Insights from Information Technology students and industry partners undertaking a capstone project in a work-integrated learning context

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Drawing on work-integrated learning (WIL) literature, this study emphasizes students' and industry partners' perspectives on the impact of student projects in cooperation with industry. Data was collected from 132 students in information technology (IT) and evaluation of students from 85 companies. Students were asked about the practical implementation of the course and the academic benefits of traditional placement-based WIL. They experienced a steep learning curve, but the knowledge acquired was perceived as highly useful. The main challenge students faced was finding an industry partner. The assessment of the students' effort was perceived as highly positive by industry. This study contributes empirical insights in relation to the IT discipline and is relevant to academic institutions that are currently incorporating WIL into curricula or intending to do so. There are also beneficial insights for industry considering opportunities for student collaboration.

Keywords**:** Work-integrated learning, bachelor's project, capstone project, IT, student perspective, empirical study

Higher education students undertake multiple courses, complete assignments, and write exams (either in-class or take-home) to earn their grades. While this builds a solid knowledge base, it is equally vital to prepare them for the working life that lies ahead. A project undertaken in an undergraduate degree is a large piece of work many students complete in the third year. Such a work can be seen as a capstone project that demonstrates their knowledge, skills, and competence. When undertaking a project in a work-integrated learning (WIL) context, students collaborate with a third-party. In this study, the third party is the industry, and the students are off-campus. There are multiple types of WIL, predominantly off-campus and predominantly on-campus (Thi Ngoc Ha, 2023). Many opportunities, benefits, and challenges may arise. For example, the student-supervisor relationship is a vital component of success (Bloom et al., 2007; Lee, 2008), which means that educational institutions need to ensure sufficient resources and support from academic staff.

A capstone project can be completed in various ways, such as through extensive data collection and/or practical assignments. For many students, this is the most extensive project they will undertake during their education, and it requires considerable time and effort. Providing students with learning experiences from real workplace settings is common in various disciplines in higher education, such as healthcare, law, and teacher training (Coleman, 2025). Thus, students can be prepared for the working life that awaits them after graduation by offering practical projects that reflect the needs and desires of industry as a part of their education. Prior research (Gafni et al., 2023) recommended that information systems programs include structured capstone projects that offer students the opportunity to learn and practice working skills required by industry and better prepare them for graduate employment. Furthermore, WIL projects can support skills such as communication, teamwork, critical thinking, and learning (Murtazin et al., 2022). Within a Norwegian context, there is also a need for more empirical research pertaining to implementation of WIL in higher education (Thon & Hauglid, 2025).

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The present study aims to fill a gap in the research literature by reporting on an information technology (IT) bachelor's project course at a large university college in Norway. Students solve complex IT-related tasks provided by industry, such as developing mobile apps, redesigning websites, programming applications, or solving issues related to data security, and artificial intelligence. The IT-project course aims for mutual gain: the students should gain practical experience by working on realistic IT projects, and industry should benefit from students' knowledge and contributions. Against this background, the following research question guided the research: *What are the benefits and challenges of IT students and industry when undertaking a capstone project in a WIL context?* The rest of this article has the following structure; the next section presents related work, followed by a description of the course that is called "Bachelor's project". Then, the method and results are presented, followed by the discussion. A section on limitations and suggested future studies precedes the conclusion.

RELATED WORK ON WIL AND CAPSTONE PROJECTS

WIL is defined as "An educational approach involving three parties–the student, educational institution, and an external stakeholder–consisting of authentic work-focused experiences as an intentional component of the curriculum." (Zegwaard et al., 2023, p. 39). According to Sunnemark et al. (2023, p. 403), WIL

> is seen as related to forms of practice-based education like work-based learning, 'sandwich' learning, cooperative education, clinical placements, service learning and internships. However, there is more to WIL than a pedagogical approach. As a theoretical and practical field, WIL has given rise to several educational practices.

The aim of WIL is, therefore, to enhance students' employability and professional growth by linking academic theory to real-world practice (Thon & Hauglid, 2025) and is characterized by the trinity of academic institution, student, and industry.

Through on-campus WIL, students can get to know the field of practice through guest lecturers from the industry and/or work on practical assignments at the university to solve real-world problems (Thi Ngoc Ha, 2023). Traditional placement-based WIL occurs when students work off-campus with an industry partner to acquire practical experience and knowledge. Compared to traditional teaching in a classroom setting, WIL offers a different type of learning through practical application to work-based tasks. Examples of WIL include apprenticeships, internships, and applied research projects; participating in student clubs or having a part-time job is not considered WIL (CEWIL Canada, 2021). WIL has traditionally been embedded in educational fields such as nursing and pedagogy (Billett, 2024; Thon et al., 2024), however, there is significant potential for including WIL in other educational fields.

According to Karim et al. (2019), WIL is embedded in both the bachelor's and master's levels and has traditionally been targeted at undergraduate students with limited work experience. Previous research found that students reported the WIL approach as a highly positive educational experience (Karim et al., 2019). Other studies support that practice-based learning makes students feel prepared for the workforce (Alanson, 2023), which is fundamental and aligned to the aim of WIL. Although undergraduate students at the bachelor's level in Norway typically have part-time jobs, their tasks, however, do not necessarily pertain to their studies (Presthus & Gonzalez, 2025). WIL provides them with hands-on experience relevant to their discipline. Previous research on WIL has emphasized the need to secure resources (Winborg & Hägg, 2022). Supervision is an important aspect of a student's learning process. Supervision in a WIL context can consist of an external (called 'host supervisor' by Rowe et al., 2012), and/or an internal supervisor, provided by the academic institution.

