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Article

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The Influence of Innovative Characteristics, Work Readiness, and Vocational Self-Concept on Employability of Vocational College Students

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Abstract

Purpose: Vocational education and training is important to produce skilled and innovative labor to drive the country's development in the 4th industrial revolution (IR 4.0). The employability of vocational college students is crucial to meet the country's demand for 21st-century workers. This study aims to identify the influences of innovative characteristics, work readiness, and vocational self-concept on the employability of vocational college students. The study also examined the moderating role of gender.

Methods: A quantitative correlational design was carried out to achieve the objectives of the study. The samples consisted of 395 vocational college students from five vocational colleges located in the states of Kedah and Penang, Malaysia. Data were collected through online questionnaire survey, which is made up of four instruments: Youth Innovation Skills Measurement Tool, the Work Readiness Scale, the Vocational Rational Scale and the Perceived Future Employability Scale. The validity and reliability of these instruments were well established. Descriptive and structural equation modelling (SEM) analyses were carried out.

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Findings: Innovative characteristics ($\beta = 0.252$, $t = 5.041$, $p < 0.001$), vocational self-concept ($\beta = 0.386$, $t = 7.131$, $p < 0.001$) and work readiness ($\beta = 0.219$, $t = 3.787$, $p < 0.001$) had significant effects on employability of vocational college students. The model explained 53% of the variance in employability. Gender, however, did not moderate any of the three direct significant relationships.

Conclusion: This study found that innovative characteristics, work readiness, and vocational self-concept are factors that should be taken into consideration when developing education and career programs, interventions, and support services for vocational students. The graduate employment issues faced by vocational college students can be overcome if factors identified in this study can be enhanced. Similar approaches can be applied for both male and female students since gender is not a significant moderator. Overall, this study sheds light on the employability of vocational graduates and contributes towards improving career guidance and counseling practices for vocational students.

Keywords: Employability, Vocational Education and Training, VET, Innovative Characteristics, Work Readiness, Vocational Self-Concept

1 Introduction

Vocational education and training is important to produce skilled and innovative labor to drive the country's development in the 4th industrial revolution (IR 4.0) (Shabbir et al., 2020). Employability of students from vocational colleges is crucial to meet the country's demand for 21st-century workers (Sa-Nguanmanasak et al., 2019). However, training and moulding vocational college students to effectively meet the demands of the global industrial market is one of the major challenges of technical and vocational education training (TVET) (Aktas et al., 2017; Langthaler et al., 2022). Several countries, including those in Southeast Asia, have attempted to restructure TVET to enhance vocational college students' employability (Campbell, 2016). According to Massetor et al. (2021), in 2019, almost 22.4% (3046) of the vocational college graduates in Malaysia are still unemployed, and 727 people are in the status of waiting for employment (Ministry of Education, 2019). To overcome this problem, there is a need to identify factors that are related to vocational college students' employability. Hence, enhancing the employability of students from vocational colleges is a crucial national agenda for many countries (Sa-Nguanmanasak et al., 2019).

1.1 Research Background

Vocational graduates find themselves ineligible to compete with other TVET institutions like Polytechnic Institution and Community College because they lacked innovative characteristics like creativity, interpersonal skills and etc (Massetor et al., 2021). Vocational education traditionally emphasizes practical skills and specialized knowledge, often overlooking the cultivation of broader competencies and higher order thinking skills. Vocational students need to have innovative characteristics to produce new ideas, concepts products, to lead things or recognize opportunities especially in the emerging digitalization world which will enhance their employability. However, the influence of innovative characteristics and employability of vocational college students are seldom researched. According to Ishaar et al. (2020), many vocational graduates are not innovative and creative enough to compete in the industry, which lead to their unemployment after graduation. However, due to a lack of studies that examine the influence between innovative characteristics and employment directly, the influence of this factor in vocational context could not be ascertained. Work readiness is among the key attributes that enhances the country's competitiveness. It is an important factor that drives graduates' employability (Lau et al., 2019). Students must be ready in terms of having good personal characteristics such as creativity, leadership, and innovative thinking. These characteristics are particularly crucial in the context of the IR4.0. IR4.0 is characterized by rapid technological advancements, automation, and digitalization, leading to significant transformations in industries and job roles. In this era of constant change, students with these innovative characteristics are better equipped to adapt to evolving technologies, embrace new opportunities, and contribute to the workforce effectively. They are more likely to be sought after by employers who value individuals with the ability to think critically, solve complex problems, and drive innovation. Conversely, students who lack these innovative characteristics may face challenges in securing employment as they may require additional training to keep up with the dynamic labor market demands. Therefore, fostering innovative characteristics among vocational college students is essential to get them ready for the competitive job market in IR 4.0.

Several studies (e.g., Yang & Wong, 2020) also suggest that employability is closely related to vocational self-concept. When students have a clear idea of vocational self-concept like on their interest, value, abilities and self-knowledge, vocational students should probably make better, effective career decisions in the future (Wikansari, 2017). Students with negative self-concept will limit the career choices by crossing out possible career in the list, which may increase the risk of unemployment (Wu et al., 2014). To date, most studies on vocational college students have focused more on the development of practical and vocational skills such as specific technical skills. There are few empirical studies that examine vocational college students' psychological factors and their employability in local context. There is also a lack of understanding on their current level of innovative characteristics, work readiness and

vocational self-concept. Without such information, effective career development programs and support system to enhance vocational college students' employability is less likely to be developed. Key factors identified in the literature reviews namely; innovative characteristics, work readiness and vocational self-concept should be examined in relation to employability. Research on this topic could fill in the literature gaps and contribute towards enhancing vocational college students' employability and competitiveness in the job market.

1.2 Factors Influence Employability

Past studies showed that vocational graduates find themselves ineligible to compete in the job market because they lack innovative characteristics (Massetor et al., 2021). Vocational college students need to have innovative characteristics to develop new ideas and products, lead things, and recognize opportunities (Massetor et al., 2021). According to Mansour (2021), candidate with high innovative skills are given the first priority in a job. Creativity, leadership, self-efficacy, energy, and risk-propensity are part of employee with innovative characteristics (Chell & Athayde, 2009). A recent study by Altinişik et al. (2023) has used the instrument above in the study regarding the relationship of innovative characteristics with employability of vocational students and the researchers recommended the use of the instrument in any innovative skills study. According to Shahroom and Hussin (2018), in IR 4.0, human jobs will be replaced by smart robots. Past literature shows that innovative characteristics have direct influence on the entrepreneurship and employability of vocational students (Li, 2021). Among China vocational students who came from a single-parent background, factors like self-efficacy, optimism, and motivation have an influence on their employability (Zhang, 2021). The amount of energy a vocational student also has influence towards employability because it increases the urge to starting their own business (Masri et al., 2021).

