The Interaction between Social Support and IoT Competence with Innovative Behavior among TVET Instructors in Melaka

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ABSTRACT

This study investigates the association between social support, Internet of Things (IoT) competencies, and innovative behavior among TVET (Technical and Vocational Education and Training) instructors in Melaka. It also examines the significance of IoT competence as a mediating factor in this relationship. A total of 100 instructors from six randomly selected TVET institutions in Melaka participated in the study. Data were collected using a structured questionnaire comprising four sections: demographics, social support (15 items), IoT competence (12 items, after removing 3 based on a pilot study), and innovative behavior (19 items). Respondents completed the questionnaire online using a five-point Likert scale. Data were analyzed using IBM SPSS Version 29.0, involving both descriptive and inferential statistics. Pearson correlation analysis revealed a significant positive relationship between social support, IoT competence, and innovative behavior. Mediation analysis further confirmed that IoT competence mediates the relationship between social support and innovative behavior. These findings underscore the role of both social support and IoT skills in fostering innovation among TVET instructors. The results can guide stakeholders in enhancing support systems and technology training, thereby strengthening industry-relevant TVET education aligned with Industry 4.0 demands.

Keywords: Social support, Internet of Things (IoT), IoT capabilities, Innovative behavior, TVET (Technical and Vocational Education and Training), Pearson correlation analysis, Mediation analysis, Industry 4.0

INTRODUCTION

Malaysia's Technical and Vocational Education and Training (TVET) is a crucial platform in the era of the Fourth Industrial Revolution for producing a competitive and highly skilled workforce capable of meeting the increasingly complex demands of the industry. Melaka, as one of the states with rapidly growing TVET institutions, plays a significant role in ensuring that its education system aligns with technological advancements and evolving market needs. However, close attention must be paid to the challenges faced by TVET instructors, including the need for technological skills, adequate social support, and the implementation of innovative teaching approaches.

Technological skills, particularly those related to the Internet of Things (IoT), are essential for delivering relevant and effective education. According to UNESCO-UNEVOC (2019), IoT not only enhances learning interactions but also enables instructors to provide students with experiences that mirror real-world industry environments. However, Ahmad et al. (2021) found that a substantial number of TVET instructors in Malaysia have yet to achieve adequate proficiency in IoT due to a lack of professional training and limited exposure to current technological applications.

The development of new ideas and the application of creative teaching strategies are essential for instructors to adapt their methods in response to student needs and evolving industry demands. This innovative behavior enables educators to remain relevant and effective. However, factors such as work pressure, limited resources, and a lack of recognition for innovation often hinder instructors from embracing such practices (Jafar et al., 2020). Moreover, Lee et al. (2023) emphasized the need for further research on the relationship between social support, technological competence, and innovative behavior particularly within the context of Malaysia's Technical and Vocational Education and Training (TVET) institutions.

One of the major challenges faced by TVET instructors is the lack of adequate social support. Support from administrators, colleagues, and industry partners plays a vital role in boosting instructors' confidence and ability to implement new teaching methods. However, Subramaniam and Aziz (2022) found that stakeholder involvement in providing this support remains inconsistent, with significant weaknesses in collaboration between TVET institutions and the industry. Similarly, Rasul et al. (2015) noted that instructors have limited opportunities for industrial training, primarily because industries lack incentives to participate in such initiatives.

In addition, the vocational education and training (TVET) system in Malaysia is considered to have significant weaknesses in terms of technological skills, particularly those related to the Internet of Things (IoT). As one of the core technologies of the Fourth Industrial Revolution (IR 4.0), IoT has the potential to enhance teaching effectiveness through interactive and relevant approaches. However, many TVET instructors reportedly lack adequate training or experience in using this technology. Che Amran et al. (2020) highlighted that, despite ongoing efforts to improve instructors' technological competencies, flaws in the implementation of training programs have led to a substantial skills gap.