Moreover, the relationship between students and the supervisor is also vital and plays a role in terms of success (e.g., Bloom et al., 2007; Lee, 2008). Therefore, supervisors need to have time and motivation to connect with and support students during WIL. Moreover, wellbeing is an important issue. Students in higher education experience stress related to, for instance, their studies and finances (Zegwaard & Adams-Hutcheson, 2025). Therefore, students also need support in avoiding stress and improving wellbeing during WIL (Smeltzer & McCracken, 2025).

To facilitate success and satisfaction among the stakeholders, it is important to be aware of potential barriers that may occur. Govender and Vaaland (2020) conducted a literature review to investigate challenges associated with WIL and collaborations with industry in business schools. They identified five crucial aspects of the learning process that were lacking in WIL projects—institutional support, mentoring and assessment, student readiness, curriculum relevance, and host motivation—all of which need to be promoted when students collaborate with businesses. Furthermore, Winborg and Hägg (2022) identified three dimensions that are seen as important factors in a student's learning process: the creation of meaning and understanding of university literature, generic individual skills (e.g., team skills, communication skills, and networking skills), and general knowledge about how a workplace operates. From this, we see that students need to synthesize and critically interpret academic literature to build informed understanding, along with developing transferable individual skills.

Writing a bachelor's thesis is a vital and complex task for students, and the results intend to show their academic skills (Tuononen & Parpala, 2021). For many students within IT, they must not only demonstrate technical skills related to design, IT development, and programming, but they must also document their work (e.g., by writing an academic report). To ensure that students hold relevant knowledge and experience after graduation, there is the potential for academia to increase and improve collaboration with industry. Higher education in Norway prioritizes collaboration with industry which is also a symbol of quality in education. In line with this, Norway's government has called for an increased work-life relevance in higher education (Thon et al., 2024).

Dynamics and collaboration between team members vary depending on the composition of the individuals. Different characteristics can be important and influence how the team works. Sæter et al. (2025) examined gender dynamics, team roles, and engagement in an agile capstone course by analyzing 27 presentations and interviewing 10 students and two teaching assistants. Students acquired important collaboration and technical skills, while presentations revealed gendered emphases; women focused on design and processes, men on architecture and technical solutions. The authors conclude that more inclusive educational strategies are needed to ensure equal participation in agile software development courses. Although gender differences were not investigated in the present study, it is still an interesting observation and might reflect how students act in work-life. In capstone projects, students must also handle unpredictability in, for example, requirements, customer needs, and resource priorities. Projects often evolve, so the ability to manage various types of change is essential. An examination on how IT students experienced the bachelor's project during a lockdown imposed by the COVID-19 pandemic (Raaen et al., 2022), showed that infection control measures had a significant negative impact on perceived collaboration and communication among the students, as students were unable to meet physically. However, the students' grades on the bachelor's project were not affected by the lockdown. The students handled the situation well, and there was a sudden need to use new technologies for collaboration and interaction in the bachelor's project work. This demonstrates, among other things, the students' robustness and ability to handle rapid change. Beyond this, the experience also prepared students to cope with rapid change that can occur in working life, and at the same time manage to deliver high-quality work.

Although there are many benefits associated with WIL, especially from the students' point of view, it is important to ensure that this way of learning is in line with the expectations among all the stakeholders involved. Previous research (Jackson et al., 2016) has identified challenges in WIL that need to be taken into consideration. For example, employers faced challenges related to finding viable projects for students and suitable students for their projects. Consequently, it is therefore important to match the students with projects and companies to find the right fit. Concerns about supervisors' performance and their ability to supervise students were also pointed out. To address these challenges, Jackson et al. (2016) recommended various ways to improve the experience of working life for all stakeholders and ensure the growth of WIL in higher education. In summary, although WIL provides students with useful learning and training opportunities that can be applied in their working life, it requires planning and facilitation that is the responsibility of the educational institution.

DESCRIPTION OF THE BACHELOR'S PROJECT

This section describes the IT bachelor course that is the focus of the present study. At the educational institution (department) where the empirical data were collected, IT students undertake a course called 'Bachelor's Project' in their sixth and final semester. The course counts 30 European Credit Transfer and Accumulation System (ECTS) and is carried out in collaboration with industry. It gives students the opportunity to apply theoretical and practical knowledge as well as experience project management. However, the project must be related to IT and address the learning outcomes of the course. The learning outcomes are threefold and include knowledge, skills, and general competence regarding the completion of an IT project in teams. Below are the learning outcomes added (Kristiania University of Applied Sciences, n.d.).

Knowledge

The student...

- has broad knowledge of key topics, theories and scientific methods that are relevant to a self-chosen problem statement;
- can explain how the project benefits the business/company;
- can plan and manage the implementation of the project;
- can use sources and references correctly in a written report;

Skills

- can obtain necessary information in a structured way;
- can apply relevant theories and subject matter in the work with a problem statement;
- can design and quality assure the solution in accordance with specifications and established standards;
- can communicate key subject matter, theories and the solution, both in writing and orally;

General competence

- can describe and evaluate experiences in the project, and what has been learned from the process;
- can communicate the result of the project in a clear and well-structured way, adapted to the target group; and
- can evaluate how the assignment relates to established knowledge/research in the area.

