



OPEN ACCESS

EDITED BY

Sandra Carvalho,
University of Minho, Portugal

REVIEWED BY

Hanan Eid Badwy,
University of Sadat City, Egypt
Ana Tecilazic,
Algebra University, Croatia

*CORRESPONDENCE

Isyaku Salisu
✉ isy.salisu@uoh.edu.sa

RECEIVED 12 October 2025

REVISED 21 December 2025

ACCEPTED 29 December 2025

PUBLISHED 04 February 2026

CITATION

Salisu I, Alshammari MM and
Al-Samhi NM (2026) Psychological pathways
to perceived employability: a dual-theoretical
lens on the mediating roles of self-efficacy
and resilience in career development
programs.

Front. Educ. 10:1723538.

doi: 10.3389/feduc.2025.1723538

COPYRIGHT

© 2026 Salisu, Alshammari and Al-Samhi. This
is an open-access article distributed under
the terms of the [Creative Commons
Attribution License \(CC BY\)](#). The use,
distribution or reproduction in other forums is
permitted, provided the original author(s) and
the copyright owner(s) are credited and that
the original publication in this journal is cited,
in accordance with accepted academic
practice. No use, distribution or reproduction
is permitted which does not comply with
these terms.

Psychological pathways to perceived employability: a dual-theoretical lens on the mediating roles of self-efficacy and resilience in career development programs

Isyaku Salisu^{1*}, Mohammad Mulayh Alshammari¹ and
Nezar Mohammed Al-Samhi²

¹Department of Management Information Systems, Humanities Research Centre, University of Ha'il, Hail, Saudi Arabia, ²Department of Marketing, Humanities Research Centre, University of Ha'il, Hail, Saudi Arabia

Introduction: Under current labor market uncertainties, employability has been an increasing concern for higher education students. As such, perceived employability is gaining importance and becoming a significant field of inquiry. However, how it is influenced in the academic environment remains inadequately studied. Drawing from the dual theoretical lens of social cognitive career theory and conservation of resources theory, this study investigates the impact of career development programs (CDP)—mentoring, training, and internships—on perceived employability, mediated by self-efficacy and resilience, among final-year university computer science students in the Hail area of Saudi Arabia.

Methods: In this cross-sectional study, data were collected from 348 university graduating computer science students. This study used partial least squares structural equation modelling to assess the measurement and structural model.

Results: Mentoring and training were significantly related to perceived employability, while internships were not. For predictors of self-efficacy, only internships predicted employability, while mentoring and training did not. Self-efficacy did not predict perceived employability. Mentoring, training, and internships were significantly related to resilience. Resilience and perceived employability were significantly related. Self-efficacy mediated the relationship between internship and perceived employability but did not mediate the relationship between mentoring and training and perceived employability. Resilience mediated the relationship between mentoring, training, and internship, and perceived employability.

Discussion: The findings of this study contribute to the literature on CDPs and perceived employability and provide valuable insights for policymakers, career development program developers, and educators. By emphasizing the importance of key career development program functions, educational institutions can develop effective programs and interventions that bridge the skill gap and enhance computer students' career prospects and employability.

KEYWORDS

career development programs, perceived employability, resilience, self-efficacy, students, university

1 Introduction

The complexities of the contemporary labor market, marked by rapid technological advancements, economic fluctuations, and organizational restructuring, have contributed to increased job insecurity and unemployment (Pitan and Muller, 2020b). For individuals entering the workforce, securing employment quickly is critical for career progression and long-term success. Consequently, employability has become a central concern for young people aspiring to establish themselves in their professional careers (Räty et al., 2020). Perceived employability (PE), which refers to an individual's assessment of their probability of securing new employment (Van Hootegeem et al., 2019; Zou et al., 2024), plays a fundamental role in managing job uncertainty, as the rates of graduate employment have become a significant aspect of government financing and university rankings, sector quality guidelines, and institutions' marketing strategies (Healy et al., 2022).

In recent decades, PE has gained significant attention among higher education students and sparked academic interest (Noor and Azmi, 2021). Numerous employability models have been created, and researchers have examined the concepts and variables that significantly influence them (Räty et al., 2020). However, there remains a lack of studies on PE. For instance, Onyishi et al. (2015) argued that the few available empirical studies on PE that exist mostly focus on workers, whereas empirical analyses of models concerning university students' PE are rare (Caballero et al., 2022; Duggal et al., 2024; Jackson et al., 2024). Other studies have posited that little research has empirically examined the factors influencing students' PE; hence, critical elements, behaviors, and contextual factors have been ignored (Dražić et al., 2018; Caballero et al., 2022; Petruzzello et al., 2023). Therefore, the formation of PE in an academic context remains inadequately studied. Furthermore, according to Álvarez-González et al. (2017, p. 283), there is "a deficiency of data regarding the characteristics, predictors, and consequences of PE." One of the predictors that has been conspicuously neglected is CDPs. According to Bennett et al. (2023), much of the research on university students' PE treats learners as experientially homogenous, often overlooking the potential impact of CDPs on students' employability-related behaviors. The theoretical model of PE proposed by Vanhercke et al. (2014) posits that proximal elements, such as student self-efficacy and resilience, facilitate individual professional growth and enhance PE. However, they have been overlooked in scientific inquiries (Petruzzello et al., 2023).

In recent decades, enterprises have undergone significant transformations, including digital revolutions, global economic crises, and labor market fluctuations. These changes have heightened employers' demands for advanced capabilities among prospective workers. In such dynamic, complex, and uncertain environments, human capital has emerged as one of the most critical factors for organizational survival and success. To meet these demands, businesses seek individuals with the highest levels of knowledge and skills for each role. Consequently, students must cultivate qualities that employers value, which extend beyond academic achievements to include experience, knowledge, and skills aligned with labor market needs. Universities play a pivotal role in fostering these qualities, making it a fundamental objective of education to equip youth with the resources and information necessary to strategically plan for their future.

Most college students pursue undergraduate degrees with the primary goal of increasing job opportunities and salary potential (McDow and Zabrocky, 2015). However, according to Álvarez-González et al. (2017), despite the growing proportion of the postsecondary education population, employment rates for graduates in many nations remain unsatisfactory. This issue is often exacerbated by inadequate qualifications among job seekers (Carroll and Economics, 2015). Research suggests that individuals with university degrees who participate in CDPs are more likely to secure employment, highlighting the importance of such initiatives (Morgan and Osborn, 2025).

Career development (CD) is particularly crucial for contemporary youth, who are often described as "motivated but directionless" (Nicoll et al., 2024; Zahra and Malik, 2024). Although young individuals have high educational aspirations, many lack the cohesive CD skills required to achieve their employability goals. This gap underscores the importance of enhancing CD initiatives in educational institutions to help young people formulate pragmatic career plans. According to Kayyali (2024), while extensive CD initiatives have proliferated, many school-to-work programs lack essential components such as career mentorship, training, and internships, and instead focus on teacher-led collaborations with employers. Additionally, despite increasing demand for individuals with CD expertise, student participation in CDPs has recently declined (Dumas Reysier and Chaker, 2024). Surprisingly, insufficient emphasis has been placed on analyzing the impact of CDPs on students' career outcomes. The absence of this aspect in the CDP research discourse is significant, as involvement in such programs is seen as a dependable indicator of positive career-related behavior and other outcomes (Chen et al., 2021; Qu et al., 2021; Ramaprasad et al., 2022). Further, while prior studies have examined CDP and employability independently, limited research integrates these relationships within a unified theoretical framework (McKenzie et al., 2018; Okolie et al., 2020a; Glerum and Judge, 2021). Furthermore, the underlying mechanism by which CDP and students perceived employability remains underexplored. Hence, this paper has added to the body of knowledge by combining SCCT and COR theory and elucidating how a career development program improves students' perceived employability through self-efficacy and resilience of computer science students in the Hail region.

The subsequent sections of the study are organized as follows: The following section examines the theoretical framework used in this investigation, followed by a literature assessment and the formulation of hypotheses. We then examined the development of instruments and methodologies for data collection. The data were analyzed, and the implications were considered accordingly. Lastly, our report presents the results, acknowledges several limitations, and suggests avenues for further research.

2 Theory and hypotheses development

To enable an integrated perspective of the interactions between career interventions, psychological resources, and PE among students, this study adopted a dual theoretical approach by integrating social cognitive career theory (SCCT) (Lent et al., 1994) with the conservation of resources (COR) theory (Hobfoll, 1989, 2011). SCCT specifically deals with cognitive and motivational processes

(self-efficacy and resilience) as outcomes of career development, while COR is a perspective that supports this point of view, highlighting how programs, as a resource-enriching mechanism, are used to maintain employability in the face of uncertainty.

2.1 Social cognitive career theory

Expanding upon the principles of Bandura (2001), prolific social cognitive theory, and the innovative theoretical translation efforts of Hackett and Betz (1981), SCCT was developed as a cohesive framework intended to enhance and establish connections among the fundamental theoretical models of career development (Brown and Lent, 2019; Lent and Brown, 2016). The SCCT framework comprises five interrelated theoretical models, each including a shared set of social cognitive, interpersonal (e.g., personality, ability), and environmental factors, within a fundamental set of assumptions. They assert that self-efficacy, attitudes, and result expectancies are fundamental determinants of several facets of educational and occupational behaviors (Brown and Lent, 2023). SCCT examines the interaction between self-efficacy, outcome expectancies, and personal aspirations in influencing career-related behaviors and outcomes.

SCCT elucidates the CD of young individuals within a sociocognitive behavioral framework, emphasizing career self-efficacy, which may be augmented over time through career improvement or mentorship programs that influence job-related behaviors (Okolie et al., 2020a). SCCT emphasizes the central role of self-efficacy beliefs in influencing individuals' career decisions and behaviors. Career resilience can be viewed as a personal resource influenced by environmental factors (e.g., mentoring, training, and internships) and self-regulatory behaviors, both of which SCCT incorporates (Rossier et al., 2017). SCCT considers how external factors (e.g., CDPs) interact with personal factors (e.g., self-efficacy and resilience) to shape career outcomes (e.g., employability) (Murthy and Antony, 2025). SCCT explicitly accounts for the role of contextual influences (e.g., access to CDPs) on career development (Yao and McWha-Hermann, 2025); therefore, the theory is highly suitable for explaining the framework presented in this study.

2.2 Conservation of resources theory

In line with SCCT, this study also relies on COR theory, which views personal, social, and material assets as resources that people seek to gain and preserve (Hobfoll, 2011). The tangible resources offered as a result of CDPs include skills, knowledge, networks, and psychological resources, such as self-efficacy and resilience (Taylor et al., 2022a; Brass et al., 2023). COR states that with such an accumulation of resources, students are better able to cope with stressors, adapt to challenges, and gain a competitive advantage in the job market (Jabeen et al., 2022; Yu et al., 2023). It is possible to consider self-efficacy and resilience as important personal resources, which not only help reduce potential losses but also help gain resources, which enhance the perception of employability.

In general, therefore, the paper combines SCCT and COR to examine how mentoring, internships, and training increase students' perceived employability. SCCT offers psychological clarification and explains how career development experience results in self-efficacy,

outcome expectations, and students' sense of agency, which are determinants of perceived employability (Zhong and Xu, 2023). COR also augments this view by focusing on resource acquisition; CDPs provide students with useful personal, social, and experiential resources that can help them become more resilient, less uncertain, and more confident in navigating the labour market (Akkermans et al., 2021). SCCT and COR are synergistic in that resources acquired through CDPs enhance self-efficacy and outcome expectations, which are outlined in SCCT. By integrating these theories, the study accounts for psychological as well as resource-based processes in which CDPs contribute to perceived employability.

2.3 Perceived employability

Employability has been extensively discussed in academic literature, with several researchers offering various, although interconnected, definitions of the term (Forrier et al., 2018; Fugate et al., 2021). Scholars tend to agree on its importance across various professional stages, especially with the move from education to employment (Dacre Pool and Sewell, 2007). Employability denotes the capacity and opportunity to acquire or maintain a significant, potentially realizable, and sustained job (Monteiro et al., 2021). PE refers to an individual's self-assessment of their capability and potential to obtain a job commensurate with their qualifications (Vanhercke et al., 2014). This pertains to the views and convictions of the likelihood of securing a full-time job after graduation (Healy et al., 2022; Pitan and Muller, 2020c). It is based on a psychological and subjective perspective of employability, positing that individuals respond to their perceptions rather than to objective fact (Vanhercke et al., 2014). Individuals may have competencies or access to objective environmental resources that enhance their employability. However, if individuals do not consider these features as useful instruments for achieving success in the job market, they perceive themselves as unemployable. Consequently, they are unable to respond or act consistently to achieve advantageous subjective and objective professional results (Silla et al., 2009). Hence, employability (PE) is an outcome generated by both personal and environmental elements presumed to influence the subjective sense of employability (Forrier et al., 2018).

