International Journal of Data and Network Science 9 (2025) 57–76

Contents lists available at GrowingScience

International Journal of Data and Network Science

homepage: www.GrowingScience.com/ijds

Mapping SDGs' 4 and 8 through enhancing technological skills for students' employability and establishing a software professional employability skills development program

Khaled Salmen Aljaaidi[a*], Ibrahim Alnour Ibrahim Abdulmajeed[b], Salim Mohammed Bafaqeer[c] and Safoora Habeeb[d]

[a]*Department of Accounting, College of Business Administration, Prince Sattam bin Abdulaziz University, Kingdom of Saudi Arabia*
[b]*Department of Management, Nahda College, Khartoum, Sudan*
[c]*Department of Accounting, College of Business Administration, Hadhramout University, Yemen*
[d]*Department of Commerce and Business Studies, Jamia Millia Islamia, New Delhi, India*

C H R O N I C L E

Article history:
Received: July 15, 2024
Received in revised format: August 20, 2024
Accepted: September 30 2024
Available online: October 1, 2024

Keywords:
Technological skills
Software lab
Employability
PSAU-GPSDP
PSAU
SDGs 8 & 4
Saudi Arabia

A B S T R A C T

The purpose of this study is to: (1) evaluate the technological skills of the final-year undergraduate students, (2) how such abilities influence their likelihood of getting employed and (3) student opinions on whether a computer lab-based specialization in software training can boost employability. This study is a survey-based methodology. The sample size encompasses 140 final year students in the College of Business Administration at Prince Sattam bin Abdulaziz University during the academic year 2023-2024. Descriptive statistical analyses indicate that most students believe they have sufficient technical skills but not enough for securing better jobs. Moreover, it is clear among them that expertise in specialized software packages enhances career prospects significantly. The research results also show a huge gap between technological competencies learners have now and what employers demand currently. In response, this study suggests that PSAU should establish software laboratories in their colleges for specialized training on software as required by the job market and workplace. The Vice Rectorate for Academic and Educational Affairs launches a program called "Graduate and Professional Skills Development Program (PSAU-GPSDP)", which emphasizes student employability as it develops, implements, and evaluates mechanisms to enhance students' chances of getting jobs upon graduation. The results of this study are in line with SDG No. 8 (Decent Work and Economic Growth), SDG No. 4 (Quality Education), and Saudi Vision 2030. Therefore, this study has practical implications for decision-makers at the Ministry of Education and university levels, university professors, researchers on how employability skills of students could be enhanced in the higher education institutions.

1. Introduction

The Vision 2030 of Saudi Arabia is about modernizing the country, and this can be done by altering the educational infrastructure for the creation and sharing of knowledge. Consequently, various student-centered learning environments have been established that are driven by technology. Nevertheless, there still exists a large disparity between university graduates' skills vis-à-vis labor market requirements; notably in terms of employability skills among Saudi Arabian graduates. For a seamless transition from

* Corresponding author.
E-mail address k.aljaaidi@psau.edu.sa (K. S. Aljaaidi)

ISSN 2561-8156 (Online) - ISSN 2561-8148 (Print)

doi: 10.5267/j.ijdns.2024.10.002

university to work graduate employability is important because it helps students fit into new jobs easily. In Saudi Arabia, policy makers have started realizing that there is need to develop technological competencies which will help align education graduates with demands from the job market (Haidar & Al-Shorafa, 2023; Singh & Alshammari, 2023; Alshammari et al., 2024; Abdullateef et al., 2023; Yusuf & Jamjoom, 2022). What employers want versus what they get in terms of employee qualifications has become an alarming concern for many organizations today due to differences between skills gained through universities and those demanded by industries specifically when it comes to soft or transferable employment skills (Haidar & Al-Shorafa, 2023; Ebaid, 2021; Hassock & Hill, 2022; Idkhan et al., 2021; Pereira et al., 2019).

In spite of the fact that digital tools have been highly recommended in higher education, they are often not used effectively or at all because of some major obstacles (Quadri et al., 2017; Singh & Alshammari, 2023). Students' lack of basic technology skills and problems associated with cultural and educational systems are among the factors that make this situation worse (Bhatti et al., 2022). Removing these barriers is important to ensure that educational outcomes are in line with Saudi Vision 2030 which aims at making this country a knowledge-based economy (Nurunnabi, 2017; Oraison et al., 2019; Allmnakrah & Evers, 2020). It is necessary to investigate employability skills including technological competencies extensively so as to come up with approaches that will improve preparedness for work among Saudi graduates as well as foster sustainable economic development (Alshammari et al., 2024; Abdullateef et al., 2023; Pitan & Muller, 2020; Prior et al., 2019).

Being part of G20 and one of the largest economies in the Middle East region, Saudi Arabia plays significant roles towards achieving Sustainable Development Goals (SDGs). It is vital to break the cycle of inadequate skills, low productivity and inequality in order to foster inclusive economic growth that provides for sustainable jobs. Quality education is not just one among many goals; it is key to ensuring decent work especially for young people but not only them. Skill upgrading should be continuous so as to match changing needs within this competitive labor market thereby laying foundation stones towards sustainability while also becoming instrumental in attaining SDGs. Specifically speaking about target 4.4 under SDG number 4 which focuses on 'Quality Education', there needs to be a significant increase in numbers of youth or adults having relevant skills including technical vocational competencies necessary for gainful employment as well entrepreneurship before year 2030 ends. Similarly, still, considering target number 5 under SDG 8 dubbed 'Decent Work and Economic Growth' which is supposed ensure full productive employment; with special attention being paid towards equal pay among other things such like realizing this by persons living disabilities young individuals too should benefit equally from any job opportunity created by any employer come year 2030 or any year after that if possible. Saudi Arabia is essential to these SDG goals for not only its economic diversification and growth but also its social development. Saudi Arabia should prioritize skills development and quality education, which will enhance employability, lower unemployment rates, and foster a more inclusive society. This plan coincides with the wider objectives of Vision 2030 that seeks to make Saudi Arabia a knowledge-based economy as well as contribute significantly towards global sustainable development endeavors (Alam et al., 2022; Nurunnabi, 2017; Allmnakrah & Evers, 2020; ILO, 2016; UN, 2016).

It is well established by the extant research that there is a big gap between what employers' demand from graduates in terms of skills learned during their time at university versus what they actually receive. For instance, Alshammari et al., (2023) discovered that many Saudi students do not have updated technological skills especially in the software development area, data analysis field or digital communication (Avramenko, 2012). Moreover, this problem was also highlighted by Singh et al., (2022) who mentioned that nowadays most jobs need employees who are very good in technology like computers, programming languages etc. Further, Alshammari et al. (2024) indicated that IT is not taught thoroughly because some parts are missing from the teaching strategies used today by lecturers while learners lack comprehensive IT skills. In the tech industry, students don't have enough exposure to sophisticated IT governance and the practical application of IT concepts. Saudi students frequently have shortages to meet global job market expectations because they lack critical skills and career guidance as highlighted by Al-Bazaei (2023). According to Abdullateef et al. (2023), universities can make their graduates more employable by realigning curricula and training programs with changing needs of the Saudi labor market. Allmnakrah and Evers (2020) argue that technical know-how alone is insufficient for students because the Saudi Arabian workforce is now being influenced by technological advancement; hence there is need for them also to be adaptive with this new development through innovative thinking.

Ahmad and Alammary (2022) note that software capstone project management in Saudi universities is important since it helps identify gaps in these programs while proposing a unified approach towards improving them. Theoretical knowledge is not enough for students' employability because they may not gain competence in applying what they learn into practice thus missing out on soft skills required by employers as observed by Bhatti et al. (2022). To mitigate against this, the study proposes that teaching should prioritize cultural adaptability as well as involvement from industries through experiential learning methods. Educational institutions are finding it difficult to keep up with new industry developments and standards due to the fast rate at which technology is advancing. These problems are worsened by the fact that most of them still use traditional teaching methods that focus on theoretical knowledge rather than practical skills thereby making the situation even worse (Bhatti et al., 2022). The failure to integrate digital literacy into education systems denies students an opportunity of acquiring necessary competencies needed by employers in the modern workplace. Moreover, cultural aspects also contribute because people may not be ready for change or they might have already set norms on what should be taught as well as how it should be delivered especially if technical abilities were emphasized during curriculum development stages (Alshammari et al., 2024; Quadri et al., 2017).

There are several reasons why it is important to study this discrepancy between what students learn at universities vis-à-vis what employers expect from them concerning their knowledge about various tools used in different industries including those related with Information Communication Technology (ICT) in Saudi Arabia. First and foremost, closing down such gaps improves chances for employability among graduates. With diversification process taking place within Saudi Arabian economy away from traditional oil sector towards more technology-oriented fields there comes need for skilled labor force having expertise not only in these but also other critical areas required so by aligning qualifications attained through learning institutions with market demands job seekers will be able meet employer's needs thus reducing unemployment rates thereby enhancing economic prosperity (Nurunnabi, 2017). Further, this study is in line with Saudi Vision 2030 that aims at making the country a knowledge-based economy. It is possible for the education system to greatly contribute to this vision by producing a competent and competitive workforce through emphasizing on development of relevant skills mainly in digital and technological fields. Career wise, it enhances personal employment opportunities as well as stimulates national economic growth (Allmnakrah & Evers, 2020). The social benefits of closing the skills gap are beyond measure. Inclusion and equal chances for work can be fostered by ensuring that women among other marginalized groups get access to training they need. This is particularly important in societies where these categories have been traditionally excluded from participating fully in the labor market due to cultural norms which disapprove their involvement. Equipping every learner with contemporary job requirements paves way for more fairness and unity among people (Gadi, 2021; Bhatti et al., 2022). Lastly but not least important; investigating this issue is important so as to continuously enhance the education itself. By identifying specific areas of weakness in universities' preparation of students for life after graduation, policymakers will know what reforms should be made thus bringing closer educational graduates vis-à-vis current staffing needs in various industries.

