and foreign SE professionals are needed and required, also due to skilled labor shortage.

In addition to the technical knowledge and skills, also other non-technical skills are essential in SE. These skills have been characterized in SWEBOK V3.0 [1] that contains knowledge areas significant to SE professionals. Professional Practice is one of the knowledge areas and contains Communication Skills. Non-technical skills are often referred as “soft skills”.

To understand the current situation what expectations SE companies and other organizations have for language, intercultural, and communication skills and what skills jobseekers should possess and demonstrate when looking for a job, and have acquired during education, job ads targeted for junior software engineers were studied.

This study is based on online job ads applicable to junior software engineers. The job ads present skills and knowledge areas that are desired and required from graduates and other novice software engineers and what kind of communicative working environment these junior software engineers are hired for. This paper, especially, aims to specify the content and scope of the necessary language, intercultural, and communication skills required from junior software engineers.

As the SE working environment and its requirements are changing, there is a need to understand the current skill requirements set for junior software engineers and increase general understanding of the nature of communicative environmental factors considered relevant in SE organizations in present day. This is especially relevant from the perspective of graduates and other novice software engineers seeking and recruited to open SE jobs. Better understanding of the current communication skills requirements can also be utilized in revising and improving SE education.

The rest of the paper is organized as follows. Section 2 reviews related work on language, intercultural, and communication skills relevant to SE as well as skill identification based on job ads. Section 3 describes the research questions, data collection process, and data analysis. Section 4 presents the results of the study. In Sect. 5, the results obtained are discussed and compared with those found in previous studies. Section 6 discusses validity issues, and Sect. 7 concludes this article and gives an outline of future work.

## 2 Related Work

To succeed at work, a SE professional needs various language, intercultural, and communication skills. Studying skill requirements is possible using job ads and skill count, a skill identification method, to increase the understanding of the nature of essential communication skills.

### 2.1 SE Professional Communication Skills

Software engineers' work, characterized in SWEBOK [1], contains different software-related practices from software construction and processes to software quality, economics, and other foundations. Dealing with communication-related issues, SWEBOK highlights that SE professionals must possess skills to be able to work with others,

both internally in teams and with customers and other stakeholders also in multidisciplinary environments. SWEBOK also highlights team members' tolerance, and rules and their dependence on societal norms. Moreover, pure communication skills enable clear understanding between a software engineer and customers, supervisors, coworkers, and suppliers. Effective communication covers face-to-face meetings and written communication such as documentation, emails, and collaboration tools. [1] Software engineers are required a variety of skills and knowledge to succeed in the field.

The role of soft skills has been emphasized, for instance in SWEBOS [2] that highlighted that soft skills are equally important as technical knowledge, because software is developed in teams and software engineers need to interact with each other and various stakeholders. SWEBOS highlights issues such as cooperation, willingness to communicate even across disciplinary boundaries, presenting ideas, and respect. [2] Furthermore, even if technical skills can be regarded as a prerequisite in IT industry, soft skills can bring commercial benefits: soft skills enable faster staff integration and happier, more productive teams. Moreover, soft skills are vital in creating relationships and building customer trust. IT industry calls for communication and interpersonal skills, and teamwork [3] which belong also to the most valued soft skills in SE along with analytic & problem-solving, commitment & responsibility, and eagerness to learn [4].

**English Skills.** English is used as a lingua franca in ICT and very often English is the main or one of the working languages in software companies. The importance of English proficiency appears generally in the industry of IT and Computer Services [5]: 73% of the employers in countries or territories where English is not an official language, stated that English is significant for their organization. Reading was the most important skill, followed by speaking, listening, and writing.

The importance of English proficiency is, naturally, emphasized when moving from a domestic environment to a more international environment i.e. when changing from a native language to a foreign language. Proficiency presupposes the understanding and use of English of a professionally oriented domain to a necessary level [6]. Despite the official working language(s), also other languages can be used in various contexts.

**Intercultural Skills.** While working together with practitioners of different cultural origins, a software engineer needs intercultural skills, where intercultural communication is regarded as interaction with people from different cultural backgrounds [7]. Cultural sensitivity plays a role at the workplace, along with linguistic matters [8].

