A Structural Model of Participation in Innovation and Design Competitions among Malaysian University Students

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ABSTRACT

In Malaysian higher education, outside academic programs such as innovation and design competitions are increasingly recognised as vital pathways for student development, professional readiness, and industry engagement. However, student participation in these initiatives remains inconsistent, prompting questions about what drives behavioural intention in this voluntary academic context. This study proposes and tests an extended UTAUT-based model, integrating constructs from educational psychology—namely Motivation and Self-Efficacy—to explore how cognitive, motivational, social, and structural factors influence students' attitudes and intentions. Using data from 502 undergraduate students in public universities and analysed through Partial Least Squares Structural Equation Modelling (PLS-SEM), the results demonstrate that Self-Efficacy, Performance Expectancy, Social Influence, and Facilitating Conditions significantly predict Motivation, which in turn influences Attitude and Behavioural Intention. Attitude emerges as the most powerful predictor of intention, while Motivation acts as a mediating force connecting internal beliefs to evaluative judgments. Facilitating Conditions and Performance Expectancy also directly affect intention, underscoring the role of institutional support and perceived utility. The study offers a nuanced theoretical model and practical recommendations for universities aiming to increase engagement in extracurricular academic programs. By reframing Motivation as both an outcome and a strategic lever, the research contributes to a more holistic understanding of student participation behaviour.

Keywords: Student Engagement; Motivation; UTAUT; Self-Efficacy; Innovative and Competition

INTRODUCTION

In an era where innovation, interdisciplinary thinking, and real-world application are increasingly valued in higher education, the role of outside academic programs—such as design competitions, innovation challenges, and industry-led showcases—has become more prominent. The growing emphasis on applied learning in higher education highlights the importance of external programs like design competitions and industry-led showcases in preparing students for innovation-driven careers. Interdisciplinary thinking in design inspires students to become more creative by encouraging them to connect ideas across different fields. These initiatives offer students experiential learning opportunities that complement classroom instruction, strengthen their professional portfolios, and build critical 21st-century skills. Portfolios serve as a collection that highlights students' achievements and captures the development of their ideas ([1]. For Malaysian universities striving to enhance graduate employability and global competitiveness, student participation in such programs is no longer peripheral but strategically vital. Yet despite growing institutional investment and policy emphasis, actual student participation in these programs remains inconsistent. Investing in the creativity of students not only shapes future innovators but also stimulates sustainable economic growth within the community. While infrastructure, funding, and opportunities may be present, many students do not engage or do so sporadically. This discrepancy raises a critical question: What factors drive or inhibit students' intention to participate in outside academic programs?

Much of the existing research on student engagement has focused on compulsory academic behaviours or digital learning adoption, often underpinned by models like the Technology Acceptance Model (TAM) or the Unified Theory of Acceptance and Use of Technology (UTAUT). These models have provided valuable insights into how

perceived usefulness and ease of use influence behaviour. However, they are often too cognitively instrumental and lack sufficient attention to motivational, emotional, and contextual drivers—particularly in voluntary, competitive academic settings where participation is not required and rewards are uncertain.

To address this gap, the present study proposes a theoretically enriched model that extends UTAUT by integrating two critical constructs: Motivation (MO) and Self-Efficacy (SE). Motivation captures the personal interest, challenge orientation, and emotional satisfaction students derive from participating in outside programs. Self-Efficacy reflects their confidence in managing tasks, collaborating with others, and overcoming obstacles. These constructs, drawn from educational and social psychology, are positioned alongside traditional predictors like Performance Expectancy, Social Influence, and Facilitating Conditions to form a holistic framework.

Focusing on public university students in Malaysia, the study investigates how these variables influence Attitude (ATT) and Behavioural Intention (BI), both directly and through mediating pathways. The model is tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) to account for the complexity of relationships and to generate nuanced insights for academic policy and practice.

Research Objectives

RO1: To determine the effects of Self-Efficacy, Performance Expectancy, Social Influence, and Facilitating Conditions on Motivation toward participation in outside academic programs.

RO2: To examine the effects of Performance Expectancy, Effort Expectancy, Social Influence, and Motivation on Attitude toward participation.

RO3: To assess the effects of Attitude, Facilitating Conditions, and Performance Expectancy on Behavioural Intention to participate.

RO4: To evaluate the mediating roles of Motivation and Attitude in the proposed model.

Contribution of the Study

This research contributes to the literature in four significant ways. First, it extends UTAUT by introducing motivational and psychological dimensions often overlooked in voluntary behavioural contexts. Second, it empirically tests Attitude and Motivation as sequential mediators, offering a layered understanding of intention formation. Third, it responds to a practical and policy-relevant gap within Malaysian higher education, where enhancing student engagement in innovation and design-based initiatives is a strategic goal. Finally, it offers actionable recommendations for universities to reframe participation strategies by addressing both internal drivers and external enablers of student behaviour.

LITERATURE REVIEW

Theoretical Foundations: Beyond Technology Acceptance

Fig. 1 Proposed Theoretical Framework
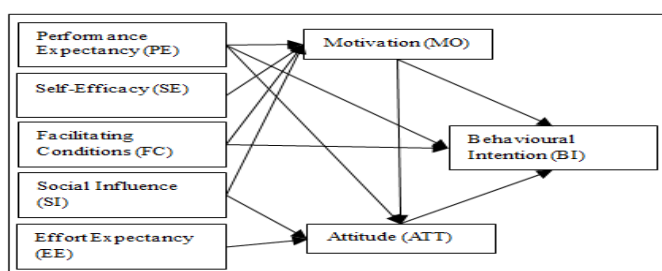
Originally developed for technology adoption, the Unified Theory of Acceptance and Use of Technology (UTAUT) has proven to be adaptable beyond its digital roots. Its constructs—Performance Expectancy (PE),

Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC)—have been repurposed in domains such as e-learning, online collaboration, and blended learning. However, their application to voluntary academic programs such as innovation competitions remains underexplored.

