

Enhancing undergraduates' career preparedness: environmental determinants and mediating role of resilience

Ainullutfi Azzman¹, Teoh Sian Hoon¹, Leele Susana Jamian¹, Nurhayani Romeo¹, Mohammad Hafiz Mohd Yusof², Koo Ah Choo³

¹Faculty of Education, Universiti Teknologi MARA, Bandar Puncak Alam, Malaysia

²College of Computing, Informatics and Mathematics, Universiti Teknologi MARA, Tapah, Malaysia

³Centre for Interaction and Experience Design, COE for Immersive Experience, Multimedia University, Cyberjaya, Malaysia

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ABSTRACT

Current environmental changes, combined with personal challenges, require further study to address the existing knowledge gap in career preparedness. Hence, this study aims to examine determinants of undergraduates' career preparedness by integrating environmental and psychological factors within an extended theoretical framework. Specifically, this study investigates the effects of resilience as a mediator in the relationship between environmental factors and career preparedness. This study used stratified purposive sampling to capture final-year undergraduates from universities in three main structures, namely research universities, non-research public universities, and private universities. A total of 409 undergraduates participated in this study. A correlational research design was employed for the investigation of the relationships. Structural equation modeling (SEM) was used to test the hypothesized relationships and mediation effects. The results indicated that environmental factors were a robust predictor of resilience (effect size, $f^2=1.377$) and exerted a small but significant direct effect ($f^2=0.051$) on career preparedness. Furthermore, resilience strongly predicted career preparedness ($f^2=0.450$). Overall, the findings show that resilience mediates the relationship between environmental factors and career preparedness. This study contributes to the literature by demonstrating that resilience-based activities, such as career planning and goal-setting sessions, should be focused on undergraduates who are participating in a constructive environment.

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Corresponding Author:

Teoh Sian Hoon

Faculty of Education, Universiti Teknologi MARA

42300 Bandar Puncak Alam, Selangor, Malaysia

Email: teohsian@uitm.edu.my

1. INTRODUCTION

Final-year graduates are not guaranteed employment and often face uncertainty when entering the workforce, requiring them to navigate career transitions and adapt to technological and environmental changes to remain career-ready [1]–[3]. This concern has intensified the focus on programmed outcomes in attitudes, behavior, and cognition, with policymakers relying on graduate employment data to assess educational relevance. Yet many students still experience stress and uncertainty about their future roles [4]–[8]. Consequently, career preparedness should be understood as a function of resilience and environmental support. It enables higher education to contribute to sustainable employability and lifelong learning beyond short-term outcomes [9]–[13]. Although previous studies have examined career

preparedness, limited research has explored how environmental factors and resilience interact in this process. Particularly, career preparedness is not merely determined by knowledge or skill a student acquires from university; it is a dynamic outcome of the individuals' attitudes and behaviors as they navigate around their environments [3], [4]. Students should adapt to the complexities of the current ecological and systemic situation that are affecting the job market demand. The various support systems in higher education may offer support or pose challenges to students, which in turn strengthen or weaken their resilience in their career pathway.

Grounded by the social cognitive career theory (SCCT) and the ecological systems theory (EST), this study aims to investigate these aspects to further understand career preparedness among university students. The previous research or discussions scarcely bring these two theoretical perspectives into an integrated discussion from the perspective of final-year students in the contexts of Malaysia. Most studies are dominated by SCCT perspective [14], [15] and are conducted in different geographical contexts such as in [16]–[18]. The novelty of this study lies in providing a holistic synthesis of a career preparedness model, interacting between SCCT and EST. This integrated model brings two crucial systems supporting a discussion on career readiness, namely the personal and environmental systems for undergraduate students.

The objective of this study is to examine the predictive relationships between environmental factors, resilience, and career preparedness. Specifically, the research investigates the direct relationship between these variables and determines the mediating effect of resilience in the pathway from environmental factors to career preparedness. The research questions (RQ) are:

- Is there any relationship between environmental factors and career preparedness? (RQ1)
- Is there any relationship between environmental factors and resilience? (RQ2)
- Is there any relationship between resilience and career preparedness? (RQ3)
- Is there any mediating effect of resilience in the relationship between environmental factors and career preparedness? (RQ4)

2. LITERATURE REVIEW

Universities play major roles to increase employability rates, which is also driving the economic growth. The growing emphasis on graduate employment rates has further shifted institutional priorities toward measurable outcomes, yet these indicators often function more as performative benchmarks in academia. It is expected that universities will operationalize these indicators into valid representations of career preparedness, while also masking issues such as underemployment and skill misalignment. This situation has been stressed to show how important it is to review and raise awareness about undergraduates who benefit from meaningful practices in the academic program's outcomes [19]. Hence, creating a constructive environment and integrating it into the academic program are crucial.

Despite structured programs and claims to produce “work-ready” graduates, persistent unemployment highlights a misalignment between educational outputs and labor market realities [20]. In response, the discourse increasingly emphasizes adaptability and soft skills, particularly resilience; this individualized framing risks obscuring systemic barriers and institutional responsibilities. Resilience, commonly associated with persistence and psychological fortitude, is connected to overcoming challenges [21]; however, its direct influence on employability is inadequately substantiated, particularly in volatile economic environments. Moreover, existing studies tend to isolate influencing factors, offering limited insight into how individual, institutional, and external forces like the environment interact in shaping career preparedness, which is crucial for understanding the comprehensive landscape of employability in today's job market.

2.1. Interplays between the theories

Career preparation involves awareness, which encompasses cognitive abilities such as knowledge and skills as well as personal factors like attitude and behavior. This awareness is necessary for them to commit to career decision-making [1], [22], [23]. Additionally, this understanding is clearly described in the SCCT [14] that illustrates students' career preparedness and career decision-making is developed through interplay between personal factors (cognitive career knowledge, other knowledge, skills; attitudes; interests and goals; behavior seeking information) and environmental factors (learning experiences and contextual supports). Hence, career preparedness is described as an emergent product of both personal and environmental factors [14]. Students' opportunities to develop career preparedness are exemplified through SCCT and Bronfenbrenner's environmental theory [24]. By referring to the integration, previous studies' results could be further affirmed with the support of these two theories. For example, previous studies emphasized the importance of students' traits that trigger avoidance or consciousness in determining careers [16] and made further observations regarding the process of making career decisions.

SCCT plays an important role in explaining how universities design their academic programs. In current modern education, universities are taking steps to embed valuable content with 21st-century skills as well as STEM skills. These efforts will shape students' cooperative abilities by prioritizing interaction among entities around them, like peers. These efforts also help people understand how different members of society and authorities are connected, as Bronfenbrenner's theory points out that a person's success comes from many interactions, like those with friends and the indirect connections between friends or between parents and teachers. It encourages the strength of social support and hence develops career self-efficacy.