The need for innovative action in education also demands serious attention. Innovative behavior refers to the adoption of creative approaches, the development of new teaching methods, and the adaptation of teaching strategies to meet learners' needs. Although such practices are crucial for enhancing teaching quality, they are often hindered by high job pressure, limited resources, and inadequate social support. Minghat et al. (2013) further noted that instructors' reluctance to innovate may also stem from a lack of confidence in the effectiveness of innovation within the TVET context.

Taken together, these challenges indicate a need for further investigation into the relationship between social support, IoT competencies, and innovative behavior among TVET instructors—particularly in the context of Melaka. This study aims to contribute to the development of more effective strategies for enhancing the quality and effectiveness of Malaysia's TVET system. Therefore, this research is guided by the following objectives:

1. To identify the level of social support among TVET instructors in Melaka.
2. To identify the level of IoT competence among TVET instructors in Melaka.
3. To identify the level of innovative behavior in teaching among TVET instructors in Melaka.
4. To examine the relationship between social support, IoT competence, and innovative behavior among TVET instructors in Melaka.

LITERATURE REVIEW

Social Support

Social support refers to the emotional, instrumental, and informational assistance individuals receive from their social networks. For instructors, receiving adequate social support helps reduce work-related stress, enhances motivation, and improves teaching effectiveness. Emotional support includes moral encouragement and psychological assistance from colleagues, administrators, and the broader community. Instrumental support refers to tangible resources such as access to technological equipment and training, while informational support encompasses advice, strategies, and guidance aimed at improving workplace efficiency (House, 1981; Tardy, 1985).

Studies have shown that social support can significantly influence instructors' creativity. A supportive teaching environment—fostered by administrators and colleagues—can motivate educators to experiment with innovative instructional strategies (McConnell et al., 2020). In the context of the Fourth Industrial Revolution, informational support plays a key role in helping educators stay updated with modern teaching methods, including the integration of technologies such as the Internet of Things (IoT) (Ahmad et al., 2021).

Within the TVET context, social support is closely linked to effective technology integration in the classroom. Instructors who receive strong support are more likely to adopt and adapt to new technologies (Hussain et al., 2021). Additionally, community support through collaboration and resource sharing enhances the success of innovative teaching and learning implementation (Chauhan et al., 2022).

In summary, social support not only strengthens instructors' motivation but also encourages innovation—especially in TVET education, where adaptability and responsiveness to rapid technological advancement are essential.

IoT Competence

Internet of Things (IoT) competence refers to an individual's knowledge, skills, and ability to understand, utilize, and integrate IoT technology into their professional tasks. In the context of education, this includes the ability to operate smart devices, analyze data, and creatively apply IoT tools in teaching to enhance learning outcomes and foster innovation (Ahmad et al., 2021).

Studies have emphasized the importance of IoT competence in addressing the challenges posed by the Fourth Industrial Revolution. Instructors who are proficient in using IoT tools such as microcontrollers, sensors, and programming platforms are better equipped to deliver instruction that aligns with evolving technological demands (Hussain et al., 2021). Additionally, familiarity with broader IoT concepts such as big data and cloud computing enables educators to offer more engaging and hands-on learning experiences (Chauhan et al., 2022).

IoT competence also contributes to instructors' innovative behavior. The use of emerging teaching tools, including augmented reality (AR) and digital simulations, has been shown to enhance students' understanding of IoT through immersive and interactive environments (Bayani, 2020). Instructors with high IoT self-efficacy tend to be more confident in designing innovative and effective teaching materials (De Vanzari et al., 2023).

In the TVET context, strengthening IoT competence requires continuous professional development and targeted training. Ahmad et al. (2021) stress the need for TVET institutions to provide structured programs and technological support to ensure that instructors can effectively apply IoT-based instruction. These competencies are crucial to preparing students with skills aligned to current and future industry needs.

Innovative Behavior in Teaching

Innovative behavior refers to the actions individuals take to develop, promote, and implement new ideas aimed at improving effectiveness, efficiency, or overall success in their work (Scott & Bruce, 1994). In the educational context, this includes the use of emerging technologies, the creation of new teaching strategies, and the ability to overcome challenges in the learning process (Aboobaker & Zakkariya, 2021).

