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Enhancing employability through university-industry linkages: Omani engineering students' perspectives of the Eidaad internship programme

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Like many Middle East and North Africa countries, one of the main socio-economic challenges facing Oman is the creation of meaningful graduate employment opportunities. A combination of factors that include the gap between the expertise and skills acquired in higher education and workforce requirements means many students struggle to find suitable jobs upon graduation. Consequently, providing quality education and developing national talents are key objectives of the country's Vision 2040 development roadmap. Higher levels of cooperation between tertiary institutions and industry within the framework of government policy are necessary to achieve these outcomes. This study explores undergraduate engineering student perceptions of one example of this collaboration - the Eidaad internship programme. To better understand interns' perceptions of the programme's personal and professional benefit across targeted areas and means for further improvement, a three-part on-line questionnaire was administered to current and former programme participants. Results indicate overwhelmingly positive perceptions of the programme, including in terms of enhancing interns' teamwork skills, workplace participation, communication skills, clarity of career plans and objectives, and so on. Participant suggestions for improvement include the creation of concrete employment pathways and the provision of further on-the-job training opportunities. Implications for the Eidaad and similar internship programmes are discussed.

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Introduction

Ensuring graduates achieve meaningful and productive employment is a challenge facing many Middle East and North Africa (MENA) societies, including the relatively wealthy Arab Gulf states (International Labour Organization, 2015, 2022; Islam et al., 2022; Poplavskaya et al., 2023). The gap between the skills, mind-sets, and expertise students develop in the region's higher education institutions and those demanded by the world of work has been identified as contributing to the lack of graduates' workforce readiness. This is what Mishrif et al. (2023) describe as the divide between education outputs, organisational skills requirements, and the increasingly globalised regional labour market. Limited industrial experience and lack of ability to apply theoretical learning to real-world situations are often described as at the very core of the university-workforce gap, an outcome of which is the extended basic learning and development, in addition to professional development, programmes that many companies provide employees. Compounding these concerns, Omani graduates have further been characterised as lacking soft skills, including higher-level thinking and problem-solving skills, and as having only basic demonstrable abilities in interpersonal communication, information literacy, teamwork, leadership, and so on (Al Hinai et al., 2020).

As the nature and extent of these issues imply, some scholars argue that Oman's higher education system may only be preparing graduates with generic skills that fail to match the more complex requirements of the workforce (Belwal et al., 2017; Edwin and Sabura, 2019). As a result, many of the nation's organisations, and especially those in the private sector, have traditionally relied on imported expatriate labour (Ali et al., 2017), with even post-pandemic peaks of workforce nationalisation seeing no more than 16% of the private sector consisting of Omani workers (Mishrif et al., 2023). The apparent limited success of higher education in preparing graduates for future careers may be associated with the World Economic Forum's (2017) description of the quality of the sultanate's education system as below world average. Perhaps in acknowledgement, the creation of a high-quality education system with strong societal partnerships has appeared as a core objective of Oman's socio-economic development plans (Educational Council, Sultanate of Oman, 2018).

One potentially effective way of enhancing both graduate employability and the quality of education is the closer alignment of academia, industry, and government (Belwal et al., 2017; Edwin and Sabura, 2019). Such cooperation has been posited as vital for achieving Oman's envisioned transformation to a knowledge society (Chryssou, 2020). Accordingly, concerned government authorities have launched a number of initiatives to improve education system quality and ensure school and college graduates are workforce-ready. An example is the Eidaad programme, which seeks to enhance graduate capabilities and employability by placing selected undergraduate engineering students in an industrial internship. As it is still in the first several years of its operation, as of yet, to the best of the authors' knowledge, no studies have systematically investigated interns' perceptions of the Eidaad programme, including in terms of its personal and professional benefit across programme objectives or means for improvement. The current research sought to redress this imbalance by administering a three-part questionnaire to Eidaad participants from the first three years of the programme's implementation.

Literature review

Graduate employability in Oman. The sultanate's national development policy, Oman Vision 2040, highlights the need to

create a competitive knowledge economy based on a creative, innovative, and educated populace, including through private sector development, economic diversification, and workforce nationalisation known locally as 'Omanisation'. The provision of jobs, and especially quality jobs in high-tech, future-proof industries, is at the heart of these objectives. This is especially important given Oman's status as a relatively young nation, with a median population age of 30.6 years, where ~50,000 people graduate from school and university, of which 40,000 become jobseekers, each year (Bertelsmann Stiftung, 2022; UNICEF Oman, nd).

Despite the pressing nature of job creation, high rates of youth unemployment and limited female labour force participation remain a perennial issue in many MENA countries, including Oman (Islam et al., 2022). In fact, the International Labour Organization (2022) estimated the unemployment rate across Arab countries in 2023 to be 8.7%, with young people and women particularly affected. With specific reference to Oman, the World Bank (2023) estimated unemployment rates among 15–24-year-old to be ~14.6% in 2021, and UNICEF Oman (nd) claims that ~20% of young people in the country are currently not in employment, education or training. While discrepancies between these figures indicate some of the challenges inherent in accurately measuring unemployment rates in the country, the conclusion that young people and females are generally over-represented in the ranks of the unemployed is one that is widely reported and that also receives backing from the sultanate's National Centre for Statistics (2020).

Although there is widespread regional acknowledgement of the necessity of ensuring MENA citizens benefit from employment creation, individual and systemic obstacles continue to hamper this (Al-Mahrooqi and Denman, 2018). Belwal et al. (2017) offer one of the main causes of high unemployment rates in the Arab world as the widening gulf between university curricula and the challenges and needs of the business world. The authors maintain that the effectiveness of the relationship between the labour market and higher education institutions can be determined by "the extent to which higher education provides graduates knowledge and skills that match the employment needs" (p. 815). In Oman, Belwal et al. state that a number of gaps exist between the higher education system and industry, including the lack of consistent training programmes and limited academia-industry partnerships. In response, they highlight the importance of enhancing coordination between different stakeholders to ensure graduates bring better values and productivity to future employers, encouraging learner self-development and skill sets, and facilitating student industry exposure and collaboration.

