

Work readiness, internship quality, and employability in logistics education: a PLS-SEM study

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ABSTRACT

This study examines how logistics and supply chain management education supports students' transition from university to employment. It addresses a key issue in application-oriented programs: coursework and internships do not automatically translate into work readiness, perceived employability, or transition confidence. Drawing on employability and career development research, the study tests an integrated model linking career adaptability, career decision clarity, career support perception, work readiness, internship effectiveness, perceived employability, and transition outcome perception. Data were collected from 1,080 students through an anonymous online survey conducted from 23 March to 10 April 2026. Partial least squares structural equation modeling was applied. Results show that career support perception, career adaptability, and career decision clarity enhance work readiness, while work readiness and internship effectiveness improve perceived employability. Perceived employability is the strongest predictor of transition outcome perception, whereas internship effectiveness contributes mainly through employability beliefs rather than direct effects.

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1. INTRODUCTION

The transition from university to employment has become an urgent issue in higher education because universities are increasingly expected to demonstrate that graduates are not only academically qualified but also ready to perform in professional workplaces. This transition is no longer a simple movement from graduation to the first job. It is a developmental process shaped by students' personal resources, institutional support, learning experiences, and ability to convert these resources into credible labor-market opportunities [1]–[5]. For application-oriented programs, the central educational problem is therefore how universities can transform curriculum, career support, and workplace learning into work readiness and transition confidence.

This problem is especially relevant in logistics and supply chain management education. Students in this field are expected to combine disciplinary knowledge with coordination, communication, problem solving, digital awareness, teamwork, and practical decision-making in complex operating environments [6]–[10]. Graduate success in logistics depends on the alignment of curriculum, teaching, internships, and career preparation rather than classroom learning alone. However, employability preparation is still frequently treated as a supplementary activity, while the educational pathway through which support, readiness, internship quality, and employability beliefs jointly shape transition outcomes remains insufficiently clarified.

Previous research provides important insights into graduate employability, work-integrated learning, internship experience, work readiness, perceived employability, career adaptability, and career self-management. Nevertheless, three gaps remain. First, existing studies have examined internship and work-integrated learning quality [11]–[14], work readiness [15]–[18], perceived employability [19]–[21], and career adaptability or career self-management [22]–[24], but fewer studies explain how these resources operate together as one transition pathway. Second, internship participation is often assumed to be beneficial, although its educational value depends on task relevance, supervision, feedback, workplace learning quality, and students' ability to connect internship experience with career capability [11]–[14]. Third, relatively few studies integrate career adaptability, career decision clarity, career support perception, work readiness, internship effectiveness, perceived employability, and transition outcome perception in a single model for logistics education.

To address these gaps, this study develops and tests an integrated pathway model of university-to-work transition in logistics education. The novelty of the study lies in positioning perceived employability as the closest psychological mechanism through which educational preparation becomes transition confidence, while conceptualizing internship effectiveness as both a quality-based educational input and a conditional factor that strengthens the employability value of work readiness. This approach moves beyond the simple assumption that support or internship participation automatically generates successful transition outcomes.

The study is guided by three research questions (RQ). RQ1 asks how career adaptability, career decision clarity, and career support perception influence students' work readiness in logistics education. RQ2 asks how work readiness and internship effectiveness shape perceived employability and transition outcome perception. RQ3 asks whether internship effectiveness strengthens the relationship between work readiness and perceived employability and whether perceived employability mediates the pathway from educational preparation to transition outcomes. Consistent with these research questions, the hypotheses are developed in the theoretical section and tested using partial least squares structural equation modeling.

The study contributes to educational research by integrating employability theory, career construction theory, social cognitive career self-management, and work-integrated learning research into a coherent transition pathway for logistics education. Rather than treating career resources, readiness, internships, and employability beliefs as isolated predictors, the study theorizes university-to-work transition as a staged educational mechanism in which institutional and personal career resources shape work readiness, work readiness is converted into perceived employability, and perceived employability becomes the most proximal explanation of transition outcome perception. This framing clarifies how application-oriented programs can transform educational preparation and internship quality into transition confidence.

