

How Individual Factors Shape Innovative Work Behavior in Malaysian HEIs: The Role of Innovation Capability, Knowledge Sharing and Psychological Empowerment

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Abstract: This study investigates the factors driving academics' innovative work behavior (IWB) in Malaysian Higher Education Institutions (HEIs), focusing on individual innovation capability, psychological empowerment, and knowledge sharing. The respondents comprised 382 academics from 24 Malaysian universities listed in the QS World Ranking 2023, selected through convenience sampling. Data were collected via a Google Form questionnaire distributed by email. The descriptive analysis assessed individual innovation capabilities, psychological empowerment, and knowledge-sharing levels, and their impact on IWB. The findings indicate high engagement in innovative activities, with academics demonstrating strong innovative capabilities, a sense of empowerment, and active knowledge-sharing practices. These individual factors significantly contribute to fostering IWB, highlighting the importance of continuous professional development, supportive institutional environments, and collaborative cultures in promoting innovation within HEIs. This study provides valuable insights for policymakers and university administrators to enhance the innovative potential of academics, ultimately contributing to the advancement of knowledge and improvement of educational practices in Malaysian HEIs. Future research should explore longitudinal effects and potential moderating factors to further understand innovative work behavior dynamics in academic settings.

Keywords: *Innovative Work Behavior, Individual Innovation Capability, Psychological Empowerment, Knowledge Sharing, Higher Education Institutions, Malaysia*

1. Introduction and Background

In the last two decades, academics have devoted more emphasis to studying innovative work behavior (IWB) due to the demonstrated influential effects of IWB on individual and organizational results (Afsar et al., 2020; Rajandran & Subramaniam, 2023; Sari et al., 2021; Usmanova et al., 2020). The organization's growth and survival are contingent upon IWB, as behavior plays a crucial role in organizational transformation (Zainal & Matore, 2019). In addition, IWB has the potential to transform the work environment by encouraging teamwork, which in turn boosts productivity (Supriyanto, 2019). With the growing recognition of the significance of IWB, non-profit and for-profit organizations are actively searching for effective techniques to encourage their staff members to demonstrate IWB (Choi et al., 2021; Srirahayu et al., 2023). Although much research has been conducted on IWB, there is still a paucity of studies focusing on understanding the process that leads to it (Riaz et al., 2018). Prior research on factors influencing IWB has primarily concentrated on Western nations (Zhou & Velamuri, 2018), and less effort was given to service industries (Javed et al., 2017). Mohammed Afandi & Mohd Effendi Ewan, (2020) Pointed out in their research that there is still a dearth of and a restricted amount of discussion on IWB in the context of education and academia.

The urgency of research on IWB among academics in Malaysian higher education institutions (HEIs) cannot be overstated. As the country strives to become a regional education hub and adapt to the challenges of the Fourth Industrial Revolution (IR 4.0), fostering innovation among academic staff becomes imperative (Rahman Ahmad et al., 2020; Rajandran & Subramaniam, 2023). Besides, to satisfy the current requirements of the market, universities must establish a competitive edge and develop the ability to recover quickly from challenges, which highlights the importance of effectively managing their human resources (Wahab et al., 2024). Due to this, HEIs are increasingly pressured to adapt and innovate to remain competitive and relevant. Because of the fast-paced changes in the labor market and digital transformation, academics are facing immense pressure to improve their teaching methods and instructional materials to keep up with students, particularly at universities (Atatsi

et al., 2021). According to Wahab et al., (2024), academics must demonstrate IWB to better adapt to new situations and be an asset in making their institutions more competitive. Employees who exhibit IWB are those who are constantly thinking of new ways to solve problems or meet the needs of others, and who are also able to recognize when a trend has changed and adapt their thinking accordingly (de Jong & Hartog, 2007).

Thus, to ensure the education system is always competitive, academics should have innovative attitudes or behaviors (Rajandran & Subramaniam, 2023; Wahab et al., 2024). However, existing literature indicates a scarcity of local research on IWB, notably in the context of academic environments (Hashim et al., 2019; Ibus et al., 2020; Johari et al., 2021). This suggests a lack of comprehensive exploration of IWB in Malaysian education. Researchers still have ample space and opportunity to delve deeper into the IWB of academics, as their understanding of how to enhance innovative academic methods remains incomplete (Mohammed Afandi & Mohd Effendi Ewan, 2020). In line with this phenomenon, this paper aims to address the knowledge and empirical gaps surrounding academics IWB in educational institutions, which are responsible for designing and delivering valuable and useful knowledge to students.

Bos-Nehles & Veenendaal, (2019) Observe a lack of knowledge regarding the cultivation of innovation at the individual level. According to a bibliometrics review by Farrukh et al., (2022) The antecedents of IWB at the individual level are the least explored research areas. Luu, (2019) Also emphasizes that employees' use of IWB has not received as much attention as a team or organizational innovation. Previous studies have highlighted the need for focused research on IWB at the individual/personal level (De Jong & Den Hartog, 2010; Farrukh et al., 2022) and therefore the present study will focus on the individual level.

A thorough examination of the literature indicates that knowledge sharing (KS) significantly influences IWB (Aldabbas et al., 2021; Alshahrani et al., 2023; Chen & Pongtornkulpanich, 2024; Islam et al., 2022). Organizations that actively nurture a culture of knowledge sharing are also able to enhance the utilization of IWB (Mustika et al., 2020). According to Nugroho, (2023), asserts that knowledge sharing greatly aids in improving academics' IWB. This includes its ability to encourage teamwork, facilitate the sharing of information and experience, spark new ideas, and aid in the development of novel approaches. As a result, there is limited research on KS in education settings, particularly among academics (Abdullah & Omar, 2020), providing an opportunity to further study in HEIs.

Conversely, psychological empowerment (PE) has been extensively researched and has demonstrated its importance to IWB. However, the results remain uncertain. Some studies show a significant relationship (Helmy et al., 2019; Park & Kim, 2022; Pham et al., 2024; Yadav et al., 2023) while other studies show a negative relationship (Sinaga et al., 2021; Zhang et al., 2021). This has led to a research vacuum on the testing of sophisticated models that can help us better grasp the link between psychological empowerment and IWB among academics at universities.