Carmeli et al. (2010) found that a work environment that fosters creativity significantly enhances instructors' innovative behavior. Educators are more inclined to experiment with new teaching methods when institutional leadership actively supports such initiatives. Positive interactions with colleagues further encourage innovation by enabling the exchange of ideas and collaborative problem-solving. Within the context of the Fourth Industrial Revolution, technological advancements play a central role in driving innovation. Badshah et al. (2023) argue that integrating technologies such as IoT, artificial intelligence (AI), and data analytics empowers educators to design more engaging and industry-relevant learning environments. These innovations not only improve student outcomes but also require instructors to remain adaptable and forward-thinking.

Apart from external influences, internal factors such as passion for teaching and intrinsic motivation also play a key role in encouraging innovation. Instructors committed to continuous professional development are more likely to adopt new teaching approaches despite potential challenges (Meneses et al., 2024). Afsar et al. (2019) further emphasize that access to professional development, recognition of creativity, and emotional support are critical in nurturing intrinsic motivation—an essential component of innovative behavior.

In summary, fostering innovative teaching practices is vital for TVET instructors to improve instructional effectiveness and prepare students for the dynamic demands of the labor market. The literature underscores that innovation in teaching stems from a combination of technological competence, personal initiative, and institutional encouragement.

Theoretical Framework

This study is grounded in several key theories that explain the relationships between technical competence (specifically IoT), social support, and innovative behavior among TVET instructors. Social Support Theory

(House, 1981) posits that enhancing an individual's work performance depends on receiving informational, instrumental, and emotional support. The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) highlights the integration of technological, pedagogical, and content knowledge as crucial for effective teaching. Additionally, Innovative Behavior Theory (Scott & Bruce, 1994) conceptualizes innovation as a three-stage process: ideation, promotion, and implementation. Social Cognitive Theory (Bandura, 1986) further explains how behavior, environment, and personal factors interact to influence creativity within educational contexts.

Within this study's conceptual framework, the two independent variables IoT competence and social support are proposed to influence the dependent variable, which is innovative behavior among TVET instructors. Social support is operationalized as the emotional, instrumental, and informational assistance instructors receive. IoT competence refers to educators' knowledge, skills, and ability to utilize and integrate IoT technologies in teaching. This framework guides the investigation into how social support and IoT competence may enhance instructors' motivation and capacity to innovate in the classroom.

1. Social Support Theory

House (1981) categorized social support into three types: emotional, instrumental, and informational support. Emotional support encompasses empathy, moral encouragement, and attention provided by coworkers, administrators, or community members. Instrumental support refers to tangible aid such as physical assistance, provision of resources, training, and technological facilities. Informational support involves guidance, instructions, and actions aimed at enhancing workplace performance.

This theory is highly relevant to TVET education, as social support helps instructors manage job-related stress and motivates them to improve their performance. Research has shown that workplace social support enhances job satisfaction, productivity, and the willingness to innovate in teaching practices (Ahmed et al., 2020; Chiaburu & Harrison, 2008).

2. Pedagogical Content Knowledge and Technology (TPACK Framework)

The TPACK framework, developed by Mishra and Koehler (2006), emphasizes the integration of technological knowledge, pedagogical knowledge, and content knowledge in education. Technological knowledge refers to an instructor's understanding of technologies, such as the Internet of Things (IoT). Pedagogical knowledge involves effective teaching strategies that incorporate technology, while content knowledge is the instructor's mastery of the subject matter and ability to convey it meaningfully.

This framework is central to the study because IoT competence is seen as a key factor in enhancing instructional effectiveness. By integrating IoT technology, instructors can improve their teaching practices and equip TVET students with the skills needed to meet the demands of the Fourth Industrial Revolution (Hussain et al., 2021).

3. Behavioral Theory

Scott and Bruce (1994) categorize innovative behavior into three stages: idea generation, idea promotion, and idea implementation. Idea generation involves identifying challenges and developing creative solutions. Idea promotion is the process of persuading others about the value of these ideas. Finally, idea implementation refers to putting the ideas into practical use.