Increased emphasis is being placed on how colleges assist graduates in attaining professional objectives, as a crucial return on substantial commercial and governmental investments (Baird and Parayitam, 2019). Research indicates that boosting students' self-confidence and self-belief may significantly increase employability more than boosting specific skills and competencies. Employability researchers agree that increased self-awareness, knowledge of labor market prospects, and motivation will enable students to make more educated job and life choices after graduation (Qenani et al., 2014). PE cultivates students' confidence in pursuing selected career trajectories, demonstrating resilience and effectively marketing themselves to employers in an evolving business environment. Hence, students with elevated levels of professional efficacy exhibit confidence in their vocational competencies and have a positive outlook on job opportunities in the labor market (De Cuyper and De Witte, 2010). High-level positive emotions arise from the accumulation of human capital or activation of favorable emotions. When people enhance their human capital (e.g., knowledge and skills) via educational

investments and CDPs, they bolster their confidence in their capacity to get full-time employment, hence seeing themselves as greatly employable (Veld et al., 2016).

2.4 Career development programs

Upon entering senior high school, students choose a professional pathway. By executing CD activities, school counselors contribute significantly to students' preparedness for pertinent career options (Anthony et al., 2022). CD has been defined by various scholars. For example, Pahala et al. (2024) argued that it denotes the process of learning and refining skills, information, and experience that empowers people to attain their professional objectives. Kononiuk et al. (2020) define CD as the process of managing learning, experience, and change to attain a self-defined, desired professional future. Liao et al. (2024) define it as an ongoing process in which a person consistently sets and modifies professional objectives over time. Porter et al. (2023) have stated that CD denotes the process of selecting a profession, enhancing one's abilities, and progressing along one's professional trajectory. Therefore, CD can be viewed as an individual's continuous educational journey. This underscores that students may make informed career choices via CD initiatives such as mentorship, structured learning, internships, training, and other professional experiences (Liao et al., 2024).

CDPs are structured initiatives designed to encourage and empower students toward professional growth. They provide students with opportunities to overcome disadvantages by clarifying their desired career trajectories and outlining strategies to attain their objectives (McIlveen et al., 2013). CDPs are increasingly being recognized as catalysts for organizational growth and productivity, prompting all firms to embrace this notion and provide career advancement opportunities for their people. CDPs are considered crucial for establishing a competitive advantage by enhancing production and efficiency. CDPs significantly influence people and their job efficiency, benefiting both workers and businesses (Jain et al., 2021). Several scholars have examined the impact of CDPs on various outcomes, including PE.

The literature suggests that CDPs are a multidimensional construct composed of many elements, such as mentoring, internship, and training (Glerum and Judge, 2021; Layton et al., 2022; Okolie et al., 2020b; Rubio et al., 2017). Mentoring is a collection of institutional tactics and activities aimed at improving students' career trajectories through dyadic interactions between a more experienced academic or staff member and a less experienced person or student (Owusu-Agyeman, 2024). An internship is defined as "any official or formal program where students gain valuable practical experience in certain fields or potential career of interest" (Galbraith and Mondal, 2020). Training is the opportunity provided to individuals to acquire and equip themselves with the knowledge and skills required to increase work efficiency (Kumar and Bayram, 2025).

2.5 Development of hypotheses

Based on the theoretical framework presented in Figure 1, and consistent with previous empirical evidence, this research formulates a series of testable hypotheses to test the proposed relationships between the key constructs. The hypothesized relationships are direct

and indirect mechanisms by which the CDPs are likely to impact the perceived employability among students.

2.5.1 CDP and PE

Employability researchers have consistently emphasized the significance of career management skills and CD learning in relation to PE (Donald et al., 2019). In studies on PE, CD is often acknowledged as a significant component; however, it has not been examined in detail. Conversely, numerous researchers examining individual employability as a psychosocial learning process have increasingly engaged in contemporary CD research (Jackson and Tomlinson, 2019, 2020, 2022; Tomlinson and Jackson, 2021). Nevertheless, studies on the substantive interactions between CD and PE are limited.

CDP significantly improves the employability of university students by providing structured opportunities for skill application and practical experience. These programs often include internships, seminars, mentorship, and networking activities (Dixon and Gordon, 2022; Okolie et al., 2020b). University career services, which are often managed by certified CD practitioners to assist students in formulating career options and objectives, addressing problems, and pursuing and obtaining job and work experience opportunities (Donald et al., 2019).

The findings from large-scale international datasets also help evidence the relevance of CDPs in enhancing students' perceived employability. According to EUROSTUDENT reports, students who have completed internships, skills training, and career guidance activities are more likely to feel confident that they are ready to enter the labour market (Mühleck et al., 2025). Equally, the EUROGRADUATE data repeatedly show that graduates who had work-based learning, structured training, and mentoring during their studies experience easier entry into the job market and self-perceive themselves as highly employable (European Commission, 2025). Such tendencies in European systems of higher education support the main idea of this research: mentoring, internships, and training have a significant impact on students' perceived employability. Hence, we argued that Students participating in professional development programs are more prepared to meet employer expectations, thereby increasing their competitiveness in the job market. Consequently, we hypothesized the following:

H1: Mentoring and PE are positively related.

H2: Training and PE are positively related.

H3: Internships and PE are positively related.

2.5.2 CDP and self-efficacy

Career development is a lifelong activity (Levine et al., 2018). During adolescence, school serves as the primary social context in which individuals begin to formulate career-related choices before entering the workforce (Wang, 2012). Academic variables, such as academic self-efficacy and motivation, significantly impact the career trajectories of individuals from youth to adulthood (Deng et al., 2022a). Adolescents' perceptions, selections, explorations, and planning for their future jobs enable a healthy transition to adulthood and may profoundly impact their subsequent lives (Michael, 2019).

According to SCCT, cognitive variables precede and shape the formation of professional interests and objectives (Lent et al., 1994; Lent and Brown, 2016). Self-efficacy is posited as a fundamental cognitive element that influences professional behavior and behavioral

modifications. Previous studies have shown a correlation between professional growth and academic self-efficacy, particularly in educational contexts (Ibrahim et al., 2020; Pekkarinen and Hirsto, 2017; Tenzin et al., 2019). Academic self-efficacy refers to an individual's perceived capacity to attain personally valued objectives or standards in an educational environment (Muris, 2001). Students' job identities and career exploration activities are associated with academic self-efficacy (Deng et al., 2022b). Students' academic self-efficacy may evolve through activities that modify their behavior to attain their objectives. Therefore, students with heightened self-confidence in academic settings tend to have a clearer understanding of their interests, talents, and objectives and are more likely to participate actively in career exploration activities (Choi et al., 2012; Turda, 2024).

Furthermore, students with elevated self-efficacy have greater confidence in their capacity to effectively engage in activities related to making and committing to career decisions. Conversely, career indecision is inversely associated with self-efficacy. Moreover, previous studies have shown that variations in academic self-efficacy may predict alterations in students' future career aspirations (Michael, 2019). In this instance, analyzing the correlation between career growth and academic self-efficacy may illuminate the potential influence of professional maturity on academic-specific variables (Deng et al., 2022b). Hence, as shown in Figure 1, we hypothesized the following:

H4: Mentoring and self-efficacy are positively related.

H5: Training and self-efficacy are positively related.

H6: Internships and self-efficacy are positively related.

2.5.3 Career self-efficacy as a mediator

The notion of self-efficacy is essential for comprehending the careers of individuals with limited access to the information required for the construction of control beliefs, as may occur with jobless individuals (Biramo et al., 2025; Turner, 2014; Wang and Lent, 2024). From a sociocognitive standpoint, self-efficacy denotes an individual's conviction in their capacity to strategize and execute the necessary actions to achieve certain outcomes (Bandura, 2001). Self-efficacy has been examined in the context of career theories and is included in sociocognitive career theory (Lent and Brown, 2013). CD self-efficacy refers to a person's sense of their capability to execute certain actions that are essential for professional preparation, entrance, or adaptation (Brown and Lent, 2023). For jobless people, professional self-efficacy is closely linked to the ability to alter one's unemployment status (Biramo et al., 2025). This study posits that participation in professional development programs enhances students' career self-efficacy, thereby affecting their PE. Therefore, we hypothesized the following:

H7: Career self-efficacy and students' PE are positively related.

H8: Career self-efficacy mediates the relationship between mentoring and students' PE.

H9: Career self-efficacy mediates the relationship between training and students' PE.

H10: Career self-efficacy mediates the relationship between internships and students' PE.

2.5.4 CDP and resilience

Resilience is a contextual phenomenon characterized by complex and dynamic interactions between human, environmental, and sociocultural elements. As interest in bolstering student resilience increases, particularly due to their susceptibility to significant stress, the implementation of effective programs is essential for boosting resilience (Venegas et al., 2019).

CDPs are often informed by theoretical frameworks and justifications to effectively promote resilience (Taylor et al., 2022b). Theory and research have substantiated that CDPs (mentoring, training, and internships) may enhance resilience and other career-related outcomes (Haugevje and Heian, 2024). For instance, mentoring offers a framework for youths to cultivate essential protective characteristics, including connections with peers and others, as well as individual abilities (Beltman and MacCallum, 2006). Training and internships are excellent ways to improve students' resilience by exposing them to real-world challenges, professional environments, and opportunities for personal growth (Ang et al., 2022). Through these, students develop skills, adaptability, and confidence that contribute to their capacity to recover from adversity and excel in challenging circumstances (Turner and Holdsworth, 2023; Yeager and Dweck, 2012).

CDPs have been associated with several positives outcomes. However, the literature on CDP lacks balanced and critical studies from the standpoint of noncognitive qualities, such as resilience. Hence, further studies are needed on CDP as a tool for the development of resilience (Haugevje and Heian, 2024). We thus propose the following hypotheses:

H11: Mentoring and resilience are positively related.

H12: Training and resilience are positively related.

H13: Internships and resilience are positively related.

2.5.5 Resilience as a mediator

Resilience refers to the extent to which a person faces stressful events or scenarios (Salisu et al., 2020; Salisu and Hashim, 2017; Tam et al., 2024). It denotes an individual's capacity to exhibit work-related adaptive behaviors throughout periods of career transitions. Näswall et al. (2013) suggested that resilience should be accurately termed employee resilience. Previous studies have shown that workplace mentoring significantly contributes to the development of professional resilience (Arora and Rangnekar, 2014), which, in turn, promotes an individual's well-being via job success (Han et al., 2021). Individual resilience leads to greater career success (Glass, 2007). Consequently, resilience is a crucial determinant of an individual's career outcomes, including PE.

CDPs aim to provide students with relevant skills, establish professional networks, and expose them to industry practices that are essential for crossing the intricacies of modern career trajectories (Kayyali, 2024). These programs also foster professional resilience. By cultivating resilience, students become more adept at navigating a fluctuating job market and adjusting their objectives and tactics in response to career-related challenges (Rezaiee and Kareshki, 2024). This flexibility enhances their employability, as they become capable of not only acquiring skills but also maintaining employment under difficulty. Therefore, we propose the following hypothesis:

H14: Career resilience and students' PE are positively related.

H15: Career resilience mediates the relationship between mentoring and PE.

H16: Career resilience mediates the relationship between training and students' PE.

H17: Career resilience mediates the relationship between internships and students' PE.

3 Materials and methods

The participants were computer science students from universities in the Hail region of the Kingdom of Saudi Arabia. To mitigate frequent method bias, the first page of the questionnaire included a cover letter assuring the participants that their replies were voluntary and anonymous (Podsakoff et al., 2012). The study distributed more than 600 questionnaires; however, 353 valid responses were recorded and retained for the final analysis. The participants were final-year students from 2 public universities in Hail region, selected using convenience sampling. G* Power was used to determine the sample size (Krieger et al., 2023; Mitra, 2024). This analysis, using $\alpha = 0.05$ and power = 0.80 indicated that a minimum of 92 participants was required. Hence, the final sample of 353 exceeded this recommended threshold. The study sample comprised 182 males and 171 females, all over 20 years old.

3.1 Measurement development

This study used established and verified questions from previous studies to evaluate the constructs under investigations. The original survey was written in English. This study used a back-to-back translation technique to translate the survey into Arabic. The dependent variable, PE, was measured using six items adopted from Pitan and Muller (2020a). Regarding independent variables, Noe (1988) scale was used to measure mentoring. The original scale has more than 10 items but has been adapted in some studies to a 10-item format (Richard et al., 2009). Eight items were adopted from Rothman (2007) to measure internships. Fourteen items were adopted from Tyagi et al. (2023) to measure training. Regarding the mediating variables, six items from the General Self-Efficacy Scale (GSE-6; Romppel et al., 2013) were used to measure self-efficacy, while Campbell-Sills and Stein's (2007) 10-items questionnaire was adopted to measure resilience. The study used a 7-point Likert scale ranging from "1 (strongly disagree) to "7 (strongly agree) to measure the variables under consideration.

4 Analysis and results

4.1 Preliminary analysis

Prior to model assessment, preliminary data checks were conducted to ensure compliance with the assumptions of multivariate data analysis. First, the outliers were examined using the Mahalanobis distance (D^2). Results revealed that the data did not have issues regarding outliers. Second, the data for the study were obtained from

a single source, indicating that common method variance (CMV) might amplify the correlations among the variables (Bozionelos and Simmering, 2022). Therefore, two statistical approaches were used to assess its effect, the first being Harman's test (Podsakoff et al., 2012). The primary component represents just 25.34% of the overall variance, which is less than 50%. The second approach encompassed a conservative methodology for CMV assessment (Kock and Lynn, 2012) to perform an assessment of full collinearity. The highest variance inflation factor (VIF) for all constructs was 2.23, which was below the benchmark value of 3.3 (Kock and Lynn, 2012). Hence, CMV is improbable for addressing substantial issues in this inquiry. Third, the conditions for multivariate normality were assessed before analyzing the model's appropriateness. Mardia's coefficient method (Cain et al., 2017) revealed a skewness coefficient of 11.32929 and a kurtosis coefficient of 25.28165, both of which were beyond the crucial thresholds of 2 and 20, thus confirming the non-normal distribution of the data (Kline, 2011; Byrne, 2013; El Bouch et al., 2022). Consequently, partial least squares structural equation modeling (PLS-SEM) was used for bootstrapping. PLS-SEM is a non-parametric inferential technique capable of handling data with the issue of nonnormality (Sarstedt et al., 2017).