Through the project, there is an opportunity for students to demonstrate their knowledge and for industry to get support with IT projects that they may not have the resources to carry out themselves. The students have no financial, legal, or product-related responsibilities toward the company, and they receive no income for the work. The company owns the final product (code, design, etc.), and the students own the bachelor report (a written document). Students work in groups of 3–5 students and are assigned an academic supervisor. The supervisor follows up regarding the process and the use of IT development methods, suggests relevant literature, and assists with report writing (structure and content). Students also attend lectures that provide information regarding, for example, reporting and academic skills. Students must possess or acquire professional technical knowledge during the project period. Consequently, they must ensure that the IT challenge they undertake to solve matches the technical knowledge that the group collectively possesses. Although students are responsible for sourcing a company, the school provides assistance. One example is arranging a 'speed-date' between companies and students. Companies are invited to the school with stand-up tables, roll-up posters and representatives, and discuss opportunities with students. The 'speed-date' is arranged annually in the fifth semester, before the project starts in January (the following year).

From our school's perspective, there are expectations of companies that pertain to agreements with students. The company should offer an external supervisor who follows up on the project's progress and provides professional advice, and the students should be given access to the necessary software/licenses to complete the assigned tasks. Ideally, they should also provide office space so that students can physically work together. In addition, the company is required to assess the students' work after completion of the project. The companies do not provide a grade but complete an evaluation form with a Likert scale for each group as described below.

Students submit a written project report and reflection notes. Students also give oral presentations describing their projects, which are followed by questions from two examiners; the internal supervisor and an external examiner. The latter can be a representative from industry or academia. The internal and external examiners meet and compare notes before assigning grades. Students receive a grade (A–F) for the course.

Table 1 shows that there are many concerns and interests at play in such a project, and the aim is to benefit all stakeholders. This requires the cooperation of and contributions from the three parties involved.

TABLE 1: Responsibilities and expectations of the three main stakeholders in a WIL bachelor's project.

Three main stakeholders		
Student	**University**	**Industry**
Forms a group (3–5 students)	Provides an internal supervisor	Provides external supervisor/contact person
Finds a company and an IT project	Assists students in finding a student group or company if needed	Owns the artifact/solution
Is expected to learn about new technology, literature, etc.	Offers lectures on project management, how to write a report, etc.	Is expected to offer necessary software and equipment
Writes a report, takes reflection notes, and orally presents the project to examiners	Assesses the project, including assigning a grade (A–F)	Is not obligated to use the artifact/solution
Receives no salary during the project period	Acts as a liaison between the student and the company	Meets with the internal supervisor and provides a written assessment of the group

METHOD

This study draws on qualitative and quantitative data collected from students and people from industry. No personal data were included in the present study, and it is impossible to trace the answers to any company, employee, or student. No recordings were made at any time.

Data Collection

An online survey was administered to students in the third year (i.e., the sixth and final semester) of their bachelor's degree in IT. The survey was presented at the start of a lecture, and participation was voluntary. All responses were collected anonymously. The survey was designed using the tool Nettskjema. Nettskjema is developed by the University of Oslo in Norway and is considered to be ethical and safe. According to the Nettskjema (n.d.) webpage:

> Nettskjema maintains a high level of security so that you can safely and easily store data up to confidential data (sensitive personal information, health information, etc.). Nettskjema, along with Services for Sensitive Data (TSD), is approved by REK and Sikt to collect strictly confidential data.
>
> User access control, two-factor authentication, and strict compliance with data protection regulations make Nettskjema the safest platform for creating, managing, and storing surveys, registrations, and feedback forms.

The survey consisted of six items related to the practical implementation of the course, and students' overall experiences related to the bachelor's project, as well as the academic benefits and challenges that the students faced. Each of the items (which were formulated as statements) had sub-items that respondents were asked to respond to on a 5-point Likert scale ranging from 1 (strongly disagree) to 5

(strongly agree). The respondents also had the opportunity to register their own comments and observations in the free-text fields provided in the survey. Data collection was carried out in March and April 2025. During this period, the students were well under-way with their projects and prepared to respond to the items. The survey was closed with 132 respondents from a total of 493 enrolled students in the course, indicating a response rate of 26.77%.

Data collected from industry representatives in May 2025 included a form evaluating the students' performance, sent by email. When the students had completed the project, an evaluation form was sent to the external supervisor at the company. The external supervisor was asked to assess the students' work in terms of process, collaboration, knowledge, and expectations. The survey consisted of eleven fixed items. The response alternatives were; very good, good, poor, very poor, or not applicable. Each company (n=118) received the evaluation form by email sent by the internal supervisor at the school, and the person serving as an external supervisor at the company filled it out. Eighty-five out of 118 companies provided feedback, equating to a 72.03% response rate. This indicates that the companies take the time to assess the students. Such assessments are a great opportunity for the school to get feedback and gain an understanding of the importance of this collaboration, and the value students create for companies.

Sample of the Students

This section consists of an overview of the student sample who responded to the online survey. Table 2 presents demographic data gathered through the survey.

TABLE 2: Respondents' demographic data (n=132 students).

