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ENHANCING UNIVERSITY PERFORMANCE THROUGH THE LENS OF POTENTIAL FACTORS FOR INNOVATION CAPABILITY AMONG ACADEMIC STAFF IN MALAYSIAN UNIVERSITIES: A TOTAL QUALITY MANAGEMENT - BASED INVESTIGATION

*Nur Balqishanis Zainal Abidin[1], Ainin Zakiah Othman[1], Loshini Thiruchelvam[1], Nur Intan Liyana Mohd Azmi[1], Mohd Rashid Ab Hamid[2], Nur Amalina Mat Jan[1]

[1]
Faculty of Science, Universiti Tunku Abdul Rahman, Perak, Malaysia

[2]
Centre for Mathematical Science, Universiti Malaysia Pahang, Pahang, Malaysia

Corresponding Author:
Faculty of Science, Universiti Tunku Abdul Rahman, Perak, Malaysia
E-mail:
balqishanis@utar.edu.my

ABSTRACT

This study aims to investigate the potential factors within Total Quality Management (TQM) that can enhance innovation capabilities among academicians in Malaysian universities. The adoption of TQM principles is pivotal for the development of university performance. Structural Equation Modelling (SEM) was employed to analyse the underlying relationships among latent constructs, comprising of leadership management commitment, people management, stakeholder focus, student focus, recognition and rewards, vision, innovation capabilities, and university performance, as proposed in the model. A total of eight hypotheses were formulated to examine these latent relationships. The Partial Least Squares Structural Equation Modelling (PLS-SEM) technique was utilized to empirically assess the model. Data was gathered through a survey conducted via convenience sampling in both private and public universities in Malaysia, resulting in 123 usable questionnaires. The findings indicate that three out of the seven hypothesized relationships between TQM enablers and innovation capabilities are statistically significant, as evidenced by t-values exceeding 1.96 with two-tailed test using 10,000 bootstrapped samples. These significant relationships influence innovation capabilities and subsequently impact university performance. In contrast, insignificant findings suggest that academic staff working independently minimizes the influence of people management, with limited impact from quality improvement, student focus, and vision dimensions.

Keywords: **Total Quality Management, University Performance, Innovation, Partial Least Square**

INTRODUCTION

Total Quality Management (TQM) is mainly defined as the practice of continuous improvement in an organization to provide quality services or goods to their customers (Nasim, Sikander, & Tian, 2020; Yahiaoui et al., 2022) and this concept is also being practiced in higher education institutions (HEIs) (Wu & Gu, 2022; Abbas, 2020; Kaputa, Loucanova, & Tejerina Gaite, 2022; Y.-A. Kim, Kim, & Tzokas, 2022; Militaru, Ungureanu, & Creţu, 2013). According to Douglas and Jr (2001), TQM enables more innovation activities and is crucial to ensure HEIs stay competitive in its field. Thus, TQM impacts the innovation process and the performance of HEIs. While practicing TQM, all stakeholders should play their role for the HEIs scenario which should consist not only the academic staff, but also the students, and their management staff (Nasim et al., 2020; Ruben, 2018).

Looking further into TQM, this approach has seven distinct dimensions comprising leadership management, people management, student focus, continuous improvement, other stakeholder focus, recognition and rewards, and lastly, vision. A strong leadership management enables the establishment of a good learning culture, explaining to the employees the importance of innovation and creating an environment where all the employees work together to achieve a common goal (Texeira-Quiros, Justino, Antunes, Mucharreira, & Nunes, 2022). Besides, good people management enables creation of a positive working environment where managers and other employees committedly work together as partners in the on-going projects in order to create innovations (Hasham, 2018). Furthermore, student focus factor ensures all the educational curriculum and innovation activities carried out by the top management and employees always consider students as the main customer and benefits them (Hajdari, 2019; Jin, Xu, & Biscocho, 2020).

Next, continuous improvement is seen as a basic requirement needed in all areas of the work in order to remain competitive globally. With respect to HEIs, continuous improvement can be done by providing training to their staff, establishing research centres, having a good working environment within it, and providing enough funding for the innovators to carry out their research (Al-Melham & Al-Subaie, 2021). Other stakeholder factor emphasizes the importance of HEIs to have collaboration with external parties such as industries, local communities or government bodies while doing the innovation projects. This would enable a better discussion and idea sharing which could help provide a better end product, besides obtaining extra funding for the project (Aleixo, Leal, & Azeiteiro, 2018). Recognition and rewards factor is seen as another factor impacting innovation capabilities since researchers will feel more motivated when their innovation success is being appreciated by the organization, for example through giving awards, promotion or incentives. These will encourage the researchers to perform better (Ali, 2012). Finally, vision defines what the leader of the HEIs wants his organization to be in future (Calder, 2014). Thus, with a good vision, the innovative approach would be clearer and it brings the employees to work together with the highest potential of themselves, creating more successful innovations (Al-Mansoori & Koç, 2019).

Although the advantages of TQM approach are clear, the impact level of each dimension/factor towards innovation capabilities and finally university performance might vary according to the organizations since the capability or practice of each organization vary accordingly.

Thus, this study would like to investigate how far universities in Malaysia practice TQM. For this, questionnaires are distributed to a number of respondents consisting of Academic Staffs of universities in Malaysia, asking how far TQM dimensions have been practiced in their organizations and how far it has impacted their university's performance through the innovation capabilities.

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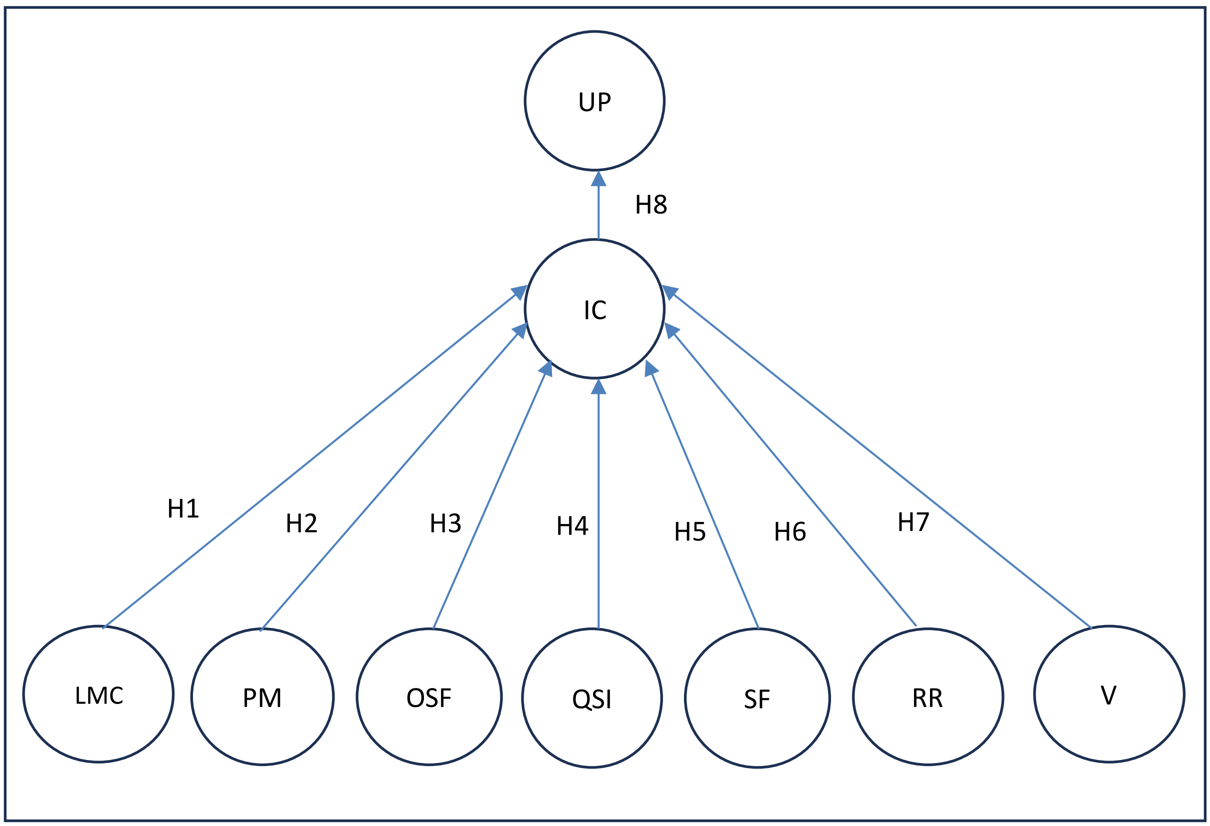
LITERATURE REVIEW & RESEARCH HYPOTHESES

TQM has emerged as a crucial framework for enhancing organizational performance across various sectors, including the realm of higher education. In the context of Malaysian universities, this study delves into the specific factors within TQM that have the potential to significantly enhance innovation capabilities among academic professionals. The seven constructs of TQM namely leadership management commitment, people management, stakeholder focus, student focus, recognition and rewards, and vision were identified to support the innovation capabilities and indirectly contribute to the overall university performance.

Research Model

Figure 1 illustrate the research model which consists of eight hypotheses to empirically examine the components in TQM posited in the model that influences innovation capabilities and improved university performance.



Note: UP: Universities Performance, IC: Innovation Capabilities, LMC: Leadership Management Commitment; PM: People Management; OSF: Other Stakeholder Focus; QSI: Quality System Improvement; SF: Student Focus; RR: Recognition and Reward; V: Vision; H: Hypothesis

Figure 1. Research model consisting of TQM components with hypotheses that promote innovation capabilities and enhance universities' performance.

Leadership commitment, which is the first TQM component, is hypothesized to significantly influence innovation capabilities in higher education is described as H1. It plays a pivotal role in fostering the learning culture through "transformational leadership." Effective leadership, as highlighted by Texeira-Quiros et al. (2022), includes employee training and commitment to continuous improvement. As emphasized by McLaughlin and McLaughlin (2020), understanding individual attitudes toward innovation is crucial for developing innovative skills. Besides, strong leadership is the crucial foundation in creating an effective institution management (Sibarani, 2023). Communication, diversity promotion, and trust contribute towards generating novel teaching methods and research ideas (Vladić, Maletič, & Maletič, 2021). Transformational leadership, as per Gui, Lei, and Le (2021), motivates collaboration and teamwork for common goals, even during challenges like the Covid-19 pandemic (Calen, Tarigan, Rosita, Susanto, & Alimin, 2021). Encouraging knowledge sharing among employees, suggested by Lathong, Ba Phong, and Saeheng (2021), is an effective strategy. Lei, Leaungkhamma, and Le (2020) note that transformational leadership positively influences innovation skills, particularly through the stronger impact of self-efficacy over optimism. Thus, the alternate hypothesis is postulated as follows:

H1: Leadership management commitment significantly influences the innovation capabilities.