This involves revising the curriculum, improving lecturers training programs and introducing more applied learning. Such steps can help create an education system that is more dynamic and responsive to changing needs of the global economy (Alshammari et al., 2024; Singh & Alshammari, 2023). Therefore, this study aims to: (1) assess students' technological skills; (2) explore how students' current technological skills can be used to improve their employability; (3) find out if students think that they would become more employable after being trained on specialized software in a computer lab and (4) suggest Graduate and Professional Skills Development Program (PSAU-GPSDP). The program should be designed as a proactive measure to bring postgraduate education in line with contemporary job market requirements, especially those related with software use. This study utilizes an online survey approach targeting 140 senior undergraduate business administration majors in College of Business Administration at Prince Sattam bin Abdulaziz University.

The remainder of this paper is organized as follows: section 2 reviews a related work, section 3 outlines the Graduate and Professional Skills Development Program (PSAU-GPSDP), section 4 highlights the research methodology, section 5 addresses the results and discussions, and section 6 concludes the study.

2. Related work

To study technology is to study information. This definition has been given by the Information Technology Association of America (ITAA) in 2009. The IT field is concerned with software applications and computer-based systems that support them as well as their design, development, implementation and management. Most students use ICTs for collecting, managing organizing data and collaboration enabling purposes. However, as jobs undergo rapid digitalization it becomes clear that more advanced technical skills will be required than ever before. Despite possessing elementary technical know-how many learners still struggle when it comes to complex aspects like coding; analyzing statistics or being literate digitally among others. Additionally, soft skills are also found wanting frequently among students; problem solving ability critical thinking capacity communication skills teamwork spirit which are necessary for successful application of technology in professional contexts. To fill these lacunae, practical hands on training should be included into curricula so that learners can get internships work with industry experts undertake projects based learning etcetera (Olivares et al., 2020; Banasik & Jubb, 2021; Isa et al., 2020)

Laudari and Leaney (2019) conducted research about software studio experiences that affect the employability of students. They found out that a readiness for work can be improved by engaging in learning based on a studio which imitates real world software development. This study used qualitative and quantitative methods, showing that those who have been through this process gain more technical skills as well as team working abilities, communication skills and professional confidence. Studios are also good because they are immersive; thus, making them effective in bridging the gap between what is taught in class rooms with what is needed by industry players out there. For instance, Venkatesh et al., (2014) evaluated the GradProSkills program at Concordia University designed to equip postgraduate students with non-academic professional skills such as communication, project management and leadership. The mixed methods design of this research revealed that through tailored workshops and resources, the scheme was able to meet different needs among learners thereby resulting into positive feedback from many individuals who participated in it due to acquisition of new abilities coupled with increased levels of self-assurance vis-a-vis career prospects.

An employability skills framework is proposed by Mahajan, Gupta and Misra (2022) which draws on academia, industry and students to bridge the gap between what is taught in universities and what employers expect from graduates. They do this through interviews as well surveys where they identify cognitive, interpersonal as well as technical clusters of critical employability skills. The model highlights the importance of industry partnership with institutions of learning in aligning curricula to market needs. It also recognizes personal reflection by learners alongside skill building activities for them. In this way all-round preparedness among job seekers can be achieved thus calling for continuous updating of content vis-a-vis changing global trends. Metilda et al. (2017) examined how digital technology can improve business management graduate's employability skills. This study found that while there are plenty of resources available online which include interactive tools like videos or apps, graduates still don't possess some specific IT related abilities demanded by employers within their industries. Commonly mentioned types were: literacy in computing devices operating systems; knowledge about different programs used for statistical analysis; ability to use artificial intelligence among other emerging technologies such as big data analytics etc. However even though most schools have started integrating ICT into teaching processes, many students lack necessary practical competences coupled with higher-order thinking capacities. Therefore, it suggests more training on technological applications together with real life situational examples should be incorporated into various levels of education so that young people become ready for work once they graduate.

Alshammari et al. (2023) investigated how technology knowledge can be integrated into the Saudi Arabian higher education curriculum with a view of promoting sustainable development. The study finds out that many students in Saudi Arabia do not have current technical competencies like software development, data analysis and digital communication due to old fashioned syllabuses and lack of enough practical exposure. They highlighted that it is important for schools to update their systems of learning so as to equip learners with skills that are relevant in the job market today which can only be achieved through use of modern technology tools and methods. Some of the areas where they recommend improvements include among others software proficiency, digital literacy as well analytical abilities. In the same vein, Singh, Singh, Alam, and Agrawal (2022) seek to address the disparities between what is taught by universities/colleges vis-à-vis what employers want from potential employees, especially those who have been through formal education in Saudi Arabia. They observe an increasing demand for technological knowhow alongside digital competence while at the same time noting that the majority of Saudi students find themselves lacking practical up-to-date knowledge/skills, this being caused mainly by; theoretical orientation without any practical exposure coupled with limited resources including outdated materials used during teaching process. In order to not just meet but exceed these expectations, there should be reforms done within our educational system aimed at ensuring that learners are adequately prepared for industry needs through advanced digital literacy, more technical knowhow plus better problem solving abilities.

Singh and Alshammari (2023) examined how e-learning technology incorporated into higher education in Saudi Arabia can increase educational attainment as well as prepare students for the modern job market. They point out that it also has the potential of revolutionizing Saudi society by making quality education more accessible while at the same time aligning skills among learners with industry needs. Alshammari et al. (2024) conducted a study on higher education strategies, IT governance, academic excellence and career prospects within the context of Saudi Arabian universities. They observed that current systems do not adequately equip learners with sufficient IT knowledge which is essential for their success in life after university especially when it comes to advanced levels such as those related to practical application or management of information technology resources. This creates a gap between what employers require from graduates and what they actually possess thereby affecting their readiness for employment thus calling upon institutions to update their courses in line with these requirements so that students may be better equipped for jobs in the ICT sector towards achieving digital transformation goals set forth by the kingdom under its vision 2030.

Binyamin, Rutter and Smith (2019) argue that Saudi students lack digital literacy skills and technological competencies necessary for employability purposes globally; therefore, there is need of improving this area through necessary measures like curriculum review and enhanced training facilities. They further demand reforms be made within universities' curriculums so as to incorporate comprehensive technological studies which would respond adequately towards demands posed by current job market trends internationally. Additionally, Al-Bazaei (2023), Alanazi & Benlaria (2023) highlight the importance of aligning competences among graduates with international benchmarks coupled with preparing them adequately for entering highly competitive labor markets worldwide as stipulated by objectives contained in Saudi vision 2030.

The Need for Saudi Arabian universities to update curricula and training programs so they can keep up with changes in the labor market has been stressed by Abdullateef et al. (2023). They found out that Saudi students lack practical skills such as industry-specific technical knowledge, hands-on experiences or professional competences. Students often do not know how to apply what they have learnt into practice thus making them not ready for work. If these weaknesses are addressed it will improve employability among graduates as well as contribute towards achieving Saudi Vision 2030 goals. Allmnakrah and Evers (2020) also stress that more technology savvy employees with innovative minds are needed by the labor market in KSA today than ever before; therefore digital literacy should be improved among Saudi students together with critical thinking and problem solving abilities being developed too if educational institutions were to meet these objectives then learners would be better placed when seeking jobs because their employers would require them to think critically while handling various situations which may arise within or outside workplace context besides having strong foundation in using different tools like computers.

Alsughayer and Alsultan (2023) indicated that there is an increasing need for accountants who have technical knowledge, practical experience, and strong interpersonal skills to support the wider aims of economic development under Vision 2030. Haidar and Al-Shorafa (2023) found that the Saudi labor market demands accounting professionals with not only technical competence but also hands-on practice and good communication abilities. This means that the skills taught in universities do not match what employers expect from job seekers hence calling for educational reforms. Sayaf et al., (2021) point out that more experts are required who can work with sophisticated digital systems; unfortunately, many learners are only being taught basic computer literacy which falls short of industry needs. While it is important to concentrate on information communication technology (ICT) within education systems; students must improve their digital skills so as to meet these demands when they enter the job market. Advanced digital literacy development along with adaptability towards new technologies coupled together with practical application using various devices remains key towards enhancing employability among individuals especially youth who constitute the majority within populations. Ahmad & Alammary (2022) documented that software capstone project management should be given priority at Saudi universities through identification of gaps followed by proposing a unified approach aimed at improving these programs.

Gadi (2021) points out that Saudi female students, despite having theoretical knowledge, often lack essential digital and technical skills required for employment. The study underscores deficiencies in practical technology applications, problem-solving, and critical thinking, recommending that educational institutions enhance programs with hands-on training, industry collaborations, and soft skills development. Kumar, Haque, and Venugopal (2019) argue that the current educational focus on theoretical knowledge limits graduates' preparedness for real-world challenges. They advocate for integrating practical experiences, such as internships and problem-based learning, into the curriculum to better prepare students for the job market. Ebaid (2021) echoes this concern, noting that while graduates have adequate technical knowledge, their ability to apply this knowledge effectively in real-world scenarios is lacking. Similarly, Almutairi and Hasanat (2018) found that Saudi Information Systems (IS) students frequently lack critical technical and soft skills, including practical application, problem-solving, and teamwork. They suggest that practical training, project-based learning, and internships are essential for improving students' readiness for successful employment.

According to Kovács (2021), there is a wide discrepancy between the skills currently possessed by workers and the abilities that employers expect them to have. They identified several necessary technology skills, including digital marketing tools proficiency; data analysis knowledge; and familiarity with online communication strategies such as social media management systems. Also, students lack experience and skills in advanced areas of technology. Quadri et al. (2017) reported that technical expertise blended with soft skills is highly valued by employers. However, many Saudi Arabian learners do not possess the mandatory digital competency needed for successful electronic learning. Designated key issues are poor digital literacy levels; difficulty in navigating through various virtual platforms used for teaching purposes and limited self-directed study capabilities among others like time management, motivation hence perceived as challenges they face when engaging with online materials. Bhatti et al. (2022) observed that most Higher Education students receive only theoretical understanding which lacks practical application context thus making it difficult for them to acquire necessary employability skills like leadership, teamwork spirit. To address these weaknesses, they suggest that educators should use strategies based on experiential learning theory alongside fostering cultural adaptability among learners through industrial attachments where possible.