Questions	Responses
What is your gender?	Female: 39 (29.5%); Male: 86 (65.2%); Other: 3 (2.3%); Do not want to answer: 4 (3%)
What is your age?	18–23 years: 34 (25.8%); 24–29 years: 71 (53.8%); 30–39 years: 24 (18.2%); ≥40 years: 3 (2.3%); Do not want to answer: 0 (0%)

Table 2 shows that 30% of the respondents were female and 65% were male. The remainder identified as "other/do not want to answer" this question. Most respondents were 24–29 years old, followed by those aged 18–23 years. This is a representative sample of respondents representing third year bachelor's students, as most IT students at our school typically consist of young, male students.

Data Analysis

The quantitative data were reviewed using the survey tool (Nettskjema) and then exported to Microsoft Excel® for analysis and data visualization. Regarding the qualitative analysis, a total of 96 responses to the two open-ended items were received. This relatively small number of responses allowed manual analysis using Microsoft Excel®. Each comment from the respondents was studied separately, and a cluster analysis was conducted in which the occurrence of topics was coded. One comment could include zero, one, or several topics. This technique was inspired by Miles and Huberman (1994). The screen shot from Microsoft Excel® in Figure 1 illustrates the manual cluster analysis with an excerpt of four participants. Color coding was used for convenience, for example red fonts for negative sentiments.

FIGURE 1: Screen shot of the cluster analysis using Microsoft Excel®.

Question 4: Describe with your own words your experience with the Bachelor project? For example: collaboration in your group, the task to be carried out, the motivation to high performance, etc.										
Topic ->	Challenging	Rewarding	Good	Company good	Comp poor	Good team	Poor info from school	Poor team-member	Int. superv poor	Comment from participants
1	1	1	0	0		0	0	0	0	Challenging, but rewarding. Would have liked to be able to spend more time on the project as a group.
2	0	0	1	0		0	0	0	0	Good
3	0	0	1	0		0	0	0	0	I think that is has been fairly ok, good cooperation and communication
4	0	1	1	1		0	0	1	0	The task is handled in a good and effective manner. We become very motivated by the company that we work with, but we are 5 students in the group and 1 of us has not been very present. Has very poor technical skills and lack work morale.

The feedback forms from the companies were manually registered and the ratings of the student groups were compiled in a matrix created in Microsoft Excel® and then the results were summarized. This allowed easy access to students' scores on each of the evaluation criteria.

Ethical Approval

The research is conducted according to The National Research Ethics Committees of Norway (n.d.) and the Norwegian Agency for Shared Services in Education and Research (n.d.).

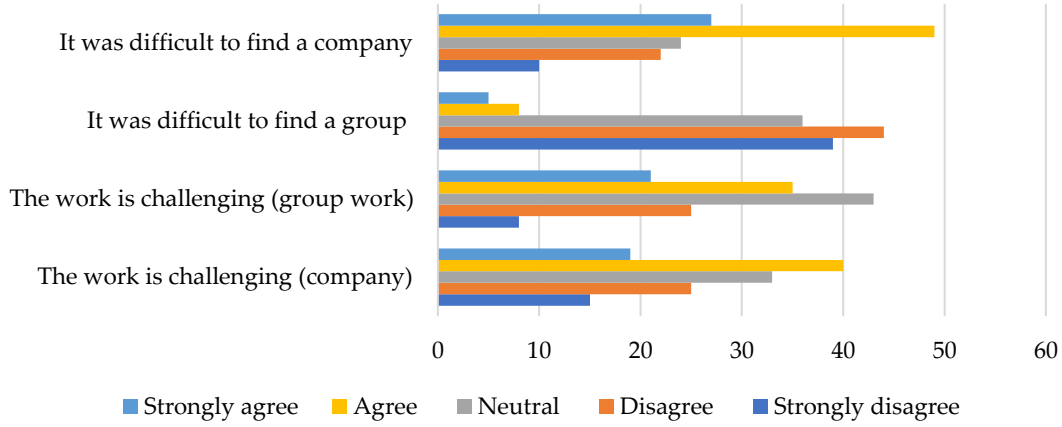
RESULTS

This section is divided into three subsections that present the survey findings: practical implications of the bachelor's project (challenges, personal interest, supervision, and expectations), students' perceptions of the academic benefits of the project, and qualitative findings (comments in the free-text field offered by the respondents).

Practical Implementation of the Bachelor's Project

Figure 2 presents the challenges respondents perceived during the practical implementation of the bachelor's project.

FIGURE 2: Challenges perceived by the students (n=132).

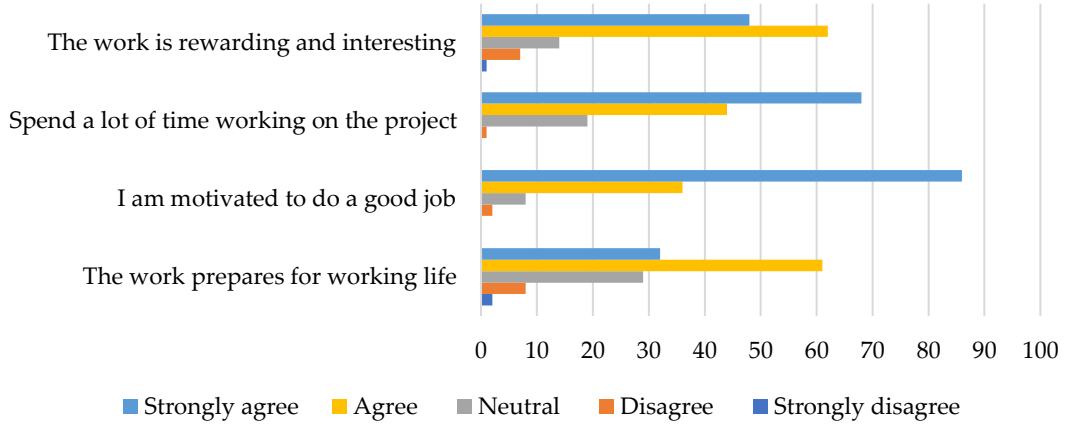


Note: Actual numbers are provided rather than percentages.

