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The role of human capital attributes and content knowledge in enhancing undergraduate innovative capability

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ABSTRACT

This study examines undergraduates' innovative capabilities in a higher learning institution. Human capital attributes, such as individual characteristics and social skills, were adopted that might influence innovative capability among students. Additionally, this paper examines the moderating role of content knowledge in these relationships. Individual characteristics and social skills are essential in strengthening young people's innovative capabilities. Research suggests that firms should be more involved and engaged with universities to generate high-impact innovations. Synergistic collaborations may help many developing countries create impactful innovations. Thus, understanding the factors influencing innovative capabilities among undergraduates seems important as higher learning institutions are the backbone of developing future human capital. A quantitative research design was employed using an online survey questionnaire. The data was gathered through a purposive sampling technique from 140 students at the Universiti Teknologi Mara, Melaka, Malaysia. Hierarchical regression analysis revealed that individual characteristics and social skills significantly impact innovative capability. The inclusion of content knowledge as the moderator did not provide support for the moderation hypotheses but it did add a 1% variation in the innovative capability. The theoretical and managerial implications for fostering innovativeness among undergraduates are also discussed.

Contribution/Originality: This study contributes to the innovation literature by examining how individual characteristics and social skills influence undergraduates' innovative capabilities, with content knowledge as a moderating factor. This paper highlights student-level innovation in a Malaysian university context, offering a multidisciplinary perspective that informs curriculum design and talent development in higher education, unlike prior research focusing on employees or firms.

1. INTRODUCTION

Education 4.0 represents the advancement of higher education institutions (HEIs) in adopting innovative educational approaches for enhanced learning (Balqishanis et al., 2023). HEIs, as learning entities, are crucial for a nation's success in driving innovation worldwide. The education sector upgrades itself by incorporating new technological, theoretical, and practical knowledge with technological advances and the global exchange of

knowledge and skills (Wu & Gu, 2022). Institutions must develop their innovative capabilities and enhance the quality management of their operations in all aspects to gain a competitive advantage (Abbas, 2020). Several fundamentals require advancements and process innovations in addition to quality education following the pandemic. The study of innovation capability has yielded mixed conclusions due to varying perspectives and definitions (Mendoza-Silva, 2021; Samson, Gloet, & Singh, 2017). Innovation capability refers to the capacity to effectively incorporate and utilize various skills, functional competencies, and resources to adapt and thrive in a changing environment (Fauziyah & Rahayunus, 2021). Prior research in innovation has shown the positive effects of determinants of innovation capability (Kim, Choi, Sung, & Park, 2018; Park & Kim, 2021; Steinhauser, 2021). Past studies have also examined the effects of innovation capability, with firm performance being the outcome that has received the most empirical validation (Aman-Ullah, Mehmood, Amin, & Abbas, 2022; Teece, 2014). Despite the claims made in the literature on knowledge management, knowledge is a vital component of the innovation process. Lei, Leaungkhamma, and Le (2020) found a positive relationship between knowledge, learning capability, and organizational capability in terms of innovation speed and innovation quality.

Individual characteristics are crucial for enhancing young people's innovative capabilities. A study in Ukraine by Krakhmalova (2021) highlights that integrating education, science, and practice fosters creative potential, promoting continuous improvement and student-centered learning for improved outcomes. Moreover, social skills are vital for successful workplace integration and achieving company objectives, while personality traits influence social behavior (Jusri & Lechner, 2024). Thus, university students must develop individual traits and social skills in today's technological and diverse environment for effective preparation.

Undergraduates possessing high levels of innovative capability and social adaptability are more confident in taking specific actions and performing beyond expectations. Thus, enhancing their employability (Li, Pu, & Liao, 2022). Developing and changing higher education depends critically on many countries' efforts to foster students' occupation-related competences and traits to increase job possibilities (Healy, Brown, & Ho, 2022; Rees, 2021; Sin, Tavares, & Amaral, 2019). Producing graduates who satisfy industrial needs depends critically on the active support of government agencies and the cooperation between higher education institutions and the business sector.

