Received on (08-03-2025) Accepted on (22-02-2026)

Bridging the Skills Gap: Designing Tailored Engineering Programmes to Align with Industry Needs and Foster Sustainable Development in Palestine

Sadiq AbdElall[1], Ahmed Abu Hanieh[2], Afif Hasan[2], Husam Arman[3], Ahmad Ramahi[4] Mahmoud Amer[5]

[1] Faculty of Engineering, Islamic University of Gaza, Palestine

[2] Faculty of Engineering, Birzeit University, Palestine

[3] Techno-Economics Division, Kuwait Institute for Scientific Research (KISR)

[4] Faculty of Engineering, Najah University, Palestine

[5] Palestinian Federation of Industries, Palestine

https://doi.org/10.33976/JERT.13.1/2026/2

Abstract—This study aims to enhance value creation in Palestinian industries by addressing the need for highly qualified engineers. A systematic approach was employed to identify key stakeholders, assess their needs, and develop tailored educational content for a new master's program and lifelong professional learning courses. Industrial qualification demand was extracted from job announcements, complemented by a literature review of similar programs. These findings informed the design of a survey targeting local Palestinian industries, which confirmed the high relevance of the identified qualifications. The results highlighted a significant demand for professionals skilled in advanced production techniques, sustainable engineering, and quality management. This research underscores the critical role of aligning academic programs with industry needs to bridge the skills gap, foster innovation, and drive economic growth in Palestine. The proposed programs aim to equip engineers with the expertise required to meet evolving industrial challenges and contribute to sustainable development.

Index Terms— Engineering qualifications; Curriculum development; Sustainable engineering; Industrial demand; Palestine.

I INTRODUCTION

Industries are placing greater emphasis on their know-how, driven by the demands of today's globalized competition, where profitability and growth are paramount. Know-how refers to specialized knowledge and expertise that ensures product quality, functionality, and efficient production processes. It plays a crucial role in enhancing an industry's competitive advantage by driving innovation, improving efficiency, and ensuring high standards. Strengthening and optimizing know-how competencies is essential for sustaining industrial growth and competitiveness. By strategically improving these competencies, industries can enhance their position in both local and global markets, fostering long-term success and resilience in an increasingly competitive and dynamic business environment.

To thrive in today's competitive business environment, industries seek highly skilled professionals who possess both technical expertise and strong interpersonal abilities [4]. Engineers, in particular, must collaborate effectively with colleagues, suppliers, and clients from diverse cultural backgrounds, functioning as integral members of global teams. Beyond technical proficiency, they need broad engineering knowledge, adaptability, and the ability to work seamlessly across international networks [5, 6]. Additionally, engineers must integrate economic, environmental, and social considerations into their solutions to ensure sustainable and responsible innovation. Balancing profitability with societal and environmental impact is essential for long-term success in an increasingly interconnected and dynamic industrial landscape [7].

In Palestine, academia faces challenges due to a mismatch between educational and job-market demands [8]. Studies across Arab countries highlight a persistent gap between graduates' qualifications and industry needs [9, 10]. Furthermore, research indicates that education and training quality remain inadequate, primarily due to a lack of specialized programs. This disconnect limits graduates' employability and hinders economic growth, emphasizing the urgent need for curricula that align with market requirements and foster practical, industry-relevant skills.

Over time, engineers and technical staff often struggle to keep up with the latest advancements in their fields [11, 12]. This issue arises when professionals fail to keep their knowledge up to date. Given the rapid pace of technological change, many technical personnel fall behind, especially

those without access to lifelong learning programs. This highlights the urgent need for continuous education alongside formal training, ensuring that professionals maintain their expertise while staying aligned with modern advancements, ultimately enhancing their effectiveness and competitiveness in the evolving job market.

One of the best ways to improve industrial performance is to focus on human capacity building. Developing a new curriculum for engineering education and a professional lifelong learning programme can enhance industrial competitive advantage. The newly developed curriculum shall focus on enhancing industrial know-how and addressing sustainability issues. Social and environmental aspects can be addressed in a comprehensive programme leading to a degree certification, or incorporated into the descriptions of specific courses taught in any engineering discipline. Professional lifelong learning courses can be demonstrated as short training courses given to engineers and technicians from industry to cope with recent advances in engineering and science. These courses should focus more on practical issues than on theory.

The discussion highlights the need for targeted educational programs alongside a dedicated training centre to bridge the gap between industry and academia. These initiatives should align with industry demands, ensuring that education and training equip graduates with the necessary qualifications and skills. By tailoring programs to meet market needs, such efforts can enhance employability, strengthen industry-academia collaboration, and drive economic growth through a more competent and adaptable workforce.

To assess local market needs for the proposed program, a questionnaire was distributed to selected stakeholders from a range of sectors, including the food, chemical, pharmaceutical, marble, plastic, metal, engineering, and other relevant industries. The survey gathered essential data on required qualifications by asking questions about industry demands. Some stakeholders expressed interest in theoretical courses on energy, sustainability, and project management, while others favoured practical courses in production and manufacturing, emphasising the integration of sustainability into these processes. The survey results were instrumental in designing the curriculum and training courses. Additionally, project partners held a workshop to discuss the findings and evaluate the university's relevant courses, including those within the new program and lifelong learning initiatives.

