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From Digital Competencies to Job Market Readiness: The Mediating Role of Employability Competencies and the Moderating Role of Labor Market Dynamism

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Abstract

Rapid technological changes and evolving labor market demands have increased the importance of identifying the competencies required for successful workforce participation. This study examines how digital competencies (DC) contribute to job market readiness (JMR) among university students and recent graduates in Saudi Arabia by investigating the mediating role of employability competencies (EC) and the moderating role of labor market dynamism (LMD). Drawing on Human Capital Theory and Career Construction Theory, the study develops an integrated framework explaining how individual competencies and labor market conditions jointly shape workforce preparedness. Data were collected using a stratified random sampling approach from 400 participants (248 final-year university students and 152 recent graduates) recruited from universities in Riyadh, Jeddah, Dammam, Medina, and Yanbu using a structured questionnaire. The hypotheses were tested using regression analysis and Hayes' PROCESS macro, while confirmatory factor analysis was conducted using AMOS 27. The results indicate that DC positively influences both EC and JMR. EC also positively affected JMR and partially mediated the relationship between DC and JMR. Furthermore, LMD significantly strengthened the positive effect of DC on JMR, suggesting that digital competencies are becoming increasingly valuable in dynamic employment environments. This study contributes to the workforce preparedness literature by providing a more comprehensive explanation of how digital competencies are associated with job market readiness through employability competencies and identifying labor market dynamism as a contextual condition associated with the strength of this relationship. The findings offer implications for universities, policymakers, and students seeking to enhance employability outcomes and align workforce development initiatives with Saudi Arabia's Vision 2030.



Academic Editors: Kim M. Beasy and Valeria Vargas

Received: 19 June 2026

Revised: 20 July 2026

Accepted: 27 July 2026

Published: 29 July 2026

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Keywords: digital competencies; employability competencies; job market readiness; labor market dynamism; sustainable employability; Saudi Arabia

1. Introduction

The rapid digital transformation of economies has reshaped labor markets and altered the competencies required for long-term workforce participation. Advances in digital technologies, automation, artificial intelligence, and data-driven business processes have increased the demand for individuals who possess not only technological capabilities but also the adaptability needed to respond to evolving workplace requirements [1,2]. Consequently, digital competencies have become increasingly important for employability,

career development, and human capital development [3,4]. From a sustainability perspective, preparing individuals for changing labor market demands is essential to support productive employment, workforce resilience, and sustainable economic growth. These priorities align closely with Sustainable Development Goal 8, which emphasizes decent work, productive employment, and sustainable economic development [5]. Furthermore, sustainable employability highlights individuals' ability to maintain productive and meaningful participation in the labor market throughout their careers while adapting to changing work environments [6–8].

Although the Sustainable Development Goals (SDGs) are inherently interconnected [5], this study focuses specifically on SDG 8 because its objective of promoting productive employment and decent work is most directly aligned with the study's emphasis on graduates' job market readiness and workforce preparedness [5]. This focused perspective enables a more in-depth examination of the competencies associated with successful labor market participation while recognizing that sustainable development extends beyond employment outcomes alone. Accordingly, this study examines one important dimension of sustainable development rather than attempting to address the full breadth of the SDG agenda.

Although this study focuses specifically on SDG 8, the proposed framework also has implications for other Sustainable Development Goals that support inclusive and sustainable development. In particular, strengthening digital and employability competencies is closely associated with SDG 4 (Quality Education) because higher education institutions play a central role in developing graduates' capabilities for lifelong learning and workforce participation. Improving graduates' readiness for employment may also contribute to SDG 10 (Reduced Inequalities) by enhancing access to employment opportunities for diverse groups of graduates [5]. Furthermore, within the context of Saudi Arabia's Vision 2030 [5,9], continued investment in digital education and workforce participation has the potential to support SDG 5 (Gender Equality) by expanding opportunities for women to participate in an increasingly digital economy. Although these broader interconnections are beyond the scope of the present study, they highlight that workforce preparedness contributes to sustainable development through multiple interconnected SDGs [5].

Although digital competencies are widely recognized as important determinants of employability and career success, the existing literature remains fragmented in explaining how these competencies contribute to workforce preparedness and success. Prior studies have largely focused on the direct relationships between digital competencies and employment-related outcomes, including employability, career adaptability, and labor market participation [10,11]. While these studies generally report positive associations, they provide limited insight into the underlying mechanisms through which digital competencies translate into job-market readiness. Moreover, existing findings suggest that technical capabilities alone may not be sufficient to support successful labor market transitions, as employers increasingly emphasize transferable competencies alongside digital expertise [12,13]. Although previous studies consistently report positive associations between digital competencies and employment-related outcomes, they provide limited insight into the specific role of digital competencies in graduates' job market readiness. This limitation provides a foundation for examining the relationships investigated in the present study.

Employability competencies may explain this relationship. Competencies such as communication, teamwork, adaptability, problem-solving ability, and professional effectiveness have consistently been associated with employment success and career development [12,13]. Although employability competencies have frequently been examined as direct predictors of employability and career success, their potential role in explaining the relationship between digital competencies and job market readiness has received comparatively little

attention. Accordingly, this study examines employability competencies as a mediating mechanism linking digital competencies to graduates' job market readiness.

In addition to individual competencies, labor market conditions may also shape employment outcomes. Contemporary labor markets are characterized by technological change, evolving occupational requirements, and increasing competition for employment opportunities [14]. Although prior research has primarily emphasized individual competencies, comparatively less attention has been devoted to examining the conditions under which these competencies become valuable. Accordingly, this study examines labor market dynamism as a moderating factor to determine whether the relationship between digital competencies and job market readiness varies across different labor market environments.

These relationships also require an appropriate theoretical perspective capable of explaining both the development of individual competencies and the conditions under which they are associated with workforce preparedness. Human Capital Theory [15–17] proposes that investments in knowledge, skills, and competencies increase individuals' capacity to achieve favorable labor market outcomes. Complementing this perspective, Career Construction Theory [18,19] emphasizes the role of adaptive personal resources in facilitating successful transitions from education to employment. Integrating these two theoretical perspectives provides a coherent foundation for examining how digital competencies, employability competencies, and labor market dynamism are associated with graduates' job market readiness.

The Saudi Arabian context offers a particularly relevant setting for examining these relationships. Through Vision 2030, Saudi Arabia is pursuing economic diversification, digital transformation, and human capital development initiatives designed to strengthen workforce competitiveness and support sustainable economic growth [9]. These initiatives emphasize graduate employability, digital capability development, and stronger alignment between educational outcomes and labor market requirements [3]. Despite substantial investments in higher education, digital infrastructure, and workforce development programs, concerns regarding graduate readiness and skill alignment continue to receive attention from employers and policymakers [20]. Beyond its practical relevance, the Saudi Arabian context is theoretically important because it represents a rapidly transforming labor market characterized by accelerated digitalization, economic diversification, and workforce nationalization initiatives. Such conditions create an environment in which digital competencies, employability competencies, and labor market dynamism are likely to play a particularly important role in shaping workforce preparedness. Consequently, Saudi Arabia provides an opportunity to examine whether relationships established primarily in developed economies remain applicable to an emerging economy undergoing substantial labor market transformation. Given the central role of human capital development in Saudi Arabia's long-term development agenda, understanding the factors that contribute to successful labor market participation among graduates is both timely and practically important.

Despite the growing body of research on digital competencies and employability, limited attention has been devoted to examining how digital competencies are associated with job market readiness through employability competencies and varying labor market conditions within a single theoretical framework. Addressing this gap may provide a more comprehensive understanding of workforce preparedness, particularly in rapidly digitalizing economies such as that of Saudi Arabia.

This study advances the employability and workforce preparedness literature in three important ways. First, it addresses a significant limitation of prior research by explaining the mechanism through which digital competencies contribute to job market readiness, demonstrating the mediating role of employability competencies. Second, it extends existing

knowledge by identifying labor market dynamism as a boundary condition that influences the effectiveness of digital competencies in shaping workforce preparedness. Third, by integrating human capital and career construction theories within a single framework, this study provides a more comprehensive explanation of how individual competencies and environmental conditions jointly influence graduates' readiness for workforce participation. Collectively, these contributions move beyond traditional direct-effect explanations and offer a more nuanced understanding of how workforce preparedness is developed in contemporary labor markets.

2. Literature Review

2.1. Digital Competencies

Digital competencies refer to the knowledge, skills, and abilities required to effectively access, evaluate, manage, create, and communicate information through digital technologies in academic and professional environments [1,21–26]. As organizations increasingly rely on digital technologies to support innovation, communication, and decision-making, digital competencies have become critical determinants of workforce preparedness. Human Capital Theory [17] provides a useful theoretical lens for understanding this relationship by proposing that investments in valuable knowledge and skills enhance individual productivity, adaptability, and labor market value. Within this framework, digital competencies represent a strategic form of human capital that enables individuals to acquire, process, and apply knowledge in technology-intensive environments, thereby increasing their capacity to respond to evolving workplace requirements and employment opportunities. However, while Human Capital Theory explains the value-generating role of digital competencies, employability research suggests that career outcomes are also shaped by broader developmental and adaptive processes that extend beyond technical skills [11,13]. Understanding workforce preparedness necessitates examining both the intrinsic value of digital competencies and the complementary capabilities that facilitate their translation into labor market success.

A substantial body of research supports the positive role of digital competence in employment-related outcomes. Studies have consistently shown that individuals with stronger digital capabilities are better able to adapt to technological changes, engage in digital communication, and perform complex problem-solving tasks, all of which are increasingly valued by employers [1,2]. Similarly, research conducted in higher education settings suggests that digitally competent graduates exhibit greater employability and career readiness because they are better positioned to meet the technological expectations of contemporary organizations [26]. Across diverse contexts, these findings collectively indicate that digital competence constitutes an important resource for facilitating successful labor market participation.