TQM's next construct, people management, is crucial and influence innovation capabilities is described as H2. Effective people management is vital for fostering innovation in HEIs. Sonia (2021) discusses how TQM in higher education emphasizes the importance of human resources as a key component in achieving customer satisfaction and loyalty. Alshatnawi and Ghani (2018) stress that staff involvement in TQM is crucial, encouraging motivated employees for continuous improvement. Quality teaching staff also plays a vital role in fostering commitment and teamwork (Khurniawan, Sailah, Muljono, Indriyanto, & Maarif, 2020). Long, Kowang, and Wan Ismail (2015) state that practicing TQM shows a positive link with people management. Having skilled individuals is essential for creativity and successful project implementation (Jin et al., 2020; OECD, 2015). Research by Bachioua, Kachaou, and Keffane (2020) and Khan and Naeem (2018) found that maintaining professionalism and a positive work environment through effective people management is crucial for successful project implementation and sustainable business performance. Additionally, employee involvement and participative management in TQM are vital for continuous improvement and increased productivity (Hasham, 2018). Thus, the alternate hypothesis is postulated as follows:

H2: People management significantly influences the innovation capabilities.

H3 suggests that other stakeholder focus influences innovation capabilities. Santoso et al. (2021) emphasize involving various parties, such as the government, local communities, and educational institutions, to enhance university lecturers' innovation skills. Industry collaborations, highlighted by Lester and Sotarauta (2007), provides funding and contribute to knowledge creation, recognizing the pivotal role of universities in knowledge generation (Tseng, Huang, & Chen, 2020). Gjelsvik (2018) argues for regional alignment, considering diverse stakeholders like students, employees, and society. Nadim and Al-Hinai (2016) stress continuous updates aligned with stakeholders' needs. Aleixo et al. (2018) advocate for partnerships with government organizations, customers, and research partners. Collaboration is crucial for defining a university's path to its desired future (Sisto, Sica, & Cappelletti, 2020). Thus, the alternate hypothesis is postulated as follows:

H3: Other stakeholder focus significantly influences the innovation capabilities.

Improving the quality system has an impact on innovation capabilities (H4). Laila and Ahmed (2022) emphasize the need for ongoing improvement in all institutional areas to stay competitive amidst environmental changes. Munazza Mahmood and Sobia Noreen (2021) stress that knowledgeable, skilled, and determined university employees are crucial for achieving innovation capabilities, requiring a training system aligned with customer needs. Abdullah Al-Melham and Abdullah Al-Subaie (2021) propose that universities can foster innovation through dedicated centers, conducive work environments, and ample resources. Krasovskiy, Pilyavski, Shendrikova, and Nazrieva (2020) assert that creating an innovative environment, considering research, professionals, infrastructure, and funding, is vital for successful innovation in universities. The innovation process involves pre-innovation awareness, research, and implementation stages. Aithal and Kumar (2016) exemplify continuous improvement in an Indian private university across various aspects. Thus, the alternate hypothesis is postulated as follows:

H4: Quality system improvement significantly influences the innovation capabilities

H5 asserts that a focus on students significantly influences innovation capabilities. TQM, which prioritizes continuous improvement and student satisfaction, regards students as the main "customers" (Hajdari, 2019; Jin et al., 2020). In higher education, TQM principles are applied through quality assurance processes (Bruçaj, 2018) ensuring high-quality education with regular assessments of curriculum and teaching methods. Krakhmalova (2022) study aligns with TQM goals by enhancing the innovative potential of young individuals. Usher and Barak (2020) emphasize the importance of team diversity, Setiawan et al. (2022) highlight the adoption of Information Technology (IT), and Ellitan and Mulia (2019) stress university-industry collaboration to address skill gaps. Additionally, it is recommended to foster students' social entrepreneurial intentions with government support (Herlina, Disman, Sapriya, & Supriatna, 2021). Thus, the alternate hypothesis is postulated as follows:

H5: Student focus significantly influences the innovation capabilities

Recognition and rewards, another component of TQM in HEIs, significantly influence innovation capabilities (H6). Employee contributions should be appreciated through timely recognition, including promotions and awards (Ali, 2012). Zhang (2000) emphasizes the need for a regular and transparent performance measurement process with suitable criteria for rewards, involving HEIs staff in the selection process (Nadim & Al-Hinai, 2016). Recognition and rewards enhance knowledge management success in university-industry collaborations (UIC), fostering new innovations. Incentives like pay increases, bonuses, or promotions contribute to successful knowledge management in collaborations (Khadhraoui, Plaisent, Lakhal, & Prosper, 2016; Lach & Schankerman, 2004). Continuous encouragement for employees with research degrees, teaching and research awards, and international reputation is recommended (S. Aithal, 2016). Researchers express motivation and expect recognition and rewards for successful innovative activities, influencing their promotion criteria (Ghardashi, Yaghoubi, Bahadori, & Teymourzadeh, 2019; Muhammad Jawad Iqbal, 2011). Thus, the alternate hypothesis is postulated as follows:

H6: Recognition and rewards significantly influence the innovation capabilities

Vision has influence on innovation capabilities (H7) which represents the leader's aspirations for the future of the organization in HEIs. It serves to unite employees and unleash their highest potential (Al-Mansoori & Koç, 2019; Calder, 2014). Research consistently supports the notion that the vision of HEIs is a key factor in their innovation capabilities (Changli & Hongchun, 2009; Hsiao, Chen, Chang, Chou, & Shen, 2009; Kozirog, Lucaci, & Berghmans, 2022); Tian, 2023). Nadim and Al-Hinai (2016) emphasize that vision reflects the innovative approach and goals of HEIs leadership. Arundel, Bowen-Butchart, and Gatenby-Clark (2016) add that a strategic vision, developed by effective leadership, supports innovation in universities. The innovation process in universities, driven by goals, involves creating infrastructure, integrating education, science, and business, requiring collaboration among university staff, students, and higher management (Krasovskiy et al., 2020). Păunescu, Lepik, and Spencer (2022) note that the individual vision of each HEIs shapes how it implements goals within the social innovation ecosystem. S. Aithal (2016) suggests that HEIs with innovative education models, clear mission, vision, objectives, and core values can produce highly competent students. Ghardashi et al. (2019) highlight the importance of policy sagacity, closely linked to a university's vision, considering environmental conditions for innovation alignment. Thus, the alternate hypothesis is postulated as follows:

H7: Vision significantly influences the innovation capabilities

Posited as the alternative hypothesis H8, this research contends that the influence of innovation capabilities extends to shape university performance. Recognizing the pivotal role universities play within innovation ecosystems and in which they contribute significantly to the development of a smart, sustainable, and inclusive economy (Diaconu, 2017; Heaton, Siegel, & Teece, 2019). Besides, Almaskari, Mohamad, and Yahaya (2020) insights underscore how strong leadership can impede innovation development within HEIs. The study by Adom, Boateng, and Gnankob

(2019) unveils the positive outcomes associated with innovation capabilities in HEIs, including heightened team spirits, increased productivity, competitive advantage, and enhanced loyalty to institutional services. Yordanova, Bozev, Stoimenova, and Biolcheva (2020) offer valuable insights into the intricate relationship between educational innovations, addressing critical issues in universities and bolstering innovation performance on a national scale. Additionally, Guo (2021) emphasis on key points for innovation and development in colleges centers on the imperative to enhance the quality of higher education and nurture students endowed with inventive abilities. Thus, the alternate hypothesis is postulated as follows:

H8: Innovation capabilities significantly influence the university performance

In summary, this research model, thoroughly examined the preceding literature, elucidating the influence of TQM components on the innovation capabilities crucial for enhancing university performance. By identifying and understanding these key factors, higher education institutions can leverage TQM principles to amplify their innovative potential, contributing to sustained success in an ever-evolving educational landscape. The study aims to analyse the fundamental connections among latent constructs, encompassing TQM components such as leadership management commitment, people management, stakeholder focus, student focus, recognition and rewards, vision, innovation capabilities, and university performance, as posited in the model. The eight hypotheses formulated were investigated to explore these latent relationships. For the empirical evaluation of the model, the PLS-SEM technique was employed.

METHODOLOGY

This study employed a quantitative research design, involving the collection of primary data through the feedback obtained from respondents via a survey.

Participants

The target respondents for this study are the academicians from HEIs in peninsular Malaysia. The sampling was conducted on HEIs in Peninsular Malaysia, representing four regions: the southern region (Johor), northern region (Perak, Kedah, and Perlis), western region (Selangor, Kuala Lumpur, Putrajaya, Negeri Sembilan, and Melaka), and eastern region (Pahang, Kelantan, and Terengganu).

A non-probability sample is used in this study involving convenience sampling which happens when participants who meet the research's requirements are enrolled in the study. Convenience sampling technique is needed when the population is unknown and it is difficult to get responses from the entire sampling period (Reynolds, Simintiras & Diamantopoulos, 2003). The sample size for this study was determined using G power analysis as suggested by Memon et al. (2020), adequate with minimum total sample size of 89, two-tailed test shown in Figure 2.