3. Graduate and Professional Skills Development Program (PSAU-GPSDP)

A proactive initiative, the PSAU Graduate Professional Skills Development Program (PSAU-GPSDP) seeks to ensure that post-graduate learners are equipped with skills required by current job market. This program places a strong emphasis on diverse technological and software training for graduate students. The main objective of this program is to produce graduates who are competent in various professional skills relevant to technology areas mainly, thus enhancing their chances of employability amongst others within the competitive labor force. In order to effectively implement it, PSAU-GPSDP is incorporated into the university's organization structure with an administrative mandate under direct supervision of the Vice Rectorate for Academic and Educational Affairs. A college office aligned with the Vice Dean for Academic and Educational Affairs should be established in each faculty within the university so as to ensure a common approach towards providing these services.

The PSAU-GPSDP consists of non-credit workshops and resources supplementing academic curriculum that train essential domain competencies not fully addressed through traditional classroom teaching methods. This endeavor is important because it supports both institutional and national policies aimed at promoting employability among graduates. For instance, one of PSAU’s second strategic objectives is “Empowering students to compete in the labor market” (https://www.psau.edu.sa/en/node/1966). Furthermore, according to the National Qualifications Framework at the Bachelor level such skills as selection, use and adaptation of digital technologies tools including ICT tools for processing data analysis must become basic proficiency of any student which will support and improve his researches or projects (Education & Training Evaluation Commission, 2023). The area that has been given much attention by PSAU-GPSDP involves information technology and software which show they are fundamental throughout different career choices like business professionals, engineers; medical doctors; teachers; even art creators as well. Forms of post-workshop feedback are used as formative evaluation tools with the view of continuously improving the program and student experiences.

PSAU-GPSDP is congruent with the university's strategic plan (2030) which stresses experiential learning and community outreach as central activities integral to the university mission. It enables students to apply their academic knowledge in real-life environments thereby making them successful after graduation. Alongside this, they help to link academic learning to industry needs and develop a number of university-industry partnerships. In addition, PSAU-GPSDP presents an opportunity for working together with software firms and developers who can advertise & promote their products; give discounts, updates, workshops, materials etc. by attracting numerous such organizations from these sectors so that they can enhance our programs through different means like offering sales promotions on their products or cutting down prices while at same time it creates a symbiotic relationship between school management and technology sector through enhancing how competences taught at University are meaningful towards career paths taken by graduates.

3.1 Phase one: Development

The Vice Rectorate for Academic and Educational Affairs, through the chairman of PSAU-GPSDP steering committee who is also the Vice Rector himself, appoints faculty members from each college. The committee oversees the project as a pilot initiative over a period of three years. The committee has also been mandated to raise funds for this venture from internal and external donors such as the ministry of Education and United Nations so far. In every College, there should be a subcommittee whose main role is to suggest fresh software in accordance with market needs. In order for the PSAU-GPSDP initiative to cater for specific students' requirements, representatives from business colleges, engineering colleges, health colleges, education colleges and arts colleges within which may include student representatives as well as staff support from Vice Rectorate for Academic & Educational Affairs make up part of its steering body. Specifically, it is the student-driven approach that characterizes this project name because some students can volunteer to assist in computer lab activities such as maintenance or program development team members. These are besides other CGI based positions that may be required by the course unit. Central registration system would be vital for tracking participation rates and providing students with easy access to records of their engagement in various activities under PSAU-GPSDP. The team must collaborate with web designers on site creation while conducting focus groups involving current graduate students' alumni and faculty will enable them to come up with online resources sorted by academic programs, workshops classified according to college and activities categorized into sections like sports days or laboratories' assignments among others. For instance, searching through activities' calendars might help locate events by date/time. Through the PSAU-GPSDP all undergraduate degree holders shall have free access to professional skill set training materials.

As an example of this kind of project it may involve partnership agreements with internal education programs or external suppliers providing software services or products (e.g., installation/activation/updating/maintenance/delivery/workshops/consultation/certification). At PSAU, the faculty members may be involved in different ways of this project as per their specializations. They might be involved in making participation at the project's webpage and workshop delivery, when they inform students on class time about this program or help them to understand that it is a good one; reviewing reports' feedback and revising content where necessary.

3.2 Phase two: Implementation

Each university college should establish a computer lab with equipment required for running software applications, enabling students to use software applications and providing workshops. A digital learning platform should also be created. These computer labs and digital platforms will operate according to these guidelines: For instance as regards the computer labs, the following colleges shall have a computer lab presents at their main building which are (1) Scientific colleges; College of Business Administration, College of Engineering, College of Computer Engineering and Sciences, College of Engineering – Wadi Aldwaser, and College of Business Administration – Hotat bani Tamim, (2) Health colleges; College of Medicine, College of Pharmacy, College of Dentistry, College of Applied Medical Sciences, and College of Applied Medical Sciences – Wadi Addwasir, (3) Humanities colleges; College of Education, College of Education – Wad Addwasir, College of Arts and Science- Wadi Addwasir, College of Sciences and Humanities, College of Sciences and Humanities – Hotat bani Tamim, College of Sciences and Humanities – Slayel, College of Sciences and Humanities – Alflaj, and (4) Applied Colleges

It is necessary to provide all computer labs with relevant hardware, which will allow them to work properly. Software that is most often used in the market for each specialty must be installed on computer systems. The college's academic programs dictate what software applications should be installed; these vary according to the scientific specializations. For example, the software used at Scientific Colleges could not be applicable at any other medical university, humanitarian colleges and those focusing on applied sciences. These applications need to be introduced to students.

For instance, within the College of Business Administration, different software is used in the market as follows: Accounting software includes Accounting Software, Enterprise Resource Planning (ERP) Software, Tax Preparation Software, Expense Management Software, Payroll Software, Financial Reporting and Analysis Tools, Bank Reconciliation Software, Document Management Systems, Audit Applications, Financial Planning and Analysis (FP&A) Software. In human resources, there are Human Resource Information System (HRIS), Applicant Tracking System (ATS), Onboarding Programs, Performance Management Systems (PMS), Learning Management System (LMS), Time and Attendance Systems, Employee Engagement Platforms, Benefits Administration Solutions, Employee Self-Service Portals(ESS), HR Analytics Platforms. Finance software encompasses Financial Management Solutions, ERP, Financials Accounting Packages, Financial Planning & Analysis, Treasury Management Systems, Risk Control Tools, Budgeting/Forecasting, Payment Gateways, Regulatory Compliance Officer, and Portfolio Management Software. Marketing tools include Customer Relationship Management (CRM) Software, Marketing Automation Software, Email Marketing Software, Content Management System (CMS), Social Media Management Tools, Search Engine Optimization (SEO) Tools, Analytics and Data Visualization Tools, Ad Management Platforms, Marketing Project Management Software, Customer Experience (CX) Software, and Marketing Attribution Software. Legal software involves Case Management Software, Document Management Systems (DMS), Legal Research Software, eDiscovery Software, Legal Billing Software, Contract Management Software, Legal Practice Management Software, Court Management Systems, Legal Analytics Software, Legal Collaboration Tools, and Legal CRM (Customer Relationship Management). Management Information Systems (MIS) utilize Database Management Systems (DBMS), Enterprise Resource Planning (ERP) Software, Business Intelligence (BI) Tools, Dashboard and Reporting Tools, Customer Relationship Management (CRM) Systems, Supply Chain Management (SCM) Software, Data Warehousing Solutions, Workflow Automation Software, Collaboration and Communication Tools, Knowledge Management Systems, and Cybersecurity and Identity Management Solutions. Business software includes Enterprise Resource Planning (ERP) Software, Customer Relationship Management (CRM) Software, Accounting Software, Project Management Software, Collaboration and Communication Tools, Office Productivity Suites, Business Intelligence (BI) Tools, Human Resource Management Systems (HRMS), Inventory Management Software, E-commerce Platforms, Point-of-Sale (POS) Systems, and Cybersecurity Solutions.

The laboratory requires enough computers. A good number of computers in a software lab guarantees that students can have access to the necessary tools and programs, which encourages hands-on learning and skill development. It supports group work, facilitates timely completion of assignments, and allows students to fully participate in software-based coursework and activities. Further still, the lab should have an adequate number of technical and academic staff every day so as to provide students with guidance on application usage and ensure they get help immediately when required. This helps create an environment conducive for learning thus helping one overcome any technical challenges while improving a student's understanding as well as proficiency with such software. In addition, manuals as well as guidelines ought to be available so that there are precisely defined ways in which programs are supposed to be used; this will enable students to learn how these applications operate quickly hence using them more efficiently. Such resources help explain common problems, enhance user awareness, and foster independent study resulting in better utilization of technology.

Moreover, the marketplace expects that these software applications be up-graded based on emerging technologies being applied by employers today. It ensures that what is learned by students remains relevant, follows industry policies, and makes them more employable through exposure to the latest tools and applications employed within their professions. A yearly training plan must include annual workshops held during semesters at the university for all undergraduate students that are notified about it for participation purposes. Each student has to get licensing both for off-campus & on-campus usage of application software. This also means equal chances should be given to male & female trainees pursuing their course within class works on application use licenses. Furthermore, those who are going into their final year of study but have another year left before graduation need to have access to these licenses if they cannot do without the software while preparing projects or examinations or other papers required for classes (thus increasing their skills level). A certificate showing successful completion of a major-related/software-applications course should be earned by each student. Such certification acknowledges the fact that students have made some achievements in their resumes and show prospective employees that they are indeed ready to embark on their own careers in their respective areas of expertise.

The learning platform part should consist of creating an online learning platform. Establishing an online learning platform to complement software laboratories is essential for expanding the reach and enhancing training efficacy among postgraduate fellows. This would serve as a very important educational tool through which various digital resources such as instructional videos, keynote presentations, courses, learning pathways, interactive forums can be found. However, perhaps the most important benefit of this platform is its ability to give students access to education materials beyond the walls of physical lab rooms without any time restrictions at all. This becomes extremely useful when lab computers are fully used up as it ensures that even then students can still access their class work and practice with applications when they want to do so. Students may also enjoy MOOC (Massive Open Online Course) content providing them with free high-quality educational materials that might be available anytime they are free (it enriches one’s knowledge and does not cost anything).