Despite this broad consensus, the literature remains divided on the mechanisms through which digital competencies contribute to workforce preparedness. Several studies have reported that digital competencies exert a direct influence on employability-related outcomes because digital skills have become essential requirements across contemporary workplaces, enabling individuals to adapt to technological changes and perform effectively in digital environments [1,2]. In contrast, [12] found that transferable competencies, such as communication, teamwork, and adaptability, are more influential predictors of graduate employability than technical skills. Ref [13] similarly argued that employability outcomes depend on a broader portfolio of competencies extending beyond digital capabilities. These findings suggest that digital competencies may not independently determine workforce preparedness but instead derive part of their value from complementary employability-related capabilities. These contrasting findings reveal an important theoretical tension

concerning whether digital competencies function as independent drivers of workforce preparedness or derive their value through complementary competencies that facilitate the application of digital knowledge in workplace settings. The inconsistency across studies may reflect differences in educational systems, labor market structures, occupational contexts, and employability outcomes examined [11,13]. Consequently, existing evidence suggests that the relationship between digital competencies and workforce preparedness is more nuanced than previously assumed and may involve both direct and indirect pathways that remain insufficiently understood in the literature.

Although existing research has established the importance of digital competencies, there is limited understanding of how these competencies are translated into job market readiness and the conditions under which their effects become stronger or weaker [1,2]. By predominantly emphasizing direct-effect relationships, prior research may oversimplify the process through which digital competencies contribute to workforce preparedness and overlook the developmental mechanisms and contextual conditions that influence this relationship. Consequently, existing evidence provides only a partial explanation of how digital competency contributes to employment readiness. Addressing this limitation, the present study adopts an integrated perspective by proposing that digital competencies contribute to job market readiness not only directly but also indirectly through employability competencies, while the strength of this relationship may vary according to labor market dynamism. This approach extends the current understanding by simultaneously examining the mechanisms and boundary conditions underlying the digital competencies–job market readiness relationship.

2.2. Employability Competencies

Employability competencies refer to the transferable knowledge, skills, and personal attributes that enable individuals to obtain, maintain, and succeed in employment across changing labor market conditions [6,12,13,27,28]. These competencies extend beyond technical expertise and encompass communication, problem-solving, adaptability, teamwork, and career management capabilities that facilitate effective performance in the workplace. From the perspective of Human Capital Theory, investments in such competencies increase individuals' productivity and labor market value [17], whereas Career Construction Theory emphasizes their role as adaptive resources that support career transitions and responses to changing occupational demands [18]. Together, these perspectives suggest that employability competencies represent both productive and adaptive capabilities that support long-term workforce participation and sustainable careers.

Previous research consistently identifies employability competencies as an important complement to technical and discipline-specific knowledge rather than a substitute. Across educational and organizational contexts, communication, adaptability, teamwork, and problem-solving have been associated with graduates' ability to meet employer expectations, adjust to workplace demands, and achieve favorable career outcomes [6,11–13,29]. Collectively, these studies suggest that employability competencies strengthen graduates' capacity to apply their knowledge effectively within increasingly dynamic work environments, thereby facilitating workforce participation and career development.

Nevertheless, the literature offers differing perspectives on the role of employability competencies in workforce preparedness. One perspective argues that employability competencies are among the strongest determinants of career success because they enable individuals to adapt to evolving organizational and labor market requirements [11,13]. In contrast, another perspective contends that employability competencies alone may be insufficient to produce favorable employment outcomes without adequate technical expertise and occupation-specific knowledge [12]. Rather than representing contradictory

findings, these perspectives suggest that employability competencies derive much of their value from interaction with other forms of human capital. Consequently, workforce preparedness is likely to depend on a combination of technical, digital, and transferable competencies rather than on any single competency in isolation.

Although previous research has established the importance of employability competencies, considerably less attention has been devoted to understanding their role as an explanatory mechanism linking digital competencies to job market readiness (JMR). Existing studies have primarily examined employability competencies as direct predictors of employability and career outcomes, providing limited insight into the processes through which digital competencies are translated into workforce preparedness. Building on this gap, the present study proposes that employability competencies function as a mediating mechanism through which digital competencies are associated with graduates' job market readiness, thereby providing a more integrated perspective on workforce preparedness.

2.3. Labor Market Dynamism

Labor market dynamism refers to the degree of change, uncertainty, and complexity characterizing employment environments, including technological advancement, evolving skill requirements, changing industry demands, and fluctuations in employment opportunities [1,14,30]. As economies become increasingly digitalized, labor markets continuously reshape workforce expectations and competency requirements of the workforce. From the perspective of Human Capital Theory, individuals possessing relevant and valuable competencies are more likely to achieve favorable labor market outcomes, particularly in environments characterized by changing skill demands [17]. Complementing this view, Career Construction Theory emphasizes adaptability as a key personal resource that enables individuals to respond effectively to changing occupational conditions and career transitions [18]. Together, these perspectives suggest that labor market dynamism represents an important contextual condition that may influence how individual competencies are translated into workforce preparedness.

Rather than directly affecting employment outcomes, labor market dynamism appears to influence the value attached to individual competencies. Previous research consistently suggests that technological disruption, evolving occupational requirements, and increasing competition have heightened employers' demand for graduates who possess digital capabilities, adaptability, and a continuous learning orientation [3,11,14,23,30,31]. Collectively, these studies indicate that rapidly changing labor markets reward individuals capable of responding to technological and organizational changes, highlighting the growing importance of competencies that support long-term employability and career development.

Nevertheless, the literature presents two complementary perspectives on the role of labor market dynamism. One perspective argues that dynamic labor markets create greater opportunities for individuals possessing strong competencies because employers increasingly value adaptability, digital capability, and lifelong learning in response to technological change [14]. In contrast, another perspective emphasizes that highly dynamic labor markets may increase uncertainty by accelerating skill obsolescence, intensifying competition, and changing occupational requirements, thereby making successful labor market entry more challenging [3]. Rather than representing contradictory findings, these perspectives suggest that labor market dynamism functions as a contextual condition that influences the extent to which individual competencies become valuable under different labor market conditions. Consequently, workforce preparedness is likely to depend not only on graduates' competencies but also on the environments in which those competencies are evaluated and applied.

Although labor market dynamism has received increasing attention in employability research, considerably less attention has been devoted to examining its role as a boundary condition influencing the relationship between digital competencies and job market readiness. Existing studies have largely treated labor market conditions as contextual characteristics rather than investigating whether they strengthen or weaken the contribution of individual competencies to workforce readiness. Building on this perspective, the present study proposes that labor market dynamism moderates the relationship between digital competencies and job market readiness, providing a more context-sensitive explanation of graduates' workforce preparedness.

2.4. Job Market Readiness

Job market readiness refers to the extent to which individuals possess the knowledge, skills, competencies, confidence, and preparedness required to successfully transition from education to employment and meet the expectations of contemporary labor markets [10,11]. The concept encompasses career preparedness, job search effectiveness, interview readiness, confidence, and the ability to adapt to workplace requirements. From the perspective of Human Capital Theory, graduates possessing valuable knowledge and competencies are expected to achieve more favorable labor market outcomes because employers reward capabilities that enhance productivity and performance [17]. Complementing this perspective, Career Construction Theory emphasizes that successful career transitions depend on adaptive personal resources that facilitate career decision-making and workforce integration [18]. Together, these perspectives suggest that job market readiness reflects not only the possession of relevant competencies but also an individual's capacity to apply them effectively within changing labor market environments.

Rather than representing a single competency, job market readiness is increasingly viewed as the outcome of multiple interrelated capabilities that support graduates' transition into employment. Previous research consistently associates higher levels of readiness with greater career confidence, more effective job search behaviors, improved recruitment performance, and smoother school-to-work transitions [10,11,13]. Collectively, these studies indicate that workforce preparedness extends beyond academic achievement and technical expertise, encompassing broader competencies that enable graduates to respond to evolving workplace expectations successfully.

Nevertheless, the literature presents different perspectives regarding the primary drivers of job market readiness. One perspective emphasizes technical and discipline-specific competencies, arguing that workforce preparedness is largely determined by possessing relevant knowledge and occupational expertise [10,17]. In contrast, another perspective suggests that transferable competencies, including communication, adaptability, teamwork, and career management, play a more influential role because they enable graduates to respond effectively to changing labor market demands [12,13]. Rather than representing conflicting explanations, these perspectives imply that job market readiness is a multidimensional outcome shaped by the combined influence of technical expertise, transferable competencies, and contextual labor market conditions. This integrated view provides a more comprehensive understanding of workforce preparedness than approaches that emphasize any single determinant.

Although previous research has identified numerous determinants of job market readiness, considerably less attention has been devoted to examining how different competencies interact in changing labor market environments. Existing studies have primarily investigated isolated predictors of workforce preparedness, providing limited insight into the mechanisms through which digital competencies are associated with job market readiness, or the contextual conditions under which these relationships become more pronounced.

Building on this gap, the present study proposes an integrated framework in which digital competencies are associated with job market readiness both directly and indirectly through employability competencies, while labor market dynamism serves as a contextual condition that influences the strength of this relationship. This perspective offers a more integrated explanation of workforce preparedness by simultaneously considering individual competencies, developmental mechanisms, and labor market conditions.

