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**An Examination of Challenges and Readiness  
Among Computer Science Students Pursuing  
Industry Internships**

Bachelor's Thesis (9 ECTS)

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# **An Examination of Challenges and Readiness Among Computer Science Students Pursuing Industry Internships**

## **Abstract:**

Estonia is internationally recognized for its strong information technology sector and digital leadership. To keep the sector evolving, it is essential to integrate the next generation into the professional workflow. Internships can serve as a link between academic studies and real-world industry, offering students their first practical experience in the field. This bachelor's thesis investigates the challenges faced by computer science students in securing internship positions and explores how companies evaluate internship candidates. The study is based on data from three data sources: a student questionnaire, a company questionnaire, and an analysis of internship advertisements. The results show that while students often perceive lack of experience as the main barrier, companies place more importance on motivation, communication skills, and basic technical knowledge. The thesis concludes with recommendations for universities on how to better support students in becoming internship-ready.

**Keywords:** internship, computer science

**CERCS:** P170 Computer Science; S212 Sociology of Enterprise

## **Informaatika üliõpilaste väljakutsed ja valmisolek IT-sektori praktikaks**

### **Lühikokkuvõte:**

Eesti on rahvusvaheliselt tuntud oma tugeva infotehnoloogia sektori ja eduka digitaliseerimise poolest. Selle valdkonna pidev areng eeldab uue põlvkonna sujuvat kaasamist tööturul. Praktika on seejuures oluline vaheetapp akadeemiliste õpingute ja reaalse tööturu vahel, pakkudes üliõpilastele esimese praktilise kokkupuute erialase tööga.

Selleks, et rohkem üliõpilasi leiaksid praktikakohti, on oluline uurida, mis on valukohad selles protsessis. Käesoleva bakalaureusetöö eesmärgiks on uurida neid väljakutseid üliõpilaste ning ettevõtete vaatepunktist. Uuring tugineb kolmele andmeallikale: üliõpilaste küsitlusele, ettevõtete küsitlusele ja praktikakuulutuste analüüsile. Tulemused näitavad, et kuigi üliõpilased tajuvad peamiseks takistuseks kogemuste puudumist, peavad ettevõtted

olulisemaks motivatsiooni, suhtlemisoskust ja baastadmisi tehnoloogiavaldkonnas. Töö lõpeb soovitustega ülikoolidele, kuidas paremini toetada üliõpilasi praktikaks ettevalmistumisel.

**Võtmesõnad:** praktika, arvutiteadus

**CERCS:** P170 Arvutiteadus; S212 Tööjõu- ja ettevõtlussotsioloogia

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## Introduction

Estonia is widely recognised as a digital-first society. It is a country which attracts entrepreneurs, IT professionals, and digital nomads, providing an excellent stage for innovative technology startups, many of which have the potential to become unicorns. Given this context, computer science has become one of the most popular fields of study among students [18]. Academic knowledge alone is not enough to develop into a competent professional. Real-world practice opportunities are essential for students to build strong technical foundations and valuable interpersonal skills [16].

Internships play a central role in this process [29]. These programs allow students to apply their classroom academic knowledge in professional environments. Allowing them to experience industry workflows and gain clarity about their future career paths. However, not all students secure internship placements despite Estonia's strong technology sector and computer science education. According to the survey conducted for this thesis, only 40.9% of students who have applied for internships actually managed to get an offer. The reasons for this vary - from limited practical experience and lack of confidence, to challenges in self-presentation, few available positions, or difficulties navigating the application process. While the value of internships is acknowledged, less attention has been given to why students struggle to gain internship access. This thesis aims to explore and analyse the challenges students face entering the workforce and whether industry reflects those.

The main goal of this thesis is to examine the challenges and readiness of computer science students pursuing industry internships. It aims to identify key barriers students report and the actual skill sets industry expects from internship candidates. In addition, there is a particular time frame when students and companies are interested in internship programs.

The thesis starts with a literature review, which helps to provide a general overview of already known issues. It is followed by an overview of methodology, where the structure of the conducted surveys is described. In total, the problem was searched from three different angles. Firstly, by asking the students' side. Then, a questionnaire is performed to get industry insights. Finally, the study analysed twelve internship position advertisements to find the most commonly wanted skill patterns. After the survey results and advertisement analysis are presented, key research findings are highlighted and compared with insights from the theoretical framework. The discussion also includes practical suggestions for universities and

students to help them navigate the internship process better. Finally, the thesis acknowledges limitations and suggests new directions for future improvements and research.

# 1. Background

## 1.1 The Role of Internships in Career Development

Internships are crucial in helping computer science (CS) students prepare for future careers. They offer structured opportunities to bridge academic learning with professional realities [4]. They do more than enhance resumes - they help students grow confidence, clarify career paths, and build the soft and technical skills needed for success in the industry [2]. In short, internship programs are a critical link between the theoretical academic world and practical professional employment [14].

This idea is also reflected by the ACM/IEEE Computer Science Curricula 2023, which was developed by the world's largest educational and scientific society, the Association for Computing Machinery (ACM). While the curriculum does not explicitly mandate internships, it strongly encourages institutions to provide students with real-world engagements to develop professional competencies, such as teamwork, ethical decision-making, and communication [5].

Internships offer much more than a temporary position. During internships, students actively contribute to real-world teams and projects, giving them much-needed confidence in upcoming professional careers [14]. It is a platform to apply their classroom knowledge in professional industry workflows, increasing students' self-efficacy [27]. In that sense, internships act as learning platforms. For the first time, many students can see and feel the relevance of their academic studies in real-world settings [30]. According to 600 software engineers, internships are vital for cultivating organisational awareness, project collaboration, and time management [3].

Kapoor and Gardner-McCune [14] conducted a multi-institutional study of 536 computer science undergraduates to explore further the impact internships have on students. Their research reveals that students who participate in internships are more likely to engage in co-curricular activities. Such as short hackathons, to put their technical skills to the test, develop stronger problem-solving skills, and enhance their networking abilities, which helps students' communication skills [14].

Moreover, internships are instrumental in enhancing students' career readiness and long-term employability. Firstly, students might gain clarity in career direction [16]. Internships allow

students to test out what it means to work in the field they study [16]. Even internships that involve repetitive or routine tasks can have value, as they help students recognise what types of work environments, roles, or industries they want to pursue or avoid [16]. From the employer's perspective, internships serve as low-risk mechanisms for evaluating candidates' technical abilities, cultural fit, and willingness to learn. For instance, Swedbank's head, Grete Kotkas, noted that internships allow mutual evaluation between students and employers, with about one-third of interns securing full-time positions afterwards [19]. Similarly, Telia Eesti's HR Consultant, Liina Jutt, emphasised that internships provide real work experience, enhancing resumes and facilitating future job applications [19]. However, internships are not as widespread as one may expect, given their benefits. According to the Kapoor and Gardner-McCune study, there is a significant participation gap - only 57.5% of CS students had completed an internship by the end of their studies [14]. This indicates that while internships help students become more prepared for the workforce, a notable portion of graduates may miss out on this critical preparatory step.

Internships play a key role in developing employability skills, particularly in areas that traditional coursework often underemphasized. They provide more frequent feedback loops than students encounter in academic environments [30]. Projects usually involve code reviews, iterative testing, collaboration with stakeholders, and communication across functional teams, which means constant communication. Well-designed and structured internships improve interns' technical skills and help students learn from mistakes, ask better questions, and become more resilient contributors [30]. Another vital knowledge gain is networking [11]. Students build relationships with mentors, managers, and peers that often outlast the internship. These connections can lead to future job opportunities, references, or collaborative projects [11].

However, internship benefits are not just one-sided. They can also function as dynamic arenas for knowledge sharing between academia and industry [19]. Students come to industry with the most current academic theories, coding practices, and tools, giving industry new innovative perspectives [13]. In return, companies expose students to production workflows, domain-specific challenges, and tools that cannot be accessed in a classroom [13].

This alignment with industry is especially critical in software engineering, where tools, methodologies, and expectations evolve rapidly [2]. Generally, universities do not offer as large-scale projects as those in industry. This means that tools like CI/CD, version control

systems, and cloud-native technologies are rarely used on a small scale [2]. However, many entry-level jobs already expect some competence with Docker, Git, or AWS [2]. Internships and programs help close this gap by offering students an environment where these technologies are standard practice. In addition, universities can adjust their curricula by integrating relevant tools that students report into coursework to help future students be better prepared for industry [2].

Overall, internships are more than temporary work placements - they are essential developmental experiences that shape students into career-ready professionals. They boost confidence, refine career aspirations, strengthen workplace competencies, expand professional networks, and build bridges between universities and employers [13].

## **1.2 Applying Theoretical Knowledge in Practice**

Internships are playing a significant role in connecting the academic world with real-world experiences [8]. While university curricula often emphasize core concepts such as algorithms, data structures, and systems architecture, these are rarely sufficient on their own to prepare students for the complexities of modern industry work [20]. Internships allow students to gain practical experience they usually don't get in a regular classroom. This practical exposure allows students to apply theoretical knowledge in real-world scenarios, enhancing their understanding and ability to recall information [4].

This need for applied learning is echoed by Kapoor and Gardner-McCune, who describe internships as “authentic disciplinary experiences” that help students transition from knowledge consumers to capable contributors within industry settings [14]. Their study also shows that students who had completed internships were significantly more likely to engage in co-curricular activities such as hackathons or open-source work - suggesting that real-world experience not only deepens technical knowledge but also encourages proactive learning behaviors [14]. Classroom instruction often doesn't fully equip students with the interpersonal skills, organisational abilities, and time management techniques needed in actual software jobs. Internships help fill this gap, making them a necessary part of shaping well-rounded, job-ready graduates [3].