Edwin and Sabura (2019) note that the gap between education and employability is an ongoing issue in Oman that negatively influences the ability of graduates to acquire suitable jobs. In addition to limited opportunities in the government sector, which has traditionally been the most desirable graduate career path, the authors claim that Omani graduates often struggle with limited English-language skills, a lack of alignment between their qualifications and the workforce, limited industrial experience, and a general preference in the private sector for expatriate workers. They continue that employers often complain about the lack of higher education focus on industrial experience, skills training, and technical information and concepts. These employment enablers are dynamic and require a swift adoption of technology advancements which some higher education institutions struggle to cope with. To address these concerns, the authors recommend a series of measures for aligning higher education with industrial expectations, including by incorporating more soft skills, such as problem solving and teamwork, and

the provision of industrial linkage schemes and on-the-job training programmes.

Al Hinai et al. (2020) agree that one of the most significant issues facing Omani higher education graduates is the gap between their skills and workforce requirements, especially in the private sector. The authors maintain that some of the most important skills for enhancing graduate employability are critical and analytical thinking, problem solving, and communication, in addition to lifelong learning, information literacy, teamwork, professional ethics and morality, entrepreneurship, and leadership. With specific reference to engineering students, the most important graduate attributes affecting employment readiness include human capital (e.g. graduate knowledge, skills etc.), social capital (team building etc.), and individual attributes (career orientations, academic excellence etc.). According to the authors, Omani engineering graduates lack most required employment skills which “harshly affects” their employability and workforce achievement. Al Hinai et al. conclude by detailing the necessity of further aligning academic programmes with future job opportunities, promoting connections with the labour market, and integrating technical industrial skills into programmes.

Soundararajan (2022) surveyed company top management and higher education faculty, students, and employees in Oman to determine perceptions of twelve vital employment skills, including teamwork, self-management, flexibility, ICT knowledge, and so on. The author reports a number of significant differences between the skills the different groups believe to be the most valuable for the workforce. For example, while all sample groups identified the value of enthusiasm and motivation, faculty and students both considered commitment, planning, and organisation to be among the most important skills, while managers placed these as amongst the least salient. Further, managers considered ICT knowledge to be vital for their workplaces, though faculty and students both held this in relatively little regard. A number of other disconnects in participant group perceptions were also apparent, including “a significant difference in employers’ expectations on employees’ learning and development skills” (p. 3081). As a result, the author recommends employers contribute to developing graduate employability skills through the provision of training, workshops, and other programmes – a recommendation that has been echoed elsewhere in the literature (Al-Mahrooqi and Denman, 2018; Al Riyami, 2021).

Engineering Industry-Academic Programmes. The alignment of engineering graduates’ skills and attributes with industry needs is an ongoing concern around the world (McGunagle and Zizka, 2020). More than a decade ago, Atkinson and Pennington (2012) described the apparent paradox in the UK of employers calling for more engineering graduates while ~13% of such graduates could not find work. The researchers interviewed 66 engineering graduates who had indicated a status of unemployed on their recently completed higher education leavers’ destination census and 12 that indicated an employed status, in addition to 19 engineering employers. While reporting no significant differences in the characteristics and behaviours of employed and unemployed graduates, all participant groups nonetheless highlighted the gap between employer needs and graduate skills, especially in terms of the ability to apply technical skills and engineering knowledge in work settings. This was associated with a strong link between graduates’ levels of engineering work experience and employability. Employers further demonstrated a strong preference for high bachelor-level academic results and postgraduate degrees. Based on these outcomes, the authors note how industry-academia programmes, such as the University of Birmingham’s

Engineering Industrial Placements Programme, which offers selected undergraduates paid work experience and possible job opportunities upon graduation, could act as models for bridging the gap between employer needs and graduate skills for other institutions to follow.

In Malaysia, Abdul Karim and Maat (2019) administered a student employability skills questionnaire to 204 engineering technology students from nine technical institutes in order to develop a model for predicting graduates’ employability skills and employment prospects. Similar to respondents in Atkinson and Pennington (2012), students’ education levels were reported as amongst the most important factors in future employability, complemented by other variables such as engagement in entrepreneurial and career development activities. The researchers conclude that engineering programmes explicitly focused on graduate employability, including by incorporating career planning, in-service learning, and work-based education, can enhance programme delivery and learner skill development.

While these studies support the integration of internships and work-based education into engineering programmes to close the skills gap between university and employment, a number of researchers have examined student interns’ perceptions of these programmes. Sriram and Somu (2020) administered a 16-item on-line questionnaire to 107 students from various Indian universities offering engineering internship training programmes. Of these, 91% maintained that internship programmes were necessary, 95% believed they were beneficial, and ~75% reported being satisfied with their internships. Around 71% also reported that their internship work was related to their branch of study, while 75% claimed being confident and clear about their responsibilities in the host organisation. The authors conclude by noting these engineering students’ overall positive perceptions of intern programmes and their belief that internships allow them to gain practical work experience and enhance their engineering skills and abilities.

After describing how industrial internship programmes are widely accepted in the literature as offering valuable learning experiences and increasing graduate employability, Nogueira et al. (2021) administered a 15-item, four subscale questionnaire to 447 engineering students involved in internship programmes at public universities and polytechnic schools in Portugal. The instrument’s subscales were clear goals, university support, work support, and generic competencies. Following instrument validation, the authors describe how participants perceived general competencies, such as developing problem solving and analytical skills and time management, as being amongst the most well developed through their internships. Participants, however, offered their lowest levels of agreement for the university support item regarding the assistance their college departments offered while preparing to find an internship. Female participants also had significantly lower values on the subscales than males, which the authors attribute to possible gender bias experienced in the workplace. Female participants also offered lower levels of agreement for the overall assessment item of, “Globally, I was satisfied with my internship”.

The Eidaad Programme. In response to the widely-accepted skills gap between higher education and the workforce, and the belief that internships are an important means of addressing this, the Omani government, through its concerned ministries and authorities, has introduced a number of programmes and initiatives to ensure graduates transition to the workforce smoothly and efficiently (see Supreme Council for Planning and World Economic Forum, [nd](#), for some examples). One national programme concerned with bridging the gap between graduate skills

and the workforce is Eidaad, which was established by Petroleum Development Oman's External Learning & Development Manager as an outcome of the 2017 Oman Energy Forum. Following its founding, ownership passed to the Ministry of Higher Education, Research and Innovation (MoHERI) to ensure programme accreditation and that student credits align with the country's educational schemes (Eidaad, 2023).