Since the COVID-19 pandemic began in 2019, many businesses have faced significant challenges due to economic decline (Flögel & Gärtner, 2020), market disruptions (Wang, Noe, & Wang, 2021) and falling sales (Kim, 2021). This has severely impacted the labor market, with decreased demand for workers and an oversupply of graduates from higher education institutions. Consequently, finding employment has become increasingly difficult for recent graduates during this pandemic. Students must prepare themselves with high innovation capabilities to compete with their peers and stay relevant in the job market.

In Malaysia, the rising unemployment rate among graduates has become a significant concern for governments, universities, and society (Green & Henseke, 2016; Minocha, Hristov, & Reynolds, 2017; Mok, Xiong, & Ye, 2021). A deficiency in social skills and positive personal attributes can hinder graduates' ability to thrive in the workplace (Roberts & Mroczek, 2022). Additionally, not all organizations possess the necessary structure and processes to foster innovative capabilities, which can hinder their ability to gain a competitive advantage (Arrieta & Avolio, 2020). Nevertheless, cultivating innovative capability is crucial for achieving organizational goals, as it empowers employees to develop and implement new ideas that drive success.

College students develop occupation-related competencies as the world is consistently driven by the infusion of new generation information technology and the knowledge economy (Kauffman & Toth, 2021). Innovative capability empowers students to think critically, solve problems creatively, adapt to challenges, and collaborate effectively, fostering a mindset that drives personal growth and prepares them for future opportunities.

Studies have shown that individuals with a greater degree of domain-specific knowledge are more skilled at recognizing opportunities for innovation (Simonton, 2018). Given the above concerns, this study aims to investigate the impact of innovation capability. This research will be viewed from the perspective of human capital attributes,

and content knowledge will be included as the moderator variable. Therefore, the following research question is drawn as the foundation of this study:

Research Question: How do individual characteristics and social skills influence students' innovative capability, and to what extent does content knowledge moderate these relationships?

A hierarchical regression analysis was conducted using the Statistical Package for the Social Sciences (SPSS) to answer this research question. This analysis enables researchers to evaluate the contribution of various sets of variables in explaining the dependent variable. SPSS is a valuable tool for understanding complex data relationships and can produce detailed statistical interpretation findings. Although innovative behaviour depends on multiple variables, human capital attributes are important for promoting innovative capability (Jusri & Lechner, 2024; Krakhmalova, 2021).

This research is significant as it contributes to the literature by incorporating a new moderating variable element. A strong understanding of the moderating variable is crucial for developing and applying innovative concepts. Studies have shown that people with extensive expertise are more adept at identifying potential opportunities for innovation and successfully producing creative solutions (Ericsson, Krampe, & Tesch-Römer, 1993; Korzilius, Bücker, & Beerlage, 2021).

2. LITERATURE REVIEW

2.1. Studies on Innovation Capability at the Universities

Research on innovation capability has gained increasing attention for its antecedents and consequences at both higher education institutions (HEIs) and organizational levels. Schumpeter (1934) was the first to acknowledge the role of innovation and the entrepreneur as the key agents of innovation in driving economic growth and development. Innovation is often described as a new or improved idea, method, or approach. It can also be the recombination of old ideas or anything that is viewed as new or improved. Traditionally, innovation has been linked to either a process or an outcome, with the latter being the most widely studied (Mendoza-Silva, 2021). Innovation is defined as the process of developing and implementing new management approaches, processes, or methods to help a business achieve its goals. Furthermore, innovation can be defined as an outcome, such as introducing a new product to the market or using a technology in a practical environment (Lawson & Samson, 2001; Utterback, 1971).

Capabilities are the characteristics that distinguish a firm from its competitors and partners. For example, multiple organizations within the same industry may exhibit differing performances. Organizational success varies due to differences in strategic capabilities, resources, and competencies rather than the industry itself. Teece, Pisano, and Shuen (1997) later broadened the definition of a firm's resources (Penrose, 1959) to include competencies that enable a superior fit with demanding situations. Several theoretical studies have examined dynamic capabilities (Eisenhardt & Martin, 2000; Teece, 2014; Teece et al., 1997). Nonetheless, one of the major issues is understanding the relationship between dynamic and innovation capabilities.