Internships also serve as testing grounds for the practical application of theoretical knowledge, particularly in settings that require interdisciplinary collaboration or role-specific

expertise. Even though students often excel at learning theoretical concepts like modelling and algorithms in class, many find it challenging to apply that knowledge in real-world areas such as finance or embedded systems [2]. This is particularly true for those without a computing background [2]. Internships offer a controlled yet authentic environment where students learn to navigate the nuances of industry tools, legacy systems, and organizational workflows. Students who have worked on various technical projects, like chatbots or analytics dashboards, have also gained a broader skill set and a better understanding of how theoretical topics are implemented in production environments [30].

Beyond technical competence, internships play a crucial role in developing the soft skills necessary to succeed in professional environments [3]. In contrast to academic assessments, which often provide delayed or abstract feedback, real-world settings offer continuous and immediate responses through code reviews, team retrospectives, and stakeholder interactions [6]. These feedback loops help students refine both their technical and interpersonal skills. For many students, this iterative process is where true learning takes place - each review or revision offers a new opportunity to reflect and grow [14].

Working within cross-functional teams also exposes students to challenges rarely simulated in academic settings [4]. Navigating ambiguity, changing priorities, and finding a balance between what's technically possible and what users want demands open-mindedness and good communication skills. Students must apply their theoretical knowledge and learn to explain, defend, and revise their decisions in a collaborative context [4]. As Liebenberg et al. emphasize, this type of exposure encourages the development of user-centered thinking and prepares students for the reality of software development work, where success depends as much on adaptability and teamwork as on clean code [20].

The importance of context cannot be overstated. According to Song and Runeson [26], meaningful learning happens when students are embedded in real systems and have access to relevant tools, workflows, and mentorship. Although their research focuses on academic-industry collaboration in software engineering research, the principles apply directly to internships. When students are given access to production environments and meaningful tasks, they begin to see how theory maps - or sometimes fails to map - onto practice [26]. This kind of awareness helps create a more realistic and grounded sense of professional work.

In essence, internships provide the bridge between abstract knowledge and practical expertise. They serve not only as extensions of academic learning but also as environments where students build confidence, develop communication and problem-solving skills, and gain clarity about their own strengths and career interests. By challenging students to think beyond the boundaries of a course syllabus and engage with real-world complexity, internships transform education into readiness [6]. For universities seeking to better align with industry needs, internships should not be viewed as optional or supplemental, but as essential parts of a well-rounded computer science education.

### **1.3 Industry Expectations**

A gap remains between what computer science students learn in academic programs and what the software industry expects of them during internships and early career roles [9]. While universities provide a strong foundation in theoretical subjects like algorithms, data structures, and system design, they often fall short in preparing students for the practical challenges of the actual industry workplace environment [20]. In contrast, the industry values hands-on experience and familiarity with collaborative workflows, deployment pipelines, and agile methodologies - skills that students frequently lack upon graduation [2]. Tools like Git, CI/CD, Docker, Kubernetes, and automated testing systems are widely used in professional contexts but remain underrepresented in university curricula, resulting in a persistent disconnect between the classroom and the workplace [9].

This discrepancy becomes particularly evident when students enter internships and encounter unfamiliar development processes, legacy systems, or the fast-paced expectations of production teams [30]. Interns often struggle not because they lack intelligence or motivation, but because they haven't previously operated in environments that reflect the realities of industry [14]. Employers note that students with prior experience - through open-source contributions, personal projects, or hackathons - tend to integrate more smoothly, adapt quicker, and require less supervision [14]. Structured internship programs that immerse students in end-to-end development workflows provide valuable exposure to practical skills like debugging, testing, using APIs, and managing code in shared repositories [20, 30].

Equally important is the ability to understand and align technical work with broader business and user needs. Industry feedback highlights a recurring challenge: many computing students lack contextual awareness and fail to grasp how their contributions affect user experience,

business operations, or long-term product goals [26]. This gap is especially visible in students' difficulty adjusting to shifting priorities or integrating customer feedback into their development process [3]. Internships help cultivate this awareness by embedding students into teams where they must balance technical execution with stakeholder expectations and evolving requirements [20, 26].

Communication skills remain one of the most emphasized soft skills across nearly every technical role [20]. In collaborative work settings, the ability to ask clarifying questions, document progress, explain decisions, and contribute to team discussions is vital [3, 30]. However, this is often an area where students are underprepared. Some interns avoid asking questions due to fear of seeming unqualified, that might be seen as disinterest [14]. Practitioners overwhelmingly agree that soft skills need stronger emphasis in university curricula. Akdur's 2022 study supports this, revealing that approximately 55% of respondents from the software industry strongly agreed and about 40% agreed that communication and teamwork skills are essential [2]. Students who demonstrate effective communication and emotional intelligence tend to perform better, integrate more seamlessly into teams, and build stronger relationships with mentors and stakeholders [30].

Interpersonal and collaborative skills also directly impact product outcomes. Miscommunication or poor teamwork can result in mismatched expectations, rework, and project delays [26]. Interns who can clearly explain their thinking, navigate technical choices, and adjust their methods based on feedback bring a lot more value to a team [20, 30]. Moreover, those who show confidence in presenting their work and engaging with non-technical colleagues are often seen as more mature and career-ready [26].

Beyond soft communication skills, the industry also values traits like self-direction, curiosity, and a willingness to learn [30]. Interns are rarely expected to know everything but are expected to demonstrate initiative, seek feedback, and take ownership of their learning process [14]. Those who embrace feedback and actively reflect on their performance tend to progress faster and make more meaningful contributions [3]. These behaviors align with what is often referred to as career agency - a proactive stance toward one's own development involving goal-setting, initiative, and continuous learning [26].

Adaptability is especially crucial in fast-paced tech environments. Interns frequently face rapidly changing priorities, unfamiliar codebases, and new tools or methodologies [2]. The

ability to adapt quickly without becoming overwhelmed is often the difference between thriving and merely surviving in an internship [20, 30]. Technical fluency is essential, but employers increasingly prioritise candidates who demonstrate resilience, flexibility, and the ability to adapt and learn quickly [26].

Exposure to real-world project work is another critical differentiator. When students are given responsibility for building actual features - such as designing APIs, implementing data pipelines, or contributing to frontend interfaces - they gain not only technical competence but also an understanding of how software is built and maintained in production environments [9, 30]. These projects foster ownership, accountability, and an appreciation of software lifecycle management that is hard to replicate in controlled classroom environments [14, 15].

Internships also provide access to professional tools and environments that students may not otherwise encounter in academic settings. Tools like automated monitoring systems, source control platforms, ticketing systems, and deployment pipelines are standard in the workplace but often omitted from coursework due to time or resource constraints [9]. This reinforces the importance of integrating internship experiences or similar practical exposure into the learning journey to help students become more aligned with professional expectations [20, 26].

Finally, employers frequently express concern about the onboarding burden they face when students enter the workforce without familiarity in key areas such as agile methodologies, collaboration platforms, or stakeholder engagement practices [2]. Interns who already understand how teams operate - who can participate in sprint planning, write documentation, or attend stand-ups with confidence - are more likely to succeed and less likely to require extensive supervision [14]. This reality underscores the need for universities to strengthen the connection between coursework and workplace readiness through hands-on learning experiences and stronger academic-industry partnerships [26]. Beyond theoretical proficiency, students are expected to demonstrate a blend of technical know-how, problem-solving ability, communication and collaboration skills, adaptability, and awareness of business contexts.

## **2. Methodology**

For gathering well-rounded information to answer research questions, three different approaches were taken. Firstly, a questionnaire for students was put together and promoted, in order to get students' point of view of the current job and internship market. Secondly, a questionnaire for tech companies was conducted, to get their input of what is important when hiring interns, which soft and technical skills are most valued. Lastly, an analysis of junior and internship advertisements was done, to get better input which skills are looked for in these positions.

### **2.1 Research Design for Students Questionnaire**

To gain students' perspective on finding an internship position, a questionnaire was initially distributed via students' group chats to bachelor's (BSc) and master's (MSc) programs across two universities, the University of Tartu and TalTech and additionally to current students of one-year programming school Kood/Jõhvi. The questionnaire was created using the Typeform platform [33], and the questions were in English. Later, the questionnaire was promoted at three job fairs: Delta Career Day [8] organised by the University of Tartu, Key to the Future Career Fair [34] arranged by the TalTech student council and Kood/JobFair [18] by Kood/Jõhvi. The questionnaire was shared with a QR code in the Pipedrive booth at all career fairs. The survey was open for answers between 19 December 2024 and 13 March 2025.

The survey comprised 26 questions (see Appendix I): 23 were multiple-choice and three were open-ended. Six of the multiple-choice questions allowed respondents to select more than one option, while the remaining 17 required a single answer. However, due to branching logic, no respondent answered all the questions. A branching logic was used to allow respondents to be directed to different sections based on their previous answers to ensure a more logical and personalised answering flow. The survey itself was structured into five sections:

1. Demographics – seven questions covering degree level (BSc/MSc), field of study, and year of study.
2. Internship search – six questions exploring when and how students searched for internships.
3. Internship preferences and hiring process – five questions focused on desired internship timing and application process.

4. Internship experience – five questions addressing workload, compensation, and academic flexibility.
5. Post-internship outcomes – three questions covering job offers, overall internship satisfaction, and perceived knowledge gaps.