This theory explains how TVET instructors can incorporate technology and novel teaching methods to improve learning outcomes. Social support and IoT competence are crucial in supporting educators throughout all stages of innovative behavior from generating ideas to successfully implementing them (Afsar et al., 2019; Janssen, 2000).

4. Social Cognitive Theory

Bandura (1986) proposes that an individual's behavior is shaped by the dynamic interaction between personal, environmental, and behavioral factors. In this study, personal factors refer to TVET instructors' IoT skills;

environmental factors include social support from administrators, colleagues, and the community; while behavioral factors pertain to the instructors' innovative actions.

This theory is particularly relevant to this research as it explains how personal abilities and the work environment interact to influence innovative behavior. For instance, positive social support can enhance instructors' confidence in adopting new technologies, thereby promoting creativity in TVET education.

Conceptual Framework of the Study

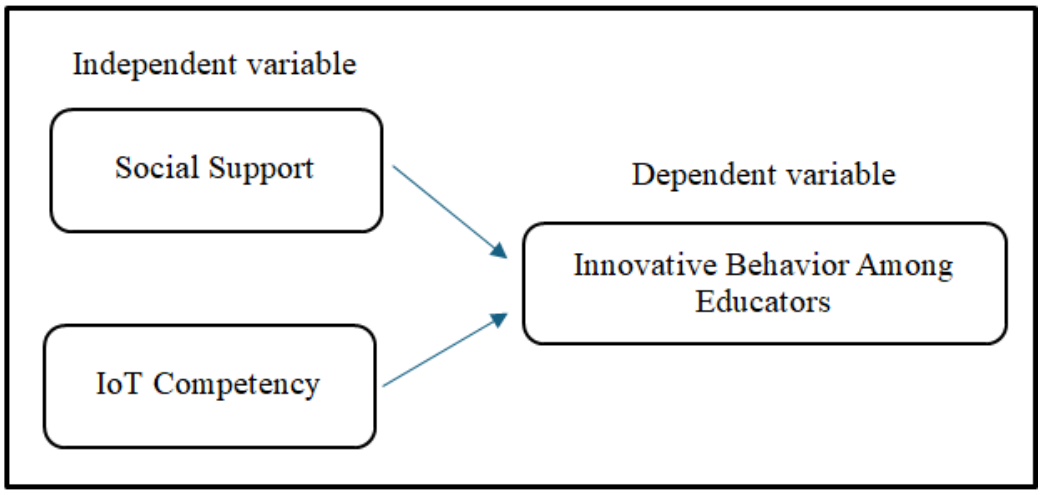

Figure 1: Conceptual Framework: Social Support, IoT Competency and Innovative Behavior Among Educators

Previous research on social support, technological competence, and innovative behavior has produced mixed findings, often influenced by contextual and organizational factors. For instance, Ahmed et al. (2020) and Chiaburu and Harrison (2008) found a positive relationship between social support and employee creativity, highlighting how a supportive work environment—characterized by positive interactions with administrators and coworkers—can motivate individuals to engage in innovative activities.

Conversely, studies conducted in resource-limited or uncertain settings suggest that emotional support alone may not be sufficient to foster creativity. Instead, factors such as creative self-efficacy and structural incentives play a crucial role (Tang et al., 2020). These inconsistencies may arise from differences in organizational culture, particularly regarding the availability of incentives and opportunities to implement new ideas.

In this conceptual framework, IoT competence and social support serve as independent variables influencing innovative behavior as the dependent variable. IoT competence refers to the technical skills and knowledge of TVET instructors in utilizing IoT technologies in teaching, while social support encompasses emotional, instrumental, and informational assistance received from colleagues, administrators, and the community.

The relationship between these variables is depicted in a model where increased IoT competence directly enhances instructors' ability to design and implement creative teaching methods. Simultaneously, social support acts as a catalyst by encouraging and facilitating the use of IoT and innovation in teaching through moral support, resources, and guidance. The model also considers the interaction between the two independent variables, where strong social support can amplify the effectiveness of IoT usage, thereby strengthening the positive impact on innovative behavior.