II OVERVIEW OF PALESTINIAN INDUSTRIES

The industrial sector in Palestine is a cornerstone of the national economy, playing a crucial role in shaping both economic and social conditions. According to PCBS data on the industrial sector in Palestine, industrial enterprises employed 116,000 workers in 2021 and the industrial sector contributed about 12% of GDP that year [13]. Figure 1 highlights the employment contributions of various industrial sub-sectors. Despite its significance, the sector faces persistent challenges that hinder its growth potential. A major obstacle is the ongoing political instability stemming from the Israeli occupation, which imposes severe restrictions on imports and exports, disrupting trade and supply chains[14, 15].

Furthermore, the sector grapples with systemic issues, including inefficiencies in management, inconsistent production quality, limited competitiveness, and a shortage of skilled labour [16, 17]. These challenges collectively constrain the sector's ability to expand and innovate. Addressing these barriers through targeted policies, workforce development investments, and improved infrastructure could unlock the sector's potential, enabling it to drive sustainable economic growth and create more employment opportunities for Palestinians.

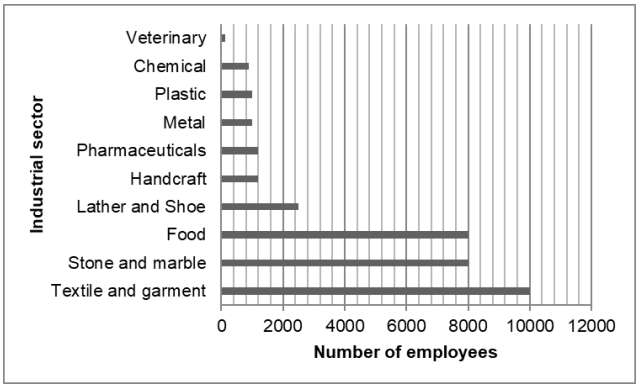

Figure 1: Employment Contribution by Industrial Sectors [1]

Despite challenges, the industrial sector in Palestine has significant growth potential. The region benefits from abundant human resources and a market with strong absorptive capacity, providing a solid foundation for development. To enhance profitability and expansion, Palestinian industries must prioritize fostering a competitive environment and improving industry-related services. Diversifying production and expanding into service-oriented activities could further strengthen the sector, making it more resilient and dynamic. By addressing existing obstacles—such as political instability, limited trade, and skill gaps—and leveraging these opportunities, the industrial sector can achieve sustainable growth. This, in turn, would enable it to play a more substantial role in driving the national economy, creating jobs, and improving overall socio-economic conditions.

To strengthen the industrial sector and increase its economic contribution, adopting a national industrial development program aligned with academic institutions is essential. The program's success depends on a comprehensive analysis of stakeholders and beneficiaries. Key beneficiaries include industrial sector representatives, government agencies, and academic institutions. Coordinated engagement among these three partners enables a more integrated and effective industrial strategy. Such collaboration supports innovation, enhances workforce skills, and addresses sector-specific challenges, thereby improving competitiveness. Ultimately, this

coordinated approach is critical for achieving sustainable industrial development and long-term economic growth at national and regional levels globally.

III ENGINEERING EDUCATION IN PALESTINE

Palestine's population is notably young, with 51% of people in the West Bank and Gaza Strip under the age of twenty [18, 19]. This youthful demographic offers a valuable opportunity to invest in education and knowledge transfer, paving the way for future growth. According to the Palestinian Ministry of Education and Higher Education, 51 universities and colleges operate in the region [20], demonstrating a strong foundation for educational advancement. By prioritizing and expanding educational initiatives, this vibrant, young population can be empowered to drive economic and social development, unlocking their potential to shape a more prosperous future for Palestine.

Palestine has over 225,000 university students (scholastic year 2022/2023) out of a population of about 5.4 million — a share comparable to or exceeding that of many countries in the Arab world and beyond [21]. Despite the disruptive impact of the Israeli occupation and widespread poverty, Palestinian students maintain exceptionally high educational aspirations. Across all social, economic, and political backgrounds, there is a unanimous consensus on the importance of providing high-quality education for the youth. This shared value underscores education as the top priority for every Palestinian family.

Engineering and technical/scientific programmes remain among the most popular choices for Palestinian students. According to the latest data from the Palestinian Central Bureau of Statistics (PCBS), in the scholastic year 2022/2023 there were 21,228 students enrolled in Engineering programmes out of a total of 225,418 higher education students — i.e., about 9.4% of all tertiary-level students [22]. This trend reflects the strong societal emphasis on technical and scientific education, highlighting the potential for these fields to drive innovation and development in Palestine.

However, as in many countries in the region, Palestine faces a disconnect between an educated workforce and economic productivity. A significant challenge lies in the mismatch between the qualifications supplied by educational institutions and the demands of the job market [8]. Aligning education with real-time labour market needs can enhance students' employability and job retention [3]. By equipping graduates with relevant, up-to-date skills, they can thrive in their chosen careers, while employers gain access to skilled individuals who can drive innovation and competitive advantage. This alignment is crucial for fostering sustainable economic growth.

IV INDUSTRY-ACADEMIA RELATIONSHIP

The education system functions much like a production system, comprising inputs, processes, and outputs. In a production system, raw materials enter as inputs, undergo various processes to enhance their value, and emerge as higher-value outputs. Similarly, in education, students enter the system as inputs, are shaped through teaching and learning activities, and graduate as outputs with improved qualifications and skills. This analogy highlights how education transforms individuals by adding value through knowledge, training, and development, preparing them to contribute effectively to society and the workforce. Both systems rely on efficient processes to achieve meaningful and impactful outcomes.