4.2 Statistical techniques

The present study used PLS-SEM (Smart-PLS 4) for data analysis (Ringle et al., 2022). Owing to its ability to reduce type II errors and accommodate various model dimensions, PLS-SEM has been recognized as an advanced analytical technique for model evaluation. Moreover, many studies (Hair et al., 2021a, 2021b; Sarstedt et al., 2021; Sarstedt et al., 2022) have underscored its nonparametric characteristics as a notable advantage. This indicates that there is no need for the data to adhere to a normal distribution and is appropriate for the analysis of exploratory research and small-scale studies. As stated in Sarstedt et al. (2022), variance-based structural equation modeling is favored over covariance-based structural equation modeling because of its measurement philosophy and analytical objective, which is to develop a theory rather than verify it. Further, many current studies (Badwy et al., 2025; Qalati et al., 2025a,b), applied this analytical technique for data analysis.

4.3 Measurement model assessment

Cronbach's alpha, Rho-A, and composite reliability (CR) were used to evaluate construct reliability. Table 1 shows that these key criteria were significantly higher than the conventional benchmark of 0.50 (Hair et al., 2017; Hair Jr and Sarstedt, 2019), confirming the trustworthiness of the measures (Figure 1).

The CR, average variance extracted (AVE), and item loadings were used to ascertain convergent validity. Validity was achieved when the item loadings were greater than 0.50, the CR values were greater than 0.70, and the AVEs were all greater than 0.50 (Hair et al., 2017; Vishnoi et al., 2024), as indicated in Table 1 and Figure 2.

The heterotrait-monotrait ratio was assessed for discriminant validity (Cheung et al., 2024; Franke and Sarstedt, 2019; Rasoolimanesh, 2022). Table 2 indicates that the correlations among all the components are less than 0.90, indicating excellent

TABLE 1 Internal consistency reliability and convergent validity.

Constructs	Items	Loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Internship	INT1	0.681	0.854	0.875	0.882	0.517
	INT2	0.748				
	INT3	0.710				
	INT4	0.720				
	INT5	0.688				
	INT6	0.707				
	INT7	0.776				
Mentoring	MTR1	0.759	0.919	0.923	0.932	0.581
	MTR10	0.660				
	MTR2	0.694				
	MTR3	0.781				
	MTR4	0.802				
	MTR5	0.765				
	MTR6	0.768				
	MTR7	0.818				
	MTR8	0.844				
	MTR9	0.709				
Perceived Employability	PE1	0.706	0.816	0.827	0.866	0.52
	PE2	0.675				
	PE3	0.727				
	PE4	0.775				
	PE5	0.675				
	PE6	0.762				
Resilience	RES1	0.801	0.938	0.941	0.948	0.645
	RES10	0.825				
	RES2	0.838				
	RES3	0.807				
	RES4	0.705				
	RES5	0.728				
	RES6	0.841				
	RES7	0.830				
	RES8	0.807				
	RES9	0.834				
Self-Efficacy	SEF1	0.802	0.875	0.882	0.905	0.614
	SEF2	0.775				
	SEF3	0.738				
	SEF4	0.765				
	SEF5	0.813				
	SEF6	0.805				

(Continued)

TABLE 1 (Continued)

Constructs	Items	Loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Training	TRN1	0.669	0.947	0.977	0.95	0.579
	TRN10	0.782				
	TRN11	0.721				
	TRN12	0.735				
	TRN13	0.687				
	TRN14	0.721				
	TRN2	0.733				
	TRN3	0.760				
	TRN4	0.774				
	TRN5	0.775				
	TRN6	0.780				
	TRN7	0.814				
	TRN8	0.832				
TRN9	0.850					

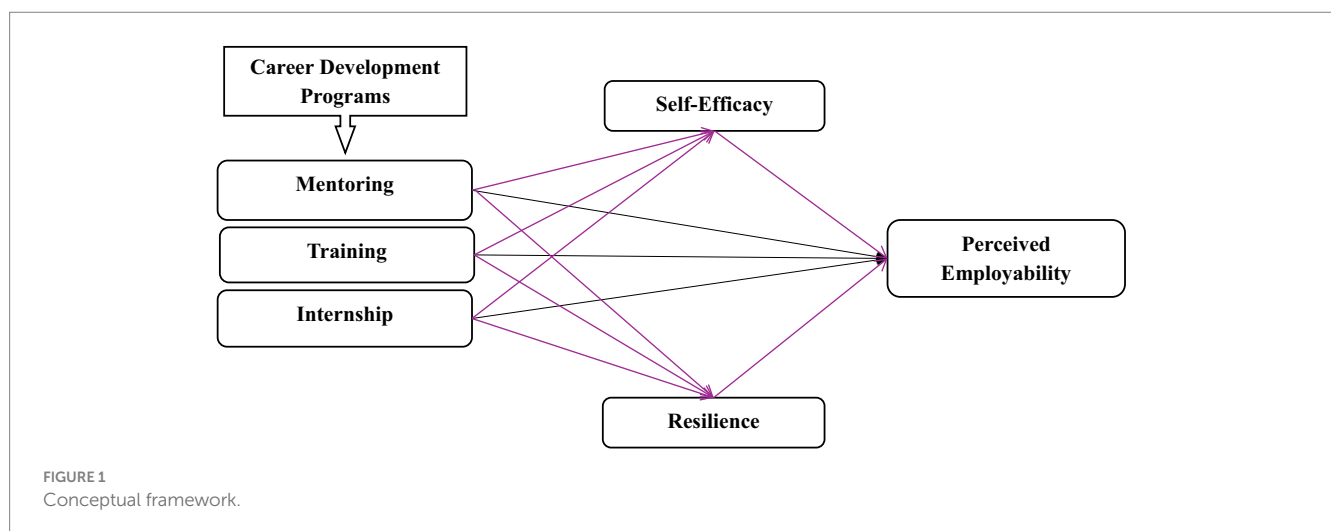


FIGURE 1
Conceptual framework.

discriminant validity. Table 3 further indicates that all the variables present a VIF < 5 (Kalnins and Kendall, 2024; Rasoolimanesh, 2022), confirming that multicollinearity was not a concern in this study.

4.4 Structural model assessment

The structural model was estimated in five stages: (1) lateral collinearity, (2) path coefficients, (3) in-sample predictive power (R²), (4) effect size (f²), and (5) out-of-sample predictive power (PLSpredict). First, VIF was examined to check for lateral collinearity. As indicated in Table 4, none of the VIF values exceeded the threshold value of 5 (Hair et al., 2017; Kalnins and Kendall, 2024; Rasoolimanesh, 2022), demonstrating that multicollinearity had no significant influence.

Second, the structural model's assumptions were examined via a bootstrapping resampling method with 10,000 subsample iterations (Becker et al., 2023) to assess the significance of the path coefficients. Table 4 and Figure 3 present the results of the hypothesized relationships. The results indicate that mentoring and training were significantly related to PE (H1: $\beta = 0.620, p = 0.000$; H2: $\beta = 0.121, p = 0.003$) while internship was not (H3: $\beta = -0.022, p = 0.339$); therefore, H1 and H2 were well supported, while H3 was not supported. The relationships between CDP (mentoring, training and internship) and the two mediating variables (self-efficacy and resilience) were examined, and the results indicated that only internship predicted self-efficacy (H4: $\beta = 0.756, p = 0.000$) while mentoring and training did not influence self-efficacy (H5: $\beta = 0.029, p = 0.182$; H6: $\beta = 0.009, p = 0.404$); therefore, H4 and H5 were not supported while H6 was supported. Further, the link between self-efficacy and PE was not significant (H7: $\beta = -0.134, p = 0.005$); hence,

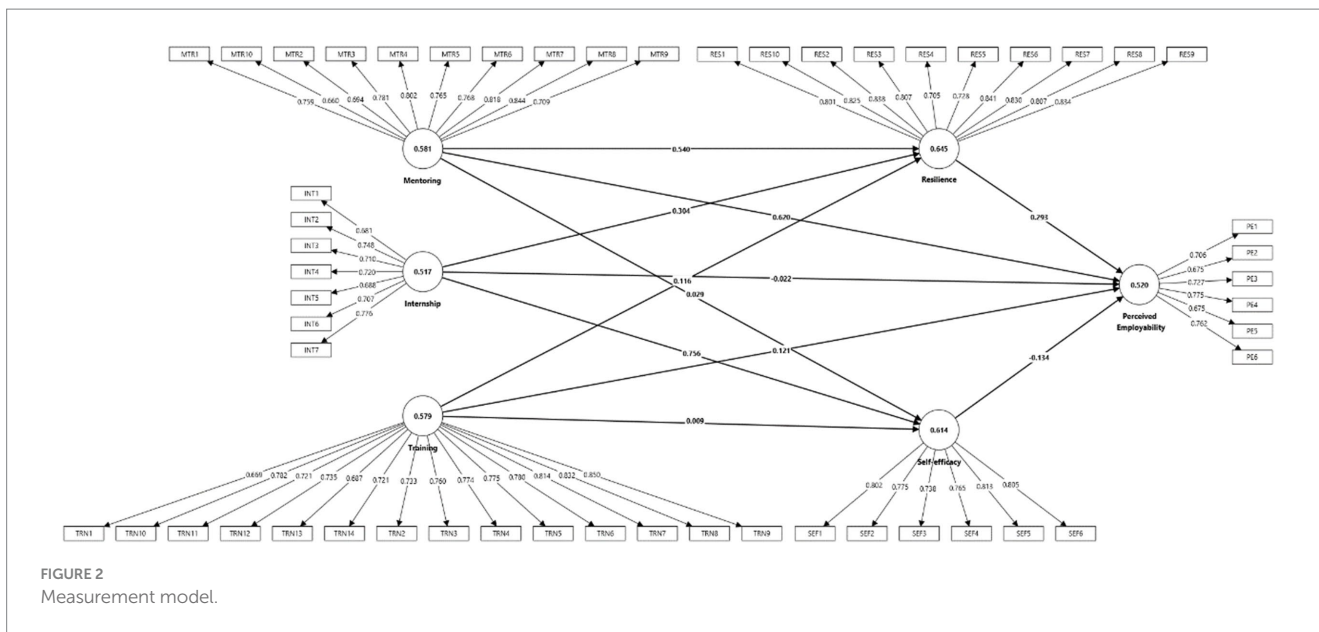


TABLE 2 Discriminant validity (HTMT).

Constructs		1	2	3	4	5	6
1	Internship						
2	Mentoring	0.119					
3	Perceived Employability	0.078	0.846				
4	Resilience	0.332	0.583	0.664			
5	Self-efficacy	0.770	0.102	0.075	0.425		
6	Training	0.073	0.072	0.236	0.076	0.059	

H7 was not supported. The results also show that mentoring, training, and internships influenced resilience (H11: $\beta = 0.540, p = 0.000$; H12: $\beta = 0.116, p = 0.016$; H13: $\beta = 0.304, p = 0.000$). Resilience also predicted PE (H14: $\beta = 0.293, p = 0.000$); therefore, H11–H14 were well supported. This study also examined the mediating roles of self-efficacy and resilience. According to the result, the relationship between internship and PE through self-efficacy was significant (H10: $\beta = -0.102, p = 0.006$), while mentoring to PE and training to PE were not significant (H8: $\beta = -0.004, p = 0.211$; H9: $\beta = 0.001, p = 0.412$). Hence, H10 was supported, whereas H8 and H9 were not. Furthermore, as hypothesized, the link from mentoring, training, and internship to PE was mediated by resilience (H15: $\beta = 0.158, p = 0.000$; H16: $\beta = 0.034, p = 0.023$; H17: $\beta = 0.089, p = 0.000$). Hence, H15–H17 were supported.

4.5 Model quality checks

To guarantee the dependability of the model and its outcomes, it is essential to meticulously evaluate its quality. Consequently, this study assessed model quality via in-sample (R^2) and out-of-sample (PLSpredict) prediction capabilities (Shmueli et al., 2019; Chin et al., 2020), in addition to a cross-validated predictive ability test (CVPAT; Becker et al., 2023; Ringle et al., 2023) and f^2 . The in-sample predictive

power was evaluated using the R^2 coefficient of the endogenous variables, that is, PE ($R^2 = 0.662$), self-efficacy ($R^2 = 0.575$), and resilience ($R^2 = 0.406$), which were deemed entirely adequate under our circumstances (Becker et al., 2023). Concerning the out-of-sample indicators, we executed the PLSpredict process via 10 folds and ten repetitions, interpreting the findings as per Shmueli et al. (2016, 2019). Thus, we first verified that all PLS–SEM Q2 values for the indices of PE, self-efficacy, and resilience were positive models. Given that the prediction errors exhibited a symmetrical distribution, we examined the indicator calculation of PLS–SEM root mean square error (RMSE) < LM RMSE (Table 3). Verification of this condition across all the metrics showed that the model demonstrated substantial predictive power.