This online learning platform brings multiple advantages. First, it greatly expands the range of educational materials on offer to appeal to different learning styles and proficiencies. These include introductory videos and more advanced courses that focus on relevant topics pertaining to software applications used in their future professions. Secondly, convenient access and flexibility offered by online platforms enable students to engage with content at their own pace and according to their availability such as those who juggle work with studies. Collaboration areas such as forums and discussion boards facilitate interaction between learners encouraging them to seek assistance from peers or offer suggestions. Through this aspect of sharing, there is not only a better understanding but also a supportive learning community is established. Moreover, the site can be updated continually so that such software changes can be incorporated into students' daily working environment.

To set up an online learning system involves several critical steps. The first thing is developing high-quality educational materials required for this purpose. These consist of generating, gathering, processing, editing or curating videos as well as presentations and full courses that deal with relevant software applications being applied in lab sessions. Furthermore, collaborating with industry experts would ensure that the material remains current while matching with present-day industry criteria. After preparing the content itself, choose a robust Learning Management System (LMS). In addition to having user registration features, interactive forums should be supported by the LMS besides various types of contents available within it like course management mainly through receiving students' registrations since it should possess an ability to incorporate different media formats in its pages across all browsers as well as devices employed in classroom activities. Specifically targeting laboratory users must have been integrated too so that there is no need for leaving any ongoing task even when moving from one experiment's point till another part of the same practical area urgently needed during one study period (with some examples given below: integration plugins: 3D molecular viewer plugin). Small-scale testing should then be carried out following which feedback may indicate the areas that require improvement so as to serve better student users.

In order for students to engage with this platform successfully, simple registration procedures must be established. Registration will be done through university credentials of students so that it is safe and hassle-free. Also, introductory tutorials should be offered to help students interact with the site, essentially focusing on how they can navigate through it, get into courses and participate in forums. Students should have an opportunity to choose classes that match their interests and career aspirations among others. New content updates may also come in the form of notifications sent to students' email addresses. Moreover, constant support should be provided to help learners deal with any technical glitches or teaching problems encountered along the way. In addition, user feedback and emerging technologies need to inform regular upgrades made so as not make the system become irrelevant at any stage of education.

Students using this online learning platform will have a comprehensive tool which complements classroom training by providing them with resources and flexibility necessary for achieving success while mastering software applications vital for their professional development at school lab environments.

3.3 Phase three: Evaluation

It is important to assess the Software Lab and Learning Platform projects of PSAU Graduate Professional Skills Development Program (GPSDP) in order to ascertain their effectiveness, applicability and influence on student skill enhancement. Both projects will be evaluated using a comprehensive method that will offer tips for betterment as well as compliance with industrial norms and educational goals. The Software Lab and Learning Platform must be effectively prepared by the PSAU-GPSDP to produce graduates who can get into various professional careers successfully.

3.3.1 Evaluation of the software lab

The evaluation of the Software Lab is divided into several key areas. Firstly, there should be periodic reviews carried out to ensure that lab activities are in line with wider goals of PSAU-GPSDP and reflect these objectives as well as industrial demands. Second, it is crucial to evaluate adequacy and effectiveness of resources available in the lab such as hardware, software and educational materials. This can be achieved by conducting audits of laboratory resources periodically, getting students' and faculty's feedback as well as comparing them with industry standards. In addition, gauging student participation in lab activities helps to understand engagement and gauge learning outcomes through attendance records, completion rates of lab assignments/projects, surveys and feedback forms. Evaluating instructors' performance and impact during the lab sessions is also important whereby peer reviews, students' evaluations and professional development records can be used for this.

Moreover, an assessment must be made on how far a student has acquired relevant skills in any given laboratory activity using pre- and post-assessments; practical exams and project evaluations among others. The long-term impact of a particular lab on students' employability and career success can help gather information regarding alumni career progress through surveys by employers or employer feedbacks and employment records for instance elaborate on some methods that could be used to measure these impacts. However, the evaluation will focus on specific aspects that will give comprehensive insights into its effectiveness while suggesting ways it can be improved so that it meets program objectives thereby preparing students effectively for employment.

3.3.2 Evaluation of the learning platform

Evaluating Learning Platform comprises several aspects which ensure its efficiency and relevance towards learners: firstly, content quality & relevance must be ensured; regular academic and industry experts' reviews; updating contents based on latest technological advancements as well as collecting student's feedback about content effectiveness are part of measures that make this holistic approach keep up-to-date platform valuable for students' educational need.

Another aspect of evaluation is User Experience (UX). The usability and accessibility of the platform should be assessed to ensure successful user experience. This may include UX testing, studying users' behavior via platform analytics, and evaluating navigation, ease of use, and overall satisfaction. Furthermore, it is important to track student engagement with the platform. This can be done through course enrollment tracking, completion rates, resource interactions analytics along with surveys on what drives engagements and even gamification elements meant to increase participation rates.

It is essential to evaluate how well a learning management system meets desired learning outcomes. Such assessments may include quizzes, tests or/and assignments that help measure knowledge acquisition as well as gather feedback on learning impact progress in the course. Technical performance should also be monitored using metrics such as uptime; load times; technical issue tracking; regular maintenance must be performed to maintain reliability. Additionally, level and quality of interaction between students as well as instructors and peers are paramount where forum activity and discussion participation are recorded while instructor support is assessed in terms of feedback collected from them. Lastly, by tracking the issuance of certificates; gathering feedback from students & employers; monitoring integration into students' career development process we will determine if certifications provided through our platform have any impact on motivation or career prospects for example.

3.3.3 Overall Evaluation Framework

It is important to establish a framework for ongoing evaluation and improvement of both projects. A cyclical review process involving regular feedback collection, data analysis and iterative updates of the lab and platform based on evaluation results will be established. This ensures that both the Software Lab and Learning Platform are kept current and relevant so as to continually meet students' evolving needs as well as industrial standards.

Therefore, it should engage a multitude of stakeholders such as students, faculties, industry ties, and alumni in the evaluation process. In order to achieve this purpose, different activities including focus groups, advisory board meetings, stakeholder surveys among others will be done. Involving various stakeholders helps in obtaining an all-inclusive understanding of what the program does best or where it needs to improve thereby creating a friendly atmosphere for constant improvement.

Transparency must be maintained during evaluations processes as well as their outcomes. Consequently, there should be regular reports from these evaluations while findings ought to be shared with stakeholders who can use them for strategic planning or decision making purposes. PSAU-GPSDP will ensure that graduate students are professionally equipped through detailed evaluative techniques such that they can cope with various challenges in life after campus just like maintaining a very professional attitude when using electronic communication services like email correspondence at work for instance. These initiatives can constantly be improved through continuous assessment thus increasing their quality and impact by complying with industrial standards and educational best practices in the field of technology education today.

4. Research methodology

4.1 Research design and instrument

The research design, which is both descriptive as well as analytical, is being used for this study to find the technological skills that graduate students have in mind. The link between technological skill development and future employability are analyzed by using interviews to get an insight about how graduates perceive their experiences regarding employment opportunities and how well they are prepared for them through technological skills acquisition. Additionally, there are insights from different software lab ideas. The literature review was done extensively to come up with a list of items reflecting the concept of technology proficiency and job prospects. The approach used here has been adopted and adapted from similar studies after adapting the instruments so that it fits within the objectives of this study. Similarly, the questionnaire was also subjected to three educators who have been involved in teaching and researching careers guidance over more than fifteen years and who, following some suggestions, made a number of additions/deletions before giving final approval of it. The data were collected in the second semester of the academic year 2023-2024. The data is collected through an online self-completion survey. The survey included 19 items; 11 items measured the technological skills of the graduates, 3 items measured the employment chances, and 5 items measured the software lab's training and employment. The items were measured using a 5-point Likert scale. There were also multiple-choice questions asking about respondents' backgrounds including gender, age group, major area of study and grade point average (GPA) plus career intentions after graduation as open text responses contained within Google Forms surveys directed towards final year undergraduate students in College of Business Administration using different social media sites together with emails from lecturers in charge thereby making it possible for learners student community members whom these students distributed among themselves could reach these questionnaires easier than they would otherwise not have done. A pilot test was conducted using a number of 30 respondents before it was given to the rest of the participants. The purpose of this pre-test was to determine how long it would take on average for someone who completes these questionnaires, if their answers are adequate representations (in terms number and scope) as well whether or not they cover relevant issues under consideration within the academic context while responding accordingly with them during our research work. Both types of questionnaires used were selected through simple random sampling techniques. All respondents in this study were senior students studying in the College of Business Administration at Prince Sattam bin Abdulaziz University. We adhered to research ethics while conducting the data collection process. Ethics were maintained throughout the entire process and consents were taken by all participants after they understood what we wanted from them.

4.2 Study population and sample size

This study focuses on technological skills and job prospects among final year undergraduate students majoring in business administration at Prince Sattam bin Abdulaziz University during academic year 2023-2024.

4.3 Data collection

To collect data from the respondents, we used different google-docs web links for conducting the survey. Before conducting the survey, we had to tell the respondents why this data was being asked and that their answers would be kept private and confidential. The questionnaire consisted of demographic questions as well as technological skills and employability issues. Usable questionnaires were provided out of all questionnaires distributed. It was difficult to determine the response rate for this study because it is not possible to know how many online surveys were distributed via social media.

4.4 Data analysis

After carrying out data screening and cleaning, we used IBM SPSS version 26.0 and Microsoft Office Excel 16 to analyze the findings statistically. This research employed descriptive statistics (mean, standard deviation, minimum, maximum, frequency and percentages), KMO test, Barlett's test of sphericity, Principal Component Analysis (PCA), ANOVA and Cronbach Alpha.

5. Results and discussions

The sample characteristics are illustrated in the following Table 1.