The Eidaad programme is similar to the sandwich courses offered in the UK in that interns spend nine months, which is equivalent to an academic year in Oman, working in a company. It is also based on similar principles, with the most important being achieving educational integration with industry and providing engineering students with extensive hands-on practical experience and skill development. Consequently, MoHERI (2021) states that the overriding concern of the programme is to close the gap between industry and higher education institutions while facilitating partnerships and intellectual exchange. It seeks to complement and integrate the capabilities of industry and academia through genuine and close partnerships between both parties. The programme's mission is to "improve Graduate Employability Index and enhance graduate capabilities to bridge industry/academia gap and attain global recognition with the excellence of our people" (Eidaad, 2023, Vision). Vision fulfilment is pursued by exposing selected undergraduates to an extended period of applied learning through placement in an internship in local industries, thus developing industry experience and offering a competitive advantage in the workforce upon graduation. MoHERI (2021, p. 2) details the programme's specific objectives as:

- i. Up-skill students with the proper communication/behavioural/future skills and applied technical skills before graduation;
- ii. Align academia output to industry needs;
- iii. Enhance students' technical fundamentals and critical thinking skills and expose them to open-ended real-life situations.

To achieve these objectives, the Eidaad programme focuses on training interns across the six areas of disciplined core competencies, job tasks and related activities, discipline courses, soft skills and real-life projects, attitude and discipline, and professional and ethical behaviour (MoHERI, 2021). The main programme benefits for students identified by Eidaad (2023) are learning the applied fundamentals of future job disciplines, aligning university projects with industry problems, enhancing employability and future career prospects, increasing competitiveness in the graduate marketplace, supporting better-informed future career decisions, and possibly allowing interns to secure permanent jobs upon graduation. For participating organisations, which do not receive any form of external funding for their involvement in the programme, Eidaad contributes to the development of high-level transferable skills among graduates as future employees in addition to the enhancement of industry-based research. Consequently, Eidaad has been explicitly identified as a supporter of Oman Vision 2040, including through its promotion of Omanisation and aligning "the supply and demand of future jobs and skills through systematic planning" (MoHERI, 2021, p. 2).

In terms of functioning, Eidaad is an elective programme offered by 25 higher education institutions across Oman. At the research site, the programme is open to all fourth year engineering students to take as a registered course following completion of at least 90 credits. Bachelor studies at the university begin for most students after a non-credit general foundation programme usually lasting between 1–2 years. For programme participation, students receive 6 credit points towards their

College of Engineering 136-credit requirement. Participant programme selection involves an initial online placement test followed by an interview with the host company. During the first three years of its operation, ~15–20% of the research site's College of Engineering yearly cohort has participated. From applicants across the programme's first three offerings, ~68.07% met all prescribed eligibility requirements and were subsequently invited to sit the exam/interview. Around 30.91% of these chose not to move ahead with their applications, 15.18% failed their exam/interview, and 53.90% were accepted. Withdrawal rates after acceptance during this period were ~7.3%.

Selected students are placed according to their specialisations and the specific demands of the host company. Once placed, participants are deemed full-time employees by their host organisations, which, upon the signing of nine-month contracts to cover the internship period, pay interns a monthly salary.

Intern organisations are predominantly from the private sector, and are usually involved in energy, telecommunication, and infrastructure. Upon acceptance, participants are assigned an industry supervisor and receive detailed work descriptions and an internship work plan with weekly and monthly milestones. Communication between the intern organisation and the university takes place through regular meetings between learners' academic and industry supervisors. Interns also have regular meetings with their academic supervisors to explore areas of progress and challenge.

During the internship, participants undergo continuous evaluation of the achievement of their weekly and monthly milestones. Industry supervisors hold regular meetings with participants, at which interns present their achievements and address questions related to task competencies. Interns are also required to submit a comprehensive report to the college detailing work accomplishments after the internship period. The College of Engineering appoints an examination committee to review the reports before interns present their experiences in front of it.

Despite the extensive nature of intern assessment and evaluation, as of yet the authors are not aware of any systematic attempt to evaluate the effectiveness of the programme itself. As one of the sultanate's flagship graduate development initiatives, the current research addressed this issue by examining interns' perceptions of the personal and professional value of the programme across its targeted areas, in addition to means for programme enhancement, for students from one of the participating higher education providers.

Methods

Research questions. The current research sought to gain a clearer understanding of interns' perspectives of the Eidaad programme by exploring the following research questions:

- (1) What are intern' perceptions of the personal and professional benefit of the Eidaad programme?
- (2) What impact, if any, does intern background (e.g., gender, academic programme, reported university cohort, reported Eidaad cohort, GPA, and current academic/employment status) have on these perceptions?
- (3) How do interns believe the Eidaad programme could be improved?

Instrument. The research team initially developed an on-line questionnaire to be administered to current and former Eidaad interns based on the programme's targeted areas and expected outcomes. The initial form of the questionnaire was submitted to a judgmental validation panel of three experts in programme management, quality assurance, and/or assessment and

evaluation from two higher education institutions in Oman. Panel members, who were not otherwise involved in the study or the Eidaad programme, were asked to provide feedback on the questionnaire in such areas as theoretical coverage of categories and items, alignment between items and categories, category and overall questionnaire length, item wordings and clarity, user friendliness and so on. This process was employed to help ensure the questionnaire's validity and user-friendliness, and to avoid some of the common issues associated with self-rated competences questionnaires, such as the use of abstract and vague item wordings, double-barrelled items, social desirability, and even the potential impact of eliciting background information on respondents' self-ratings (Braun et al., 2012). Changes suggested by the panel were discussed by the research team in relation to the study's parameters and research questions, with almost all recommendations subsequently implemented.