Furthermore, this study examined the results of the CVPAT of the target construct (PE, self-efficacy, and resilience; Lienggaard et al., 2021; Sharma et al., 2023). Since all PLS–SEM predictions in Table 5 are significantly better than the naïve indicator average (IA) prediction benchmark (CVPAT_IA), we concluded that the model has predictive validity.

Furthermore, the study used Cohen (1998) f^2 to determine the construct’s impact magnitude. Values of 0.02 or greater indicate a minor influence, a value of 0.15 indicates a medium effect, and a value of 0.35 indicates a strong effect. The f^2 values in Table 3 indicate that all the supported hypotheses have f^2 values greater than 0.02. This indicates that these variables have well predicted the criterion variable.

Finally, as recommended, researchers should evaluate model-fit criteria. Such as the standardized root mean square residual (SRMR), which should be less than 0.08 (Guenther et al., 2023) in this study, as shown in Table 3. The value of SRMR was 0.074, which is lower than the threshold value of 0.08, indicating model fit.

5 Importance-performance matrix analysis (IPMA)

This study’s findings were expanded via the *post hoc* importance-performance matrix analysis (IPMA), which uses perceived

TABLE 3 PIs predict.

Focal constructs	Q ² predict	PLS		LM		PLS-LM	
		RMSE	MAE	RMSE	MAE	RMSE	MAE
PE1	0.179	1.008	0.777	1.004	0.803	0.004	-0.026
PE2	0.164	0.948	0.748	0.966	0.787	-0.018	-0.039
PE3	0.199	0.943	0.736	0.947	0.747	-0.004	-0.011
PE4	0.491	0.832	0.664	0.842	0.622	-0.010	0.042
PE5	0.285	1.041	0.823	1.095	0.829	-0.054	-0.006
PE6	0.474	0.869	0.646	0.840	0.580	0.029	0.066
RES1	0.262	1.051	0.846	1.087	0.851	-0.036	-0.005
RES10	0.226	0.976	0.782	1.012	0.802	-0.036	-0.020
RES2	0.293	1.011	0.818	1.047	0.826	-0.036	-0.008
RES3	0.216	1.043	0.856	1.055	0.861	-0.012	-0.005
RES4	0.238	0.973	0.796	0.955	0.748	0.018	0.048
RES5	0.163	1.095	0.896	1.101	0.875	-0.006	0.021
RES6	0.232	0.982	0.782	1.012	0.803	-0.030	-0.021
RES7	0.323	0.945	0.751	0.968	0.762	-0.023	-0.011
RES8	0.223	1.035	0.848	1.053	0.860	-0.018	-0.012
RES9	0.293	1.011	0.818	1.039	0.822	-0.028	-0.004
SEF1	0.453	0.791	0.600	0.000	0.000	0.791	0.600
SEF2	0.266	1.010	0.782	0.943	0.729	0.067	0.053
SEF3	0.224	1.035	0.814	1.052	0.825	-0.017	-0.011
SEF4	0.470	0.823	0.621	0.812	0.586	0.011	0.035
SEF5	0.298	0.970	0.721	0.953	0.689	0.017	0.032
SEF6	0.277	0.903	0.677	0.869	0.640	0.034	0.037

employability as the criterion variable. IPMA seeks to find antecedents with comparatively high importance for the criterion variable, but comparatively low performance. The components that underlie these constructs offer possible directions for development that may receive much attention; that is, priority setting is allowed while using IPMA because it helps to identify the most crucial aspects of certain constructs related to a phenomenon (Hair Jr and Sarstedt, 2019; Ringle and Sarstedt, 2016).

The IPMA shown in Figure 4 indicates the relative contribution (importance) and the performance of the main predictors of PE in students. Mentoring was the most important construct (0.75) with a rather moderate performance (72), meaning that it is the most significant aspect of the creation of employability perceptions. However, mentoring must be performed more effectively to have an overall greater effect. Resilience and training also demonstrated significant importance (0.26 and 0.14, respectively) with fairly good performance levels (70–75), making them effective levers that significantly contribute to the outcomes of employability. Conversely, self-efficacy indicated a low significance but a high performance, meaning that despite students' confidence, it does not correlate substantially to the outcomes of employability, as observed in the previous result of negative correlation. Lastly, the use of internships had an extremely low impact (negative contribution) even with a fair performance score, indicating that in their current form, internships are not an effective way to improve employability. Therefore, the

IPMA suggests that universities and policymakers must focus more on enhancing mentoring, since it can yield maximum difference in the case of better performance, whereas resiliency and training opportunities should be further developed to help students sustain their employable potential.

6 Discussion

The increasing skill gap among university students is a substantial barrier to PE. Prior studies (e.g., Pheko and Molefhe, 2017) have argued that students who have undergone some form of CDP during or after their university degrees are more likely to be employed. However, some students lack these fundamental abilities, which limits their employability. Previous research has indicated that most higher education graduates who lack certain employability abilities do not possess career development plans that may assist them. Therefore, this quantitative, cross-sectional study investigated the impact of CDPs on PE enhancement among university students in the Hail area. CDPs, which include mentorships, internships, and formal training, provide young people with vital skill-building opportunities. Assessing the efficacy of these programs is essential to mitigate unemployment and foster economic growth in the Hail area. This study also introduced noncognitive elements (self-efficacy and resilience) as underlying mechanisms.

TABLE 4 Results of the hypothesis testing.

Confidence intervals											
Relationships	Std. Beta	Std. Dev.	t values	p values	LL BCI	UL BCI	VIF	R ²	F ²	Model Fit (SRMR)	Decision
Mentoring → Perceived Employability	0.620	0.039	15.964	0.000	0.549	0.678	1.512		0.753		Supported
Training → Perceived Employability	0.121	0.044	2.747	0.003	0.040	0.185	1.026		0.043		Supported
Internship → Perceived Employability-	-0.022	0.052	0.414	0.339	-0.105	0.067	2.361	0.662	0.001		Not Supported
Mentoring → Self-efficacy	0.029	0.032	0.907	0.182	-0.024	0.082	1.004		0.002		Not Supported
Training → Self-efficacy	0.009	0.039	0.243	0.404	-0.052	0.075	1.002		0.000		Not Supported
Internship → Self-efficacy	0.756	0.024	31.711	0.000	0.714	0.792	1.003	0.575	1.340		Supported
Self-efficacy → Perceived Employability	-0.134	0.052	2.594	0.005	-0.225	-0.052	2.497		0.021		Not Supported
Mentoring → Self-efficacy → Perceived Employability	-0.004	0.005	0.804	0.211	-0.015	0.002			0.000		Not Supported
Training → Self-efficacy → Perceived Employability	-0.001	0.006	0.223	0.412	-0.013	0.006			0.000		Not Supported
Internship → Self-efficacy → Perceived Employability	-0.102	0.041	2.506	0.006	-0.175	-0.039			0.010		Supported
Mentoring → Resilience	0.540	0.049	10.981	0.000	0.455	0.617	1.004		0.489		Supported
Training → Resilience	0.116	0.054	2.154	0.016	0.040	0.184	1.002		0.023		Supported
Internship → Resilience	0.304	0.052	5.811	0.000	0.220	0.391	1.003	0.406	0.155		Supported
Resilience → Perceived Employability	0.293	0.047	6.296	0.000	0.219	0.372	1.788		0.142	0.074	Supported
Mentoring → Resilience → Perceived Employability	0.158	0.029	5.383	0.000	0.114	0.211			0.025		Supported
Training → Resilience → Perceived Employability	0.034	0.017	1.996	0.023	0.003	0.058			0.001		Supported
Internship → Resilience → Perceived Employability	0.089	0.022	4.108	0.000	0.060	0.133			0.008		Supported

Seventeen hypotheses (11 direct and 6 mediating) were tested through a PLS-SEM analysis. Among the direct relationships, mentoring and training were significantly related to PE, while internships were not. Among the predictors of self-efficacy, only internships predicted employability, whereas mentoring and training did not. Self-efficacy did not predict PE. Regarding predictors of resilience, all of the elements of CDP (mentoring, training, and internship) were significantly related to resilience. Additionally, resilience and PE were significantly associated. However, among the mediation relationships, self-efficacy mediated the relationship between internship and PE but did not mediate the relationship between mentoring, training, and PE. Resilience mediated the relationship between all elements of CDP (mentoring, training, and internship) and PE.

Research on employability underscores the significance of workers' competencies and abilities in enhancing job acquisition chances (Bargsted et al., 2021), with CDPs being essential for attaining this goal; their influence on employability has also been regularly demonstrated (Veld et al., 2016; Cuéllar-Molina et al., 2025). The

significant relationships among mentoring, training, and PE suggest that these programs enhance students' confidence in their abilities to secure employment. This result is consistent with Cuéllar-Molina et al. (2025) and Niu et al. (2024), who found a positive influence of mentoring on students' employability. Bolton-King (2022) has stated that CDPs are excellent tools for enhancing students' employability skills and substantially improving self-confidence and self-efficacy in interpersonal and communication abilities. The positive effects can be explained through SCCT, as mentoring and training provide mastery experiences and social persuasion that strengthen students' career self-efficacy. In the Saudi context, where formal career guidance is still in its early stages (Hooley, 2017; Alnajjar and Abou Hashish, 2024), mentoring and training can serve as a counterbalance to limited industry exposure, thereby increasing students' confidence and adaptability. Internships, however, did not directly influence PE, which is surprising given their practical nature. This may indicate that internships alone are insufficient to boost perceptions of employability without the development of other essential mechanisms. The results suggest that while internships can be a valuable component of career

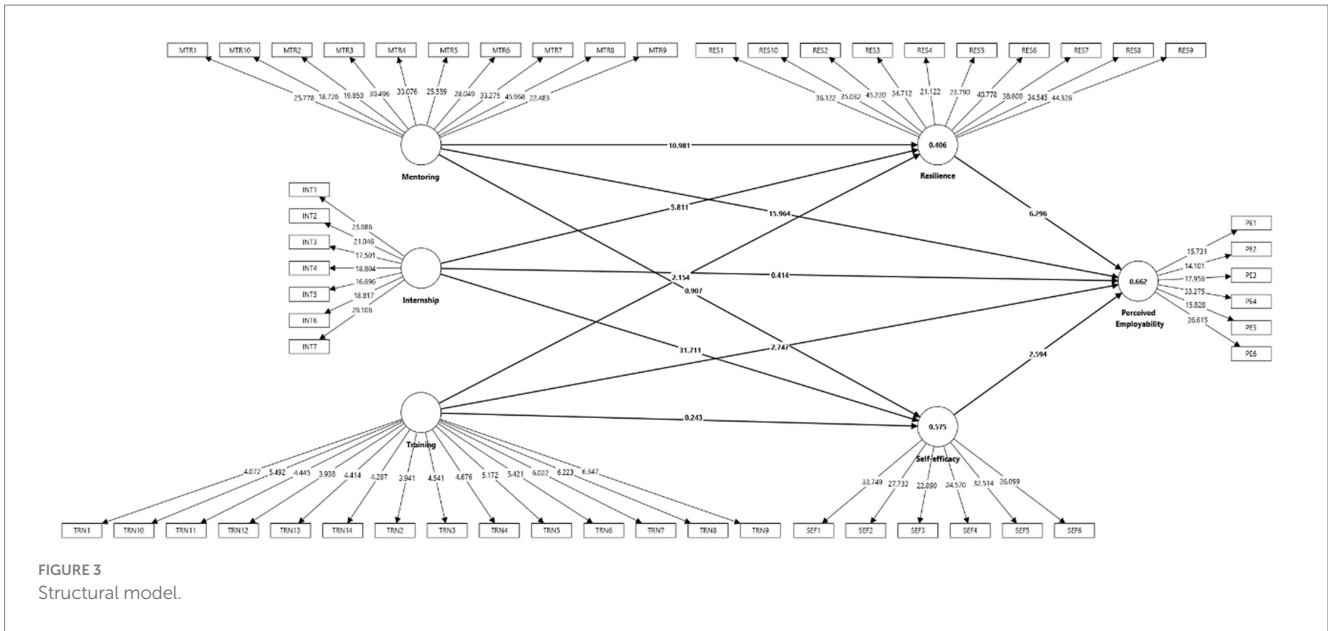
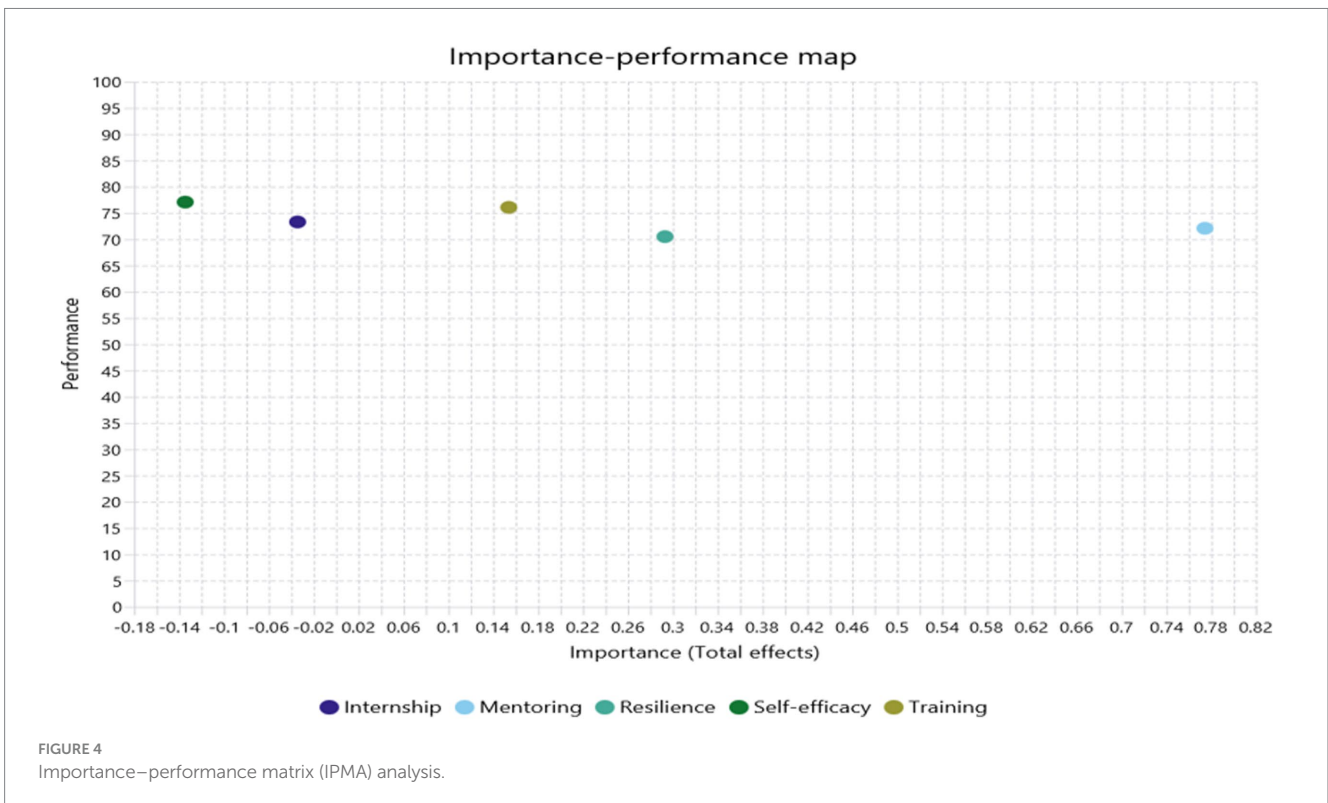