Employability is also closely related to vocational self-concept. Students with a clear idea of their vocational self-concept like their interests, values, abilities, and self-knowledge, can make better, effective, career decisions in the future (Wikansari, 2017). Whereas students with a negative vocational self-concept, on the other hand, will limit their career choices by crossing out possible career in the list, increasing the risk of unemployment (Wu et al., 2014). Vocational self-concept is an important element in the famous Super's vocational theory. According to Sururi (2020), Super's vocational self-concept is relevant to IR 4.0. Super's exploratory phase (age 15-24) is characterised by introductory time of listing down but not finalising choices. In the exploratory stage, there is crystallization, specifying, and implementing. At this stage students should have some idea about what they will pursue and formulate (Lau et al., 2019). Career flexibility is an indicator of employability (Lau et al., 2020). Through a person's choice behaviour, vocational interest and value do affect the job criteria (Hansen & Wiernik, 2018). It is stated that, students often look for satisfaction of a job through

work roles in which they can express themselves (Sururi, 2021). As supported by Wikansari (2017), there are very few studies on how vocational self-concept influences students' future job decisions. This study will be informative to provide extra evidence on this matter because vocational self-concept was found to be related to career indecision and positively associated with job acquisition (Wikansari, 2017).

In addition to innovative characteristics and vocational self-concept, work readiness is crucial to vocational college students' employability. As reported by Caballero et al. (2011), there are three components to work readiness namely (a) personal characteristics, (b) work competence, and (c) social intelligence. A person who is ready for work has the capability to perform well at the required level consistently with only minimal supervision and contribute value to the company. Students who are ready for work and have the necessary competencies are better prepared for employment after graduation and long term work success (Bryne, 2020). It is being mentioned in the study of Lau et al. (2019), that in order to have work readiness, students should possess good work ethics, adequate interpersonal skills, clear employment goal, optimism about future, ability to persevere difficulties, adapt to a new work culture, have capacity to learn new things, be agile, and keeping physically fit and mentally alert. Work readiness is a criterion used in recruitment and, one that is becoming increasingly valued and is expected to be possessed (beyond just certification) by candidates (Priksat et al., 2019). This argument is supported by Mari et al. (2019) who claims that academic qualification alone does not guarantee a job in the competitive work market if the graduates lacks skills like work readiness. Higher institutions like vocational college face big pressure in preparing students for the digitalized industrial world (Ghavifekr & Radwan, 2021). According to Jiang (2022), vocational students' self-personal problems has relationship with their employability. Social intelligence also has influence on the employability of vocational students. As such, vocational colleges must be responsible in equipping students with the required skills that will allow them to manage their future careers. Work readiness is all about having the attributes and attitudes needed to be successful in work (Lau et al., 2019). Work readiness will enhance students' employability and get them ready for the dynamic and challenging 4.0 job market. Based on the objectives of this research work, the study proposed the following research questions:

1. Do innovative characteristics affect employability of vocational college students?
2. Do work readiness affect employability of vocational college students?
3. Do vocational self-concept affect employability of vocational college students?

The following hypotheses were proposed in this research work:

- H1. Innovative characteristics have a positive influence on employability.
- H2. Vocational self-concept has a positive influence on employability.
- H3. Work readiness has a positive influence on employability.

1.3 Gender Differences in Employability Among Vocational College Students

Gender imbalance in vocational education is well known, yet it has only little attention until now (McDool & Morris, 2022). According to Lim et al. (2019), in 2013, the female labor force participation rate surpassed the 50% mark for the first time, and the rate was 54.7% in 2017. In Malaysia, the participation of females in higher education is more visible nowadays, but, the number of female students in vocational colleges is still less even though there is no quota issue. As mentioned by Rahayu and Aryanti (2022), TVET education is well-known among male students, rarely chosen by female students and only a small fraction of female students apply to TVET institutions like vocational colleges. Male students are more interested in technical engineering courses while female students are more interested in home economics courses like home management, clothing & textiles, food & nutrition, hospitality management, and child care (Chukwu et al., 2020).

With regards to innovative characteristics (creativity, leadership, energy, self-efficacy, and risk-propensity), most of the studies point toward males having an upper hand over females. Some of the basic attributes of business leaders are being brave, independent, and able to take risks (Gupta et al., 2017). Research done by Joensuu-Salo et al. (2015) says that men show stronger interest and higher risk taking to become entrepreneurs than women. According to Naukkarinen and Bairoh (2022), male vocational engineering students develop creativity easier compared to female students, that will be helpful in future work. Even in China, Zeng et al. (2022) find that male vocational students are more driven and exhibit elevated energy when it comes to adapting to work. But, as stated by Ismail et al. (2019), in some countries, the percentage of females enrolled in TVET is lower than males due to factors such as the government itself, school society and parents. The finding from the study by Abdullah et al. (2020), shows that there is a statistical difference between male and female students in vocational colleges on social intelligence, cross-cultural skills, and leadership skills. However, there is no significant difference between students' genders on initiative and self-direction or self-efficacy skills. The mean score of male students was higher compared to female students in the skills above.

Focusing on work readiness (personal characteristics, work competence, and social intelligence), there were no obvious and significant differences in work competence skills between male and female engineering students in Malaysia and Thailand, as both genders showcased similar levels of work quality, practical ability, personal character, moral principles, social intelligence, decision making skills, and adapting to formal organisation (Sa-Nguanmanasak et al., 2019). However, referring to a study by Ismail et al. (2020), on being work-ready, male students are slightly ahead of female students, especially on leadership, personality, knowledge extent, and social and emotional intelligence. Yet, female students are more work-ready as they have superior thinking skills, better team players and have more experience.

Finally, on vocational self-concept (vocational interest and value, vocational abilities, and self-concept), male vocational students have more inclination for higher aspiration, better education self-esteem, and greater flexibility in career compared to female students (Zeng et al., 2022). Based on a research by Avram et al. (2019), it is easier for students with stronger adaptability in their careers to give more importance to future career development and be more self-reliant in overcoming obstacles in academic tasks. Hence, male vocational students may tend to rank higher than female students in terms of vocational self-concept, according to those studies.

Answering the question of the effect of gender on the employability of vocational college students, a recent study suggests that there is actually not much effect on employability due to the gender gap in vocational students. The findings of a study by Masud et al. (2018) indicate that the employability of the TVET graduates was related to their personal strengths or abilities, and appreciation or value they received from the organisation, their motivation and support in their career progression, regardless of their gender. This suggests that employability can only be influenced by skills and has nothing to do with gender.

The following are hypotheses related to the moderating effects of gender:

- H4. Female students moderate the relationship between innovative characteristics and employability.
- H5. Female students moderate the relationship between vocational self-concept and employability.
- H6. Female students moderate the relationship between work readiness and employability.
- H7. Male students moderate the relationship between innovative characteristics and employability.
- H8. Male students moderate the relationship between vocational self-concept and employability.
- H9. Male students moderate the relationship between work readiness and employability.

1.4 Limitations

The samples were Malaysian Vocational Certificate (SVM) and Malaysian Diploma Certificate (DVM) students from all five vocational colleges in Penang which consist of 14 programs such as engineering programs like automotive technology and etc, design programs like graphic design and business administrative programs like business management and etc.