Education and training aim to enhance an individual's qualifications by the end of the learning period. Pre- and post-education performance can be measured across six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation [23]. The educational process involves activities such as lectures, exercises, projects, and laboratory experiments designed to transfer knowledge and skills to students. These methods collectively prepare learners to think critically, solve problems, and apply their learning effectively in real-world contexts.

The graduate, as the output or product of the education system, must meet the needs of the "customer"—the industry that employs them. Academia, as the supplier of graduates, must align its programmes with industry demands, ensuring graduates possess the required qualifications, skills, and competencies. Additionally, education systems should address broader social and environmental considerations, preparing graduates to contribute meaningfully to society while meeting the evolving expectations of the job market. This alignment ensures relevance and value for both graduates and employers.

A One-way relationship

The one-way relationship model reflects limited interaction and coordination between academia and industry. In this model, students enter academia, undergo educational processes, and graduate to join the workforce, as illustrated in Figure 2. The relationship between academia (the supplier) and industry (the customer) is unidirectional, with academia pushing graduates into the job market. This often results in a mismatch between the qualifications supplied and industry demands. Addressing these gaps through additional training increases costs and wastes time, highlighting the need for stronger collaboration to align educational outcomes with real-world industry needs and reduce inefficiencies.

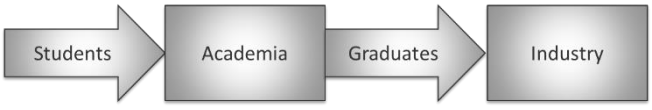

Figure 2: One-Way Relationship Between Industry and Academia [3]

B Integrated relationship

The integrated model fosters collaboration across multiple areas of academia and industry, as illustrated in Figure 3. Beyond academia's traditional role of supplying graduates to the industry, this model emphasizes cooperation in research, training, and lifelong learning. Graduates can return to academia for further education, such as advanced degree pro-

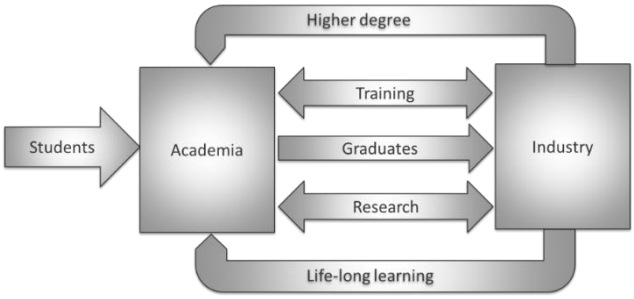

Figure 3: Industry-academia integrated relationship [2]

grammes, while professionals engage in continuous learning. During their studies, students gain practical experience through internships and industry-linked graduation projects. Instructors contribute through consultancy, research, and training, while industry experts teach specialized courses that bridge theory and practice. This dynamic partnership enhances the quality of education and research, ensuring that academic outputs align with industry needs and ultimately driving innovation and workforce readiness.

V PUSH/PULL STRATEGY FOR CURRICULUM DEVELOPMENT

Engineering education programmes are designed to equip students with essential skills, knowledge, and competencies. However, industries primarily seek specialized qualifications aligned with their specific business needs, often showing less interest in broader foundational skills, such as those related to social and environmental issues [24]. This model proposes an approach to engineering curriculum design that balances global sustainability goals with industry-specific demands. By aligning academic programmes with industry's practical needs, the qualifications gap—between what industry requires and what academia provides—can be effectively bridged. This ensures graduates are both globally conscious and industry-ready, fostering sustainable development and workforce relevance.

According to the ABET Engineering Accreditation Commission (2025–2026), accredited engineering programs must include a minimum of 30 semester credit hours (or equivalent) in college-level mathematics and basic sciences, including experimental experience. Additionally, programs are required to provide at least 45 semester credit hours (or equivalent) covering engineering topics, including core engineering science and design courses, along with associated tools and methodologies. Beyond these specified requirements, programs must incorporate a broad education component, which may include humanities, social sciences, and other general-education courses, as well as a culminating major engineering design experience (e.g., a capstone project). ABET does not mandate fixed credit-hour allocations for these latter components; rather, institutions must ensure that students acquire sufficient depth and breadth across these areas to meet program educational objectives [25].

The curriculum proposed by Humboldt emphasized a dual focus on general education and individual development. It aimed to cultivate each student's unique abilities through a foundation in mathematics, classical languages, and history, fostering a well-rounded education (allgemeine Menschenbildung). This approach allowed students increasing freedom as they advanced academically, ensuring they developed both intellectually and personally. Specialized training was introduced only after this broad-based education, with maturity defined as the point when a student could transition from learning from others to independent learning. Similarly, modern accreditation criteria for engineering programmes, such as those set by Akkreditierungsagentur für die Studiengänge der Ingenieurwissenschaften und der Mathematik (ASIIN), emphasize a balance between foundational knowledge and specialized skills, ensuring graduates are both well-rounded and professionally competent [26].

- 20% basic math and science
- 25% engineering fundamentals
- 15% engineering electives
- 15% multidisciplinary content
- 25% thesis or project work

Push strategies are driven by long-term forecasts, often leading to high inventory levels and potential product obsolescence if demand shifts. In contrast, pull strategies are demand-driven, responding directly to customer needs, but they can be challenging to implement when lead times are lengthy [27]. A hybrid approach combines the strengths of both strategies: products are pushed through initial phases to leverage economies of scale, then customized in later stages to meet specific customer demands. This balance minimizes risks while maximizing flexibility. Applying this concept to curriculum design, a hybrid push-pull strategy can be implemented. Foundational knowledge is "pushed" to students early on, ensuring a strong base, while specialized, demand-driven skills are "pulled" in later stages, aligning education with industry needs and fostering adaptability.