Innovation capabilities in universities are essential for driving progress in knowledge advancements, as these institutions play a critical role in fostering innovation ecosystems (Heaton, Siegel, & Teece, 2019). Innovative capability is widely acknowledged as a crucial internal resource that can lead to exceptional performance in higher education (Castela, Ferreira, Ferreira, & Marques, 2018; Huesig & Endres, 2018; Santoro, Vrontis, Thrassou, & Dezi, 2018; Zouaghi, Sánchez, & Martínez, 2018). Students play a crucial role in driving future innovation. Therefore, they are challenged to cultivate the essential skills and abilities pertinent to their prospective careers (Li et al., 2022). Higher education institutions (HEIs) worldwide are implementing higher-quality educational services to equip students with the knowledge and skills necessary to develop their innovative capabilities and to enhance the teaching and learning experience (Jingjing Wu & Gu, 2022).

2.2. The Relationship between Individual Characteristics and Innovative Capability

The success of organizations today is largely dependent on gaining a competitive advantage through innovation. In this rapidly changing world, innovation is one of the important factors that contribute to the growth, competitiveness, and survival of companies. Acquiring knowledge of the factors that contribute to innovation is crucial for both academics and professionals. Individual characteristics are one of the important factors in this scenario. Literature has demonstrated that most organizations nowadays experience an increase in innovation when they actively increase and leverage their employees' innovative capabilities (Voo et al., 2019). Thus, the researcher believes that to address the deficiency in employees' innovative capabilities, proactive measures should be implemented to commence at the early stages of university education.

In today's rapidly evolving world, the integration of cutting-edge information technology and the knowledge economy drives significant change, continually pushing forward. Consequently, university students are tasked with developing crucial skills and competencies necessary for their future careers (Li et al., 2022). University students play an essential role in shaping this development as the key drivers of future innovation (Huang & Li, 2021). Still, there is a lack of effective strategies and methods to enhance students' innovation capabilities (Chen, Li, Li, Zhang, & Dong, 2013). Furthermore, limited research has explored how individual characteristics influence innovative capabilities. The micro-foundations or individual factors that underpin innovation processes are critical to understanding this dynamic (Steinhauser, 2021).

Effective innovation capabilities require individuals to dedicate themselves fully to the idea with enthusiasm and self-motivation (Hölzle & Gemuenden, 2010). These individuals may or may not have been formally designated for involvement in the innovation process. Nonetheless, they demonstrate a significant level of personal engagement in innovative activities and actively support and cultivate the project. Individual characteristics, such as openness and conscientiousness, are among the factors that influence innovation at the individual level. Understanding whether individual characteristics influence innovative capability, specifically among students, is important (Corvello, Belas, Giglio, Iazzolino, & Troise, 2023). An individual's behaviour is consistently shaped by various elements, including culture, subculture, social class, reference groups, family, personality, and psychological characteristics (Orji, Sabo, Abubakar, & Usman, 2017).

Furthermore, Hölzle and Gemuenden's (2010) study indicates that an individual's innovative capability is influenced by their personal traits. Assigning a responsibility or innovation project that fits their particular traits results in better performance, more pleasure, and more success in their capacity for innovation. According to Nam and Nga's (2024) study, a person's innovative capacity is influenced by their particular personality traits, especially openness and conscientiousness. Zaremohzzabieh and Mohd Rasdi (2023) also yielded similar findings, stating that personality traits and employee capacity for innovation have a positive relationship. Thus, the researchers suggest the following hypothesis to establish the relationship between individual characteristics and innovative capability.

Hypothesis 1: Individual characteristics would positively influence students' innovative capabilities.

2.3. The Relationship between Social Skills and Innovative Capability

Social capabilities research provides an extensive evaluation of innovation relationships to deliver optimal business methods for developing innovative staff. Students must use their knowledge to practice innovative skills because they represent the essential winning abilities for the twenty-first century (Atasoy, Özdemir, & Evli, 2023). Organizations commonly achieve their best results by customizing creative performance to match the needs of different situations. Modern individuals need specific skills together with knowledge according to the framework of 21st-century skills to achieve success in the present era. Advanced reasoning and analysis, along with teamwork and complex challenge-solving capabilities, good decision-making, creativity, information technology adoption, entrepreneurship, career advancement, leadership, and effective personal responsibility make up the 21st-century skill set (Ananiadou & Claro, 2009; Belet-Boyacı & Güner-Özer, 2019).