The deputy of directors and counselors were requested to give clear instructions to the students and provide assurance on their anonymity in answering of this survey. There were concern with the achievement of the number samples needed hence, permission to collect data from Alor Setar and Kulim vocational colleges from neighbour state, Kedah were acquired as a backup.

As for the delimitation of this study, since this study is focused on vocational college students, the findings of the study may not be generalized to students from other types of educational institutions. Moreover, the analysis carried out in this study does not look into innovative thinking, work readiness and vocational self-concept by each programs of vocational college. This study is more interested to provide an overview on the influence of innovative characteristics, work readiness, vocational self-concept on employability of vocational college students. Besides, all three variables were measured with established instruments that include five major characteristics namely creativity, self-efficacy, energy, leadership and risk-propensity in innovative characteristics, three major work readiness namely personal characteristics, work competence and social intelligence, three factors of vocational self-concept that are vocational interest and value, vocational abilities and self-concept. So, other form of characteristics, skills or factors are beyond the scope of this study.

2 Conceptual Framework

Figure 1 shows the conceptual framework of this study. Vocational college students' employability is influenced by their innovative characteristics (creativity, leadership, energy, self-efficacy, risk-propensity) which are stated in Chell and Athayde (2009), vocational self-concept (vocational interest and value, vocational abilities, self-concept) from Groenestege (2012), and work readiness (personal characteristics, work competence, social intelligence) by Caballero et al. (2011). This study aims to identify the influences of innovative characteristics, work readiness, and vocational self-concept on the employability of vocational college students. The study also examined the moderating role of gender. The link between these factors and employability is supported by the CareerEDGE theory, the DOTS employability model, and Career Development theory. CareerEDGE theory explains on five factors: career development learning, experience, degree subject knowledge, understanding and skills, generic skills, and emotional intelligence- that can lead towards employability through a com-

plex interaction with self-esteem, self-efficacy, and self-confidence (Pool & Sewell, 2007). Whereas, according to Paadi (2014), DOTS employability is designed as the opposite of the CareerEDGE model because it is a very simplified version compared to the CareerEDGE model. DOTS employability includes decision learning, opportunity awareness, transition learning, and self-awareness as important skills needed in employability (Watts, 2006). The Career Development theory explains that there are five processes of self-rating about future career (Super, 1990). Self-concept was proposed as the main psychological factor that influences employability (Super, 1990; Wu et al., 2014).

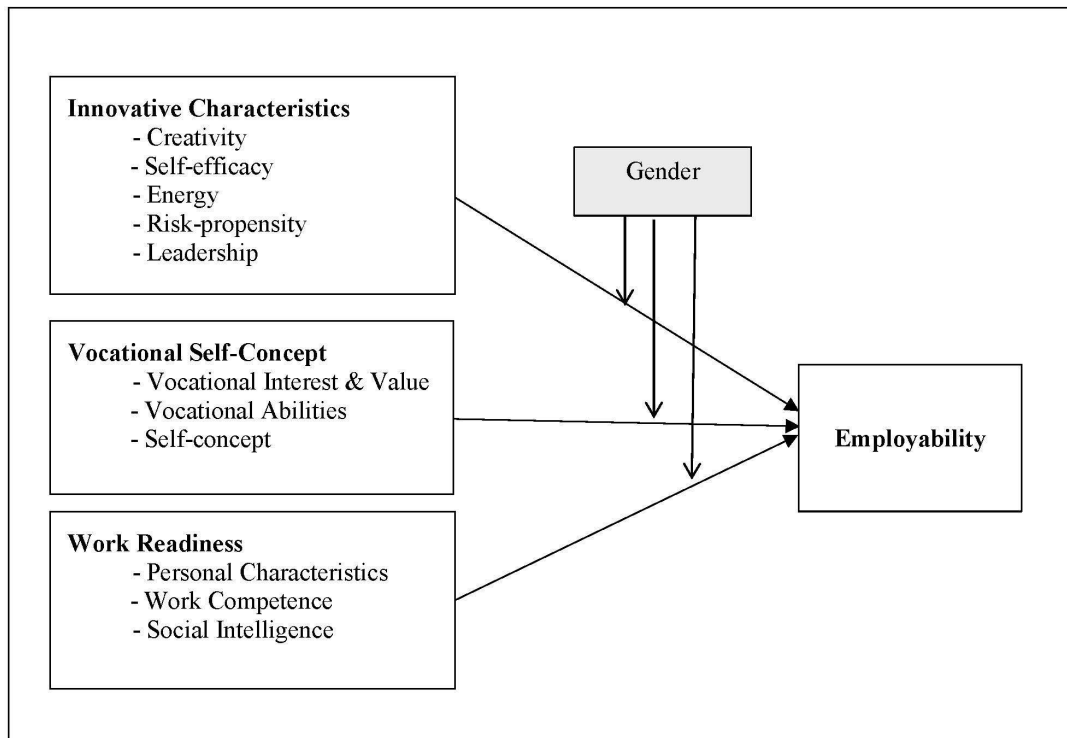


Figure 1: Conceptual Framework

3 Theoretical Framework

The relationships between innovative characteristics, work readiness, and vocational self-concept are supported by three main theories: Super's (1990) Career Development Theory, Pool and Sewell's (2007) CareerEDGE Theory, and Watts's (2006) DOTS Employability Model. While each theory emphasizes different variables, the CareerEDGE Theory and DOTS

Employability Model support the relationship between innovative characteristics, work readiness, and employability. Additionally, the DOTS Employability Model and Career Development Theory support the relationship between vocational self-concept and employability. Despite their differences, all three theories acknowledge the interconnections of these variables. This study utilized measurement tools such as the Youth Innovation Skills Measurement Tool by Chell and Athayde (2009), the Work Readiness Scale by Caballero et al. (2011), and the Vocational Rational Scale by Groenestege (2012) to explore the connection between these variables and employability. The theories explain how innovative characteristics, work readiness, and vocational self-concept influence employability. For example, Pool and Sewell (2007) suggest that the CareerEDGE skills, such as self-esteem, self-efficacy, and career development learning, impact individuals' responses to the work environment, which aligns with the positive relationship found in this study between innovative characteristics and employability.

The DOTS Employability Model emphasizes decision-making skills, job search skills, and self-presentation skills as contributors to employability. This supports the positive correlation and influence of work readiness on employability. Similarly, the Career Development Theory highlights the development of self-concept and the implementation of vocational preferences in achieving successful employability. The study's findings further support these theories, revealing positive correlations between all three independent variables and employability. The literature review by Paadi (2014; Wu et al., 2014) also underscores the significance of factors such as creativity, leadership, energy, self-efficacy, risk-propensity, work competence, personal characteristics, social intelligence, vocational value & interest and vocational abilities in employability. Therefore, all three theories receive support. The findings suggest that the theories used in this study can be integrated into a comprehensive theory of employability by incorporating all the components of innovative characteristics, work readiness, and vocational self-concept. The Career Development Theory appears suitable for this purpose, as it encompasses the contributions of these factors to employability. Thus, all three theories are relevant for explaining the employability of vocational college students (see Figure 2).