The curriculum should begin with a push strategy to deliver foundational knowledge and later shift to a pull strategy to align with industry needs. Engineering programmes are divided into three components: compulsory courses (45%),

elective courses (30%), and a senior project (25%), as shown in Figure 4. This structure ensures a balance between broad-based learning and specialized skills, equipping students with both theoretical depth and practical expertise tailored to market demands.

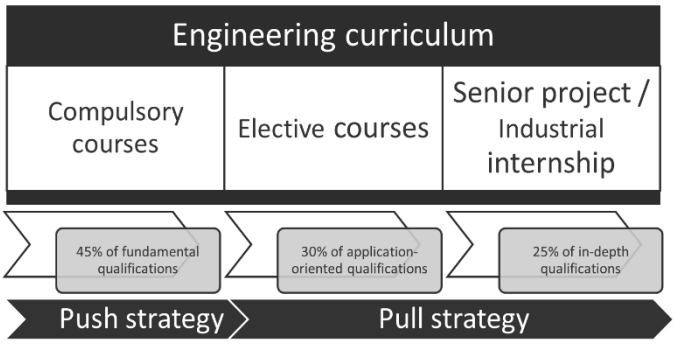

Figure 4: Push/pull strategy for designing engineering curriculum [3]

A Push strategy

At the start of their engineering studies, students are guided through compulsory courses that follow a push strategy. These courses provide foundational knowledge in science, mathematics, and ethics, equipping students with essential technical and theoretical skills. The content is designed based on long-term forecasts of competency demands, ensuring relevance to future industry needs. Beyond technical expertise, these courses also foster personal and interpersonal skills, preparing students for collaborative and professional environments. Importantly, sustainability principles are integrated into the compulsory curriculum, encouraging students to consider social and environmental impacts alongside economic outcomes in their engineering solutions. This approach ensures graduates are not only technically proficient but also socially responsible, capable of creating balanced and sustainable solutions in their careers.

B Pull strategy

In the later stages of their engineering studies, particularly at the senior level and shortly before graduation, students choose elective courses and a senior project based on their interests and career goals. This phase follows a pull strategy, where students take responsibility for selecting courses and projects that align with their personal objectives and industry demands. By being aware of the qualifications sought by employers, students can tailor their choices to better prepare for their desired job positions [3]. The senior project, in particular, offers students an excellent opportunity to specialize in a specific area of knowledge while enhancing essential skills such as communication and teamwork. When elective courses and senior projects are selected with industry needs in mind, students significantly improve their chances of securing suitable employment. This approach ensures that the advanced stages of engineering education focus on meeting industrial qualifications by emphasizing elective courses and research projects in the final year, thereby bridging the gap between academic preparation and real-world job-market requirements.

VI METHODOLOGY

The study aims to design a master's programme in sustainable engineering and lifelong learning courses tailored to local Palestinian industrial needs. The methodology, illustrated in Figure 5, begins by identifying key stakeholders, followed by data collection to determine the programme's required qualifications. Data is gathered from three sources: industrial qualifications listed in job advertisements [3, 24]; best practices from similar programmes at other universities, as outlined in Table 1; and learning outcomes defined by the Accreditation Board for Engineering and Technology (ABET) [25]. This comprehensive approach ensures the curriculum aligns with industry demands, global standards, and educational best practices, creating a programme that is both locally relevant and internationally competitive.

A team of academic and industrial partners—including Technische Universität Berlin, Birzeit University, An-Najah National University, and the Palestinian Federation of Industries—was established to develop a curriculum aligned with local industry needs and international standards. Through a series of workshops, the team collected and adapted data to ensure the programme's relevance and quality. A structured questionnaire was designed, featuring an introductory cover letter and three main sections to gather and analyze critical information systematically

Table 1: Global Best Practices in Sustainable Engineering Programmes

University	Name of programme	Degree
University of Cambridge	Engineering for Sustainable Development	MPhil
University of California	Sustainable Engineering	M.Sc.
Delft University of Technology	Sustainable Energy Technology	M.Sc.
Princeton University	Sustainable Energy	M.Sc.
Purdue University	Environmental and Ecological Engineering	B.Sc. M.Sc.
KTH Royal Institute of Technology	Sustainable Energy Engineering	M.Sc.
Arizona State University	Sustainable Engineering	M.Sc., Ph.D.
University of Michigan	Engineering Sustainable Systems	M.Sc.
University of Strathclyde	Sustainable Engineering	M.Sc.
Rochester Institute of Technology	Sustainable Engineering	M.Sc., Ph.D.