TABLE 5 CVPAT- Comparing hypothesized models with benchmark models.

Target constructs	PLS vs indicator approach (IA)					PLS vs. linear model (LM)				
	PLS loss	IA loss	Average loss difference	t-value	p-value	PLS loss	LM loss	Average loss difference	t-value	p-value
Perceived Employability	0.889	1.289	-0.400	6.240	0.000	0.889	0.909	-0.020	0.797	0.426
Resilience	1.026	1.364	-0.337	5.612	0.000	1.026	1.069	-0.042	1.544	0.123
Self-efficacy	0.859	1.277	-0.418	5.509	0.000	0.859	0.719	0.139	4.462	0.000
Overall	0.943	1.320	-0.376	7.930	0.000	0.943	0.930	0.013	0.756	0.45



preparation, their ability to predict PE depends on different variables, such as the quality of the experience, alignment with job-market needs, and individual factors. To maximize their impact, internships should be well-structured, relevant, and complemented by other forms of skill development and networking (Tan et al., 2023).

CDPs are crucial for personal resources such as self-efficacy. According to the results, internships had a significant effect on self-efficacy, whereas mentoring and training did not. One plausible reason as to why internships significantly influence self-efficacy is because they provide hands-on, real-world experiences that allow individuals to apply their academic knowledge in a professional setting. This experiential learning boosts confidence, as interns successfully tackle challenges, solve problems, and navigate workplace dynamics. The tangible outcomes of their work and the positive feedback they receive help strengthen their beliefs about their abilities, leading to an increase in self-efficacy.

However, mentoring and training might not have the same immediate impact on self-efficacy because they often focus more on knowledge transfer or guidance without providing direct, actionable experiences that interns gain through actual job tasks. While mentoring offers support and advice and training builds knowledge, neither expertise may provide the same opportunities for interns to “test” their skills in real-world scenarios. Without the chance to engage in work directly, individuals may not experience the same level of mastery or competence, which is critical for boosting self-efficacy. In addition, mentoring and training can focus more on addressing weaknesses or preparing for future challenges, which may not immediately translate into a stronger belief in one’s current abilities.

The results also show that CDPs are essential resources for resilience. Studies have shown that resilience encompasses a multifaceted amalgamation of protective characteristics and processes inherent to the individual and their surrounding social context, which, in the presence of risks and vulnerabilities, promote good adaptation or adjustment (Sulimani-Aidan and Tayri-Schwartz, 2021). This result indicates that mentoring, training, and internships are significantly related to resilience, as each experience provides unique support mechanisms that help individuals develop the psychological strength to overcome challenges. This finding aligns with the COR theory that CDPs are critical resource-generating processes, which equip students with psychological, social, and experiential resources. Mentoring offers guidance, emotional support, and advice to help individuals navigate difficult situations and build resilient mindsets, competence, and preparedness. Having a mentor to turn to can help individuals gain perspective, learn coping strategies, and feel more confident about their ability to face setbacks. Training equips individuals with new skills and knowledge to enhance their confidence and competence. As individuals become more proficient in their tasks, they become better prepared to handle stress and obstacles, fostering resilience. It also helps them adapt to new challenges, thereby improving their ability to recover from adversity. Internships provide direct, real-world experiences that contribute significantly to resilience, assisting students to develop adaptive capacity and overcome downturns. In these settings, individuals are often placed in challenging environments that require them to problem-solve, collaborate, and adapt. These experiences help them build emotional and mental toughness by

dealing with uncertainty, managing expectations, and overcoming setbacks. Consequently, they develop the necessary resilience to cope with future challenges in both personal and professional contexts. Further, these well-organized career support systems are critical for final-year students at Saudi Arabian universities, where the transition into the labor market is usually characterized by low confidence and intense competition (Hooley, 2017). The programs enable students to overcome employment pressures and ambiguity, becoming more resilient and able to handle stress, adjust to evolving expectations, and continue despite career-related challenges. In this regard, the findings indicate that CDPs are critical not only for enhancing skills but also for developing the psychological resources required to facilitate successful school-to-work transitions.

Self-efficacy, which is often associated with positive outcomes, can negatively influence PE in certain contexts (as was found in this study). Individuals with high self-efficacy may become overly confident in their abilities and underestimate the need for continuous learning or adaptation to changing job markets. This overconfidence can lead to complacency and result in individuals failing to recognize gaps in their skills or invest in necessary professional development. In addition, high self-efficacy can result in a rigid mindset, making it difficult for individuals to accept feedback or adapt to new work environments. As a result, they may perceive themselves as more employable than they actually are, potentially leading to disappointment or frustration when job opportunities do not materialize as expected. However, resilience significantly influenced PE, underscoring its importance as a psychological resource that helps students navigate the job market.

Internships significantly enhanced both self-efficacy and resilience, suggesting that while internships do not directly affect PE, they contribute indirectly by building these critical psychological traits. It exposes students to real job activities that make them have confidence and adaptive capacity. Consistent with SCCT, internships provide mastery experiences, which reinforce career-related self-efficacy, whereas, according to COR, the internships serve as resource-building experiences to enable students to handle work-related challenges. In the framework of the Saudi Vision 2030, which focuses on employability and workforce readiness, internships are essential in helping students to bridge the gap between school and the working environment. Mentoring significantly enhanced resilience but not self-efficacy, indicating that mentoring may be more effective in helping students cope with challenges than in building confidence in specific skills. Finally, training significantly enhanced resilience but not self-efficacy, suggesting that training programs should focus more on skill building and less on fostering confidence. In the Saudi Arabian higher education setting, the results present significant differences in the effects of CDPs on the psychological resources of students.

Regarding mediating effects, self-efficacy mediated the relationship between training and PE, and between mentoring and PE. This highlights the importance of confidence-building in translating CDPs into employability perception. Resilience showed a marginally significant mediating role between training and PE, suggesting that resilience partially explains how training enhances PE. However, the mediating roles of self-efficacy and resilience between internships and PE were not significant. This indicates that

internships contribute to employability through mechanisms not captured in this study.

6.1 Implications

6.1.1 Theoretical implications

This research contributes to the field of study by merging SCCT and COR theory to help us understand how CDPs can influence students' PE based on psychological resources. The findings demonstrate that mentoring is the most powerful direct predictor of employability, training is a less powerful but significant predictor, and internships have no direct impact on employability. Rather, internships have a substantial positive influence on self-efficacy, which, interestingly, negatively impacts PE. This paradoxical result contests the traditional assumption of SCCT that increased self-efficacy must always enhance career performance and indicates that overconfidence or self-illusion can harm employability perceptions in situations where structural labor market constraints apply. Therefore, this study is an extension of SCCT, as it proves that the role of self-efficacy might be conditional—and in some situations, it might undermine rather than boost perceptions of employability.

Conversely, the role of resilience was consistently a strong mediator, playing a major role in relaying the impact of mentoring, training, and internships to employability. Such a result corresponds to COR theory, according to which psychological resources aid people to buffer stressors and turn to external support to achieve adaptive results. This study highlights the significance of the resource accumulation and adaptation processes in the development of employability by demonstrating that the central pathway involves resilience. This broadens the COR construct by placing resilience as a central resource that transforms developmental opportunities into perceptions of sustainable employability. Overall, the combination of SCCT and COR offers a more detailed conceptualization of employability, with mentoring increasing employability directly, internships augmenting psychological resources, and resilience instead of self-efficacy as the most reliable tool connecting CDPs with students' employability.

6.1.2 Practical implications

This study has important implications for universities, educators, career-development practitioners, and students. Universities and educators should emphasize mentoring and training programs, as these directly enhance students' PE. Mentoring can help students build resilience, while training programs can improve both skills and confidence. Although internships do not directly influence PE, they are valuable for building self-efficacy and resilience. This indirect role highlights the need for Saudi Arabian universities to ensure that internships are structured to maximize these psychological benefits, such as by providing reflective activities or mentorship during internships. They also ought to focus on high-quality and organized internship programs, which provide substantial involvement in tasks, feedback, and chances for reflection. Career centers ought to work in close partnership with the industry players so that the internship programs expose the students to problem-solving scenarios in the real world that would inspire confidence and flexibility, as opposed to the routine or observation scenarios. Faculty members and career advisors should be oriented to make deliberate efforts to develop the

psychological resources of students because employability is not merely a skill-based phenomenon but is also based on the belief and capability of students to deal with the challenges of a career. Finally, the Saudi universities should add more practice-based and feedback-driven mentoring and training programs to boost resilience and self-efficacy more efficiently, based on the workforce development goals of Vision 2030.

At the policy level, the findings can be used to evidence national higher education and workforce development policies in Saudi Arabia, especially those that are based on Vision 2030. Policymakers can use these insights to enhance policies and financing structures that ensure the internalization of internships in university curricula in the state. Since it has been proven that internships are beneficial in developing self-efficacy and resilience in individuals, the policies must be supported by the establishment of relationships between universities and the organizations of the public and private sectors in order to increase access to quality internship placements. In addition, career development systems at the national level might cease paying single attention to technical skills and explicitly incorporate the development of psychological capital, including confidence and adaptability, as the fundamental graduate outcomes. The change would facilitate a more sustainable employability and equip the graduates with effective competitiveness to meet the demands of a dynamic and competitive labor market.

Career development practitioners should incorporate elements into CDPs that foster self-efficacy and resilience, as these traits are critical for employability. For example, training programs could include modules for overcoming challenges and building confidence. Mentoring programs should focus on helping students develop coping strategies and resilience, as these are areas in which mentoring has a strong impact.

Students should actively seek mentoring and training opportunities, as these have a direct impact on their PE. While internships may not directly boost employability perceptions, students should recognize their value in building self-efficacy and resilience, which are essential for long-term career success. The findings highlight the usefulness of resilience and self-efficacy as transferable psychological assets for computer science students working in rapidly changing technological landscapes. These findings suggest that universities design career development activities not only to prepare computer science students with technical and professional skills but also to intentionally cultivate resilience and self-efficacy so that graduates are psychologically ready to succeed in very competitive and uncertain careers.

Lastly, the research also has the larger implications of society besides institutional and policy implications. The findings indicate avenues by which graduate vulnerability in the school-to-work transition can be minimized by proving that CDPs enhance resilience and self-efficacy. Rehabilitated and more assertive graduates are more prepared to handle uncertainty in finding a job and adapting to the evolving needs of employment, as well as pursuing lifelong learning. Under the Saudi environment, where youth employability is a strategic agenda, the improvement of these psychological resources helps to make people ready to work as well as to stabilize the society and diversify the economy. Finally, the CDPs, which ensure the growth of the skills of the individual and the psychological resources, can help not only an individual in achieving success in their career, but also in the development of society and the economy, in the long term.