Cultural sensitivity is significant when people from different cultural backgrounds collaborate. Business and social etiquette, meeting protocols, formality and rituals, orientation to time, communication style, working methods, and decision-making process are good examples demonstrating cultural differences that can be faced in international SE. Moreover, the actions influenced by cross-cultural matters can be carried out both online and onsite via emails and online meetings, as well as in face-to-face meetings. [9] Culture is an omnipresent part of any communication activity [10].

**Communication Skills.** A software engineer needs communication skills that are essential for personal but also for company success [11]. From the perspective of an

organization, an employee needs organizational communication skills enabling interaction with a larger, external environment. Interpersonal communication skills are essential when two or more people exchange thoughts in face-to-face contexts. [12] These skills are significant for software engineers, who collaborate with people within and outside of their teams. Software engineers collaborate mostly with other software engineers, both on their team and other teams, but collaboration rates can also be high with engineering and project managers as well as scientists outside of the team and operations specialists of business and service operations. [13] Software developers can spend even 45% of their time collaborating with their colleagues [14].

Communication can, in fact, be regarded as one of the critical success factors for software projects. Failure in communication can prevent a team from achieving progress in a project. Communication as a success factor covers project communication, leadership, relationship between users and staff, ambiguity reduction, and stability maximization. The centrality of communication becomes evident because communication factors have impacts on other success factors such as team, technical, organizational, environmental, and product and project management. Moreover, the success of the project can depend on more elementary tasks such as user and customer involvement, documentation, team capability and competence, teamwork, selection of the right project team, personnel recruitment, progress meetings, project review, feedback, and well-defined project requirements. [15] Software development productivity can be extended by skills and competences, team cohesion, collaboration among team members, ease of communication, work environment regarding collaborative work and software processes, and stakeholder participation [16].

A software engineer's communication toolbox covers a broad range of interpersonal, professional, and team communication skills. Vital skills in SE could contain communication design, explaining, discussions, receiving communication, sharing information, nonverbal communication, usage of forms and tools, and presentations [17] as well as questioning, reinforcement, self-disclosure, listening, humor and laughter, and persuasion [18]. A software engineer's "career success is affected by the ability to consistently provide oral and written communication effectively and on time" [1]. Also, other studies have stressed the importance of written and verbal communication [19].

Communication is a significant part of collaboration. In fact, communication is one of the six facets in teamwork quality, covering the frequency of communication or time spent on communication, ways of formal and informal communication, directness of communication between team members, and openness in information sharing [20].

## 2.2 Skill Identification in Job Ads

"A job posting, also known as a job ad, is an announcement that informs people that a certain job position is available. This announcement is written, generally in an engaging tone, and describes the job position. It has a title and a description. The description provides details about the position, including skill requirements." [21].

Skill count is one of four methods identified for skill identification from job ads. It is regarded as the most reliable and the most popular method for skill identification and is based on manual reading. Job ads are labelled and tagged manually with 0/1, to count

the skills for statistical analysis. Skill counts can be based on skill bases using a defined list of skills, or alternatively, skill count methods can be used without skill bases relying on expert judgments. Other skill identification methods comprise topic modelling, skill embedding, and machine learning techniques. [21].

Skill identification can be based on three approaches. Skills can be identified as single words or multi-word phrases, skills expressed in sentences, and, thirdly, as their combinations. These methods can be used for many purposes such as skill extraction and job market analysis, curricula development, skill mismatch and alignment, competitive intelligence and talent search, and skill demand prediction. [21].

Various skill identification methods have been used before to identify in-demand job roles [3, 22, 23] but also knowledge and skills. Knowledge and skills required by software development industry including technical and non-technical skills revealed that communication skills were the most often demanded topic. Also, teamwork skills were significant along other identified topics: education, experience, technical skills, and knowledge. [22] A corresponding study on SE labor market revealed that communication skills are the most demanded soft skill, followed by teamwork, management skills, writing skills, leadership, and problem solving [24]. The results from similar studies [23, 25, 26] regarding communication-related topics were collected to Table 1. It is, however, important to notice that the skill bases were different in various studies.

**Table 1.** Skills identified on the job ads by their appearance.

Year (field)	2017 (RE) [26]	2018 (SD) [23]	2013 (SE) [25]
	%		
Communication skills	56	31	13
Interpersonal skills		8	15
English skills	41	36	65
Local native language	65		4
Other languages	9		

As Table 1 shows, there are considerable variations in rates, for instance in communication and local native skills. Identified communication skills requirements varied between 28% and 56%, including interpersonal skills. Local native skills were required only in the RE study [26] by 65%. English skills’ appearance varied from 36% to 65%.