Another factor that has been overlooked in IWB studies is individual innovation capabilities (IIC). A greater ability for innovation can enable individuals to effectively address work-related challenges, thereby improving both the quality and quantity of their output (Fauziyah & Rahayunus, 2021). According to Nugroho et al., (2021), academic IIC has become a driver of business sustainability. Therefore, organizations regard IIC as a useful asset to establish and maintain a competitive edge and enhance firm performance. The emerging topic of study focused on innovation capability has garnered significant attention from numerous scholars (Chotivanich & Phorncharoen, 2023; Fauziyah & Rahayunus, 2021; Ferreira et al., 2020; Nham et al., 2020). Notwithstanding these significant advancements, there remains a dearth of agreement among scholars. Therefore, this paper seeks to bridge this gap by examining the interplay between psychological empowerment, knowledge sharing, and individual innovation capabilities in fostering academic IWB within Malaysian HEIs.

2. Literature Review

Innovative Work Behavior: Organizational success in today's distribution environment is dependent on having an innovative workforce in an age of digitization, globalization, and fast changes (Udin, 2022). As a result, scholars and organizational practitioners in the fields of management and distribution science have been interested in employees' IWB. Janssen, (2000) defines IWB as employees deliberately generating, proposing,

and implementing new ideas at work, either individually or within a team or organization, to enhance performance. Similarly, Jong & Hartog, (2007) describe IWB as individuals deliberately acting to introduce or implement new ideas, services, methods, or procedures within their job roles, departments, or organizations.

While there is significant scholarly interest in studies on IWB, research specifically focused on IWB in higher education institutions (HEIs) remains limited (Ayoub et al., 2023; Messmann et al., 2018). HEIs undoubtedly contribute significantly to the performance of innovation (Ibus, Wahab, & Ismail, 2020). According to Roffeei et al. (2018), education is crucial since it serves as a reservoir of knowledge and helps shape people's attitudes and talents to become knowledge workers. Given that education is crucial for promoting creative and innovative thinking among students, academics' IWB is critical in the changing environment. This will aid academics in developing a creative attitude, reframing the role of the university in society, and assisting universities in transitioning from traditional to entrepreneurial universities (Farrukh et al., 2022). According to a study by Ebrahim et al., (2023) Knowledge sharing and psychological empowerment are among the most prominent factors in IWB studies. While study by Nham et al., (2020) Highlighted the lack of research specifically examining innovation capability at both personal and organizational levels, even though individual innovation capability is crucial for driving organizational innovation.

Psychological Empowerment: Psychological empowerment (PE) is a process that involves an individual's subjective, cognitive, and attitudinal experiences, enabling them to feel capable, competent, and authorized to complete activities (Llorente-Alonso et al., 2024). Conger & Kanungo, (1988) are widely recognized as the first authors to introduce the notion of PE. Further Thomas & Velthouse, (1990) consider empowerment as a motivating element associated with intrinsic task motivation which consists of four components namely impact, competence, meaning, and self-determination. Spreitzer, (1995) further developed the idea of empowerment by specifically examining its use in the workplace in which the research built upon earlier studies conducted by Thomas & Velthouse, (1990). Spreitzer, (1995) Explains that meaning is how well an employee thinks their values, beliefs, attitudes, and actions match up with their job duties. While Thomas & Velthouse, (1990) refer to competence as an individual's ability to effectively perform job-related tasks when applying effort. Meanwhile, self-determination refers to an employee's perspective on how to carry out their responsibilities, encompassing aspects such as initiative, action, task behavior, and methodology and lastly impact refers to the degree to which an employee can influence the results or outcomes within the company (Spreitzer, 1995). In the past two decades, extensive research on psychological empowerment has provided compelling evidence of its significant impact as a motivational element in influencing IWB (Gultom et al., 2022; Yadav et al., 2023). Afsar & Masood, (2018) Reported empowered employees are likely to demonstrate higher levels of IWB. When an employee has a sense of empowerment, they perceive their job as having a more significant purpose, exhibit increased levels of skill in their work, possess a larger ability to affect outcomes, and have a wider range of options for completing tasks (Nasir et al., 2019).

Knowledge Sharing: Knowledge sharing (KS) is a collaborative process in which employees within an organization exchange knowledge, resulting in the creation of new knowledge (Van Den Hooff & Ridder, 2004). The KS process consists of two distinct phases: knowledge donating and knowledge collecting. Knowledge collection involves engaging and inspiring individuals to share their knowledge or intellectual resources, whereas knowledge donation refers to the transfer of one's intellectual assets to others (Van Den Hooff & Ridder, 2004). To be more specific, knowledge collection and knowledge donation are practices carried out by employees to acquire and share new information, enhancing the overall comprehensiveness of everyone's knowledge (Nham et al., 2020). Almulhim, (2020) states that knowledge sharing may be incredibly beneficial to partners or employees when it comes to solving problems, implementing policies, or developing new ideas. Higher education institutions are classified as knowledge-intensive enterprises due to their significant involvement in knowledge generation, development, and dissemination through teaching, learning, and research (Chen & Pongtornkulpanich, 2024). Hence, academics should possess the skills to effectively administer and harness knowledge, as well as disseminate it, to optimize its utilization and generate groundbreaking results. Knowledge sharing has been evaluated as a foundation for innovation and has demonstrated its ability to enhance the effectiveness of research and development in organizations (Nugroho, 2023). Empirical findings indicate that the act of sharing knowledge, which includes both donating and collecting knowledge, plays a significant role in enhancing employees' IWB (Akram et al., 2018; Chen & Pongtornkulpanich, 2024; Khan et al., 2023; Natsir & Yunus, 2023).