6.1.3 Limitations and direction for future studies

The study may be limited by its sample size, the specific context of the university, or the region in which it was conducted. Generalizability to other settings may be limited, as the data were gathered only from university computer science students in the Hail area, which may limit the generalizability of the findings to students in other disciplines and tertiary institutions as well as in other geographical locations. Future research could address this limitation by including more diverse populations of students across different fields of study and institution types to build a more comprehensive understanding of the impact of CDPs on employability outcomes. This study focused on PE, which is subjective. Future research would involve objective measures of employability, e.g., job placement rates or employer ratings, employment status, job quality, and career satisfaction. These would improve knowledge on the role of psychological resources in sustainable employability. This study was cross-sectional and collected data at one specific moment in time. Longitudinal research can track students over time to examine how CDPs, self-efficacy, and resilience influence employability at different stages of their academic and professional journeys, thus providing profound insights. The quality, timing, and sequencing pattern of CDPs should also be explored in future studies in order to find out the impact of various program designs on the development of self-efficacy and resilience.

Additionally, the study did not explore other potential mediators or moderators. Hence, future studies should investigate other mediating variables such as networking ability, emotional intelligence, and industry-specific knowledge to provide a more comprehensive understanding of the pathways between CDPs and employability. Subsequent studies can also focus on determining the boundary conditions by investigating the moderators, including gender, academic discipline, institutional support, or conditions in the labor market. It is possible that comparative studies in universities and institutional types, regions, sectors of the labor market, and countries might help find out the contextual factors that affect the effectiveness of CDPs, and that studies that involve digital and AI-enabled career intervention will be able to capture new forms of career support. A qualitative study can further illuminate how students perceive the effect of internships, mentoring, and training on employability, self-efficacy, and resilience, and what the most effective program features are to promote psychological resources.

The research ought to address the quality and design of internship, such as the complexity of tasks, supervision, and feedback, in future to gain a better insight into how these factors influence self-efficacy and resilience. Moreover, this can be investigated in studies concerned with digital and hybrid career development initiatives, gender-specific dynamics, and cross-sector differences to explain the contextual variation. The multi-source data on both students and employers would enhance the strength and practical applicability of the further results as well as the model can be extended to incorporate other psychological resources. Lastly, future studies are encouraged to develop and experiment interventions targeting specifically the self-efficacy and resilience development during CDPs to achieve the greatest effect on employability.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study involving humans was conducted in accordance with the accepted ethical standards (Declaration of Helsinki). Ethical approval was obtained from the Research Ethics Committee (REC) at the University of Hail prior to data collection. Participation was voluntary, and written informed consent was obtained from all respondents before completing the questionnaire. Participants were assured of anonymity and confidentiality, and no personally identifiable information was collected.

Author contributions

IS: Formal analysis, Methodology, Writing – review & editing, Conceptualization, Writing – original draft, Visualization, Software, Resources, Funding acquisition. MA: Investigation, Funding acquisition, Conceptualization, Supervision, Writing – review & editing, Project administration, Data curation, Validation, Writing – original draft. NA-S: Supervision, Investigation, Conceptualization, Writing – review & editing, Resources, Project administration, Writing – original draft, Validation, Funding acquisition.

Funding

The author(s) declared that financial support was received for this work and/or its publication. This research has been funded by the Humanities Research Center, Deanship of Scientific Research, University of Ha'il -Kingdom of Saudi Arabia, through Project Number RCP-24 132.

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that Generative AI was not used in the creation of this manuscript.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

- Akkermans, J., Spurk, D., and Fouad, N. (2021). Careers and career development. In Oxford Research Encyclopedia of Psychology. doi: 10.1093/acrefore/9780190236557.013.557
- Alnajjar, H. A., Hashish, A., and Aly, E. (2024). Exploring the effectiveness of the Career Guidance and Counseling Program on the perceived readiness for the job market: a lived experience among nursing students. *Frontiers in Public Health*, 12, 1403730. doi: 10.3389/fpubh.2024.1403730
- Álvarez-González, P., López-Miguens, M. J., and Caballero, G. (2017). Perceived employability in university students: developing an integrated model. *Career Dev. Int.* 22, 280–299. doi: 10.1108/CDI-08-2016-0135/FULL/HTML
- Ang, W. H. D., Chew, S. H. J., Dong, J., Yi, H., Mahendren, R., and Lau, Y. (2022). Digital training for building resilience: systematic review, meta-analysis, and meta-regression. *Stress. Health* 38, 848–869. doi: 10.1002/smi.3154
- Anthony, J., Arnado, S., and Posadas, F. C. (2022). The career development program and the career readiness of grade 10 students in a private institution. *Ibero-Am. J. Educ. Soc. Res.* 2, 7–19.
- Arora, R., and Rangnekar, S. (2014). Workplace mentoring and career resilience: an empirical test. *Psychol. Manager J.* 17, 205–220. doi: 10.1037/MGR0000021
- Badwy, H. E., Qalati, S. A., and El-Bardan, M. F. (2025). Unlocking happiness: how crafting your career path boosts life satisfaction through forward thinking and self-confidence in career choices. *Humanities and Social Sciences Communications*, 12, 1–12. doi: 10.1057/s41599-025-04655-9
- Baird, A. M., and Parayitam, S. (2019). Employers' ratings of importance of skills and competencies college graduates need to get hired: evidence from the New England region of USA. *Educ. Train.* 61, 622–634. doi: 10.1108/ET-12-2018-0250/FULL/PDF
- Bandura, A. (2001). Social cognitive theory of mass communication. *Media Psychol.* 3, 265–299. doi: 10.1207/S1532785XMEP0303_03
- Bargsted, M., Yeves, J., Merino, C., and Venegas-Muggli, J. I. (2021). Career success is not always an outcome: its mediating role between competence employability model and perceived employability. *Career Dev. Int.* 26, 119–139. doi: 10.1108/CDI-06-2020-0141/FULL/PDF
- Becker, J. M., Cheah, J. H., Gholamzade, R., Ringle, C. M., and Sarstedt, M. (2023). PLS-SEM'S most wanted guidance. *Int. J. Contemp. Hosp. Manag.* 35, 321–346. doi: 10.1108/IJCHM-04-2022-0474/FULL/HTML
- Beltman, S., and MacCallum, J. (2006). Mentoring and the development of resilience: an Australian perspective. *Int. J. Ment. Health Promot.* 8, 21–32. doi: 10.1080/14623730.2006.9721898
- Bennett, D., Knight, E., and Bell, K. (2023). Graduate employability and the career thinking of university STEM students. *Timescapes Teaching Higher Educ.* 22, 88–103.
- Biramo, Y. B., Merikine Gebresilase, B., Elka, Z. Z., and Demissie, E. B. (2025). The effect of perceived employability on the job search behavior of unemployed youths: the mediating role of job search self-efficacy. *Int. J. Adolesc. Youth* 30:2454999. doi: 10.1080/02673843.2025.2454999
- Bolton-King, R. S. (2022). Student mentoring to enhance graduates' employability potential. *Sci. Justice* 62, 785–794. doi: 10.1016/J.SCIJUS.2022.04.010
- Bozionelos, N., and Simmering, M. J. (2022). Methodological threat or myth? Evaluating the current state of evidence on common method variance in human resource management research. *Hum. Resour. Manag. J.* 32, 194–215. doi: 10.1111/1748-8583.12398
- Brass, T., Kennedy, J. P., Gabriel, F., Neill, B., Devis, D., and Leonard, S. N. (2023). Learning analytics for lifelong career development: a framework to support sustainable formative assessment and self-reflection in programs developing career self-efficacy. *Front. Artif. Int.* 6:1173099. doi: 10.3389/FRAL.2023.1173099/FULL
- Brown, S. D., and Lent, R. W. (2019). Social cognitive career theory at 25: Progress in studying the domain satisfaction and career self-management models. *J. Career Assess.* 27, 563–578. doi: 10.1177/1069072719852736
- Brown, S. D., and Lent, R. W. (2023). "Social cognitive career theory" in Career psychology: Models, concepts, and counseling for meaningful employment. eds. W. Walsh, L. Y. Flores, P. J. Hartung and F. T. Leong (New York, NY: American Psychological Association), 37–57.
- Byrne, B. M. (2013). Equation modeling with Mplus: Basic concepts, applications, and programming. London: Routledge.
- Caballero, G., Álvarez-González, P., and López-Miguens, M. J. (2022). Which are the predictors of perceived employability? An approach based on three studies. *Assess. Eval. High. Educ.* 47, 878–895. doi: 10.1080/02602938.2021.1983769
- Cain, M. K., Zhang, Z., and Yuan, K. H. (2017). Univariate and multivariate skewness and kurtosis for measuring nonnormality: prevalence, influence and estimation. *Behav. Res. Methods* 49, 1716–1735. doi: 10.3758/S13428-016-0814-1/TABLES/7
- Campbell-Sills, L., and Stein, M. (2007). Psychometric analysis and refinement of the Connor-Davidson resilience scale (CD-RISC): validation of a 10-item measure of resilience. *J. Trauma. Stress.* 20, 1019–1028. doi: 10.1002/jts.20271
- Carroll, D., and Economics, M. T.-E. and 2015, undefined (2015) "Job search as a determinant of graduate over-education: evidence from Australia," Taylor Francis, 23, pp. 631–644. doi:10.1080/09645292.2014.908164
- Chen, T., Shen, C., and Gosling, M. (2021). To stay or not to stay? The causal effect of interns' career intention on enhanced employability and retention in the hospitality and tourism industry. *J. Hosp. Leis. Sport Tour. Educ.* 28:100305. doi: 10.1016/j.jhlste.2021.100305
- Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., and Wang, L. C. (2024). Reporting reliability, convergent and discriminant validity with structural equation modeling: a review and best-practice recommendations. *Asia Pac. J. Manag.* 41, 745–783. doi: 10.1007/S10490-023-09871-Y/TABLES/7
- Chin, W., Cheah, J. H., Liu, Y., Ting, H., Lim, X. J., and Cham, T. H. (2020). Demystifying the role of causal-predictive modeling using partial least squares structural equation modeling in information systems research. *Industrial management. Data Systems* 120, 2161–2209. doi: 10.1108/IMDS-10-2019-0529
- Choi, B. Y., Park, H., Yang, E., Lee, S. K., Lee, Y., and Lee, S. M. (2012). Understanding career decision self-efficacy. *J. Career Dev.* 39, 443–460. doi: 10.1177/08948453111398042
- Cohen, J. (1998). Statistical power analysis for the behavioral sciences. Second. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Cuellar-Molina, D., García-Cabrera, A. M., Lucia-Casademunt, A. M., and Gutiérrez-Pérez, F. J. (2025). Perceived employability among European workers: the impact of human capital, training practices and national values. *Bottom Line.* doi: 10.1108/BL-05-2024-0063/FULL/XML
- Dacre Pool, L., and Sewell, P. (2007). The key to employability: developing a practical model of graduate employability. *Education+training*, 49, 277–289. doi: 10.1108/00400910710754435
- De Cuyper, N., and De Witte, H. (2010). Temporary employment and perceived employability: Mediation by impression management. *Journal of Career Development*, 37, 635–652. doi: 10.1177/0894845309357051
- Deng, X., Zeng, H., Liang, M., and Qiu, J. (2022). Relations between different career-development profiles, academic self-efficacy and academic motivation in adolescents. *Educ. Psychol.* 42, 259–274. doi: 10.1080/01443410.2021.2007853
- Dixon, J., and Gordon, N. (2022). Improving graduate futures and employability through embedded industrial experience. *New Directions Teaching Phys. Sci.* 17:3596. doi: 10.29311/ndtps.v0i17.3596
- Donald, W. E., Baruch, Y., and Ashleigh, M. (2019). The undergraduate self-perception of employability: human capital, careers advice, and career ownership. *Stud. High. Educ.* 44, 599–614. doi: 10.1080/03075079.2017.1387107
- Dražić, M. Č., Petrović, I. B., and Vukelić, M. (2018). Career ambition as a way of understanding the relation between locus of control and self-perceived employability among psychology students. *Front. Psychol.* 9:408737. doi: 10.3389/FPSYG.2018.01729/BIBTEX
- Duggal, H. K., Lim, W. M., Khatri, P., Thomas, A., and Shiva, A. (2024). The state of the art on self-perceived employability. *Global Business and Organizational Excellence*, 43, 88–110. doi: 10.1002/joe.22245
- Dumas Reyssier, S., and Chaker, R. (2024). The effects of internship abroad on engineering students' self-perceived employability. *Eur. J. Eng. Educ.* 49, 1246–1264. doi: 10.1080/03043797.2024.2400184
- El Bouch, S., Michel, O., and Comon, P. (2022). A normality test for multivariate dependent samples. *Signal Process.* 201:108705. doi: 10.1016/J.SIGPRO.2022.108705
- Forrier, A., De Cuyper, N., and Akkermans, J. (2018). The winner takes it all, the loser has to fall: provoking the agency perspective in employability research. *Hum. Resour. Manag. J.* 28, 511–523. doi: 10.1111/1748-8583.12206
- Franke, G., and Sarstedt, M. (2019). Heuristics versus statistics in discriminant validity testing: a comparison of four procedures. *Internet Res.* 29, 430–447. doi: 10.1108/INTR-12-2017-0515/FULL/HTML
- Fugate, M., De Vos, A., Forrier, A., and De Cuyper, N. (2021). Is what's past prologue? A review and agenda for contemporary employability research. *J. AOM* 15, 266–298. doi: 10.5465/annals.2018.0171
- Galbraith, D., and Mondal, S. (2020). The potential power of internships and the impact on career preparation. *Res. High. Educ. J.* 38.
- Glass, N. (2007). Investigating women nurse academics' experiences in universities: The importance of hope, optimism, and career resilience for workplace satisfaction. *Annual review of nursing education*, 5, 111.
- Glerum, D. R., and Judge, T. A. (2021). Advancing employability: applying training evaluation to employability development programs. *Career Dev. Int.* 26, 363–390. doi: 10.1108/CDI-09-2020-0248/FULL/HTML
- Guenther, P., Guenther, M., Ringle, C. M., Zaefarian, G., and Cartwright, S. (2023). Improving PLS-SEM use for business marketing research. *Ind. Mark. Manag.* 111, 127–142. doi: 10.1016/J.INDMARMAN.2023.03.010
- Hackett, G., and Betz, N. E. (1981). A self-efficacy approach to the career development of women. *J. Vocat. Behav.* 18, 326–339.

- Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. (2017). A primer on partial least squares structural equation Modeling (PLS-SEM). Thousand Oaks, CA: Sage Publications.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., and Ray, S. (2021a). "An introduction to structural equation Modeling" in Partial least squares structural equation Modeling (PLS-SEM) using R. Classroom companion: Business. eds. Hair, J. F. Jr. and G. T. M. Hult (Cham: Classroom Companion: Business. Springer, Cham).
- Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., and Ray, S. (2021b). Partial least squares structural equation Modeling (PLS-SEM) using R. Cham: Springer.
- Hair, J. F. Jr., and Sarstedt, M. (2019). Factors versus composites: guidelines for choosing the right structural equation modeling method. *Project Management. Proj. Manag. J.* 22, 619–624. doi: 10.1177/08756972819882132
- Han, Y., Chaudhury, T., and Sears, G. J. (2021). Does career resilience promote subjective well-being? Mediating effects of career success and work stress. *J. Career Dev.* 48, 338–353. doi: 10.1177/0894845319851875
- Haugsevje, Å. D., and Heian, M. T. (2024). Sustainable creative careers through mentoring: understanding social resilience in the art field. *Poetics* 107:101930. doi: 10.1016/j.poetic.2024.101930
- Healy, M., Hammer, S., and McIlveen, P. (2022). Mapping graduate employability and career development in higher education research: a citation network analysis. *Stud. High. Educ.* 47, 799–811. doi: 10.1080/03075079.2020.1804851
- Hobfoll, S. E. (1989). Conservation of resources: a new attempt at conceptualizing stress. *Am. Psychol.* 44, 513–524. doi: 10.1037/0003-066X.44.3.513
- Hobfoll, S. E. (2011). Conservation of resource caravans and engaged settings. *J. Occup. Organ. Psychol.* 84, 116–122. doi: 10.1111/J.2044-8325.2010.02016.X
- Hooley, T. (2017). Moving beyond 'what works': Using the evidence base in lifelong guidance to inform policy making. 94498.
- Ibrahim, A., Clark, K., Reese, M., and Shingles, R. (2020). The effects of a teaching development institute for early career researchers on their intended teaching strategies, course design, beliefs about instructors' and students' knowledge, and instructional self-efficacy: the case of the teaching Institute at Johns Hopkins University. *Stud. Educ. Eval.* 64:100836. doi: 10.1016/j.stueduc.2020.100836
- Jabeen, Q., Nadeem, M. S., Raziq, M. M., and Sajjad, A. (2022). Linking individuals' resources with (perceived) sustainable employability: perspectives from conservation of resources and social information processing theory. *Int. J. Manag. Rev.* 24, 233–254. doi: 10.1111/IJMR.12276
- Jackson, D., Bridgstock, R., Lambert, C., Tofa, M., and Sibson, R. (2024). Subjective career success among new graduates and the role of personal factors. *Education+Training*, 66, 964–980. doi: 10.1108/ET-01-2024-0035
- Jackson, D., and Tomlinson, M. (2019). Career values and proactive career behaviour among contemporary higher education students. *J. Educ. Work.* 32, 449–464. doi: 10.1080/13639080.2019.1679730
- Jackson, D., and Tomlinson, M. (2020). Investigating the relationship between career planning, proactivity and employability perceptions among higher education students in uncertain labour market conditions. *High. Educ.* 80, 435–455. doi: 10.1007/S10734-019-00490-5/TABLES/5
- Jackson, D., and Tomlinson, M. (2022). The relative importance of work experience, extra-curricular and university-based activities on student employability. *Higher Education Res. Dev.* 41, 1119–1135. doi: 10.1080/07294360.2021.1901663
- Jain, A., Mishra, S., and Goyal, R. (2021). Analysis of career development opportunities in IT sectors in Jaipur. *Lecture Notes Networks Syst.* 166, 733–741. doi: 10.1007/978-981-15-9689-6_80
- Kalnins, A., and Kendall, P. H. (2024). Additional caution regarding rules of thumb for variance inflation factors: extending O'Brien to the context of specification error. *Qual. Quant.* 22, 1–24. doi: 10.1007/S11135-024-01980-0/METRICS
- Kayyali, M. (2024). "Career development in higher education: best practices and innovations" in Advancing student employability through higher education. eds. B. Christiansen and M. Even Angela (London: IGI Global), 1–19.
- Kline, R. B. (2011). Principles and practice of structural equation modeling. 3rd Edn. New York, NY: Guilford Press.
- Kock, N., and Lynn, G. (2012). Lateral collinearity and misleading results in variance-based SEM: an illustration and recommendations. *J. Assoc. Inf. Syst.* 13, 1–12. doi: 10.17705/1jais.00302
- Kononiuk, A., Pająk, A., Gudanowska, A. E., Magruk, A., Rollnik-Sadowska, E., Kozłowska, J., et al. (2020). Foresight for career development. *Фопсаім* 14, 88–104. doi: 10.17323/2500-2597.2020.2.88.104
- Krieger, E. A., Drachev, S. N., Mitkin, N. A., Postoev, V. A., and Grjibovski, A. M. (2023). Sample size calculation using G*power software. *Marine Med.* 9, 111–125. doi: 10.22328/2413-5747-2023-9-2-111-125
- Kumar, S., and Bayram, G. E. (2025). "The effect on education and training" in Greening our economy for a sustainable future: Science of sustainable systems. eds. S. Grima, K. Sood and E. Ozen (Amsterdam: Elsevier), 117–185.
- Layton, R. L., Scott Solberg, V. H., Jahangir, A. E., Hall, J. D., Ponder, C. A., Micoli, K. J., et al. (2022). Career planning courses increase career readiness of graduate and postdoctoral trainees. *F1000Res* 9:1230. doi: 10.12688/f1000research.26025.1
- Lent, R. W., and Brown, S. D. (2013). Social cognitive model of career self-management: toward a unifying view of adaptive career behavior across the life span. *Journal of counseling psychology*, 60, 557. doi: 10.2013-23511-001
- Lent, R. W., and Brown, S. D. (2016). Social cognitive career theory in a diverse world. *J. Career Assess.* 25, 3–5. doi: 10.1177/1069072716657811
- Lent, R., Brown, S., and Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *J. Vocat. Behav.* 47:36.
- Levine, K., Sutherland, D., and Cole, D. (2018). Creating a lifelong career development model | Canadian journal of career development. *Can. J. Career Dev.* 17, 25–42. doi: 10.82396/cjcd.v17i2.3135
- Liao, W., Hu, Y., Liu, J., Liu, M., and Zhao, L. (2024). Unpacking Chinese Mingshi's (expert teachers) career trajectories. *Teach. Teach. Educ.* 148:104677. doi: 10.1016/j.tate.2024.104677
- Liengaard, B. D., Sharma, P. N., Hult, G. T. M., Jensen, M. B., Sarstedt, M., Hair, J. F., et al. (2021). Prediction: coveted, yet forsaken? Introducing a cross-validated predictive ability test in partial least squares path Modeling. *Decis. Sci.* 52, 362–392. doi: 10.1111/DECI.12445
- McDow, L. W., and Zabrocky, K. M. (2015). Effectiveness of a career development course on students' job search skills and self-efficacy. *J. Coll. Stud. Dev.* 56, 632–636. doi: 10.1353/CSD.2015.0058
- McIlveen, P., Beccaria, G., and Burton, L. J. (2013). Beyond conscientiousness: career optimism and satisfaction with academic major. *J. Vocat. Behav.* 83, 229–236. doi: 10.1016/j.jvb.2013.05.005
- McKenzie, S., Coldwell-Neilson, J., and Palmer, S. (2018). Understanding the career development and employability of information technology students. *Journal of Applied Research in Higher Education*, 10, 456–468. doi: 10.1108/JARHE-03-2018-0033
- Michael, R. (2019). Self-efficacy and future career expectations of at-risk adolescents: the contribution of a tutoring program. *J. Community Psychol.* 47, 913–923. doi: 10.1002/JCOP.22163
- Mitra, A. K. (2024). Sample Size Estimation. *Stat. Approaches Epidemiol. Concept Appl.* 22, 275–292. doi: 10.1007/978-3-031-41784-9_17
- Monteiro, S., Almeida, L., and García-Aracil, A. (2021). 'It's a very different world': work transition and employability of higher education graduates. *Higher Education Skills Work-Based Learn.* 11, 164–181. doi: 10.1108/HESWBL-10-2019-0141/FULL/HTML
- Morgan, M. J., and Osborn, D. S. (2025). College career courses and growth toward vocational identity achievement status. *J. Career Assess.* 33, 73–91. doi: 10.1177/10690727241250352
- Mühleck, K., Jühlke, R., Köppen, L., Peter, F., Wefling, K., and Dau, J. (2025). Careers, competences and values of European higher education graduates in 2022. *EUROGRADUATE 2022: comparative synthesis report*. European Commission. Available online at: <https://irihs.ihs.ac.at/id/eprint/7309/1/muehleck-juehke-koepfen-et-al-2025-careers-competences-values-european-higher-education-graduates-2022.pdf>
- Muris, P. (2001). A brief questionnaire for measuring self-efficacy in youths. *Journal of Psychopathology and behavioral Assessment*, 23, 145–149. doi: 10.1023/A:1010961119608
- Murthy, R. N., and Antony, J. M. (2025). Personal cognitive predictors influencing career resilience among Indian women information technology professionals. *J. Employ. Couns.* 62, 163–174. doi: 10.1002/JOEC.12245
- Näswall, K., Kuntz, J., Hodliffe, M., and Malinen, S. (2013). Employee Resilience Scale (EmpRes): Technical Report. Available online at: www.resorgs.org/nz
- Nicoll, J. C., Doyle, L., and Okay-Somerville, B. (2024). "The occupational aspirations and wellbeing of young people in the UK" in Young people's career development and wellbeing. eds. E. Knight and B. Okay-Somerville (Cham: Springer), 89–114.
- Niu, Y., Xu, X., Lewis, S., Xie, L., and Reed, M. (2024). Examining the role of mentoring on perceived employability among university students in China. *J. Career Assess.* 33, 239–263. doi: 10.1177/10690727241256291
- Noor, M., and Azmi, F. (2021). Students perceived employability: a systematic literature search and bibliometric analysis. *Eurasian J. Bus. Econ.* 14, 37–56. doi: 10.17015/ejbe.2021.028.03
- Okolie, U. C., Nwajiuba, C. A., Binuomote, M. O., Ehiobuche, C., Igu, N. C. N., and Ajoke, O. S. (2020). Career training with mentoring programs in higher education: facilitating career development and employability of graduates. *Educ. Train.* 62, 214–234. doi: 10.1108/ET-04-2019-0071/FULL/HTML
- Onyishi, I. E., Enwereuzor, I. K., Ituma, A. N., and Omenma, J. T. (2015). The mediating role of perceived employability in the relationship between core self-evaluations and job search behaviour. *Career Dev. Int.* 20, 604–626. doi: 10.1108/CDI-09-2014-0130/FULL/HTML
- Owusu-Agyeman, Y. (2024). Using multilevel mentoring as a situated learning approach to enhance the professional development of teachers in higher education. *J. Prof. Capital Commun.* 9, 19–36. doi: 10.1108/JPC-03-2023-0016/FULL/HTML
- Pahala, Y., Agusinta, L., Nasution, N., Lermatan, E., and Octaviani, R. (2024). Determination of employee engagement: analysis of servant leadership, organizational commitment, compensation and career development in middle-class. *Dinasti Int. J. Educ. Manage. Soc. Sci.* 5, 1–12. doi: 10.38035/dijemss.v5i3.2348
- Pekkarinen, V., and Hirsto, L. (2017). University lecturers' experiences of and reflections on the development of their pedagogical competency. *Scand. J. Educ. Res.* 61, 735–753. doi: 10.1080/00313831.2016.1188148