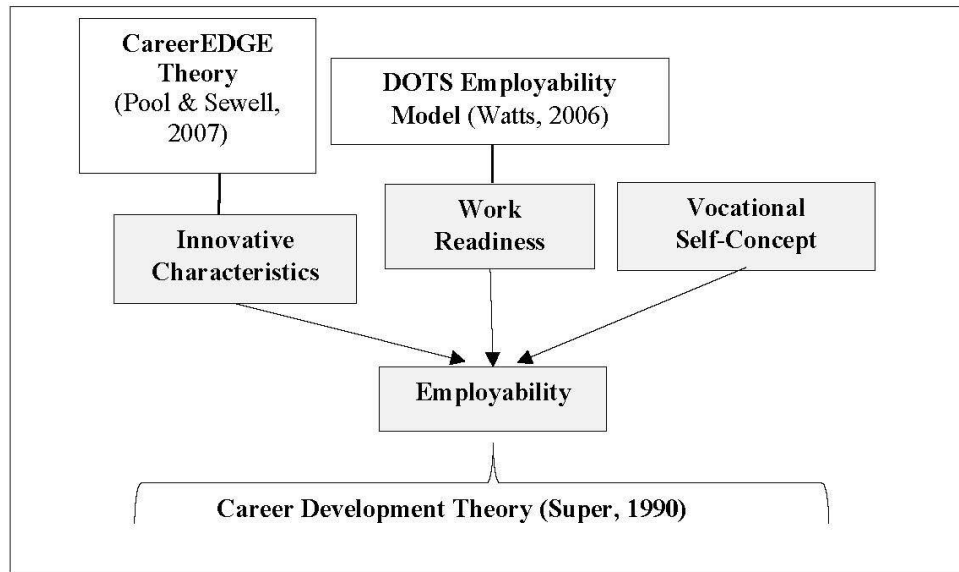


Figure 2: Source. Adapted from Pool and Sewell (2007), Watts (2006), Super (1990: Cited by Paadi 2014) and Wu et al. (2014)

4 Method

A quantitative correlational design was carried out to achieve the objectives of the study. The samples consisted of 395 vocational college students from five vocational colleges located in the states of Kedah and Penang, Malaysia. A total of 395 students from various engineering programs like Electric technology, design programs like Graphic Design and business administrative programs like Business Management and etc have responded to the survey.

Respondents were selected using Stratified Random Sampling technique. The validity and reliability of these instruments were established before the data collection. All four instruments were adapted to Malay language for the vocational students' better understanding. So, the check on translation and suitability were done with two TVET experts from two public universities in Malaysia. First expert is a professor from Universiti Tun Hussein Onn Malaysia (UTHM). The expert is the head of advanced centre for TVET, specializes in curriculum development and an expert of psychological factors like leadership, critical skills, work competency and etc. The second expert is from Universiti Sains Malaysia (USM), an expert that has TVET education background previously and specializes in curriculum interventions. Content validity depended fully on the comments from validators. Some items that were erased and most of the items were paraphrased according to the context of vocational students and for their easy understanding. Pilot study was done with three vocational

programme students: Welding Technology, Computer System & Network Technology and Industrial Machining Technology from a vocational college in Kedah. Items with low reliability were deleted and the Self-concept sub set from Vocational Self-concept were deleted due to very low Cronbach's Alpha (.39).

Descriptive and structural equation modelling (SEM) analyses were carried out. Responses were provided on four-point likert scale ranged "Strongly Disagree", "Disagree", "Agree" and "Strongly Agree". A four-point likert was chosen to make sure respondents make a fixed positive or negative response in order to avoid respondents move on without giving careful thoughts to the current question (Hopper, 2016). Approval to carry out the study was obtained from the Education Planning and Research Division, Ministry of Higher Education, the State Education Department, and all the vocational colleges involved. The research ethical guidelines were followed in this research in order to protect the respondents' confidentiality.

Data were collected through an online questionnaire survey, which is made up of four instruments (refer Table 1 for example): The Youth Innovation Skills Measurement Tool, which aims to offer strong measure of young student's innovation skills, to show the ways of revealing this capacity, to understand innovative behaviour within secondary schools, sixth form colleges and to identify any kind school or college initiatives that would promote the development of innovative attitudes and behaviour (Chell & Athayde, 2009), the Work Readiness Scale to assess "being ready" for job skills in college graduates with different background specializations (Caballero et al., 2011), the Vocational Rational Scale is to measure the self-concept crystallization in the field of career development (Groenestege, 2012), and the Perceived Future Employability Scale to measure young adults' perceived future employability, their perceptions on their future skills, experience, networks, personal traits, labour market knowledge and institutional reputation at the time of completing their formal education when they are on entering the labour market (Gunawan et al., 2018). The collected data were entered into the Statistical Package for the Social Sciences (SPSS) version 26 for descriptive statistical analysis. This was followed by the Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis that was carried out via SmartPLS 3 to evaluate the measurement and structural models. The application of PLS-SEM in this study enables researchers to estimate complex model with many constructs, indicator variable, and structural paths so that the causal explanations on the relationship between the constructs (Sarstedt et al., 2017). Additionally, PLS-SEM can handle reflective model and consists of great statistical power which helps researchers identify the significance of a specific relationship efficiently (Hair et al., 2017). PLS-SEM model evaluation begins with the assessment of measurement model to check its reliability and validity of the construct, which then continues with the assessment of structural model to check the predictive capabilities of the model and the relationships between the constructs (Hair et al., 2017).

5 Results and Findings

Both descriptive and inferential statistics were run. Descriptive statistics were used to describe the data distributions and Structural Equation Modelling (SEM) analysis was used to answer the research questions, since this study focuses on relationships of innovative characteristics, work readiness and vocational self-concept on employability.

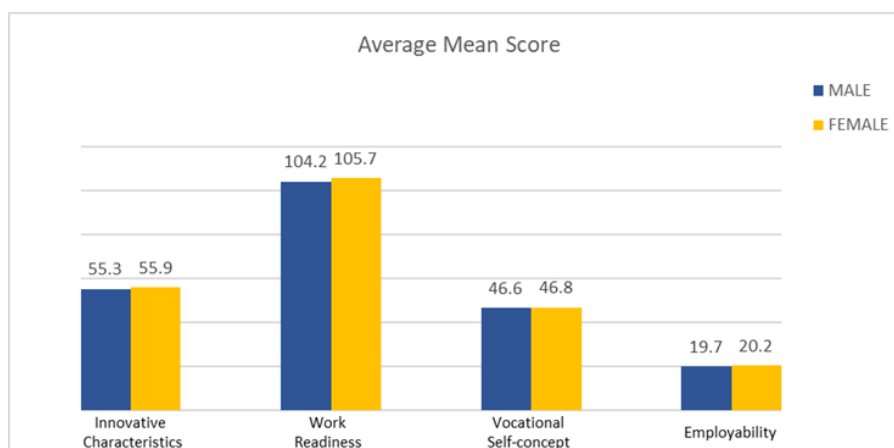


Figure 3: The Average Mean Score of Innovative Characteristics, Work Readiness, Vocational Self-Concept and Employability

The bar chart above shows the average mean scores for innovative characteristics, work readiness, vocational self-concept and employability between male and female students. Preliminary analysis showed that the mean scores for females on all the factors above were slightly higher than males, which provided the rationale to analyse the potential moderating role of gender.