3. Theoretical Background and Hypotheses Development

Human capital and career construction theories offer complementary explanations for workforce preparedness. Human Capital Theory explains how investments in competencies enhance an individual's value in the labor market by accumulating knowledge and skills. In contrast, Career Construction Theory describes how individuals apply and adapt these competencies in response to changing career and environmental demands. While Human Capital Theory clarifies why digital and employability competencies are valuable resources, Career Construction Theory explains how these resources facilitate adaptation, career transitions, and workforce integration. Therefore, integrating these perspectives provides a more comprehensive explanation of job market readiness by simultaneously accounting for competency development, competency utilization, and environmental adaptation.

3.1. Digital Competencies and Job Market Readiness

Drawing on the conceptual background presented in Section 2.1, Human Capital Theory suggests that investments in valuable knowledge and skills enhance individuals' productivity, adaptability, and labor market value [17]. From this perspective, digital competencies should improve graduates' readiness for workforce participation because they enable individuals to effectively utilize digital technologies, respond to technological changes, and satisfy the competency requirements of contemporary employers. As workplaces become increasingly digitalized, graduates with stronger digital competencies are expected to navigate recruitment processes, workplace technologies, and evolving occupational demands more effectively, thereby strengthening their job market readiness.

Empirical research generally supports a positive relationship between digital competencies and employment-related outcomes. Several studies have reported that individuals with stronger digital competencies demonstrate higher levels of employability, career adaptability, and workforce participation because digital capabilities facilitate effective communication, information management, and problem-solving in technology-intensive environments [1,2,10]. However, other scholars argue that digital competencies alone may not guarantee successful labor market transitions, emphasizing the complementary role of broader employability-related capabilities and contextual labor market factors [12,13]. These contrasting perspectives suggest that although digital competencies are important, their contribution to workforce preparedness requires further investigation.

Building on these theoretical and empirical arguments, the present study proposes that digital competencies are an important antecedent of job market readiness. Graduates with stronger digital competencies are expected to demonstrate greater confidence in using digital technologies, adapt to changing workplace requirements, and respond to employer expectations during the transition from higher education to employment. Accordingly, the following hypothesis is proposed:

H1. *Digital competency positively influences job market readiness.*

3.2. Digital Competencies and Employability Competencies

Building upon the conceptual discussion presented in Sections 2.1 and 2.2, Human Capital Theory suggests that investments in one form of human capital can facilitate the development of complementary competencies that enhance individuals' overall capabilities [17]. From this perspective, digital competencies should not be viewed solely as technical skills but as enabling resources that support the acquisition of broader employability competencies. As individuals engage with digital technologies, they are required to communicate, collaborate, solve problems, evaluate information, and adapt continuously to technological changes. Consequently, stronger digital competencies are expected to contribute to the development of transferable competencies that enhance employability.

Previous research generally supports this expectation. Studies suggest that digital learning environments foster communication, collaboration, critical thinking, creativity, and problem-solving capabilities that extend beyond technical proficiency [32–35]. Similarly, research on workforce preparedness identifies communication, teamwork, adaptability, and problem-solving as essential employability competencies required in contemporary workplaces [36,37]. However, some scholars argue that technical competencies alone are insufficient for employability unless complemented by broader interpersonal and career-related capabilities [12,13]. These differing perspectives indicate that the relationship between digital competencies and employability competencies warrants further empirical examination.

The increasing integration of digital technologies into educational and professional environments further suggests that digital competencies may function as developmental resources that facilitate the acquisition of broader employability-related capabilities. Consequently, individuals who effectively utilize digital technologies may be more likely to strengthen the transferable competencies required for successful workforce participation.

H2. Digital competencies positively influence employability competencies.

3.3. Employability Competencies and Job Market Readiness

Building upon the conceptual discussion presented in Sections 2.2 and 2.4, Human Capital Theory suggests that transferable competencies constitute valuable forms of human capital that enhance individuals' productivity and labor market value [17]. Career Construction Theory further proposes that adaptive competencies enable individuals to successfully manage career transitions and respond effectively to changing occupational demands [19]. From these perspectives, graduates possessing stronger employability competencies should be better prepared to navigate recruitment processes, satisfy employer expectations, and successfully transition from higher education to employment.

Empirical evidence generally supports this expectation. Previous studies have consistently shown that communication, teamwork, adaptability, problem-solving, and career management competencies contribute to employability, career success, and workforce participation [6,11–13]. Employers increasingly value transferable competencies alongside academic qualifications when evaluating graduate readiness [38–40]. Nevertheless, some researchers argue that employability outcomes also depend on contextual factors such as labor market conditions and organizational opportunities, suggesting that competencies alone may not fully explain graduates' readiness for employment [11]. These differing perspectives indicate the need to further examine the direct contribution of employability competencies to job-market readiness.

Based on these theoretical and empirical arguments, this study proposes that employability competencies directly enhance graduates' readiness for labor market participation. Individuals with stronger communication, adaptability, teamwork, problem-solving, and career management competencies are expected to demonstrate greater confidence in pursu-

ing employment opportunities and successfully integrating into contemporary workplaces. Accordingly, the following hypothesis is proposed:

H3. *Employability competencies have a positive influence on job market readiness.*

3.4. The Mediating Role of Employability Competencies

Building on the relationships proposed in H2 and H3, this study argues that digital competencies contribute indirectly to job market readiness through employability competencies. Human Capital Theory suggests that investments in one form of human capital can facilitate the development of complementary capabilities that subsequently enhance labor market outcomes [17]. Similarly, Career Construction Theory proposes that individuals transform their knowledge and abilities into successful career outcomes by developing adaptive personal resources that support career transitions [19]. From these theoretical perspectives, digital competencies are unlikely to improve workforce preparedness, solely because individuals possess technical knowledge. Rather, their value depends on whether they foster broader employability competencies that enable graduates to apply digital knowledge effectively in the workplace.

One possible explanation is that digital environments require individuals to engage in continuous learning, virtual collaboration, information evaluation, technology-mediated communication, and complex problem-solving. Through repeated engagement in these activities, individuals gradually develop broader employability competencies, including communication, teamwork, adaptability, critical thinking, and problem-solving. These competencies enhance graduates' ability to navigate recruitment processes, respond to employer expectations, and adapt successfully to evolving workplace demands. Consequently, employability competencies are expected to function as the developmental mechanism through which digital competencies are translated into job-market readiness.

This theoretical explanation is broadly consistent with previous research suggesting that digital learning environments foster communication, collaboration, adaptability, creativity, and problem-solving capabilities that support employability [35,37,41–43]. Likewise, studies have shown that these employability-related competencies contribute positively to graduates' career readiness and employment outcomes [6,10,13]. However, prior research has largely examined digital competencies and employability competencies as independent predictors of employability-related outcomes, providing a limited understanding of the mechanisms through which digital competencies contribute to job market readiness. By proposing employability competencies as the explanatory pathway linking digital competencies to workforce preparedness, this study offers a more comprehensive explanation of how graduates transform digital capabilities into successful labor market participation:

H4. *Employability competencies mediate the relationship between digital competencies and job market readiness.*

3.5. The Moderating Role of Labor Market Dynamism

Building on the conceptual discussion presented in Section 2.3, this study proposes that labor market dynamism functions as an important contextual condition influencing the effectiveness of digital competencies in enhancing job market readiness. Dynamic Capabilities Theory suggests that the value of individual capabilities depends on the environment in which they are applied [44]. Accordingly, competencies that provide only limited advantages in relatively stable environments may become substantially more valuable when external conditions change. From this perspective, digital competencies are expected to contribute more strongly to job market readiness when labor markets are char-

acterized by continuous technological advancement, evolving occupational requirements, and increasing competition for employment opportunities.

One possible explanation is that rapidly changing labor markets continually alter the knowledge, skills, and competencies that employers expect. Under such conditions, graduates with stronger digital competencies are better able to acquire new knowledge, adapt to emerging technologies, solve unfamiliar problems, and respond effectively to changing workplace expectations. In contrast, graduates with limited digital competencies may experience greater difficulty adjusting to technological changes, resulting in lower confidence and preparedness for labor market participation. Consequently, labor market dynamism is expected to strengthen the positive influence of digital competencies on job market readiness because digital capabilities become increasingly valuable as technological and occupational changes accelerate.

This theoretical reasoning is broadly consistent with previous research, indicating that rapidly evolving labor markets increase the importance of digital capabilities, continuous learning, and adaptability for successful workforce participation [3,14,30]. At the same time, other scholars argue that dynamic labor markets also create greater uncertainty by accelerating skill obsolescence, changing occupational structures, and intensifying employment competition [11]. These contrasting perspectives suggest that labor market dynamism should not be viewed simply as a direct determinant of workforce preparedness but rather as a contextual condition that influences the extent to which digital competencies enhance graduates' readiness for employment. Therefore, examining this moderating effect provides a more nuanced understanding of when digital competencies become most beneficial for successful labor market transitions.

H5. *Labor market dynamism strengthens the positive relationship between digital competencies and job market readiness.*

Based on the theoretical arguments and hypotheses developed in the preceding sections, Figure 1 presents the conceptual framework of the study. The framework illustrates the proposed direct relationship between digital competencies and job market readiness, the mediating role of employability competencies, and the moderating role of labor market dynamism.