Many studies underscore that both environmental support (mentoring, internships, and institutional career services) and individual beliefs and skills (self-efficacy, decision competence, and adaptability) were highly investigated. Furthermore, the focus includes investigating students' confidence to engage in decision tasks and provide the contextual resources necessary for those decisions to translate into effective job-seeking and early-career success [10]. The career support and learning opportunities in the environment may be perceived as unhelpful by students. However, if the environmental supports are more specific and meeting students' needs, they will be more likely to accept the opportunities. Hence, the interplay between the factors is ambiguous, which deserves further investigation.

2.2. Social cognitive career theory

SCCT provides guidelines on career preparedness. These guidelines emphasize individuals' cognition and affection which primarily reflects personal factors such as self-efficacy, outcome expectations, and personal goals, as well as their engagement in social activities that demonstrate how career preparedness is achieved [14], [17], [25]. Both personal and engagement factors shape an individual in selecting their career as they complement each other. Furthermore, the broader environment acts as a key driver, shaping both cognitive and social elements while directly impacting an individual's developing abilities [3], [5], [14].

According to Lent *et al.* [26], an individual's career development is highly associated with personal, behavioral, and environmental factors. From an environmental perspective, university students interact with numerous parties and environments, including the use of various technologies, communicating with different groups, and analyzing labor market conditions. Once they enroll in university, they are not only engaging in learning content, lecturers, and friends but also to discover others in the environment [27]. For learning content, a university offers up-to-date programmed that provide opportunities to develop relevant skills and knowledge through interaction with experts, industries, and environments. For example, students have opportunities to engage in fieldwork that is led by their lecturer or mentors in the university [28].

University students have opportunities to develop relevant skills and knowledge because most universities offer up-to-date programmed. They also gain opportunities to socialize and build connections with those around them because their university provides a supportive environment [3], [8], [17], [25]. The interaction of environment and individual capabilities, as well as self-resilience, enables them to navigate the journey, particularly in adapting to the academic and social challenges they face during their university experience. These experiences may vary depending on the universities' transformations and changes in policies. Moreover, the support provided by their universities, such as academic and psychological support, can reduce anxiety while improving students' skills and resilience in facing academic and career challenges [14], [24].

Therefore, based on the SCCT theory, an individual must have the inner strength to effectively navigate the process of adapting to learning environments, overcoming learning difficulties, mastering new technology, and engaging in other challenges. Their awareness of coping with all challenges and bouncing back from difficulties is highly essential. The challenges include achieving satisfactory results despite various constraints, such as adapting to new technology and the increasing difficulty of the syllabus. Along the way of equipping themselves with knowledge and skills, being aware of their abilities and ways to cope is essential. Their abilities to bounce back from difficulties strengthen them. Hence, universities should provide holistic opportunities for career development that extend beyond classroom learning. Such development includes providing structured career guidance, industry engagement, and skill-based programs [25]. Lecturers and academic staff, together with career services units and institutional leadership, play an important role in preparing students with technical skills and soft skills. In addition, the availability of resources, such as guidance, industrial training, and training platforms, enhances graduates' readiness to face the demands of a dynamic job market. These contexts were supported in previous studies, which suggest that quality resources, including teachers as a resource, as well as the skills acquired, can meet graduate outcomes and subsequently increase their confidence in the job market [3], [10], [17].

Career preparedness does not rely solely on university resources; it also depends on an individual's attitude toward utilizing these resources [2], [3], [5], [14], [17]. Individuals who appreciate all these opportunities will make full use of them. With this effort, they can prepare themselves. Additionally, these students need to be trained to be flexible and solve problems alone. Rich resources, combined with a strong mentality, enhance career preparedness. According to the SCCT, support from institutions helps students

build confidence in their skills and allows them to adjust positively when they encounter challenges in their career paths. Even though it is difficult to inculcate resilience, these kinds of cultures can be embedded in classroom activities. Despite all the arrangements and efforts, addressing these considerations may require additional attention. Hence, individual development is required among the students. Promoting problem-solving and adaptive activities remains essential for building resilience and sustaining career preparedness [2], [12].

2.3. Environmental factors: ecological systems theory

Bronfenbrenner's EST [24] explains the influence of environmental factors on individual development, such as career preparedness development. The microsystem involves the immediate environments an individual directly interacts with. The interaction between an individual and other parties, such as friends, parents, and teachers, as well as organizations such as universities, can significantly influence career preparedness [24]. Hence, the ways in which the microsystem influences career preparedness could be observed from not only direct support in terms of resources such as finance and references but also interactions that engage students to acquire a picture of careers. This process can enhance students' motivation, skills, and perceptions of career preparedness.

The mesosystem refers to the interconnection between two or more microsystems, which provides avenues to build students' confidence and job readiness. This process happens because when two parties are connected, one party that is close to the students (such as parents, teachers, or peers) gains input and may share opportunities or input that support career preparedness [24]. This indirect support is becoming stronger when the student engages in searching more information based on information received in the two parties' interaction.

These inputs arise from the interactions between the two parties. Alternatively, one party may initiate the establishment of connections that indirectly foster positive intuition in the student. For example, when a lecturer or an expert discusses career challenges in a discourse, the content of that discussion can offer useful advice to the student if it is later shared or highlighted in their interactions. On the other hand, students may reinforce their understanding through repeated exposure to information and consistent interactions with key individuals. Practically, mesosystems create opportunities for employment by fostering engagement between industry and universities. The linkages enhance opportunities to get a job. This system is useful as it provides silent support for further integrating motivation or guidance and provides the necessary linkages between settings of the career situation and students' abilities. It creates more opportunities and builds confidence to explore more areas of career.

This study examines how environmental factors and resilience influence career preparedness among undergraduates in Malaysia. Most importantly, the investigation focuses on the extent to which environmental factors provide direct and indirect effects on career preparedness. The indirect effect is observed in how resilience plays a role in enhancing the relationship between career preparedness and environmental factors. Furthermore, these relationships are observed in specific dimensions of resilience (future orientation, tenacity, and developmental adaptability), environmental factors (microsystem, mesosystem, and exosystem), and career preparedness (attitudes, knowledge and skills, and behavior). These dimensions have their indicators as measured in questionnaire items. Thus, the higher-order (HO) constructs (career preparedness, resilience, environmental factors) are represented by the lower-order (LO) dimensions that have their indicators as measured in questionnaire items. Figure 1 illustrates the scopes of indicators for each LO dimensions. For example, for microsystem, the indicators include university, curriculum, and lecturer aspects.

All the dimensions effectively represent the relevant factors. Specifically, the environmental factors are well reflected mainly on microsystem, mesosystem, and exosystem as introduced in EST [24]. Specifically, the input of microsystem includes knowledge, skills, resources regarding careers, and encouragement. Learners would be motivated if a mesosystem existed through connections between family members and other parties. It may provide opportunities for them to engage with industries or develop their careers. In the mesosystem, families, as direct careers who are consistently concerned about their children, are becoming increasingly important in partnerships with schools because they can assist their children in various aspects and provide numerous opportunities [29]. Collaboration between universities and industries, or any two microsystems that could enhance graduates' career aspirations, forms this mesosystem.