2. METHOD

2.1. Theoretical basis and hypothesis development

University-to-work transition is increasingly understood as a developmental process in which students transform academic capital, psychological resources, career learning, and contextual support into the capacity to participate effectively in the labor market [1]–[5]. In this process, work readiness is close to career action because it reflects the degree to which students feel prepared to meet the demands of real work environments [15]–[18]. Perceived employability is also central because it captures students' beliefs about their ability to access suitable employment and is conceptually closer to transition outcome perception than more distant preparation resources [19]–[21].

Internship effectiveness has important theoretical implications because internships create educational value only when they are relevant, supportive, and developmentally meaningful [11]–[14]. A high-quality internship can increase perceived employability by giving students clearer evidence of their workplace capability. It can also strengthen the effect of work readiness on perceived employability because students are more likely to believe in their employability when readiness is validated by meaningful workplace experience.

At the upstream level, career adaptability, career decision clarity, and career support perception are expected to shape work readiness. Career adaptability helps students manage career-related tasks and uncertainty, while career decision clarity gives direction to preparation and reduces ambiguity about future work [22], [23]. Career support perception reflects the extent to which students believe that their institution provides useful guidance, resources, and learning opportunities that help them prepare for employment. Recent career-development research also suggests that adaptive career resources and decision confidence are important for students preparing for school-to-work transition [24].

Based on this framework, the study proposes nine hypotheses. H1 states that career adaptability positively affects career decision clarity; H2 states that career adaptability positively affects work readiness; H3 states that career decision clarity positively affects work readiness; H4 states that career support perception positively affects work readiness; H5 states that work readiness positively affects perceived

employability; H6 states that internship effectiveness positively affects perceived employability; H7 states that internship effectiveness positively moderates the relationship between work readiness and perceived employability; H8 states that perceived employability positively affects transition outcome perception; and H9 states that internship effectiveness positively affects transition outcome perception. Together, these hypotheses test whether transition outcomes are explained mainly by a pathway from preparation resources to work readiness, perceived employability, and transition confidence.

The proposed research model is presented in Figure 1. The model connects upstream resources, readiness and internship quality, perceived employability, and transition outcome perception in one integrated structure. This structure allows the study to examine direct, indirect, and moderating effects within the same educational transition framework.

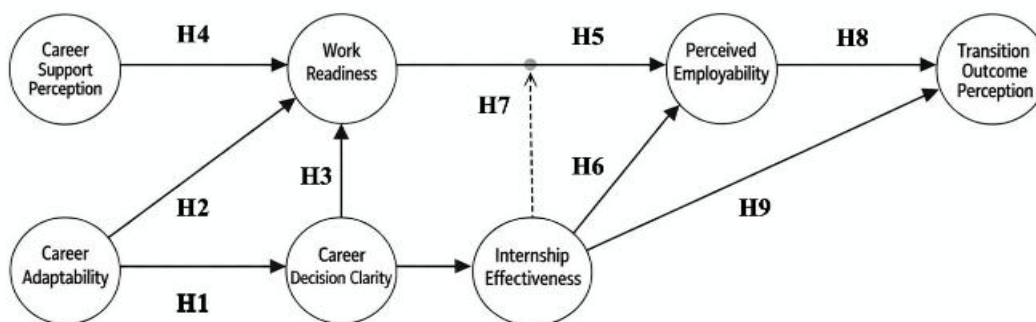


Figure 1. Proposed research model

2.2. Research method

The study used a cross-sectional quantitative design and model analysis using partial least squares structural equation modeling (PLS-SEM). This approach was selected because the study examines multiple latent constructs, direct and indirect relationships, and a moderating effect within a model that emphasizes explanatory and predictive value [25], [26]. PLS-SEM is appropriate for this study because the objective is to explain how educational preparation mechanisms operate together rather than to confirm a fully established covariance-based model.