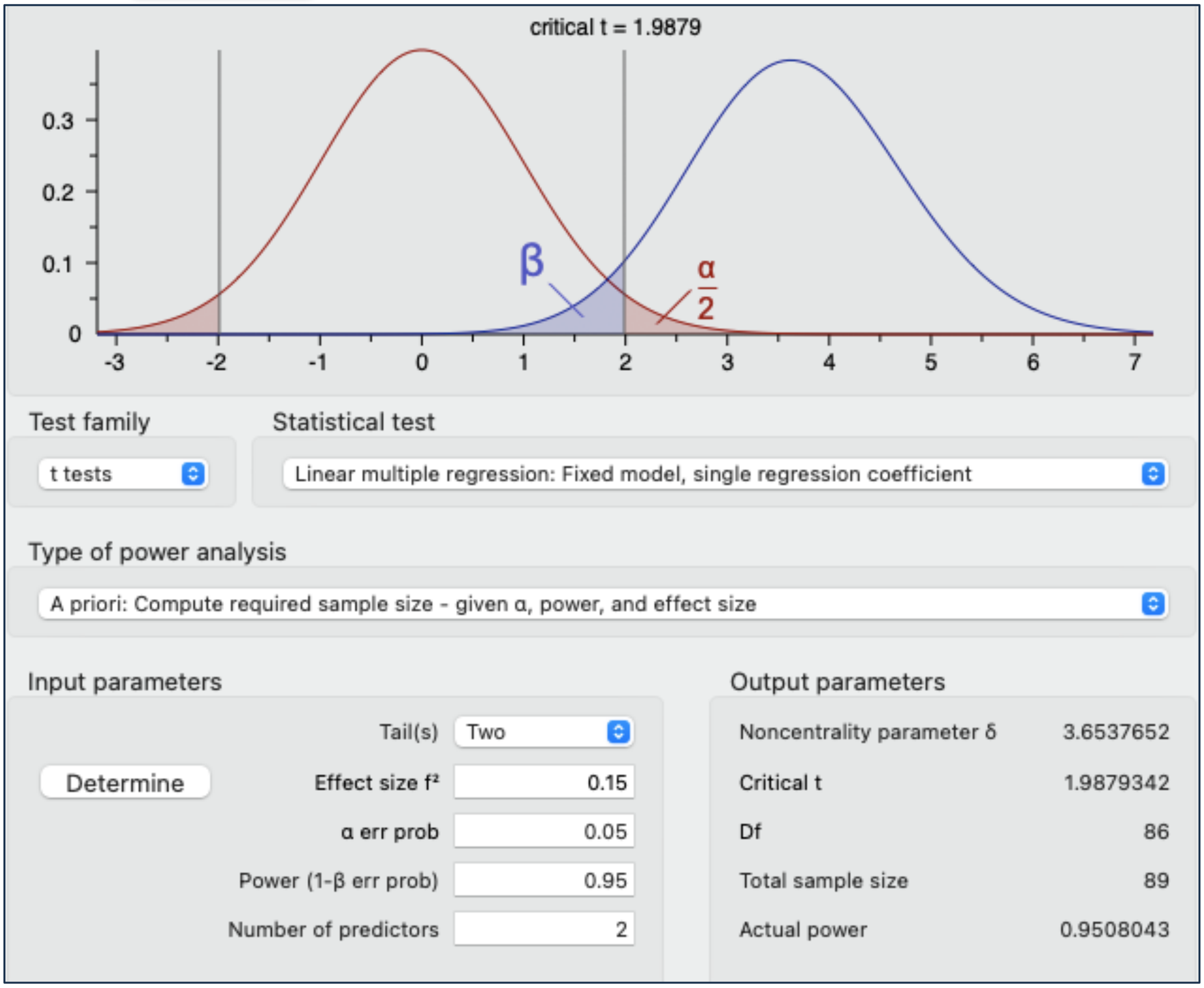


Figure 2. G-power analysis output

A total of 300 respondents participated in this study by answering the questionnaires collected through online (Google Forms) and physical survey (innovation exposition) which yielded 123 valid responds. Out of the 300 questionnaires distributed, 123 were completed and returned, while the remaining 177 were incomplete and not returned. The response rate which was only 41% attributed to personal factors such as difficulty in accessing the respondents and difficulty in obtaining consent for data collection.

Instrument and Data Collection

A survey questionnaire was adapted and adopted from TQM principles which was customized to the context of HEIs in Malaysia. It consists of 5 items in Section A regarding the demographic information of respondent, and Section B to J comprises of nine constructs totaling 36 items. The nine constructs involved in the study are leadership management commitment, people management, student focus, other stakeholders focus, quality system improvement, recognition and reward, vision, innovation capability and university performance. A five-point Likert scale was utilized in all items of each construct which is from strongly disagree (1) to very agree (5) for the section B until H. Whereas, section I used 2 types of five-point Likert scale which are not all very supportive (1) to highly supportive (5) for the first item and uses very poor (1) to excellent (5) for the rest of the items in the construct. Meanwhile, the last section of the questionnaire which represents the construct of university performance employed a scale from very dissatisfied (1) to very satisfied (5). The items were adapted from TQM studies and modified to fit the present HEIs context. The original intent and meaning were preserved while adjustments were made to improve clarity and alignment with HEIs context.

A pre-test was conducted before the main study, incorporating feedback from four expert reviews to confirm the content, structure, arrangement, layout, phrasing, and clarity of the items within the questionnaire. Following this, a pilot test involving a selected group of eight respondents was conducted to address and resolve any doubts about the reliability of the instruments.

The collected data were subsequently interpreted and analysed utilizing Statistical Package for the Social Sciences (SPSS) version 26.0 and Smart Partial Least Square (SmartPLS) version 4.0. The SPSS was employed to assess the questionnaire's reliability, to conduct a descriptive analysis for the demographics information, and analyse using the common bias method. The PLS-SEM analysis generated using SmartPLS software to assess the measurement and structural models. The measurement model elucidates constructs, reliability, and validity, while the structural model to test the hypothesized research model (Hair et al., 2017).

RESULTS

Descriptive Analysis

Table 1 shows the descriptive analysis on the demographic data of the respondents. There were four information collected for demographic profile such as gender, designation, years of services and universities' region. Results showed 56.9 percent of the responders were female, while 43.1 percent were male.

Table 1. Demographic data analysis of the respondents (N = 123)

Variables	Answer	Frequency	Percentage (%)
Gender	Female	70	56.9
	Male	53	43.1
Designation	Professor	7	5.7
	Assistant Professor	6	4.9
	Associate Professor	14	11.4
	Senior Lecturer	38	30.9
	Lecturer	58	47.2
Years of service	2 years and below	22	17.9
	More than 2 to 5 years	14	11.4
	More than 5 to 10 years	44	35.8
	More than 10 years	43	35.0
Universities' region (Peninsular of Malaysia)	North	32	26.0
	South	12	9.8
	East	10	8.1
	West	69	66.1

When the designations for individuals in this dataset were observed, a wide diversity of academic jobs identified. Particularly, 7 academicians hold the title of Professor, which represents 5.7% of the total. Only 6 academicians are designated as Assistant Professors, accounting for 4.9% of the total. Associate Professors comprise a bigger group of 14 academicians, which constitutes 11.4% of the sample. The majority, 38 academicians, are classed as Senior Lecturers, making up 30.9% of the total. Furthermore, 58 academicians are classified as Lecturers, comprising the biggest group of 47.2%.

The dataset also includes information on the respondents' years of service. Twenty-two of them have fewer than two years of service, accounting for 17.9% of the total. A somewhat smaller group, consisting of 14 people, has more than 2 but less than 5 years of experience, forming 11.4% of the sample. Significantly, 44 people have served for more than five but less than ten years, representing 35.8% of the total. Nearly on par with this group, 43 people have more than ten years of service, corresponding to 35.0% of the dataset. From the results of this demographic analysis, most respondents have more than 2 years of experience as a lecturer which gives them a very familiar surroundings of innovation capabilities in their university and enough experience to answer the survey. The western university region holds the majority, comprising 56.1% of the total respondents, followed by the northern university region with 26.0%. Conversely, the eastern university region has the lowest representation, accounting for only 8.1% of the total respondents, while the southern university region trails slightly higher at 9.8%.

Reliability of the Instrument

Table 2 displays Cronbach's Alpha values for each construct, all exceeding 0.7, indicating good consistency (Kotian et al., 2022). The final research questionnaires were developed based on suggestions gathered from both the pre-test and pilot test, with necessary revisions made to ensure the reliability of the instrument. Consequently, all the items in this study have been demonstrated to be reliable and valid.

Table 2. The value of Cronbach's alpha of pilot test for each construct.

Constructs	Number of Items	Cronbach's Alpha
leadership management commitment	6	.904
People management	4	.806
Student focus	5	.891
Other stakeholder focus	5	.892
Quality system improvement	4	.921
Recognition and rewards	4	.913
Vision	4	.908
Innovation capabilities	3	.902
University performance	1	-

Thus, this finding provides additional evidence that every construct from respective items has satisfactorily met the reliability analysis criteria.

Common Bias Method

Common bias method is a factor that can impede the robustness and reliability of research (Jordan & Troth, 2020). In this study, Variance Inflation Factor (VIF) will be used to examine the common bias method. In the context of multiple linear regression analysis, the VIF is a commonly used metric for assessing collinearity which quantifies the degree of multicollinearity by examining the relationship between explanatory variables, and it relies on the maximum likelihood estimation of the regression coefficients (Ekiz, 2021). Kim (2019) states that multicollinearity signifies a significant level of linear correlation among independent variables within a multiple regression model, which can result in erroneous outcomes in regression analyses. Multicollinearity is typically considered to be a concern when the VIF exceeds within a range of 5 to 10 (Kim, 2019).

Table 1. VIF values for the independent variables

Construct Variables	Collinearity Statistics	
	Tolerance	VIF
Leadership Management Commitment	0.424	2.361
People Management	0.463	2.158
Student Focus	0.330	3.026
Other Stakeholder Focus	0.268	3.731
Quality System Improvement	0.291	3.433
Recognition & Reward	0.342	2.927
Vision	0.335	2.982
University Performance		

Table 3 presents the VIF values of independent variables. Based on the findings, it can be concluded that there are no issues of multicollinearity in this study, as all the independent variables have VIFs of below 5.

Assessment of the Measurement Model

To determine a relationship between the factors and the theoretically defined constructs, PLS analysis begins with a study of the measurement model. The estimation of the measurement model in this investigation includes nine latent constructs. In this study, reflective measurement model was applied in which the arrow points from a construct to its indicators (manifest variables), suggesting that the construct influences the way the indicators vary (Hair, Ringle, & Sarstedt, 2013). A reflective measurement model necessitates the need for reliability and validity testing such as 1) indicator reliability, 2) internal consistency reliability, 3) convergent validity, and 4) discriminant validity (Hair et al., 2021). In the second stage, an assessment of the structural model is carried out, encompassing calculations of effect sizes, testing for predictive relevance, and assessing the variance explanation of endogenous constructs.