This process resulted in a three-part, English-language questionnaire. English was selected for the questionnaire as the research site's College of Engineering offers all its instruction in the language. Further, all non-exempt students entering the university undertake an English foundation programme for between 1 to 4 semesters before taking further compulsory English credit courses during their degree programmes. As a result, completing the questionnaire in English was considered by the researchers to be well within learners' language proficiency levels. The limited population size ($N=86$) meant piloting the instrument was not feasible. However, Cronbach alpha coefficients were calculated to determine internal consistency for all questionnaire categories.

Questionnaire Part I contained six items yielding categorical data about participant gender, academic programme, reported university cohort, reported Eidaad cohort, GPA, and current academic or employment status. Part II featured 63 positively-worded items about participants' experiences of the Eidaad programme across the following categories: Teamwork and Workplace Participation (13 items); Career Development (7 items); Professionalism and Work Ethic (6 items); Oral and Written Communication (11 items); Critical Thinking/Problem Solving Skills (8 items); Leadership and Workplace Independence (7 items); Use of Workplace Technologies (7 items); and Interpersonal and Intercultural Development (4 items). Likert response options were: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1). Part II item and overall category data were interpreted as interval in nature. Questionnaire Part III contained a single open-ended question asking respondents for suggestions about how the Eidaad programme could be enhanced.

Sample. The population for the study was defined as all past and current Eidaad programme participants from Sultan Qaboos University's College of Engineering. Eight-six of these students have been involved in the programme as interns since its inception as follows: 22 in academic year 2020/2021, 49 in 2021/2022, and 15 in 2022/2023. The decrease in intern numbers between the latter two programme offerings has been attributed by administrators to its relatively new status in the university, although future trends and stakeholder feedback, including that offered in this report, will provide a more accurate picture of the programme's status among targeted students.

Written permission was received to administer the on-line questionnaire after the study's classification by the authors' institution as negligible risk research in which no personally identifying information was collected and that was not associated with any foreseeable risk of harm or discomfort to respondents other than inconvenience. The research team attempted to

contact all past and present interns via email with a link to the on-line questionnaire and information about the study's purpose, voluntary nature, anonymity of responses, and the potential dissemination of findings. As a number of former students no longer had access to university email accounts, a second message containing the same information was sent via text through the university's registration office to registered mobile numbers.

Adhering to institutional guidelines for the research, tacit consent was considered offered when participants submitted their on-line questionnaire responses. At the end of the data collection window from 5–19 March 2023, 38 participants had submitted responses, representing ~44.19% of the targeted intern population. This is very close to the average response rate of 44.1% reported in Wu et al.'s (2022) meta-analysis of 1,071 independent online surveys in education fields. Participant demographics are detailed in Table 1.

Data analysis. GNU PSPP software was used for quantitative data analysis. Internal consistency of questionnaire categories was determined through the calculation of Cronbach alpha coefficients. Based on Hinton et al. (2004, cited in Taherdoost, 2016), alpha coefficient levels were interpreted as follows: excellent (0.90 and above), high (0.70–0.90), moderate (0.50–0.70), and low (0.50 and below). Descriptive analysis was initially employed in the form of frequency counts of respondent background categorical data, in addition to item and category means and standard deviations for Part II interval data. Part II item and category means were interpreted as follows:

- Strongly agree – 4.20–5.00
- Agree – 3.40–4.19
- Neutral – 2.60–3.39
- Disagree – 1.80–2.59
- Strongly disagree – 1.00–1.79

Response means indicating agreement was interpreted as offering generally positive perceptions and vice versa. An independent samples t-test was next conducted to explore if statistically significant differences existed on questionnaire category means based on participant gender. In addition, five One-Way Analysis of Variance (ANOVA) tests were employed to examine the potential impact of participant academic programme, reported university cohort, reported Eidaad cohort, GPA, and employment status on category means. Levene's Test of Homogeneity of Variances was used for both the t-test and ANOVAs to determine if equal variances for participant groups could be assumed. In cases where Levene's Test was statistically significant at the $p \leq 0.05$ level, the non-parametric Welch's t-test statistic was used in place of the t-test, and the Kruskal-Wallis test was calculated instead of ANOVAs. Levene's Test values are reported for statistically significant results below.

Normality assumptions were examined through the calculation of skewness for category means, which was interpreted as slight (around ± 0.5), moderate (± 1), severe (± 2), and extreme (± 5). All skewness values fell within the slight to moderate ranges, ranging from -0.03 to -1.26 , with an average of -0.53 . While $p \leq 0.05$ was set as the acceptable probability level for the t-test, given the increased possibility of type I error associated with multiple ANOVAs, a Bonferroni correction was made with the resultant acceptable probability level established as $p \leq 0.01$.

Short responses to the open-ended question were placed in table rows in a word processor document. In those cases where respondents offered more than one suggestion, these were pasted on separate rows. The researchers read each response and, after discussion, wrote a summary word or phrase in the adjacent column representing response content. All responses with the

Table 2 Teamwork and workplace participation.

#	Item	Mean	Std. Dev.
1.	I was clearly informed about the level of performance expected of me during the internship programme.	3.79	1.02
2.	My tasks were clearly established and communicated to me at the beginning of the internship.	3.61	1.13
3.	I was provided with a clear schedule and work plan for the internship.	3.76	1.05
4.	I was able to work as an effective team member during the internship.	4.26	0.76
5.	My work was useful for the internship organisation.	4.39	0.72
6.	I contributed directly to the success of my team at the internship organisation.	4.26	0.64
7.	I received regular feedback about my performance during the internship.	3.76	1.13
8.	I had access to the infrastructure and equipment necessary to perform my tasks during the internship (e.g. PC, desk etc.).	4.55	0.55
9.	My work was appreciated and valued by my team at the internship organisation.	4.39	0.64
10.	I had a good relationship with my industrial supervisor during the internship.	4.47	0.73
11.	My industrial supervisor helped me become involved in practical work tasks during the internship.	4.47	0.69
12.	My team at the internship organisation was encouraging and supportive.	4.45	0.60
13.	The internship helped enhance my teamwork skills.	4.53	0.69
Category Total		4.21	0.50

Table 3 Career development.