- Petruzzello, G., Mariani, M. G., Guglielmi, D., Van Der Heijden, B. I. J. M., De Jong, J. P., and Chiesa, R. (2023). The role of teaching staff in fostering perceived employability of university students. *Stud. High. Educ.* 48, 20–36. doi: 10.1080/03075079.2022.2105830
- Pheko, M. M., and Molefhe, K. (2017). Addressing employability challenges: a framework for improving the employability of graduates in Botswana. *Int. J. Adolesc. Youth* 22, 455–469. doi: 10.1080/02673843.2016.1234401
- Pitan, O. S., and Muller, C. (2020). Students' self-perceived employability (SPE): Main effects and interactions of gender and field of study. *Higher Educ. Skills Work-Based Learn.* 10, 355–368. doi: 10.1108/HESWBL-03-2019-0040/FULL/HTML
- Pitan, O. S., and Muller, C. (2020a). Student perspectives on employability development in higher education in South Africa. *Educ. Train.* 63, 453–471. doi: 10.1108/ET-02-2018-0039/FULL/HTML
- Podsakoff, P. M., MacKenzie, S. B., and Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annu. Rev. Psychol.* 63, 539–569. doi: 10.1146/annurev-psych-120710-100452
- Porter, T. H., Rathert, C., and Lawong, D. (2023). Career development through career transition coaching: a qualitative study of military veterans and student coaches. *J. Service-Learning Higher Educ.* 16, 20–43.
- Qalati, S. A., Badwy, H. E., and El-Bardan, M. F. (2025a). Career Proactivity Unleashed: Charting the Path to Sustainable Success Through the Art of Self-Regulated Learning. *Journal of Employment Counseling*, 62, 116–126. doi: 10.1002/joc.12244
- Qalati, S. A., Badwy, H. E., Lathabhavan, R., and El-Bardan, M. F. (2025b). Human resources practices and career sustainability: Analysis of multiple mediation mechanisms in Egyptian hotels. *Journal of Human Resources in Hospitality & Tourism*, 1–28. doi: 10.1080/15332845.2025.2588518
- Qenani, E., MacDougall, N., and Sexton, C. (2014). An empirical study of self-perceived employability: improving the prospects for student employment success in an uncertain environment. *Act. Learn. High. Educ.* 15, 199–213. doi: 10.1177/1469787414544875
- Qu, H., Leung, X., Huang, S., and He, J. (2021). Factors affecting hotel interns' satisfaction with internship experience and career intention in China. *J. Hosp. Leis. Sport Tour. Educ.* 28:100311. doi: 10.1016/j.jhlste.2021.100311
- Ramaprasad, B. S., Rao, S., Rao, N., Prabhu, D., and Sheetal Kumar, M. (2022). Linking hospitality and tourism students' internship satisfaction to career decision self-efficacy: a moderated-mediation analysis involving career development constructs. *J. Hosp. Leis. Sport Tour. Educ.* 30:100348. doi: 10.1016/j.jhlste.2021.100348
- Rasoolimanes, S. M. (2022). Discriminant validity assessment in PLS-SEM: a comprehensive composite-based approach. *Data analysis perspectives. Data Anal. Persp. J.* 3, 1–8.
- Räty, H., Hytti, U., Kasanen, K., Komulainen, K., Siivonen, P., and Kozlinska, I. (2020). Perceived employability and ability self among Finnish university students. *Eur. J. Psychol. Educ.* 35, 975–993. doi: 10.1007/S10212-019-00451-7
- Rezaiee, M., and Kareshki, H. (2024). Empowering career pathways: integrating self-regulation strategies with career counseling practices. *Front. Educ.* 9:1422692. doi: 10.3389/FEDUC.2024.1422692/BIBTEX
- Richard, O., Ismail, K., and Bhuian, S. (2009). Mentoring in supervisor–subordinate dyads: antecedents, consequences, and test of a mediation model of mentorship. *J. Bus. Res.* 62, 1110–1118. doi: 10.1016/j.jbusres.2008.09.007
- Ringle, C. M., and Sarstedt, M. (2016). Gain more insight from your PLS-SEM results: the importance-performance map analysis. *Ind. Manag. Data Syst.* 116, 1865–1886. doi: 10.1108/IMDS-10-2015-0449
- Ringle, C. M., Sarstedt, M., Sinkovics, N., and Sinkovics, R. R. (2023). A perspective on using partial least squares structural equation modelling in data articles. *Data Brief* 48:109074. doi: 10.1016/j.dib.2023.109074
- Ringle, C. M., Wende, S., and Becker, J.-M. (2022). SmartPLS 4. Oststeinbek: SmartPLS GmbH.
- Romppel, M., Herrmann-Lingen, C., Wachter, R., Edelmann, F., Pieske, B., and Grande, G. (2013). A short form of the General Self-Efficacy Scale (GSE-6): Development, psychometric properties and validity in an interventional non-clinical sample and a sample of patients at risk for heart failure. Available online at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC3578200/> (accessed: April 1, 2025).
- Rossier, J., Ginevra, M. C., Bollmann, G., and Nota, L. (2017). The importance of career adaptability, career resilience, and employability in designing a successful life. *Psychol. Career Adaptability Employability Resilience* 12, 65–82. doi: 10.1007/978-3-319-66954-0_5
- Rothman, M. (2007). Lessons learned: advice to employers from interns. *J. Educ. Bus.* 82, 140–144. doi: 10.3200/joeb.82.3.140-144
- Rubio, D. M., Robinson, G. F. W. B., Gabrilove, J., and Meagher, E. A. (2017). Creating effective career development programs. *Cambridge* 1, 83–87. doi: 10.1017/cts.2016.30
- Salisu, I., and Hashim, N. (2017). A critical review of scales used in resilience research. *IOSR J. Bus. Manag.* 19, 23–33. doi: 10.9790/487X-1904033440
- Salisu, I., Hashim, N., Mashi, M. S., and Aliyu, H. G. (2020). Perseverance of effort and consistency of interest for entrepreneurial career success: does resilience matter? *J. Entrepr. Emerg. Econ.* 12:25. doi: 10.1108/JEEE-02-2019-0025
- Sarstedt, M., Hair, J. F., Pick, M., Liengaard, B. D., Radomir, L., and Ringle, C. M. (2022). Progress in partial least squares structural equation modeling use in marketing research in the last decade. *Psychol. Mark.* 39, 1035–1064. doi: 10.1002/mar.21640
- Sarstedt, M., Ringle, C. M., and Hair, J. F. (2017). Partial least squares structural equation modeling. *Handbook of market, handbook of market research*. Cham: Springer, 1–40.
- Sarstedt, M., Ringle, C. M., and Hair, J. F. (2021). Partial least squares structural equation modeling. Cham: Springer International, 587–632.
- Sharma, P. N., Liengaard, B. D., Hair, J. F., Sarstedt, M., and Ringle, C. M. (2023). Predictive model assessment and selection in composite-based modeling using PLS-SEM: extensions and guidelines for using CVPAT. *Eur. J. Mark.* 57, 1662–1677. doi: 10.1108/EJM-08-2020-0636/
- Shmueli, G., Ray, S., Estrada, J. M. V., and Chatla, S. B. (2016). The elephant in the room. *Predictive Perf. PLS Models J. Bus. Res.* 69, 4552–4564. doi: 10.1016/j.jbusres.2016.03.049
- Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J. H., Ting, H., Vaithilingam, S., et al. (2019). Predictive model assessment in PLS-SEM: guidelines for using PLSpredict. *European journal of marketing. Eur. J. Mark.* 53, 2322–2347. doi: 10.1108/EJM-02-2019-0189
- Silla, I., De Cuyper, N., Gracia, F. J., Peiró, J. M., and De Witte, H. (2009). Job insecurity and well-being: Moderation by employability. *Journal of Happiness Studies*, 10, 739–751. doi: 10.1007/s10902-008-9119-0
- Sulimani-Aidan, Y., and Tayri-Schwartz, T. (2021). The role of natural mentoring and sense of belonging in enhancing resilience among youth in care. *Child Youth Serv. Rev.* 120:105773. doi: 10.1016/J.CHILDYOUTH.2020.105773
- Tam, H., Lin Chan, A. Y., Fung Fung, T. T., and Isangha, S. O. (2024). The mediating effect of psychological strengths and resilience on enhancing youth employability through social entrepreneurship education and training. *Child Youth Serv. Rev.* 156:107325. doi: 10.1016/J.CHILDYOUTH.2023.107325
- Tan, N., Shien, C., Ong, C., and Billett, S. (2023). Promoting student readiness for work-life through internships: challenges and support. *Austr. J. Adult Learning* 63:3. doi: 10.3316/informit.473769206428435
- Taylor, D. B., Johns, K. M., Reilly, M. L., and Hedlefs, R. M. (2022). A career development program: building resilience in veterinary undergraduates. *Aust. J. Career Dev.* 31, 26–41. doi: 10.1177/10384162211066372
- Tenzin, K., Dorji, T., Choeda, T., and Pongpirul, K. (2019). Impact of faculty development programme on self-efficacy, competency and attitude towards medical education in Bhutan: a mixed-methods study. *BMC Med. Educ.* 19:468. doi: 10.1186/s12909-019-1904-4
- Tomlinson, M., and Jackson, D. (2021). Professional identity formation in contemporary higher education students. *Stud. High. Educ.* 46, 885–900. doi: 10.1080/03075079.2019.1659763
- Turda, E. S. (2024). The relationship between personality factors, vocational identity and career decision-making self-efficacy. *IJRVT* 11, 55–75. doi: 10.13152/IJRVT.11.1.3
- Turner, N. K. (2014). Development of self-belief for employability in higher education: ability, efficacy and control in context. *Teach. High. Educ.* 19, 592–602. doi: 10.1080/13562517.2014.901951
- Turner, M., and Holdsworth, S. (2023). Developing resilience: examining the protective factors of early career construction professionals. *Constr. Manag. Econ.* 41, 805–819. doi: 10.1080/01446193.2023.2208238
- Tyagi, A., Jaiswal, D., and Sharma, J. (2023). Role of training comprehensiveness and resource commitment in enhancing the police performance leading to development of public trust. *J. Police Crim. Psychol.* 38, 1005–1016. doi: 10.1007/S11896-023-09595-1
- Van Hootegeem, A., De Witte, H., De Cuyper, N., and Elst, T. V. (2019). Job insecurity and the willingness to undertake training: the moderating role of perceived employability. *J. Career Dev.* 46, 395–409. doi: 10.1177/0894845318763893
- Vanhercke, D., De Cuyper, N., Peeters, E., and De Witte, H. (2014). Defining perceived employability: a psychological approach. *Pers. Rev.* 43, 592–605. doi: 10.1108/PR-07-2012-0110/FULL/HTML
- Veld, M., Semeijn, J. H., and van Vuuren, T. (2016). Career control, career dialogue and managerial position: how do these matter for perceived employability? *Career Dev. Int.* 21, 697–712. doi: 10.1108/CDI-04-2016-0047/FULL/HTML
- Venegas, C. L., Nkangu, M. N., Duffy, M. C., Fergusson, D. A., and Spilg, E. G. (2019). Interventions to improve resilience in physicians who have completed training: a systematic review. *PLoS One* 14:e0210512. doi: 10.1371/JOURNAL.PONE.0210512
- Vishnoi, S. K., Mathur, S., Bagga, T., Singhal, A., Rawal, P., Sharma, S., et al. (2024). Construct modelling, statistical analysis and empirical validation using PLS-SEM: a step-by-step guide of the analysis procedure. *Int. J. Data Anal. Tech. Strategies* 16, 162–180. doi: 10.1504/IJDATS.2024.137877
- Wang, M.-T. (2012). Educational and career interests in math: a longitudinal examination of the links between classroom environment, motivational beliefs, and interests. *Dev. Psychol.* 48, 1643–1657.
- Wang, R. J., and Lent, R. W. (2024). The role of self-efficacy in coping with the psychological challenges of job loss: application of the social cognitive career self-management model. *J. Career Assess.* 32, 818–837. doi: 10.1177/10690727241239946

- Yao, C., and McWha-Hermann, I. (2025). Contextualizing career development: cultural affordances as the missing link in social cognitive career theory. *J. Vocat. Behav.* 159:104114. doi: 10.1016/J.JVB.2025.104114
- Yeager, D. S., and Dweck, C. S. (2012). Mindsets that promote resilience: when students believe that personal characteristics can be developed. *Educ. Psychol.* 47, 302–314. doi: 10.1080/00461520.2012.722805
- Yu, Y., Lau, J. T. F., and Lau, M. M. C. (2023). Development and validation of the conservation of resources scale for COVID-19 in the Chinese adult general population. *Curr. Psychol.* 42, 6447–6456. doi: 10.1007/S12144-021-01933-Y
- Zahra, S., and Malik, A. (2024). High school students' career program and parental involvement: effect on career maturity. *J. Behav. Sci.* 34:99363. doi: 10.13140/RG.2.2.18395.99363
- Zhong, H., and Xu, J. (2023). Precarious employment and subjective career success during the school-to-work transition. *Psychology Research and Behavior Management*, 2327–2339. doi: 10.2147/PRBM.S418017
- Zou, H., Ullah, A., Qazi, Z., Naeem, A., and Rehan, S. (2024). Impact of micro-credential learning on students' perceived employability: the mediating role of human capital. *Int. J. Educ. Manag.* 38, 897–915. doi: 10.1108/IJEM-01-2023-0002/FULL/XML