Survey questions were structured based on existing literature and previous research. For the demographic section, questions, like degree level, field of study, and year of study, were based on Kapoor and Gardner-McCune [3], whose research focused on internships among computer science students. Furthermore, a pilot study by List about internships in Estonian IT companies helped frame these questions [1]. Research by Akdur [3] and Liebenberg et al. [20] highlighted the connection between elective choices and job readiness, which inspired elective course questions. The second survey section covering internship search was primarily based on Kapoor and Gardner-McCune [14], who explored how students begin to apply for internships. Additionally, Sweetser et al.'s [30] study emphasised seasonal timing. Questions in the third section were supported by Qunying and Runeson's study [26] on industry and academia partnership in software engineering and the List pilot study. The fourth section was similarly supported by Sweetser et al.'s study [30]. The final section was mainly based on the List pilot study, but also supported by Kapoor and Gardner-McCune's study [14].

In total, 148 responses were collected, 79% (117) were from bachelor's students and 21% (31) were from master's students (see Figure 1). From bachelor's students, 40 were third year, 37 second year, 25 first year and 15 marked down as other (e.g. on academic leave). Regarding master's students, 17 were first year, seven second year, one third year student and five marked down as other (e.g. on academic leave). Most BSc respondents were enrolled in Computer Science, with 87 answers. It was followed by seven Mathematical Statistics students and five Computer Engineering students. Four responses were received from the following curricula: Hardware Development and Programming, Business Information Technology and IT Systems. Lastly, three students were enrolled in Mathematics, two in Cyber Security Engineering and one in IT Systems Administration. MSc respondents were mainly enrolled in Computer Science (12), eight students were from Data Science, seven were from Software Engineering, two were from Robotics and Computer Engineering, and one was from Cybersecurity and Digital Transformation in the Company.

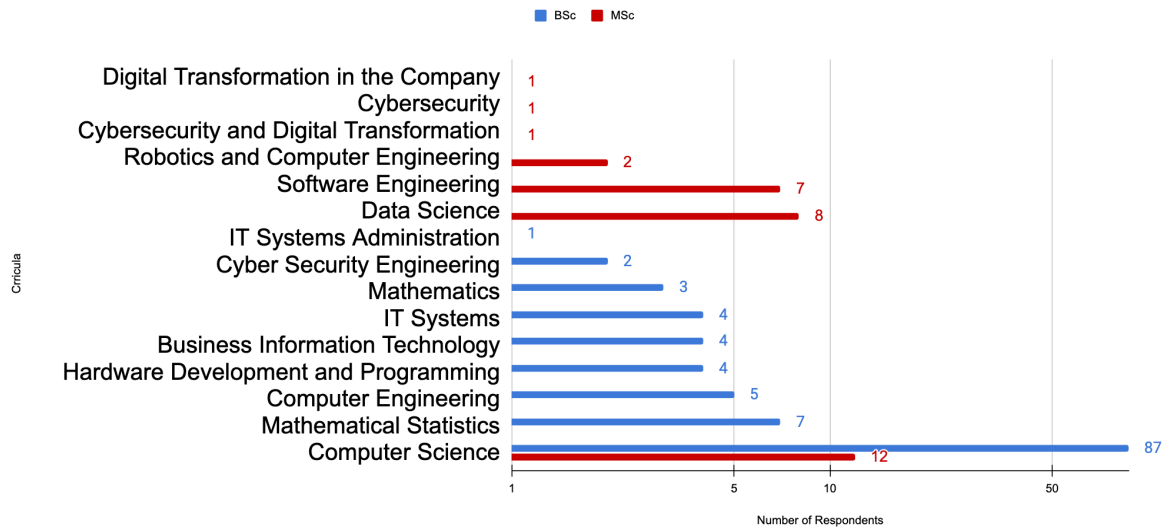


Figure 1. Survey Respondents by Curricula and Degree

Descriptive statistics were calculated to analyse the collected data. Frequencies and percentages were determined for multiple-choice questions to identify trends. For open-ended responses, qualitative analysis uncovered common themes regarding the internship search process.

## 2.2 Research Design for IT-Companies Questionnaire

A supplementary questionnaire was designed and distributed to IT companies to better understand why companies hire interns and what qualifications they prioritise. This questionnaire aimed to provide insight into the technical and soft skills companies seek in internship applicants. Additionally, since the student questionnaire had already been analysed, the company-focused survey included targeted follow-up questions addressing students' concerns and perceived barriers, particularly regarding why they believe they are often not selected for internship positions. In addition to addressing concerns raised by students, the design of this survey was also supported by academic literature. For example, Liebenberg et al. [20] discussed the importance of technical skill for entering industry, while Akdur [3] emphasised that soft skills are often as critical as technical knowledge for early-career success.

The questionnaire was developed using the Typeform platform, mirroring the format and branching logic used in the student questionnaire. This questionnaire was distributed through personal connections in Estonian IT companies, allowing hiring managers to receive it directly. In addition, it was shared in a LinkedIn post to reach an even larger audience. The survey was open relatively short, from 28 April 2025 to 5 May 2025. Like the students' questionnaire, English was used as the survey language.

The survey consisted of 10 questions (see Appendix II), with both multiple-choice and open-ended formats. The open-ended questions explored which soft and technical skills companies most value in interns, the primary motivations for hiring interns, and whether companies see internships as a bridge between academia and industry. Meanwhile, the multiple-choice questions collected data on logistical and regulatory aspects of internships, such as duration, timing, and typical steps in the hiring process.

Responses were collected from 11 different organisations, including product- and service-based companies and one freelancer who shared their experience throughout their careers. In total there were 14 responses. The companies that answered were Bolt, Pipedrive, Telia Eesti, BigBank AS, TalentHub, Elektrum, HRMS Guide, Nymble Ltd, Verston, Ready Player Me and Sunly AS.

## 2.3 Research Design for Internship Advertisements

After finalising the students' questionnaire, it was understood that a more thorough understanding of industry-required skills is needed. For that aim, an additional analysis of internship programs and junior position job advertisements was conducted. This research's main objective was clearly marking expected skills for early-career roles.

Twelve internship advertisements from ten different companies were reviewed. Initial selection for companies was made based on the top-10 2024 results of the annual "Attractive Employers Survey" conducted by Instar, which, as a sub-category, ranks organisations that are most appealing to IT students [12]. From that list, seven different internship advertisements were found for Software Engineering Internship at Microsoft [22], Software Engineering Intern and Graduate Software Engineer at Wise [35, 36], Engineering Summer Internship at Pipedrive [23], Digital Analytics Trainee at Swedbank [29], Software Engineer Intern at Bolt [7], and Software Developer Intern at SEB [28]. Five advertisements from companies outside the top 10 were added to the analysis to get a broader picture. Those were a Software Engineer Intern at Twilio [32], a Summer Internship in Data at Luminor [21], a Software Developer Trainee at Ericsson [10], a Software Engineer Intern [25], and a Java Developer Intern [24] at Playtech. Four advertisements were found by using LinkedIn, six using companies' official websites and two using CV Keskus.

The analysis itself focuses on stated requirements, both technical and soft skills. It also emphasises identifying recurring patterns to find the most commonly needed skill sets. This part gives another look at industry expectations, which can be compared to students' and companies' questionnaire answers.

### 3. Survey Result

#### 3.1 Students Survey Findings

##### 3.1.1 Courses

The students were asked about the name of their curriculum and whether they had enrolled in any elective courses in addition to the required ones. Only three students answered that they hadn't taken any elective courses yet. Two were second-year BSc students, and the third was a first-year MSc student. The other 145 respondents had selected at least one elective course.

For bachelor's students, the two most common elective course areas were backend development (57 times mentioned) and frontend development (52 times mentioned). Also, a popular course was machine learning, with 30 mentions, and other data science and analytics-related courses, with 39 mentions (see Figure 2). A clear trend between students' curricula and selected elective courses could be drawn for some curricula. Computer Science students most frequently selected frontend, backend, data science, and cloud computing as their elective focuses, which shows interest in deepening their technical programming skills. Mathematical Statistics and Mathematics students leaned more toward databases, data science, and analytics, reflecting a bigger interest in number-based fields.

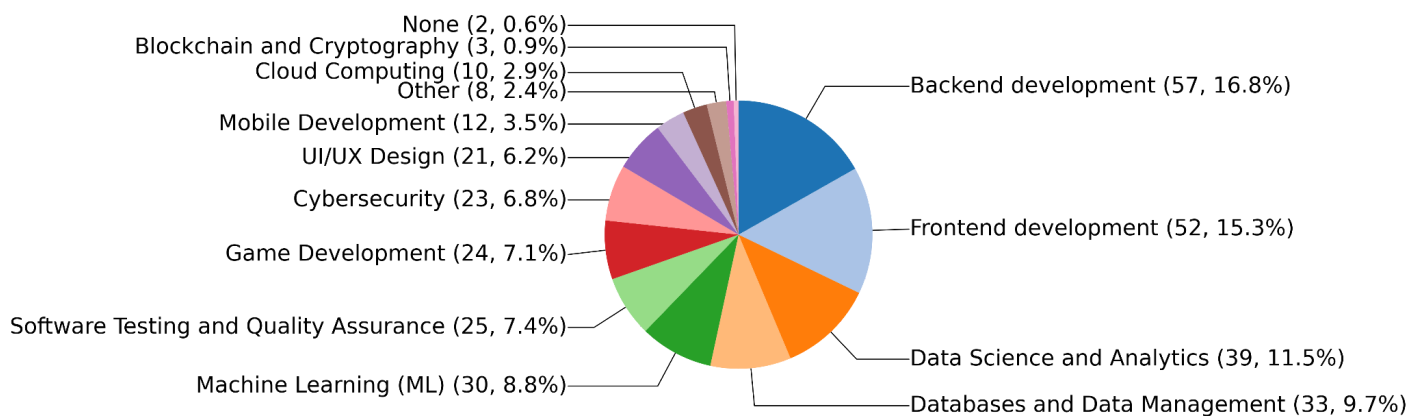


Figure 2. Elective courses selected in BSc

For master's students, the backend (15 times was mentioned) and frontend (12 times was mentioned) related courses were also popular (see Figure 3). However, more specifically, the ordinary elective course was machine learning with 15 mentions, which is expected since 64.1% of master's students studied Computer Science or Data Science. In both fields, machine learning techniques are used. Other popular elective courses were data science and analytics (11) and cloud computing (7). Similarly, some correlations between curricular and

elective courses can be noticed. Like BSc students, Data Science and Computer Science students selected electives like machine learning, data analytics, and backend development. Software Engineering students focused on backend, frontend, and mobile development, directly supporting full-stack development roles.