Individual Innovation Capabilities: Lathong, (2021) defines IIC as the ability of employees to conceptualize and implement novel ideas. According to Basadur et al., (1982), for employees to participate in innovative activities, they need to have creative thinking skills that include both divergent and convergent thinking abilities. Divergent thinking refers to the capacity to generate multiple alternative solutions or perspectives, while convergent thinking employs analytical and judgemental skills to assess the value of an idea or pinpoint the root causes of problems (Basadur & Finkbeiner, 1985; Scott et al., 2004). Both sets of capabilities are essential for generating innovative and potentially feasible ideas. Therefore, for an employee to innovate, they must possess both types of talents. Academic staff must be adaptable and innovative to survive in an unpredictable environment under IR 4.0 (Hussein et al., 2016). It is mainly because the ability of staff to innovate is a major factor in an organization's innovation (Zhao et al., 2020). Enhanced capacity for innovation can assist individuals in resolving work-related challenges, thereby improving the quality and quantity of their output (Fauziyah & Rahayunus, 2021). Academic innovation capability becomes a driver of business sustainability (Nugroho et al., 2021). Thus, individual innovation capability is considered a valuable asset for firms to provide and sustain competitive advantage in the implementation of the entire strategy. Researchers have looked at how IIC affects many things, such as knowledge sharing, hard and soft skills, organizational learning, employee performance, transformational leadership, organizational culture, and individual and organizational drives (Ben Moussa & El Arbi, 2020; Fauziyah & Rahayunus, 2021; Iddris et al., 2022; Imron et al., 2021; Lathong, 2021; Lei et al., 2020; Nham et al., 2020; Nugroho et al., 2021; Wibowo et al., 2020). However, not much research has been done on the relationship between IIC and IWB. Studies on the use of IIC to strengthen IWB are even more limited in the education field.

3. Research Methodology

This study employs a quantitative research design to examine the factors driving academics' IWB in Malaysian Higher Education Institutions (HEIs). In particular, the study focuses on three independent variables: individual innovation capability, psychological empowerment, and knowledge sharing, as well as the dependent variable, IWB. The intended target population consists of academics from 24 Malaysian universities listed in the QS World Ranking 2023. The study's sample size consists of 382 respondents who were selected using convenience sampling, a non-probability selection technique that allows for convenient access to participants. Data were collected using a structured questionnaire that was developed through Google Forms. Academics from various disciplines and faculties received the questionnaire via email. The survey items were adapted and adopted from validated scales in existing literature to ensure reliability and validity. The data were analyzed using SPSS 29.0.

Measurements

Innovative Work Behaviour: The 10-item scale from De Jong and Den Hartog (2010) was used to evaluate the employees' IWB. Participants were required to indicate how frequently, using a 5-point Likert-type scale ranging from 1 (never) to 5 (always), they manifest the behaviors mentioned in the survey. A sample item is "I generate original solutions for problems".

Psychological Empowerment: Psychological empowerment is assessed using the scale developed by Spreitzer, (1995). This instrument comprises 12 items, with three items measuring each of the four dimensions of psychological empowerment: meaning, competence, self-determination, and impact. Respondents will rate their agreement with each statement on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Examples of items include "The work I do is meaningful to me" (meaning), "I am confident about my ability to do my job" (competence), "I have significant autonomy in determining how I do my job" (self-determination), and "My impact on what happens in my department is large" (impact).

Knowledge Sharing: The measurement scale used to assess knowledge sharing was adopted from Van Den Hooff & Ridder, (2004). The questions were extensively employed by numerous prior investigations. (De Vries et al., 2006; Nham et al., 2020). The questions were examined according to knowledge donating and knowledge collecting. The measurement consists of eight items. These items are rated on a Likert scale ranging from 1 (indicating strongly disagree) to 5 (indicating strongly agree). Examples of items include "When I've learned something new, I tell my colleagues about it" and "When I need certain knowledge, I ask my colleagues about it".

Individual Innovation Capabilities: Individual innovation capabilities are measured using a modified version of the scale originally developed by Hurt et al., (1977) and subsequently adapted by An et al., (2015) and Ganesan & Weitz, (1996). This unidimensional measure consists of 6 items and uses a Likert scale from 1 (totally disagree) to 5 (totally agree). The items are designed to gauge the degree to which respondents believe they are involved in creative and innovative activities. Sample items include “I enjoy trying out new ideas” and “I frequently improvise methods for solving a problem when an answer is not apparent”. This scale has been validated and shown to be reliable in previous research (Nham et al., 2020).

4. Findings

The background of 382 respondents is described through a table based on the demographic characteristics of gender, age (years), service duration, academic qualification, and position. It is analyzed according to the frequency and percentage as stated in Table 1. Firstly, the majority of the respondents are female academics with 259 (67.8%) while 123 academics (32.2%) are male academics. In terms of age, it states that most of the respondents in this study are between the age of 40-49 years with 169 respondents (44.2%) and between age 30-39 years with 117 respondents (30.6%). The remaining are between ages 50-59 years with 48 respondents (23.3%) followed by between age 20-29 years with 4 respondents (1.0%) and above 60 years with the least number of 3 respondents (0.8%). Next, majority of the respondents have more than 20 years of service duration with 93 respondents (24.3%) followed by 16-20 years of service duration with 77 respondents (20.2%), 11-15 years of service duration with 76 respondents (19.9%), 1-5 years of service duration with 71 (19.1%) and 6-10 years of service duration with 63 respondents (16.5%). In terms of academic qualification, 296 respondents (77.5%) are PhD holders meanwhile 86 respondents (22.5%) are Master holders. Lastly, for positions, most of the respondents are senior lecturers with 181 respondents (47.4%) followed by Associate Professor Madya Dr. with 80 respondents (20.9%), a lecturer with 68 respondents (17.8%), PhD Dr. with 38 respondents (9.9%) and the lowest is Professor with 15 respondents (3.9%).

Table 1: Descriptive Analysis on Respondents Demographic

| Item | | Frequencies (n) | Percent (%) |
|------------------------|-------------------------|-----------------|-------------|
| Gender | Male | 123 | 32.2 |
| | Female | 259 | 67.8 |
| Age | 20-29 years | 4 | 1.0 |
| | 30-39 years | 117 | 30.6 |
| | 40-49 years | 169 | 44.2 |
| | 50-59 years | 48 | 23.3 |
| | More than 60 years | 3 | 0.8 |
| Service Duration | 1-5 years | 73 | 19.1 |
| | 6-10 years | 63 | 16.5 |
| | 11-15 years | 76 | 19.9 |
| | 16-20 years | 77 | 20.2 |
| | More than 20 years | 93 | 24.3 |
| Academic Qualification | Master | 86 | 22.5 |
| | PhD | 296 | 77.5 |
| Position | Lecturer | 68 | 17.8 |
| | Senior Lecturer | 181 | 47.4 |
| | PhD Dr. | 38 | 9.9 |
| | Associate Professor Dr. | 80 | 20.9 |
| | Professor | 15 | 3.9 |

Reliability Analysis

Considering the overall reliability of the observable variables, every observable variable has a high level of reliability between .741 and .968. The results show that Cronbach’s Alpha for all variables is acceptable, good, and excellent since the value of Cronbach’s Alpha is more than 0.7. Hence, the actual study is reliable.