#	Item	Mean	Std. Dev.
14.	The internship programme allowed me to better define my career goals.	4.42	0.64
15.	The internship programme was relevant and meaningful to my short- and long-term career interests.	4.24	0.79
16.	The internship experience made me better prepared for my future career.	4.43	0.73
17.	The internship experience made me a more desirable job candidate.	4.18	0.77
18.	The internship allowed me to better understand how to apply theoretical knowledge acquired at university to the workforce.	4.13	0.81
19.	The internship highlighted the connections between my studies and the workforce.	3.86	0.92
20.	The internship increased my level of competency in my field.	4.32	0.77
Category Total		4.27	0.61

Table 4 Professionalism and work ethic.

#	Item	Mean	Std. Dev.
21.	The internship programme allowed me to mature professionally.	4.18	0.73
22.	The internship programme helped me develop a strong work ethic.	4.32	0.77
23.	The internship programme improved my time management skills.	4.16	0.72
24.	The internship programme helped me understand the importance of performing tasks efficiently and professionally.	4.34	0.75
25.	The internship programme helped me realise the importance of adhering to the intern organisation’s code of conduct.	4.13	0.78
26.	The internship programme helped me understand the importance of maintaining the confidentiality of organisational data and information.	4.45	0.65
Category Total		4.26	0.60

graduate skills (Abdul Karim and Maat, 2019; Atkinson and Pennington, 2012). Participants’ lowest levels of agreement were in response to whether the internship increased their desirability to future employers or if it allowed them to apply theoretical knowledge to real-world work settings. This could represent an area of potential concern as the alignment of university curricula with industry needs has been identified both as an ongoing issue in Oman (Belwal et al., 2017) and as central to students’ successful transformation into dynamic, industry-ready professionals (Laguador et al., 2020).

Six items were featured in the Professionalism and Work Ethic category (Table 4). Participants again expressed agreement with all items. The item recording the lowest mean, however, had to do with whether the internship helped participants understand the importance of employers’ codes of conduct, which may point to limited familiarity with these policies, even if participants nonetheless claimed a strong awareness of the importance of maintaining the security of organisational data. Interestingly, participants only offered moderate levels of agreement about

whether they matured professionally during the internship programme. This finding was somewhat unexpected as the enhancement of both general and professional capabilities has been described as amongst the most important perceived outcomes for both STEM (Nogueira et al., 2021; Sriram and Somu, 2020) and non-STEM (Anjum, 2020) interns. Moreover, it may suggest that the “generic” knowledge and skills employers in Oman often claim fresh graduates have (Belwal et al., 2017; Edwin and Sabura, 2019) may not, at least according to interns themselves, be transformed into more professionally-focused skills and know-how as intended.

Table 5 details responses to the 11 items from the Oral and Written Communication category. Participants agreed that they were generally comfortable with most facets of information gathering, writing, and making presentations during their internships, with all items related to these areas receiving means indicating strong levels of agreement. The lowest item means were for speaking and oral interaction, even though these still fell within the agreement response range. However, the fact that

Table 5 Oral and written communication.

#	Item	Mean	Std. Dev.
27.	When required, I was confident making presentations during the internship.	4.37	0.82
28.	I was comfortable taking the lead in group discussions during the internship.	4.00	0.84
29.	I found it easy to speak with confidence in meetings and other professional interactions during the internship.	4.11	0.76
30.	When necessary, I demonstrated the ability to persuade others to accept my point of view during the internship.	4.11	0.69
31.	I was able to provide constructive feedback to others during the internship.	3.84	0.83
32.	I found it easy to maintain an interest in what was discussed at meetings during the internship.	4.00	0.87
33.	I was comfortable with asking questions during the internship.	4.49	0.65
34.	I was confident with writing formal emails during the internship.	4.50	0.56
35.	I was comfortable with gathering information from different sources and reporting it professionally during the internship.	4.32	0.67
36.	I demonstrated creativity in preparing presentation materials/reports during the internship.	4.26	0.72
37.	I was comfortable with writing clear and coherent reports during the internship.	4.24	0.79
Category Total		4.23	0.47

Table 6 Critical thinking/problem solving skills.

#	Item	Mean	Std. Dev.
38.	The internship programme helped develop my critical thinking skills.	4.27	0.77
39.	The internship programme gave me the opportunity to solve complex real-world problems.	4.05	0.85
40.	During the internship, I was able to come up with new ideas and initiatives.	3.68	1.03
41.	During the internship, I was able to identify new information required to draw conclusions about various issues and matters.	4.03	0.69
42.	During the internship, I was able to recognise how new information could change solutions to problems and issues.	4.05	0.66
43.	The internship allowed me to understand information in new and/or unfamiliar areas.	4.19	0.81
44.	During the internship, I was comfortable with separating relevant from irrelevant information when problem solving.	3.95	0.70
45.	During the internship, I was able to communicate critical analyses and solutions to problems and issues effectively.	3.86	0.71
Category Total		4.01	0.57

respondents offered lower levels of agreement about whether they could persuade others, lead group discussions, provide constructive feedback and so on may indicate more pre-internship training in these areas, or even in-training support, is necessary. This could be especially the case as English is the dominant language of both engineering studies and the private sector in Oman, with competency in the language often intricately tied to professional success (Holi, 2020).

Of the eight items from the Critical Thinking/Problem Solving Skills category in Table 6, participants only strongly agreed with one regarding the overall impact of the programme on their critical thinking skills. While none of the response means fell within the neutral, let alone disagreement, response ranges, participants offered lower levels of agreement about their abilities to identify, understand, and apply new information, and to solve real-world problems. These results may reflect the characterisation of Omani graduates as generally having limited higher-order thinking and problem solving skills (Al Hinai et al., 2020; Atkinson and Pennington, 2012), and may imply the necessity of placing a more explicit focus on these areas during their bachelor studies. Closely linked to these outcomes, participants offered their lowest levels of agreement about whether they were able to develop new ideas and initiatives as interns. Although it could be asserted that this is not an overriding concern for interns, implementing mechanisms to acknowledge and implement intern ideas and innovation interests can contribute to their motivation and willingness to continue sharing suggestions with the host organisation, in addition to eventual employability (Trego et al., 2019).

The questionnaire category of Leadership and Workplace Independence received the lowest overall category mean (Table 7). Participants agreed that they were generally comfortable with some of the more abstract aspects of their internships, including considering organisational values, strategic plans, and the placement of their roles within a wider institutional framework.