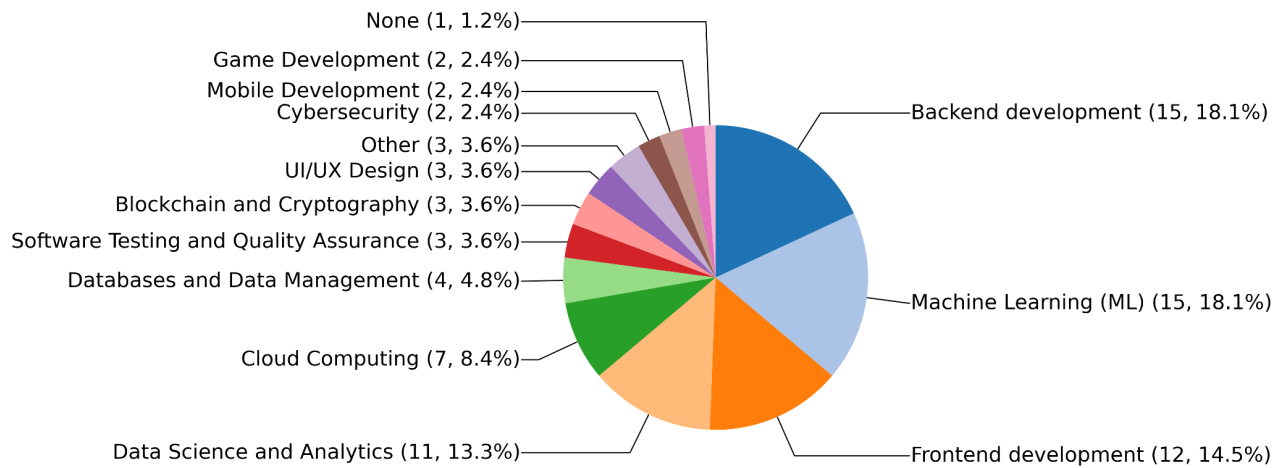


Figure 3. Elective courses selected in MSc

### 3.1.2 Finding Internships

Most of the students, both Master's and Bachelor's, have looked for and applied for internships or jobs. Of 31 Master's students, 24 have done so, and 91 out of 117 Bachelor's students have applied for intern positions. Of those 33 students who hadn't yet applied for internships, 72.7% (24) noted that they plan on using them soon. Only nine students answered that they do not plan on searching or applying for internships (see Figure 4).

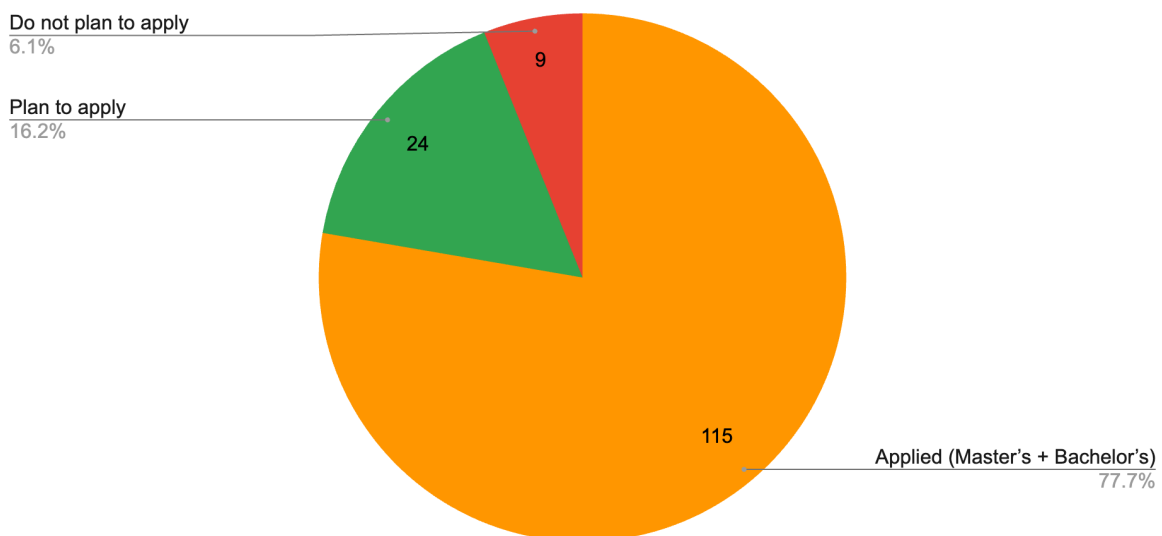


Figure 4. Internship Application Status Among All Students

There was a variation in how early they began searching for an internship, but a significant portion started applying early in their academic journey (see Figures 5 and 6). Among those BSc students who had looked for internships, 48 started in their first year, 32 in their second year, 10 in their third year, and two students commented they had already started looking before starting their Bachelor's degree. For MSc students, 10 noted that they had already looked for internships during their Bachelor's or after their Bachelor's degree. Eight of the Master's students who had applied for internships started looking for them in their first year of the Master's. Six noted that they'll start looking for an internship after finishing their Master's, indicating they want to focus on studies. In general, most students looking for internships start with it quite early in their academic careers. It can be due to wanting a real-life outlet and practice possibilities for theoretical knowledge, or just wanting to start their professional career as early as possible. Even though not all students had applied for internships, the number of those who had or are planning to was relatively high. This means there is generally a significant interest in entering into professional settings.