Table 2: Reliability Analysis (N=382)

| Variables | Number of items | Cronbach's Alpha |
|------------------------------------|-----------------|------------------|
| Innovative Work Behavior | 10 | .904 |
| Individual Innovation Capabilities | 7 | .927 |
| Psychological Empowerment | 12 | .903 |
| Knowledge Sharing | 8 | .891 |

Descriptive Analysis

For this study, the mean score is used to evaluate the level of IWB, psychological empowerment (PE), knowledge sharing (KS) and individual innovation capabilities (IIC) practice of academics of HEIs in Malaysia. The data were analyzed descriptively using mean through SPSS version 29.0. The Mean Score Interpretation Table constructed by Moidunny (2009) was used in this study to measure the mean score. The Mean Score Interpretation Table is shown in Table 3 while Table 4 shows the descriptive analysis. According to Table 4, academics in Malaysia HEIs have high levels of IWB (M = 3.82), high levels of PE (M = 4.14), high levels of KS (M = 3.95), and high levels of IIC (M = 4.12). It can be concluded that the mean score for IWB and all the independent variables is high.

Table 3: Mean Score Interpretation Table

| Mean Scale | Level |
|-------------|-----------|
| 1.00 – 1.80 | Very Low |
| 1.81 – 2.60 | Low |
| 2.61 – 3.20 | Medium |
| 3.21 – 4.20 | High |
| 4.21 – 5.00 | Very High |

Source: Moidunny (2009). The Effectiveness of the National Professional Qualification for Educational Leaders (NPQEL).

Table 4: The Total Mean Score of Variables

| | Descriptive Statistics | | | |
|--------------------|------------------------|--------|----------------|----------------------|
| | N | Mean | Std. Deviation | Interpretation Level |
| Mean_IWB | 382 | 3.8296 | .61122 | High |
| Mean_PE | 382 | 4.1440 | .53087 | High |
| Mean_KS | 382 | 3.9496 | .64269 | High |
| Mean_IIC | 382 | 4.1248 | .66139 | High |
| Valid N (listwise) | 382 | | | |

Descriptive Analysis of Innovative Work Behavior

Table 5 explains the descriptive statistics for the question set on Innovative Work Behaviour designated for this study. The descriptive statistics for Innovative Work Behavior (IWB) among academics reveal interesting insights into how lecturers in Malaysian universities engage with innovation within their institutions. For example, among the IWB practices in organizations, question set (Q2) shows the highest mean (M=4.24) with 136 respondents strongly agreeing that they always want to know how things can be improved in their workplace. It shows a high engagement of academics in continuous improvement. This high level of engagement can be attributed to the intrinsic motivation of academics to continuously enhance their work environment. In academia, there is a strong emphasis on quality improvement and staying updated with the latest developments. With education changing constantly, sticking to one method is not feasible. (Mohammed Afandi & Mohd Effendi Ewan, 2020). Academics often seek to refine their teaching methods, research practices, and administrative processes, leading to a high mean in this category.

While examining Q3-Q5 the result shows high engagement in searching for new methods with (M=4.14, M=3.88, M=4.01) respectively. The majority of the respondents agree with the statements for example for Q3 around 200 respondents often search for new working methods, techniques, or instruments in their institutions. The advancement of education technology, expanding branches of knowledge, and increasing challenges in education require our education system to be innovative to remain competitive (Mohammed Afandi & Mohd

Effendi Ewan, 2020). Next, for Q4, 193 respondents agreed they often generate original solutions for problems. For Q5 almost 210 respondents agreed that they often find new approaches to executing tasks. The high engagement in these areas can be linked to the dynamic nature of academic work, which requires constant innovation to stay relevant and effective. Academics are encouraged to explore new pedagogical strategies, research methodologies, and technological tools. Thus, educational institutions can facilitate and encourage innovation by providing academics with the necessary resources and equipment to experiment with new teaching methodologies (Carvalho et al., 2023).

Meanwhile, Q6 and Q7 also show high engagement in influencing others. Almost 149 respondents agreed they often make important organizational members enthusiastic about innovative ideas while Q7 shows 162 respondents stated they often attempt to convince people to support an innovative idea. The high engagement in influencing others reflects the proactive role that academics play in advocating for innovation within their institutions. This can be attributed to their commitment to improving their work environment and the desire to see innovative ideas come to fruition. Influencing colleagues and administrative staff requires strong interpersonal skills and a supportive organizational culture. Academics often utilize their credibility and expertise to persuade others, fostering a collaborative environment that is conducive to innovation.

Following the rest of the questions, high means for Q8 (M=3.68), Q9 (M=3.80), and Q10 (M=3.93), with many respondents systematically introducing, contributing to, and developing new ideas with 167 respondents, 182 and 194 respondents respectively. The practical application of innovative ideas is crucial in academia, where research findings and new teaching practices need to be integrated into everyday work. This high level of engagement demonstrates that academics not only generate ideas but also take steps to implement them, ensuring that their innovative efforts have tangible outcomes. According to Kleysen & Street, (2001), idea implementation is a difficult phase because so many proposed ideas will never see the light of day.

However, Q1 shows lower engagement in non-daily work issues. The lowest mean (M=3.58) with 143 respondents stated only sometimes they pay attention to issues not part of their daily work. This lower engagement might be due to the heavy workload and time constraints faced by academics, making it difficult to focus on issues beyond their immediate responsibilities. Additionally, the academic environment often prioritizes specific tasks related to teaching, research, and service, leaving little room for attention to peripheral issues. Academics are often required to perform challenging tasks in a high-pressure setting, which encompasses conducting demanding research, publishing scholarly work, fulfilling teaching and supervisory duties, securing research funding, and managing administrative tasks. (Janib et al., 2021). The total mean score for IWB is (M=3.83), which indicates a significant level of innovative activity but also offers an opportunity for further improvement. The relatively high mean indicates that academics have a proactive approach towards innovation, which is essential for the ongoing enhancement of teaching and research processes within higher education institutions (HEIs).