Grounded in SCCT, equipping undergraduates with knowledge for the development of cognition is always in the university's planning for developing career skills [14], [30]. However, there is a growing understanding that the interplay between individual agency and broader ecosystem factors shapes career outcomes [14], which are observed from career preparedness. In the contemporary undergraduate experience, the transformation of characters or attitudes requires closer attention for career preparedness [2], [11], [12], [31]. While advanced technology and modern digital facilities provide unprecedented access

to information, the oversupply of knowledge in turn inadvertently lowers undergraduates' confidence and causes cognitive passivity [9], [30], [32], as seen in resilience. Consequently, the easy, smooth process of obtaining the latest and up-to-date information, unfortunately, develops the risk of reduced critical thinking and deep cognitive engagement [3], [31], which can hinder undergraduates' ability to analyze information critically and apply it effectively in real-world situations. Also, the widespread use of modern technology has led to less meaningful social interaction, which could weaken the development of important skills needed for careers, as emphasized in SCCT.

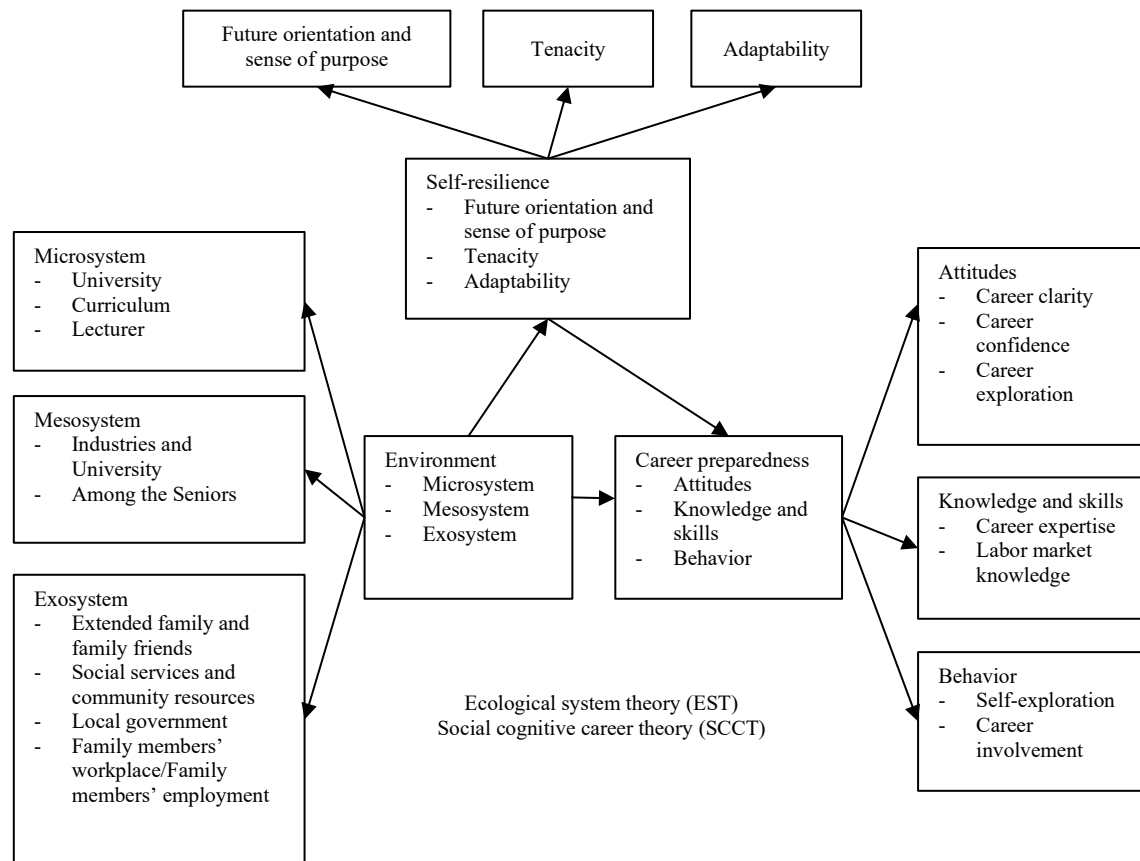


Figure 1. Conceptual representation of microsystem, mesosystem and exosystem influences on career preparedness with the mediating effect of resilience

3. METHOD

3.1. Research design

This study employed a quantitative correlational research design to examine the relationships among key constructs. These variables were directly observed from the participants naturally, without any manipulation of the study environment [33], [34]. Additionally, the data for all variables was collected from the same respondents. This research design provides a systematic approach for examining the strength and direction of relationships among them. The investigation involves constructing models that include available predictors of environmental factors and resiliencies, along with the predicted variable of career preparedness.

3.2. Sampling

Data were collected using an online questionnaire through randomized invitations to the final-year undergraduate students across Malaysian universities. Participation in this study was voluntary, and data collection was limited to final-year students, as they are considered the most relevant cohort for evaluating employability readiness before transitioning into the labor market. This study was conducted to capture the career preparedness of undergraduates whose backgrounds were from three main structures, namely: i) research universities; ii) non-research public universities; and iii) private universities. Stratified purposive sampling was employed to ensure inclusion of samples from these three types of universities. Hence, an equal number of questionnaires were distributed to the universities. The return rates were based on the

voluntary responses among the universities. A total of 409 participants who volunteered to participate came from the three main structures of backgrounds, thereby 75% from public universities (research and non-research universities) and 25% from private universities. The sample size is sufficient to represent the target population, as it exceeds the minimum requirement of 385, promising a normal distribution [35], [36]. Prior to participation, informed consent was obtained from all respondents, and they were briefed on the objectives and confidentiality procedures of the research. Ethical principles regarding voluntary participation, anonymity, and data protection were strictly adhered to throughout the study.

3.3. Measurement and instrumentation

The instrument items focused on students' university experiences and how they coped with academic and career-related challenges in relation to their overall career preparedness. The instrument consisted of multi-item scales (1=strongly disagree to 10=strongly agree), measuring three major constructs. Firstly, construct career preparedness [37], [38] was operationalized based on subdimensions of career attitude (9 items), career knowledge and skill (8 items), and career behavior (6 items). Secondly, construct of environmental factors [39]–[41] was conceptualized through dimensions of microsystem (e.g., university curriculum, faculty support with 14 items), mesosystem (e.g., industry linkages, peer networks with 7 items), and exosystem (e.g., family/community support, policy context with 15 items). Finally, construct resilience was conceptualized based on research work [42] and focus on orientation (6 items), tenacity (4 items), and adaptability (4 items).

3.4. Data collection

This study analyzed data on three constructs, namely environmental factors, resilience, and career preparedness, among the target population of Malaysian final-year undergraduates. In addition, three university experts validated the research instruments to establish the constructs and items. The study employed a stratified purposive sampling technique. The selected samples were collected within the targeted population across Malaysian universities. The sampling frame was limited to three universities representing northern, central, and southern regions of Malaysia to ensure coverage of research universities, non-research universities, and private universities. After obtaining the research ethics approval from the university, permission was granted by the selected universities to conduct physical data collection through intact classrooms in the respective institutions. The final sample size depended on the participants' willingness to respond to the questionnaire.