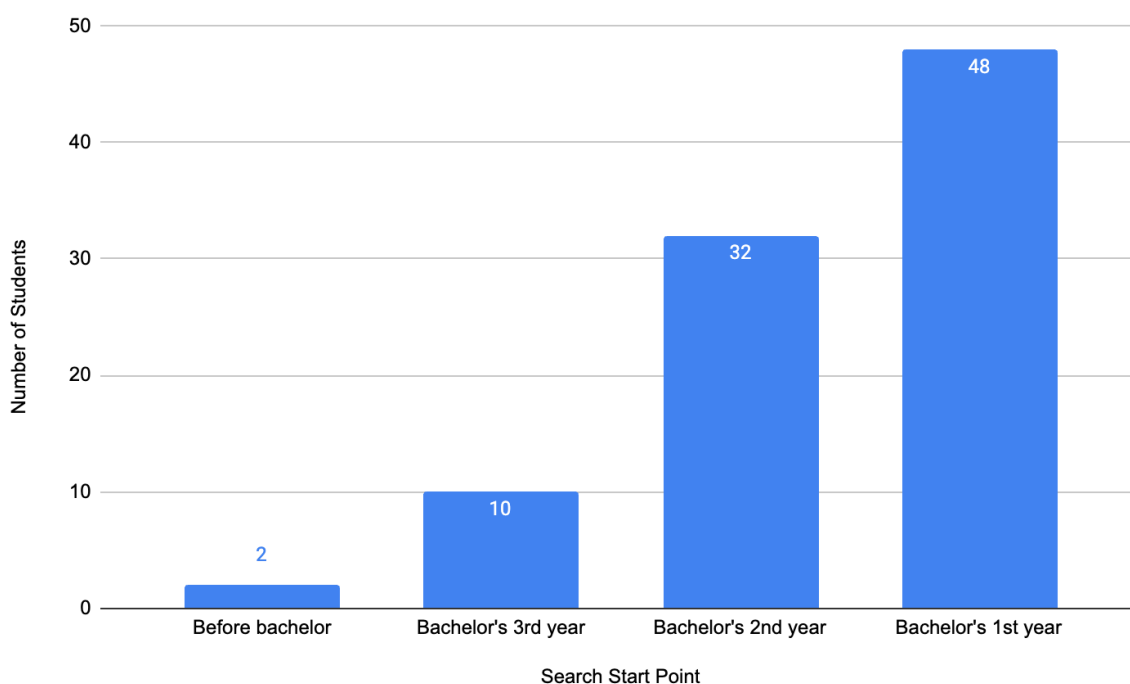


Figure 5. Timing of First Internship Search Among Bachelor's Students

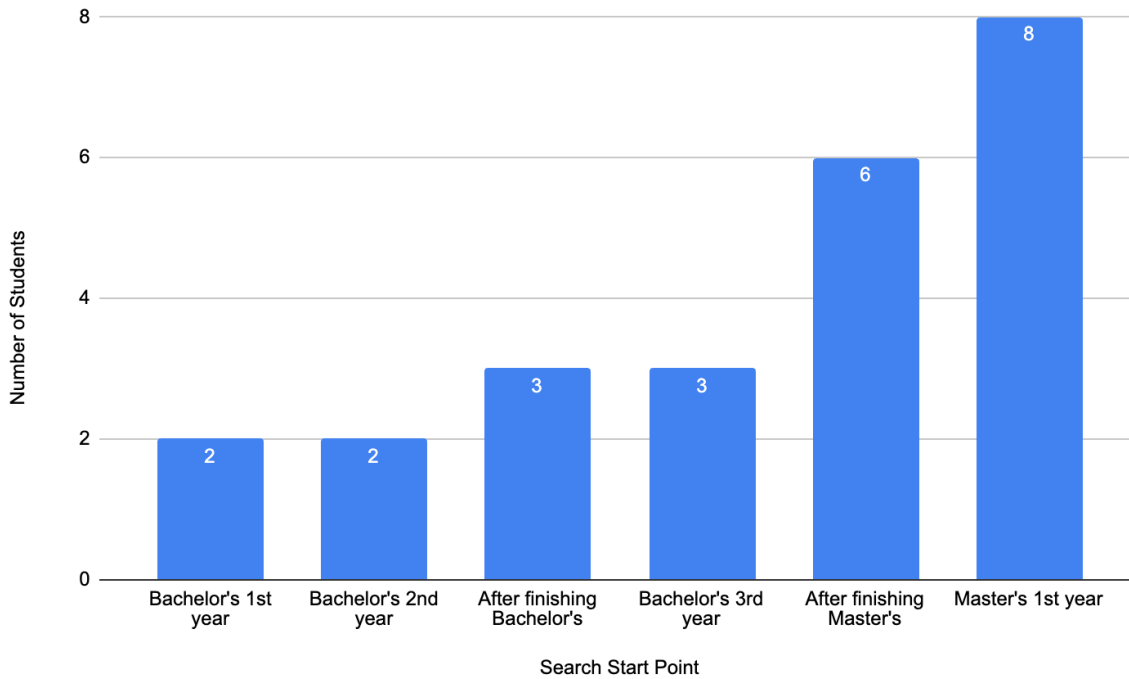


Figure 6. Timing of First Internship Search Among Master's Students

Students primarily used online platforms and university resources to find internships. LinkedIn was the most popular search engine among BSc and MSc students, with 63 mentions. A very popular way was also the university's portals, which have posts about internship position openings and career fairs, which are usually also organised by universities. This indicates that helping students find internships is also an essential topic for universities. Additionally, networking was reported 53 times and referrals 13 times, which suggests that personal connections and strong professional relationships can play an excellent role in professional development. It is also vital for companies to have good visibility on all their platforms, since company websites (40 mentions) and social media (26 mentions) were familiar sources for finding internship openings.

Many students prefer internships at a particular time of the year, which is likely to overlap with academic breaks. When asked if the timing of the internship mattered to them from those who had looked for placements, 31.3% did not have a preference. However, there was a strong preference for the summer months (June–August). Of all respondents, 58.3% selected summer as a preferred internship period. Preference for other seasons, such as spring

(March-May), autumn (September-November) and winter (December-February), was relatively low, with only a total of 16 mentions.

### 3.1.3 Internship Experience

Out of 115 students looking for internships, 47 were offered a position. That makes the success rate 40.9%. In terms of payment, out of all secured internship programs, 89.4% were paid positions, leaving only five unpaid programs. The hiring process typically progressed quickly for those who successfully secured an internship (see Figure 7). From initial contact, whether through an application submission or an interview, to receiving an internship offer took 20 students up to 3 months. For nine students, it was between 1 and 2 months; for 13 students, the process was a bit longer, somewhere between 2 and 3 months. More extended periods were relatively rare. Only three students reported the process taking 3 to 4 months, and only one reported it taking 5 to 6 months.

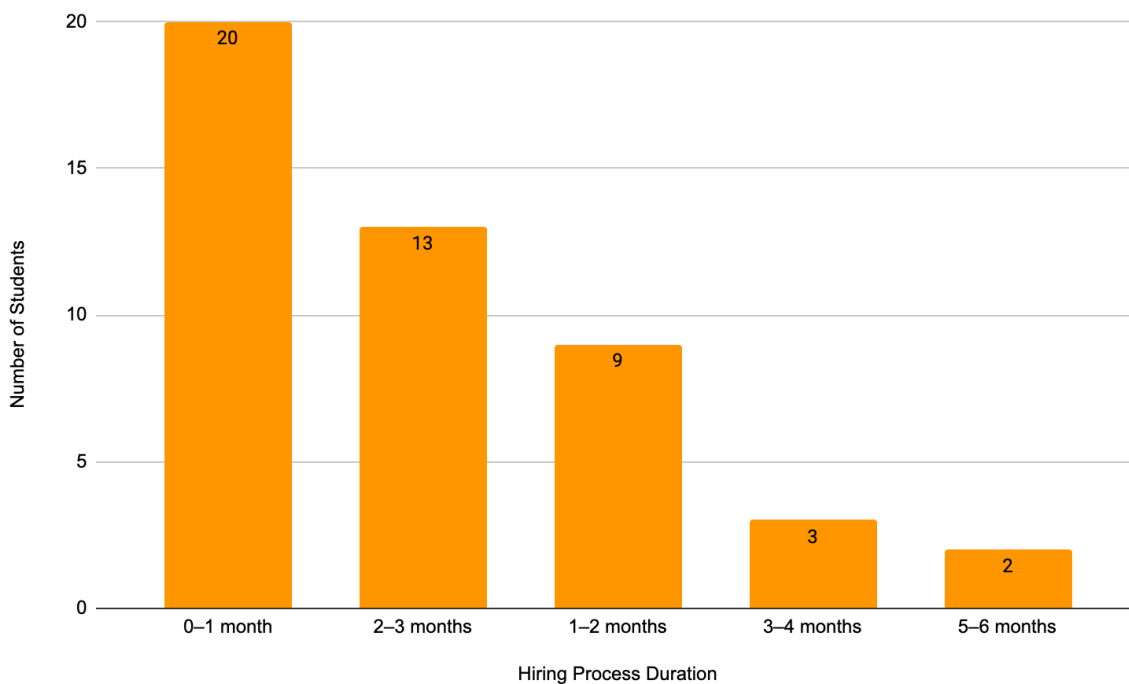


Figure 7. Length of Hiring Process from Initial Contact to Job Offer

The hiring process involved common steps for almost every student applying for internships. The most frequently reported steps were submitting a CV and writing a cover letter. An initial screening interview or a phone call typically followed this. After positive answers from these rounds, candidates were commonly sent some technical task or coding homework. An

interview with a senior manager or a panel interview was conducted to make final decisions. Few had to give a project or homework presentation, participate in a behavioural interview, a technical interview or a live-coding session.

Regardless of students' preference to intern during the summertime, when there usually should not be academic responsibilities, 31 students study simultaneously while completing the internship. The remaining 34.0% did not study simultaneously or only had a short period of overlapping time. Among those who studied and interned at the same time, many reported difficulties balancing the two. In open responses, students described it as like having two full-time jobs, while others noted that their grades suffered due to limited time for coursework. Several respondents specifically pointed out difficulties with managing their time.

In some cases, professional growth and academic grades suffered, resulting in negative feedback and extra stress. One student mentioned that university exams overlapped with the internship period, which made it especially difficult to focus on both. Also, students' private lives suffered. It was mentioned that, along with full-time employment and schoolwork, there was no time left for any social events, which made the experience “quite horrid and drained the fun out of coding and problem-solving”. Additionally, some students stated that having multiple technical tasks for different internship applications simultaneously made it hard to focus on schoolwork.

However, not all students found balancing an internship and studies difficult. Several respondents stated that they managed their time well, and some mentioned that they did not struggle because their coursework was not particularly demanding. Others noted that internships allowed them some flexibility to adjust working times or have smaller workloads at the start of an internship. Additionally, many students interned during the summer and did not report any struggle with balancing work and school, as there were no overlapping commitments.

When having difficulties balancing an internship and studies, it was asked if internship providers considered students' academic commitments. Most students reported that their internship providers were understanding and took a supportive approach towards helping interns to balance their responsibilities. The most common response highlighted that internship schedules were adjusted around class times or exam sessions to accommodate students' needs. Also, 29.8% of students were given free days to catch up with their

coursework and assignments. A notable number of respondents, 25.5%, did not have any significant amount of academic commitments at the same time or noted the academic load to be insignificant; therefore, they did not need any accommodation. Unfortunately, four students answered that the internship provider demonstrated understanding but made no formal accommodations.

In this survey, 66.0% of internships resulted in a permanent job offer, which means 31 out of 47 internship experiences led to long-term employment opportunities (see Figure 8). That shows how impactful internships can be for starting a professional career.