Table 1
Sample characteristics

Characteristics		Frequency	Percentage
Gender	Male	86	61.4
	Female	54	38.8
Age	18-21	48	34.3
	22-25	92	65.7
Specialization	Accounting	37	27
	Finance	41	29
	HRM	35	25
	MIS	27	19
CGPA	5.00 – 4.76	24	17.1
	4.75 – 4.51	18	12.9
	4.50 – 4.01	36	25.7
	4.00 – 3.51	20	14.3
	3.50 – 3.01	20	14.3
	3.00 – 2.51	19	13.6
	2.50 – 2.01	3	2.1

The study includes participants from various demographic backgrounds with diverse characteristics including age group distribution among other identified features such as gender ratio where there were more males than females taking part in the research project. This implies that although there was an underrepresentation of women by comparison to men who comprised approximately 6 out every 10 participants majoring in finance still involved in this project; there was no less than one fourth of the sample being made up of females in that category. Majority of them were 22-25 years old, which accounted for 65.7% (n=92) while the remaining 34.3% (n=48) were between 18 and 21 years. The participants had diverse academic specializations, with finance as the most popular one, selected by 29% (n=41), followed by accounting with a population percentage of 27% (n=37). Meanwhile, human resource management was chosen by 25% representing 35 students whereas 19% stood for MIS.

A wide range of academic performance levels among the participants can be deduced from this analysis showing different cumulative grade point averages (CGPAs). About a quarter of participants scored CGPAs ranging from 4.01 to 4.50 making up about 36 students meaning that they performed excellently academically. Additionally, those who scored CGPAs between 4.76 and 5 had 17% (24 students) whilst nearly 13% came within the range between (4.75-4.51). As many as 40 students earned grades averaging from B plus to A minus similarly; another set comprising twenty students garnered scores ranging between B minus and C.

Table 2
Descriptive statistics and Cronbach Alpha of technological skills

Items	Statements	Mean	Std. Deviation	Number of items	Cronbach α value
TECH1	I can use technology to communicate with others	4.7929	.40671	11	.997
TECH2	I learn to use new technologies	4.6929	.57397		
TECH3	I can adapt to changes in technology	4.5643	.67013		
TECH4	I can solve technical problems	3.7143	1.10125		
TECH5	I have advanced IT skills (data analysis, simulation, interpreting visualization)	3.3357	1.32280		
TECH6	I can understand predictive data analytic tools and methods	3.5357	1.21389		
TECH7	I think critically about information yielded by data analysis	3.5643	1.11375		
TECH8	I can apply IT as a basic information management tool	3.8143	1.17886		
TECH9	I am creative in using digital technologies	3.5286	1.23756		
TECH10	I can connect and collaborate with people using technology	4.5857	.53625		
TECH11	I am aware of the online safety skills	4.1571	.80709		

Table 2 summarizes the statistical analysis of graduate students' perceptions of their technological skills while taking into account 11 different items, revealing internal consistency with a Cronbach's Alpha of 0.997. The students were more proficient in technology enabled communication with others scoring a mean of 4.7929 and standard deviation of 0.40671 thus indicating great confidence towards use of technology in communication. For example, this is shown by the fact that they demonstrate an average high score on learning new technologies (mean = 4.6929; SD = 0.57397) which could imply they are very good at acquiring technological skills that are new to them. The score for adaptability to technical changes was also above average (mean = 4.5643; SD = 0.67013). On the other hand, there were some areas where students had less trust with regards to their ability to solve technical problems (Mean=3.7143; SD=1.10125), indicating more variation and room for improvement.

Table 3
Descriptive statistics of technological skills

	Level of agreement – Frequency (%)				
Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
TECH1	111 (79.3)	29 (20.7)	---	---	---
TECH2	105 (75)	27 (19.3)	8 (5.7)	---	---
TECH3	91 (65)	39 (27.9)	8 (5.7)	2 (1.4)	---
TECH4	43 (30.7)	36 (25.7)	44 (31.4)	12 (8.6)	5 (3.5)
TECH5	41 (29.3)	17 (12.1)	43 (30.7)	26 (18.6)	13 (9.3)
TECH6	44 (31.4)	23 (16.4)	42 (30)	26 (16.6)	5 (3.6)
TECH7	36 (25.7)	34 (24.3)	49 (35)	15 (10.7)	6 (4.3)
TECH8	49 (35)	44 (31.4)	28 (20)	10 (7.1)	9 (6.4)
TECH9	40 (28.6)	35 (25)	32 (22.9)	25 (17.9)	8 (5.7)
TECH10	85 (60.7)	52 (37.1)	3 (2.1)	---	---
TECH11	53 (37.9)	61 (43.6)	21 (15)	5 (3.6)	---

Similarly, ratings for highly specialized IT competences like data interpretation and simulation were moderate at M =3.3357 (SD=1.32280). The need for enhanced training in advanced analytical techniques is further stressed by a mean score of 3.5357 and standard deviation of 1 .21436 for familiarity with predictive analytic tools and methods used in big data analysis. However, this suggests that although students have some capacity to think critically about information from quantitative analyses, they need more development in this area as indicated by mean=3.L5643 (SD=1 .11375). Respondents had moderate confidence when it came to using IT as a tool for organizing information (Mean=3 .8143; SD=1 .17886).

Creativity in the application digital technologies scored averagely at M =3 .5286 (SD=1.23756). In contrast, the respondents were highly rated for their ability to connect and collaborate with others through technology (Mean=4 .5857; SD=0 .53625). Lastly, learners were quite responsible when it came to cyber safety issues as shown by an average of 4.1571 and standard deviation of 0.80709.

The items were evaluated by subjects on a 5-point Likert Scale where “strongly agree” was represented by 5, “agree” – 4, “neutral” -3, “disagree” -2 and “strongly disagree-1”. From Table 3, it could be observed that all of the students believe that they can use technology to communicate in one way or another. Many students stated that they had been exposed to new technologies (n =132; 94.3%) while almost the same number reported that it would not be a problem for them to adjust to new innovations (n =130; 92.9%). About technical problem-solving skills, the majority of them thought they are able in this field as out of 79 respondents (56.4%). However, only 58 students mentioned having some knowledge in advanced IT competences for example: data analysis and technique interpretation respectively (41.4%). Similar numbers indicated familiarity with predictive data analytic tools and methods used during mining operations within big datasets (47.8%).

Information from data analysis was critically thought about by half of the participants (n = 70; 50%). A good number of them (n = 93; 66.4%) confirmed that they could put IT into use for simple information management purposes. Moreover, more than one out every two respondents (75 persons; 53.6%) stated they were imaginative in applying digital technologies. Almost all participants (n = 137;97.8%) expressed high confidence that they are able to connect and collaborate using technology with others. The results further indicate that most of the respondents (81.5 %) are aware of online safety skills such as scams, hacking and viruses among others. These findings suggest high levels of communication and adaptability skills among participants and a need for development in advanced IT competencies and creative use of digital technologies are identified.

After conducting this, the sampling adequacy test (KMO test) and tests for normality of data (Barlett’s test of sphericity) were applied and found suitable. Then principal component analysis (PCA) was applied to the data with varimax rotation to get initial factors. Only factors with eigenvalue ≥ 1.0 were retained. After checking initial communalities estimates, items that cross loaded and had factor loadings ≤0.40. were dropped off. The initial pool of 11 items grouped into one factor consisting of 11 items in total representing a total variance of 50.112%. Also supported by scree test technological factor structure is also indicated by it. All commonalities value is between its lowest value at .454 TECH3 and its highest value at .868 TECH9.

The Principal Component Analysis (PCA) using the varimax rotation is applied to combine the indicators of TECH.

Table 4
Factor analysis results – Technological skills

Factor/Item description		Factor Loadings
TECH1	I can use technology to communicate with others	.495
TECH2	I learn to use new technologies	.582
TECH3	I can adapt to changes in technology	.454
TECH4	I can solve technical problems	.773
TECH5	I have advanced IT skills (data analysis, simulation, interpreting visualization)	.850
TECH6	I can understand predictive data analytic tools and methods	.794
TECH7	I think critically about information yielded by data analysis	.838
TECH8	I can apply IT as a basic information management tool	.771
TECH9	I am creative in using digital technologies	.868
TECH10	I can connect and collaborate with people using technology	.468
TECH11	I am aware of the online safety skills	.709
Eigenvalue		5.512
% of variance		50.112
Kaiser-Meyer-Olkin (KMO)		.826
Bartlett’s Test of Sphericity: Approx Chi-Square		925.734
df		55
Sig		.000

After the TECH-factorial structure was scrutinized and labeled, ANOVA was applied to examine the differences in perceived technological skills attached to these dimensions by each of the three intentions of the graduate students as to whether their intention is to go for professional work after graduation, go for academic work, and/or they are not sure.

Table 5
Comparison of work intention and technological skills

	Work		Postgraduate		Not sure		
Dimension	Mean	SD	Mean	SD	Mean	SD	*F* Value
TECH	4.3298	.7236	3.9712	.58084	3.7500	.60112	10.259***

Note(s): ***p < 0.001; **p < 0.01; *p < 0.05; not significant (ns) 5 p > 0.05

Table 5 shows that there are significant differences in students’ perception about the technical skills across all graduates (F = 10.259; p < .001), which emphasizes different self-appraisals based on their career plans. Further insights into these perceptions can be obtained through post-hoc analyses. Students preferring professional work after graduating have the highest confidence in their technology literacy with an average score of 4.3298, meaning they are optimistic since they believe that they have been adequately taught and thus expect them to perform well using technology related skills as professional sectors often demand a high level of expertise in information technology. Over time, the use of sophisticated learning tools among professors will enable such professionals to handle classes effectively hence making students competent individuals ready for future duties. However, those planning to go into teaching have a mean score lower than 4 indicating slightly less than full confidence in their technical abilities. Academic environment has more theoretical concepts and research work rather than technology like it happens generally within other professions.