Table 5: Mean Score, Standard Deviation and Interpretation of Innovative Work Behavior

| Statement | N | Std. Deviation | Mean | Descriptive Statistics | | | | |
|---|-----|----------------|------|------------------------|---------------|----------------|----------------|----------------|
| | | | | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I pay attention to issues that are not part of my daily work. | 382 | .996 | 3.17 | 18 (4.7%) | 76 (19.9%) | 143 (37.4%) | 113 (29.6%) | 32 (8.4%) |
| I wonder how things can be improved | 382 | .672 | 4.24 | | 7 (1.8%) | 30 (7.9%) | 209 (54.7%) | 136 (35.6%) |
| I search for new working methods, techniques, or instruments. | 382 | .725 | 4.14 | 1 (0.3%) | 6 (1.6%) | 53 (13.9%) | 200 (52.4%) | 122 (31.9%) |

| | | | | | | | | |
|--|-----|--------|--------|-------------|--------------|----------------|----------------|---------------|
| I generate original solutions for problems. | 382 | .748 | 3.88 | | 10 (2.6%) | 103 (27.0%) | 193 (50.5%) | 76 (19.9%) |
| I find new approaches to executing tasks. | 382 | .720 | 4.04 | 1 (0.3%) | 6 (1.6%) | 68 (17.8%) | 210 (55.0%) | 97 (25.4%) |
| I make important organizational members enthusiastic about innovative ideas. | 382 | .906 | 3.67 | 5 (1.3%) | 27 (7.1%) | 129 (33.8%) | 149 (39.0%) | 72 (18.8%) |
| I attempt to convince people to support an innovative idea | 382 | .946 | 3.74 | 7 (1.8%) | 30 (7.9%) | 100 (26.2%) | 162 (42.4%) | 83 (21.7%) |
| I systematically introduce innovative ideas into work practices. | 382 | .915 | 3.68 | 5 (1.3%) | 34 (8.9%) | 107 (28.0%) | 167 (43.7%) | 69 (18.1%) |
| I contribute to the implementation of new ideas. | 382 | .873 | 3.80 | 6 (1.6%) | 19 (5.0%) | 97 (25.4%) | 182 (47.6%) | 78 (20.4%) |
| I put effort into the development of new things. | 382 | .850 | 3.93 | 4 (1.0%) | 19 (5.0%) | 71 (18.6%) | 194 (50.8%) | 94 (24.6%) |
| Total Mean_IWB | 382 | .61122 | 3.8296 | | | | | |

Descriptive Analysis of Individual Innovation Capabilities

Table 6 presents the descriptive analysis of individual innovation capabilities (IIC) among academics. The findings indicate a generally high level of engagement in innovation activities, reflecting a strong propensity for creativity and continuous improvement within the academic community. In Q1, the analysis reveals that a significant portion of respondents, 179 (46.6%), agreed that they enjoy trying out new ideas (M=4.22). This high level of agreement suggests a positive attitude towards experimentation and innovation among academics. The ability to innovate helps academics be more prepared for the 4.0 educational environment. (Wibowo et al., 2020). This is crucial as the enjoyment of exploring new ideas is a fundamental driver of innovation and creativity in academic settings. Similar trends were observed for Q2 and Q3, where 171 respondents (44.8%) with (M=4.22) agreed that they have a strong eagerness for discovery that leads to new ideas and actively seek out new ways to do things with (M=4.16). This eagerness reflects an intrinsic motivation to innovate, which is essential for academic progress. Academics who are constantly looking for new methods and solutions are more likely to contribute to the advancement of knowledge and the improvement of educational practices. Fauziyah & Rahayunus, (2021) Has been found that individuals with a higher capacity for innovation are better equipped to address workplace challenges, leading to improved quality and quantity of work. Q4 shows that a majority of respondents, 187 (49.0%) with (M=4.19), frequently improvise methods for solving problems when an answer is not apparent. This ability to improvise and adapt is a critical component of innovative capability. It indicates that academics are not only generating new ideas but also effectively applying them to solve unforeseen challenges, which is a key aspect of innovative work behavior.

Innovation capability among faculty members can help HEIs successfully execute the transformation process, leading to improved performance (Ibus et al., 2020). The analysis for Q5 and Q6 reveals that the highest number of respondents agreed that they consider themselves creative and original in their thinking and behavior (161 respondents, 42.1%, M=3.95) and feel they are becoming more creative due to continuous learning in their institutions (173 respondents, 45.3%, M=4.01). This finding underscores the role of continuous professional development and a supportive learning environment in fostering creativity among academics. Continuous learning and professional development opportunities provided by institutions play a significant role in enhancing the creative capabilities of their staff. The respondents demonstrate a very high level of Individual

Innovation Capability, as seen by their total mean score of (M=4.12). Academics believe themselves to be skilled innovators, possessing the requisite creativity, adaptability, and problem-solving abilities to promote innovation.

Table 6: Mean Score, Frequency and Interpretation of Individual Innovation Capabilities

| Statement | N | Std. Deviation | Mean | Descriptive Statistics | | | | |
|--|-----|----------------|--------|------------------------|--------------|---------------|----------------|----------------|
| | | | | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| I enjoy trying out new ideas. | 382 | .733 | 4.22 | 1 (.03%) | 4 (1.0%) | 52 (13.6%) | 179 (46.6%) | 146 (38.2%) |
| I have a strong eagerness for discovery that leads to new ideas. | 382 | .733 | 4.22 | | 4 (1.0%) | 58 (15.2%) | 171 (44.8%) | 149 (39.0%) |
| I seek out new ways to do things. | 382 | .759 | 4.16 | | 6 (1.6%) | 66 (17.3%) | 171 (44.8%) | 139 (36.4%) |
| I frequently improvise methods for solving a problem when an answer is not apparent. | 382 | .728 | 4.19 | | 7 (1.8%) | 50 (13.1%) | 187 (49.0%) | 138 (36.1%) |
| I consider myself to be creative and original in my thinking and behavior. | 382 | .862 | 3.95 | | 21 (5.5%) | 88 (23.0) | 161 (42.1%) | 112 (29.3%) |
| I feel myself becoming more creative because of continuous learning in the institutions. | 382 | .828 | 4.01 | 2 (0.5%) | 12 (3.1%) | 81 (21.2%) | 173 (45.3%) | 114 (29.8%) |
| Total Mean_IIC | 382 | 4.1248 | .66139 | | | | | |

Descriptive Analysis of Psychological Empowerment

Table 7 presents the descriptive analysis of psychological empowerment among academics, assessed through 12 items divided into four dimensions: meaning, competence, impact, and self-determination. Q1 to Q3 fall under dimension meaning, Q4 to Q6 under competence, Q7 to Q9 under impact, and Q10 to Q12 under self-determination. The findings indicate varying levels of psychological empowerment across these dimensions, reflecting how academics perceive their roles, capabilities, and influence within their institutions. For meaning, a substantial majority of respondents strongly agreed that their work is very important to them (Q1: 264 respondents, 69.1%, M=4.66), that their job activities are personally meaningful (Q2: 250 respondents, 65.4%, M=4.62), and that the work they do is meaningful (Q3: 260 respondents, 68.1%, M=4.66). These very high levels of agreement suggest that academics find significant personal value and purpose in their work. The sense of meaning is a critical component of psychological empowerment, as it drives motivation and job satisfaction.