5.1 Assessment of Measurement Model

To ensure that the model is functional, the first step of evaluating PLS-SEM results is to examine the measurement models (Hair et al., 2019). By examining PLS-SEM estimates, it allows researchers to check the reliability and validity of the construct measures (Hair et al., 2017). Since this study involves reflectively measured constructs, the model was assessed based on internal consistency reliability and validity. The values of composite reliability were checked for the internal consistency reliability of the model.

The four constructs namely vocational self-concept, work readiness, innovative characteristics, and employability and each of their indicators are shown in Table 1. First, composite reliability was reported to indicate whether the measurement model fulfils the internal consistency reliability. The present model composite reliability values 0.855 to 0.905, indicating the indicator variables achieved satisfactory internal consistency reliability. Next, the findings showed that the outer loadings ranged from 0.713 to 0.836, which fulfilled the minimum threshold of 0.7 for acceptable indicator reliability. The AVE of constructs recorded a range from 0.558 to 0.613, which were greater than the threshold of .5 (Garson, 2016). In short, the present measurement model achieved convergent validity as the indicators fulfilled the recommended values of outer loadings, composite reliability, and average variance extracted (AVE).

Table 1: Convergent Validity Results

Latent variables	Item	Outer loading	CR	AVE
Employability (EMP)				
EMP1	I would know the steps I need to take to do well in my chosen career	0.806	0.905	0.613
EMP2	I would have developed the ability to find out about job opportunities in my chosen field	0.779		
EMP3	Employers will be able to see that I am well motivated from what I have achieved	0.775		
EMP4	Employers will be able to see that I have clear goals for myself	0.762		
EMP5	Future employers would see that I have the right technical skills and knowledge that they want	0.792		
EMP6	I would have developed the reasoning and problem solving skills that future employers often require	0.784		
Innovative characteristics (IC)				
IC1	It's energizing and rewarding to help other people.	0.732	0.865	0.563
IC2	I feel really motivated when I produce something that no one else has.	0.788		
IC3	I want my work to provide me opportunities to show that I can overcome problems.	0.713		
IC4	Once I start something I will finish it.	0.790		
IC5	I would join a union/club group independently if it was something I really wanted to do.	0.725		
Vocational self-concept (VSC)				
VSC1	I have a real clear picture of my work-related attributes and characteristics	0.762	0.855	0.597
VSC2	I know my own values well enough to make a career decision right now	0.722		

VSC3	I know pretty much what I'm looking for in a college major and a career	0.836		
VSC4	I feel confident that my career plans match my personality, interests, etc	0.766		
Work readiness (WR)				
WR1	I can adapt to different social situations at work	0.742	0.883	0.558
WR2	I can develop good relationships with people at work	0.776		
WR3	I can easily adapt to new situations	0.741		
WR4	I have confidence in technical competency	0.736		
WR5	I can cope with multiple demands at work	0.739		
WR6	I can analyse and solve complex problems	0.747		

Note: CR = composite reliability; AVE = average variance extracted.

5.2 Discriminant Validity

After establishing the convergent validity, the assessment continues with the examination of discriminant validity. Scholars have recently suggested to assess heterotrait-monotrait (HTMT) ratio of correlations for discriminant validity (Henseler et al., 2015). The findings in Table 2 suggest that the values of HTMT are below the threshold value of 0.90. In other words, it proves the establishment of the discriminant validity of the present model.

Table 2: Discriminant Validity Results (HTMT)

	Employability	Innovative characteristics	Vocational self-concept	Work readiness
Employability				
Innovative characteristics	0.672			
Vocational self-concept	0.795	0.645		
Work readiness	0.708	0.641	0.834	

5.3 Assessment of Structural Model

The collinearity issue for the structural model (Figure 4) was examined to determine whether the predictor constructs are below the critical levels of collinearity (Hair et al., 2017). It is suggested to examine the values of variance inflation factors (VIF) for the assessment of the collinearity issue (Sarstedt et al., 2021). Based on the results, the VIF values of the constructs were lower than the critical value of 5 (Table 3), indicating that the issue of collinearity for all three sets of predictor variables did not exist.

Table 3: Inner VIF Values

	Employability	Innovative characteristics	Vocational self-concept	Work readiness
Employability				
Innovative characteristics	1.605			
Vocational self-concept	2.103			
Work readiness	2.176			

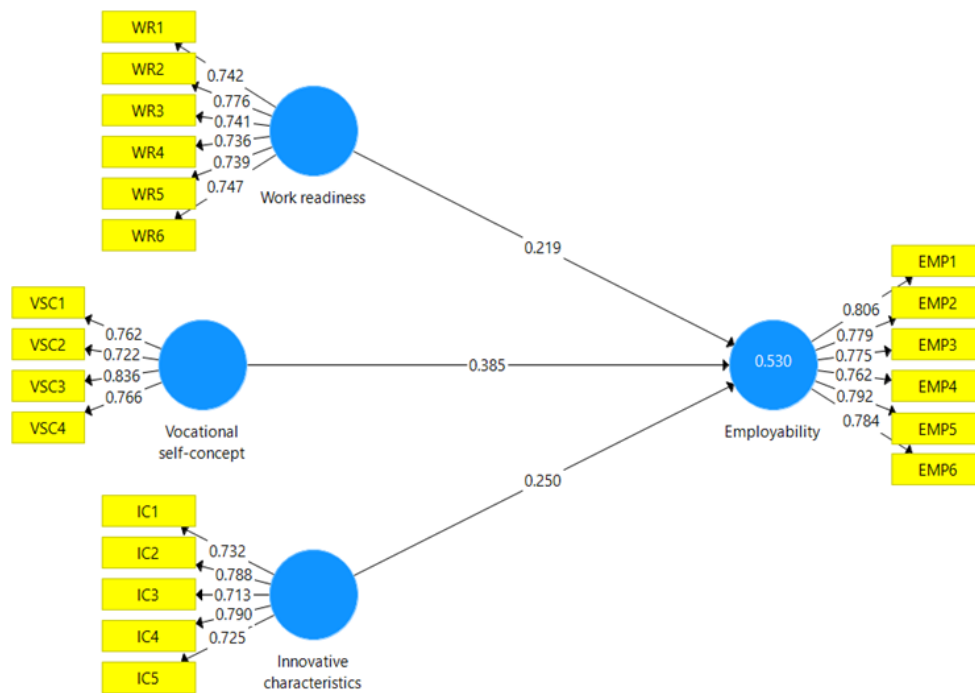


Figure 4: Structural Model

5.3.1 Direct Effect Path Coefficients

After confirming no collinearity issue, the analysis continues with an understanding of the predictive capabilities of the model by referring coefficient of determination (R²), cross-validated redundancy (Q²), and the path coefficients. The researchers started with the examination of the coefficient of determination, R², value of the endogenous construct(s). The coefficient of determination, R², reflects the level of the latent construct's explained variance. It is also known as in-sample predictive power which ranges from 0 to 1, with higher values

indicating a greater explanatory power (Rigdon, 2012). Based on the guideline, the R² values of 0.75, 0.50, and 0.25 can be represented as substantial, moderate, and weak predictive power respectively (Henseler et al., 2009). In this study, the endogenous construct, EMP recorded an R² value of 0.530, implying that the VSC, WR, and IC moderately explained 53% of the variance in EMP.