The development of social capabilities through social programs leads to improved individuals' innovation abilities (Atasoy et al., 2023). Research conducted by Soda, Stea, and Pedersen (2019) and Kremer, Villamor, and Aguinis (2019) indicates that interpersonal skill holders excel at perspective coordination and communication, which leads to enhanced innovative results. Innovative processes depend on knowledge sharing because the sharing process extends to such extensive levels (Obstfeld, Borgatti, & Davis, 2018). The practice allows teams to build identical concepts that serve as foundations for their team identity development. Organizations need superior social abilities to achieve successful knowledge transfer between different organizational units across time and space. Reagans and McEvily (2020) demonstrate that people with social skills actively participate in information sharing. Social skills enable organizations to boost innovation through learning because they enhance group performance. According to Atasoy et al. (2023), the enhancement of innovation through social skills leads to better teamwork, knowledge sharing, and problem-solving.

Problem-solving depends on uniting different viewpoints through team collaboration based on the aforementioned discussions. People who have the capacity to solve conflicts alongside empathy excel at social interactions that generate constructive concepts (Hülsheger, Anderson, & Salgado, 2018). Empathetic people possess the skill to understand other perspectives, which leads to both effective and creative solutions for problems (Wang et al., 2021). Therefore, the research proposes the following hypothesis to analyze the impact of social skills on the ability to innovate:

Hypothesis 2: Social skills would positively influence students' innovative capabilities.

2.4. The Moderating Effect of Content Knowledge on Individual Characteristics, Social Skills, and Innovative Capability

Organizations need innovative strategies to improve competitiveness and stimulate growth. Organizational innovation requires knowledge about which elements influence the development of innovative capabilities. According to Schumpeter (1934), entrepreneurship operates through creative processes that bring together new resources to develop innovations across product creation, production approaches, and market system development. According to his model, innovative activity demands complete control over technological understanding, practical applications, and contemporary trends. Objectively fundamental knowledge is the basis for transformative concepts to fulfill their potential market relevance. Shulman (1986) provides the explanation of content knowledge as an individual's understanding of specialised subject matter. A specific area of interest requires all its essential procedures, theories, concepts, and factual information to be considered part of content knowledge. Research shows individual characteristics and social skills are important predictors of innovation but it does not clarify the impact of content knowledge on these relationships.

Innovative ideas require content knowledge to become essential components. The findings show that people with specialized knowledge excel at identifying innovation opportunities and executing creative concepts (Simonton, 2018). According to Guler and Nerkar (2019) and Palmer, Weng, and Koenig (2020), the innovation predictive factors consist of individual characteristics, including cognitive flexibility, risk-taking propensity, and creativity. According to Ericsson et al. (1993), content knowledge is essential for creative individuals to improve their ideas before achieving successful innovation. According to McGrath (2019), it allows people to chart uncertain grounds more effectively and develop their risk-taking abilities for innovation.

Experimental research conducted by Korzilius et al. (2021) together with Tenzer, Pudelko, and Harzing (2020) demonstrates that teamwork and communication soft skills receive considerable improvement through content knowledge development, which generates better collaborative outcomes and innovation results. Individuals use content knowledge as an essential tool to enhance their ability to share ideas and work together, which helps create better conditions between personal traits and social abilities toward innovation development. The way content knowledge interacts with other factors implies that content knowledge development investments will boost

organizational innovation potential to a significant degree. The researchers propose the following hypothesis based on these arguments:

Hypothesis 3: Content knowledge would moderate the effects of (a) individual characteristics and (b) social skills on their innovative capability.

3. RESEARCH FRAMEWORK

Based on the literature, Figure 1 illustrates the proposed research framework. In this framework, individual characteristics and social skills act as independent variables. Content knowledge is treated as the moderating variable, and innovative capability acts as the dependent variable.