Job ads are different and the number of references to non-technical skills can vary. Based on the previous studies, it seems that soft skills play a significant role in job ads: soft skills were mentioned in 72% [25] or 86% of the job ads [26]. Moreover, about 60% of the employers were looking for two or more soft skills [3].

### 3 Methodology

This study aims to explore junior software engineers' employability-related language, intercultural, and communication skills requirements in SE. The study is reviewing the skills sought by companies based on the job ads. The ads reveal aspects of the employers, workplaces, and positions as well as needs, skill requirements, and working environment. The job ads describe the relevant issues employers consider important as well as indicate what kind of working environment the jobseekers are hired for. The ads are regarded to describe the requirements set for junior software engineers in job seeking.

#### 3.1 Goals and Research Questions

For the purpose to investigate how language, intercultural, and communication skills are presented in the job ads applicable to junior software engineers, the following research questions (RQ) were formulated:

1. What language, intercultural, and communication skills are required from a junior software engineer?
2. How is the communicative working environment characterized?

These research questions belong partly together, providing both quantitative and qualitative views on the studied skill areas. Whereas RQ1 focuses mainly quantitatively on the skill requirements of all the studied skill areas, RQ2 concentrates more on qualitative working environment descriptions of communication and collaboration aspects.

#### 3.2 Data Collection

Data for this study has been collected from the job ads published either in Finnish or in English in the TE Offices' Vacancies job seeking service maintained by Public Employment and Business Service in Finland during 27.1.-11.3.2022. Job ads were searched by various Finnish and English keywords referring to SE positions: software engineer, software developer, software designer, back-end developer, front-end developer, full stack developer, and web developer as well as their Finnish counterparts, considering subtle differences in their spelling.

The applicability of the job ad to this study was proved by reading. All the job ads outside the field of SE were excluded. Also, web developers who only create content for websites, without SE-related practices, were excluded.

The main inclusion criterion contained the requirement of having a job title listed above. At this phase, the job titles with developer, engineer or designer endings specified with a different technical prefix without the term 'software', 'back-end', 'front-end', 'full stack', or 'web' were disregarded.

Next, each job ad was inspected by reading, and thus, according to the second-level criteria, a position had to be permanent, or harnessed with a possibility of permanence, and applicable to junior software engineers. All the senior and expert level job ads were excluded, either based on the expert or senior term in the job title or secondly, based on

a clearly specified requirement in the job description that the job was directed for more experienced jobseekers, either having at least three years' work experience or otherwise expert-level competence. Based on the inclusion criterion, a position is applicable to a junior if it is applicable to a jobseeker with work experience less than three years. The difficulty of the job position was not judged based on the presented job tasks for the inclusion purposes.

Lastly, all the summer job and trainee positions were excluded, as well as the SE positions overseas. Also, identical copies of the ads, published by the same employer, were excluded.

### 3.3 Data Analysis

The analysis of 166 job ads was based on content and thematic analysis. All the job ads were read and analyzed thoroughly two to four times for coding purposes. Manual coding was based on linguistic, cultural, and communicative elements, arising from both the skill requirements and working environment descriptions. The first rounds of analysis were conducted during the data collection process.

The codes covered the language of the ad, job title, skill requirements and working environmental descriptions for languages, multiculturalism, communication, and collaboration issues. The coding was conducted for two purposes: to enable skill identification and calculation of relative proportions and to uncover working environmental issues. Skill identification was based on judgments and manual labeling. The skills were counted, and statistical content analysis was performed, similarly to other calculations of relative proportions.

Skill identification was based on exact matches of skills in terms of exact names of the skill, the alternate labels, or aliases of the skills. The skill requirements were described as single words, multi-word phrases, and sentences. Importantly, this study separated skill requirements from the working environment descriptions, and only clear requirements were counted as requirements for the job. Judgments were also based on the location of the phrase in the job ad in relation to other requirements. Often, skill requirements were given as a list.

Generally, the analysis relied on skill identification and calculation of relative proportions with the support of qualitative descriptions. In addition to percentages, the study aimed to describe communicative working environment junior software engineers are hired for.

The conclusions drawn are based on the occurrences of the skill requirements and working environment descriptions in the ads. If an issue is mentioned in the job ad, then it is regarded as important for the job. All the findings, classifications, and comparisons made in the study are based on the occurrences of the issues. On the other hand, if an issue is omitted, it is not assumed to be insignificant for the job.