One way to examine the predictive accuracy is the Q² values. In the blindfolding output, the findings revealed that the Q² values of three endogenous constructs, EMF, IMF, and TRSL were recorded at 0.301. The findings suggest that the model has predictive relevance as the Q² value is greater than 0 (Sarstedt et al., 2021). The next step is to assess the effect size, *f*². When there is a removal of a specific predictor construct in the model, the change in the R² value can evaluate whether the removed construct exerts a substantive impact on the endogenous constructs (Hair et al., 2017). This measure is known as the effect size. Effect size indicates the effect of a predictor latent variable at the structural level (Henseler et al., 2009). The effect size is a measure of the magnitude of an effect that is independent of sample size (Benitez et al., 2020). Guidelines by Cohen's (1988) explain that 0.02 represents small, 0.15 represents medium, and 0.35 represents large effects of the exogenous latent variables. In this study, the effect size *f*² for the structural model relationship was calculated. Vocational self-concept (*f*² = 0.160) had a medium effect size on employability because it was above the threshold of medium effect at 0.15. Both innovative characteristics (*f*² = 0.090) and work readiness (*f*² = 0.051) had a small effect size on employability because it was above the threshold of small effect at 0.02. Therefore, this implied that the vocational self-concept had a larger effect size on employability compared to innovative characteristics and work readiness. The results proved the building of theory postulating the practical significance of vocational self-concept on employability among vocational college students.

In this study, structural equation modeling analysis was conducted to examine the path coefficient. First, three direct effect hypotheses were tested (see Table 4). Bootstrapping was conducted with a sub-sample of 5000 to test whether a path coefficient is significantly different from zero. In this study, three direct relationships were tested, as shown in Table 4: 1) Innovative characteristics and employability, 2) vocational self-concept and employability, and 3) work readiness and employability. According to the results, all the constructs recorded a *t* value greater than 1.96. First, innovative characteristics ($\beta = 0.252$, $t = 5.041$, $p < 0.001$) had a significant effect on employability. The finding suggests that the greater the innovative characteristics among vocational students, the higher their employability. Second, vocational self-concept ($\beta = 0.386$, $t = 7.131$, $p < 0.001$) exerted a significant effect on employability. When vocational students' vocational self-concept is higher, the employability becomes higher. Third, work readiness ($\beta = 0.219$, $t = 3.787$, $p < 0.001$) had a significant effect on employability. It implies that when vocational students' work readiness is high, their employability is high as well.

Table 4: Results of Direct Effect Path Coefficients

No	Relationship	Beta	t value	p value	Confidence interval (BC)		Result
					LL	UL	
H1	Innovative characteristics ⇒ Employability	0.276	5.670	0.000	0.183	0.373	Supported
H2	Vocational self-concept ⇒ Employability	0.406	7.742	0.000	0.303	0.509	Supported
H3	Work readiness ⇒ Employability	0.165	2.851	0.000	0.052	0.281	Supported

5.3.2 Multigroup Analysis

Measurement invariance of composite models (MICOM) is an important issue when conducting PLS-SEM multi-group analyses (MGA). Based on the guideline by Henseler et al. (2016), the MICOM procedure consists of three steps: (1) Configural invariance, (2) compositional invariance, and (3) the equality of composite mean values and variances. Based on Table 5, the results of Step 1 and 2 of MICOM indicated no lack of measurement invariance, thus establishing partial measurement invariance. When there was no issue of measurement invariance, the researchers continued with the multi-group analysis. It allows the comparison between the standardised path coefficients across the groups via MGA (Henseler et al., 2016).

Table 5: Results of Measurement Invariance of Composite Models

Construct	Configural invariance	Compositional invariance assessment		
		Original correlation	5.00%	Compositional invariance
Employability	Established	0.999	0.998	Established
Innovative characteristics	Established	0.995	0.992	Established
Vocational self-concept	Established	0.996	0.993	Established
Work readiness	Established	0.999	0.994	Established

Once partial measurement invariance was established using MICOM, the researchers continued with the assessment of group differences via MGA. The results in Table 6 indicated that path coefficient differences were not statistically significant. This implies that there was no significant difference across gender (male vs female) in all three direct relationships.

Table 6: Results of Multigroup Analysis

Path	Path coefficients group 1 (Male)	Path coefficients group 1 (Female)	Path coefficients difference	Permutation p values
Innovative characteristics \Rightarrow Employability	0.212	0.368	-0.156	0.178
Vocational self-concept \Rightarrow Employability	0.384	0.391	-0.008	0.947
Work readiness \Rightarrow Employability	0.249	0.132	0.117	0.398

5.3.3 Moderating Effects

Based on the findings in Table 7, the gender variables (both male and female) did not exert any moderating effects on the relationship between (1) innovative characteristics and employability, (2) vocational self-concept and employability, and (3) work readiness and employability respectively. The findings suggest that all three direct relationships were not moderated by gender (Figure 3 and 4).

Table 7: Results of Moderating Effects

No	Relationship	Beta	t value	p value	Confidence interval (BC)		Result
					LL	UL	
H4	Innovative characteristics \Rightarrow Female \Rightarrow Employability	0.038	0.830	0.407	-0.055	0.126	Unsupported
H5	Vocational self-concept \Rightarrow Female \Rightarrow Employability	-0.016	0.347	0.729	-0.111	0.077	Unsupported
H6	Work readiness \Rightarrow Female \Rightarrow Employability	-0.059	1.158	0.247	-0.155	0.043	Unsupported
H7	Innovative characteristics \Rightarrow Male \Rightarrow Employability	-0.038	0.824	0.410	-0.128	0.053	Unsupported
H8	Vocational self-concept \Rightarrow Male \Rightarrow Employability	0.017	0.346	0.729	-0.078	0.112	Unsupported
H9	Work readiness \Rightarrow Male \Rightarrow Employability	0.059	1.179	0.239	-0.042	0.152	Unsupported

To conclude, the findings showed that vocational self-concept had a significant direct effect on employability. Second, work readiness exerted a significant direct effect on employability. Third, innovative characteristics had a significant direct effect on employability. Hence, Hypotheses 1, 2, 3 were supported. On the other hand, gender did not moderate any of the three direct significant relationships. Hypotheses 4 to 9 were not supported. Figure 5 indicates the results of moderation analysis for female students whereas Figure 6 displays the results of moderation analysis for male students.