For questions on competence, most respondents strongly agreed that they are confident in their ability to do their job (Q4: 229 respondents, 59.9%, M=4.56) and feel self-assured about their capabilities (Q5: 218 respondents, 57.1%, M=4.52). For Q6, 182 respondents (47.6%, M=4.26) agreed they had mastered the skills necessary for their job. These results indicate a very high level of perceived competence among academics. While the question on impact demonstrates a majority of respondents agreed that their impact on their department is large (Q7: 163 respondents, 42.7%, M=3.99), they have a great deal of control over what happens in their organization (Q8: 120 respondents, 31.4%, M=3.33). They significantly influence organizational outcomes (Q9: 118 respondents, 30.9%, M=3.26). These high levels of agreement reflect a notable sense of impact among academics. Perceiving oneself as influencing departmental or organizational decisions is a key aspect of psychological empowerment, contributing to a sense of agency and responsibility. Lastly, for self-determination, the majority of respondents agreed that they have significant autonomy in determining how they do their job (Q10: 176 respondents, 46.1%, M=3.81), can decide on their own how to go about their work

(Q11: 180 respondents, 47.1%, M=4.09), and have considerable opportunities for independence and freedom in their job (Q12: 181 respondents, 47.4%, M=3.96). These findings suggest that academics experience a high level of self-determination, which is crucial for psychological empowerment. Autonomy in job roles allows for creativity, innovation, and personalized approaches to work, enhancing job satisfaction and performance. The Psychological Empowerment dimension had the highest mean score of (M=4.14), suggesting that academics have a strong sense of confidence in their talents, find their work worthwhile, and believe they have a substantial influence on their organizations.

The high level of agreement for Q1 indicates that academics find their work to be highly significant. Academics often view their roles in teaching, research, and contributing to knowledge as highly meaningful, which enhances their engagement and commitment. The high mean score for Q2 suggests that job activities themselves are seen as personally meaningful. This could be due to the alignment between the tasks performed and the personal values and goals of the academics. When individuals perceive their job activities as meaningful, they are more likely to be motivated and satisfied with their work. Similar to Q1 and Q2, the high agreement for Q3 underscores the overall meaningfulness of the work performed by academics. When employees think their jobs are important, they will put in more effort to understand problems from different points of view and look for different ways to solve them using data gathered from many different sources (Shalley & Gilson, 2004). Employees who had a sense of meaning and were determined were innately inspired to come up with new ideas (Javed et al., 2019).

The high level of agreement for Q4 indicates that academics feel confident in their ability to perform their job tasks effectively. This sense of competence is crucial for psychological empowerment as it enhances self-efficacy and the belief in one's ability to achieve desired outcomes (Bandura, 1997). Q5's high mean score suggests that academics have a strong belief in their capabilities. This self-assurance is likely influenced by their extensive education, training, and experience in their respective fields. When individuals believe in their capabilities, they are more likely to take on challenging tasks and innovate in their work (Bandura, 1997). The agreement level for Q6 reflects the perception of skill mastery among academics. Mastery of necessary skills is fundamental for feeling competent and effective in one's role (Bandura, 1978). A strong sense of competence makes people more prosperous in many ways. (Francis & Alagas, 2019). Employees who possess a high level of competence are more inclined to propose novel approaches to tasks or processes (Singh & Sarkar, 2012).

The high agreement for Q7 indicates that academics perceive themselves as having a significant impact within their departments. This perception of impact is crucial for psychological empowerment as it enhances the sense of control and influence over one's work environment (Spreitzer, 1995). Although the agreement for Q8 is slightly lower, the mean score still indicates a sense of control among academics. Control over work-related decisions is a key component of psychological empowerment, as it allows individuals to shape their work environment and processes (Thomas & Velthouse, 1990). Similar to Q8, the agreement level for Q9 highlights the perceived influence academics have within their organizations. This influence is essential for feeling empowered and motivated, as it allows individuals to contribute to organizational goals and initiatives.

The high agreement for Q10 indicates that academics experience significant autonomy in their roles. Autonomy is a critical aspect of self-determination, allowing individuals to make decisions about their work processes and activities (Deci & Ryan, 1985). Q11's high mean score reflects the freedom academics have in determining their work methods. This self-determination is vital for fostering a sense of ownership and responsibility for one's work, which can lead to greater engagement and innovation. Employees with a strong sense of self-determination are more adaptable, creative, initiative, persistent, and self-controllable (Thomas & Velthouse, 1990). The strong agreement with Q12 underscores the significant opportunities for independence and freedom in academic roles. This independence is essential for psychological empowerment, as it allows individuals to align their work with personal and professional goals, enhancing overall job satisfaction and performance (Deci & Ryan, 2000).