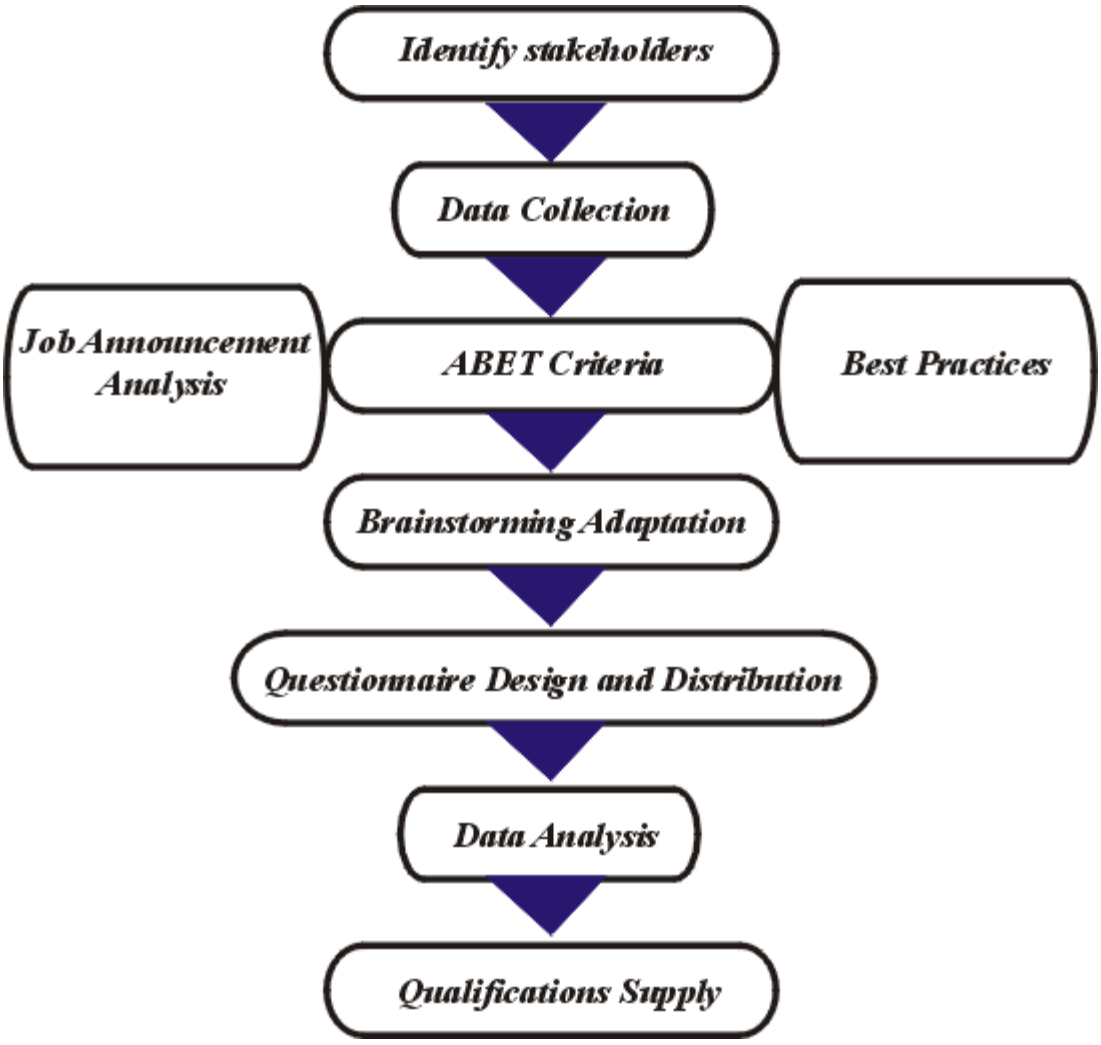

Figure 5: Methodology of curriculum development and lifelong learning courses

Part I: General Information About the Industry

This section includes questions about the size, type, administrative structure, and engineering specializations within industries. It aims to provide an overview of the industrial landscape in Palestine, identify correlations between industry size/type and qualification demands, and focus on the perspectives of larger industries to inform the curriculum design.

Part II: Training Needs Assessment

Divided into three subsections—general training needs, specialized engineering training needs, and technician training needs—this section aims to identify the skills and knowledge gaps among students, graduates, and employees. The long-term goal is to align their competencies with global standards by offering training in sustainable engineering technologies and current industry norms. This part also assesses the target groups, key training topics, specific skills to be developed, and the capabilities required for the training centre.

Part III: Assessment of the Master's Programme in Sustainable Engineering

This section evaluates the need for a master's programme in sustainable engineering and guides its curriculum design. The programme is structured around three core blocks: production, quality, and sustainability. A five-point Likert scale was used to measure the importance and weight of each topic or course. Questions were developed through brainstorming sessions with project partners' experts, ensuring a comprehensive and balanced approach to curriculum development.

This methodology ensures the programme is both locally relevant and globally competitive, addressing industry demands while adhering to international accreditation standards.

VII SURVEY AND RESULT ANALYSIS

The project team sent approximately 200 faxes and emails to individuals in manufacturing industries across all sectors in the West Bank. Despite challenges in encouraging participation, the response rate of 34% was considered acceptable. The collected questionnaire data were analyzed using SPSS to derive meaningful insights for the study.