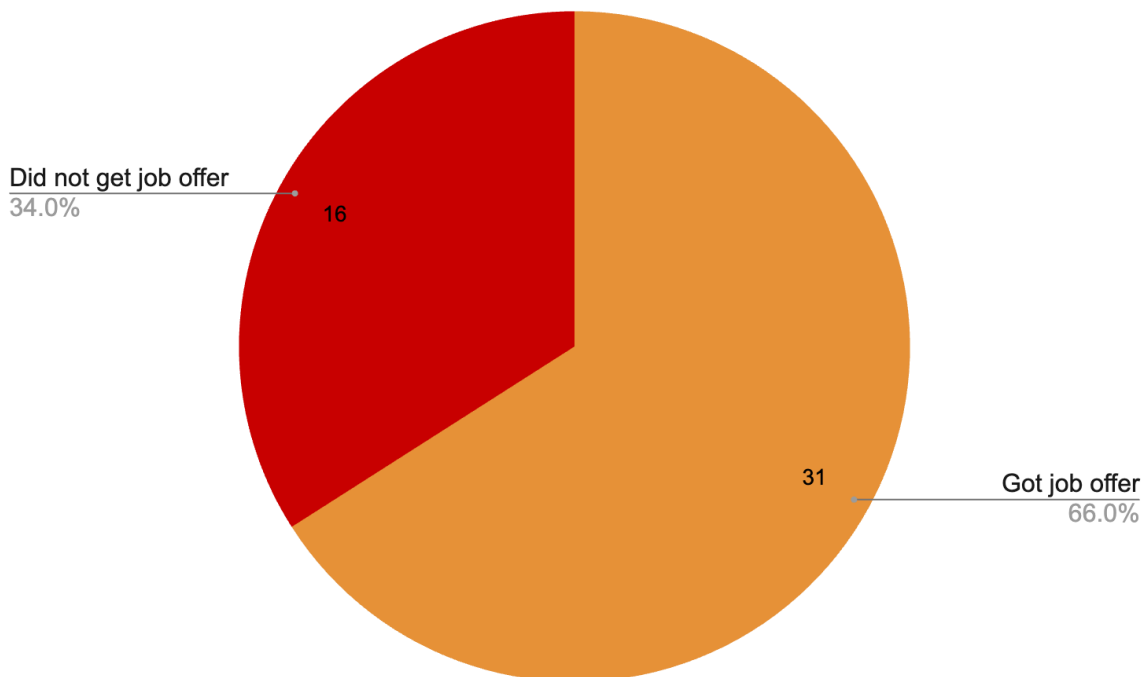


Figure 8. Internship Outcomes

### 3.1.4 Knowledge Gaps

Students who did not secure an internship were asked to share their main challenges and speculate why they were rejected. By far, the most frequent response was a lack of experience. This belief shows that many students feel they have a low chance of entering the competitive job market without prior work experience or formal internships. Also, a recurring thought was the general lack of open positions. Some students admitted to applying to only a

handful of positions, but others pointed out that there are few job openings while demand is high. Or, internship programs did not occur in a suitable time frame and overlapped with other responsibilities.

In addition to experience-related concerns, many students brought up challenges tied to soft skills, particularly not knowing how to present themselves in interviews or lacking confidence in themselves. Others noted that they struggle with creating a strong and outstanding CV. This might be due to limited content because of a small experience, or not knowing how to frame their academic expertise and projects in writing.

## **3.2 Findings from Companies Questionnaire**

As previously mentioned, another questionnaire was sent to get insight from the industry about the hiring process.

### **3.2.1 Reasons for Offering Internships**

Most companies view internships as strategic opportunities to build future talent pipelines, with many expressing the hope that successful interns will transition into full-time roles. Organizations such as Bolt, Bigbank, and recruitment consultancy Nymble highlighted looking for candidates who demonstrate growth potential and could become long-term hires. These companies also see internships as a way to position themselves as the preferred employer for students entering the job market for the first time. In addition to talent acquisition, some companies emphasized the value of internships as a form of community contribution. For example, Verston and Pipedrive noted that having interns allows them to give back to the tech community by investing in future talents and supporting the development of Estonia's engineering education.

While the overall sentiment toward internships was positive and educational, a few companies pointed out more pragmatic benefits, describing interns' hiring reasons as high impact at low cost. While it might seem a harsh statement, these responses reflect the realistic appeal of internship programs for some cases. Ultimately, they highlight that internships can serve both as meaningful learning experiences for students and as practical support for companies facing talent shortages or resource constraints

### **3.2.2 Internship Duration, Frequency and Hiring Process**

Most commonly, companies offer internships once a year, with the most frequent start period being summer (June-August). Companies that provide internships twice a year usually start their programs sometime in the spring (March-May) and the second in the fall (September-November). Internship duration typically ranges from 1 to 3 months, but many companies offer 3 to 6 months-long internships. Only one company answered that they provide a longer 6-12 month internship program. Some consultancy firms indicated that internships are only offered occasionally, based on internal resource availability and demand for junior-level support.

Most companies use a multi-step recruitment process that mirrors their full-time hiring flows. The majority reported an initial screening (such as a CV review or application video), followed by online assessments or aptitude tests. These are typically followed by technical tasks, coding assignments and behavioural interviews, often using STAR-based question formats. Panel interviews and final meetings with senior managers or executives are also common.

### **3.2.3 Expected Soft and Technical Skills**

When asking which soft skills are looked for in a potential hire, the overall theme was internal drive, good communication, and an interest in the field (see Figure 9). Employers frequently mentioned such qualities as curiosity, willingness to learn and passion. Suggesting that companies value interns eager to expand their knowledge while interning. One of the most commonly highlighted qualities included teamwork, collaboration, problem-solving skills, and attention to detail. Companies value candidates with a positive attitude, accountability, empathy, and a growth mindset. Therefore, industry looks for not only technical skills but also strong interpersonal abilities.



Figure 9. Most Valued Soft Skills in IT Interns According to Employers

From a technical perspective, employers generally expect entry-level knowledge and not advanced skill sets. Basic programming languages, like Python, Java, JavaScript or TypeScript, were frequently mentioned. Some companies also highlighted the importance of databases and, therefore, knowledge of SQL and NoSQL. Depending on the internship's focus, additional familiarity with different operating systems (like Windows or Linux), or tools such as Git, Docker, or CI/CD pipelines might be relevant. The most popular backend-focused stacks were Node.js, Fastify, REST API, Knex and frontend HTML, CSS, React, and Redux. Moreover, some companies have pointed out the ability to document processes clearly and understand basic task ticketing systems, like Jira or ServiceNow (see Figure 10).

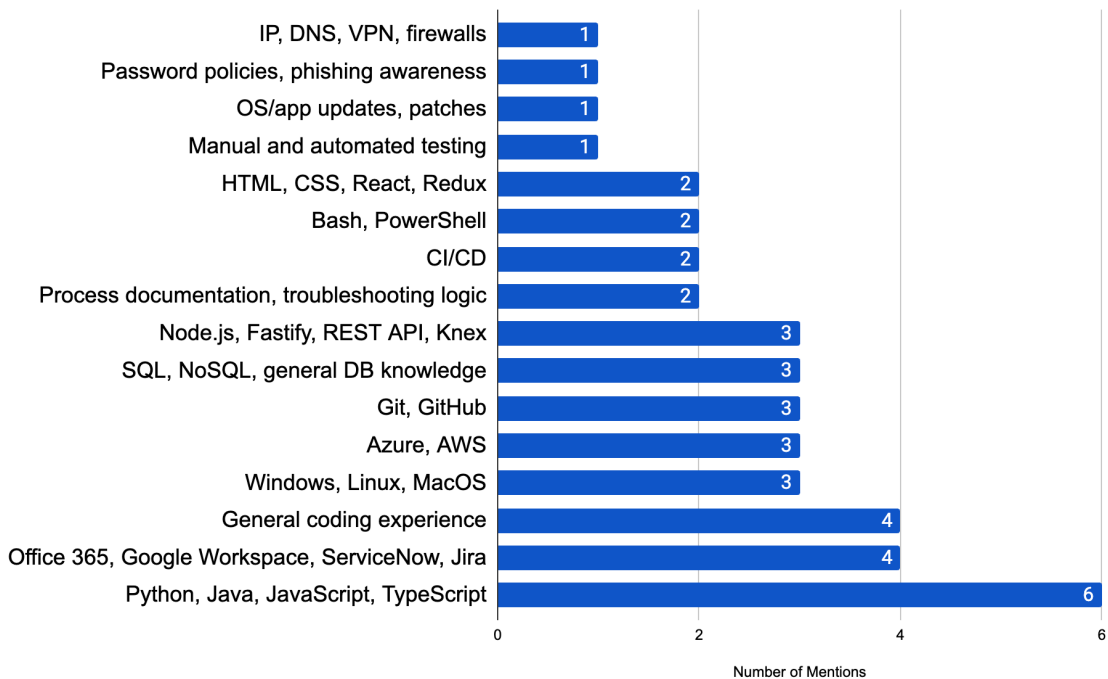


Figure 10. Most Commonly Expected Technical Skills for IT Interns

### 3.2.4 Rejection Reasons

A central concern among students surveyed earlier was the belief that students are often rejected from internship positions due to a lack of experience. While competition for internships is considered high, and some responses agreed with that statement, most companies reject the idea that prior experience is a strict requirement. Firms like Bigbank, Pipedrive, and freelancer answerer explicitly noted that internships exist to give students first exposure, not to filter them out for not already having it.

Instead, many employers pointed to issues of presentation and self-awareness as more common rejection factors. Poorly written CVs, vague or generic motivation in the tech field overall, and unclear career goals were frequently cited as weaknesses. Also, it was brought out that the candidates don't just match the company's values. Some companies also noted that the final adverse decision is made because applicants don't know how to "sell themselves". So, even though basic programming skills are necessary, final rejection is most commonly due to insufficient communication and self-presentation skills rather than an actual lack of technical skills.

A recurring theme was that even a small amount of relevant experience - like hobby projects, open-source contributions, or course-related work - can go a long way. What matters is not

the length of experience but the story and motivation behind it. In this sense, employers are not looking for polished professionals, but for students who show enthusiasm, a readiness to learn, and a clear connection between their studies and future goals.