3.5. Data analysis

Data were analyzed using partial least squares structural equation modeling (PLS-SEM) via SmartPLS 4. Following the guidelines by Sarstedt *et al.* [36], two main analytical stages (measurement model and structural model) were undertaken. Firstly, the measurement model in Figure 2, was constructed in the process of validation of the items. Secondly, the structural model in Figure 3, was constructed to present the findings of the study by assessing path coefficients (β), t-values, p-values via bootstrapping (5,000 resamples), as well as coefficient of determination (R^2).

The following discussion provides interpretations about the measurement model of this study. It provides a detailed description of reliability and validity across all constructs to establish both the consistency and appropriateness of the instrument for the study. The measurement model in Figure 2, was constructed to establish reliability and validity. The model consists of nine low-order constructs (LOCs) from three factors, namely environmental factors with LOCs microsystem, mesosystem, and exosystem; resilience with LOCs orientation, tenacity, and adaptation; career preparedness with LOCs attitudes, knowledge and skills, and behavior. Table 1 presents the summary for the measurement model. The results include the indicator reliability for LOCs, as well as the convergent validity for higher-order construct (HOC). In summary, results for LOC show that all outer loadings are more than 0.70 and contribute to good reliability. Results for HOC generally show that the secondary loadings were more than 0.899. These results could proceed with a structured model with the beginning structured paths as listed in the research questions.

For LOCs, Figure 2 shows all indicators have outer loading of more than 0.70, indicating that all indicators share a high degree of common variance with the respective LOCs. For example, the indicators for behavior in career preparedness range from 0.855 to 0.917. For HOCs, Figure 2 shows all HOCs (environment, resilience, and career) have high loadings (between 0.899 to 0.967) on their LOCs. For example, resilience has a high loading of 0.967 on orientation.

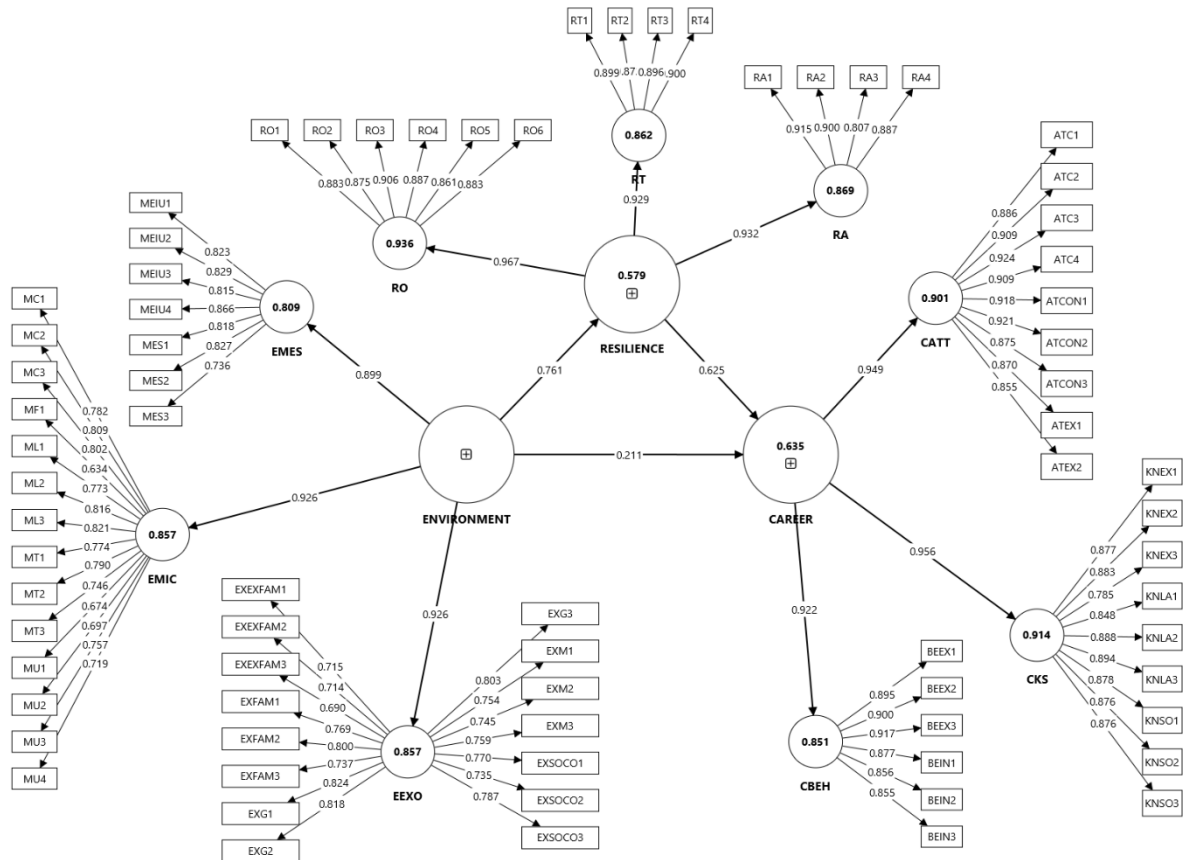
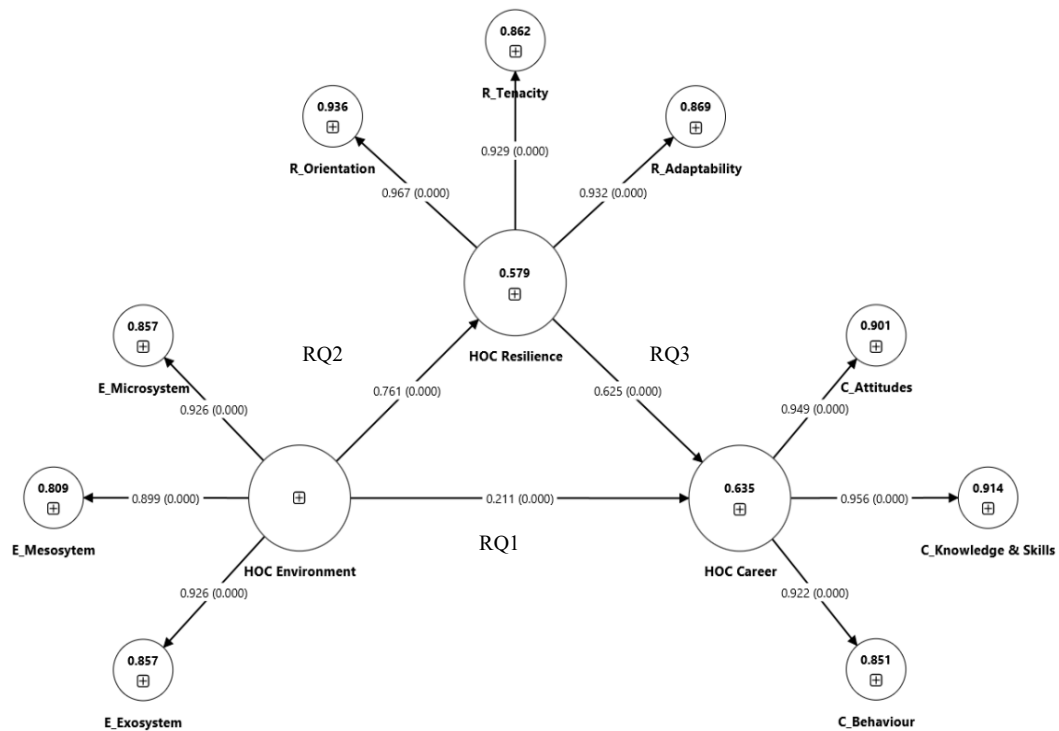