The study used purposive sampling combined with voluntary response sampling. The inclusion criteria were: i) respondents had to be students enrolled in logistics and supply chain management or closely related programs; ii) they had to be at least 18 years old; and iii) they had to have sufficient understanding of career preparation, internship, or employment transition issues to answer the questionnaire. Responses were excluded when participants were outside the target field, submitted incomplete questionnaires, gave patterned responses, or failed the screening conditions.

Data were collected through an online structured questionnaire administered from 23 March 2026 to 10 April 2026. The questionnaire link was distributed through class networks, student groups, program-level communication channels, and instructor-supported announcements in logistics-related programs. Participation was voluntary and anonymous, and respondents were informed that the survey was conducted for academic purposes only, that no personally identifiable information would be collected, and that they could stop responding at any time.

The final sample included 1,080 valid responses after screening. The sample was intentionally focused on students approaching career transition, including third-year, fourth-year, final-year, and graduate-level students, while still retaining some earlier-year students for comparison. This design improves the interpretive relevance of the model because the constructs of work readiness, perceived employability, internship effectiveness, and transition outcome perception are most meaningful for students who are close to employment decisions.

All constructs were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. Measurement items were adapted from established studies and adjusted to fit the context of logistics and supply chain management education. Career adaptability was adapted from Savickas and Porfeli [22], career self-management theory was informed by Lent and Brown [23], work readiness was informed by recent work-readiness research, perceived employability was informed by recent employability research, and internship effectiveness was informed by work-integrated learning and internship-quality studies [11]–[24].

Analysis followed the two-step PLS-SEM procedure recommended for measurement and structural assessment [25], [26]. The first step evaluated outer loadings, Cronbach's alpha, rho_A, composite reliability, average variance extracted, and discriminant validity using the heterotrait-monotrait ratio [27]. The second step evaluated path coefficients, t-values, p-values, f^2 , R^2 , Q^2 predict, indirect effects, and the moderating effect of internship effectiveness, with predictive relevance assessed in line with PLSpredict guidance [28].

To reduce common method bias, the study applied procedural remedies during questionnaire design and administration. These included anonymity, concise wording, construct-based item grouping, voluntary participation, and reduced pressure to provide socially desirable responses. The variance inflation factor values ranged from 1.000 to 2.832, suggesting that multicollinearity and full collinearity did not present serious threats [29], [30], although common method bias cannot be completely eliminated in cross-sectional self-reported data.

3. RESULTS AND DISCUSSION

3.1. Results

Table 1 presents the demographic and educational profile of the respondents. Respondents were mainly female, concentrated in the 21-23 age group, and predominantly enrolled at the university level. Most participants were in the third or fourth year or in the final dissertation stage, and nearly three quarters had completed at least one internship, making the sample consistent with the study's focus on students approaching the transition from study to employment.

Table 2 reports the reliability and convergent validity of the constructs. Most constructs achieved acceptable levels of reliability and convergent validity. Two issues require caution: career decision clarity showed the weakest measurement properties, and work readiness had an average variance extracted value slightly below the conventional threshold, although both constructs were retained because of their theoretical relevance and acceptable composite reliability.

Table 3 summarizes the structural model estimates and hypothesis-testing results. Eight of the nine hypotheses were supported. Career support perception exerted the strongest influence on work readiness, work readiness had a strong positive effect on perceived employability, and perceived employability was the strongest direct predictor of transition outcome perception.

Table 4 presents the structural model quality indicators. The model shows moderate explanatory power for work readiness, perceived employability, and transition outcome perception. The positive Q^2 predict values indicate predictive relevance for the endogenous constructs, while the standardized root mean square residual (SRMR) and normed fit index (NFI) values support an acceptable overall model fit for the PLS-SEM analysis.