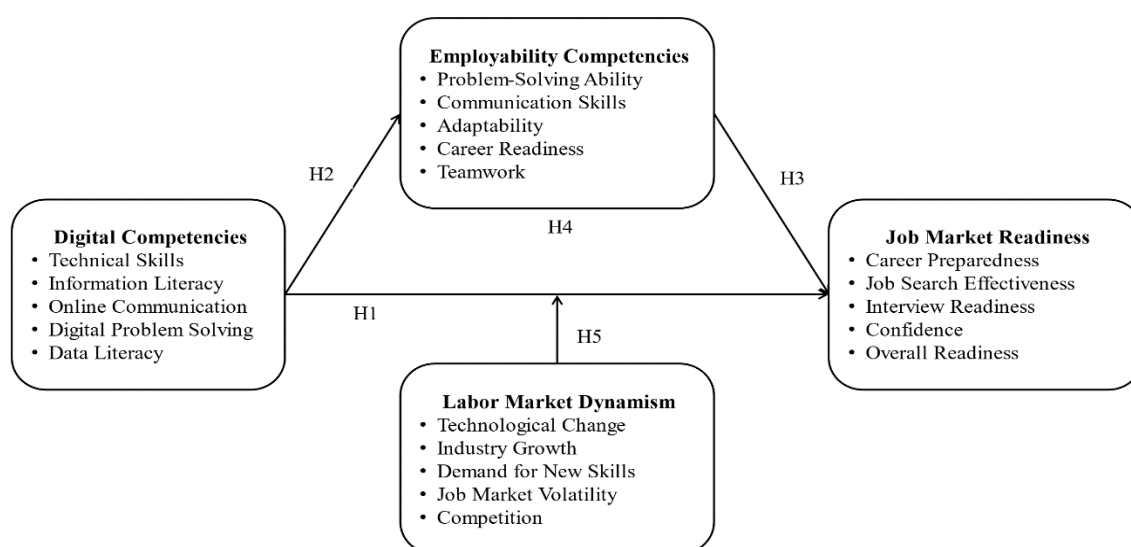


Figure 1. Conceptual framework.

4. Methodology

This study employed a quantitative, cross-sectional research design to examine the relationships among digital competencies, employability competencies, labor market dynamism, and job market readiness among final-year university students and recent graduates in Saudi Arabia. A survey-based approach was adopted because it enables the empirical examination of relationships among multiple constructs and facilitates the testing of direct, mediating, and moderating effects using established statistical procedures [45]. Although a cross-sectional design is appropriate for examining theoretically derived relationships among variables, it does not permit definitive causal inferences because all the data were collected at a single point in time. Accordingly, the findings should be interpreted as evidence of statistical associations rather than as definitive causal effects.

The target population comprised final-year university students and recent graduates who were either preparing to enter the labor market or had recently entered employment. The transition from higher education to employment represents a critical stage during which competencies are expected to shape workforce readiness; therefore, the unit of analysis was individual graduates, rather than organizations. Therefore, respondents were not selected from specific companies or sectors but from diverse academic disciplines to obtain a broader understanding of graduate employability in the Saudi Arabian context. A stratified sampling approach was employed to ensure a broad representation across academic disciplines. The sampling frame was established in collaboration with the participating public and private universities in Saudi Arabia. Universities identified all eligible final-year students and recent graduates within each academic discipline and distributed the online questionnaire through official academic departments, alumni offices, career development centers, institutional mailing lists, and alumni networks to collect the data. The sampling frame was organized into academic strata comprising Business Administration, Information Technology, Accounting, Engineering, Arts and Sciences, and related disciplines. This approach was adopted to ensure an adequate representation of graduates from different academic disciplines, thereby improving the representativeness of the sample and reducing potential sampling bias. The questionnaire was distributed to all eligible participants within each academic stratum through official university communication channels, thereby ensuring broad representation across predefined academic disciplines. Because participation was voluntary, the final sample reflected responses from individuals who chose to participate after receiving the survey invitation, and complete random selection of respondents could not be guaranteed. A total of 450 questionnaires were distributed, and 417 responses were received, resulting in an initial response rate of 92.7%. Following data screening for completeness and response quality, 400 valid questionnaires were retained for analysis, yielding a usable response rate of 88.9%. The final sample size of 400 exceeded the minimum recommendations for structural equation modeling and mediation–moderation analyses, thereby providing adequate statistical power for hypothesis testing [45,46].

Data were collected between January and March 2026 using an online questionnaire administered in collaboration with participating public and private universities across Saudi Arabia. Universities disseminated the questionnaire through official academic departments, alumni offices, career development centers, institutional mailing lists, and alumni networks to all eligible participants in each academic discipline. Participation was voluntary, and respondents were informed of the academic purpose of the study before completing the questionnaire. To reduce response bias, anonymity and confidentiality were assured, and no personally identifiable information was collected from the participants. Completion of the questionnaire was considered evidence of informed consent.

The survey instrument was developed using previously validated scales and was adapted to the context of graduate employability in Saudi Arabia. Prior to data collection,

the questionnaire was reviewed by three academic experts specializing in management, employability, and information systems to evaluate the item clarity, content relevance, and contextual appropriateness. Minor wording revisions were incorporated before pilot administration. A pilot study involving approximately 30 respondents was conducted to evaluate the clarity and comprehensibility of the questionnaire. The results indicated that no substantial modifications to the measurement items were necessary. The instrument consisted of two sections: the first section collected demographic information, including gender, age, educational qualifications, academic disciplines, and employment status. The second section contained 22 measurement items distributed across four constructs: Digital Competencies (six items), Employability Competencies (five items), Labor Market Dynamism (five items), and Job Market Readiness (six items). All items were measured using a Five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Digital Competencies were measured using six items adapted from [1,26]. Employability Competencies were measured using five items adapted from [6,12,13]. Labor Market Dynamism was assessed using five items adapted from [3,14]. Job Market Readiness was measured using six items adapted from [10,11]. All measurement items are presented in supplementary material.

As all variables were measured using self-reported survey data, common method bias (CMB) was assessed using both procedural and statistical remedies. Procedural remedies included assuring anonymity and confidentiality, emphasizing that there were no right or wrong answers, and minimizing item ambiguity [47]. Harman's single-factor test indicated that the first unrotated factor accounted for 34.7% of the total variance, which was below the recommended 50% threshold. In addition, a Common Latent Factor (CLF) analysis was conducted in AMOS by introducing a latent method factor connected to all observed measurement items. The standardized factor loadings from the original CFA model were compared with those obtained after including CLF. The differences between the two sets of loadings were all below the recommended threshold of 0.20, indicating that common method variance was unlikely to substantially affect the results.

Data were analyzed using IBM SPSS Statistics 27 and AMOS 27. Descriptive statistics were first employed to summarize the respondents' characteristics. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted to evaluate the measurement models. Reliability was assessed using Cronbach's alpha and composite reliability (CR), and convergent validity was evaluated using the average variance extracted (AVE). Discriminant validity was examined using the Fornell–Larcker criterion [48] and heterotrait–monotrait ratio (HTMT) [49]. The proposed hypotheses were tested using regression analysis and Hayes' PROCESS macro. PROCESS Model 4 was employed to examine the mediating role of employability competencies, whereas PROCESS Model 1 was used to evaluate the moderating role of labor market dynamism [50]. Statistical significance was assessed using bootstrapping procedures with 5000 resamples and 95% confidence intervals (CIs).

5. Data Analysis and Results

Table 1 summarizes the demographic characteristics of the 400 respondents. The sample was predominantly female, aged 20–24 years, pursuing or holding a bachelor's degree, with most participants reporting internship experience, seeking employment, and attending public universities. Respondents represented a broad range of academic disciplines, supporting the diversity of the study sample. Collectively, the demographic characteristics indicate that the sample captures a broad representation of university students and recent graduates across different academic disciplines and demographic groups, thereby providing an appropriate foundation for the subsequent analyses.

Table 1. Demographic Profile (N = 400).

Variable	Category	Frequency	Percentage (%)
Gender	Male	172	43.0
	Female	228	57.0
Age	Under 20 years	42	10.5
	20–24 years	252	63.0
	25–29 years	86	21.5
	30 years and above	20	5.0
Educational Level	Diploma	52	13.0
	Bachelor's Degree	314	78.5
	Master's Degree	34	8.5
Academic Discipline	Business Administration	102	25.5
	Information Technology	88	22.0
	Accounting	70	17.5
	Engineering	58	14.5
	Arts and Sciences	44	11.0
	Other Disciplines	38	9.5
Academic Status	Final-Year Student	248	62.0
	Recent Graduate	152	38.0
Internship Experience	Yes	276	69.0
	No	124	31.0
Employment Status	Seeking Employment	232	58.0
	Employed Part-Time	101	25.3
	Employed Full-Time	67	16.7
University Type	Public University	308	77.0
	Private University	92	23.0
Total		400	100.0

Table 2 summarizes the descriptive statistics of the study variables. The results indicate generally high mean scores for all constructs, particularly employability competencies, with moderate variability across respondents.

Table 2. Descriptive Statistics.

Variable	N	Mean	Std. Deviation	Minimum	Maximum
Digital Competencies (DC)	400	4.11	0.67	1.00	5.00
Employability Competencies (EC)	400	4.19	0.61	1.00	5.00
Labor Market Dynamism (LMD)	400	3.87	0.73	1.00	5.00
Job Market Readiness (JMR)	400	4.06	0.65	1.00	5.00

Taken together, the descriptive statistics indicate that respondents generally reported moderate to high levels across the study constructs, while the observed variability suggests sufficient dispersion in participants' responses to support subsequent multivariate analyses.

Table 3 shows the normality assessment results, which illustrate that the skewness and kurtosis statistics for all constructs were within acceptable limits, indicating no significant departures from normality and supporting the use of subsequent statistical analyses.

Overall, the normality assessment indicates that the distributions of all study variables satisfy the assumptions required for subsequent parametric analyses, supporting the appropriateness of the statistical techniques employed in this study.

Table 3. Normality Assessment.