### **3.3 Findings from Internship Advertisements**

In technical skills, the expectations varied a bit based on more specific IT-internship roles. However, a majority of companies expect candidates to have at least some kind of knowledge of Git. Regarding programming languages, Java was mentioned most frequently - eight times out of 12. The second closest was Python, which was mentioned in seven advertisements. While all positions needed a base level of programming skills and interest in the technology field itself, the programming language that was required varied based on the domain of the internship. For instance, in more data-focused roles, such as Luminor and Swedbank, the main expectation was knowledge of SQL and a general understanding of databases. At the same time, software engineer roles focused more on full-stack technologies.

Several companies also included specific technologies from their internal stack, such as Node.js, React, Fastify, or Docker, not as mandatory requirements but as tools interns will encounter in the program. These references were typically framed as learning opportunities, not dealbreakers. For example, Pipedrive listed Node.js, React, Fastify, Knex, SQL, and Docker as the main technical stack, but did not list deep knowledge as a necessity for the position. They focused more on motivation and willingness to commit to learning through internships.

Regarding academic background, eight out of twelve internships required candidates to be enrolled in or have recently completed an engineering, computer science or related field university degree. This confirms that most internships focus on hiring students or recent graduates. Also, it suggests that while companies understand that interns are still developing their skills, they expect a foundational understanding gained through formal education.

Despite technical skills, all internship advertisements said that soft skills were equally, if not more, necessary. In all internship advertisements, communication skills were mentioned as an essential quality. Companies such as Microsoft, SEB, and Swedbank explicitly noted the importance of clear and effective communication, both oral and written, which is expected of the candidate. Secondly, teamwork and collaboration were highlighted consistently and mentioned in nine advertisements. Being able to work effectively in diverse teams was a

common theme among Microsoft, Telia, and Ericsson. This reflects the expectations from industry for candidates to be able to give clear progress updates, articulate their ideas and participate in team discussions.

A third major theme was adaptability and a growth mindset. Interns were frequently described as needing to be curious, eager to learn, and open to feedback. Twilio, for example, described ideal candidates as interested and motivated learners. Similarly, Ericsson, Playtech, and Swedbank described the intern they look for as one with a proactive problem-solving approach and who is self-driven to develop continuously. Candidates must be open to feedback and be able to adapt their work based on given feedback. Bolt and Wise both emphasised that interns must be eager to learn and be able to take ownership of their work. A common theme across all intern-level advertisements was that even though candidates might lack extensive work experience, they must be willing to grow to a higher professional level.

## **4. Discussion and Recommendations**

From the students questionnaire, as previously stated, only 47 out of 139 students who actively searched for internships were offered a position. This suggests that while student interest in internships is high, relatively few actually secure placements. However, among those who did land an internship, approximately 66.0% also received a job offer afterwards, which showcases the important career-building value in internships. This contrast suggests that the main bottleneck lies in the initial ability to break into the industry system.

### **4.1 Noted Knowledge Gaps and Challenges**

Internship advertisements and industry feedback both consistently highlighted that basic technical preparedness is crucial for securing an internship position. For instance, advertisements and companies surveyed expected familiarity with programming languages such as Java, Python, and JavaScript, as well as a basic understanding of version control (like Git). Previous research supports this idea. For example, Liebenberg et al. [20] identify these tools as foundational for software development roles. However, more specific knowledge is required based on the internship domain. A general understanding of databases and SQL is emphasised for more data-driven positions. Basic HTML/CSS and React knowledge was noted for more frontend-focused internships. Understanding cloud basics, like Azure and AWS, was mentioned as a bonus. While advanced tools such as Docker, CI/CD pipelines, and Kubernetes pop up occasionally, the general sentiment is that a solid foundational knowledge is enough for interns. Sweetser et al.'s [30] previous research supports this idea. Their findings suggest that basic technical knowledge is sufficient for candidates. Internships are designed to serve as learning environments rather than requiring extensive prior expertise [30].

Students themselves reported a lack of experience as the main reason for rejection. This sentiment is somewhat aligned with Kapoor and Gardner-McCune's [14] findings, who reported inexperience as an essential factor in students' confidence. However, the industry survey in this study gave a majority of opposite feedback. While few companies noted that experience might be an important factor, most suggested that the real issue is not the absence of experience, but how students present their skills. Instead, they look for indicators such as the ability to adapt and learn, interest in the field and a problem-solving mindset. These values can be demonstrated by participating in hackathons, personal projects, open-source contributions, or coursework portfolios. A finding also reflects Ansari's [4] emphasis on

experiential learning through applied projects. These activities often count as real-world experience in the eyes of employers and carry more weight than the number of past job titles on a CV.

Therefore, the bigger issue is the challenge of self-presentation and communication, which students themselves also acknowledged. Many reported struggles with articulating their strengths in CVS or interviews. This is also reflected in the responses gathered from companies in this study, many of which cited weak CVs or vague motivation as rejection reasons. Companies emphasised in their answers that traits like communication, teamwork, and adaptability are key elements in a good internship candidate. Additionally, Akdur [3] and Sweetser et al. [30] found that soft skills can be more decisive than technical skills. They stated that interns who lack confidence or hesitate to engage often don't perform as well, showing a link between self-confidence and success in internships. Akdur's research shows that 95% of industry professionals agreed that communication and collaboration skills are critical for intern success [3]. Taking this all into account, soft skills are by no means just secondary qualifications. These characteristics are usually what differentiates one candidate from another.

While technical preparation is a minimum requirement, strong communication skills and the ability to present are just as critical, if not more. Companies are looking for candidates who can express their experiences and skills clearly. As mentioned in a company survey, they must know how to sell themselves. This shows a need to not only prepare students with good technical knowledge but also teach them how to showcase soft skills in appealing ways.

## **4.2 Suggestions for Supporting Students in Securing Internships**

A practical way to address the previously mentioned soft-skill gaps could be through additional offerings within courses related to internships. For example, at the University of Tartu, bachelor's computer science students can take a voluntary course called Practical Training in Informatics [31]. In addition, workshops and seminars on CV writing could help students learn how to present university coursework and personal projects better. To prepare students for real hiring processes, mock interviews might be a good way to practice articulating their strengths and experiences. Even better value would be if these are conducted by actual hiring managers or recruiters who explain the structure and focus of their hiring processes. Finally, former students could be asked to share their own experiences on how to secure an internship and how to balance between working and studying.

Universities could consider integrating modern development practices into their standard and elective courses to prepare students better technically. For instance, core programming courses could be complemented with hands-on experience using Git, Docker, or CI/CD pipelines. Akdur [3] and Liebenberg et al. [20] have also suggested that such integration would significantly enhance job readiness. Also, to better show students' strengths, encouraging them to maintain public GitHub repositories, participate in hackathons, or contribute to open-source projects would help make their skills visible to employers. Lastly, since small independent tasks are rare in industry, project-based learning that mimics real-world software development, such as agile sprints or collaborative group tasks, would help bridge the knowledge gap. A good example of this approach is the programming school Kood/Jõhvi. Their curriculum is built around practical and project-based learning, focusing on real-world challenges and collaborative software development [17]. Universities with more traditional academic settings could take inspiration from that program and integrate similar elements into their courses, which could help students gain more practical experience and better prepare them for industry expectations.

In addition, both students and companies clearly preferred summer internships, particularly during June to August, when academic responsibilities are lower. The most commonly preferred internship length was 1–3 months, which fits nicely into the summer break period. Some companies also offer 3–6 month internships that can start in spring and transition into full-time over summer, which may suit students with more flexible schedules. If universities have partnerships with companies, it would be beneficial to encourage those internships to take place primarily during the summer. Aligning internship opportunities with students' schedules could allow them to focus more on their experiences without the stress of managing coursework. Assisting students in planning for summer internships ahead of time can increase participation and improve the outcomes they achieve.

## **5. Limitations and Suggestions for Future Research**

This thesis gives an overview of the challenges of computer science students pursuing industry internships and gives insights into how the industry is approaching the hiring of interns. However, it is important to acknowledge certain limitations that could be improved in future research.

Regarding student data collection, the sample size was reasonably strong and included respondents from two universities and one programming school across Estonia. However, an even larger sample size could reveal more recurring patterns or less visible challenges. Future studies could also expand the scope beyond computer science and software engineering students. In technology, product designers, product managers and researchers are essential parts of teams. However, they most commonly come from design, management, and economics. By including more IT-related professions, we can better understand how internship readiness and expectations differ among various disciplines. Extending the research beyond Estonia's borders could also be beneficial by comparing the situation in neighbouring countries. Also, it might be worth considering conducting a study across multiple academic years to examine whether patterns remain consistent or shift with changes in the job market and curriculum.

The company-side data, however, had a more limited sample size compared to the number of student answers. While the responses gathered offered valuable insights, future research would benefit from including a wider range of companies. This would help better capture the diversity of hiring strategies, expectations, and challenges of offering internships.

Another limitation is that this study did not explore gender-based differences in access to internships or hiring outcomes. Gender was not considered a variable in the student or company questionnaires. Thus, this research does not provide insight into whether different experiences or barriers exist for students based on gender. Given ongoing discussions about diversity and representation in the tech sector - especially the underrepresentation of women in software engineering - this is a significant area for future research. Investigating whether gender plays a role in hiring decisions, perceived preparedness, or confidence levels could offer valuable perspectives for universities and companies looking to promote inclusivity.