Evidently, the students generally found it difficult to find a company with which to conduct their bachelor's project. Although the school contributes by holding speed dates between students and potential companies, it is still the students' responsibility to establish contact and agree on a project.

This is clearly more challenging for some groups than for others. Regarding finding a group (students work in groups of 3–5), the results were far more positive. Most of them found it easy to find fellow students to collaborate on a project. When it comes to challenges related to the project, several students found it challenging to collaborate both internally in the group and with the company. However, a preponderance of students was either neutral or did not consider this a challenge. Figure 3 provides the findings pertaining to the students' personal interest in their project.

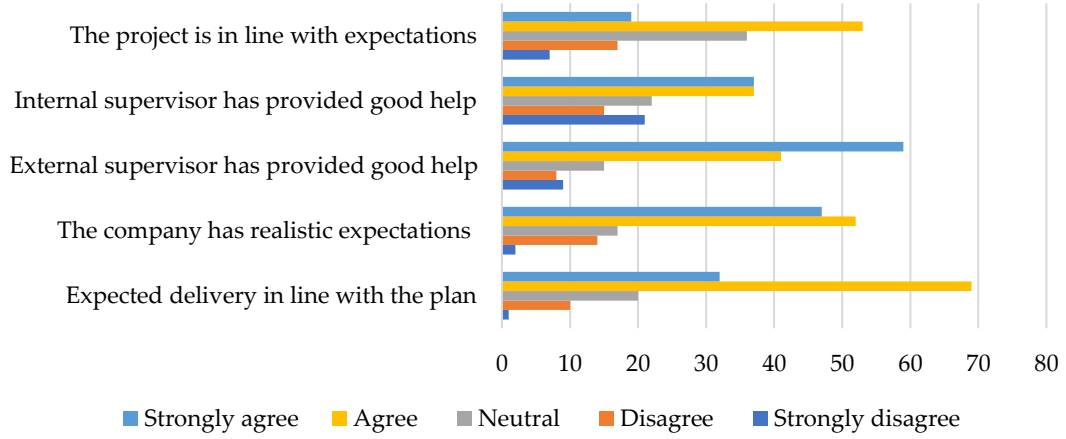
FIGURE 3: Students' personal interest in the bachelor's project (n=132).



Note: Actual numbers are provided rather than percentages.

The findings show that most students found the project interesting and invested a lot of time in it. They were also highly motivated to do a good job and considered the work beneficial in terms of preparing them for working life. Figure 4 presents the students' views on supervision and expectations.

FIGURE 4: Students' views on supervision and expectations (n=132).



Note: Actual numbers are provided rather than percentages.

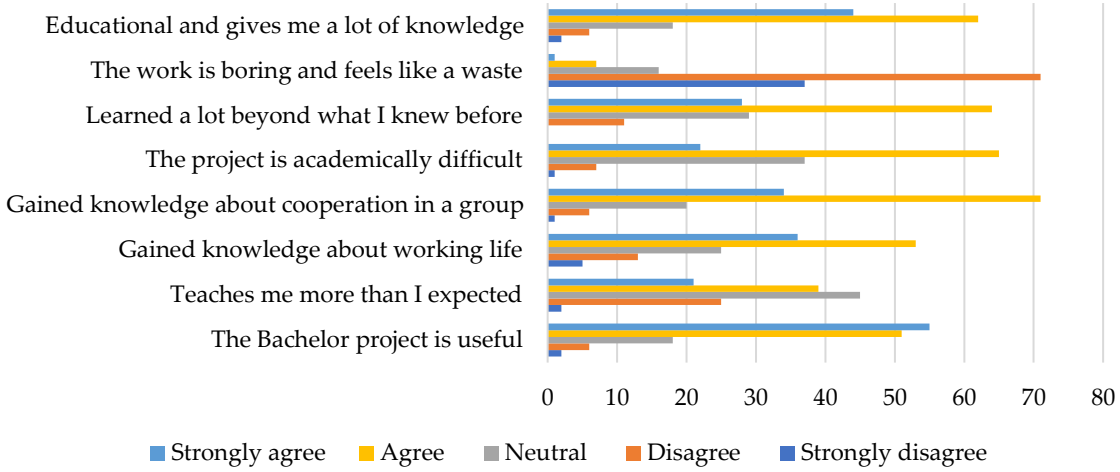
The findings show that the implementation of the bachelor's project was largely in line with the students' expectations and that they were largely able to deliver what was initially planned. They also

generally considered the companies to have realistic expectations of what they could produce or develop during the semester. Supervision is a key element of such projects, and some students found that external supervisors (employees of the company) offered better supervision than internal supervisors (academic supervisors). Although there are various potential reasons for this, one may be that the external supervisor is often more involved in the students' daily work.