Table 1. Characteristics of the study sample (N=1,080)

Variable group	Subsection	Frequency	Rate (%)
Gender	Male	476	44.1
	Female	604	55.9
Age	From 18-20 years old	248	23.0
	From 21-23 years old	529	49.0
	From 24-26 years old	216	20.0
	Over 26 years old	87	8.0
Education level	University	713	66.0
	Master's students	270	25.0
	PhD student	97	9.0
School year	Years 1-2	238	22.0
	Years 3-4	551	51.0
	Final year/Dissertation phase	291	27.0
Internship experience	No internship yet	302	28.0
	Completed 1 internship	508	47.0
	Completed 2 or more internships	270	25.0

Table 2. Reliability and convergent validity of constructs

Construct	Number of variables	Outer loadings	Cronbach's α	rho_A	CR	AVE
Career adaptability	8	0.584-0.776	0.856	0.862	0.889	0.502
Career decision clarity	5	0.543-0.648	0.557	0.561	0.738	0.361
Career support perception	6	0.726-0.818	0.872	0.875	0.903	0.610
Internship effectiveness	6	0.775-0.876	0.908	0.913	0.929	0.685
Perceived employability	6	0.710-0.808	0.852	0.856	0.890	0.576
Transition outcome perception	4	0.697-0.831	0.778	0.791	0.857	0.601
Work readiness	10	0.562-0.811	0.878	0.887	0.901	0.480

Table 3. Structural model results and hypothesis testing

Hypothesis	Path	β	t	p	f ²	Decision
H1	CA → CDC	0.163	5.581	<0.001	0.027	Supported
H2	CA → WR	0.195	7.066	<0.001	0.044	Supported
H3	CDC → WR	0.184	7.733	<0.001	0.055	Supported
H4	CSP → WR	0.454	16.592	<0.001	0.240	Supported
H5	WR → PE	0.451	20.144	<0.001	0.323	Supported
H6	IE → PE	0.341	14.418	<0.001	0.185	Supported
H7	IE × WR → PE	0.167	7.697	<0.001	0.047	Supported
H8	PE → TOP	0.607	28.745	<0.001	0.505	Supported
H9	IE → TOP	0.019	0.736	0.462	0.000	Not supported

Note: CA=career adaptability; CDC=career decision clarity; CSP=career support perception; IE=internship effectiveness; PE=perceived employability; TOP=transition outcome perception; WR=work readiness.

Table 4. Structural model quality

Construct	R ²	Level	Q ² predict	RMSE	MAE
Career decision clarity	0.027	Weak	0.023	0.990	0.807
Work readiness	0.408	Moderate	0.372	0.794	0.642
Perceived employability	0.376	Moderate	0.252	0.866	0.709
Transition outcome perception	0.377	Moderate	0.106	0.947	0.794
SRMR	0.040				
NFI	0.908				

The indirect effects were separated into Table 5 to respond to the reviewers' request for clearer table sequencing. These results clarify the mechanism through which preparation resources and internship effectiveness influence transition outcome perception. The significant indirect paths confirm the central mediating role of perceived employability in the proposed model.

Overall, the results support a pathway in which educational preparation contributes to transition outcomes mainly through work readiness and perceived employability rather than through direct effects alone. The findings therefore indicate that transition success in logistics education is shaped by preparation, practice-based experience, and employability beliefs. This evidence provides a coherent basis for the discussion of theoretical and educational implications.

Table 5. Significant indirect effects

Indirect influence path	b	t	p
CA → CDC → WR	0.030	4.381	<0.001
CA → WR → PE	0.088	6.736	<0.001
CSP → WR → PE	0.205	12.383	<0.001
WR → PE → TOP	0.273	15.631	<0.001
IE → PE → TOP	0.207	12.771	<0.001
IE × WR → PE → TOP	0.102	7.428	<0.001

3.2. Discussion

The findings answer the research questions by showing that transition outcomes in logistics education are better explained by a pathway logic than by a simple input-output logic [1]–[5]. Educational preparation resources do matter, but their influence is transmitted mainly through students' work readiness and perceived employability rather than through direct effects alone [15]–[21]. This interpretation helps move the literature beyond the assumption that support and internship participation automatically generate positive transition outcomes [11]–[14].