Figure 2. Measurement model (factor loading for the 1st and 2nd order)

Figure 3. Structural model with 2nd measurement loadings and R^2

Additionally, all constructs in Table 2 achieved composite reliability (CR) values well above the minimum threshold of 0.70, ranging from 0.931 to 0.982. The Cronbach's alpha values, which indicate internal consistency, were also strong, ranging from 0.901 to 0.981, indicating that each construct is stable and reliable. Convergent validity refers to the extent to which the indicators of a construct are highly correlated with each other and can adequately explain the construct [36]. Two main criteria are used to confirm convergent validity: average variance extracted (AVE) and loading factors. For convergent validity, all constructs showed AVE values ≥ 0.50 , which is the minimum requirement indicating that the construct can explain at least 50% of the variance of its indicators [43]. In addition, the loading factors for all items are satisfactory, ranging from 0.899 to 0.967 namely more than the threshold value of 0.700, indicating that all items contributed significantly to its respective construct. Besides, the discriminant validity was established based on the heterotrait-monotrait ratio (HTMT), with a threshold value less than 0.850 or 0.900. In Table 3, it shows all the values of HTMT are below 0.900, indicating the constructs are distinct from each other, significantly discriminant in the relationship.

On the other hand, to test the assumption of collinearity, the variance inflation factor (VIF) was confirmed. In this study, the results show that all indicators and relationships in the model have VIF values ranging from 1.000 to 2.377, displaying values below the recommended threshold of 5.0 [36]. This proves that no multicollinearity problem could disrupt the stability of the model estimation. Overall, the results confirm that the constructs were well-defined, with indicators that reliably measure their intended concepts and were clearly distinct from one another.

Table 1. Summary for the measurement model

Level	Criteria in the assessment	Result of the model
LOC	Indicator reliability	Outer loadings >0.700 ; mostly report >0.800
HOC	Convergent validity	Secondary loadings (HOC $\rightarrow$ LOC) >0.899
Model	Structural path	Environmental factors $\rightarrow$ resilience (0.761) Resilience $\rightarrow$ career preparedness (0.625)

Table 2. Construct reliability and validity

Construct	Items	Cronbach's alpha	CR (rho c)	AVE	Loading	Fornell-Larcker criterion	VIF
C_attitude	9	0.969	0.974	0.804	0.949	0.897	1.000
C_behaviour	6	0.944	0.955	0.781	0.922	0.884	1.000
C_knowledge_skills	9	0.959	0.965	0.753	0.956	0.868	1.000
E_exosystem	14	0.948	0.954	0.581	0.926	0.762	1.000
E_mesosystem	7	0.917	0.933	0.667	0.899	0.817	1.000
E_microsystem	13	0.943	0.950	0.576	0.926	0.759	1.000
R_adaptation	4	0.901	0.931	0.772	0.932	0.879	2.377
R_orientation	6	0.943	0.955	0.779	0.967	0.883	1.000
R_tenacity	4	0.914	0.940	0.795	0.929	0.892	1.000

Table 3. HTMT for establishing discriminant validities

Relationship	HTMT value
Career preparedness $\leftrightarrow$ environmental factors	0.702
Career preparedness $\leftrightarrow$ resilience	0.805
Environmental factors $\leftrightarrow$ resilience	0.748

4. RESULTS

After the measurement model was validated, the assessment of the structural model in Figure 3, was conducted to determine the strength of the relationships between constructs, the explanatory power of the model, as well as the mechanisms of direct and indirect effects. The relationships based on path coefficients were investigated in line with the research questions (RQ1, RQ2, and RQ3), as presented in Figure 3. Additionally, R^2 values in Figure 3 were referred to address RQ4. Bootstrapping with 5,000 subsamples is used to obtain coefficient values, t-statistics, and p-values for all hypotheses as presented in Table 3 [36].

Referring to Figure 3, which presents the dimensions of the variables (environmental, resilience, and career preparedness) with the path coefficients, the discussion of the findings related to the research questions (RQ1, RQ2, and RQ3) are discussed. The relationships were directly identified in the second order that consists of constructs: environmental factors, resilience, and career preparedness. Particularly, the dimensions of each construct were assessed in the first order. The constructs were represented by the dimensions, which were reflected in the items.

4.1. Findings for RQ1, RQ2, and RQ3

Table 4 is presented to provide a summary of findings for RQ1, RQ2, and RQ3. Table 5 provides a clear description and summary of the dimensions for the variables of environmental factors, resilience, and career preparedness. Table 4 presents the results of hypothesis testing for the direct effects in the second outer layer, specifically the relationships between environment and career preparedness, environment and resilience, as well as resilience and career preparedness. The significant values of the t-statistics were identified to determine the significance of the results. Additionally, the effect size (f^2) serves as a guide to justify the strength of the relationship between the investigated factors. While Table 4 presents the statistical relationships between the variables for the stated research questions, Table 5 reports the descriptive statistics to further illustrate the mean values of each variable and its dimensions. The variables are career preparedness, environmental factors, and resilience.

Table 4. Hypothesis testing for the direct effects in the second stage (HO) model

Research question	Relationship	Path coefficient (β)	Significance (p)	T statistics	Effect size (f^2)	Interpretation
RQ1: is there any relationship between environmental factors and career preparedness?	H1: there is a relationship between environmental factor and career preparedness	0.211	0.000	3.491	0.051	H1 is supported, mild positive relationship but significant direct effect
RQ2: is there any relationship between environmental factors and resilience?	H2: there is a relationship between environmental factor and resilience	0.761	0.000	22.123	1.377	H2 is supported, strong positive relationship
RQ3: is there any relationship between resilience and career preparedness?	H3: there is a relationship between resilience and career preparedness	0.625	0.000	11.293	0.450	H3 is supported, more dominant predictor of career preparedness

Table 5. Descriptive statistics for each dimension

Construct	Dimension	Mean	Std. Deviation
Career preparedness	Overall	8.50	1.187
	Attitudes	8.56	1.282
	Knowledge and skills	8.34	1.281
	Behavior	8.66	1.187
Environment	Overall	8.36	1.113
	Microsystem	8.56	1.071
	Mesosystem	8.10	1.384
	Exosystem	8.28	1.264
Resilience	Overall	8.59	1.126
	Orientation and sense of purpose	8.62	1.177
	Tenacity	8.64	1.181
	Adaptability	8.50	1.224

Table 5 provides more information in describing each dimension for environmental factors, resilience, and career preparedness. Students rated overall at 8.50 for career preparedness, with the highest dimensions of behavior (mean=8.66), attitudes (mean=8.56) and knowledge and skills (mean=8.34). Overall, they rated their career preparedness level as more than satisfactory, with an average rating of over 8.00 out of 10. Descriptively, the undergraduates rated their behavior (mean=8.66) and attitudes (mean=8.56) higher than knowledge and skills (mean=8.34), indicating that while descriptively they showed more satisfaction with their behavior and attitudes, they perceived their knowledge and skills as lower. These findings suggest that an individual who shows confidence in his or her behavior and attitudes have the potential to demonstrate resilience, but they need more structured knowledge to aim for goals in their future careers [5], [17].