Academic Benefits of the Project

The survey also examined students' views on the academic benefits such a project might provide. Figure 5 presents the findings regarding this topic.

FIGURE 5: Students' views on the academic benefits of the bachelor's project (n=132).



Note: Actual numbers are provided rather than percentages.

The students reported that they gained a lot of new knowledge during the project period and rarely found it boring or a waste of time. Although they found the work challenging and demanding, they also found it valuable in terms of collaborating in a group on a large IT solution/product over a long period. Overall, they found the bachelor's project very useful and felt that they gained valuable experience that would benefit them in working life.

Open-Ended Comments from the Respondents – Overall Experiences

Two open-ended items were presented, and although some students gave one-word responses, such as "Good," some provided responses that were more detailed. The first qualitative item was as follows: "Describe in your own words your experience with the bachelor's project, such as collaboration with your group, the task to be carried out, your motivation to perform at a high level, etc." Out of the 79 responses that were received, most were positive. "The project is rewarding" was most mentioned (39 times), followed by "Good" (35 times). Table 3 presents an overview of the distribution of the responses in descending order.

TABLE 3: Overview of topics pertaining to the first open-ended item.

	Topic	Occurrence	Sentiment	Stakeholder
1	The effort put into the project is rewarding	39	Positive	Student
2	Overall, the bachelor's project is good	35	Positive	University
3	Good teamwork	32	Positive	Student
4	Internal supervisor poor	15	Negative	University
5	Company good	14	Positive	Company
6	Poor teamwork	13	Negative	Student
7	Challenging	9	Positive	Student
8	Poor information and follow-up from school	8	Negative	University
9	Company or external supervisor poor	6	Negative	Company

While some of the comments were purely positive or negative, many were also nuanced. For example, one student stated:

> Collaboration with the group is going very well. Collaboration with the client exceeds all expectations. Missing much better follow-up from the school. Motivation goes up and down a bit, but we, as a group, are good at keeping each other going and motivating each other.

Another student stated, "Collaboration has been rewarding but also quite challenging at times." One positive comment reads as follows: "Collaboration within the group has been good, the project as a whole has been good, and the entire group has been motivated to do the best possible job."

One negative comment reads as follows:

> Motivation is low, and it feels challenging that students with no previous experience are given responsibility for tasks they have never encountered before. I understand that the purpose is to learn through practice, but for those of us who start with zero knowledge and experience, it is difficult to get any real learning benefits. It can be experienced as a bit too free, where you largely must figure everything out on your own, without enough guidance.

The second qualitative item was as follows: "If you have comments on the items above, or other comments pertaining to the bachelor's project, please specify". Seventeen responses were received. Most of the comments on this item were negative. One participant stated that the course had been "OK," and another stated that "it has been a good experience so far." The rest of the answers had a negative tone. Thirteen participants mentioned that the information from the school had been poor, lacking, or confusing, followed by five occurrences of frustration about the internal supervisor. The overview in Table 4 (below) reveals that most of the comments dealt with the shortcomings of the school. For example, one student wrote:

> I wish there was a little more follow-up from the school and a few more lectures when it comes to the report and how it should look. I would have liked to have some guidelines in relation to meeting with the company to make sure that we as a group had not worked too much. We have

> worked about 100% like other employees with development and are now sitting with a lot of report writing and are not finished with the development. I would have liked to have had a little more info and overview earlier. The school should have been better at providing more companies.

Although the school does its best to connect students with companies, there are still areas where there is potential for improvement. The extent to which individual students follow up on their duties, attend lectures, and take initiative varies and can affect their views of the implementation of the project.

TABLE 4: Overview of topics of the second open-ended item (n=17).

	Topic	Occurrence	Sentiment	Stakeholder
1	Wanting more information from the university	13	Negative	University
2	Wanting more follow-up from the internal supervisor	5	Negative	University
3	Overall, the bachelor's project is good	2	Positive	University
4	Wanting more follow-up from the company/external supervisor	1	Negative	Company

In summary, the quantitative and qualitative data complement each other. Although the researchers would have liked to find even more explanations for the statistical data, some honest and valuable insights were obtained from the students' responses. These insights can, for example, lay foundations for in-depth interviews with the universities, students, and industry representatives.

Data Collected from the Companies

In addition to the surveys, student evaluations were collected from the companies involved in the project. The assessment was delivered by the external supervisor at the company. The results are presented below in Table 5.

TABLE 5: Assessment received from the companies (n=85).

Evaluation criteria	Very good	Good	Poor	Very poor	N/A
Work effort	66	18	1	-	-
Project management	53	24	7	-	1
Competence and skills	55	23	7	-	-
Technical quality of the product	53	26	5	-	1
Professional appearance	60	22	3	-	-
Ability to learn new things	63	18	3	1	-
Ability to suggest alternative solutions	49	25	8	1	2
User training/documentation	45	24	4	-	12
Collaboration with external supervisor	56	18	3	-	8
Collaboration with users	57	5	4	2	17
Overall assessment of the work	63	17	4	1	-

Note: Actual numbers are provided rather than percentages.

Table 5 shows that the students generally scored very well in the assessment from the companies. They found that the students put a lot of work into their projects and possessed good knowledge related to project management. The same applies to their technical skills, professional appearance, and collaboration skills. Most companies assessed the work performed by the students as very good.