Table 7: Mean Score, Frequency and Interpretation of Psychological Empowerment

| Statement | N | Std. Deviation | Descriptive Statistics | | | | | |
|--|-----|----------------|------------------------|-------------------|---------------|----------------|----------------|----------------|
| | | | Mean | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| The work I do is very important to me. | 382 | .536 | 4.66 | | 1 (0.3%) | 9 (2.4%) | 108 (24.3%) | 264 (69.1%) |
| My job activities are personally meaningful to me. | 382 | .556 | 4.62 | | 1 (0.3%) | 11 (2.9%) | 120 (31.4%) | 250 (65.4%) |
| The work I do is meaningful to me | 382 | .505 | 4.66 | | | 6 (1.6%) | 116 (30.4%) | 260 (68.1%) |
| I am confident about my ability to do my job. | 382 | .580 | 4.56 | | 1 (0.3%) | 14 (3.7%) | 138 (36.1%) | 229 (59.9%) |
| I am self-assured about my capabilities to perform my work activities. | 382 | .600 | 4.52 | | 2 (0.5%) | 15 (3.9%) | 147 (38.5%) | 218 (57.1%) |
| I have mastered the skills necessary for my job. | 382 | .694 | 4.26 | | 3 (0.8%) | 46 (12.0%) | 182 (47.6%) | 151 (39.5%) |
| My impact on what happens in my department is large. | 382 | .872 | 3.99 | 4 (1.0%) | 13 (3.4%) | 83 (21.7%) | 163 (42.7%) | 119 (31.2%) |
| I have a great deal of control over what happens in my organization. | 382 | 1.116 | 3.33 | 26 (6.8%) | 59 (15.4%) | 119 (31.2%) | 120 (31.4%) | 58 (15.2%) |
| I have significant influence over what happens in my organization. | 382 | 1.090 | 3.26 | 26 (6.8%) | 64 (16.8%) | 126 (33.0%) | 118 (30.9%) | 48 (12.6%) |
| I have significant autonomy in determining how I do my job. | 382 | .898 | 3.81 | 5 (1.3%) | 25 (6.5%) | 92 (24.1%) | 176 (46.1%) | 84 (22.0%) |
| I can decide on my own how to go about doing my work. | 382 | .832 | 4.09 | 1 (0.3%) | 19 (5.0%) | 53 (13.9%) | 180 (47.1%) | 129 (33.8%) |
| I have considerable opportunities for independence and freedom in how I do my job. | 382 | .890 | 3.96 | 4 (1.0%) | 23 (6.0%) | 65 (17.0%) | 181 (47.4%) | 109 (28.5%) |
| Total Mean_PE | 382 | 4.1440 | .53087 | | | | | |

Descriptive Analysis of Knowledge Sharing

Table 8 presents the descriptive analysis of knowledge sharing among academics, divided into two dimensions: knowledge donating and knowledge collecting. The findings demonstrate a high level of engagement in both knowledge-donating and knowledge-collecting activities, indicating a collaborative culture among academics. For knowledge donating majority of respondents agreed with the statements "When I've learned something new, I tell my colleagues about it" (Q1: 197 respondents, 51.6%, M=3.94), "I share the information I have with my colleagues" (Q2: 200 respondents, 52.4%, M=4.12), "I think it is important that my colleagues know what I am doing" (Q3: 158 respondents, 41.4%, M=3.65), and "I regularly tell my colleagues what I am doing" (Q4: 144 respondents, 37.7%, M=3.46). These high levels of agreement suggest that academics are actively involved in

sharing their knowledge with colleagues. This behavior is crucial for the dissemination of new information and practices within academic institutions, fostering an environment of continuous learning and improvement. The agreement with Q3 highlights the importance of keeping colleagues informed about one's work. This practice fosters a sense of community and collaboration, as it allows colleagues to provide feedback, offer support, and potentially collaborate on related projects. It also ensures that efforts are aligned toward common institutional goals.

While for knowledge collecting, similarly, a majority of respondents agreed with the statements "When I need certain knowledge, I ask my colleagues about it" (Q5: 192 respondents, 50.3%, M=4.32), "I like to be informed of what my colleagues know" (Q6: 167 respondents, 43.7%, M=3.80), "I ask my colleagues about their abilities when I need to learn something" (Q7: 187 respondents, 49.0%, M=4.07), and "When a colleague is good at something, I ask them to teach me how to do it" (Q8: 189 respondents, 49.5%, M=4.24). These results indicate a high level of engagement in knowledge-collecting activities among academics. Actively seeking knowledge from colleagues enhances individual capabilities and promotes a culture of shared expertise and mutual support. The overall mean score for knowledge sharing is (M=3.95), which suggests a significant level of involvement in activities related to sharing knowledge. This implies that academics are not only eager to offer their expertise but also actively seek knowledge from their colleagues, fostering a collaborative climate that promotes ongoing learning and innovation.

The high level of agreement for Q1 suggests that academics are keen to share new knowledge with their peers. This behavior may be attributed to the intrinsic motivation to contribute to the academic community and the recognition of the value of collective learning. Academics often work in collaborative environments where the exchange of new ideas is essential for advancing research and teaching practices. (Cagatan & Quirap, 2024). According to Bin Saripin & Kassim, (2019) Those who are willing to share knowledge are found to be more innovative, The high mean score for Q2 indicates that information sharing is a common practice among academics. This could be driven by the need for transparency and the benefits of shared knowledge in improving work efficiency and academic output. Besides, sharing knowledge can enhance individuals' ability to think creatively, effectively, efficiently, and innovatively (Fauziyah & Rahayunus, 2021). This demonstrates that the act of sharing knowledge will lead to broader opportunities for increased creativity and innovation (Bin Saripin & Kassim, 2019).

The agreement with Q3 highlights the importance of keeping colleagues informed about one's work. This practice fosters a sense of community and collaboration, as it allows colleagues to provide feedback, offer support, and potentially collaborate on related projects. Academics are more prone to being innovative and imaginative when there is a higher level of information exchange among them which facilitates their ability to address and overcome barriers and challenges related to their profession (Ibus et al., 2020). Although the mean score for Q4 is slightly lower, it still reflects a significant level of regular communication among academics. Regular updates about one's work can help in building trust and fostering a collaborative environment. It can also prevent misunderstandings and ensure that all team members are aware of each other's contributions and progress.

The high mean score for Q5 indicates that academics frequently seek knowledge from their colleagues. This behavior is likely driven by the recognition that peers can be valuable sources of expertise and information. Asking colleagues for knowledge can provide quick and practical solutions to problems and enhance one's understanding of complex topics. (Cross, Rob; Parker, Andrew; Prusak, 2000). The agreement with Q6 suggests that academics value being aware of their colleagues' knowledge. This awareness can facilitate better collaboration and resource allocation, as individuals can identify whom to approach for specific information or skills. According to Kmiecik, (2020) Individuals who receive knowledge are less likely to verify the correctness and validity of that knowledge when it originates from a trustworthy source. The high agreement level for Q7 highlights the proactive approach of academics in seeking to learn from their peers. This behavior is essential for personal and professional development, as it allows individuals to acquire new skills and knowledge from those with expertise in particular areas. It also promotes a culture of continuous learning and improvement (Bandura, 1986). The strong agreement with Q8 underscores the importance of peer learning in academic settings. Academics often recognize the value of hands-on learning from colleagues who excel in certain areas. This practice not only enhances individual capabilities but also strengthens the collaborative culture within the

institution, as it encourages knowledge-sharing and mutual support. The recipient can quickly utilize the gained knowledge without the need for time-consuming verification, hence enhancing organizational learning, alertness, and responsiveness (Kmieciak et al., 2012). In addition, increased knowledge-sharing activities among employees enhance their capacity for critical thinking and innovation (Nham et al., 2020).