Table 4. Results of Measurement Model Assessment

Construct	Items	Loadings	Cronbach's alpha	CR (ρ_c)	AVE
Leadership management commitment	LMC1	0.862	0.906	0.927	0.678
	LMC2	0.799			
	LMC3	0.816			
	LMC4	0.805			
	LMC5	0.832			
	LMC6	0.827			
People management	PM1	0.787	0.809	0.874	0.635
	PM2	0.837			
	PM3	0.747			
	PM4	0.814			
Student focus	SF1	0.829	0.893	0.921	0.699
	SF2	0.894			
	SF3	0.812			
	SF4	0.868			
	SF5	0.773			
Other stakeholder focus	OSF1	0.808	0.896	0.923	0.705
	OSF2	0.857			
	OSF3	0.832			
	OSF4	0.860			
	OSF5	0.842			

Construct	Items	Loadings	Cronbach's alpha	CR (ρ_c)	AVE
Quality system improvement	QSI1	0.871	0.921	0.944	0.809
	QSI2	0.906			
	QSI3	0.898			
	QSI4	0.921			
Recognition and reward	RR1	0.881	0.913	0.939	0.793
	RR2	0.845			
	RR3	0.899			
	RR4	0.935			
Vision	V1	0.839	0.908	0.934	0.781
	V2	0.892			
	V3	0.901			
	V4	0.902			
Innovation capabilities	IC1	0.876	0.904	0.940	0.840
	IC2	0.937			
	IC3	0.934			
University Performance	UP	1.000			

Note: UP: Universities Performance, IC: Innovation Capabilities, LMC: Leadership Management Commitment; PM: People Management; OSF: Other Stakeholder Focus; QSI: Quality System Improvement; SF: Student Focus; RR: Recognition and Reward; V: Vision.

To indicate the reliability, the first stage, factor loadings are crucial for assessing the measurement model. In essence, more reliability will result from greater average loading values (Gerbing & Anderson, 1988; Sarstedt, Ringle, & Hair, 2021). A measurement model exhibits satisfactory indicator reliability when each item's loading estimate exceeds 0.6 of the factor loading, although variations in this threshold may occur based on the underlying rationale (Afthanorhan, Awang, & Aimran, 2020). The factor loadings for each of the nine constructs are shown in Table 4 above. Of the 36 items (observed variables), factor loadings ranged with positive values from 0.799 to 1.000 which indicated greater than 0.6 and significant at the level of 1%. Thus, all the items employed in this study exhibit a satisfactory level of indicator reliability.

A measurement model is considered to possess adequate internal consistency reliability when the composite reliability (CR (ρc)) of each construct exceeds the established threshold of 0.7 (Kilic, 2016; Hair et al., 2021). The CR(ρc) of every construct ranged from 0.874 to 0.944, as shown in Table 4. These findings showed that the internal consistency reliability of the constructs' items is adequate.

In this study, the average variance extracted (AVE) value was analysed to assess the convergent validity of the measurement model. Convergent validity is considered satisfactory when constructs demonstrate AVE values that are approximately 0.5 or higher, as recommended by previous research (Hair et al., 2021). The output presented in Table 4 reveals that all the constructs exhibit AVE values ranging from 0.635 to 0.840. This observation suggests that the measurement model possesses a robust level of convergent validity.

Discriminant validity makes sure that a measurement for a concept is distinct and specifically captures the aspects of interest that are not already covered by other measurements in a structural equation model (Hair et al., 2021). In another word, discriminant validity is mainly used to evaluate and verify if the variables have a high multicollinearity issue. Hair et al. (2021) recommended the Fornell–Larcker criterion as the conventional method commonly used for evaluating discriminant validity, whereas Henseler, Ringle, and Sarstedt (2015) noted the widespread adoption of the Heterotrait-Monotrait Ratio (HTMT) for the same purpose.

According to Fornell and Larcker (1981), discriminant validity is proven when a latent variable explains a greater proportion of the variance in the indicator variables it is linked with than it does with other constructs in the same model. To meet this requirement, the squared correlations between each construct's average variance extracted (AVE) and the other constructs in the model must be compared (Henseler et al., 2015). The Fornell-Larcker criterion results in Table 5, using the square root of the constructs, confirm that the construct's ability to distinguish itself from others aligns with the recommended criteria by Henseler et al. (2015) for discriminant validity.

The HTMT, introduced by Henseler et al. (2015), was a new way to check the discriminant validity of latent constructs and considered as more stringent than traditional method. In this research, the HTMT0.90 was applied representing 90% confidence level as shown in Table 6. The HTMT0.90 findings met the established threshold with less than 0.90 recommended by Gold, Malhotra, and Segars (2001), Teo, Srivastava, and Jiang (2008) and Kline (2015), demonstrating a satisfactory level of validity established.

Table 2. Fornell-Larcker criterion

	IC	LMC	OSF	PM	QSI	RR	SF	UP	V
IC	0.916								
LMC	0.680	0.824							
OSF	0.711	0.709	0.840						
PM	0.581	0.641	0.665	0.797					
QSI	0.608	0.606	0.761	0.558	0.899				
RR	0.703	0.654	0.721	0.670	0.685	0.891			
SF	0.595	0.648	0.734	0.611	0.767	0.651	0.836		
UP	0.837	0.658	0.640	0.586	0.605	0.710	0.591	1.000	
V	0.663	0.658	0.743	0.524	0.732	0.712	0.684	0.655	0.884

Note: UP: Universities Performance, IC: Innovation Capabilities, LMC: Leadership Management Commitment; PM: People Management; OSF: Other Stakeholder Focus; QSI: Quality System Improvement; SF: Student Focus; RR: Recognition and Reward; V: Vision.

Table 3. Heterotrait-Monotrait Ratio (HTMT)

	IC	LMC	OSF	PM	QSI	RR	SF	UP	V
IC									
LMC	0.743								
OSF	0.787	0.777							
PM	0.671	0.725	0.767						
QSI	0.665	0.656	0.835	0.627					
RR	0.772	0.709	0.795	0.771	0.750				
SF	0.646	0.708	0.816	0.685	0.846	0.709			
UP	0.880	0.687	0.674	0.643	0.629	0.744	0.614		
V	0.712	0.697	0.814	0.584	0.806	0.771	0.764	0.764	

Note: UP: Universities Performance, IC: Innovation Capabilities, LMC: Leadership Management Commitment; PM: People Management; OSF: Other Stakeholder Focus; QSI: Quality System Improvement; SF: Student Focus; RR: Recognition and Reward; V: Vision.

Overall, the analysis of the measurement model confirms that the items in the survey instrument are considered as reliable and trustworthy.

Assessment of the Structural Model

Following the assessment of the entire measurement model, PLS-SEM analysis moves on to the structural model. In this context, the assessment of the structural model process is typically carried out for taking significant analysis factors to test the proposed research hypotheses. Furthermore, according to Hair, Matthews, Matthews, and Sarstedt (2017), this phase analysis is essential for obtaining important findings and determining the model's goodness.

Following the assessment of the entire measurement model, the PLS-SEM analysis moves on to the evaluation of the structural model. During this phase, the analysis focuses on identifying significant factors for testing the proposed research hypotheses. According to Hair, Matthews, Matthews, and Sarstedt (2017), this analytical step is crucial for deriving important findings and determining the goodness of the model. Key metrics considered in this context include the coefficient of determination (R^2), predictive relevance or cross-validated redundancy (Q^2) for endogenous constructs, effect size (f^2), model fit, path coefficients, and the significance levels of *t*-values, and *p*-values.

As recommended by Cain, Zhang, and Yuan (2017) and Hair, Hult, Ringle, and Sarstedt (2022), it is essential to check for multivariate skewness and kurtosis before conducting a bootstrapping analysis. The results indicated that the collected data did not follow a multivariate normal distribution, as evident from Mardia's multivariate skewness ($\beta = 585.5046$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 1545.0280$, $p < 0.01$), as shown in Figure 3. Therefore, following the guidance of Becker, Cheah, Gholamzade, Ringle, and Sarstedt (2023), the path coefficients, *t*-values, standard errors, and *p*-values for the structural model were determined using a resampling bootstrapping procedure.

Table 7. Mardia's Multivariate Skewness and Kurtosis Analysis

	b	Z	p-value
Skewness	583.5046	11961.84402	0
Kurtosis	1545.0280	18.76751	0

The next step in the structural model assessment is to evaluate using the criterions such as coefficient of determination (R^2) and predictive relevance (Q^2) of endogenous variables. The coefficient of determination (R^2) is a widely used metric in PLS-SEM and generated from endogenous latent constructs as in Table 7, all latent constructs are pointed their arrow toward the endogenous latent constructs (innovation capabilities and university performance). Chin and Marcoulides (1998) considered R^2 value of 0.67 or higher is considered substantial, while 0.33 is considered as moderate, and 0.19 is considered weak. The values of R^2 are described in the percentage, which 62% (0.67) of variance in innovation capabilities has been explained by leadership management commitment, people management, quality system improvement, focus on other stakeholders, recognition and reward, vision, and student focus, while, 70% (0.70) of variance in university performance have been explained by innovation capabilities. As overall, each endogenous latent construct in this model has R^2 value that explains more than 67% (0.67) of the variation. These values are considered high, indicating the sufficiency of the established model.

Next, to evaluate the model's predictive quality, the study assessed its predictive relevance (Q^2), which is a significant measure indicating how well the model can make predictions. In order to confirm the model's ability to predict, the study also tested the predictive value of Q^2 for the dependent (endogenous) latent construct. It should be greater than zero to support the analysis (Shmueli et al., 2019). The results of this test, as presented in Table 8, align with the study's assumption by showing values greater than zero. Thus, the estimated findings indicated that the structural model has the potential to accurately forecast values necessary for good reconstruction.