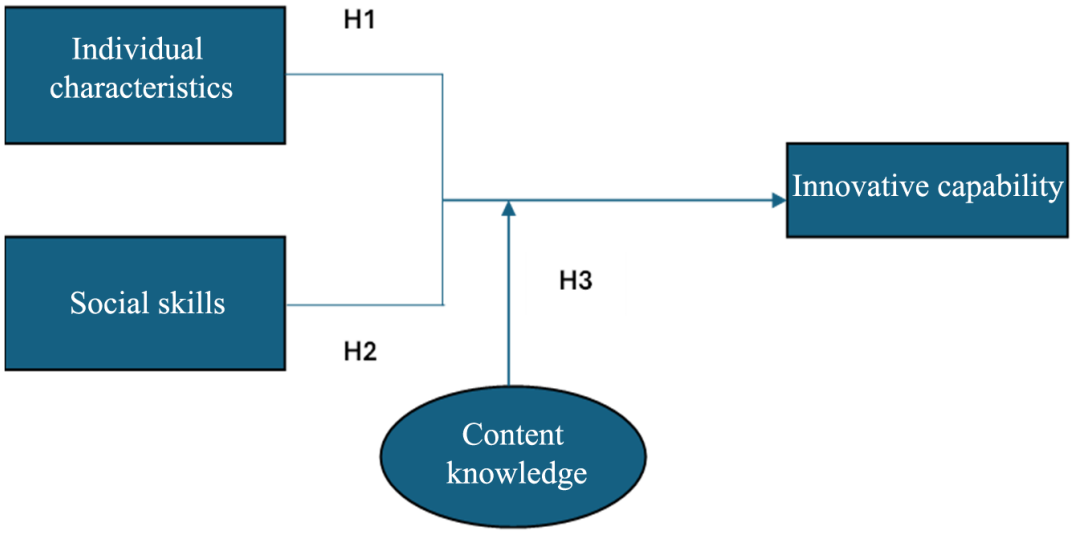

Figure 1. Proposed research framework.

4. RESEARCH METHODOLOGY

This study was a quantitative investigation to examine the relationships between individual characteristics and social skills towards students' innovative capabilities. This approach was utilized to provide statistical confirmation of the conceptual model and the relationship between variables. A survey questionnaire was designed to collect data from respondents to test the hypotheses. Data were gathered based on their perceptions regarding the variables of this study. This study also observed the moderating effect of content knowledge in addition to examining these relationships.

4.1. Sampling Technique and Sample Size

The study sample consisted of students currently enrolled at Universiti Teknologi MARA, Melaka, Malaysia. The study selected students exposed to and involved in innovation activities on campus. For this purpose, the sampling technique deemed most appropriate for this study was purposive sampling, a non-probability sampling method. This sampling technique was chosen as it allowed the researchers to select the sample based on who they thought would be appropriate for the study.

In terms of the sample size, the sample-to-item ratio proposed by Hatcher (1994) and Suhr (2006) was followed. They suggested a 5:1 ratio based on the number of items. As this study included 25 items, the minimum sample size required was 125 samples. However, 300 questionnaires were distributed, but only 142 questionnaires were returned. Two questionnaires were removed from the data analysis due to outliers. Thus, 140 responses collected for this study met the minimum requirement for further analysis. The demographic profiles of respondents are as follows:

Based on Table 1, most respondents were female, comprising 107 (76.4%), while the remaining 33 respondents (23.6%) were male. The highest percentage of the age group was respondents between 18 and 20 years old, with 89

respondents (63.6%). This is followed by those in the age group of 21-23 years old, with 42 respondents (30%). There were only nine respondents aged between 24-26 years old, with 6.4% of the sample population. Finally, regarding the level of study, the majority of respondents in this study comprised diploma students with 87 respondents (62.1%), and the rest were bachelor's degree students, representing 37.9% of the sample population.

Table 1. Demographic profile of respondents (n = 140).