Also, students who are uncertain about their career paths exhibit a mean score of 3.7500, which shows that they are not very confident in their technical skills. This uncertainty may emanate from a lack of awareness on the particular technological competencies required for different career choices. Thus, these students may not feel confident about their preparedness for careers, indicating an area where specialized support and vocational counseling could be useful to help them identify and develop the necessary skills for their future careers. These findings accentuate the necessity for differentiated technology skills development programs that cater for various career goals of students. In addition, the use of advanced technological training in line with industry standards will further boost their self-confidence and chances of finding employment among those who aspire to become professionals. On the other hand, academic careers can be enhanced by focusing more on research tools and educational technologies. Lastly, unresolved students need career counseling that is broad-based so as to have confidence thus equip them with what is needed in many diverse jobs.

Table 6 illustrates an outline of how graduate students perceive the influence of their present technological skills on employment through three items with Cronbach's alpha is 0.886 denoting a good internal consistency. The lowest rating was assigned to the students' confidence in the fact that their present technological skills would have an immense effect on their chances of getting employment (M=1.51, SD=0.800). Low scores suggest that most students believe their current technology-related abilities cannot make them competitive for the job market and they need to develop more skills or get specialized training. Similarly, 2.07 mean and a standard deviation at 0.870 means that there is moderate level of confidence among the students regarding how useful these technologies would be for a job search implying some uncertainties about being ready for employment from a practical perspective.

Table 6
Descriptive statistics and Cronbach Alpha of technological skills and employment

	Items	Mean	Std. Deviation	Number of items	Cronbach α value
EC1	The current technological skills I possess will significantly enhance my employment prospects.	1.51	.800	3	.886
EC2	I believe my current technological skills greatly improve my chances of securing employment	2.07	.870		
EC3	My current technological skills require enhancement.	2.43	1.060		

With a standard deviation of 1.060, Item #3 had the highest mean score (M=2.43) thereby showing that learners understand deficiencies in their technical competencies and hence must improve them in order to enhance employability. The larger standard deviation here suggests broader range of responses indicating different perceptions as to how much improvement is desired by learners for better performance in this area; Overall, these findings indicate clear awareness by respondents that their current technological capacities may not fully satisfy job market requirements but also well acknowledge a need to be improved furtherly; Thus, intensified measures like additional trainings or courses could be helpful towards increasing adequacy levels among students who face challenges while adjusting themselves into occupational norms. Table 7 shows the perceptions of graduate students to whether their technological skills give them high chances for employment.

Table 7
Descriptive statistics of employability chances based on current technological skills

	Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
EC1	The current technological skills I possess will significantly enhance my employment prospects.	3 (2.1)	2 (1.4)	3 (2.1)	47 (33.6)	85 (60.7)
EC2	I believe my current technological skills greatly improve my chances of securing employment	---	4 (2.9)	46 (32.9)	46 (32.9)	44 (31.4)
EC3	My current technological skills require enhancement.	5 (3.6)	11 (7.9)	58 (41.4)	31 (22.1)	35 (25)

Table 7 shows the rate in terms of how likely a graduate can be employed basing it on his/her existing technological skills as measured using a 5-point Likert scale and reveals numerous important observations made by participants involved into it; however "Strongly Agree" was indicated only by three participants representing just 2.1% whereas 2 or 1.4% have shown simple agreement;

Neutrality was indicated by three students which stands for 2.1%; at the same time, there were 47 respondents with a negative attitude (33.6%) and 85 respondents who strongly disagreed (60.7%) which means that most of the respondents do not suppose their present technological skills to be significantly beneficial for future employment as well as “Agree” or “Strongly Agree.”

None of the participants in this study agreed with the statement “I believe my current technological skills greatly improve my chances of securing employment”, while only 4 participants stated they agreed, and 46 respondent chose neutrality; On the other hand, 46 respondents expressed their disagreement towards the statement whereby 44 others strongly disputed it; This indicates widespread doubt among respondents concerning how helpful their technical abilities are when it comes to getting a job; Moreover, 5 participants where having strong conviction on this matter while 11 respondents moderately agreed; However, those who decided to go neutral were 58 which signifies that they had no opinion regarding this issue; While 31 did not support it completely every single respondent said no to this particular question out-rightly thus marking an overwhelming response rate of 80%. The distribution shows the majority of students recognize the need for improvement in their technological skills. Indeed, based on all the responses given about these three statements, a larger majority perceive that their current technological skills would lead to very low employability opportunities.

Table 8 shows that the initial pool of three items was amalgamated into a single factor that accounted for 46.226% of the total variance together. This analysis produced by factor implies that the chosen items are functioning in a cohesive manner to measure one underlying construct i.e. perception about employment prospects. The scree test validated this grouping, as it showed a clear inflection point supporting only extraction of a single factor. This test is a plot of eigenvalues associated with each factor; it shows distinctive fall after the first-factor confirms minimal contribution to explaining variance by succeeding factors and hence supports retention of only one factor.

Table 8
Factor analysis results – Employment chances

Factor/Item	description	Factor Loadings
EC1	The current technological skills I possess will significantly enhance my employment prospects.	.802
EC2	I believe my current technological skills greatly improve my chances of securing employment	.684
EC3	My current technological skills require enhancement.	.526

Eigenvalue	1.387
% of variance	46.226
Kaiser-Meyer-Olkin (KMO)	.516
Bartlett’s Test of Sphericity: Approx Chi-Square	18.436
df	3
Sig	.000

Table 8 shows the communalities values which indicate the proportion of each item’s variance explained by the extracted factor, we notice that all values fall within an acceptable range. Lowest communalities value stands at 0.526 (EC3) revealing that 52.6% of its variation is shared with this factor alone; whereas highest communalities value being 0.802 (EC1), signifying that 80.2% of the variance in this item is accounted for by the factor. These community estimates suggest strong relationships between every item and underlying constructs with however some remaining variability to be accounted for in capturing EC3’s variance. The findings demonstrate the factor structure’s strength in measuring perceptions of employment prospects. The identified factor efficiently captures the shared variance among the items, making it a reliable indicator of the construct. However, the range of communalities suggests that while the factor is a good representation, there may be additional dimensions or items that could further enhance the explanatory power and comprehensiveness of the measure. ANOVA was applied to examine the differences in perceived employment chances attached to these dimensions by each of the three intentions of the graduate students as to whether their intention is to go for professional work after graduation, go for academic work, and/or they are not sure.

Table 9
Comparison of work intention and employment chances

	Work		Postgraduate		Not sure		
Dimension	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	***F* Value**
EC	1.7582	.56991	2.0650	.51218	2.2083	.44993	9.911***

Note(s): ***p < 0.001; **p < 0.01; *p < 0.05; not significant (ns) 5 p > 0.05

Table 9 shows that there are significant differences in the perceptions of employment chances among all graduate students ($F = 9.911$, $p < 0.001$). The same data also enables a detailed understanding of these views in relation to future career plans by students. These include students aiming at professional work who have the lowest expectations about improving their job prospects through their current technological skills as their mean score is 1.7582. Hence, the low average suggests that such individuals’ computing expertise may not be good enough for securing jobs in professions because this market usually needs advanced and up-to-date computer skills. Compared to these ones, students who want to join the academic sector have a slightly higher confidence in their technology skills with a mean score of 2.0650. Thus, though meager, this better grading could imply that those aspiring for an academic career find themselves more equipped than others do. Such perception is determined by different technological demands in academia which often are less technology oriented compared to other professions that require forward-looking technologies instead of already available or developed ones. Lastly, undecided career-minded students show the highest mean score but it remains quite low at 2.2083. These findings underscore the need for targeted interventions aimed at boosting technology capabilities among graduate students targeting careers in professional domains; enhancing training programs and resources can help align their technology competence to their career goals, thus enhancing their confidence and employment potential. Participants were also asked about the significance of receiving training on specialized software in their college's computer lab and how this experience could enhance their employability skills and career prospects. The results are detailed in Table 10. The results in Table 10 indicate that the majority of respondents are of one mind about the importance of university software lab to acquisition of practical skills and better employability. As many as 32.9% agreed while 9.3% strongly agreed that a software lab was essential for acquiring industry specific experience; Majority of them indicated that they had been able to apply specialized software at workplace (52.9%), and most emphasized the direct relevance of lab work to future professions (67.1%). In other words, these findings show that students perceive the laboratory as an important bridge between theoretical aspects and real-life practice thereby preparing them for the needs of contemporary workplaces.

Table 10
Descriptive statistics of specialized software and employment

	Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
SL1	The presence of a software lab at the university is essential for gaining practical experience with industry-relevant software	13 (9.3)	46 (32.9)	13 (9.3)	0	---
SL2	Having access to a software lab improves my ability to apply specialized software skills in real-world work scenarios	74 (52.9)	41 (29.3)	17 (12.1)	8 (5.7)	---
SL3	The skills developed in a software lab are directly applicable to the types of software used in my future career	94 (67.1)	33 (23.6)	10 (7.1)	3 (2.1)	---
SL4	Exposure to specialized software through a university lab enhances my employability compared to those who did not have similar access	62 (44.3)	44 (31.4)	27 (19.3)	7 (5.0)	---
SL5	The opportunity to work with specialized software in a lab setting better prepares me for the technological demands of the workplace	68 (48.6)	36 (25.7)	31 (22.1)	5 (3.6)	---

Moreover, participants acknowledge through these responses that such exposure to customized software can increase chances of getting employed by 44.3% agreeing and another 31.4% strongly supporting this notion. The use of specialized programs is a significant element in preparing learners for real jobs according to 48.6% who indicated agreement with this opinion and an additional 25.7% seemed strongly convinced about it too while some respondents neither refuted nor accepted this suggestion.