Variable	Skewness	Kurtosis
Digital Competencies (DC)	−0.438	−0.351
Employability Competencies (EC)	−0.402	−0.468
Labor Market Dynamism (LMD)	−0.287	−0.521
Job Market Readiness (JMR)	−0.376	−0.294

As shown in Table 4, both Harman’s single-factor test and the Common Latent Factor analysis indicate that common method bias is unlikely to have materially influenced the study findings. The first unrotated factor explained only 34.7% of the total variance, while the CLF analysis revealed that all differences in standardized factor loadings were below the recommended threshold of 0.20. Collectively, these results suggest that common method variance was not a significant concern in the present study.

Table 4. Assessment of Common Method Bias.

Assessment Method	Criterion	Result	Conclusion
Harman’s Single-Factor Test	First factor < 50%	34.7%	No significant CMB
Common Latent Factor (AMOS)	Difference in standardized loadings < 0.20	All differences < 0.20	No significant CMB

Collectively, these results suggest that common method bias is unlikely to have materially influenced the observed relationships among the study variables, thereby providing greater confidence in the validity of the subsequent statistical analyses.

Table 5 presents the results of the KMO and Bartlett’s tests. The KMO value exceeded the recommended threshold, and Bartlett’s Test of Sphericity was statistically significant ($p < 0.001$), confirming the suitability of the data for factor analysis.

Table 5. KMO and Bartlett’s Test.

Test	Value
Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy	0.918
Bartlett’s Test Approx. χ^2	4528.671
df	231
Sig.	0.000

Table 6 presents the results of the exploratory factor analysis. The findings support the proposed four-factor structure, with all items strongly loading on their respective constructs. The factor loadings ranged from 0.682 to 0.872, exceeding the recommended threshold. No significant cross-loadings were detected, suggesting a distinct and interpretable factor structure. These results provide evidence of satisfactory construct validity and support the suitability of the measurement model for the subsequent analyses.

Table 7 presents the reliability and convergent validity results. All constructs satisfied the recommended criteria for internal consistency and convergent validity. Cronbach’s alpha and composite reliability values exceeded the acceptable threshold, and the AVE values surpassed the recommended minimum level. These findings indicate that the measurement model is reliable and has satisfactory convergent validity.

Table 6. Exploratory Factor Analysis (EFA) Summary.

Items	DC (C1)	EC (C2)	LMD (C3)	JMR (C4)
DC1	0.847			
DC2	0.821			
DC3	0.793			
DC4	0.758			
DC5	0.726			
DC6	0.701			
EC1		0.861		
EC2		0.834		
EC3		0.798		
EC4		0.751		
EC5		0.714		
LMD1			0.809	
LMD2			0.773	
LMD3			0.741	
LMD4			0.704	
LMD5			0.682	
JMR1				0.872
JMR2				0.843
JMR3				0.801
JMR4				0.769
JMR5				0.732
JMR6				0.708

Table 7. Reliability and Convergent Validity.

Construct	Items	Factor Loadings	CA	CR	AVE
Digital Competencies (DC)	6	0.701–0.847	0.901	0.918	0.651
Employability Competencies (EC)	5	0.714–0.861	0.893	0.911	0.672
Labor Market Dynamism (LMD)	5	0.682–0.809	0.860	0.890	0.601
Job Market Readiness (JMR)	6	0.708–0.872	0.914	0.928	0.684

Table 8 presents the Fornell–Larcker assessment results. The square root of the AVE for each construct exceeded its correlations with other constructs, providing evidence of satisfactory discriminant validity and supporting the distinctiveness of the constructs.

Table 8. Discriminant Validity (Fornell–Larcker Criterion).

Construct	DC	EC	LMD	JMR
Digital Competencies (DC)	0.807			
Employability Competencies (EC)	0.584	0.820		
Labor Market Dynamism (LMD)	0.461	0.437	0.766	
Job Market Readiness (JMR)	0.628	0.673	0.492	0.827

Taken together, the results presented in Tables 5–8 indicate that the proposed measurement model demonstrates satisfactory psychometric properties. Specifically, the evidence supports the constructs' reliability, convergent validity, discriminant validity, and overall model fit, providing a robust foundation for testing the proposed structural relationships.

Table 9 presents the HTMT assessment results. All HTMT values ranged from 0.516 to 0.792, remaining below the recommended thresholds. These findings provide additional evidence of discriminant validity and confirm that the study's constructs are empirically distinct.

Table 9. Heterotrait–Monotrait Ratio (HTMT).

Construct	DC	EC	LMD	JMR
Digital Competencies (DC)	—			
Employability Competencies (EC)	0.693	—		
Labor Market Dynamism (LMD)	0.542	0.516	—	
Job Market Readiness (JMR)	0.741	0.792	0.587	—

Table 10 presents the CFA model fit results. All fit indices met the recommended thresholds, demonstrating a satisfactory fit between the measurement model and observed data. These findings further support the validity and adequacy of the measurement model.

Table 10. CFA Model Fit Indices.

Fit Index	Recommended Threshold	Observed Value
χ^2/df	<3.00	2.143
CFI	>0.90	0.948
TLI	>0.90	0.941
RMSEA	<0.08	0.054
SRMR	<0.08	0.045

Overall, the results reported in Tables 9 and 10 indicate that the study variables exhibit meaningful associations consistent with the proposed conceptual framework, while the acceptable VIF values suggest that multicollinearity is unlikely to affect the subsequent regression analyses.

Table 11 presents the Pearson correlation coefficients among the study variables. All correlations were positive and statistically significant ($p < 0.001$), indicating that the relationships among the study constructs were consistent with theoretical expectations. These findings indicate that the study variables are positively associated and provide an initial indication of relationships that are consistent with the proposed conceptual framework. Further examination through multivariate analyses is required to evaluate the hypothesized effects of these variables.

Table 11. Correlation Matrix (Pearson's r).

Variable	DC	EC	LMD	JMR
Digital Competencies (DC)	1			
Employability Competencies (EC)	0.584	1		
Labor Market Dynamism (LMD)	0.461	0.437	1	
Job Market Readiness (JMR)	0.628	0.673	0.492	1

Note: All correlations were positive and statistically significant at $p < 0.001$.

Table 12 presents the multicollinearity diagnostics. The VIF and tolerance values satisfied the recommended criteria, indicating the absence of problematic multicollinearity among the predictor variables. These findings support the robustness of the regression-based analyses.

Table 12. Multicollinearity Diagnostics.

Variable	Tolerance	VIF
Digital Competencies (DC)	0.66	1.52
Employability Competencies (EC)	0.63	1.59
Labor Market Dynamism (LMD)	0.76	1.32

Table 13 presents the model summary, indicating that the proposed model explained 51.0% of the variance in Job Market Readiness ($R^2 = 0.510$).

Table 13. Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.714	0.510	0.506	0.287

Dependent Variable: Job Market Readiness (JMR).

Collectively, the results reported in Tables 11–13 indicate that the proposed regression model explains a substantial proportion of the variance in job market readiness and provides statistically significant support for the hypothesized relationships. These findings establish a robust empirical foundation for the subsequent mediation and moderation analyses.

Table 14 presents the ANOVA results. The overall regression model was statistically significant ($F = 256.981$, $p < 0.001$), confirming that the proposed set of predictors provided a meaningful explanation of Job Market Readiness.

Table 14. ANOVA.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	63.487	3	21.162	256.981	0.000
Residual	32.613	396	0.082	—	—
Total	96.100	399	—	—	—

Dependent Variable: Job Market Readiness (JMR).

Table 15 indicates that Digital Competencies, Employability Competencies, and Labor Market Dynamism were all significant positive predictors of Job Market Readiness, supporting the proposed hypotheses.

Table 15. Multiple Regression Results Predicting Job Market Readiness.

Predictor	B	SE	β	t	p-Value	Decision
Digital Competencies (DC)	0.301	0.036	0.332	8.361	<0.001	Supported
Employability Competencies (EC)	0.347	0.041	0.381	8.463	<0.001	Supported
Labor Market Dynamism (LMD)	0.156	0.034	0.179	4.588	<0.001	Supported

Dependent Variable: Job Market Readiness (JMR).

Table 16 indicates that Employability Competencies significantly mediated the relationship between Digital Competencies and Job Market Readiness. Both the direct and indirect effects were significant, providing support for the proposed mediation hypothesis.

Table 16. Mediation Analysis (PROCESS Model 4).

Path	Effect (β)	SE	t-Value	p-Value	95% Boot CI
Digital Competencies → Employability Competencies	0.584	0.038	15.368	0.001	[0.509, 0.659]
Employability Competencies → Job Market Readiness	0.381	0.045	8.467	0.001	[0.293, 0.469]
Digital Competencies → Job Market Readiness (Direct Effect)	0.332	0.036	9.222	0.001	[0.261, 0.403]
Digital Competencies → Employability Competencies → Job Market Readiness (Indirect Effect)	0.223	0.031	—	—	[0.166, 0.288]

Independent Variable: Digital Competencies (DC); Mediator: Employability Competencies (EC); Dependent Variable: Job Market Readiness (JMR); Bootstrap Samples = 5000.

Taken together, the results reported in Tables 14–16 provide consistent evidence that employability competencies mediate the relationship between digital competencies and job market readiness. These findings support the proposed explanatory mechanism linking digital competencies to graduates' workforce preparedness.

Table 17 indicates a significant interaction between Digital Competencies and Labor Market Dynamism, confirming the proposed moderating effect. The nature of this interaction is presented in the subsequent conditional effects and simple slope analysis.

Table 17. Moderation Analysis Results (PROCESS Model 1).