## Conclusion

This thesis examined the readiness and obstacles computer science field students encounter when searching for internships and focusing on combining academic studies with professional workflow. This research aimed to determine students' main challenges and knowledge gaps when applying for intern programs. Also, for more profound feedback on the industries' opinion on the most valued technical and soft skills, rejection reasons were asked. For that, three different complementary research methods were used. A questionnaire was conducted among three different Estonian universities and programming schools. Secondly, a survey among IT companies was done to get input on the most valuable skills and the main reasons for rejection. Lastly, an analysis of twelve internship advertisements was made to get an even better understanding of industry-expected skills for students.

As a result, it was found that interest in internships is relatively high. Of all 148 students' answers, 115 had already applied for internships, and 24 planned to do so shortly. Of those who had applied, only 40.9%, or 47 students, were offered the internship position. This made students think that their most significant obstacle was a lack of experience in the technology field. Yet, a larger portion of the industry does not agree with this. Basic technical skills are essential, as they come from internship advertisements and company questionnaires. Most commonly, the candidate was expected to be familiar with more well-known programming languages, like Python, Java, TypeScript, or JavaScript, as well as with Git and some ticketing systems, like Jira. However, most companies did not think that a lack of experience was the main reason for rejection. Students could instead present themselves and their skills. Candidates must demonstrate good communication, high motivation and teamwork skills.

The findings also confirm that internships play a vital role in developing technical and soft skills. Analysed articles suggested that internships increase self-confidence and clarify career paths. Also, out of 47 internships, 31 were offered a permanent position once the program ended, meaning internships are an essential bridge for students entering the workforce. The most preferred time for internship periods for both students and companies was summertime, as during that period, students do not have academic responsibilities and can solely focus on the internship.

This thesis had the following limitations: expanding the company survey sample size, including neighbouring countries to analyse students' worries, and comparing gender

differences. Addressing these in future works could provide an even deeper understanding of internship accessibility in the tech field.

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## Appendices

### Appendix I. Students Questionnaire

Question	Question Type	Answer Options
Are you pursuing a Bachelor's (BSc) or Master's (MSc) degree?	Multiple Choice (Single Answer)	Bachelor's (BSc), Master's (MSc)
What is the name of your curricula? (For BSc)	Multiple Choice (Single Answer)	Computer Science (Informaatika), Mathematical Statistics (Matemaatiline statistika), Computer Engineering (Arvutitehnika), Business Information Technology (Äriinfotehnoloogia), Hardware Development and Programming (Riistvara arendus ja programmeerimine), IT Systems Development (IT-süsteemide arendus), Mathematics (Matemaatika), Cyber Security Engineering (Küberturbe Tehnoloogiad), IT Systems Administration (IT-süsteemide administreerimine)
What is the name of your curricula? (For MSc)	Multiple Choice (Single Answer)	Computer Science (Informaatika), Data Science (Andmeteandus), Software Engineering (Tarkvaratehnika), Robotics and Computer Engineering (Arvutitehnika ja Robotika), Cybersecurity (Küberkaitse), Digital Transformation in the Company (Digimuutused ettevõttes), Analysis and Design of Information Systems (Infosüsteemide analüüs ja planeerimine), Business Information Technology (Äriinfotehnoloogia), Digital Health (E-tervis), E-Governance Technologies and Services (E-riigi tehnoloogiad ja -teenused), Hardware Development and Programming (Riistvara arendus ja programmeerimine), Network Technologies and Services (Võrgutehnoloogiad ja -teenused)
What year? (For BSc)	Multiple Choice (Single Answer)	1st, 2nd, 3rd, Other (e.g., academic leave)

What year? (For MSc)	Multiple Choice (Single Answer)	1st, 2nd, 3rd, Other (e.g., academic leave)
What area(s) of elective courses have you focused on, besides the mandatory/compulsory courses? (For BSc)	Multiple Choice (Multiple Answers)	Back-end development, Front-end development, Data Science and Analytics, Machine Learning (ML), Databases and Data Management, Software Testing and Quality Assurance, Game Development, Cybersecurity, UI/UX Design, Cloud Computing, Mobile Development, Blockchain and Cryptography, Other
What area(s) of elective courses have you focused on, besides the mandatory/compulsory courses? (For MSc)	Multiple Choice (Multiple Answers)	Back-end development, Front-end development, Data Science and Analytics, Machine Learning (ML), Databases and Data Management, Software Testing and Quality Assurance, Game Development, Cybersecurity, UI/UX Design, Cloud Computing, Mobile Development, Blockchain and Cryptography, Other
Have you looked/applied for internships/job? (For BSc)	Multiple Choice (Single Answer)	Yes, No
Have you looked/applied for internships/job? (For MSc)	Multiple Choice (Single Answer)	Yes, No
When did you first start looking for internships? (For BSc)	Multiple Choice (Single Answer)	Bachelor's 1st year, Bachelor's 2nd year, Bachelor's 3rd year, After Master's, Other
When did you first start looking for internships? (For MSc)	Multiple Choice (Single Answer)	Master's 1st year, Master's 2nd year, After finishing Master's, Other
Where did you primarily look for internships?	Multiple Choice (Multiple Answers)	LinkedIn, University career portal, Networking (e.g., friends, family, professors, or alumni), Career fairs, CV-keskus, Directly company websites, Social media platforms (e.g., Facebook groups, Twitter), Referrals from current employees or peers, Glassdoor
How much time passed between when you first	Multiple Choice (Single Answer)	Less than a month, 1–2 months, 2–3 months, 3–4 months, More than 4 months, I don't

started actively searching for internships or jobs and when you submitted your initial application documents?		remember
When applying to internship, does it matter to you when it takes place?	Multiple Choice (Multiple Answers)	Yes, sometime in June–August, No, Yes, sometime in September–November, Don't know, Yes, sometime in March–May, Yes, sometime in December–February
Are you planning to apply to internship/job anytime soon?	Multiple Choice (Single Answer)	Yes, No
Please specify when (e.g. after 1st year, during 2nd year's fall semester)	Open-ended	
Were you offered a position for the internship?	Multiple Choice (Single Answer)	Yes, No
How long did the hiring process take from your initial contact to receiving a job offer?	Multiple Choice (Single Answer)	0–1 month, 1–2 months, 2–3 months, 3–4 months, 5–6 months, more than 6 months
Was the internship paid or unpaid?	Multiple Choice (Single Answer)	Paid, Unpaid
Which of the following steps were involved in your hiring process?	Multiple Choice (Multiple Answers)	Writing a cover letter, submitting a CV or résumé, Initial screening interview (e.g., phone or video call), Technical task or coding assignment, Final interview with a senior manager or executive, Panel interview (with multiple interviewers), Online assessment or aptitude test, Technical interview (e.g., live coding or problem-solving session), Behavioral interview (e.g., situational or STAR-based questions), Case study, project presentation, or explaining a completed task/homework assignment
Did you study	Multiple Choice	Yes, No

simultaneously while completing the internship?	(Single Answer)	
Was it challenging to balance both responsibilities?	Open-ended	-
How did the internship provider consider your academic commitments?	Multiple Choice (Multiple Answers)	The internship provider was willing to adjust my schedule to accommodate academic commitments (e.g., allowing time for attending lectures), Internship provider gave free days to catch up on assignments, Not applicable (I didn't have significant academic commitments at the time), The internship provider demonstrated understanding but made no formal accommodations, No consideration for academic commitments was given, Other
Did the internship lead to a job offer?	Multiple Choice (Single Answer)	Yes, No
If you did not secure a CS-related internship, what do you believe were the main challenges?	Open-ended	-
How satisfied were you with the internship in terms of relevance to your studies and future career goals?	Multiple Choice (Single Answer)	Very satisfied – The internship was highly relevant to my studies and future career goals, Satisfied – The internship was generally relevant to my studies and career goals, Neutral – The internship had some relevance, but it was not strongly aligned with my studies or career goals, Dissatisfied – The internship had little relevance to my studies or career goals, Very dissatisfied – The internship was not relevant to my studies or career goals at all

## Appendix II. Companies Questionnaire

Question	Question Type	Answer Options
<b>What's your company name?</b>	Open-ended	-
<b>Why does your company choose to hire interns? (what's the main expected result)</b>	Open-ended	-
<b>How often does your company hire interns?</b>	Multiple Choice (Single Answer)	Once a year, Twice a year, Every quarter, Other
<b>How long are internship programs at your team/department?</b>	Multiple Choice (Single Answer)	1–3 months, 3–6 months, 6–12 months, Over 12 months, Other
<b>When do you typically offer internships?</b>	Multiple Choice (Multiple Answers)	Summer (June–August), Spring (March–May), Fall (September–November), Winter (December–February), Other
<b>What are the soft skills you look for in an IT-intern?</b>	Open-ended	-
<b>What technical skills are needed for IT-interns? Please specify the exact stacks.</b>	Open-ended	-
<b>In your experience, what is the most common reason internship applicants are rejected?</b>	Open-ended	-
<b>According to students, the main reason they don't secure internship positions is 'lack of experience.' Do you agree this is one of the main reasons? Why or why not?</b>	Open-ended	-

<p><b>What are the different stages of the hiring process?</b></p>	<p>Multiple Choice (Multiple Answers)</p>	<p>Initial screening (e.g., phone or video call, application video), Behavioral interview (e.g., situational or STAR-based questions), Final interview with a senior manager or executive, Online assessment or aptitude test, Technical interview (e.g., live coding or problem-solving session), Technical task or coding assignment, Case study, project presentation, or explaining a completed task/homework assignment, Panel interview (with multiple interviewers), Other</p>
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supervised by Mykhailo Dorokhov, Marina Lepp

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