Table 11
Descriptive statistics and Cronbach Alpha of software lab training and employment

Items	Statements	Mean	Std. Deviation	Number of items	Cronbach α value
SL1	The presence of a software lab at the university is essential for gaining practical experience with industry-relevant software	4.485	.66230	5	.785
SL2	Having access to a software lab improves my ability to apply specialized software skills in real-world work scenarios	4.2929	.89359		
SL3	The skills developed in a software lab are directly applicable to the types of software used in my future career	4.5571	.72242		
SL4	Exposure to specialized software through a university lab enhances my employability compared to those who did not have similar access	4.1500	.90502		
SL5	The opportunity to work with specialized software in a lab setting better prepares me for the technological demands of the workplace	4.1929	.90479		

When pondering over the results in Table 11, we can clearly see how they shed light on what postgraduate students think about a software laboratory at their university and its effect upon their potential employability and readiness for their future jobs. This analysis is based on five items that have an acceptable Cronbach's Alpha of 0.785, indicating internal consistency. The most preferred item is the statement "The skills developed in a software lab are directly applicable to the types of software used in my future career," which garners a mean score of 4.5571 with a standard deviation of 0.72242. It is evident that this high average mark indicates students' strong belief that the experience of working in the laboratory can be useful for them in dealing with the relevant software tools and applications that they will later use professionally; therefore, it demonstrates that this laboratory effectively bridges academic learning with industry requirements.

On another note, the fact that presence of a software lab is essential to practical familiarity with industry-standard software also had a comparatively higher rating of 4.485 together with SD = 0.66230. In contrast to other laboratories, this one offers hands-on practice which is highly valued by students who believe it plays an important role in preparing them for professional life. The mean score was given as 4.2929 while its higher standard deviation (SD = 0.89359) was indicated when evaluating such things like improvement concerning using specialized software packages learnt through having access to a computer lab full of these types of apps. However, even though still relatively high, lower ratings coupled with greater scatter range testify to some students' feeling about insufficient transferability from lab to job scenarios.

Mean scores were rated at 4.1500 with a standard deviation SD = 0.90502 implying there is variation regarding whether exposure to special-purpose software through university labs enhances chances of being hired after graduation or not. Although the mean score is positive, the relatively higher standard deviation indicates some variability in how strongly students feel about the direct impact of lab exposure on their employability compared to peers who may not have had similar access. Lastly, the belief that working with specialized software in a lab setting better prepares students for the technological demands of the workplace was rated with a mean score of 4.1929 and a standard deviation of SD = 0.90479. This score suggests that students generally feel well-prepared for the technological challenges they may face in their careers, although there is some variation in confidence levels. Overall, these results demonstrate that students recognize the significant value of a university software lab in enhancing their practical skills and employability. The consistently high mean scores across all items indicate strong positive perceptions, although the varying standard deviations suggest that there may be opportunities to further optimize the lab experience to ensure all students feel equally prepared for their future careers.

Table 12

Factor analysis results – Software lab and employment

Factor/Item description		Factor Loadings
SL1	The presence of a software lab at the university is essential for gaining practical experience with industry-relevant software	.813
SL2	Having access to a software lab improves my ability to apply specialized software skills in real-world work scenarios	.794
SL3	The skills developed in a software lab are directly applicable to the types of software used in my future career	.782
SL4	Exposure to specialized software through a university lab enhances my employability compared to those who did not have similar access	.661
SL5	The opportunity to work with specialized software in a lab setting better prepares me for the technological demands of the workplace	.622

Eigenvalue	2.734
% of variance	54.688
Kaiser-Meyer-Olkin (KMO)	.804
Bartlett's Test of Sphericity: Approx Chi-Square	192.778
df	10
Sig	.000

Table 12 shows the findings from factor analysis of the relationship between software laboratories and employment revealed a strong single factor, which accounted for 54.688% of the total variance. This single factor captures the composite variance in the 5 items about how significant software labs are in enhancing students' employability. High factor loadings (from 0.622 to 0.813) shows that each item has a strong relation to another underlying construct, which is the perceived impact of a programming laboratory on a student's practical experience and employability. Moreover, an eigenvalue of 2.734 supports maintaining one factor as it is much higher than the eigenvalues of any subsequent factors indicating that this particular factor alone explains most of the variances available. The Kaiser-Meyer-Olkin (KMO) measure for sampling adequacy with a value of .804 indicates adequate sample size as well as items being fit for further factor analysis procedures. Furthermore, Bartlett's Test of Sphericity was highly significant, (Chi-Square = 192.778, $p < .000$), corroborating that there is enough association among the variables to warrant use of factor analysis.

All the items have strong communality values, meaning that they are strongly related to the practice of the construct. The highest loading was for the item "The presence of a software lab at the university is essential for gaining practical experience with industry-relevant software" (0.813), indicating that 81.3% of this variable's variance is shared with all other components. The lowest factor loading occurred in the item "The opportunity to work with specialized software in a lab setting better prepares me for the technological demands of the workplace" (0.622), and this significant load reflects that it accounts for 62.2% of its variance explained by this factor. In summary, these results show that factor structure is robust and stable, which makes it a reliable instrument for gauging students' perceptions regarding how software labs impact their employability. The identified factor efficiently captures shared variances among items which suggests these aspects as being important for preparing students for professional lives characterized by high technological requirements.

ANOVA was applied to examine the differences in perceived specialized software training and its impact on employment attached to these dimensions by each of the three intentions of the graduate students as to whether their intention is to go for professional work after graduation, go for academic work, and/or they are not sure.

Table 13
Comparison of work intention and specialized software training

Dimension	Work		Postgraduate		Not sure		*F* Value
	Mean	SD	Mean	SD	Mean	SD	
SL	4.5804	.47033	4.3463	.65425	4.0667	.58395	10.122***

Note(s): ***p < 0.001; **p < 0.01; *p < 0.05; not significant (ns) 5 p > 0.05

Table 13 depicts that there are significantly different perceptions on how graduate students' career intention influences their employment prospects relative to specialized training on software ($F = 10.122$, $p < 0.001$). These differences reflect varying levels of perceived value in specialized software training depending on the students' intended career trajectories. The students aiming for professional work after graduation exhibit the highest confidence in the value of specialized software training, with a mean score of 4. 5804. This high score indicates that these students strongly feel that they must be trained to use this type of software before they can get jobs, which is attributable to the numerous job advertisements that list computer skills as a requirement for applicants. The relatively low standard deviation (.47033) indicates a strong consensus among these students regarding the importance of this training, further underscoring its perceived relevance in preparing them for professional careers. Students considering an academic career show slightly lesser belief in the impact of specialized software training (mean = 4.3463). Despite being lower than that of professionals, this mean score still high means that those who intend to join educational institutions as lecturers or undertake research work do not attach much significance to their knowledge on specific programs and applications used in modern offices and large firms. The higher standard deviation (.65425) among this group indicates more variability in their perceptions, possibly reflecting differing views on the necessity of specialized software training in academia.

Students not sure of their career paths have the lowest mean score at 4.0667 as an indicator of lack of confidence in how much their employment prospects may change due to training on specialized software. Being less confident about this group may result from a mean of 4.0667 with a lower standard deviation of .58395, which implies that they view these training programs more broadly or are unsure if they would be useful to different careers. This uncertainty can lead them towards more moderate evaluations concerning the value attributed to specialization in software programming, thus requiring further guidance and skill development for increasing employability in various fields. On the whole, these findings illustrate differing levels of importance assigned to special software instruction among students who are future employees. To those who desire professional jobs, it makes up an integral part of being considered employable while those contemplating on academic careers or not sure where they will end up place a somewhat lesser premium upon it. These results call for customized skills development approaches that consider students' career interests so as to equip all graduates with essential knowledge required by their respective professions.

6. Conclusion

The aim behind carrying out this study was twofold: first, it was intended to assess final year undergraduate students' technological literacy; secondly, the investigation sought to establish whether there is any potential link between specialized software instruction and graduate employment opportunities. The study took place in the College of Business Administration at Prince Sattam bin Abdulaziz University among 140 senior students during the academic year 2023-2024. Descriptive and analytical research design including surveys and interviews were used with the purpose to fill critical gaps in technological competencies and offer possible solutions aimed at making learners better-prepared for dynamically changing labor market conditions. Analysis reveals that although respondents generally believe that they have good technological skills, such abilities fall short of expectations given by employers' today's needs. Both the survey and interview results indicate a wide gap between students' present level of skill and competences demanded by prospective employers that are highly technological in nature. Students, however, pointed out that specialized courses in software would dramatically boost their job opportunities as they move on in life.

In order to respond to these findings, the research proposes an initiative named "Graduate and Professional Skills Development Program (PSAU-GPSDP)" that is purposed for giving focused training in customized software as per the needs of the market. Specifically, each college should have a software lab. PSAU-GPSDP program, which is managed by the Vice Rectorate for Academic and Educational Affairs, has been designed to bridge this skill gap through offering practical training that augments academic learning. The aim of this initiative is to improve technological practical skills of students thereby making them more suitable for employment. This study has implications on several fronts. These results provide convincing reasons why Prince Sattam bin Abdulaziz University administrators will invest and implement the PSAU-GPSDP program. These findings are beneficial to the Ministry of Higher Education, Ministry of Human Resource and Social Development among other educational institutions as they indicate relevance in aligning curricula with industry requirements so as to improve student employability chances. Through addressing technological skills gaps and introducing hands-on experience into educational programs, this research supports Saudi Vision 2030 overall goal while at the same time it meets United Nations Sustainable Development Goals (SDGs).

Specifically, this research contributes to SDG 4 on “Quality Education”’ by calling for instructional practices that build up student’s technological practical skills instead of theoretical ones and also conforming them towards today's job market’s needs. The proposed PSAU-GPSDP program supports SDG 4.4 which seeks to increase youth and adults with relevant skills for employment hence graduates being better prepared for workforce demands. Additionally, the PSAU-GPSDP program contributes to SDG 8 on Decent Work and Economic Growth, especially target 8.5; which aims at achieving full and productive employment together with decent work opportunities for all people everywhere in all circumstances including persons who live in poverty or extreme poverty situations such as those found in least developed or developing countries (UNHRDCP, 2015, para. 6). Through enhancing student’s technology competencies as well as giving practical training, this project will create a more skilled and adaptable workforce hence promoting economic growth and development. In addition, there is a need for future studies to examine the long-term effects of the PSAU-GPSDP program on students’ employment outcomes and career advancement. Further research may also investigate similar programs in other universities or regions in order to refine and improve strategies toward better educational and employment outcomes for such initiatives.