Table 8: Mean Score, Frequency and Interpretation of Knowledge Sharing

| Statement | N | Descriptive Statistics | | | | | | |
|---|---------|------------------------|-------|-------------------|---------------|----------------|----------------|----------------|
| | | Std. Deviation | Mean | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| When I've learned something new, I tell my colleagues about it. | 38 2 | .827 | 3.94 | 4 (1.0%) | 15 (3.9%) | 74 (19.4%) | 197 (51.6%) | 92 (24.1%) |
| I share the information I have with my colleagues. | 38 2 | .730 | 4.12 | | 9 (2.4%) | 54 (14.1%) | 200 (52.4%) | 119 (31.2%) |
| I think it is important that my colleagues know what I am doing. | 38 2 | .965 | 3.65 | 8 (2.1%) | 38 (9.9%) | 106 (27.7%) | 158 (41.4%) | 72 (18.8%) |
| I regularly tell my colleagues what I am doing. | 38 2 | 1.023 | 3.46 | 17 (4.5%) | 46 (12.0%) | 120 (31.4%) | 144 (37.7%) | 55 (14.4%) |
| When I need certain knowledge, I ask my colleagues about it. | 38 2 | .667 | 4.32 | 1 (0.3%) | 4 (1.0%) | 25 (6.5%) | 192 (50.3%) | 160 (41.9%) |
| I like to be informed of what my colleagues know. | 38 2 | .986 | 3.80 | 12 (3.1%) | 25 (6.5%) | 85 (22.3%) | 167 (43.7%) | 93 (24.3%) |
| I ask my colleagues about their abilities when I need to learn something. | 38 2 | .867 | 4.07 | 3 (0.8%) | 23 (6.0%) | 44 (11.5%) | 187 (49.0%) | 125 (32.7%) |
| When a colleague is good at something, I ask them to teach me how to do it. | 38 2 | .729 | 4.24 | 1 (0.3%) | 8 (2.1%) | 36 (9.4%) | 189 (49.5%) | 148 (38.7%) |
| Total Mean_KS | 38 2 | 3.9496 | .6427 | | | | | |

5. Managerial Implications and Recommendations

The outcomes of the study describing the specific factors that affect academics' IWB in Malaysian Higher Education institutions (HEIs) show how important it is to create a supportive and empowering environment that encourages individual innovation capability, psychological empowerment, and knowledge sharing. Universities strategically position themselves to contribute to SDG 4 (Quality Education) by cultivating atmospheres encouraging ongoing enhancement and innovation in teaching and research, as indicated by their significant involvement in innovative efforts. HEIs can promote educational excellence and equity by improving individual innovative capability, psychological empowerment, and knowledge sharing. This aligns with Malaysia's Education Blueprint 2013–2025, which prioritizes education quality, access, and equity. Furthermore, fostering a culture of innovation aligns with Malaysia's National Policy on Science, Technology, and Innovation (2021–2030), which seeks to convert the country into a knowledge-driven economy.

Therefore, university administrators should establish and maintain a culture that promotes innovation since many respondents are highly engaged in innovative activities. This includes making sure that academics have the freedom, funding, and chances to try new things and come up with creative solutions, as well as acknowledging and rewarding innovative accomplishments. Furthermore, fostering psychological

empowerment through work purpose, providing opportunities for skill development, and promoting flexibility and influence in the classroom can greatly enhance academics' innovative capabilities. Institutions should foster a collaborative environment that freely exchanges knowledge to improve educational methods and research outputs. This will further strengthen their academic staff's collective innovative capabilities.

Conclusion

In conclusion, the high average scores in all variables indicate a solid basis for innovation across Malaysian Higher Education Institutions (HEIs). Academics who possess high levels of individual innovation capability, psychological empowerment, and knowledge sharing are more likely to exhibit innovative work behavior. Nevertheless, to fully exploit these advantages, Higher Education Institutions (HEIs) must persist in providing assistance and improving these elements through specific strategies, resources, and endeavors that are in line with national and institutional objectives for educational and research excellence. Besides, the results of the descriptive statistics on IWB among academics indicate a significant preference for continual improvement, innovative approaches and solutions, influencing others, and the practical application of new ideas. However, academics tend to focus less on non-daily work matters, possibly due to organizational and workload constraints. Gaining insight into these patterns can assist universities in establishing nurturing cultures that promote innovation more effectively by eliminating obstacles and harnessing the inherent and external motivations of academics to increase their inventive work behavior. Besides, Malaysian universities' academics exhibit strong innovation capabilities, fostering an environment of continuous improvement and adaptation.

They engage in innovative activities, demonstrating a proactive approach to discovery. Their creative problem-solving skills, coupled with cognitive flexibility and resourcefulness, are crucial for tackling complex challenges. The correlation between continuous learning and increased creativity underscores the importance of professional development programs in higher education, enhancing knowledge and skills while fostering innovation. While, psychological empowerment among academics is influenced by meaningfulness, competence, impact, and self-determination. These factors contribute to increased commitment, motivation, and job satisfaction. Academics with high perceived competence are more likely to undertake demanding work, offer innovative ideas, and achieve exceptional performance. They also feel a sense of agency and control over their work environment. Thus, institutions can enhance this by engaging academics in decision-making processes and fostering a positive organizational culture. Finally, knowledge sharing among academics reveals a strong preference for both donating and collecting knowledge. It highlights the importance of a cooperative academic environment for professional growth and sharing of expertise. This not only enhances institutional competence but also improves individual comprehension and proficiency. Knowledge donation is crucial in higher education, promoting exemplary practices, innovative teaching techniques, and research discoveries. Meanwhile, engaging in knowledge-collecting activities fosters a cooperative atmosphere, promoting ongoing learning and growth. This culture enhances the quality of education and research.

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