Predictor	Effect (β)	SE	<i>t</i> -Value	<i>p</i> -Value
Digital Competencies (DC)	0.332	0.036	9.222	0.001
Labor Market Dynamism (LMD)	0.179	0.039	4.590	0.001
Digital Competencies $\times$ Labor Market Dynamism	0.127	0.031	4.097	0.001

Table 18 presents the conditional effects of Digital Competencies on Job Market Readiness across different levels of Labor Market Dynamism. The positive effect of Digital Competencies remained significant at all levels of Labor Market Dynamism. However, the magnitude of the effect increased from low to high levels of Labor Market Dynamism, providing additional evidence of a significant moderating effect.

Table 18. Conditional Effects of Digital Competencies on Job Market Readiness Across Levels of Labor Market Dynamism.

Labor Market Dynamism Level	Effect of Digital Competencies on Job Market Readiness	SE	<i>t</i> -Value	95% Confidence Interval
Low LMD (−1 SD)	0.218	0.043	5.070	[0.133, 0.303]
Mean LMD	0.332	0.036	9.222	[0.261, 0.403]
High LMD (+1 SD)	0.459	0.041	11.195	[0.378, 0.540]

Figure 2 illustrates the moderating effect of labor market dynamism on the relationship between digital competencies and job market readiness. The positive association between digital competencies and job market readiness becomes progressively stronger as labor market dynamism increases. Specifically, graduates operating in highly dynamic labor market environments derive greater benefits from digital competencies than those in relatively stable labor market conditions. These graphical results are consistent with the significant interaction effect reported in Table 17.

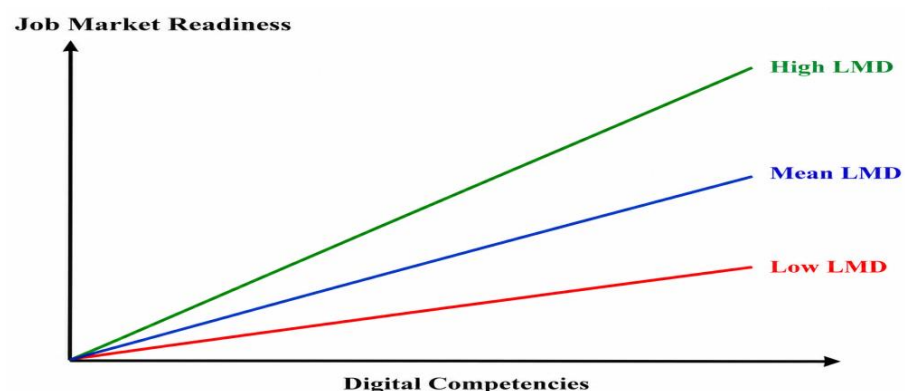


Figure 2. Moderating Effect of Labor Market Dynamism on the Relationship Between Digital Competencies and Job Market Readiness.

Collectively, the results reported in Tables 17 and 18 and illustrated in Figure 2 provide consistent evidence that labor market dynamism functions as a significant contextual condition influencing the relationship between digital competencies and job market readiness. The stronger association observed under higher levels of labor market dynamism supports the proposed moderating effect and highlights the importance of considering environmental conditions when examining workforce preparedness.

Table 19 summarizes the hypothesis testing results. All five hypotheses were supported, providing empirical evidence for the direct effects of Digital Competencies and Employability Competencies, the mediating role of Employability Competencies, and the moderating role of Labor Market Dynamism. Collectively, these findings support the validity of the proposed conceptual framework and its explanation of Job Market Readiness among university students and recent graduates.

Table 19. Summary of Hypothesis Testing Results.

Hypothesis	Proposed Relationship	Decision
H1	Digital Competencies → Job Market Readiness	Supported
H2	Digital Competencies → Employability Competencies	Supported
H3	Employability Competencies → Job Market Readiness	Supported
H4	Employability Competencies mediate the relationship between Digital Competencies and Job Market Readiness	Supported
H5	Labor Market Dynamism moderates the relationship between Digital Competencies and Job Market Readiness	Supported

Overall, the results summarized in Table 19 demonstrate consistent support for all proposed hypotheses, providing empirical evidence for the integrated framework linking digital competencies, employability competencies, labor market dynamism, and job market readiness. Overall, the findings indicate that workforce preparedness is associated with the combined influence of individual competencies and labor market conditions.

6. Discussion

This study provides an integrated perspective on workforce preparedness by examining how digital competencies, employability competencies, and labor market dynamism are associated with job market readiness among university students and recent graduates. Overall, the findings support the proposed theoretical framework by indicating that job market readiness is associated not only with individual competencies but also with the mechanisms through which these competencies operate and the labor market conditions under which they become pronounced. Because this study employed a cross-sectional design, these findings should be interpreted as evidence of statistically significant associations that are consistent with the proposed theoretical framework rather than definitive causal relationships. The following discussion focuses on interpreting these associations in relation to existing theory, prior research and the Saudi Arabian context.

6.1. The Influence of Digital Competencies on Job Market Readiness

The findings support H1 by indicating a positive association between digital competencies and job market readiness among university students and recent graduates. Rather than suggesting that digital competencies alone determine workforce preparedness, the findings indicate that graduates who report stronger digital competencies also tend to perceive themselves as better prepared for labor market participation. One possible explanation is that digital competencies enable graduates to navigate technology-intensive learning

and employment environments more effectively, thereby increasing their confidence in managing recruitment processes, accessing career information and adapting to changing workplace expectations [51,52]. This interpretation is particularly relevant in contemporary labor markets, where digital technologies are embedded in recruitment, communication, and professional practice.

The findings are consistent with previous research reporting positive associations between digital competencies and employability, adaptability, information use, and workforce participation [1,23–25,53–55]. Rather than simply confirming these relationships, the present findings extend the literature by suggesting that digital competencies are also associated with graduates' perceived readiness for workforce entry, highlighting job market readiness as an important outcome in the transition from education to employment.

From a theoretical perspective, the findings are consistent with Human Capital Theory, suggesting that digital competencies represent an important form of contemporary human capital associated with graduates' preparedness for increasingly digital labor markets [17]. However, the cross-sectional nature of the study means that these findings should be interpreted as evidence of an association rather than causation. It is also possible that graduates who perceive themselves as job-ready are more likely to report stronger digital competencies, indicating that the relationship may be reciprocal. Future longitudinal research will help clarify the direction of this relationship. Within the Saudi Arabian context, the findings are consistent with ongoing digital transformation initiatives under Vision 2030, where digital capability development has become an important component of graduate employability.

6.2. The Influence of Digital Competencies on Employability Competencies

The findings support H2 by indicating a positive association between digital competencies and employability competencies among university students and recent graduates. Rather than suggesting that digital competencies directly develop employability competencies, the findings indicate that graduates with stronger digital competencies also tend to have higher levels of communication, adaptability, teamwork, and problem-solving capabilities. One possible explanation is that digital learning and technology-mediated environments provide more opportunities for collaboration, information sharing, and continuous learning, which may be associated with the development of broader employability-related competencies [35,36].

These findings are consistent with previous studies, suggesting that digital competencies are associated with higher-order capabilities, including communication, collaboration, creativity, critical thinking, and problem-solving [32–37]. Rather than simply confirming these relationships, the present findings suggest that digital competencies are also associated with employability competencies that may support graduates' transition from higher education to employment.

From a theoretical perspective, the findings are consistent with Human Capital Theory, which views competencies as complementary forms of human capital associated with labor market value [17]. However, the observed relationship should be interpreted cautiously because the cross-sectional design does not establish whether digital competencies precede employability competencies or whether both develop simultaneously through education and professional experiences. Future longitudinal studies could provide greater insights into the temporal relationships between these constructs. Within the Saudi Arabian context, the findings are consistent with ongoing efforts to strengthen graduates' digital capabilities as part of broader workforce development initiatives.

6.3. *The Role of Employability Competencies in Enhancing Job Market Readiness*

The findings support H3 by indicating a positive association between employability competencies and job market readiness among university students and recent graduates. Rather than suggesting that employability competencies alone determine workforce preparedness, the findings indicate that graduates reporting stronger communication, adaptability, teamwork, and problem-solving capabilities also tend to perceive themselves as better prepared for the transition from higher education to employment [22]. One possible explanation is that these competencies help graduates respond more confidently to recruitment processes, workplace expectations, and career-related uncertainties [38,40]. Consequently, employability competencies appear to represent an important personal resource associated with perceived job-market readiness.

These findings are consistent with previous research linking employability competencies with successful labor market transitions, career adaptability, and employment-related outcomes [6,10–13,38–40,56,57]. Rather than simply confirming these relationships, the present findings suggest that employability competencies are also associated with graduates' perceived readiness before employment is secured, extending existing research that has focused primarily on employability and long-term career success.

From a theoretical perspective, the findings are consistent with both Human Capital Theory and Career Construction Theory, suggesting that transferable competencies are associated with graduates' preparedness for labor market participation [17,19]. Nevertheless, because this study relied on self-reported cross-sectional data, the observed relationship should be interpreted as an association rather than evidence of a causal effect. It is also possible that graduates who perceive themselves as job-ready report higher levels of employability competencies, indicating a potentially reciprocal relationship. Future longitudinal research could examine how employability competencies and job market readiness evolve over time. Within the Saudi Arabian context, the findings are consistent with ongoing efforts to strengthen graduates' employability as part of broader workforce development initiatives of Vision 2030.