On the other hand, the overall mean for environmental factors was 8.36, with the dimension of the microsystem showing the highest mean (mean=8.56), followed by the exosystem (mean=8.28) and the mesosystem (mean=8.10). Overall, undergraduates rated the environmental factors as more than satisfactory. Nevertheless, the microsystem appeared to be the highest rating among the three dimensions. This indicates that undergraduates interact more frequently within microsystems. These findings align with previous findings that undergraduates are significantly influenced by direct and immediate interaction with their surrounding support systems, including teachers, family members, peers, and the university [4], [5]. These support systems provide them with information and knowledge, in addition to offering support. Hence, focusing on the microsystem is valuable for undergraduates to gain confidence and experience.

Specifically, in terms of resilience, they rated the highest in tenacity (mean=8.64) compared to orientation and sense of purpose (mean=8.62) and adaptability (mean=8.50). Overall, they rated their resilience level as more than satisfactory, with an average rating of over 8.00 out of 10. These findings indicate that the undergraduates were more determined. They persisted in coping with their endeavors. Although they rated themselves as less proactive in adjusting to current situations, their levels of goal orientation and adaptability were nearly as high as their tenacity. Furthermore, transitioning from university to the job market needs more adaptability and not just tenacity. Previous studies highlighted that career preparedness involves proactive career planning; adaptability to current practices by modifying previous practices; and readiness to cope with employment transitions [5], [37]. Hence, undergraduates need more exposure to career talks for setting more reliable job directions.

4.1.1. Findings for RQ1

Regarding the RQ1, the hypothesis in Table 3 is supported since $t\text{-value}=3.491$, $p<0.05$. The results indicated that environmental factors had a statistically significant but small effect ($f^2=0.051$) on students' career preparedness with $\beta=0.211$, $p<0.001$. This meant that environments such as universities, families, and social support helped shape career preparedness, but their influence was not very strong. These findings aligned with social ecological theory, which viewed the environment as a supportive factor rather than a primary factor in individual career development. Descriptively (refer to Table 5), the influence of the microsystem was the highest, as it shows the highest mean score compared to the mesosystem and exosystem. Microsystem provides opportunities for students to communicate directly with anyone around them, allowing them to improve their skills and knowledge.

Although the impact was small, this relationship remained important because empirical data emphasized that a supportive environment could provide students with opportunities, access, and early exposure [44]. However, when students do have the internal capacity to take advantage of such supports, the environmental impact on career preparedness becomes limited [3], [10], [17]. This conclusion shows that providing a conducive environment alone was not enough to ensure that students are truly prepared to enter the workforce. Overall, environmental factors directly contribute to career preparedness, but they are not the main determinants.

Although the microsystem and exosystem were very important in shaping the student's environment, their direct effect on career preparedness was small [45]. This suggested that the environment primarily served as basic support, while students' career preparedness remains highly dependent on their efforts and abilities. Therefore, a favorable environment needs to be accompanied by students' internal strengths to ensure they are truly prepared to enter the workforce [2], [3], [5], [12], [17].

4.1.2. Findings for RQ2

Regarding the RQ2, the hypothesis in Table 3 is supported since $t\text{-value}=22.123$, $p<0.05$. The results showed that environmental factors had a positive and moderate impact on students' resilience, with a beta coefficient of $\beta=0.761$ and a significance level of $p<0.05$. The findings demonstrated that environment is a significant factor in increasing resilience with a strong effect size ($f^2=1.377$). Students who were in a more supportive, stable, and positive environment have higher levels of resilience, as this environment most likely provides emotional support, learning opportunities, and challenging experiences, enabling students to adapt and manage anxiety. These findings indicated that the environment requires greater focus to enhance resilience, as effort is not merely an intrinsic characteristic of students but is influenced by continuous interactions between individuals and their surroundings. These findings supported previous findings that institutions, families, and communities that play crucial roles in building student resilience should provide an environment that supports students' personal development [10]. On the other hand, the descriptive results in Table 5 showed that among the dimensions of resilience (orientation of goals, tenacity, and adaptability), tenacity was rated the highest (mean=8.64; overall mean is 8.59) compared to orientation of goals (mean=8.62) and adaptability (mean=8.50), indicating that to remain enhancing self-resilience, individuals are suggested to be persistent and endure all difficulties so that they successfully adapt throughout the learning and development processes in achieving the goal. These findings echo the discovery that grit [12], [31], also known as tenacity, essentially fosters one's resilience in striving for success factors which has a statistically significant but small effect.

4.1.3. Findings for RQ3

Regarding the RQ3, the hypothesis in Table 3 is supported since $t\text{-value}=11.293$, $p<0.05$. The findings of this study indicated that resilience contributed greatly to students' career preparedness ($\beta=0.625$, $p<0.05$). The findings demonstrated that resilience is a significant factor that influence career preparedness with a moderate strong effect size ($f^2=1.377$). The literature has emphasized that students who are resilient,

adaptable, and persistent are more prepared to face challenges and uncertainties in their future careers [46], [47]. Among all the relationships (environmental factors and career preparedness; resilience and career preparedness) tested, resilience emerged as the most dominant factor in predicting students' career preparedness. The results suggest that resilient students possess the special ability to adapt, maintain clear direction, and persevere when facing challenges, as assessed in the instrument. Practically, these findings imply that activities on career preparedness enhancement should greatly focus on building student resilience, rather than solely on career exposure or training

4.2. Findings for RQ4

Figure 4 is presented to illustrate and summarize the structure model in Figure 3. Specifically, it emphasizes the path coefficient between environmental factors and resilience ($\beta_{\text{environment \& resilience}}=0.761$), the path coefficient between resilience and career preparedness ($\beta_{\text{resilience \& career preparedness}}=0.625$), and environmental factors and career preparedness ($\beta_{\text{environment \& career preparedness}}=0.211$). These relationships are essential to presenting direct effects and indirect effects of the relationships in the structure model. Both direct and indirect effects contribute to the total effects. Specifically, Figure 5 demonstrates the calculation of the coefficients of both effects and the total effect of the relationships.