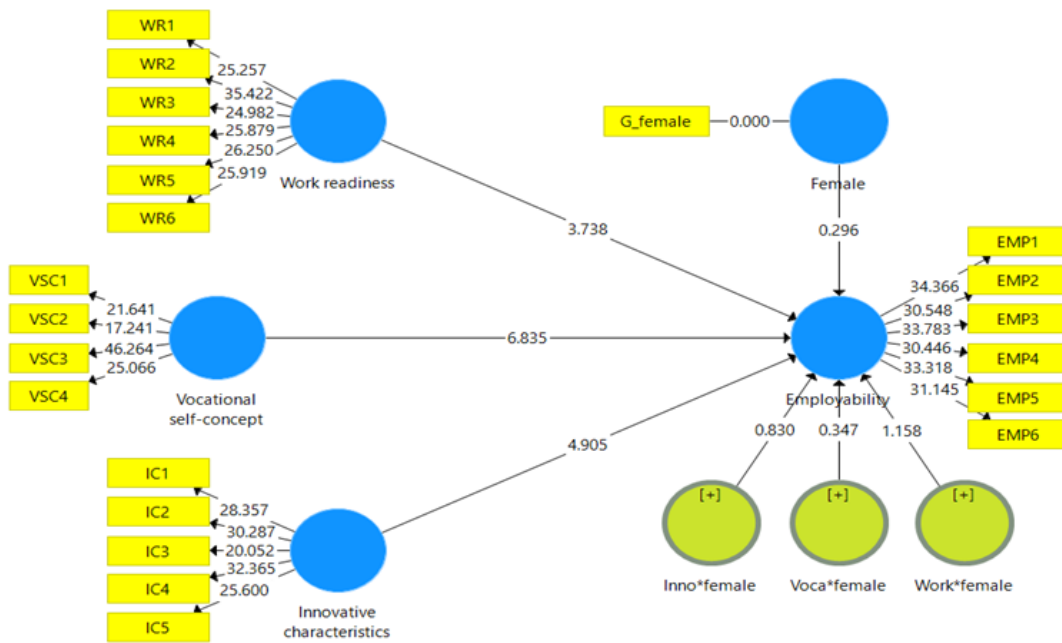


Figure 5: Moderation Analysis for Female

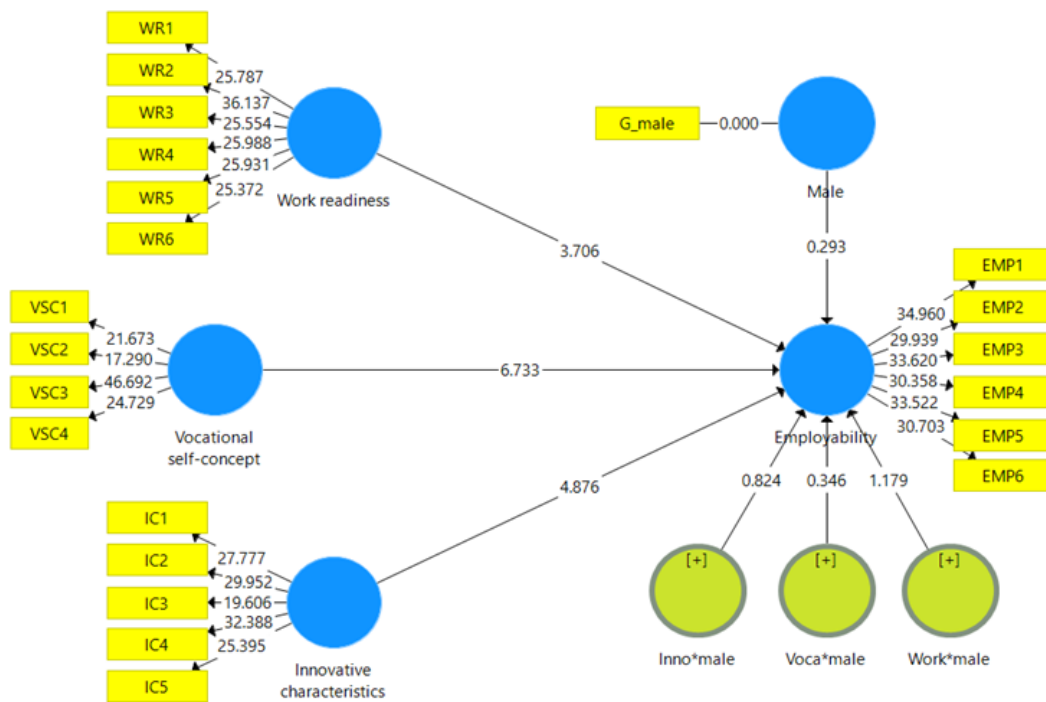


Figure 6: Moderation Analysis for Male

5.3.4 Results and Discussion

The findings showed that innovative characteristics ($\beta = 0.252$, $t = 5.041$, $p < 0.001$), vocational self-concept ($\beta = 0.386$, $t = 7.131$, $p < 0.001$) and work readiness ($\beta = 0.219$, $t = 3.787$, $p < 0.001$) had significant effects on employability of vocational college students. The model explained 53% of the variance in employability. The findings are supported by past studies. A study in China shows that the characteristics of innovation have an influence on vocational college students' employability and future entrepreneurship. It is being said that having a high innovation spirit is the only way to increase the employment of students (Li, 2021). According to Zhang (2021), psychological factors like self-efficacy, optimism, and motivation have an influence on vocational students' employability in China. This study did the analysis on all the students with single-parent and result shows that 60.1% self-efficacy has effect on their future employability. Self-drive has a positive relationship with job searching in the future due to an increase in career evaluation and exploration (Chen et al., 2022). Energy or the engagement in learning has influence towards future employability and in becoming their own boss (Masri et al., 2021). Comparing to previous literature review, Mansour (2021) says that, first job priority is given to candidate with high innovation skills believing they are good in generating novel ideas and being good in deciding best alternative for any problems to come, is supported with this study. The creators of the youth innovation skills measurement that was used for this study also say the same thing, creativity, leadership, energy, self-efficacy, and risk-propensity is the starter pack for employment (Chell & Athayde, 2009).

According to Jaafar et al. (2018), students with high work readiness skills will know how to manage a job. Study by Jiang (2022) shows that there is a high relationship between self-personal problems and vocational students' employability. It is being said that China vocational students when nearing graduation often get into employment with anxiety, worry, and emotion problems due to the constant changes in the job market environment (Jiang, 2022). Being intelligent socially, such as in tolerating frustration and coping with any problems, has a positive correlation with employability of vocational students. There is a need to cultivate the students' mental health and cultivate people-skill among them to prevent frustration in working place (Luo et al., 2022). According to Zhang (2021), psychological resilience like social behavior and emotional intelligence has a significant positive relationship with the employment. The higher their psychological resilience, the more they can cope with any social problems in the workplace and any employment process (Zhang et al., 2021). Past studies have found that there is a significant relationship between work readiness and employability among vocational college students.