The evidence for this interpretation is clear in the structural model. Work readiness strongly predicts perceived employability, perceived employability strongly predicts transition outcome perception, the interaction term is significant, and the direct path from internship effectiveness to transition outcome perception is not statistically significant. Taken together, these results indicate that internships matter educationally when they validate, reinforce, and extend students' readiness in ways that improve their employability beliefs.

For teaching and learning, the results suggest that logistics programs should not rely on disciplinary knowledge alone [6]–[10]. Instead, they should embed work-readiness development within classroom practice through simulations, authentic case analysis, reflective tasks, teamwork exercises, presentation practice, and structured career planning activities [15]–[18], [22]–[24]. The results also suggest that students need explicit support in translating what they learn into labor-market confidence, especially in application-oriented programs where employers expect practical workplace performance.

4. CONCLUSION

This study examined how logistics and supply chain management education supports students' transition from university to employment. The findings show that career support perception, career adaptability, and career decision clarity strengthen work readiness, while work readiness and internship effectiveness enhance perceived employability. Perceived employability is the strongest predictor of transition outcome perception, confirming that students' confidence in their labor-market capability is the central mechanism through which educational preparation becomes transition confidence. A key finding is that internship effectiveness does not directly predict transition outcome perception; instead, it contributes mainly by improving perceived employability and by strengthening the relationship between work readiness and perceived employability.

This study extends employability theory by positioning perceived employability as the most proximal psychological mechanism linking preparation resources to university-to-work transition outcomes. It also refines work-integrated learning and internship research by showing that internship effectiveness should not be understood simply as direct workplace exposure, but as a conditional educational mechanism that validates and amplifies the employability value of work readiness. In addition, the study integrates career construction theory, social cognitive career self-management, work-readiness research, and internship-quality research into a single logistics-education transition model. This integrated theorization moves the field beyond an input-output view of employability and explains transition outcomes as the result of aligned career resources, readiness development, internship quality, and employability beliefs.

Educationally, the findings suggest that logistics programs should embed employability development within the curriculum through simulations, case-based learning, project work, communication practice, teamwork, interview preparation, and structured reflection. Internship programs should include clear learning goals, meaningful workplace tasks, workplace supervision, academic feedback, and post-internship reflection so that internships become developmental experiences rather than placement requirements alone. The study remains limited by its cross-sectional design, self-reported data, and the weaker measurement quality of career decision clarity. Future research should test the model across disciplines, universities, and national contexts, use longitudinal designs, and refine the measurement of career decision clarity and internship-quality dimensions such as task meaningfulness, supervisor support, feedback frequency, and connection to program learning outcomes.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization

M : **M**ethodology

So : **S**oftware

Va : **V**alidation

Fo : **F**ormal analysis

I : **I**nterpretation

R : **R**esources

D : **D**ata Curation

O : **O**riginal Draft

E : **E**diting

Vi : **V**isualization

Su : **S**upervision

P : **P**roject administration

Fu : **F**unding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial, personal, academic, or professional interests that could have appeared to influence the work reported in this paper. No potential conflict of interest was identified. The authors take full responsibility for the content of the manuscript.

ETHICAL APPROVAL

This study involved voluntary participation in an anonymous online survey. All participants were informed of the academic purpose of the study, and informed consent was obtained prior to data collection. No personally identifiable information was collected, and the research was conducted in accordance with relevant institutional and national ethical principles for research involving human participants.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [ALN], upon reasonable request. The data are not publicly available because they contain information that could compromise the privacy of research participants. Any data sharing will be subject to ethical and privacy considerations.

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