However, they expressed some of their lowest levels of agreement about their abilities to anticipate how their new ideas would be received, which may be a reflection of the relative uncertainty about their capacities to offer new ideas and initiatives discussed above, in addition to whether they could perform their duties without supervision. These results may not be limited to current participants, however, as limited perceived leadership skills and independence might be somewhat typical of the internship experience (Luk and Chan, 2022). Despite this tendency, as described in relation to the previous questionnaire category, taking steps to address this issue can result in favourable intern and organisational outcomes.

Items associated with the category of Use of Workplace Technologies are featured in Table 8. Respondents agreed with all items, while not expressing strong agreement with any. Although participants offered their highest levels of agreement about their comfort with using advanced communication tools and online services, their weakest agreement was in regards to whether they gained experience with new technologies and search techniques and demonstrated the ability to apply these to workplace problems. Authors such as Edwin and Sabura (2019) maintain that graduates' abilities to keep up-to-pace with technological advancements are a key enabler of engineering post-graduation employment, even if many universities and colleges struggle to help students achieve this. Additional methods of exposing learners to these often rapidly-changing technologies and their workplace uses, both within and prior to the internship programme, should thus be explored (Abdul Karim and Maat, 2019).

The final questionnaire category as detailed in Table 9 had to do with participants' Interpersonal and Intercultural Development during the internship. High levels of agreement were offered in response to all items, including about the perceived impact of the internship on participants' awareness of the importance of professional networks. Participants also strongly agreed that the internship helped enhance their interpersonal and intercultural

Table 7 Leadership and workplace independence.

#	Item	Mean	Std. Dev.
46.	During the internship, I was comfortable performing the detailed aspects of my work and tasks.	4.03	0.88
47.	During the internship, I found it easy to anticipate how others would respond to new ideas and proposals.	3.68	0.57
48.	During the internship, I could perform my regular duties without guidance or supervision.	3.50	0.80
49.	During the internship, I found it easy to place my tasks within the bigger picture of the organisation's work.	3.76	0.89
50.	During the internship, I found the idea of making strategic plans related to my tasks appealing.	3.89	0.80
51.	During the internship, I had the flexibility to make changes to my work schedule.	3.97	0.91
52.	During the internship, I enjoyed discussing organisational values and philosophies with my co-workers.	4.05	0.73
Category Total		3.86	0.53

Table 8 Use of workplace technologies.

#	Item	Mean	Std. Dev.
53.	During the internship, I learned about the latest technologies and initiatives in my field.	3.84	1.05
54.	During the internship, I demonstrated the ability to solve a range of problems and issues with technological solutions.	3.84	0.92
55.	During the internship, I was comfortable with choosing the correct technological tools to address problems and issues.	3.79	0.78
56.	During the internship, I found it easy to use advanced search techniques to find solutions to problems and issues.	3.71	0.80
57.	During the internship, I had the opportunity to explore a range of possibilities for technological solutions to problems and issues.	3.95	0.80
58.	During the internship, I was comfortable using a wide range of advanced communication tools.	4.03	0.72
59.	During the internship, I could effectively utilise a variety of online services.	3.97	0.72
Category Total		3.88	0.59

Table 9 Interpersonal and intercultural development.

#	Item	Mean	Std. Dev.
60.	During the internship, I displayed the ability to deal flexibly with people from various cultural backgrounds.	4.29	0.61
61.	The internship helped me realise the importance of developing strong professional networks.	4.38	0.68
62.	During the internship, I was able to recognise the various skills and abilities of my co-workers.	4.26	0.69
63.	The internship increased my understanding of the interpersonal and intercultural demands of the workplace.	4.32	0.70
Category Total		4.31	0.51

awareness, which is vital for employee success in Oman's multi-cultural private sector (Mishrif et al., 2023).

An independent samples t-test was employed to determine if statistically significant differences existed on overall category means based on intern gender. The only category for which a difference at the $p \leq 0.05$ was found was for Career Development (Levene's test $F = 0.06$, $p = 0.805$). Here, male participants ($M = 4.50$, $SD = 0.47$) offered higher overall levels of agreement with category items than their female colleagues ($M = 4.08$, $SD = 0.65$; $t(34) = 2.17$, $p = .037$). A series of ANOVAs was next performed to determine if the variables of academic programme, reported university cohort, reported Eidaad cohort, GPA, and current academic or employment status shared statistically significant relationships with category means. No statistically significant differences were found at the $p \leq 0.01$ level.

Responses to the open-ended question regarding how the internship programme could be enhanced were provided by 25 respondents (65.8%). These participants offered 39 suggestions. Seven participants stated the Eidaad programme could be improved through the provision of more on-the-job training opportunities and activities, including those focused on technical and inter-personal skills, while 5 believed formal employment opportunities for programme participants at the internship organisation should be established. Four respondents each maintained that more academic credit should be offered for programme participants, and that it was important for interns to be provided with clear host organisation

schedules and work plans. Three participants highlighted the importance of better communication between their university and the intern organisation, 2 stated improvements in communication were necessary between the university supervisor and interns, while 1 added that the programme required more overall supervision by the organisation supervisor and managers and the university. The only other recommended improvements suggested by more than one participant were adding more tasks to the internship and better aligning the programme with academic programme specialisations and assessments – both were offered twice each.

Discussion

Personal and professional benefits. The first research question examined intern perceptions of the personal and professional benefit of the Eidaad programme. Respondents offered either high or very high levels of agreement with all questionnaire items, thereby suggesting generally very positive perceptions. Six of the eight questionnaire categories received overall means above 4.00 on a 5-point scale, with the highest being for categories about the impact of the programme on interns' interpersonal and intercultural development, career development, and professionalism and work ethic. The two categories recording overall means below 4.00, though still indicating positive perceptions, were related to the programme increasing interns' knowledge and use of workplace technologies and workforce independence.