Demographic variables	Frequency	Percentage (%)
Gender		
Male	33	23.6
Female	107	76.4
Age		
18-20	89	63.6
21-23	42	30
24-26	9	6.4
Level of study		
Diploma	87	62.1
Degree	53	37.9

4.2. Survey Instruments

The questionnaire was divided into five sections: demographic data, individual characteristics, social skills, content knowledge, and innovative capabilities. The measurement items for this study were adopted from previous studies. For the operationalization of individual characteristics, 10 items from Park and Kim's (2021) study were adapted. Samples of the items included "I often come up with great ideas" and "I tend to execute what I have planned." Five items measuring social skills were adapted from López-Fernández, Moreno, and Garrosa (2022). A sample item was "I can create partnerships with others." Five items measuring content knowledge (e.g. My design skills have led me to be more creative and develop solutions) were adapted from Shulman (1986). For the dependent variable, there were five items measuring innovative capability that were adopted from Liao, Fei, and Chen (2007). A sample of the item was "I often collaborate with other students to produce innovative and creative ideas." All items were measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

4.3. Data Analysis

For data analysis, the Statistical Package for Social Sciences (SPSS) version 26 was used. The procedures involved data entry, data cleaning, treatment for missing data, and identification of outliers. Then, all constructs were tested for reliability. Next, analyses such as descriptive analysis, frequency analysis, and hierarchical regression analysis were performed for hypothesis testing. Hierarchical regression allows researchers to assess the unique contribution of a variable or a set of variables after accounting for the effects of other variables already included in the model (Tabachnick & Fidell, 2019).

Table 2. Cronbach's alpha and analysis of mean (n=140)

Variables	Number of items	Cronbach's alpha	Mean	Std. deviation
Individual characteristics	9 (1 deleted)	0.88	4.04	0.51
Social skills	5	0.821	4.06	0.55
Content knowledge	5	0.783	3.85	0.56
Innovative capability	5	0.837	4.05	0.56

5. FINDINGS AND ANALYSIS

5.1. Reliability and Descriptive Analysis

According to Sekaran and Bougie (2016), the reliability measure exemplifies the consistency and stability of the instruments used to measure a construct, helping to evaluate the goodness of a measure. Based on Table 2, all

variables have scored good internal consistency and reliability. Thus, all measurement items in this study are considered reliable.

Table 2 also indicates the mean values for all variables. The mean value for students' innovative capability is high (M = 4.05 and SD = 0.56). On average, it indicates that individuals perceive themselves as highly capable of innovating. Both independent variables, individual characteristics (M = 4.04 and SD = 0.51) and social skills (M = 4.06 and SD = 0.55), also have higher mean values. As a moderating variable, content knowledge scored a slightly lower mean value than the other variables (M = 3.85 and SD = 0.56).

The standard deviations indicate some variability in how individuals perceive their skills, but this variability is not excessively high, suggesting a relatively consistent self-assessment among the variables evaluated.

Table 3. Hierarchical regression analysis

Dependent variable: Students' innovative capability				
Variables	**Model 1**	**CI,95%**	**Model 2**	**CI, 95%**
Individual characteristic	0.300***	0.164,0.512		
Social skills	0.505***	0.37, 0.696		
Content knowledge X individual characteristics			0.638	-0.183,0.373
Content knowledge X social skills			-0.433	-0.338, 0.211
Model fit statistics				
F-value	84.463***		43.214***	
R^2	0.55		0.56	
ΔR^2	0.55		0.01	

Note: *** indicates significance at 0.001.

5.2. Hierarchical Regression Analysis

Table 3 shows the results from the hierarchical regression analysis. In model 1 (direct relationship), the inclusion of individual characteristics and social skills accounted for 55% of the variance in students' innovative capability, $R^2 = 0.55$, $\Delta R^2 = 0.55$, $F(2, 137) = 84.463$, and $p < 0.001$. This indicates that the model is well-fitted and valid. The results of parameter testing are used to evaluate the research hypotheses and to explain the variance in innovative capability significantly. The findings reveal that individual characteristics have a significant effect on students' innovative capability ($\beta = 0.3$, $p < 0.001$). Consequently, hypothesis 1 is supported. This suggests that as individual characteristics increase by one standard deviation, innovative capability increases by 0.3 standard deviations. Additionally, the analysis shows a significant effect of social skills on students' innovative capability ($\beta = 0.505$, $p < 0.001$). Therefore, hypothesis 2 is supported. As social skills increase by one standard deviation, innovative capability increases by 0.505 standard deviations. The most influential independent variable is social skills, with a beta value of 0.505, compared to individual characteristics, which have a beta value of 0.3.