Data analysis was based on content and thematic analysis. The coding was conducted using NVivo, based on codes and case classifications. Later, data was exported to MS Excel, by copying code references and crosstab query results, to enable, first, analysis of the contents of the themes, and second, a statistical analysis using IBM SPSS Statistics. Originally the data collected for this study is bilingual. For reporting purposes, the job titles and extracts from the job ads written in Finnish were translated into English.

## 4 Research Results

Data chosen for this study contains 166 SE-related job ads published in Finland of which 60% were written in Finnish and 40% were written in English. Of the ads written in Finnish ( $n = 99$ ), 33 had an English job title and 3 both English and Finnish titles. Correspondingly, 1 of the ads written in English ( $n = 67$ ) had a Finnish job title and 4 job ads contained both Finnish and English titles. The job ads comprised various software engineer professional titles, as shown in Table 2.

**Table 2.** Job titles ( $n = 166$ )

Job title	%
Software Developer, Software Engineer, Software Designer	60
Junior Frontend, Backend, Full Stack, Software, Web Developer	13
Full Stack Developer	8
Frontend Developer	7
Web Developer	4
Backend Developer	4
Front-end/Back-End/Full Stack Developer (combinations)	3
Total	100

Most of the ads (60%) were looking for various software developers, engineers, and designers. The term ‘Junior’ was included in 13% of the job titles. Otherwise, the job titles contained a variety of different frontend, backend, full stack, and web developers.

### 4.1 Language Skills

Language skills requirements were presented in the job ads as clear demands, but also as the needs described more specifically. Along with clear language skills requirements, also the language of the job ad hints language needs: 40% of the ads were written in English.

Of all the job ads, 59% were looking for software engineers possessing English and 42% Finnish skills. Moreover, 4% of the ads contained requirements for other languages: 4 referred to Swedish, another domestic language in Finland, 2 to German, and 1 to multilingualism in general. Table 3 shows what kind of language skills combinations were presented in the job ads.

As Table 3 shows, employers’ language skills requirements were mainly split in three main trends. Whereas one third of the employers (30%) required both English and Finnish skills, almost one third (26%) required only English, and lastly, one third



(31%) required no language skills at all. Additionally, the requirement of Finnish skills occurred rarely on its own. Eventually, 69% of the job ads were looking for at least one language skill.

**Table 3.** Language skills requirements (n = 166)

Skill	%
Both English skills and Finnish skills	30
Only English skills	26
Only Finnish skills	8
English, Finnish, and other language skills	3
Only other language or multilingualism	1
No language skills requirements	31
Total	100

The requirements for English skills were typically presented as list items in the job ads, as follows: “Fluency in English”, “Excellent written and spoken communication skills in English”, or “Full professional proficiency in English”. Rather often, the requirement of English was specified, and connected to written (32%), verbal (31%), or communication skills (19%). Moreover, 62% of the job ads demanding English skills required fluency or excellent skill level. Sometimes, the specified requirement was connected to the situations where English is necessary such as English as a working language, test documents written in English, or need for technical English. Here, 4 of the ads described that English is used as a working language.

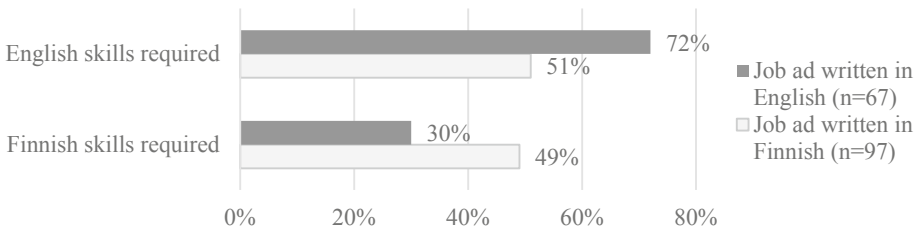
Finnish skills were required similarly to English, despite that 23% of the ads demanding Finnish skills described that Finnish skills are seen as an advantage, not mandatory for the job, as seen in the following extracts: “Finnish language skills are seen as an advantage” or “Fluent in either Finnish or English”. Especially, the job ads written in English who demanded Finnish skills stated that proficiency in Finnish is not a prerequisite for the job, but a nice bonus, plus, or an advantage. In fact, almost three fourths (71%) of the job ads written in English considered demanded Finnish skills as an advantage, hinting that the job ads written in English seem partly to be targeted for non-Finnish speaking jobseekers. In Finnish, this was not expressed in the same way: only 1 job ad written in Finnish described Finnish skills as an asset. Of the job ads demanding Finnish skills, 54% demanded fluent or excellent skill level.