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Table 8. Endogenous latent construct assessment

Endogenous latent construct	R^2	Q^2
Innovation capabilities	0.67	0.559
University performance	0.70	0.528

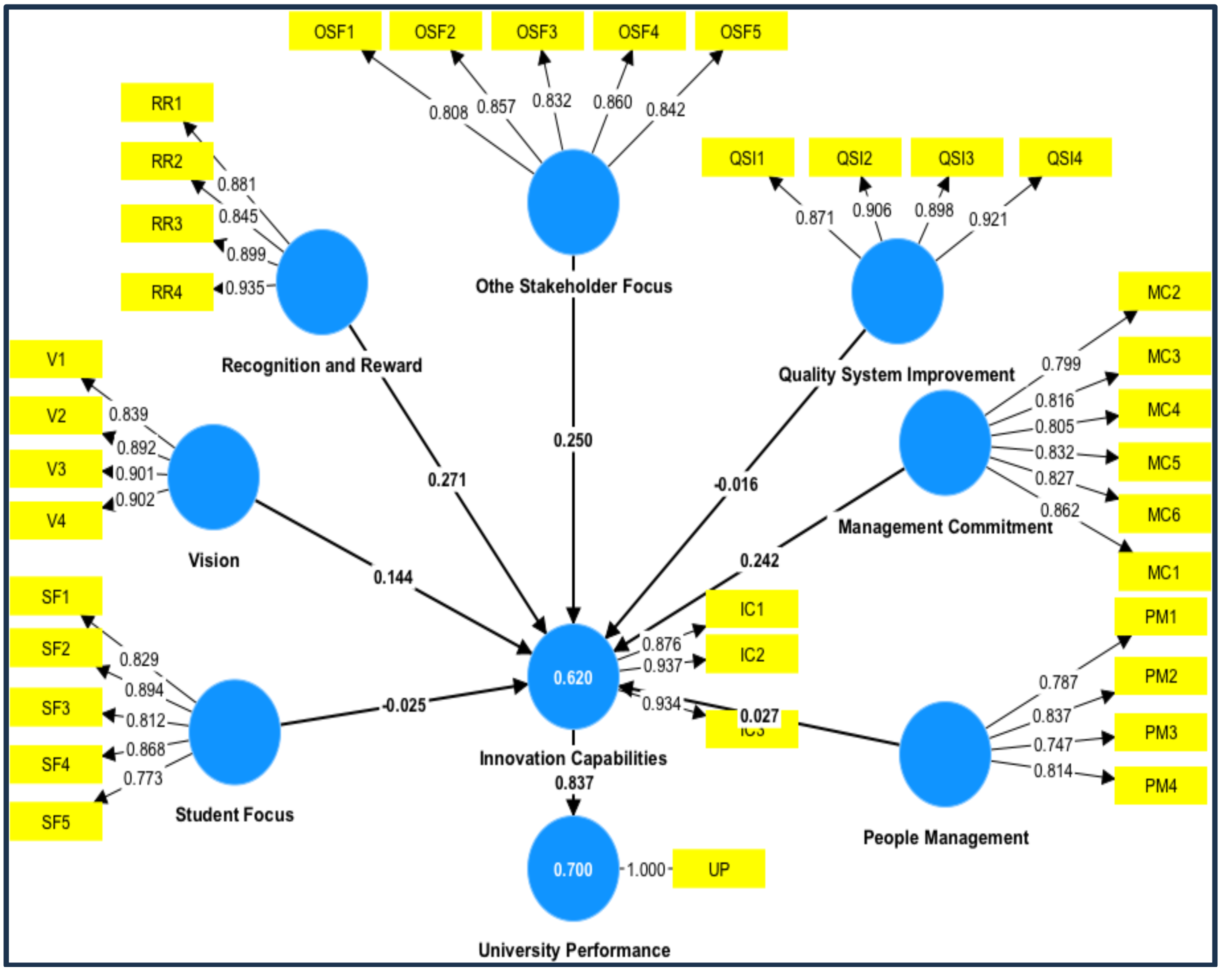

Figure 4. PLS-SEM algorithm (Item loadings, path coefficient and R2 values)

After assessing the goodness of the structural model, the bootstrapping procedure was employed to evaluate the hypothesized relationships between the effects of latent constructs and to determine the statistical significance of the parameters within the structural model. The Smart PLS 4.0 tool was used to conduct the bootstrapping procedure, which allowed for the generation of t-statistics for significance testing. Then, performing 10,000 resampling iterations with the replacement for bootstrapping as suggested by Ramayah, Hwa, Chuah, Ting, and Memon (2018), resulted in the creation number of bootstrapped samples equivalent to the original sample size of 123. Figure 5 and Table 8 summarized the hypothesized relationship from the bootstrapping procedure.

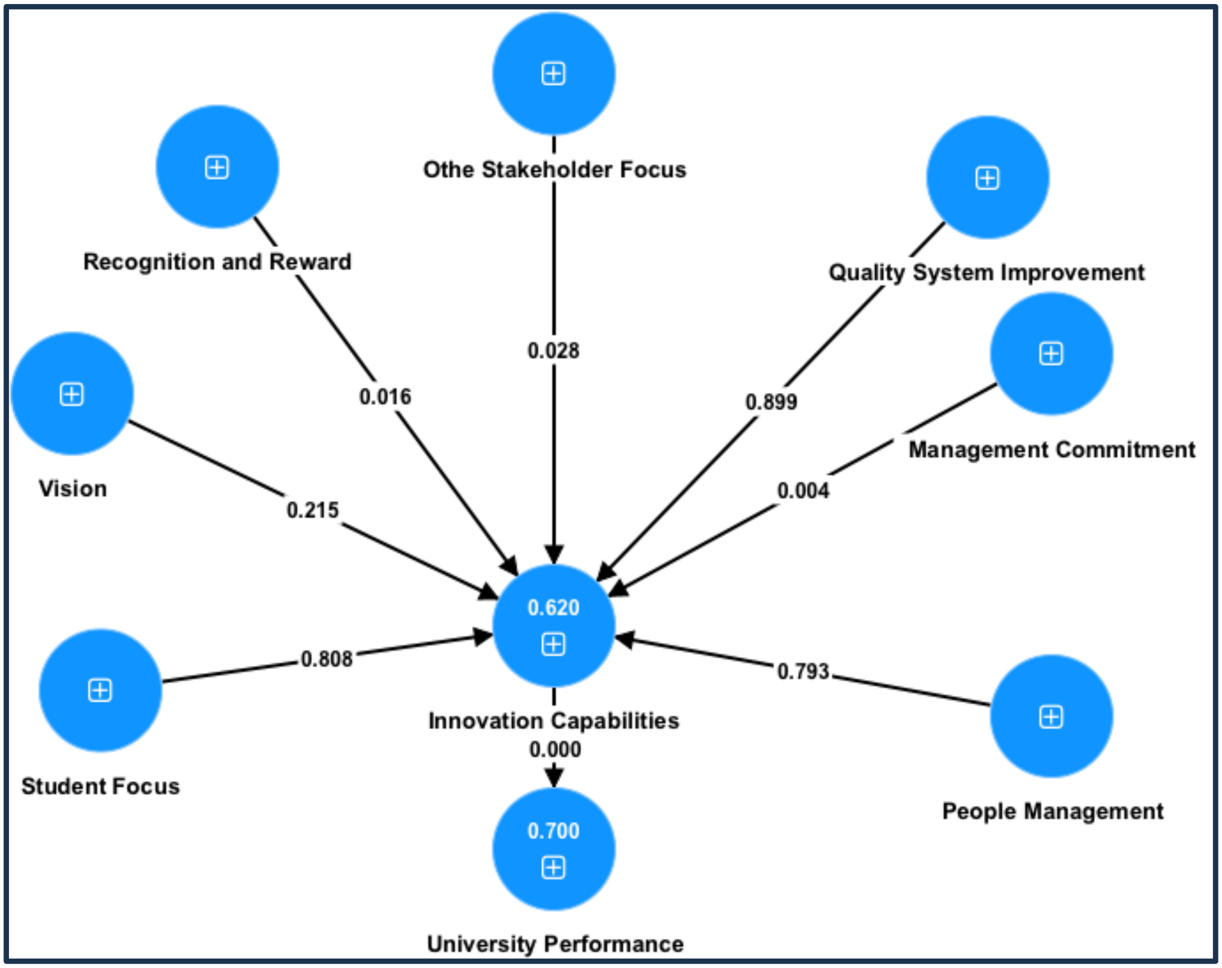

Figure 5. Bootstrapping analysis (p-values and R2 values)

This structural model consists of 8 primary hypotheses that examine 9 latent constructs. The analysis was conducted using PLS-SEM, with two endogenous latent constructs, namely innovation capabilities and university performance, tested in relation to seven exogenous latent constructs, which include leadership management commitment, people management, quality system improvement, focus on other stakeholders, recognition and reward, vision, and student focus.

In addition, the effect size (f2) used to assess the individual constructs' strength and influence on endogenous latent variable. The value of f2 are considered representative of small (0.02), medium (0.15), and large (0.35) effect sizes, respectively, as suggested by Cohen (1988).

Table 9. Hypotheses Decision

	Causal Relationship	Path Coefficient (Beta)	Standard Deviation (STDEV)	t-value	p - value	f^2	Decision
H1:	Leadership Management Commitment -> Innovation Capabilities	0.242	0.085	2.844**	0.004	0.063	Support
H2:	People Management -> Innovation Capabilities	0.027	0.101	0.262	0.793	0.001	Not Supported
H3:	Other Stakeholder Focus -> Innovation Capabilities	0.25	0.114	2.198*	0.028	0.043	Support
H4:	Quality System Improvement -> Innovation Capabilities	-0.016	0.124	0.127	0.899	0.000	Not Supported
H5:	Student Focus -> Innovation Capabilities	-0.025	0.104	0.243	0.808	0.001	Not Supported
H6:	Recognition and Reward -> Innovation Capabilities	0.271	0.112	2.419*	0.016	0.066	Support
H7:	Vision -> Innovation Capabilities	0.144	0.116	1.24	0.215	0.018	Not Supported
H8:	Innovation Capabilities -> University Performance	0.837	0.026	32.439**	0.000	2.333	Support

*Note: *t-value > ∝=0.05, **t-value > ∝=0.01 with two tailed test.*

The findings presented in Table 9 indicate that hypotheses 1, 3, and 6 exhibit significance with *t*-values exceeding 1.96 at ∝= 5% significance level, two-tailed test. Furthermore, f^2 values that were greater than 0.02 are interpreted as indicating small effect size on endogenous constructs (innovation capabilities) respectively. This suggests that leadership management commitment, other stakeholder focus, and recognition and reward have a notable influence on fostering innovation capabilities among academicians in Malaysian universities. However, the results for hypotheses 2, 4, 5, and 7 did not provide support for the hypothesized relationships, indicating that people management, quality system improvement, student focus, and vision may not play a significant role in enhancing innovation capabilities among academicians in Malaysian universities. Additionally, f^2 values below 0.02 suggested a minimal effect size, approaching to no effect size on the endogenous construct (innovation capabilities) respectively. Moving on to the last hypothesis 8, it was revealed that innovation capabilities indeed have an impact on university performance, with the effect size indicated as medium on endogenous construct (university performance).