A Organization details

The sample included industries from all West Bank governorates, representing various industrial sectors, as illustrated in Figure 6. The results revealed a high level of organizational maturity, with 51.5% of respondents having achieved local or international quality certifications. This demonstrates a strong commitment to institutional development, which is crucial for designing the training and master's programmes. The willingness of industries to invest in organizational growth highlights the potential for collaboration and

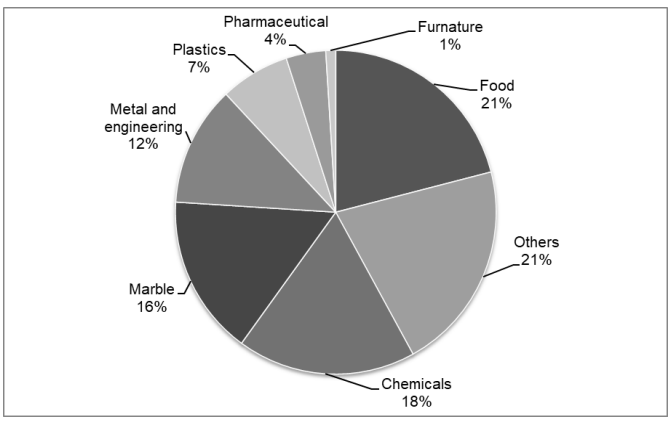

Figure 9: Distribution of Survey Participants by Industrial Sector

alignment between academic offerings and industry needs.

B Lifelong learning training needs

The analysis of the questionnaires revealed that 27% of participating Palestinian industries allocate annual training budgets, ranging from $1,400 to $50,000 per industry. The training needs assessment provided a comprehensive overview of the skills and knowledge gaps within the local industrial sector.

General training needs, as illustrated in Figure 7, emphasized the importance of strategic planning, marketing, and sales management. For specialized engineering training, occupational health and safety, along with maintenance, emerged as the highest priorities, as shown in Figure 8. The technician training assessment, depicted in Figure 9, highlighted significant demand for themes such as occupational health and safety, machine maintenance and operations, hydraulics systems, and control systems.

Sector-specific needs were also identified. The food industry prioritized strategic and annual planning, while the marble and stone sector focused on occupational health and safety. The metal and chemical industries emphasized maintenance management and strategic planning. These findings align with insights from interviews with industrial association executives, who confirmed that training needs vary significantly across sectors. This data underscores the importance of tailoring training programmes to address the

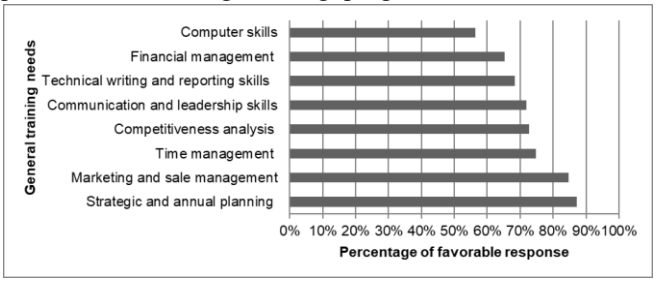

Figure 8: General Training Needs Across Industries

unique requirements of each industry, ensuring relevance and

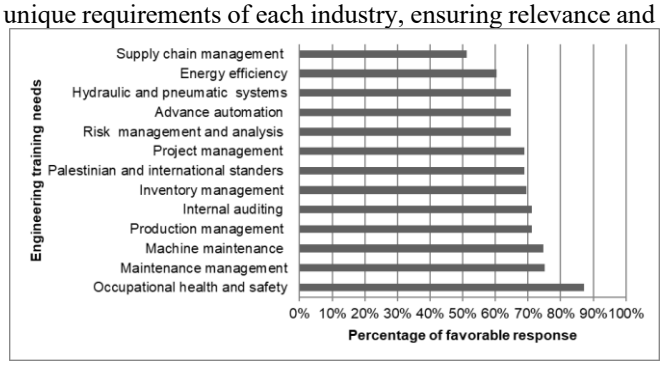

Figure 7: Specialized Engineering Training Needs

impact.

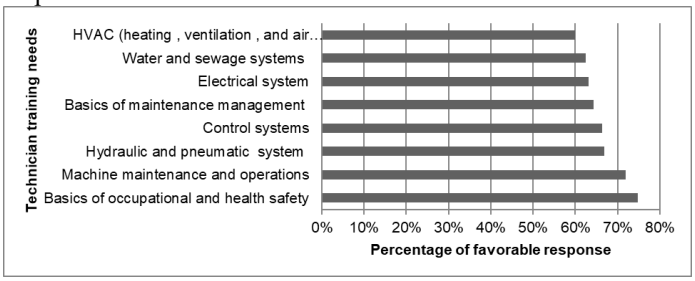

Figure 6: Technician Training Needs

C Sustainable engineering master degree courses needs

The third part of the questionnaire focused on identifying potential master's degree courses in sustainable engineering. The analysis revealed that such a programme could effectively address existing skill gaps and enhance the competencies of engineers working in Palestinian industries. This section was divided into three themes: production, quality, and sustainability.

Production: Palestinian industries responded positively to most of the proposed topics, as shown in Figure 10. The highest-ranked topics were product design and development, followed by research and development (R&D). This highlights the need for introducing advanced techniques to support the entire product development process and reflects a growing awareness of the importance of innovation in the manufacturing sector. Other significant topics included improving production techniques and automation systems to in-

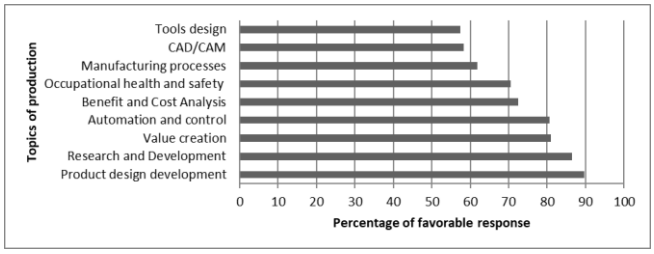

Figure 10: Topics of production demand

crease value-added processes.