To test the moderation effect, the inclusion of content knowledge in the model (model 2) accounted for an additional 1% variance in predicting students' innovative capability ($\Delta R^2 = 0.01$, $F(4, 135) = 43.214$, $p < 0.001$). Thus, the moderation model is also fit and valid. Nevertheless, the results from hierarchical regression analysis failed to support hypotheses 3a and 3b, as the interaction effects of content knowledge with individual characteristics ($\beta = 0.638$, $p > 0.05$) and with social skills ($\beta = -0.433$, $p > 0.05$) were not significant.

6. DISCUSSION

This study investigated the direct impact of individual characteristics and social skills on innovative capability among undergraduates in Malaysia, a developing country. While achieving this objective, this study also examined the moderating effect of content knowledge on those relationships. The outcomes of this study could be applied to a wider geographical context worldwide. The analysis revealed that individual characteristics significantly influenced innovative capability among students (H1: $\beta = 0.3$ and $p < 0.001$). This result aligned with Nam and Nga (2024) empirical analysis within the context of Vietnam. The research revealed that personal traits exert a substantial impact

on innovative capacity. Conscientiousness and openness to experience serve as individual characteristics that determine how much a person can innovate. Research indicates that individual traits function as one of the elements that shape innovation outcomes at a personal level. Zaremohzzabieh and Mohd Rasdi (2023) concluded that individual characteristics serve as vital elements for encouraging innovative practices through their meta-analysis.

The study results indicated that students' innovative capability is strongly influenced by their social skills (H2: $\beta = 0.505$ and $p < 0.001$). The findings corroborate those of Atasoy et al. (2023), who examined students at a western Turkish state university. The researchers found that social skills have significant effects on the development of innovative capacity. Expressing empathy as a social skill facilitated additional innovative activities among participants. High social skills enhanced individuals' effectiveness in collaboration, knowledge sharing, and innovation development. Personal social abilities emerged as a variable at the individual level that influences the creation of innovation. Additionally, Soda et al. (2019) studied Italian participants, demonstrating that effective social skills foster relationship-building abilities essential for accessing diverse information resources necessary for innovation development.

Research findings show that content knowledge failed to influence how individual qualities affect innovative capability (H3a: $\beta = 0.638$ and $p > 0.05$). New research shows individual cognitive capabilities, together with personality traits, provide better explanations of innovative capability than content learning levels of individuals. Research findings show that innovation capability receives guidance from external elements instead of individual knowledge levels following validation of this effect. The research shows how innovation processes become more complex because personal characteristics now outweigh technical knowledge as fundamental factors for creating innovative products (Chesbrough, 2020).

The analysis failed to establish a moderator effect between content knowledge and the relationship between social skills and innovative capability ($\beta = -0.433$ and $p > 0.05$). Content knowledge may serve as the foundation for understanding specific concepts. However, the connection between social skills and innovative capability may exist independently of any influence on this relationship by content knowledge. Surprisingly, students with strong social skills may not utilize these abilities to enhance their innovative thinking in relation to content knowledge. The relationship between social skills and innovative capability could stem from the ability to work effectively with others, share ideas, and create a collaborative environment. These elements might be strong enough to drive innovation independently of the depth of content knowledge. In other words, students could leverage their social skills to innovate regardless of their content expertise (Kong & Cheng, 2022).

Although neither moderation hypothesis was supported independently, the regression analysis revealed that adding content knowledge increased students' innovative capability by 1%. In other words, content knowledge had a small but measurable impact on students' ability to innovate beyond other factors already considered.

6.1. Theoretical Implications

This study makes theoretical contributions by establishing the significant role of individual characteristics and social skills in fostering innovative capabilities among undergraduates. It expands the understanding of how human capital attributes, such as conscientiousness and social skills, also interact with content knowledge to enhance innovative capability, aligning with some of the previous authors' arguments (Atasoy et al., 2023; Corvello et al., 2023; Ericsson et al., 1993). The empirical findings within the Malaysian context also validate the previously highlighted gap in the global context, which shows that the relationship between personality traits and innovative behaviour is insufficiently addressed (Nam & Nga, 2024). Thus, it is universally established that individual characteristics and social skills influence innovativeness.