Considering the different language skills requirements, 2 job ads demanded fluency either in Finnish or English, in addition to that one job ad presented that some of the projects require fluent Finnish, unlike most projects; then, fluent English would be enough. The requirement of Finnish skills in a few job ads was established on the use of Finnish as a working language with customers.

**Language Skills Requirements by the Language of the Job Ad.** Presuming that the language of the job ad indicates language skills requirements, Finnish job markets have

needs for both Finnish-speaking and English-speaking software engineers. The main emphasis based on the language of the ad seems to be in the Finnish language, because 60% of the job ads were published in Finnish. On the other hand, a high rate of the job ads published in English (40%) indicates a rather significant role of the English language in the Finnish job markets.

Secondly, also clearly presented language skills requirements indicate language needs. The impact of the language of the job ad on requirements is presented in Fig. 1.



**Fig. 1.** Impact of the language of the job ad on language skills requirements

As Fig. 1 shows, the job ads written in both languages required more English than Finnish skills even though the difference between languages is clear. Of the job ads written in English, even 72% demanded English skills and 30% Finnish skills, whereas 51% of the job ads written in Finnish demanded English and 49% Finnish skills. The job ads written in English required noticeably more English than Finnish, in contrast to the ads written in Finnish whose requirements for English and Finnish were almost equal.

This figure reveals that the language of the job ad is associated with language skills requirements. English skills are required relatively more by the ads written in English and Finnish required more by the ads written in Finnish. Eventually, 75% of the ads written in English and 65% of the ads written in Finnish required at least one language skill. The job ads written in English required more language skills than the ads written in Finnish.

## 4.2 Intercultural Skills

The role of intercultural skills in the job ads was assessed both by skill requirements and working environmental descriptions, in terms of demands for intercultural skills and descriptions of multiculturalism.

First, intercultural skills were referred in 4 of 166 job ads (2%), including requirements that a jobseeker is expected to demonstrate the “ability to work in Finnish and international networks” or must be “well-suited for an international work environment”. Only 1 of the job ads contained a clear requirement for intercultural communication skills: “We expect you to be a professional – who is comfortable in communicating with different people with different backgrounds and cultures.” Three of these four job ads demanding intercultural skills were written in English.

Secondly, multiculturalism appeared in 7% of the job ads, according to working environment descriptions. Only 4 job ads described their workplace as “a multicultural

organization”, “an international, diverse, and sociable workplace”, or a diverse community. These job ads described how they value or aim to promote diversity, or provide “equal opportunities regardless of national origin”, and they do not “discriminate on the basis of race, religion, color, or national origin”. A job ad referred to “the right mix of people with diverse backgrounds, personalities, skills, and perspectives” by striving that “people of all backgrounds are treated equally, respected, and valued for who they are.” Some job ads described that practices and methods used in projects vary by extremely diverse clients.

### 4.3 Communication Skills

Communication skills were already referred tangentially in company with language and intercultural skills requirements. As examined separately, communication issues appeared in many ways in the job ads. Skills requirements are presented in Table 4.

**Table 4.** Communication skills requirements (n = 166)

Skill	%
Communication skills	24
People/Social skills	8
Documentation skills	7
Interaction skills	4
Reporting skills	2

Of the job ads, 24% demanded communication skills, most of which were defined by a level such as good, great, or excellent. Moreover, some job ads specified demands for documentation (7%) and reporting (2%) skills, as well as customer and end user communication skills – also with non-technical persons, ability to bring up own viewpoints, receive feedback from experts, and courage to ask for help. Interaction skills were separately required by 4% of the job ads. Communication skills requirements were presented more by ads written in English (36%) than ads written in Finnish (16%).

People or social skills were demanded by 8% of the job ads of which one fourth referred directly to people or social skills. Other job ads described various characteristics a jobseeker should have such as outgoingness, caringness, outspokenness, and kindness, in addition to that some ads were just looking for nice persons and chaps.