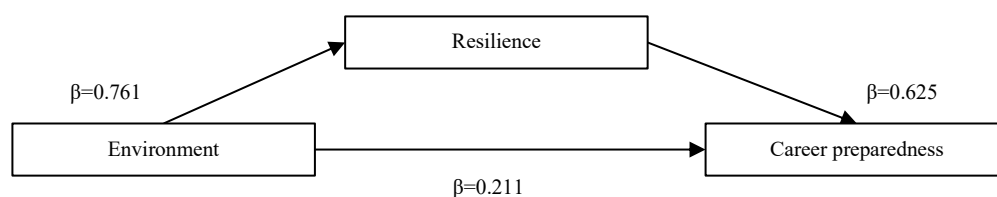


Figure 4. Mediating effect of resilience

$$\begin{aligned}
 \text{Total effect} &= \text{indirect effect} + \text{direct effect} \\
 &= (\beta_{\text{environment \& resilience}} \times \beta_{\text{resilience \& career preparedness}}) + \beta_{\text{environmental \& career preparedness}} \\
 &= (0.761 \times 0.625) + 0.211 \\
 &= 0.475 + 0.211 \\
 &= 0.686
 \end{aligned}$$

Figure 5. Estimation of the total effect

Table 6 reports the total effect, calculated as the sum of the direct and indirect effects, as shown in Figure 5. In line with RQ4, the analysis examined the direct and indirect effects of environmental factors on career preparedness, with resilience serving as a mediating variable. The estimates were generated using the bootstrapping procedure with 5,000 subsamples. The hypothesis is supported since $t\text{-value} = 14.138$, $p < 0.05$. Hence, there is sufficient evidence to conclude that resilience significantly mediates the relationship between environmental factors and career preparedness.

The total effect shown in Table 6 was referred to, and computation was performed in Figure 5 to obtain the indirect effect coefficient and the total effect coefficient of the relationship. Figure 5 illustrates that the indirect effect ($\beta_{\text{indirect}}=0.475$) of the environment on career preparedness, mediated by resilience, is calculated by multiplying $\beta_{\text{environment \& resilience}}$ with $\beta_{\text{resilience \& career preparedness}}$. The combination of indirect effect ($\beta_{\text{indirect}}=0.475$) and the direct effect ($\beta_{\text{direct}}=0.211$) provides the total effect of $\beta_{\text{total}}=0.686$, indicating that resilience partially mediates the relationship.

Table 6. Total effect

Research question	Relationship	Path coefficient (β)	Significance (p)	T statistics (O/STDEV)	Interpretation
RQ4: is there any mediating effect of resilience in the relationship between environmental factors and career preparedness?	H4: resilience significantly mediates the relationship between environmental factors and career preparedness	0.686	0.000	14.138	H4 is supported, there is a significant effect in career preparedness via resilience mediation. Path coefficients of the direct effect is 0.211 (as stated in H1) and total effect is 0.686

Figure 3 shows the contributions of environmental factors and resilience to career preparedness in terms of R^2 were further interpreted. A total of 57.9% with $R^2=0.579$ of the variation in resilience was explained by the environmental factors. Similarly, a total of 63.5% with $R^2=0.635$ of the variation in career preparedness was explained by the environmental factors and resilience. The significance of analyses suggests a parsimonious model for the career preparedness of undergraduates as measured in attitudes, behaviors, and knowledge. These results confirm that environmental factors show mild direct effects on career preparedness but provide strengths to enhance undergraduates' resilience, enabling them to develop career preparedness. The partial mediating effect suggests that undergraduates' resilience acts as a mediating factor that strengthens the link between environmental influences and career readiness.

5. DISCUSSION

This study expands the understanding of career development in higher education by showing that university students' career preparedness is more influenced by the interaction between environmental context and internal psychological resources than by the direct impact of institutional provision, such as organizing training to ensure students' success. While the university environment provides essential structural support, the study's findings suggest that this support only becomes meaningful when mediated by students' resilience. The findings are supported by empirical studies on the significance of resilience in career development [11]. Moreover, ecological theory has placed the importance of the individual as the nucleus of all factors to influence a certain ecological phenomenon such as the new careers model. An individual who is healthy and engaging in the environment reacts as a unit of the environment, hence he or she is influenced by the entities in the environment. Hence, the discussion of the influences is valued for the development [8], [15]. The SCCT has also placed both individual factors and social factors for influencing career selection and preparation. The cognitive and social connectedness aspect of the acquisition of knowledge and skills are important [7].

The direct effect of environmental factors on career preparedness, though small but significant, suggests that universities serve as the provision of career, curriculum, or industry exposure may contribute to graduates who are truly prepared for the workforce. This finding challenges the instrumental approach to graduate employability, which often emphasizes institutional inputs and employment indicators as the primary measures of higher education success. Instead, career preparedness should be understood as a developmental outcome that is gradually shaped through learning experiences at the university. These experiences could be evident in students' campus life through the practice of self-regulation, collaboration with educational institutions, and the development of soft skills during experiential learning at university [3], [10], [25], [32]. More career-oriented activities and services should be provided in the universities' environments exposure on career should be given to students at the early stage or in their final year studies. Career mindsets should be an imperative exposure in modern higher educational environments.

The significant relationship between environmental factors and self-resilience emphasizes the role of higher education as a development ecosystem that shapes students' psychological capacities. A supportive learning environment, meaningful academic relationships, and exposure to real-world challenges have the potential to strengthen students' ability to adapt, be resilient, and maintain a future-oriented mindset. Furthermore, from an ecological perspective, universities not only act as service providers but also as a development context that enables students to learn how to manage career uncertainty and complexity. In this context, resilience emerges as the most dominant predictor of career preparedness, underscoring its role as a core psychological resource in student career development. Additionally, students who have the ability to cope with stress, rebound from failure, and maintain long-term goals are found to be more prepared to navigate an increasingly uncertain job market. In this context, career preparedness goes beyond merely mastering skills and labor market knowledge; it encompasses the psychological capacity to respond constructively to change and uncertainty. In the new economic world and post-pandemic era, there is uncertainty, and many factors influence the demand and changes of the new economic and business landscape, resulting changes in the demand for employment types and requirements.

The mediation results suggest that psychological processes, particularly resilience, help explain how the higher-education environment translates into career preparedness. Environmental factors were found to contribute more indirectly through the shaping of attitudes, behaviors, knowledge, and students' resilience, rather than through direct influence. This indicates that the effectiveness of institutional interventions largely depends on the extent to which students can interpret, appreciate, and utilize the opportunities provided.

This study offers insights about how career preparedness can be modelled based on environmental factors. The results expand the understanding that undergraduates' career preparedness is more influenced by the interaction between environmental context and internal psychological resources, namely resilience, than by the direct impact of environmental factors [2], [5], [17]. It reveals that the mediator (resilience) plays

a strong role in transmitting the effect of environmental factors and career preparedness. While the undergraduates are receiving essential structural support within the environment, the study's findings suggest that this support only becomes meaningful when mediated by student self-resilience.

From the perspective of Bronfenbrenner [48], the environmental influences on students' development are multilayered (micro, meso, exo, macro, and chrono) rather than following simple linear paths. Individuals interact with components around them, such as facilitators, peers, experts, and parents, as well as indirect connections, such as connections between parents and colleagues [49]. Individuals' acceptance of the environment typically weakens the direct pathways from the "environment" to career preparedness. The SCCT posits that environmental factors, including social support, role models, and resource accessibility, commonly interact with cognition in promising career development [50]. Hence, a mediator of resilience plays a significant role in fostering career preparedness.