Furthermore, the outcomes of this study also contribute to knowledge-based innovation. The inclusion of content knowledge as a moderator highlights that having a depth of knowledge in the innovation process is a crucial interaction between individual and social factors in fostering innovative results. This means that the ability to

innovate among undergraduates is not only dependent upon having the right individual attributes and social skills but is also contingent upon students' understanding of the content and area in which the innovation activities are being carried out at the university.

This study also contributes to the interdisciplinary debate by integrating knowledge from psychology, education, and innovation management. Therefore, future research is encouraged to explore the intersections of these fields.

6.2. Managerial Implications

Higher education administrators can enhance innovation activities by implementing curriculum reform incorporating innovation capability, social skills, individual characteristics, and content knowledge. It expedites the transformation of higher education management, enhances the material of innovative activities for students, and improves the efficacy of human resource development. University students who possess these qualities would be better prepared to promptly address the needs of various businesses and navigate the complexities of the labor market by adopting this approach. Additionally, they may help organizations and governments maintain their competitive edge in an era characterized by a knowledge-based economy and innovation-driven progress. This also plays a crucial role in ensuring the long-term viability of higher education.

Moreover, Jie Wu, Pangarkar, Shi, Liu, and Wu (2024) have presented that developing countries, alongside their firms, must strengthen innovation capabilities because they face uncertain technology acquisition from traditional suppliers. These scholars argue that firms need to increase their interaction with universities to achieve significant innovations. The pressure is on universities to promote innovation through the sustained development of an innovative student culture. The curriculum design requires revision by educational institutions to merge technical information with social competence development.

According to Heaton et al. (2019) and Ralfs (2023), enhancing universities' innovation ability requires three essential elements: comprehensive research facilities, institutional partnerships, and support for multidisciplinary studies that enable the development of discoveries and their practical implementation. Universities should invest in faculty and staff professional development and create a collaborative culture to develop an open knowledge-sharing environment.

7. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This research had several limitations. First, the analysis used data from a single Malaysian higher learning institution with a small number of participants. The limited number of 142 samples possibly lacked the necessary power to extend research conclusions beyond the analyzed population. Second, designing a sampling strategy for this study creates the possibility of selection bias affecting participants. The participants who voluntarily join innovative activities represent a different population than those who do not pursue such activities. The researchers omitted deploying methods for bias control, such as the Heckman selection model, despite potential biases in their study. Third, the research model fails to incorporate several essential elements that could affect innovation capabilities, such as school culture for innovation and student background knowledge regarding innovation. The exclusion of these variables might produce distorted conclusions regarding the estimated effects.

The authors proposed two main recommendations about research methodology for future studies: boosting the sample population statistics and strengthening content knowledge tests as moderating elements. Better results would emerge from expanding the number of subjects and participant populations for improved external validity of the research. The minimal influence of content knowledge on varying innovative capability creates opportunities for future research regarding factors such as knowledge transfer, institutional culture, and leadership practices. Kottmann, Schildkamp, and van der Meulen (2024) found that educational innovation development improves when institutions adopt cultures that welcome leadership styles supporting transformation. A learning environment is formed by combining these elements to receive new ideas along with innovative capability growth among students.

Educational innovation spreads through leadership initiatives that combine cultural establishment support with new initiative backing for teachers to transform their teaching practices and address their students' educational needs.

8. CONCLUSION

This research reveals that students' innovative capacity in educational institutions depends on their personal qualities and social abilities. Educational institutions must dedicate equal attention to developing personal and social competencies and academic achievements because this combination improves student innovation effectiveness. Although content knowledge did not moderate the relationship as hypothesized, its significance in fostering an overall environment conducive to innovation cannot be overlooked, indicating a need for future research to explore this further. Additionally, the insights gained can inform policymakers in creating supportive frameworks that integrate academic learning with the development of essential competencies, ultimately leading to a more practical workforce capable of driving innovation in a rapidly evolving job market. This study contributes to the broader dialogue on enhancing the employability of graduates and reinforcing the importance of higher education institutions in shaping future human capital by addressing these aspects.

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