DISCUSSION

The supported results of H1 are aligned with study by Castillo (2020), which stated that top management, senior administrators, and faculty/staff are the main TQM proponents. Samad and Thiyagarajan (2015) added that TQM is needed to apply a comprehensive quality approach to the working environment and all aspects of the academic process in general. This is only possible through the leadership management component, defining that with a good top management, the universities can achieve more innovations. Besides, the supported result of H3 also explains the significance of collaborations with other parties such as industries, government bodies, other HEIs or the local community to enhance the innovation performance (Santoso et al., 2021). Finally, supported result of H6 describe that a token of appreciation such as through promotion, pay increase or bonus makes the employees more motivated and work harder and produce more innovations (Lach & Schankerman, 2004; Khadhraoui et al., 2016; Ali, 2012).

Similar to previous findings that utilized TQM for HEIs (Asif, Awan, Khan, & Ahmad, 2013; Notarjacomo, Strapazzon Do Couto, Bica de Almeida, Borchart, & Medeiros Pereira, 2022; Al Jabri & Nadarajah, 2021), this study also did not find all seven factors of TQM to be significant towards innovation capabilities. This can be justified by the fact that universities are non-profitable organizations thus the implementation of TQM may differ from profit-based organizations. Long et al. (2015), Sirisan, Pianthong, and Olejnik (2020) and Wu and Gu (2022) also mentioned that although TQM is found to have impact on the innovation capabilities of HEIs, the TQM dimensions/enablers that contribute to this significant relationship might vary among different HEIs. For example, study by Notarjacomo et al. (2022) identified a set of significant enablers as leadership, students, staff, technological resources, and continuous improvement. In contrast, Al Jabri and Nadarajah (2021) found top management support, student focus, continuous improvement, and employee involvement to be the significant factors of TQM in their study.

This study did not find people management, continuous improvement, student focus and vision dimensions as the significant factors of innovation capabilities for universities in Malaysia. Thus, from the perspective of the academic staffs, the success of innovation activities in a university mainly depends on; firstly, the attainment of top management's targets, as academic staffs are observed to work towards fulfilling the requirements given by top management. Secondly, successful collaboration with external parties where it will ease the funding needs and also exchange of ideas and finally through recognition and rewards given for each achievement which will motivate them to perform even better.

The insignificant relationship for people management, quality system improvement, student focus and vision dimensions towards innovation capabilities can be explained through several factors, (1) Academic staff work more independently with less involvement from other parties such as laboratory or administrative staff for example, explaining there is less influence for the people management dimension, (2) Academic staffs also might not be heavily involved in research centre activities, and for those without experiment works, there may not be need for any special requirements for their workspace, which explains the limited influence of the quality improvement dimension, (3) While the learning curriculum is student oriented, innovation research is often dependent on the needs of industry or government bodies, leading to a reduced influence of the student focus dimension, (4) Academic staffs often pursue their own research interests, which vary widely from one individual to another, resulting in less influence the of vision dimension.

Finally, the significant relationship between innovation capabilities and university performance can be explained through the idea that innovation ensures competitive advantage and sustainability of the organization (Al Jabri & Nadarajah, 2021). Innovation capabilities are known to create positive impacts such as high team spirits, risk taking, productivity, low resistance to changes, competitive advantage, increase market share, increase productivity among staff, growth, and profitability of educational institutions, creating loyalty towards the institution's services, and making teaching and learning convenient. All these are learned to higher the university's performance (Adom et al., 2019). Innovation capabilities also seen to improve any major issues of the university, thus enhancing its' performance (Yordanova et al., 2020).

Implications

This study offers implications and acknowledges certain limitations. Firstly, it is worth noting that while TQM has been widely embraced in the industry, its application in higher education institutions has not been as prevalent. In this research, all participants were from universities, emphasizing the necessity to delve into the diverse TQM elements for fostering innovation in higher education. This underscores the potential for future studies to address research issues, focusing on methods and approaches to identify TQM elements among academicians in universities, aiming for enhanced innovation performance.

Secondly, this study specifically examined higher education institutions in Malaysia without distinguishing between public and private universities, as long as they held the title of 'University.' Public universities in Malaysia are primarily funded by the government, while private universities are self-funded, which may result in varied approaches to innovation activities. The survey responses displayed a higher level of homogeneity. Therefore, it is recommended that future studies consider assessing private and public universities separately. This approach would allow for meaningful comparisons and a more in-depth exploration of potential differences.

The TQM principles were adopted and adapted for survey questions in the context of higher education. To enhance the research model, future studies could consider incorporating additional theories that support the relationship between university performance and innovation capabilities in HEIs. The inclusion of such theories would encourage future research to explore additional constructs and factors related to innovation capabilities.

Finally, based on the research findings, academic staff at universities could assess and evaluate their performance in innovation capabilities. This assessment could help identify motivational factors that encourage academics to actively participate in innovation activities, ultimately contributing to improved university rankings.

CONCLUSION

This study examines the impact of TQM dimensions on innovation capabilities in Malaysian universities, specifically focusing on leadership management commitment, people management, stakeholder focus, student focus, recognition and rewards, vision, innovation capabilities and university performance. Utilizing the PLS-SEM technique, eight hypotheses were tested. Summarizing the findings, hypotheses 1, 3, and 6 emphasize leadership management commitment, stakeholder focus, and recognition and reward, respectively, as significant influencers of innovation capabilities. However, hypotheses 2, 4, 5, and 7, related to people management, quality system improvement, student focus, and vision, is found to have lack significant support, suggesting a limited role of these factor in enhancing innovation capabilities. Hypothesis 8, on the other hand, affirms that innovation capabilities significantly impact university performance.

Given the insignificant results for hypotheses 2, 4, 5, and 7 discussed in the previous section concerning people management, quality system improvement, student focus, and vision dimensions, respectively, several considerations may offer insights into these outcomes. In light of these insights, it is recommended to further explore the nuances of these dimensions and their interaction with the academic environment. Future studies could delve deeper into the specific factors influencing innovation capabilities in academic settings, considering the unique dynamics and roles of academic staff in the innovation process. Additionally, investigating potential variations in the impact of these dimensions across different academic disciplines or departments may provide a more comprehensive understanding of their role in fostering innovation within universities.

Building on supported findings for hypotheses 1, 3, 6, and 8, the study identifies favourable outcomes for universities. Excelling in innovation provides a competitive edge, attracting students, faculty, and partnerships, and contributing to inventive teaching, research, and community engagement. Successful innovations elevate institutional standing, drawing talent and collaborators to a university known for inventive programs, research, and teaching. Innovation opens avenues for increased funding opportunities, securing more research grants and donations. Innovative programs enhance student attraction and retention, creating a dynamic learning environment. Graduates are better prepared for dynamic professional landscapes, contributing to their success and reinforcing a robust alumni network. Innovation fosters collaboration with external entities, driving partnerships with industries and local communities. It cultivates adaptability, enabling universities to navigate changes and ensures long-term sustainability. Additionally, innovation correlates with increased research productivity and impact, promotes higher job satisfaction among faculty and staff, and contributes to overall institutional excellence. In conclusion, significant benefits, ranging from heightened competitiveness to positive societal contributions, emerge when innovation capabilities profoundly influence university performance. Ongoing efforts are directed towards addressing remaining challenges and proposing avenues for future studies to delve deeper into these benefits.

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REFERENCES

Abbas, J. (2020). HEISQUAL: A modern approach to measure service quality in higher education institutions. Studies in Educational Evaluation, 67, 100933. https://doi.org/10.1016/j.stueduc.2020.100933

Abdullah Al-Melham, F., & Abdullah Al-Subaie, O. (2021). The Challenges of Achieving Competitive Advantage at Imam Abdulrahman Bin Faisal University in the Kingdom of Saudi Arabia. International Journal of Innovation, Creativity and Change, Volume 15, Issue 10, 2021.

Adom, A. Y., Boateng, L., & Gnankob, R. I. (2019). Critical analysis of the role of innovative capabilities on firm performance: Evidence from the University of Cape Coast administration in Ghana. Africa's Public Service Delivery and Performance Review, 7, 9.

Afthanorhan, A., Awang, Z., & Aimran, A. (2020). An extensive comparison of CB-SEM and PLS-SEM for reliability and validity. International Journal of Data and Network Science, 4, 357–364. https://doi.org/10.5267/j.ijdns.2020.9.003

Aithal, P. S., & Kumar, P. M. (2016). Innovations in Private Universities: A Case of Srinivas University. International Journal of Management, IT and Engineering, Volume 6, Issue 1, 250–264.

Aithal, S. (2016). Creating Innovators through setting up organizational Vision, Mission, and Core Values: A Strategic Model in Higher Education. International Journal of Management, IT and Engineering, 6(1), 310–324.

Al Jabri, A. R. S., & Nadarajah, G. (2021). THE IMPACT OF TQM PRACTICES AND ORGANIZATIONAL LEARNING CAPABILITIES ON INNOVATION PERFORMANCE IN HIGHER EDUCATION INSTITUTIONS. International Journal of Advanced Research, 9, 385–390. https://doi.org/10.21474/IJAR01/13754

Aleixo, A. M., Leal, S., & Azeiteiro, U. M. (2018). Conceptualization of sustainable higher education institutions, roles, barriers, and challenges for sustainability: An exploratory study in Portugal. Journal of Cleaner Production, 172, 1664–1673. https://doi.org/10.1016/j.jclepro.2016.11.010

Ali, A. H. A.-A. (2012). THE TOTAL QUALITY MANAGEMENT PRACTICES IN YEMENI PUBLIC UNIVERSITIES. Universiti Tun Hussein Onn Malaysia, Malaysia.

Al-Mansoori, R. S., & Koç, M. (2019). Transformational Leadership, Systems, and Intrinsic Motivation Impacts on Innovation in Higher Education Institutes: Faculty Perspectives in Engineering Colleges. Sustainability, 11(15), 4072. https://doi.org/10.3390/su11154072

Almaskari, T. H., Mohamad, E. B., & Yahaya, S. N. (2020). The Development of Innovation Capabilities. A Review Paper about the Challenges and Future Research Trend in the UAE High Education.