The conceptual framework of this study is illustrated in Figure 1 above. It highlights how IoT competence and social support both individually and interactively influence the innovative behavior of TVET instructors. IoT competence empowers instructors with the technical skills necessary to creatively integrate IoT technologies into their teaching practices. Concurrently, social support from colleagues, administrators, and the community provides emotional encouragement, practical resources, and informational guidance that sustain and enhance these innovative efforts.

By examining both variables together, this framework offers a comprehensive understanding of the factors driving teaching innovation within TVET institutions, particularly in the rapidly evolving context of the Fourth Industrial Revolution. Such understanding can inform strategies to better support instructors and ultimately improve educational outcomes aligned with industry demands.

RESEARCH METHODOLOGY

Research Design

This study utilized a quantitative approach with a correlational descriptive survey design to investigate the relationships between social support, IoT competence, and innovative behavior among TVET instructors in Melaka. This design is appropriate for identifying and analyzing statistical associations between variables without manipulating the study environment.

Data were collected using a structured questionnaire developed to quantitatively measure each construct. This design was selected for its efficiency in gathering data from a relatively large sample within a limited timeframe. Additionally, it enables the use of statistical techniques such as correlation and regression analyses to uncover meaningful patterns and relationships among variables.

The results obtained from this approach can be generalized to the broader population of TVET instructors, contributing to a deeper understanding of the factors that foster innovation in technical and vocational education.

To ensure the validity and reliability of the research instrument, several measures were undertaken. Content validity was evaluated by a panel of experts specializing in technology and educational innovation, who reviewed the questionnaire items to confirm their relevance and alignment with the research objectives. A pilot study was also conducted with a small group of respondents to assess the clarity and comprehensibility of the items.

Reliability was measured using Cronbach's Alpha to determine internal consistency for each construct. All constructs achieved Cronbach's Alpha values exceeding 0.70, indicating acceptable reliability based on the threshold recommended by Nunnally and Bernstein (1994).

Population and Sample of the Study

The population for this study comprised TVET instructors from skills training centers, community colleges, and vocational institutions across Melaka. Only full-time instructors with a minimum of one year's teaching experience were included to ensure participants had adequate exposure to institutional environments and instructional practices relevant to innovative behavior.

From a total of 23 TVET institutions in Melaka, six were randomly selected to introduce diversity into the sample and minimize sampling bias. Using the Krejcie and Morgan (1970) formula, a minimum sample size of 100 respondents was identified to provide a meaningful representation of the population.

Simple random sampling was employed, giving each eligible instructor an equal probability of selection. This method was chosen for its objectivity and effectiveness in reducing selection bias, thereby ensuring the sample fairly represents the broader population.

Data were collected via online questionnaires, enabling participants to respond at their convenience while maintaining consistency and reliability. This approach was also efficient in terms of time and resource management, especially given the geographic dispersion of the selected institutions.

The data were analyzed using SPSS and Microsoft Excel, which support comprehensive statistical analyses. Descriptive statistics summarized demographic data and variable distributions, while inferential statistics such as correlation and regression analyses were conducted to examine relationships between social support, IoT competence, and innovative behavior.

Research Instruments

Data were collected using a structured questionnaire distributed via Google Forms, allowing respondents to participate conveniently at any time and from any location. This online method is both practical and efficient for large-scale data collection (Creswell & Creswell, 2022).

The questionnaire consisted of four main sections:

- Section A: Collected respondents' demographic information such as gender, age, teaching experience, and highest academic qualification.
- Section B: Measured social support using 12 items after refinement from an initial pool of 15. Based on pilot study findings, 3 items were removed due to low relevance or strong negative responses. The retained items assessed emotional, instrumental, and informational support received from colleagues and administrators. A 5-point Likert scale was used (1 = Strongly Disagree to 5 = Strongly Agree).
- Section C: Assessed IoT competence using 18 items, focusing on instructors' knowledge, usage, and integration of Internet of Things (IoT) technologies in teaching.
- Section D: Evaluated innovative behavior in teaching using 19 items, covering the implementation of new ideas, creativity, and willingness to adopt novel teaching strategies. This section also used a 5-point Likert scale format. Items were adapted from established sources including Zimet et al. (1988) and Schwarzer and Jerusalem (1995).