As found by past studies, vocational self-concept, especially career resilience, was a strong indicator of employability in that study. Resilience is a process of valuing, appreciating, adapting and adjusting in your career (Lau et al., 2020). How much mental toughness in adapting, and adjusting to situations possessed by a student does influence their future employability

success. This is in line with the findings from Hansen and Wiernik's (2018) study, which found that vocational interest and values influence the work criteria through someone's choice behaviors.

In this study, a structural equation model that explains the employability of vocational college students was developed. This model can be used to develop interventions and career counselling support to enhance the employability of vocational students. Career counseling should focus on students' self-abilities, clarity, values, and interest in career development. Since, difference of gender has no effect towards all three variables, similar career counselling programs can be designed for both male and female. This can be done by career advisors and counselors before students choose their diploma programs. vocational colleges can carry out employment seminars, conduct mock interviews, arrange business visits, and conduct college students' professional intention surveys. Such initiatives will enhance students' innovative characteristics and get them ready to work in IR 4.0. To increase the level of work readiness and vocational self-concept, more entrepreneurship programmes can be done, rather than just focusing on working for other people, the students can also learn to start up their own business and be their own boss. Outstanding alumni can be invited to come and hold forums or talks on their experience.

6 Conclusion

In conclusion, the findings of this study have important implications on educational and theoretical perspectives on the employment of vocational graduates, career guidance and counseling practices in the field of vocational education.

As there is lack of research done on the level, relationship and influence of innovative characteristics, work readiness and vocational self-concept directly on the employability of vocational college students, this study could help to fill in the gap. The findings can be used as a help in improving the employability of vocational college students especially on the vocational self-concept. Overall, there are still little lack of studies regarding vocational self-concept that affects the future employability especially on vocational college students according to types and nature of vocational programs. This study hopefully provides useful implications to Kementerian Pendidikan Malaysia (KPM) in the sector of Technical Vocational Education and Training (TVET) and Vocational Colleges to come up with intervention programs, career counseling, elective courses focusing on improving attitudes, abilities, values towards their future work and most importantly career decision making skills and low level of vocational self-concepts.

All three theories in this study have similarities on describing innovative characteristics, work readiness and vocational self-concept that leads to employability. The results of this study extent further support for the theories involved because there is positive correlation on all

three independent variables with employability. Overall, findings also shows that the theories used in this study can be expanded by adding all the components of innovative characteristics, work readiness and vocational self-concept into a whole one theory that is Career Development theory because all this has contributions towards employability. All three theories involved is suitable to explain the employability of vocational college students.

Factors that influence the employability of vocational college students have been identified in this study. Vocational students with higher level of innovative characteristics, work readiness, and vocational self-concept were found to be more employable. The results suggest that innovative characteristics, work readiness and vocational self-concept are important factors that should be taken into account when developing education programs, intervention and support services to enhance the students' employability. The graduate employment issues faced by vocational college students can be overcome if their innovative characteristics, work readiness, and vocational self-concept can be enhanced. Similar approaches and interventions can be applied for both female and male students since gender was found to be an insignificant moderator.

Career counseling on prioritizing students' self-abilities, clarity, values and interest will lead to a high chance of being employed in the field of studies. This can be done by career advisors and counselors before students choose their programs. Vocational college can carry out employment seminars, conduct mock interviews, arrange business visits, conduct college students' professional intention surveys. Furthermore, outstanding alumni can be invited to hold forums, talks, share on their experience. Students actively participating in social practice, can continuously strengthen the social practice ability and ability to acquire work experience, will also enhance the sense of competition, and enhance the adaptability to future careers (Sun et al., 2019).

6.1 Future Research

Based on the findings of the study, vocational college students vary in the levels of innovative characteristics, work readiness and vocational self-concept. Most of them are high in innovative characteristics, moderate in work readiness whereas low in vocational self-concept. Since, during the pilot study, the sub set of self-concept were removed from the vocational self-concept because of a really low Cronbach's Alpha, in the future, the results of vocational self-concept according to different vocational programs can be further explored using bigger, different samples and adding back in the self-concept sub set into the instrument.

Zhang (2021) suggest that there is a need of studies on the relationship and influence of family environment on the employability of vocational college students. This recommendation is also supported with the evidence by a Malaysian study that says 60.1% of career exposure in Johor vocational college students is actually contributed by family and friends

(Bakry et al., 2020). Another variable that has link with the employability of vocational college students is English proficiency. A lot of vocational students in China have fear on speaking in English, leads to having hate and lack of interest towards the language (Lin, 2021). As research by Sumarsono et al. (2017) pointed out, vocational students in Indonesia are jobless and poor in overall communication skills because of a low level of English proficiency. So, the researchers made a textbook on English Language Teaching (ELT) specially for vocational students (Sumarsono et al., 2017). Problems regarding English language is not only in the neighbour countries like, China and Indonesia but in Malaysia too. According to the former Vice Chancellor of Universiti Sultan Zainal Abidin (UNISZA), Prof. Datuk Dr Hassan Basri said, one of the reason vocational graduates have difficulty in getting job is the lack in English communication skills (Massetor et al., 2021). A research finding in Batu Pahat and Kluang vocational college shows that, the students are very low in English proficiency due to less usage of the language in the classroom during studies (Massetor et al., 2021). So, teachers in vocational colleges should focus more on using English language during the teaching and practical session. There is also a need of more studies on the influence of English proficiency on the employability of vocational college students and ways to improve the proficiency, confidence and interest in speaking English language.

Findings on the level of innovative characteristics, work readiness and vocational self-concept shows that there is in need of more effective intervention programs or elective courses. Especially focusing on vocational self-concept will be a great way to enhance the skills needed for career later on because vocational students are very low in vocational self-concept. This is supported by a study from Bakry et al. (2020), that there is lack of proficiency in the career enhancing programs organized by government on TVET students. Vocational colleges should also figure out on being a major part of preparing work-ready students.

A study from China shows that, that improving a vocational student's attitude toward entrepreneurship like entrepreneurship training since their studies itself, may influence their self-belief to have their own job in the future (Lavelle, 2021). For now, China has experienced an increase in the pace of training applications particularly for vocational students (Chunying, 2020). To increase the level of work readiness and vocational self-concept, more entrepreneurship programs can be done, rather than just focusing on working for other people, the students can also learn to start up their own business and be their own boss. This pattern must be followed by many countries too especially Malaysia.

Ethics Statement

The ethical considerations and practices of the study have undergone three extensive evaluations. The evaluations were done by a panel of experts from Universiti Sains Malaysia (USM) and external vocational education expert from Universiti Tun Hussien Onn Malaysia (UTHM). In addition, approvals to carry out the study was also obtained from the Education Planning and Research Division, Ministry of Education Malaysia (Ref. No. KPM.600-3/2/3-eras [12669]) and the State Education Department (Ref. No. JPNPP.100-12/2/1 JLO2[8]), whereby the protocol and ethical considerations of the study have been carefully evaluated and endorsed. The IJRVET ethics statement has been adhered to.

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