DISCUSSION

WIL has become popular and is starting to gain a foothold within various research disciplines. In Norway, more empirical research is needed on WIL implementation in higher education (Thon & Hauglid, 2025). The present paper aims to address this gap by focusing specifically on a capstone project among IT-students. Through project work in a company, students gain valuable practical experience as part of their education (Coleman, 2025; Sunnemark et al., 2023). The findings show that the surveyed students were highly motivated to do a good job on their capstone projects and spent a lot of time on them. In general, the students also found that this project provides a good introduction to working life and the tasks that await them after completing their education in IT. This is in line with the purpose of WIL, which is to allow students to gain practical experience. Through such work, students also demonstrate their academic skills (Tuononen & Parpala, 2021). However, to prepare for the workforce, it is also vital to acquire collaboration and communication skills. WIL projects can foster communication, teamwork, and critical thinking (Murtazin et al., 2022), while also promoting problem-solving, adaptability and practical application of academic knowledge.

For a project like this to be regarded as successful by all stakeholders, several conditions must be met. Effective supervision and regular, constructive interactions between supervisors and students are particularly important (e.g., Bloom et al., 2007; Lee, 2008) and play a role in the students' learning experience. The school can offer academic guidance in many ways regarding documentation of the project, theoretical grounding, process, and scope. Meanwhile, the company gives students an introduction to work processes, expectations, and the work to be performed. Findings in the present paper show that the students were generally satisfied with the guidance they received from the companies and that the companies engage in the students' work.

However, supervision can also be seen as a challenge (Govender & Vaaland, 2020) regarding both the learning process from a student perspective and the outcomes and values produced for the company. The students' satisfaction with their academic supervisors (in contrast to the supervisor employed in the company) varied, which can be seen as a risk regarding the students' experience of the bachelor's project. The academic supervisors must be motivated to perform a good job and have enough time available for supervision. Being updated on the project that the students are working on throughout the project period, and responding to emails and inquiries from students within a reasonable time, are vital components in such a project and entail various prerequisites. Lack of follow-up can lead to student dissatisfaction with the school's effort, and/or can affect the learning experience. Reducing negative factors such as stress for students is also important (Smeltzer & McCracken, 2025; Zegwaard & Adams-Hutcheson, 2025) and lack of guidance might cause stress and pressure.

Furthermore, most students thought the companies had realistic expectations of the work they were doing. This may have been because the companies were familiar with the knowledge that the students possessed prior to the project. Companies might experience challenges related to finding viable student projects and suitable students (Jackson et al., 2016), as well as aligning project scope with business needs, providing adequate supervision and resources, and accommodating academic expectations. Regarding the academic benefits of the bachelor's project, the findings are in accordance with the aim

of WIL. Earlier studies reported that students viewed the WIL approach very positively (Karim et al., 2019) and that they felt prepared for the workforce (Alanson, 2023). The students gained both new insights and built on existing knowledge. In line with this, the respondents found the bachelor's project useful in terms of preparing them for IT jobs. They were also motivated to deliver good work, delivered according to the planned deadline and scope, and found the work completed interesting. However, the students nowadays (respondents in this study) find it harder to connect with companies for collaboration during the bachelor's project, compared to some years ago. The researchers (authors of this paper), having been involved in this course for many years, can confirm this trend among industry partners. The reasons are likely varied and complex. Nevertheless, it is therefore important to foster student collaborations that industry partners find useful and valuable. Companies should consider student-developed IT solutions as a strategic resource and cost-effective investment when internal time, budget, and/or expertise are lacking.

Although there are many opportunities and advantages associated with implementing such a project, some challenges are worth mentioning. Because the Norwegian government is seeking further industrial cooperation (Thon et al., 2024), academic institutions are completely dependent on companies having the time, capacity, and willingness to collaborate with students. Though findings reveal that the students in general found it somewhat difficult to connect with a company, by contrast, finding a group of fellow students with whom to collaborate was easier for them. Regarding this, academic programs should develop structured capstone projects (Gafni et al., 2023), including responsibility that should be placed on both the student and the institution, with a view to finding relevant projects. Thus, it may also be relevant to ask questions such as: What happens if the students do not find a project and how should the institution support students in such a case? Educational institutions that incorporate WIL into their programs need to ensure enough resources to follow up the learning process and collaborate with industry (Winborg & Hägg, 2022). Although the bachelor's project represents a substantial piece of independent work intended to demonstrate individual competence, it should be understood as an integral part of a broader learning process that includes reflection, feedback, skill development, and iterative improvement. Continuous supervision, peer interaction, and opportunities for formative assessment are therefore important to support student learning and professional growth.

The companies' assessment indicated that they were satisfied with the IT students in this project. The students were perceived as academically competent and scored high on characteristics related to work effort, collaboration, project management, and so on. This confirms the value of such collaborations, considering the students' learning, and that companies benefit from their work. Results concur with existing research but raise the question: Why are companies and students so positive towards the IT Bachelor's Project? Six highlights emerging from the research are outlined below.

[1] Does the discipline of IT play a role in this matter? On the one hand, many IT projects fail (Iivari, 2021), and much research has been conducted on critical success factors, resistance to change, project management, and similar. This is all on the students' curriculum list. On the other hand, IT has a somewhat tangible nature. Most of the student groups develop a product/artifact that is visible, like a website, an algorithm, an information dashboard, and similar, by either using existing programming skills and/or acquiring new technical know-how.