Content validity was established through expert evaluation by two senior lecturers from Universiti Putra Malaysia, who reviewed the items for relevance and alignment with the research objectives. To ensure instrument reliability, a pilot study involving 30 respondents was conducted. Internal consistency was tested using Cronbach's Alpha, and all constructs demonstrated acceptable reliability with $\alpha > 0.70$.

Data Collection Procedure

The data collection process began after obtaining approval from relevant institutional authorities and ensuring ethical clearance for the study. Participants were informed about the purpose of the research, their voluntary participation, and the confidentiality of their responses.

The finalized questionnaire was distributed online via Google Forms, which allowed for efficient and flexible data collection. A formal invitation message was sent to potential respondents via institutional emails and professional networks, containing a brief explanation of the study and a link to the questionnaire. Participants were given two weeks to complete the survey. Follow-up reminders were sent periodically to increase the response rate. Inclusion criteria were clearly stated at the beginning of the form to ensure only eligible respondents TVET instructors with at least one year of experience participated.

Data collected through Google Forms were automatically recorded in an Excel spreadsheet, which was subsequently cleaned and coded before being imported into SPSS Version 29.0 for analysis. Only complete and valid responses were included in the statistical analyses.

Data Analysis

The data collected in this study were analyzed using IBM SPSS Statistics Version 29.0 to generate both descriptive and inferential statistics aligned with the research objectives. Descriptive analysis included frequency, percentage, mean, and standard deviation to summarize respondents' demographic characteristics and to provide an overview of response patterns for each construct (social support, IoT competence, and innovative behavior).

For inferential analysis, the Pearson Correlation Coefficient (r) was used to examine the strength and direction of relationships between the two independent variables—social support and IoT competence—and the dependent variable, innovative behavior among TVET instructors.

Where appropriate, multiple regression analysis was conducted to assess the predictive power of social support and IoT competence on innovative teaching behavior, providing deeper insights into the factors that significantly contribute to innovation within the TVET context.

RESEARCH FINDING

This study involved 100 TVET instructors in Melaka. Most respondents were female (66%) while males comprised 44%. The largest age group was 31-40 years old (37%), followed by 25-30 years old (33%). Regarding academic qualifications, 43% held a Bachelor's degree, 32% a Diploma or Advanced Diploma, 18% a Master's degree, and 4% a PhD. In terms of teaching experience, the majority (59%) had 1-10 years, 31% had 11-20 years, and 10% had over 20 years of experience.

Descriptive statistics showed that the mean scores for social support, IoT competence, and innovative behavior were 3.85, 3.92, and 3.76 respectively, indicating generally positive perceptions among respondents.

Pearson correlation analysis revealed a significant positive correlation between social support and innovative behavior ($r = 0.62$, $p < 0.01$), and between IoT competence and innovative behavior ($r = 0.58$, $p < 0.01$). These results suggest that higher social support and better IoT competence are associated with increased innovative behavior among TVET instructors.

Table 1: Respondent Demographic Profile

	Group	**Frequency (f)**	**Percentage (%)**
Gender	Male	44	44
	Female	66	66
Age	25-30 years old	33	33
	31-40 years old	37	37
	41-50 years old	25	25
	51-60 years old	5	5
Academic Eligibility	Sijil Pelajaran Malaysia	3	3
	Diploma/ Advanced Diploma	32	2
	Bachelor’s Degree	43	43
	Master's Degree	18	18
	PhD	4	4
Work Experience	1-10 years old	59	59
	11-20 years old	31	31
	21-30 years old	10	10
Amount		100	100

Social Support, IoT Competence, and Innovative Behavior

Table 2 presents the mean and standard deviation scores for social support, IoT competence, and innovative teaching behavior. The results show that social support received the highest mean score of 4.22 (SD = 0.655), followed by innovative behavior with a mean of 4.26 (SD = 0.340), and IoT competence with a mean of 3.97 (SD = 0.719). These findings indicate that TVET instructors perceive strong social support and exhibit moderate levels of innovation in teaching, while IoT competence remains comparatively lower, highlighting the need for improvement in technical skills.