The job ads contained a plenty of communication-related issues when the attention was shifted from skill requirements to working environmental descriptions. Based on these descriptions, a software engineer must cope with rather diverse communication situations at work. The job ads elucidate how software engineers are encouraged to share thoughts, opinions, and viewpoints, suggest solutions, participate in decision making, influence, and ask for help. More specifically software engineers need to innovate, brainstorm, discuss, share information and expertise, guide others, handle problems, and receive feedback.

Software engineers seem to ‘work alongside customers’ or closely with end users, but also with industrial leaders, manufacturers, technology partners, subcontractors, suppliers, and authorities as well as other internal customers and stakeholders. Software engineers’ work includes encounters with rather diverse people occupying various roles, hinting at the diversity of communication situations in the working environment.

The investigation of communication skills raised the viewpoint of interrelatedness between communication and collaboration/teamwork. Based on the job ads, a software engineer collaborates closely with different professionals, such as product owners, Scrum Masters, team leads, customers and other developers in addition to different system analysts, developers, testers, application specialists, DevOps engineers, engineering leads, designers, hardware engineers, architects, UI/UX designers, security and network experts, project managers, quality assurance, R & D, product management, business operations, production, sales, marketing, service managers, graphics professionals, content creators, founders, and other experts. Collaboration with multidisciplinary actors set additional challenges for communication skills.

## 5 Discussion

This job ad-based study focused on junior software engineers’ language, intercultural, and communication skills requirements, regarding differences based on the choice of the language of the job ad. The study aimed at exploring what skills employers present in the job ads indicating the skills demanded from the junior software engineers. The attention was also drawn to communicative working environment to describe what kind of working environment junior software engineers are hired for.

Qualitative data analysis using both content and thematic analysis for the purposes of relative proportions and qualitative descriptions turned out to be a good choice. Percentages, supported by working environment descriptions, offered a comprehensive view on the studied issues.

### 5.1 RQ1: What Language, Intercultural, and Communication Skills are Required from a Junior Software Engineer?

Regarding the role English plays in the global settings, this study confirms that English plays a significant role in SE and in Finnish SE labor markets. In addition to that 40% of the ads were written in English and that 36% of the ads written in Finnish have an English job title, English skills were mentioned as a requirement for the job in 59% of the job ads. This result seems to be in line with previous studies, 41% in [26], 36% in [23], and 65% in [25]. Rather often (62%) these demands for English were specified with the demand of fluency or the excellent skill level.

Local native language skills (Finnish) were required by almost half of the ads (42%), deviating from 65% in RE [26]. Although it seems that Finnish skills are significant, a remarkable part of these Finnish skills requirements, especially in the job ads written in English, regarded Finnish skills as an advantage, not as a requirement for the job, indicating the position to be open also for international jobseekers. Otherwise, the significance of Finnish skills appears in the job ads of which 60% were written in Finnish.

Intercultural skills requirements were almost missing. Surprisingly, only 2% of the job ads demanded intercultural skills, although the English language and its clear role in the ads could be seen as a reference to more intercultural working environment. It seems that awareness of the specificity of intercultural skills in the workplace is either rather low or that job ads just neglect intercultural skills. Previous job ad studies disregarded intercultural skills requirements – perhaps because they were not presented.

The greatest variation occurred in the ways how communication skills requirements were presented in the job ads. Communication skills were required but the need and the way how they were presented dispersed considerably. Communication (24%), documentation (7%), interaction (4%), and reporting (2%) skill requirements were extended by a set of specific skills. In the light of figures, this result corresponds the previous studies, 13% in [25] and 56% in [26].

This study shows that language and communication skills requirements are reasonably presented in the job ads, but intercultural skills requirements are almost missing.

## 5.2 RQ2: How is the Communicative Working Environment Characterized?

The job ads present SE working environment as multidisciplinary where junior software engineers communicate and collaborate with numerous parties, with team members, customers, and other stakeholders. The working environment requires a jobseeker to master a multifaceted variety of diverse communication situations. These numerous communicative situations – including, for instance, information sharing, decision making, brainstorming, discussing, and guidance – pose challenges for junior software engineers and their skill acquisition. Communication environment seems to be similar to [17]. This study confirms that software engineers deal with rather diverse people with whom they communicate and cooperate [13].

Multicultural aspect was almost disregarded in working environment descriptions. Only a minor part (7%) of the job ads referred to a multicultural working environment. These sparse descriptions referred either to a multicultural or diverse workplace, or respect for others regardless of origin.