Quality: Responses in the quality section were similarly positive, with some variation in specific areas. The top-rated topics were continuous improvement, leadership skills, and documentation of work procedures, as illustrated in Figure 11. These findings underscore the importance of systematic quality management and leadership development in enhanc-

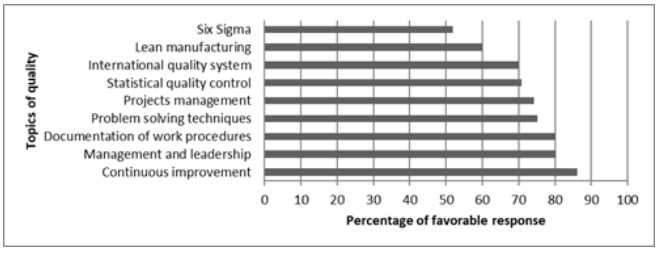

Figure 11: Topics of quality demand

ing industrial performance.

Sustainability: Industries also responded favorably to sustainability-related topics, though preferences varied. The highest-ranked areas were energy and resource efficiency, renewable energy, and clean production, as depicted in Figure 12. This indicates a strong interest in sustainability, particularly when it aligns with financial benefits. Resource efficiency courses scored highest because they directly contribute to cost reduction and savings, demonstrating the industry's preference for practical, financially viable sustainability solutions.

Overall, the results highlight the potential for a master's programme in sustainable engineering to meet industry needs by focusing on innovation, quality improvement, and cost-effective sustainability practices.

The analysis of the questionnaire components provided the research team with data-driven insights to design the education and training centres and the detailed curriculum for the new master's programme. The team presented the survey results during a workshop to validate, discuss, and refine the findings. Stakeholders from academia, industry, and government actively participated, offering valuable feedback. The workshop outcomes were instrumental in fine-tuning the curricula for both the training centres and the master's pro-

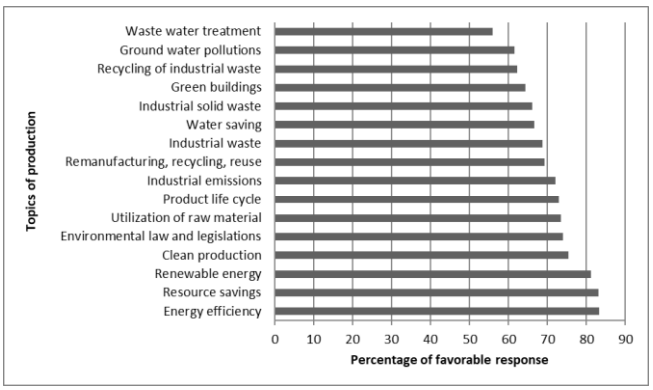

Figure 12: Topics of sustainability demands

gramme, ensuring alignment with industry needs and educational standards. This collaborative approach strengthened the relevance and practicality of the proposed initiatives.

VIII CONCLUSION

This study aimed to identify the qualifications required to equip industrial professionals with advanced knowledge in quality management, production, and sustainability, with the goal of addressing skill gaps and fostering industrial growth in Palestine. To achieve this, the study proposed the establishment of a Master's Programme and training centres in the West Bank. A comprehensive survey was conducted to gather insights into local industry needs, providing a strong foundation for the proposed initiatives.

The findings emphasized the need to establish two educational and training centres: one at An-Najah National University in the northern West Bank to serve the northern region, and another at Birzeit University in the central West Bank to serve the middle and southern regions. These centres should offer specialized training in strategic planning, marketing, sales management, industrial and occupational safety, international standards, and maintenance—areas identified as critical for industrial development.

The survey revealed a significant shortage of highly skilled professionals in key sectors, alongside a strong demand for expertise in advanced fields such as new product

development and sustainable engineering. These findings highlight the urgent need for a collaborative Master's Programme focused on production, quality, and sustainability. Such a programme would not only address the skills gap but also align with global standards, enhancing the competitiveness of Palestine's industrial sector. By integrating academic excellence with industry needs, these initiatives can drive sustainable growth, innovation, and economic development in the region.

REFERENCES

[1] PFI, "The Current Status of Industrial Sector in Palestine," Palestinian Federation of Industries, 2009.

[2] S. Abdelall, "Enabling sustainable value creation by engineering capacity building," Dr.-Ing., Institut Werkzeugmaschinen und Fabrikbetrieb 2014., Technische Universität Berlin, Berlin, 2014. [Online]. Available: www.ipk.fraunhofer.de

[3] S. AbdElall, C. Reise, and G. Seliger, "Semantic Web Approach for Determining Industry Qualifications Demand on Real-time Bases " presented at the 40th SEFI Annual Conference, Thessaloniki, Greece, 2012. [Online]. Available: http://www.sefi.be/conference-2012/Paper%20Index/Full%20list%20of%20papers.htm.

[4] M. Hirudayaraj, R. Baker, F. Baker, and M. Eastman, "Soft skills for entry-level engineers: What employers want," *Education Sciences,* vol. 11, no. 10, p. 641, 2021.

[5] S. AbdElall, R. Moflih, and G. Seliger, "Internationalizing the Engineering Qualifications," in *Sustainable Manufacturing - Shaping Global Value Creation*, G. Seliger Ed. Berlin, Germany: Springer-Verlag Berlin Heidelberg, 2012, ch. 8, pp. 329-335.

[6] S. H. Christiansen, C. Juebei, and D. Xiangyun, "Cross-institutional collaboration in engineering education–a systematic review study," *European Journal of Engineering Education,* vol. 48, no. 6, pp. 1102-1129, 2023.