6.4. *Employability Competencies as a Mediating Mechanism*

The mediation analysis provides further insight into the relationship between digital competencies and job market readiness, indicating that employability competencies represent an important explanatory mechanism underlying this association. Rather than suggesting that digital competencies alone are associated with workforce preparedness, the findings indicate that graduates reporting stronger digital competencies also tend to report higher employability competencies, which are, in turn, associated with greater job market readiness. One possible explanation is that digitally competent graduates are better positioned to engage in collaborative learning, solve complex problems, communicate effectively, and adapt to evolving workplace expectations. Consequently, digital competencies may be associated with workforce preparedness, partly through the development of broader transferable capabilities that support successful labor market participation [35–37,41–43].

These findings are consistent with previous research highlighting the importance of employability competencies in supporting graduates' transition from higher education to employment [6,10–13]. They also align with studies suggesting that digital competencies are associated with communication, collaboration, creativity, critical thinking, and problem-solving capabilities that underpin employability in contemporary workplaces [1,26,35–37,41–43]. However, rather than simply confirming these individual relationships, the present findings extend the literature by suggesting that employability competencies provide an explanatory pathway through which digital competencies are associated with graduates' perceived job market readiness. This integrated perspective

offers a more comprehensive understanding of workforce preparedness by explaining not only whether these competencies are associated with employability-related outcomes but also how they operate together within graduates' transition from education to employment.

From a theoretical perspective, the findings are consistent with Human Capital Theory and Career Construction Theory, which collectively emphasize that multiple forms of human capital and adaptive resources jointly support career development and workforce participation [17–19]. Rather than viewing digital competencies and employability competencies as independent resources, the findings suggest that these competencies may complement each other in shaping graduates' perceived readiness for labor market participation. However, because this study employed a cross-sectional research design, the temporal ordering implied by the mediation model could not be confirmed. Alternative explanations remain possible, including the possibility that graduates who perceive themselves as more prepared for the labor market also report stronger employability and digital competencies. Future longitudinal research will provide a stronger basis for examining the developmental sequence proposed in this study. Within the Saudi Arabian context, the findings are consistent with national initiatives under Vision 2030, which emphasize the simultaneous development of digital capability, employability, and workforce readiness as complementary components of sustainable human capital development.

6.5. Labor Market Dynamism as a Boundary Condition

The findings support H5 by indicating that labor market dynamism moderates the positive association between digital competencies and job market readiness. Specifically, the results suggest that this association becomes stronger at higher levels of labor market dynamism, indicating that the relationship between digital competencies and graduates' perceived job market readiness varies across different labor market environments. Rather than implying that labor market dynamism directly determines workforce preparedness, the findings suggest that digital competencies appear to be particularly valuable in environments characterized by rapid technological change, evolving skill requirements, and increasing employment competition [31,58–60]. One possible explanation is that dynamic labor markets continually reshape employer expectations, placing greater emphasis on competencies that support continuous learning, technological adaptability, information access, and responsiveness to change [59]. Consequently, graduates with stronger digital competencies may perceive themselves as better prepared to navigate increasingly complex employment environments.

The findings are generally consistent with previous research suggesting that technological transformation is reshaping occupational structures and increasing the demand for workers capable of adapting to digitalized workplaces [58–60]. Similarly, [61] emphasized that Industry 4.0 has intensified the need for continuous competency development, whereas [62] highlighted the growing alignment between labor market success and the emerging skill requirements. However, rather than simply confirming these observations, the present findings extend existing research by suggesting that labor market dynamism functions as an important boundary condition influencing the strength of the association between digital competencies and job market readiness. This perspective provides a more context-sensitive explanation of workforce preparedness by demonstrating that the value associated with digital competencies may partly depend on the characteristics of the labor market in which graduates seek employment.

From a theoretical perspective, the findings are consistent with Human Capital Theory, which suggests that the value associated with human capital may vary according to external environmental conditions [17]. They also align with Career Construction Theory, which emphasizes adaptability as a personal resource for responding to changing occupational

environments and career transitions [19,63]. Nevertheless, because this study employed a cross-sectional research design, the moderation effect should be interpreted as evidence of association rather than causation. It is also possible that graduates who perceive labor market conditions as more dynamic place greater importance on digital competencies, thereby strengthening the observed relationship. Future longitudinal research conducted across different labor market contexts would provide stronger evidence on how changing environmental conditions influence the relationship between digital competencies and workforce preparedness over time. Within the context of Saudi Arabia's ongoing digital transformation and Vision 2030 initiatives, the findings are consistent with national efforts to strengthen digital capability, workforce adaptability, and lifelong learning as complementary components of sustainable human capital development.

Beyond supporting the proposed hypotheses, the findings provide a more integrated perspective on workforce preparedness than is typically offered in the employability literature. While previous studies have generally examined digital competencies, employability competencies, and labor market conditions as separate influences on employment-related outcomes, the present findings suggest that these factors are jointly associated with graduates' job market readiness. By simultaneously examining direct, mediating, and moderating relationships, this study shifts the focus from identifying isolated predictors of workforce preparedness toward understanding the mechanisms and contextual conditions associated with graduates' transition from education to employment.

Beyond explaining workforce preparedness, the findings also provide a broader sustainability perspective by illustrating how competency development may contribute to multiple interconnected Sustainable Development Goals (SDGs), which are intended to be pursued as an integrated agenda rather than as isolated objectives [5,64]. While this study is primarily framed within SDG 8 (Decent Work and Economic Growth), the findings also have implications for SDG 4 (Quality Education) by highlighting the role of higher education in developing digital and employability competencies that support lifelong learning and successful school-to-work transitions [5]. Furthermore, strengthening graduates' job market readiness may contribute to SDG 10 (Reduced Inequalities) by improving individuals' capacity to compete for employment opportunities in increasingly digital labor markets, thereby supporting more inclusive access to decent work [5]. Within the Saudi Arabian context, continued investment in digital capability development is also consistent with the objectives of SDG 5 (Gender Equality) and Vision 2030, as expanding digital skills and workforce preparedness can help create greater opportunities for women's participation in technology-enabled sectors of the economy [5,9]. Collectively, these interconnections suggest that workforce preparedness should be understood not only as an employment outcome but also as a mechanism through which higher education contributes to more inclusive, resilient, and sustainable socioeconomic development [64].

Taken together, these findings suggest that job market readiness is associated with the combined influence of digital competencies, employability competencies, and labor market conditions. Digital competencies appear to represent foundational capabilities associated with workforce preparedness, whereas employability competencies provide an important explanatory pathway through which these competencies are associated with job market readiness. Furthermore, the positive association between digital competencies and job market readiness appears to strengthen under higher levels of labor market dynamism, highlighting the importance of considering both individual capabilities and environmental conditions when examining workforce preparedness.

The consistently significant support observed across all proposed hypotheses may partly reflect the characteristics of the study's sample. Because the respondents were final-year university students and recent graduates experiencing a similar transition into

the labor market, they may have shared relatively homogeneous perceptions regarding the importance of digital competencies, employability competencies and labor market conditions. In addition, Saudi Arabia's ongoing digital transformation under Vision 2030 has increased the emphasis placed on digital capability development within higher education and workforce policies, which may have strengthened the observed associations. Nevertheless, because this study employed a cross-sectional design based on self-reported perceptions, the findings should be interpreted as statistically significant associations rather than definitive causal relationships. Future longitudinal and multisource studies would provide stronger evidence regarding the direction and stability of these relationships over time.

Beyond its implications for employability, the findings also contribute to the sustainability literature by suggesting that digital competencies and employability competencies are positively associated with sustainable employability and long-term workforce participation. As labor markets continue to evolve through technological change and digital transformation, individuals possessing stronger digital and employability-related capabilities may be better positioned to adapt to changing employment demands and sustain productive participation in the labor market over time. Consequently, the findings support the importance of promoting digital capability development and employability competencies as part of broader efforts to strengthen workforce resilience, human capital sustainability, and economic sustainability.

Although the present study primarily examines workforce preparedness from the perspective of social and economic sustainability, the findings also have broader implications for the environmental dimension of sustainable development. Digital competencies increasingly enable graduates to engage in environmentally responsible work practices through the effective use of digital technologies that support remote and hybrid work, virtual collaboration, paperless communication, digital resource management, and more efficient organizational processes. These technology-enabled practices have the potential to reduce resource consumption, minimize unnecessary travel, and improve operational efficiency, thereby contributing indirectly to environmental sustainability. Accordingly, the competencies examined in this study should be viewed not only as drivers of employability and workforce resilience but also as capabilities that may facilitate organizations' transition toward more sustainable and resource-efficient ways of working. This perspective reinforces the interconnected nature of the economic, social, and environmental dimensions of sustainable development and highlights the broader sustainability relevance of workforce preparedness in an increasingly digital economy [5,64,65].

Although this study focuses on workforce preparedness within the context of SDG 8, the findings should not be interpreted as suggesting that employability or labor market competitiveness alone is sufficient to achieve sustainable development. SDG 8 encompasses not only productive employment and economic growth but also decent work, inclusive labor market participation, and sustainable economic development [5]. Accordingly, strengthening digital and employability competencies should be viewed as one component of broader sustainability efforts that also depend on equitable access to education, inclusive employment opportunities, and institutional policies that promote fair and sustainable work [4,5]. From this perspective, the present findings contribute to understanding one dimension of SDG 8 while recognizing that progress toward SDG 8 is closely linked to complementary progress in SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequalities), consistent with the integrated nature of the 2030 agenda.

7. Theoretical Implications

The findings have implications for Human Capital Theory and Career Construction Theory in the context of workforce preparedness. Human Capital Theory emphasizes that knowledge, skills, and competencies are associated with labor market value and productivity. The present findings refine this perspective by suggesting that digital competencies are not only directly associated with job market readiness but are also linked to readiness through broader employability competencies. This indicates that the value of digital competencies may depend partly on their connection with transferable capabilities such as adaptability, communication, teamwork, and problem-solving. In this sense, the study offers a more specific application of Human Capital Theory to digital labor market contexts.