Overall, the findings of this study suggest that effective career development in higher education requires an integrated approach that goes beyond merely providing structures and programs. Universities need to deliberately design learning environments that not only support academic achievement and career exposure but also cultivate internal psychological resources, particularly resilience. Such an approach has the potential to produce graduates who are not only ready to enter the job market but also capable of building sustainable careers in the long term.

6. IMPLICATIONS OF THE STUDY

Firstly, this study establishes the integration of the SCCT and the EST, demonstrating that students' career preparedness is simultaneously influenced by the individuals that are supported with cognition and environmental factors. While the environment provides context, psychological mechanisms, namely resilience, serve as pathways that translate environmental support into positive career outcomes. Secondly, this study provides practical implications through empirical evidence that resilience serves as an internal factor, helping individuals adapt to challenging environments and proactively secure career preparedness by leveraging opportunities with clear goal orientation, creativity, and positive attitudes. Universities play a critical role in enhancing undergraduates' engagement in class by providing them with opportunities to respond to various initiatives, such as solving real-world problem-solving scenarios that foster resilience and adaptability.

7. CONCLUSION

This study shows that university students' career preparedness is largely influenced by their own internal factors, especially the way they think, act, and their ability to overcome challenges. Although universities provide various forms of support, the main role of that environment is to help strengthen students' confidence and build their career skills. Resilience was found to have a significant direct effect on career preparedness, signifying that students who are more persistent, flexible, and have a clear future outlook are better prepared to face uncertainties in the job market.

Therefore, universities need to ensure that student development not only relies on providing a curriculum, industry exposure, and academic support, but also includes efforts to strengthen students' psychological resilience. Training that focuses on adaptability, stress management, and building a career identity can help students transition into the workforce with greater confidence and effectiveness. Such an approach ensures that graduates possess not only technical skills but also strong mental and emotional capabilities to succeed in the career world.

Nevertheless, the limitation of the study lies in the fact that the samples were randomly selected among the undergraduates in Malaysia. Since the data is confined to a single country, the findings on environmental factors, resilience and career preparedness may not be easily generalized to students in other countries with different educational and cultural contexts. Although there was data collected from students at research universities, non-research public universities, and private universities, there is no comparative analysis conducted. Future research can use comparative analysis between these institution types; public and private universities, as these two types are exploring different advanced sustainability educational landscapes that aim for a balanced integration of environmental, social, and economic considerations, thereby providing specific programmed structures. Additionally, the study does not detail exactly how these varying program structures manifest in a university's microsystem, such as differences in specific curriculum designs, faculty support, or industry linkages. Overall, the study does not detail how distinct Malaysian cultural altitudes, economic conditions, or national policies actively influenced the students' resilience or career behaviors. Conversely, the study relied entirely on quantitative correlational design using an online questionnaire. This lack of deeper contextualization aligns with the conclusion, so future studies are encouraged to incorporate qualitative research methods which would provide deeper understanding and reveal how resilience plays a role within the different university environments.

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AUTHOR CONTRIBUTIONS STATEMENT

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Ainullutfi Azzman	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	
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Mohd Yusof														
Koo Ah Choo				✓	✓		✓			✓		✓	✓	✓

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 no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

This study was approved by the UiTM Research Ethics Committee (REC) prior to data collection (Ref: REC/03/2024 (ST/MR/53)); Approval Period: October 2, 2023 – October 1, 2026).

DATA AVAILABILITY

The data obtained from this study are available from the authors.

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BIOGRAPHIES OF AUTHORS



Ainullutfi Azzman    is a Ph.D. candidate in Education Management at Universiti Teknologi MARA (UiTM) Puncak Alam, where he explores the intersection of organizational leadership and student success. He earned his master's degree in Family Counseling from Universiti Sains Islam Malaysia (USIM) in 2022, providing him with a unique psychological foundation that informs his current academic pursuits. His doctoral research focuses on career development and preparedness among undergraduates, specifically utilizing the lens of ecological systems theory to understand how multi-layered environmental factors influence a student's transition into the workforce. Beyond his core studies, he is highly skilled in both qualitative and quantitative data analysis, possessing specialized proficiency in SmartPLS for structural equation modeling. His professional interests are multifaceted, spanning educational leadership, community outreach, and digital graphic design, which allows him to communicate complex scholarly findings through creative visual mediums. He can be contacted at email: 2024306397@student.uitm.edu.my.



Teoh Sian Hoon    is a Professor at the Faculty of Education, Universiti Teknologi MARA (UiTM). She received her B.Sc. (Hons.) from Universiti Teknologi Malaysia (UTM), M.Sc., and Ph.D. from Universiti Sains Malaysia (USM). She actively engages in mathematics education teaching and supervising thesis students. Her research interests include mathematics and statistics education, with a particular emphasis on the mathematical process, STEM teaching, and modelling in a multidisciplinary context. She actively participates in research initiatives and makes valuable contributions to academic discourse through her papers and conference presentations. She can be contacted at email: teohsian@uitm.edu.my.



Leele Susana Jamian    is a senior lecturer at Faculty of Education, Universiti Teknologi MARA. She holds a Ph.D. in Educational Administration, Management and Leadership, an M.Ed. from IIUM, and a B.Ed. in TESL from UKM. With over 20 years of experience, she spent a decade coordinating educational programs. Her expertise spans teaching and supervising students from primary to postgraduate levels. As an active researcher in high COE projects, she serves as an expert consultant for global program development. Dr. Leele is a prolific writer for high-impact journals and an international plenary speaker. She can be contacted at email: leele@uitm.edu.my.



Nurhayani Romeo    is a senior lecturer and researcher at the Universiti Teknologi MARA (UiTM), Malaysia, specifically within the Faculty of Education at the Puncak Alam Campus. Her work primarily focuses on mathematics education, STEM education, and indigenous education. She can be contacted at email: nurhayani@uitm.edu.my.



Mohammad Hafiz Mohd Yusof    is a senior lecturer at the College of Computing, Informatics and Mathematics, Universiti Teknologi MARA, Perak Branch, Tapah Campus. He holds a Ph.D. (Computer Science), an M.Sc. (Information Technology), and a B.Sc. (Hons) (Intelligent Systems) from Universiti Teknologi MARA. As a Professional Technologist (Ts.), his expertise focuses on cybersecurity, specifically intrusion detection systems (IDS), machine learning, and deep learning. He is actively involved in research regarding network security and intelligent systems. His academic contributions are reflected through his publications and research impact in the field of ICT and security. He can be contacted at email: hafizyusof@uitm.edu.my.



Koo Ah Choo    is a Professor at Multimedia University, Malaysia with over 28 years of experience in higher education. Her work focuses on technology-enhanced learning and improving quality of life. She led research or projects that integrate creative technology, green practices, and social wellness into education, advancing research in upcycling creativity, digital inclusion, and academic resilience. Her current research extends to AI and data analytics, focusing on AI for learning. She can be contacted at email: ackoo@mmu.edu.my.