Table 2: Mean Findings for Social Support, IoT Competence, and Innovative Behavior

Variable	Mean	Standard deviation	Interpretation of the Mean
Social Support	4.22	.655	High
IoT Competence	3.97	.719	High
Innovative Behavior in Teaching	4.26	.340	Moderate

The data analysis showed that social support and innovative teaching behavior had higher mean values than IoT competence (moderately high). Based on these results, TVET instructors generally think positively about the support they receive and display creative teaching behaviors. However, there is still room to improve IoT competencies to deliver more effective and industry-relevant instruction.

Correlation Analysis

1. The Relationship between Social Support and Innovative Behavior

Table 3 illustrates the Pearson correlation between social support and innovative behavior. The analysis reveals a weak positive but non-significant correlation ($r = 0.138$, $p = 0.171$), suggesting that social support does not have a statistically significant relationship with innovative teaching behaviors among the respondents. This indicates that other factors may influence innovative behavior beyond perceived social support.

Table 3: The Relationship between Social Support and Innovative Behavior

Variable		**Social Support**	**Innovative Behavior in Teaching**
Social Support	Pearson Correlation	1	.138
	Sig. (2-tailed)		.171
	N	100	100
Innovative Behavior in Teaching	Pearson Correlation	.138	1
	Sig. (2-tailed)	.171	
	N	100	100

2. The Relationship between IoT Competence and Innovative Behavior

In contrast, Table 4 indicates a statistically significant positive correlation between IoT competence and innovative teaching behavior ($r = 0.237$, $p = 0.018$). This suggests that instructors with higher IoT proficiency tend to apply more innovative approaches in their teaching. The finding supports the notion that technical skills, particularly in IoT, can influence creativity in instructional practices within TVET settings.

Table 4: The Relationship between IoT Competence and Innovative Behavior

Variable		**IoT Competence**	**Innovative Behavior**
IoT Competence	Pearson Correlation	1.000	.237*
	Sig. (2-tailed)		.018
	N	100	100
Innovative Behavior	Pearson Correlation	.237*	1.000
	Sig. (2-tailed)	.018	
	N	100	100

**correlation is significant at the 0.05 level (2-tailed)

3. Multiple Regression Analysis

Table 5, 6, and 7 present the results of the multiple regression analysis used to assess the combined effect of social support and IoT competence on innovative teaching behavior. The R^2 value is 0.066, indicating that only

6.6% of the variance in innovative behavior can be explained by the two independent variables. Although the value is relatively low, the model is statistically significant (F = 3.400, p = 0.037), as shown in the ANOVA test (Table 6), suggesting that the model provides meaningful insights.

Further analysis in Table 7 reveals that IoT competence has a significant positive contribution to innovative behavior (β = 0.232, t = 2.195, p = 0.031), while social support does not show a significant effect (β = 0.051, t = 0.484, p = 0.629). This confirms earlier correlation findings that IoT skills are more influential than social support in predicting innovation among TVET instructors.

Table 5: Testing Using Multiple Regression

Model	R	R Square	Adjusted R Square	Std.
1	0.256	0.066	0.046	0.332

Table 6: Anova Test

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	0.748	2	0.374	3.400	0.037*
Residual	10.666	97	0.110		
Amount	11.414	99			

Note: shows significant at p <0.05.

Table 7: Multiple Regression Coefficient

Independent variable	B	Std. Error	Beta	t	Sig.
(constant)	3.715	0.244	-	15.216	<0.001
Social Support	0.027	0.055	0.051	0.484	0.629
IoT Competency	0.110	0.050	0.232	2.195	0.031

Note: shows significant at p<0.05.

Overall, the findings reveal that TVET instructors reported high levels of social support and moderately high IoT competence. However, only IoT competence showed a significant positive correlation with innovative behavior, while social support did not yield a significant relationship. Regression analysis confirmed that IoT competence was a significant predictor of innovative teaching practices, suggesting that technical proficiency plays a more direct role in fostering innovation than social factors alone.