[2] Although the company has no obligations to use the product/artifact, the students observe that it has value and can potentially be useful to employees of a company. This may give students a strong feeling of accomplishment.

[3] After two and a half years sitting in the classroom, students realize that a lot of the knowledge they gained in the classroom is useful and relevant with the potential to transform into real life value and benefit for the companies.

[4] The university (our institution) has extensive experience with handling the bachelor's project (for many years) which probably contributes to the success. A predictable process is needed with clear guidelines and allocated responsibilities of the school, students, and industry. The school must be the main responsible stakeholder.

[5] From the industry partner perspective, most of the companies get a tangible product/artifact that can be used more or less immediately. The companies have the least amount of responsibility in the sense that they have "less to lose". The company does not pay the students, but they invest time in training and supervising the students.

[6] Some companies have engaged student groups for many years and are familiar with what they can expect. A few companies also have the agenda: "try-before-hire". However, most of the students are not employed by the company after the project is completed.

Summing up, the students experience that the curriculum aligns with what the real-world industry demands. In addition to assessment from lecturers, the student can acquire additional feedback and skills from the practitioners. The industry gets a tangible artifact without too much responsibility, and a potential "try-before-hire" candidate.

LIMITATIONS, SUGGESTIONS FOR FUTURE RESEARCH AND CONTRIBUTION

This study has two main limitations worth mentioning. The first concern is the response rate from the students. The survey was only answered by 26.77% of the students, however, the response rate from the companies was much higher (72%). The second limitation is the lack of one specific theory/framework regarding the study design. In this study we have a broad approach to the literature field aiming to paint an overall picture from an under investigated area in Norway. Future studies should include in-depth interviews with students and companies or participatory observation when the students are working at a company. Also, future research can address the responsibilities of the various stakeholders in more detail. For example, who is responsible and who takes what action if a student fails to find a company, or if a student group drops out or gets fired?

This research contributes mainly to the practice field regarding benefits and challenges of collaboration with students and higher education institutions. However, the article also contributes to academia, with descriptive insights within the IT discipline. WIL has traditionally been prevalent in disciplines such as nursing and teaching however, this research highlights successful implementation of WIL programs for students studying IT. Further research could study whether there are any similarities or differences between IT and other disciplines.

CONCLUSION

This study was guided by the research question: *What are the benefits and challenges of IT students and industry when undertaking a capstone project in a WIL context?* From the students' perspective, the motivation to undertake this project was high, and they found that the industry provided considerable help through supervision. Moreover, the students found the work useful and that the companies had realistic expectations of them. They also spent a lot of time conducting the bachelor's project. However,

there are some challenges to consider. For example, the students struggled to find companies open to collaboration. To address this, educational institutions need to step in and, for example, reach out to companies and arrange speed-dates. To ensure industry buy-in, it is vital to make the collaboration's value unmistakable by showcasing its concrete advantages. The companies reported that students worked hard, obtained new knowledge and skills, and created useful solutions; thus, the benefits for the companies are many. Meanwhile, educational institutions must ensure that students are assigned to suitable companies with realistic projects and that they receive follow-up through supervision. Because the capstone project aims to equip students for professional challenges, educational institutions need to facilitate the entire process. Through active facilitation of collaborations with industry, by clarifying values, and by guiding students from start to finish, the bachelor's capstone project not only reinforces academic learning but also delivers graduates who are truly workplace ready.

DISCLOSURE OF THE USE OF GENERATIVE AI

No Generative AI was used in the research or the writing of this article.

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About the Journal

The International Journal of Work-Integrated Learning (IJWIL) publishes double-blind peer-reviewed original research and topical issues related to Work-Integrated Learning (WIL). IJWIL first published in 2000 under the name of Asia-Pacific Journal of Cooperative Education (APJCE).

In this Journal, WIL is defined as:

> *An educational approach involving three parties – the student, educational institution, and an external stakeholder – consisting of authentic work-focused experiences as an intentional component of the curriculum. Students learn through active engagement in purposeful work tasks, which enable the integration of theory with meaningful practice that is relevant to the students' discipline of study and/or professional development* (Zegwaard et al., 2023, p. 38*).

Examples of practice include off-campus workplace immersion activities such as work placements, internships, practicum, service learning, and cooperative education (co-op), and on-campus activities such as work-related projects/competitions, entrepreneurships, student-led enterprise, student consultancies, etc. WIL is related to, and overlaps with, the fields of experiential learning, work-based learning, and vocational education and training.

The Journal's aim is to enable specialists working in WIL to disseminate research findings and share knowledge to the benefit of institutions, students, WIL practitioners, curricular designers, and researchers. The Journal encourages quality research and explorative critical discussion that leads to the advancement of quality practices, development of further understanding of WIL, and promote further research.

The Journal is financially supported by the WILNZ, WACE, WIL Australia, and the University of Waikato.

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Types of manuscripts sought by IJWIL are primarily in two forms: 1) *research publications* describing research into aspects of WIL and, 2) *topical discussion* articles that review relevant literature and provide critical explorative discussion around a topical issue. The journal will, on occasions, consider good practice submissions.

Research publications should contain; an introduction that describes relevant literature and sets the context of the inquiry. A detailed description and justification for the methodology employed. A description of the research findings - tabulated as appropriate, a discussion of the importance of the findings including their significance to current established literature, implications for practitioners and researchers, whilst remaining mindful of the limitations of the data, and a conclusion including recommendations.

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