[7] A. A. Hanieh, A. Hasan, S. AbdElall, and P. Krajnik, "The Role of Resource Efficiency in Engineering Education," presented at the 11th Global Conference on Sustainable Manufacturing - Innovative Solutions, Berlin, Germany, 23rd–25th September, 2013, 2013.

[8] W. A. Nakhleh and M. Hanini, "The Relationship between the Competencies of Graduates of Higher Education and the Needs of the Palestinian Labour Market," *International Journal of Instruction,* vol. 15, no. 2, pp. 223-242, 2022.

[9] R. Assaad, C. Krafft, and D. Salehi-Isfahani, "Does the Type of Higher Education Affect Labor Market Outcomes? Evidence from Egypt and Jordan," (in eng), *High Educ (Dordr),* vol. 75, no. 6, pp. 945-995, Jun 2018.

[10] D. Carter, W. Minhas, and G. Al Hafidh, "Exploring employability skills in UAE higher education programs using a self-assessment matrix," *Journal of Applied Research in Higher Education,* vol. 17, no. 1, pp. 495-509, 2025.

[11] N. Z. Muzulon, L. M. Resende, G. C. L. Leal, P. C. Ossani, and J. Pontes, "Engineering in the Digital Age: A Career-Level Competency Framework Validated by the Productive Sector," *Sustainability,* vol. 17, no. 16, p. 7425, 2025.

[12] C. L. Magee, "Needs and possibilities for engineering education: one industrial/academic perspective," 2003.

[13] P. C. B. o. Statistics, "The Reality of the Industrial Sector in Palestine – on the occasion of Palestinian Product National Day (Press Release)," 2022. [Online]. Available: https://www.pcbs.gov.ps/portals/_pcbs/PressRelease/Press_En_NationalPPI2022E.pdf?utm_source=chatgpt.com

[14] J. Lipinski and R. i. Q. Shomali, "Navigating Adversity: Revisiting Entrepreneurial Theories in the Context of the Occupied Palestinian Territories," *Administrative Sciences,* vol. 14, no. 12, p. 313, 2024.

[15] Z. T. Fesen, "A barrier to prosperity? Analyzing the impact of Israeli security policy on Palestinian manufacturing productivity," *Inquiries Journal,* vol. 13, no. 01, 2021.

[16] S. Y. Dwikat, D. Arshad, and M. N. Mohd Shariff, "The influence of systematic strategic planning and strategic business innovation on the sustainable performance of manufacturing SMEs: The case of Palestine," *Sustainability,* vol. 14, no. 20, p. 13388, 2022.

[17] S. Y. Dwikat, D. Arshad, and M. N. Mohd Shariff, "Effect of competent human capital, strategic flexibility and turbulent environment on sustainable performance of SMEs in manufacturing industries in palestine," *Sustainability,* vol. 15, no. 6, p. 4781, 2023.

[18] CIA. The World Factbook: Gaza Strip – People and society; West Bank – People and society. [Online] Available: https://www.cia.gov/the-world-factbook/

[19] P. C. B. o. Statistics, "Palestinians at the end of 2023," in "Population Indicators," Ramallah, Palestine, 2023. [Online]. Available: https://www.pcbs.gov.ps/

[20] P. C. B. o. Statistics, "Higher Education Statistical

Yearbook, Scholastic Year 2020/2021 — Distribution of Higher Education Institutions by Type and Region," 2021. [Online]. Available: https://www.pcbs.gov.ps/Portals/_Rainbow/Documents/Higher_Education_2020_01E.html?utm_source=chatgpt.com

[21] P. C. B. o. Statistics, "Higher Education Indicators in Palestine, Scholastic Year 2022/2023," 2023. [Online]. Available: https://www.pcbs.gov.ps/Downloads/book2715.pdf?utm_source=chatgpt.com

[22] P. C. B. o. Statistics, "Higher Education Statistical Yearbook — Scholastic Year 2022/2023," 2024. [Online]. Available: https://www.pcbs.gov.ps/Portals/_Rainbow/Documents/Higher_Education_2022_02E%20.html?utm_source=chatgpt.com

[23] J. Moon, "Linking Levels, Learning Outcomes and Assessment Criteria," University of Bournemouth, UK, 2006.

[24] S. AbdElall, A. Ramahi, and G. Seliger, "Shaping Qualification Profiles of Engineering Graduates Based on ABET and Employment Demand," in *Interactive Mobile and Computer Aided Learning (IMCL), 2012 International Conference on*, 6-8 Nov. 2012 2012, pp. 159-166, doi: 10.1109/imcl.2012.6396468. [Online]. Available: http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6396468&tag=1

[25] ABET, "Criteria for Accrediting Engineering Programs, 2025–2026," 2025. [Online]. Available: https://www.abet.org/wp-content/uploads/2024/11/2025-2026_EAC_Criteria.pdf?utm_source=chatgpt.com

[26] J. Walther, L. Mann, and D. Radcliffe, "Global Engineering Education: Australia and the Bologna Process " presented at the 4th ASEE/AaeE Global Colloquim of Engineering Education, Sydney, Australia, 26-29 September 2005, 2005.

[27] L. Liu, H. Xu, and S. X. Zhu, "Push verse pull: Inventory-leadtime tradeoff for managing system variability," *European Journal of Operational Research,* vol. 287, no. 1, pp. 119-132, 2020.