Participants further indicated strong agreement with 27 of the 63 questionnaire items, and agreement with all remaining items. Five of the 10 items with the highest means were from the Teamwork and Workplace Participation category, with items about participant access to required infrastructure and equipment and the internship enhancing teamwork skills receiving the highest means across the entire questionnaire. Other high-scoring items from this category concerned the relationship interns had with industrial supervisors and their roles in involving participants in practical work tasks, in addition to the existence of encouraging and supportive host organisation teams. Participants further offered amongst the highest levels of agreement across the questionnaire for two items from the Oral and Written Communication category about their comfort with writing formal emails and asking questions, and from the Career Development category in terms of the programme better preparing them for future careers and helping define career goals.

Notably, four of the ten items recording the lowest overall questionnaire means were also from the Teamwork and Workplace Participation category, including those about student tasks being clearly established and communicated before the internship, having a clear work schedule, and receiving regular performance feedback. Three of the lowest-ranked items were from the Leadership and Workplace Independence category. These were about participants' abilities to view their tasks in the wider organisational framework, develop new ideas and initiatives, and anticipate others' responses to their proposals, in addition to their abilities to work without supervision. This final item received the lowest mean across the questionnaire. Other items recording amongst the lowest means were drawn from the Use of Workplace Technologies category, including participants' abilities to choose and apply technological tools and search techniques to deal with problems and issues.

Even though these item means still fall within the agreement response range, they do, nonetheless, represent areas of opportunity for programme refinement. For example, the result that participants had relatively limited positive perceptions of the usefulness of communication they had with their internship organisations about expected performance, schedules, and tasks etc. requires attention. Effective communication between all internship stakeholders is an essential part of the internship process, and one closely associated with student skill development, career enhancement, and programme satisfaction (Narayanan et al., 2010). As such, means for enhancing the effectiveness of the quite extensive existing communication channels between the college, intern, and host organisation, should be examined.

The relatively low category means received for Use of Workplace Technologies is also a potential issue as it implies participants have less favourable perceptions of their exposure to and use of the new technologies and search techniques employed in their future workplaces. The empowerment of interns through developing their technical skills in response to real-world issues is often considered one of the primary concerns of STEM internships (Trotskovsky and Sabag, 2010), including the Eidaad programme (MoHERI, 2021). However, Luk and Chan (2022) state that the perceived development of technical engineering competencies may occur unevenly across internships, while more complex competencies may not even be perceived as having developed at all. To ensure that student competence with the technical aspects of their internships are sufficiently developed, Luk and Chan recommend establishing concrete learning outcomes applicable to all programme interns complemented by learner-specific outcomes based on personal expectations and needs. The revision of the existing Eidaad milestone system to include such outcomes would necessitate a revision of its current

assessment and evaluation practices, but could ultimately result in a more productive experience for interns and host organisations.

Finally, the fact that Leadership and Workplace Independence received the lowest overall category mean suggests this is an area in need of further attention. It could be posited, of course, that interns are generally not expected to exercise leadership or act independently, as their main purpose is learning. It is therefore perhaps not surprising that limited intern leadership and independence have been reported elsewhere (Luk and Chan, 2022). However, leadership skills are vital for career success and even the development of the engineering profession itself. As such, Farr and Brazil (2009) support internships and on-the-job training that exposes learners to successful engineers and leaders who can contribute to leadership development through creating personal and professional development plans, offering constructive criticism, involving interns in higher-level meetings and strategizing etc. Pursuing host organisation mentorships within the internship framework may place an additional strain on the Eidaad programme. However, implementing formal mentorships within the programme could ultimately produce short- and long-term benefits for all stakeholders, including by helping create a new generation of engineering leaders.

Based on these results, in response to the first research question, it is possible to contend that interns hold mainly positive perceptions of the personal and professional value of the Eidaad programme. These results suggest that participants perceive the programme as enhancing their competitive advantage in the workforce, as intended by its devisers and owners (Eidaad, 2023; MoHERI, 2021), including through its focus on the development of the employment skills demanded by the Omani workforce (Edwin and Sabura, 2019). As a programme specifically designed for engineering students, it appears as though Eidaad participants believe it is directly and successfully targeting the most important graduate attributes learners need to enter the workforce, including their major-specific knowledge and skills, team building, career orientation, and so on (see Al Hinai et al., 2020). However, the interns involved in this study nonetheless believe that room exists for further improvements, especially in areas of communication, leadership and independence, and industrial technology use.

Participant background and programme perceptions. In response to the second research question about the impact of intern background on these perceptions, the only statistically significant difference on category means occurred for Career Development. Here, female participants offered a somewhat lower overall mean than their male colleagues, which could be interpreted as suggesting the programme has slightly fewer positive outcomes for their career readiness, orientations, and perceived workforce desirability. These findings also appear to support those of Nogueira et al. (2021), who reported female engineering interns in Portugal as having less favourable perceptions of their internships than males. While the authors of that study attribute this to potential discrimination experienced by females in the workplace, the possibility of these results being a reflection of a gender bias in STEM participants' self-perceptions of abilities may also be a contributing factor (Woodcock and Bairaktarova, 2015). Further, evidence of gender differences in beliefs about the efficacy of internships programmes has been offered in the literature (Wang and Degol, 2017). This is, therefore, an area warranting further investigation before any definite conclusions are drawn, especially in the context of limited female workforce participation in the MENA region (Islam et al., 2022; Yasin et al., 2020) and women representing only a limited percentage of the sultanate's STEM labour force (Islam, 2019).

Suggestions for programme improvement. The third research question examined how the Eidaad programme could be improved. Participants supported several broad courses of action that are generally associated with Calvoa and D'Amatob's (2015) most sought-after benefits of student internships: job preparation and satisfaction, on-the-job learning, job-related skills development, securing employment sooner, and CV enhancement. In addition to suggestions derived from the first two research questions as discussed above, the most frequently offered responses to the final open-ended question are closely linked with, and involve the provision of, more on-the-job training opportunities focused on technical skills and personal development, and establishing employment channels for interns to enter the host organisation upon graduation.