DISCUSSION

The findings of this study reveal a strong and significant positive correlation between IoT competence and innovative teaching behavior among TVET instructors in Melaka. This suggests that instructors who possess a higher level of technical skill—particularly in Internet of Things (IoT) technologies—are more likely to demonstrate innovative behaviors in their teaching. This outcome is consistent with the TPACK framework (Mishra & Koehler, 2006), which emphasizes the integration of technological, pedagogical, and content knowledge to enhance teaching effectiveness. Hussain et al. (2021) also support this notion, stating that the use of digital technologies helps learners engage more effectively, especially in the context of the Fourth Industrial Revolution.

Interestingly, although TVET instructors in this study showed high levels of innovation in their teaching methods, their IoT competence was only moderate. This gap points to the need for continuous and targeted professional development, focusing on building instructors' confidence and capability to utilize IoT technologies effectively. Without adequate technical competence, even highly motivated instructors may be limited in the scope and depth of innovation they can implement.

Regarding social support, the findings indicate that instructors perceived strong levels of emotional, instrumental, and informational support. However, while the correlation between social support and innovation was positive, it was not as strong as the relationship between IoT competence and innovation. This suggests that although social support plays a motivating role, it may not directly drive innovation unless coupled with tangible resources, opportunities, and autonomy. Previous research by Ahmed et al. (2020) and Chiaburu and Harrison (2008) found that while social support enhances job satisfaction and morale, it is often insufficient on its own to stimulate innovative behaviors in teaching.

This aligns with Janssen's (2000) assertion that intrinsic motivation, such as the personal desire to improve and grow professionally, plays a more decisive role in fostering innovation than external support alone. Instructors who are self-driven and passionate about teaching are more likely to adopt new technologies and methodologies, even in the absence of strong institutional support. Thus, internal factors like professional commitment and curiosity may serve as stronger predictors of innovation than social encouragement alone.

The study further highlights the importance of providing structured and practical technology training for instructors. Institutions must not only offer moral or emotional support but also ensure that instructors have access to tools, training, and technical assistance to experiment with IoT in their lessons. Furthermore, better planning of social support strategies—especially those that include mentorship, peer collaboration, and hands-on technical support—could enhance the practical value of such support.

In conclusion, these findings underscore the need for TVET institutions to invest in both technological capacity building and the redesign of support systems. Strengthening both areas in tandem can provide a more comprehensive foundation for cultivating innovation among instructors. This is particularly important as TVET institutions prepare students to meet the demands of a rapidly changing, technology-driven labor market.

CONCLUSION AND SUGGESTION

This study concludes that IoT competence significantly influences innovative teaching behavior among TVET instructors, whereas social support shows no meaningful effect. These findings highlight the importance of technological proficiency particularly IoT skills in enabling innovative practices that align with the demands of the Fourth Industrial Revolution.

TVET institutions should therefore prioritize structured, continuous professional development focused on IoT and emerging technologies. Collaboration with industry is equally essential to ensure training content is relevant and grounded in real-world applications.

Although social support was not found to be significant in this study, its practical value should not be overlooked. Institutions should revisit the way support is delivered emphasizing hands-on assistance such as access to tools, mentorship, and recognition to build a more innovation-friendly environment. Instructors themselves are encouraged to remain proactive in upskilling and staying abreast of technological trends. At the same time, institutions should foster a culture that celebrates and rewards innovation, both technically and emotionally.

Future research should consider broader factors such as workload, intrinsic motivation, and access to resources. A qualitative approach may offer deeper insight into instructors' real challenges and how best to support innovation at the ground level. Additionally, further studies should explore what forms of social support most effectively foster innovative behavior. This could include larger-scale research incorporating variables like organizational culture or leadership style.

Lastly, stronger collaboration between TVET institutions and industry through joint training programs or temporary instructor placements in tech-based companies can enrich instructors' real-world experience. Such integration is expected to enhance teaching effectiveness, drive innovation, and better prepare students for future industry demands.

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