High skill requirements for English and the number of job ads published in English implies that proficiency in English is significant and English is used for communication at work. Moreover, communication and multicultural aspects were emphasized in the ads published in English. It seems that the employer who writes a job ad in English is more aware of language, communication, and intercultural issues.

## 6 Validity Discussion

Data collection for this study took place on TE Offices' Vacancies online service that can still be regarded as one of the useful recruitment channels in Finland. Although job change can take place via other channels, too, and all open positions cannot be analyzed, the data source can be expected to provide relatively unbiased view of open job positions in Finland. The study could be replicated in other countries.

This study paid special attention to the selection of data. To reduce the dependence of the choice of the ad on the researcher, clear inclusion and exclusion criteria were created and applied. The inclusion was confirmed by thorough consideration of criteria.

Although analysis is based on free-form job descriptions different in length, content, and style, the language used in the job ads is primarily clear and concise. Despite that requirements are described in many ways, the information given should produce the same meaning for everyone. Special attention was drawn to the difference between skills requirements and working environment descriptions. The requirements specify what skills are expected from software engineers whereas descriptions of working environment describe where software engineers work. These two approaches support each other. Coding was conducted carefully and confirmed by re-reading by the same person.

The reasonable number of the job ads, 166, enabled both quantitative content analysis for skill identification and qualitative thematic analysis for working environment descriptions. The analysis was based on the job ads written in Finnish and in English. The extracts of the job ads written in Finnish were translated into English for reporting purposes. A special attention was paid on subtle differences in some of the concepts and translations from Finnish into English due to linguistic differences. The extracts were chosen with care, to preserve the original message.

The study relies on the job ads used to investigate the requirements set for junior software engineers. The results are based on the occurrences of the issues in the job ads even if the absence does not make an issue insignificant for the job. The job ads enable interpretations from many perspectives such as employers, workplace needs, job positions, and skill requirements, albeit jobseekers' perspective is the most significant.

The results can be regarded valid in Finland and could be generalized to the countries having rather similar linguistic and cultural environment. Generalization to English-speaking countries or the countries having remarkably greater multiculturalism and foreign population is controversial. Finnish working environment is characterized by the difficult Finnish language and relatively small proportion of foreign population.

## 7 Conclusions and Future Research Work

This study focused on junior software engineers' language, intercultural, and communication skills requirements, to explore the skills employers present in the job ads. The attention was also drawn to communicative working environment to describe what kind of working environment software engineers are hired for.

This study highlighted English skills and a multifaceted communication environment where software engineers collaborate with various parties. Communication skills were clearly visible in the job ads, referring to communication at work, as well as communication needs with various stakeholders and within the team. Software engineers' working environment is multidisciplinary. Labor markets have needs for skilled communicators and collaborators. Lack of communication and language skills weaken opportunities in job seeking.

The partition of language issues implies that Finnish SE working environment is almost bilingual in practice. Finnish SE labor markets seeks employees by publishing job ads in Finnish and in English with high rates for proficiency in English and moderate

proficiency in Finnish. Finnish SE labor markets have needs for fluent Finnish and English speakers.

Intercultural aspects of communication were not, in any case, generally visible. The peculiarities and specific aspects of intercultural communication are either not understood or not been aware of in designing the job ads.

Moreover, the language of the job ad indicates the needs. The ads written in English highlight proficiency in English and presents Finnish skills as an advantage for the job. Also, communication and intercultural skills were emphasized in the ads written in English. The employer who writes a job ad in English is more aware of language, communication, and intercultural issues. Respectively, the ads written in Finnish regard English and Finnish skills as important; Finnish skills are regarded more important in the ads written in Finnish than in the ads written in English. There is no need for other languages in Finnish SE labor markets.

The study revealed that language and communication -related expectations are widely presented in the job ads. However, it was observed that, despite of the language requirements, other intercultural communication aspects are not explicated in the ads. This is an aspect that would require further research, to explore and explain the reasons for it: whether this aspect is just not well-understood by the employers or missed in the job ads. Moreover, internationality aspects, qualification requirements, and teamwork, which is culture-specific, would require further research and deeper investigation. The study of these questions would require going beyond the job ad analysis and going into companies to study the understanding of intercultural communication issues. In addition, an analysis of SE education would, possibly, be necessary, to understand how these aspects are considered in education.

This single study could be replicated in other countries where similar comparisons between job ads written in different languages could be made.

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