Youth and graduate employment is a vital issue all over the world, including in the MENA region and Oman (UNICEF Oman, *nd*; World Bank, 2023). Therefore, it is not surprising respondents would like to link their internships experiences with more direct and definite employment channels. It is further encouraging that participants wish to avail themselves of more training opportunities at their host organisations, with the development of their knowledge and skills no doubt being both personally and professionally fulfilling, while also making them more attractive to future employers. In fact, student responses here demonstrate a high degree of alignment with both the need for more training opportunities identified in the literature (Al Riyami, 2021; Belwal et al., 2017; Edwin and Sabura, 2019; Soundararajan, 2022) and stated programme goals, including allowing interns to develop skills and expertise in future job disciplines, increasing graduate marketplace competitiveness, and securing full-time employment upon graduation (Eidaad, 2023).

As stated above, Sultan Qaboos University College of Engineering Eidaad interns currently receive 6 credit points for programme participation, which is the general equivalent at the research site to an undergraduate-level research project. While this is accepted by many faculty and staff as a generous allocation of credit, it appears that some respondents either do not believe it adequately reflects the amount of time and effort demanded by the internship, or perhaps is insufficient to attract quality applicants. The provision of credit points for intern programmes has a number of legal and administrative implications and, consequently, such programmes must be well-structured, efficiently-run, and professionally staffed to succeed (Harken and Price-Williams, 2022). Therefore, the extension of the credit points allocated to the programme as suggested by respondents carries a number of fundamental implications for how Eidaad is staffed and operated, and may require significant reform to available resources and managerial structures if implemented.

The final major participant suggestions revolved around clarity in intern work schedules and plans and communication between the university, host organisations, and programme participants, which is a particular issue that also emerged in response to the first research question. Calvoa and D'Amatob (2015) highlight how stakeholder cooperation can help interns overcome the main challenges faced when transitioning to the labour market, including in terms of communication, responsibility, and self-confidence. As such, adopting a more systematic stakeholder communication system in the Eidaad programme may be one of the key reforms to improving its overall efficacy in achieving its stated goals.

Conclusion

When drawing conclusions based on these results, several limitations must be taken into consideration. Discrepant response rates across reported Eidaad cohorts mean results may be more

heavily influenced by cohort 2020/21, which had an ~77% response rate, than by cohorts 2021/22 and 2022/23, with ~35% and 27%, respectively. The same is true for the relatively high number of female respondents (~53%) when compared to the rate of female enrolment in the College of Engineering's post-specialisation student body (~30–35%). However, this participation rate is nonetheless generally characteristic of the gender breakdown of the Eidaad programme, of which ~63.2% of interns have been female across its first three years. These discrepancies may mean that the positive perceptions reported here could be a result of self-selection bias, with it feasible that the majority of students from the latter two cohorts, in addition to non-respondent male interns, may hold less favourable views.

The use of exclusively positively-worded items in Part II of the questionnaire may have increased the possibility of acquiescence bias contributing to the positive perceptions reported here. Moreover, the balance sought between accuracy and user-friendliness could have meant that some questionnaire items were either too vague or abstract to accurately gauge participants' self-rated competences – an issue reported as being common to these types of data collection instruments (Braun et al., 2012). These issues might have been at least partially addressed through the use of interviews or focus groups, with such data collection methods further offering the chance to examine questionnaire themes in more detail. Unfortunately, time constraints and the practical and ethical issues of recruiting interviewees meant these methods were not employed. Finally, the fact that participants were drawn from only one of the 25 higher education institutions participating in the Eidaad programme means findings may not accurately reflect interns' perceptions from other universities and colleges. Expanding the focus of future research to include as wide a range of participating education providers as possible is therefore strongly recommended.

With these limitations acknowledged, the results reported here could nonetheless be argued to indicate that Eidaad interns, at least from the current research site, have very positive perceptions of the internship programme, especially in relation to its impact on their teamwork and workplace participation skills, oral and written communication skills, and their career development and goals. This level of positivity was not influenced by interns' academic programmes, reported university or Eidaad cohort, GPA, or current academic/employment status, although males did display slightly more favourable perceptions of the programme's impact on their career development than female interns. While numerous suggestions for improvement were offered, the most broadly supported were associated with enhancing intern employability through more on-the-job training opportunities and potential in-placement mentorship, creating direct employment pathways in the host organisation, and increasing the number of credit hours received for programme involvement. Further curriculum alignment may also be required, including through the development of students' work-specific problem solving and critical thinking capabilities and technological know-how, in addition to the refinement of current stakeholder communication and assessment/evaluation practices. These concerns could be addressed, given appropriate levels of financial and administrative support, through programme reform and higher levels of cooperation between the university and host organisations.

Despite these areas for improvement, the Eidaad programme as it currently stands appears to offer participants numerous perceived personal and professional benefits. However, further evaluation and refinement is necessary if it is to achieve the overarching aim of helping bridge the gap between industry and academia in creating a national workforce defined by 21st century skills and mind-sets. The expansion of the programme to

encompass more university students from a wider range of academic specialisations across Oman, or even its partial or whole-sale adoption by higher education institutions in other MENA nations and beyond, has the potential to represent a significant step in ensuring graduates experience every opportunity to lead productive lives that contribute to their societies' sustainable and equitable growth.

Data availability

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

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All authors contributed to the study's conception and design. Data collection was conducted by Mubarak Al Alawi and Christopher Denman. Data analysis was performed by Christopher Denman in coordination with all authors. The first draft of the manuscript was written by Mohammed Al-Abri and Christopher Denman and reviewed and revised by all authors. All authors commented on and contributed to subsequent versions. All authors read and approved the final manuscript.

Competing interests

This research did not receive funding support from any public, private, or not-for-profit funding agency. The corresponding author is the coordinator of the Eidaad programme in the Department of Petroleum and Chemical Engineering, College of Engineering, Sultan Qaboos University. The third author is the focal point for the College of Engineering's Eidaad programme and Chair of its Industrial Training Committee.

Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. The research reported in this study was granted exemption from formal ethics review by the Head of the Department of Petroleum and Chemical Engineering, College of Engineering, Sultan Qaboos University, due to its classification as negligible risk research not collecting personal information and presenting no foreseeable risk of harm or discomfort to respondents other than inconvenience.

Informed consent

All potential participants were informed in writing about the study's purpose, voluntary nature, anonymity of responses, and potential for dissemination of findings. In line with institutional approval, consent was considered given when online questionnaires were submitted.

Additional information

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