Al-Melham, Ms. F. A., & Al-Subaie, Dr. O. A. (2021). The Challenges of Achieving Competitive Advantage at Imam Abdulrahman Bin Faisal University in the Kingdom of Saudi Arabia. International Journal of Innovation, Creativity and Change, 15(10).

Alshatnawi, H. A. M., & Ghani, M. A. (2018). The effect and the Challenges of Implementing Total Quality Management on Performance of Higher Education Institutions.

Arundel, A., Bowen-Butchart, D., & Gatenby-Clark, S. (2016, September 19). The role of an inclusive innovation culture and innovation support strategies in university managerial and service innovations: Survey results for Australia and New Zealand. 1–23. Ghent, Belgium.

Asif, M., Awan, M. U., Khan, M. K., & Ahmad, N. (2013). A model for total quality management in higher education. Quality & Quantity, 47(4), 1883–1904. https://doi.org/10.1007/s11135-011-9632-9

Bachioua, H., Kachaou, K., & Keffane, S. (2020). Total Quality Management at Algerian Higher Education Institutions to Promote Our Roles in Comprehensive Development. Journal of Business Administration Research.

Becker, J.-M., Cheah, J.-H., Gholamzade, R., Ringle, C. M., & Sarstedt, M. (2023). PLS-SEM's most wanted guidance.

International Journal of Contemporary Hospitality Management, 35(1), 321–346. https://doi.org/10.1108/IJCHM-04-2022-0474

Bruçaj, S. (2018). Quality Management in Higher Education; Challenges of Private Universities in Albania. European Journal of Education.

Cain, M. K., Zhang, Z., & Yuan, K.-H. (2017). Univariate and multivariate skewness and kurtosis for measuring nonnormality: Prevalence, influence and estimation. Behavior Research Methods, 49(5), 1716–1735. https://doi.org/10.3758/s13428-016-0814-1

Calder, W. B. (2014). Achieving an Institution's Values, Vision, and Mission. College Quarterly, 17(2).

Calen, C., Tarigan, S. A., Rosita, R., Susanto, S., & Alimin, E. (2021). The role of transformational leadership, leader member exchange, digital transformation on organizational citizenship behaviour and work innovation capabilities in during Covid-19 pandemic. JPPI (Jurnal Penelitian Pendidikan Indonesia), 7(2), 203–216. https://doi.org/10.29210/020211163

Caplova, Z., & Petra \vSvábová. (2020). IBM SPSS statistics. Statistics and Probability in Forensic Anthropology. Retrieved from https://api.semanticscholar.org/CorpusID:226474313

Castillo, F. G. (2020). TQM in Higher Education for Sustainable Future. In A. N. Al-Masri & Y. Al-Assaf (Eds.), Sustainable Development and Social Responsibility—Volume 2 (pp. 373–380). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-32902-0_39

Changli, Y., & Hongchun, J. (2009). On the Cultivation of Innovative Talents in Colleges and Universities. International Education Studies, 2(4).

Chin, W., & Marcoulides, G. (1998). The Partial Least Squares Approach to Structural Equation Modeling. Modern Methods for Business Research, 8.

Cohen J., (1992). A power primer. Psychological bulletin, 112 (1), 155-159.

Diaconu, M. (2017, May). The Impact Of Innovation On The Performance Of The Modern University. 257–266. https://doi.org/10.15405/epsbs.2017.05.02.33

Douglas, T., & Jr, W. Q. (2001). Total Quality Management Implementation and Competitive Advantage: The Role of Structural Control and Exploration. Academy of Management Journal, 44, 158–169. https://doi.org/10.2307/3069343

Ekiz, O. (2021). An improved robust variance inflation factor: Reducing the negative effects of good leverage points. Kuwait Journal of Science. Retrieved from https://api.semanticscholar.org/CorpusID:245157893

Ellitan, L., & Mulia, T. W. (2019). Total Quality Management Model in Indonesia Higher Education. 2394–9333.

Emerson, R. S. W. (2021). Convenience Sampling Revisited: Embracing Its Limitations Through Thoughtful Study Design. Journal of Visual Impairment & Blindness, 115, 76–77.

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. Journal of Marketing Research, 18(1), 39–50. JSTOR. https://doi.org/10.2307/3151312

Gerbing, D. W., & Anderson, J. C. (1988). An Updated Paradigm for Scale Development Incorporating Unidimensionality and Its Assessment. Journal of Marketing Research, 25(2), 186–192. JSTOR. https://doi.org/10.2307/3172650

Ghardashi, F., Yaghoubi, M., Bahadori, M., & Teymourzadeh, E. (2019). Innovation capability in medical sciences universities: A qualitative study of Iran. Journal of Education and Health Promotion, 8(16). https://doi.org/10.4103/jehp.jehp_235_18

Gjelsvik, M. (2018). Universities, innovation and competitiveness in regional economies. International Journal of Technology Management, 76(1/2), 10. https://doi.org/10.1504/IJTM.2018.10009596

Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge Management: An Organizational Capabilities Perspective. Journal of Management Information Systems, 18(1), 185–214. https://doi.org/10.1080/07421222.2001.11045669

Gui, L., Lei, H., & Le, P. B. (2021). Determinants of radical and incremental innovation: The influence of transformational leadership, knowledge sharing and knowledge-centered culture. European Journal of Innovation Management, 25(5), 1221–1241. https://doi.org/10.1108/ejim-12-2020-0478

Guo, H. (2021). Research on the influence of university education system reform on college students' innovation ability. The International Journal of Electrical Engineering & Education, 0(0), 00207209211002082.

https://doi.org/10.1177/00207209211002082
Hair, J., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2022). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). https://doi.org/10.1007/978-3-030-80519-7
Hair, J., Hult, G. T. M., Ringle, C., Sarstedt, M., Danks, N., & Ray, S. (2021). Evaluation of Reflective Measurement Models. https://doi.org/10.1007/978-3-030-80519-7_4
Hair Jr., Joe F, Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: Updated guidelines on which method to use. International Journal of Multivariate Data Analysis, 1(2), 107. https://doi.org/10.1504/IJMDA.2017.087624
Hair Jr., Joseph F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. Long Range Planning: International Journal of Strategic Management, 46(1–2), 1–12. https://doi.org/10.1016/j.lrp.2013.01.001
Hajdari, S. (2019). Service Quality in Higher Education Institutions an Overview of Models Assessing It. European Journal of Business and Management Research, 4(3). https://doi.org/10.24018/ejbmr.2019.4.3.63
Hasham, E. S. (2018). Academic Institutions Are No Different to Any Other: Total Quality Management Does Enhance Performance. Labor: Human Capital eJournal.
Hazarika, Dr. J. (2019). SPSS as a means for Scientific Analysis in Social Science Research. International Journal of Innovative Technology and Exploring Engineering. Retrieved from https://api.semanticscholar.org/CorpusID:241249577
Heaton, S., Siegel, D. S., & Teece, D. J. (2019). Universities and innovation ecosystems: A dynamic capabilities perspective. Industrial and Corporate Change, 28(4), 921–939. https://doi.org/10.1093/icc/dtz038
Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8
Herlina, H., Disman, D., Sapriya, S., & Supriatna, N. (2021). The Perceptions of Building Students' Social Entrepreneurship in a Higher Education Context. Proceedings of the Ninth International Conference on Entrepreneurship and Business Management (ICEBM 2020). Atlantis Press. https://doi.org/10.2991/aebmr.k.210507.069
Hsiao, H.-C., Chen, S.-C., Chang, J.-C., Chou, C.-M., & Shen, C. H. (2009). Factors that influence school organisational innovation in technical institutes and universities. World Transactions on Engineering and Technology Education, 7(1).
Jin, X., Xu, H., & Biscocho, A. (2020). Total Quality Management: New Perspective of Employment Quality Management in Colleges and Universities.
Jordan, P. J., & Troth, A. C. (2020). Common method bias in applied settings: The dilemma of researching in organizations. Australian Journal of Management, 45, 14–3.
Kallogjeri, D., & Piccirillo, J. F. (2023). A Simple Guide to Effect Size Measures. JAMA Otolaryngology– Head & Neck Surgery. Retrieved from https://api.semanticscholar.org/CorpusID:257694748
Kaputa, V., Loucanova, E., & Tejerina Gaite, F. (2022). Digital Transformation in Higher Education Institutions as a Driver of Social Oriented Innovations. https://doi.org/10.1007/978-3-030-84044-0_4
Khadhraoui, M., Plaisent, M., Lakhal, L., & Prosper, B. (2016). Factors Inhibiting University-Industry Technology Transfer. Journal of IT and Economic Development, 7(2).
Khan, B. A., & Naeem, H. (2018). The impact of strategic quality orientation on innovation capabilities and sustainable business growth. International Journal of Quality & Reliability Management, 35(8), 1568–1598. https://doi.org/10.1108/ijqrm-07-2017-0126
Khurniawan, A. W., Sailah, I., Muljono, P., Indriyanto, B., & Maarif, M. S. (2020). An Analysis of Implementing Total Quality Management in Education: Succes and Challenging Factors. International Journal of Learning and Development, 10, 44–59.
Kilic, S. (2016). Cronbachs Alpha Reliability Coefficient. Journal of Mood Disorders, 6, 1. https://doi.org/10.5455/jmood.20160307122823
Kim, J. H. (2019). Multicollinearity and misleading statistical results. Korean Journal of Anesthesiology, 72, 558–569.
Kim, Y.-A., Kim, K.-A., & Tzokas, N. (2022). Entrepreneurial universities and the effect of the types of vocational

education and internships on graduates' employability. Studies in Higher Education, 47, 1–10. https://doi.org/10.1080/03075079.2022.2055324

Kline, R. B. (2015). Principles and Practice of Structural Equation Modeling, Fourth Edition. Guilford Publications. Retrieved from https://books.google.com.my/books?id=Q61ECgAAQBAJ

Kock, N. (2017). Common Method Bias: A Full Collinearity Assessment Method for PLS-SEM. Retrieved from https://api.semanticscholar.org/CorpusID:125704377

Kotian, H., Varghese, A. L., & Motappa, R. (2022). An R Function for Cronbach's Alpha Analysis: A Case-Based Approach. National Journal of Community Medicine. Retrieved from https://api.semanticscholar.org/CorpusID:251992428

Kozirog, K., Lucaci, S.-M., & Berghmans, S. (2022). Universities as key drivers of sustainable innovation ecosystems.