Acknowledgement

This project is sponsored by Prince Sattam bin Abdulaziz University (PSAU) as part of funding for its SDG Roadmap Research Funding Program Project number PSAU/2023/SDG/92.

References

Ahmad, E., & Alammary, A. (2022). Towards unified management of software capstone projects in Saudi universities: a survey-based study. *Arab Gulf Journal of Scientific Research, 40*(2), 118-138. https://doi.org/10.51758/AGJSR202240201

Alam, M. J., Ogawa, K., & Islam, S. R. B. (2022). Importance of skills development for ensuring graduates employability: The case of Bangladesh. *Social Sciences, 11*(8), 360. https://doi.org/10.3390/socsci11080360

Alanazi, A. S., & Benlaria, H. (2023). Bridging higher education outcomes and labour market needs: A study of Golf University graduates in the context of Vision 2030. *Social Sciences, 12*(6), 360. https://doi.org/10.3390/socsci12060360

Al-Bazaei, H. B. H. (2023). The Role of Saudi Universities in Supporting and Communicating with Graduates in Accordance with International Requirements. *International Journal of Instruction, 16*(1). https://doi.org/10.29333/iji.2023.1611a

Aldossari, A. S. (2020). Vision 2030 and reducing the stigma of vocational and technical training among Saudi Arabian students. *Empirical Research in Vocational Education and Training, 12*(1), 3. https://doi.org/10.1186/s40461-020-00051-6

Allmnakrah, A., & Evers, C. (2020). The need for a fundamental shift in the Saudi education system: Implementing the Saudi Arabian economic vision 2030. *Research in Education, 106*(1), 22-40. https://doi.org/10.1080/00345271.2020.1750895

Almutairi, M. M., & Hasanat, M. H. A. (2018, April). Predicting the suitability of IS students’ skills for the recruitment in Saudi Arabian industry. In *2018 21st Saudi Computer Society National Computer Conference (NCC)* (pp. 1-6). IEEE. https://doi.org/10.1109/NCC.2018.8381451

Alshammari, A. M., Alshammari, F. F., Thomran, M., & Altwaiji, M. (2023). Integrating technological knowledge into higher education curricula: An essential measure for attaining sustainable development in Saudi Arabia. *Sustainability, 15*(22), 15956. https://doi.org/10.3390/su152215956

Alshammari, K., Thomran, M., Alobaid, R., Grada, M., Alquhaif, A., Alshebami, A. S., ... & Al-Anazi, F. (2024). Cultivating Success: Unveiling the Influence of Higher Education Strategies on Information Technology Governance, Academic Excellence, and Career Prospects in Saudi Arabia. *Sustainability, 16*(12), 5025. https://doi.org/10.3390/su16125025

Alsughayer, S. A., & Alsultan, N. (2023). Expectations gap, market skills, and challenges of accounting education in Saudi Arabia. *Journal of Accounting Education.* https://doi.org/10.1016/j.jaccedu.2023.100845

Avramenko, A. (2012). Enhancing students' employability through business simulation. *Education+ Training, 54*(5), 355-367. https://doi.org/10.1108/00400911211244669

Banasik, E., & Jubb, C. (2021). Are accounting programs future-ready? Employability Skills. *Australian Accounting Review, 31*(3), 256-267. https://doi.org/10.1111/auar.12375

Bhatti, M. A., Mat Saat, S. A., Aleidan, M. M., Al Murshidi, G. H. M., Alyahya, M., & Juhari, A. S. (2022). Are business graduates’ employability skills and learning/teaching techniques universal? Exploring the role of culture: A comparative study among Australia, China, Pakistan, and Saudi Arabia. *Sustainability, 14*(5), 3069. https://doi.org/10.3390/su14053069

Binyamin, S., Rutter, M., & Smith, S. (2019). Extending the technology acceptance model to understand students’ use of learning management systems in Saudi higher education. *Journal of Educational Technology & Society, 22*(2), 24-35. https://www.jstor.org/stable/26736876

Ebaid, I. E. S. (2021). Employers' perceptions of generic employability skills of accounting graduates: Evidence from Saudi Arabia. *Journal of Management and Business Education, 4*(2), 136-149. https://doi.org/10.5281/zenodo.5508031

Education & Training, Evaluation Commission (2023). National Qualifications Framework in Kingdom of Saudi Arabia, 2nd Edition.

Gadi, N. H. (2021). The obstacles of women's employment in Saudi Arabia in the digital technology age. European Journal of Human Resource Management Studies, 5(1).

Haidar, F. T., & Al-Shorafa, A. J. (2023). Employers' Needs of Accounting Graduates Skills in the Saudi Labor Market: Analytical Study. *Journal of Organizational Behavior Research, 8*(1-2023), 286-296. https://doi.org/10.5281/zenodo.7947450

Hassock, L., & Hill, C. (2022). Employability and employment: The role of higher education in a rapidly changing world. In *Higher education and job employability* (pp. 155-178). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-74593-4_9

Idkhan, A. M., Syam, H., & Hasim, A. H. (2021). The Employability Skills of Engineering Students: Assessment at the University. *International Journal of Instruction, 14*(4), 119-134. https://doi.org/10.29333/iji.2021.1448a

ILO. (2016). Decent Work and the 2030 Agenda for Sustainable Development. International Labour Organisation. Available online: https://www.ilo.org/global/topics/sdg-2030/lang--en/index.htm

Isa, M. U., Kamin, Y. B., Salihu, Y. I., Shuaibu, H., & Cledumas, A. M. (2020). Enhancing Employability Skills of Woodwork Technology Education Students through Project Based Learning at Colleges of Education (Technical) in Nigeria. Universal Journal of Educational Research, 8(9A), 31-40. https://doi.org/10.13189/ujer.2020.082905

Kovács, I. (2021). Digital marketing soft skills and university students' perceptions of employability. *GiLE Journal of Skills Development, 1*(1), 25-36. https://doi.org/10.5277/GJSD210102

Kumar, N. S., Haque, M. I., & Venugopal, K. (2019). Employment challenges in Saudi Arabia: An attitudinal study. *Entrepreneurship and Sustainability Issues, 6*(4), 1637-1646. https://doi.org/10.9770/jesi.2019.6.4(16)

Mahajan, R., Gupta, P., & Misra, R. (2022). Employability skills framework: a tripartite approach. *Education+ Training, 64*(3), 360-379. https://doi.org/10.1108/ET-09-2021-0145

Metilda, R. M., & Neena, P. C. (2017). Impact of digital technology on learning to enhance the employability skills of business management graduates. *The Online Journal of Distance Education and E-Learning*, 5(2), 35-41. DOI: 10.24059/olj.v5i2.981

Nurunnabi, M. (2017). Transformation from an oil-based economy to a knowledge-based economy in Saudi Arabia: the direction of Saudi vision 2030. *Journal of the Knowledge Economy, 8*, 536-564. https://doi.org/10.1007/s13132-016-0385-4

Olivares, S. L., Adame, E., Treviño, J. I., López, M. V., & Turrubiates, M. L. (2020). Action learning: challenges that impact employability skills. Higher Education, Skills and Work-Based Learning, 10(1), 203-216. DOI: 10.1108/HESWBL-02-2019-0028

Oraison, H., Konjarski, L., & Howe, S. (2019). Does university prepare students for employment?: Alignment between graduate attributes, accreditation requirements and industry employability criteria. *Journal of Teaching and Learning for Graduate Employability, 10*(1), 173-194. https://doi.org/10.21153/jtlge2019vol10no1art785

Pereira, E. T., Vilas-Boas, M., & Rebelo, C. C. (2019). Graduates' skills and employability: The view of students from different European countries. *Higher Education, Skills and Work-Based Learning*, 9(4), 758-774. https://doi.org/10.1108/HESWBL-01-2019-0012

Pitan, O. S., & Muller, C. (2020). Student perspectives on employability development in higher education in South Africa. *Education+ Training, 63*(3), 453-471. https://doi.org/10.1108/ET-10-2018-0236

Prior, J., Laudari, S., & Leaney, J. (2019). What is the effect of a software studio experience on a student's employability? In *Proceedings of the Twenty-First Australasian Computing Education Conference* (pp. 28-36). Association for Computing Machinery (ACM). https://doi.org/10.1145/3285600.3285604

Quadri, N. N., Muhammed, A., Sanober, S., Qureshi, M. R. N., & Shah, A. (2017). Barriers affecting successful implementation of e-learning in Saudi Arabian universities. *International Journal of Emerging Technologies in Learning (Online), 12*(6), 94. https://doi.org/10.3991/ijet.v12i06.7268

Sayaf, A. M., Alamri, M. M., Alqahtani, M. A., & Al-Rahmi, W. M. (2021). Information and communications technology used in higher education: An empirical study on digital learning as sustainability. *Sustainability, 13*(13), 7074. https://doi.org/10.3390/su13137074

Singh, A., & Alshammari, M. (2023). Advancing, empowering, and reshaping Saudi society through integrating e-learning technology into higher education. *International Journal of Advanced and Applied Sciences, 10*(7), 178-187. https://doi.org/10.21833/ijaas.2023.07.021

Singh, A., Singh, H. P., Alam, F., & Agrawal, V. (2022). Role of education, training, and E-learning in sustainable employment generation and social empowerment in Saudi Arabia. *Sustainability, 14*(14), 8822. https://doi.org/10.3390/su14148822

UN. (2016). THE 17 GOALS|Sustainable Development. Sustainable Development. Available online: https://sdgs.un.org/goals

Venkatesh, V., Rabah, J., Lamoureux-Scholes, L., Pelczer, I., Urbaniak, K., & Martin, F. (2014). Development, Implementation, and Evaluation of a Professional Skills Development Program: The Case of Concordia University's GradProSkills. *Canadian Journal of Higher Education*, *44*(3), 39-53.

Yusuf, N., & Jamjoom, Y. (2022). The role of higher education institutions in developing employability skills of Saudi graduates amidst Saudi 2030 Vision. *European Journal of Sustainable Development, 11*(1), 31-31. https://doi.org/10.14207/ejsd.2022.v11n1p31