The findings also provide a more nuanced view of workforce preparedness by suggesting that job market readiness is associated with the combined role of digital competencies, employability competencies, and labor market conditions. This contrasts with studies that examine competencies as isolated predictors of employment outcomes. Instead, the present results suggest that employability competencies may function as an explanatory pathway linking digital competencies with perceived readiness, while labor market dynamism may condition the strength of this association.

In relation to Career Construction Theory, the findings suggest that employability competencies may represent adaptive resources that help graduates manage the transition from education to employment [19,63]. Rather than treating adaptability as a broad career resource, the study highlights specific employability-related capabilities through which graduates may respond to changing labor market expectations. This interpretation is consistent with Career Construction Theory while extending its application to digitalized and dynamic labor market contexts.

Finally, the findings are relevant to sustainable employability research. Sustainable employability emphasizes individuals' capacity to maintain productive labor market participation over time. The present study suggests that digital competencies and employability competencies are associated with this capacity by supporting graduates' perceived readiness for workforce participation under changing labor market conditions. However, these implications should be interpreted cautiously because the cross-sectional design does not establish causal ordering. Future research could further examine whether digital and employability competencies contribute to sustainable employability over time using longitudinal designs.

Beyond extending Human Capital Theory and Career Construction Theory, this study also contributes to the broader sustainability literature by demonstrating that workforce preparedness can be understood within an integrated sustainable development perspective. Rather than viewing employability solely as an economic outcome, the findings suggest that developing graduates' digital and employability competencies may simultaneously support educational advancement, inclusive labor market participation, and more sustainable organizational practices enabled by digital technologies. This perspective extends the theoretical understanding of workforce preparedness by positioning competency development as a mechanism that contributes to the interconnected economic, social, and environmental dimensions of sustainable development, thereby responding to recent calls for a more holistic conceptualization of sustainability within higher education and workforce research [5,64,65].

8. Practical Implications

These findings provide important implications for universities and higher education institutions seeking to strengthen graduate employability and workforce readiness. A particularly important finding of this study is that employability competencies serve as

the mechanism through which digital competencies enhance job-market readiness. This suggests that universities should move beyond isolated digital skills training and design learning experiences that intentionally transform digital capabilities into broader employability-related competencies. Curriculum designers should integrate digital technologies into project-based learning, internships, simulations, industry-sponsored projects, and collaborative assignments that simultaneously develop communication, teamwork, adaptability, problem-solving, and career management skills. Such an integrated approach can help ensure that students not only acquire technological proficiency but also develop transferable competencies required to apply digital knowledge effectively in professional settings.

The findings also provide valuable guidance for policymakers responsible for higher-education reform and workforce development. The moderating effect of labor market dynamism indicates that the value of digital competencies increases as labor market conditions become more dynamic, technology-driven, and skill-intensive. Consequently, policymakers should prioritize educational policies that enable institutions to respond rapidly to the changing workforce requirements. Within the context of Saudi Arabia's Vision 2030, this may involve supporting continuous curriculum modernization, strengthening industry–university partnerships, expanding work-integrated learning opportunities, and investing in national digital upskilling initiatives. Policymakers should also establish mechanisms to regularly monitor emerging skill demands and translate labor market intelligence into educational planning. Such initiatives can help create a workforce that remains adaptable, competitive, and aligned with the evolving needs of a digitally transforming economy.

The results further suggest that students should view digital competencies as a foundation for developing broader professional capabilities, rather than as standalone technical skills. While technological proficiency remains increasingly important across industries, the findings demonstrate that digital competencies generate greater career benefits when accompanied by strong employability competencies. Therefore, students should actively seek opportunities to strengthen their communication, collaboration, adaptability, critical thinking, and problem-solving abilities through internships, professional certifications, industry projects, volunteer activities, and extracurricular engagement. In addition, students should adopt a mindset of continuous learning and remain responsive to changing expectations in the labor market. By simultaneously developing technical and transferable competencies, graduates can improve their readiness for employment and enhance their long-term career resilience in increasingly dynamic labor market environments.

From a broader sustainability perspective, the findings suggest that investments in graduates' digital and employability competencies can generate benefits that extend beyond individual employment outcomes. Universities, employers, and policymakers should view competency development as part of a wider sustainable development strategy that supports lifelong learning, inclusive workforce participation, and resilient labor markets. Furthermore, promoting digital capabilities may encourage more resource-efficient and technology-enabled work practices, including virtual collaboration and digital service delivery, which can indirectly contribute to environmentally sustainable organizational operations. Consequently, initiatives designed to strengthen graduates' workforce preparedness may simultaneously advance economic, social, and environmental sustainability objectives, consistent with the integrated vision of the Sustainable Development Goals and Saudi Vision 2030 [5,9,64,65].

9. Limitations and Future Research

Despite its contributions to the digital competence and employability literature, this study has several limitations that should be considered when interpreting its findings. First, the cross-sectional research design limits the ability to establish definitive causal relationships among the examined variables because all data were collected at a single point in time. Future longitudinal research would provide stronger evidence regarding how digital competencies, employability competencies, labor market dynamism, and job market readiness evolve over time. Second, the study relied on self-reported measures, which may be influenced by common method bias and social desirability. Although validated measurement instruments and appropriate statistical procedures were employed, future studies could incorporate multiple data sources, objective performance indicators, or employer assessments to provide a more comprehensive evaluation of workforce preparedness.

A further limitation relates to the research's contextual scope. The study was conducted in Saudi Arabia and focused exclusively on university students and recent graduates. Although this context provides valuable insights into workforce development within a rapidly transforming economy pursuing ambitious digitalization and human capital development initiatives under Vision 2030, the findings may not be fully generalizable to other national, cultural, and institutional settings because educational systems, labor market structures, digital infrastructure, employer expectations, and workforce development policies differ across countries. Moreover, students' and recent graduates' experiences and perceptions may differ from those of experienced employees, vocational learners, entrepreneurs, or professionals at different career stages. Although the study employed a stratified sampling approach based on academic discipline to improve representation across different fields of study, the voluntary nature of participation may have introduced some degree of self-selection bias. Consequently, the findings should be interpreted with appropriate caution when generalizing to the broader population of university students and recent graduates in Saudi Arabia, and caution should also be exercised when extending these findings beyond the population and context examined in the present study.

Building on these limitations, future research should investigate additional mechanisms and contextual conditions that may explain or strengthen the relationship between digital competencies and workforce preparedness. For example, career adaptability, AI literacy, digital self-efficacy, and psychological capital may operate as complementary mediating mechanisms, whereas organizational AI adoption, institutional digital maturity, employer digital support, and organizational learning climate may represent important boundary conditions. Examining these factors would provide a more refined understanding of how workforce preparedness develops across different educational and labor market contexts.

The findings also raise several questions for future research. For example, do employability competencies fully or only partially explain the relationship between digital competencies and job market readiness? Does labor market dynamism influence other employability mechanisms beyond digital competencies? Would the proposed framework remain applicable in labor markets characterized by widespread AI adoption? Addressing these questions would refine Human Capital Theory and Career Construction Theory while providing opportunities to integrate Sustainable Employability Theory and emerging perspectives on digital careers and AI-enabled employability, thereby advancing theoretical understanding of workforce preparedness in rapidly evolving labor markets.

10. Conclusions

This study examined how digital competencies, employability competencies, and labor market dynamism are associated with job market readiness among university students and recent graduates in Saudi Arabia. By integrating Human Capital Theory and

Career Construction Theory, the study provides a unified perspective on the individual and contextual factors associated with workforce preparedness in an increasingly digital labor market.

The findings suggest that workforce preparedness is associated not only with digital competencies but also with the broader employability competencies through which these capabilities are translated into job market readiness. Furthermore, the strength of this association appears to depend partly on labor market dynamism, highlighting the importance of considering both individual capabilities and external labor market conditions when examining graduates' readiness for employment.

Overall, this study demonstrates that workforce preparedness should be understood as a multidimensional outcome shaped by the combined influence of digital competencies, employability competencies, and changing labor market conditions. Beyond advancing understanding of graduates' transition into employment, the findings also reinforce the importance of viewing sustainable development as an integrated and interconnected agenda. While the study primarily contributes to SDG 8 (Decent Work and Economic Growth) by identifying factors associated with job market readiness, it also has broader implications for SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequalities) by emphasizing the role of competency development in supporting lifelong learning, expanding opportunities for workforce participation, and promoting more inclusive access to employment. Furthermore, although environmental sustainability was not the primary focus of this study, strengthening digital competencies may indirectly encourage more sustainable organizational practices through digital collaboration, resource efficiency, and technology-enabled work processes. Collectively, these findings suggest that investing in graduates' digital and employability competencies represents not only an investment in workforce preparedness but also a meaningful contribution to more inclusive, resilient, and sustainable socioeconomic development in the digital era [5,9,64,65].

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su18157689/s1>, From Digital Competencies to Job Market Readiness.

Funding: This study was conducted without financial support from any external funding agency, grant provider, or sponsoring institution.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the College of Business Administration, TAIBAH University, Yanbu (protocol code CBA-14461572782-02 and 10 February 2026 of approval).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The original contributions presented in this study are included in the article/Supplementary Material. Further inquiries can be directed to the corresponding author (s).

Conflicts of Interest: The author declares that there are no competing interests or conflicts of interest associated with this study. The research was conducted and reported objectively without any financial, personal, or institutional influences that could have affected the integrity of the research process or its findings.

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