Krakhmalova, N. (2022). DEVELOPMENT OF THE INNOVATIVE POTENTIAL OF YOUNG PEOPLE ON THE BASIS OF THE USE OF THE UNIVERSITY HACKATHON ECOSYSTEM. Management, 34(2), 45–61. https://doi.org/10.30857/2415-3206.2021.2.5

Krasovskiy, I. N., Pilyavski, V. P., Shendrikova, S. P., & Nazrieva, M. V. (2020). Mechanism of the Innovation Development in the University: Presented at the International Scientific Conference "Far East Con" (ISCFEC 2020), Vladivostok, Russia. Vladivostok, Russia. https://doi.org/10.2991/aebmr.k.200312.296

Lach, S., & Schankerman, M. (2004). Royalty Sharing and Technology Licensing in Universities. Journal of the European Economic Association, 2(2–3), 252–264. https://doi.org/10.1162/154247604323067961

Laila, S. S. A.-A., & Ahmed, S. Alh. (2022). The Applicability of Total Quality Management in Employees' Performance Development in Private Universities. Vol. 13 No. 1 (2023).

Lathong, L., Ba Phong, L., & Saeheng, P. (2021). Transformational Leadership, Knowledge Sharing, and Innovation Capability: An Empirical Study from Lao Firms. Journal of International Business and Management, 4(9). https://doi.org/10.37227/jibm-2021-08-1154

Lei, H., Leaungkhamma, L., & Le, P. B. (2020). How transformational leadership facilitates innovation capability: The mediating role of employees' psychological capital. Leadership & Organization Development Journal, 41(4), 481–499. https://doi.org/10.1108/lodj-06-2019-0245

Lester, R. K., & Sotarauta, M. (2007). Innovation, universities, and the competitiveness of regions editors: Richard K. Lester and Markku Sotarauta. Helsinki: Tekes.

Long, C. S., Kowang, T. O., & Wan Ismail, W. K. (2015). Total Quality Management Practices and Innovation Performance: A Review. Advanced Science Letters, 21(5), 1086–1088. https://doi.org/10.1166/asl.2015.6007

McLaughlin, L., & McLaughlin, J. F. (2020). Do we innovate as we believe we do? Journal of Research in Innovative Teaching & Learning, 14(2), 218–231. https://doi.org/10.1108/jrit-10-2019-0073

Memon, M., Ting, H., Hwa, Cheah, Ramayah, T., Chuah, F., Cham, T. (2020). Sample Size for Survey Research: Review and Recommendations. https://doi.org/10.47263/JASEM.4(2)01.

Militaru, M., Ungureanu, G., & (Creţu, A. (2013). The Prospects of Implementing the Principles of Total Quality Management (TQM) in Education. In Procedia—Social and Behavioral Sciences (Vol. 93, p. 1141). https://doi.org/10.1016/j.sbspro.2013.10.003

Muhammad Jawad Iqbal. (2011). Academic staff knowledge sharing intentions and university innovation capability. AFRICAN JOURNAL OF BUSINESS MANAGEMENT, 5(27). https://doi.org/10.5897/AJBM11.576

Munazza Mahmood, Sobia Noreen. (2021). IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT IN HIGHER EDUCATION: AN EVALUATION OF THE RESULTS ACHIEVED BY THE PUBLIC AND PRIVATE UNIVERSITIES. Pakistan Journal of Educational Research, 4(4). https://doi.org/10.52337/pjer.v4i4.337

Nadim, Z. S., & Al-Hinai, A. H. (2016). Critical Success Factors of TQM in Higher Education Institutions Context. International Journal of Applied Sciences and Management, Vol. 1, No. 2, 147-156, 2016.

Nasim, K., Sikander, A., & Tian, X. (2020). Twenty years of research on total quality management in Higher Education: A systematic literature review. Higher Education Quarterly, 74(1), 75–97. https://doi.org/10.1111/hequ.12227

Notarjacomo, M. H. B., Strapazzon Do Couto, B., Bica de Almeida, F., Borchart, M., & Medeiros Pereira, G. (2022). Total Quality Management: Practices to Leverage Its Principles in Distance Higher Education. In A. Hamrol,

M. Grabowska, & D. Maletič (Eds.), Advances in Manufacturing III (pp. 60–71). Cham: Springer International Publishing.

OECD. (2015). Empowering the public sector workforce to achieve public sector innovation. OECD. https://doi.org/10.1787/9789264236561-4-en

Păunescu, C., Lepik, K.-L., & Spencer, N. (Eds.). (2022). Social Innovation in Higher Education: Landscape, Practices, and Opportunities. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-84044-0

Ramayah, T., Hwa, C., Chuah, F., Ting, H., & Memon, M. (2018). Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 3.0: An Updated and Practical Guide to Statistical Analysis.

Rendón-Macías, M. E., Villasís-Keever, M. Á., & Miranda-Novales, M. G. (2019). [Descriptive statistics]. Revista Alergia Mexico, 63 4, 397–407.

Robertson, O., & Evans, M. S. (2020). Just how reliable is your internal reliability? An overview of Cronbach's alpha (α). PsyPag Quarterly. Retrieved from https://api.semanticscholar.org/CorpusID:255899191

Ruben, B. D. (2018). Quality in Higher Education. Transaction Publishers. Retrieved from https://books.google.com.my/books?id=8rzcngEACAAJ

Reynolds ,N.L.,Simintiras, A.C.,Diamantopoulos. (2003). A Theoretical justification of sampling choices in international marketing research: Key issues and guidelines for researchers. J. Int. Bus. Stud, 34, 80–89.

Samad, K. A., & Thiyagarajan, R. (2015). TQM IN HIGHER EDUCATION - A CONCEPTUAL MODEL TO ACHIEVE EXCELLENCE IN MANAGEMENT EDUCATION. 6 Issue 1, 634–645. INTERNATIONAL JOURNAL OF MANAGEMENT (IJM).

Santoso, P. B., Purwanto, A., Siswanto, E., Hartuti, Setiana, Y. N., Sudargini, Y., & Fahmi, K. (2021). Effect of Hard Skills, Soft Skills, Organizational Learning and Innovation Capability onIslamicUniversity Lecturers' Performance. INTERNATIONAL JOURNAL OF SOCIAL AND MANAGEMENT STUDIES (IJOSMAS), 2(1), 14–49.

Sarstedt, M., Ringle, C., & Hair, J. (2021). Partial Least Squares Structural Equation Modeling. https://doi.org/10.1007/978-3-319-05542-8_15-2

Sarstedt, M., & Ringle, C. M. (2020). STRUCTURAL EQUATION MODELS: FROM PATHS TO NETWORKS (WESTLAND. Retrieved from https://api.semanticscholar.org/CorpusID:251883630

Setiawan, R., Princes, E., Tunardi, Y., Chandra, A., Noerlina, N., Mursitama, T. N., & Limto, D. (2022). Assessing the Impacts of IT Usage, IT Adoption, and Innovation Capabilities in Increasing the Hybrid Learning Process Performance. International Journal of Learning, Teaching and Educational Research, 21(4), 337–354. https://doi.org/10.26803/ijlter.21.4.19

Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J.-H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: guidelines for using PLSpredict. European Journal of Marketing, 53(11), 2322–2347. https://doi.org/10.1108/EJM-02-2019-0189

Sibarani, D. P. (2023). LEADERSHIP MANAGEMENT IN THE CONCEPT OF TOTAL QUALITY MANAGEMENT IN INTERNATIONAL STANDARD SCHOOL. Improvement: Jurnal Ilmiah Untuk Peningkatan Mutu Manajemen Pendidikan, 10(1), 31–39. https://doi.org/10.21009/improvement.v10i1.34583

Sirisan, S., Pianthong, N., & Olejnik, M. K. (2020). A structure equation model of total quality management and innovation capability affecting organisational performanc. Asia-Pacific Journal of Science and Technology, 25(04). Retrieved from https://doi.org/10.14456/apst.2020.32

Sisto, R., Sica, E., & Cappelletti, G. M. (2020). Drafting the Strategy for Sustainability in Universities: A Backcasting Approach. Sustainability, 12(10), 4288. https://doi.org/10.3390/su12104288

Sonia, N. R. (2021). Total Quality Management dalam Lembaga Perguruan Tinggi. Southeast Asian Journal of Islamic Education Management.

Teo, T. S. H., Srivastava, S. C., & Jiang, L. (2008). Trust and Electronic Government Success: An Empirical Study. Journal of Management Information Systems, 25(3), 99–132. https://doi.org/10.2753/MIS0742-1222250303

Texeira-Quiros, J., Justino, M. do R., Antunes, M. G., Mucharreira, P. R., & Nunes, A. de T. (2022). Effects of Innovation, Total Quality Management, and Internationalization on Organizational Performance of Higher Education Institutions. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.869638

Tian, L. (2023). Rethinking the global orientation of world-class universities from a comparative functional perspective. International Journal of Educational Development, 96, 102700.

https://doi.org/10.1016/j.ijedudev.2022.102700

Tseng, F.-C., Huang, M.-H., & Chen, D.-Z. (2020). Factors of university–industry collaboration affecting university innovation performance. The Journal of Technology Transfer, 45(2), 560–577. https://doi.org/10.1007/s10961-018-9656-6

Usher, M., & Barak, M. (2020). Team diversity as a predictor of innovation in team projects of face-to-face and online learners. Computers & Education, 144, 103702. https://doi.org/10.1016/j.compedu.2019.103702

Vladić, N., Maletič, D., & Maletič, M. (2021). Determinants of Innovation Capability: An Exploratory Study of Inclusive Leadership and Work Engagement. Quality Innovation Prosperity, 25(2), 130–152. https://doi.org/10.12776/qip.v25i2.1596

Wu, J., & Gu, Y. (2022). Innovation capabilities in the convergence trend of higher education from the perspective of quality management. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.979059

Yahiaoui, F., Chergui, K., Aissaoui, N., Brika, S. K. M., Lamari, I. A., Musa, A. A., & Almezher, M. (2022). The impacts of total quality management practices in Algerian higher education institutions. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.874209

Yordanova, Z., Bozev, V., Stoimenova, B., & Biolcheva, P. (2020). Innovation and Competitiveness of Universities – An Empirical Research. In M. Themistocleous & M. Papadaki (Eds.), Information Systems (pp. 438–447). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-44322-1_32

Zhang, Z. (2000). “Implementation of Total Quality Management, an Empirical Study of Chinese Manufacturing Firms. University of Groningen, Netherland.