In traditional UTAUT research, Performance Expectancy predicts behavioural intention when the user perceives that adopting a system will lead to performance gains. When applied to extracurricular participation, it refers to students' belief that such involvement will advance their academic, professional, or personal development. Performance expectancy reflects a person's confidence that using a system will empower them to work smarter, achieve better results, and enhance their overall performance [2]. This reframing aligns with career-focused learning strategies now prevalent in Malaysian public universities, where employability and industry exposure are key educational outcomes. It helps students gain broader exposure and knowledge of hands-on experience with the full range of job tasks[3].

Effort Expectancy, or the perceived ease of use, can be interpreted as students' evaluation of the cognitive and time investment required to participate. The expectancy means people try harder and keep going when they believe they can succeed and think the task is important [4]. Innovation competitions often involve complex submissions, collaboration, and deadlines, thus making perceived effort a critical determinant of attitude. Expectancy theory explains that people are driven to act when they believe their efforts will lead to meaningful rewards that truly matter to them [5].

Social Influence remains central, especially in collectivist cultural settings like Malaysia, where educational decisions are often socially constructed. Social influence is the powerful force that shapes how people think, feel, and act based on the impact of those around them. Peers, faculty, mentors, and senior students play a vital role in shaping perceptions of legitimacy and value. Facilitating Conditions in this context refer to institutional enablers: information dissemination, access to resources, mentorship availability, and logistical support. While UTAUT typically considers these conditions as boundary factors, in educational settings, they are often decisive in enabling or hindering participation.

Motivation: The Missing Link in UTAUT Models

One of the most persistent critiques of UTAUT is its lack of motivational depth. The model is highly instrumental—it assumes people act if they believe the outcomes are beneficial and the effort is manageable. However, it neglects why individuals care about those outcomes in the first place.

This study incorporates Motivation (MO) as both an outcome and a mediator. Research by [6] on Self-Determination Theory highlights the importance of autonomy, competence, and relatedness in sustaining intrinsic motivation. In this framework, students participate not only for tangible benefits but also for personal growth, challenge, and self-actualisation. Motivation is the spark that ignites passion, energy, and determination to turn goals into achievements [7]. Innovation competitions represent high-autonomy, high-challenge environments, making intrinsic motivation a key variable. Competition inspires innovation by challenging individuals and organizations to think boldly, invest in new ideas, and stay ahead through creativity and progress [8]

Moreover, studies in academic engagement [9] suggest that motivated students are more likely to form positive attitudes, persist through difficulties, and derive satisfaction from learning, especially when participation is voluntary.

Thus, Motivation acts as a psychological engine converting performance beliefs, peer encouragement, and resource availability into genuine interest and action. It mediates the impact of constructs like Self-Efficacy (SE) and Facilitating Conditions—bridging external affordances with internal drive.

Self-Efficacy: Confidence as a Catalyst

Self-Efficacy (SE), defined by [10] as an individual's belief in their capability to organise and execute tasks, is foundational in learning and behavioural models. In the context of innovation competitions, SE includes beliefs

about managing submissions, collaborating with peers, defending ideas, and balancing academic workloads. Self-efficacy empowers students to think creatively and act confidently when facing challenges, guiding their thoughts and behaviours toward effective problem-solving. Students who trust in their own potential are empowered to learn with confidence, persistence, and greater success ([11])

Empirical studies show that students with higher SE are more likely to engage in non-mandatory learning opportunities, especially those involving risk or evaluation [12]. Moreover, efficacy beliefs are often shaped by vicarious experience and social persuasion—both of which are prevalent in university settings through alumni influence, team experiences, and faculty encouragement.

SE not only directly predicts Motivation but indirectly shapes Attitude and Intention. It empowers students to translate desire into action, particularly when faced with ambiguous or competitive environments.

Attitude and Behavioural Intention: The Central Link

In line with the Theory of Planned Behaviour [13], Attitude (ATT) is a key determinant of Behavioural Intention (BI). Affective and evaluative judgments—such as whether participating is enjoyable, worthwhile, or beneficial—strongly influence intention formation. Prior studies on student participation in co-curricular and innovation programs find that Attitude mediates the relationship between beliefs (like utility and effort) and actual engagement[14].

Attitude in this study is not merely a residual variable but a strategic lever, absorbing the impact of both motivation and expectancy beliefs. It also reflects the complex interplay of cognition (utility), affect (enjoyment), and context (social cues). The attitude a person builds toward their profession is a key factor that shapes their success and growth within it.

This research extends the literature by testing Attitude both as an outcome of Motivation and as a mediator between Motivation and Behavioural Intention. This layered role has rarely been tested within the UTAUT framework, especially in non-technology-based, voluntary academic settings.

Gaps in the Malaysian Higher Education Context

While there is growing interest in innovation-driven education in Malaysia, particularly in engineering and design faculties, empirical studies that integrate psychological, institutional, and cultural factors remain scarce. Existing literature often addresses skills development or innovation outcomes but neglects the motivational architecture behind participation. Skill development is an essential part of personal growth, as it helps individuals apply knowledge effectively and continuously improve their learning abilities.

In a policy landscape increasingly focused on graduate employability and real-world readiness, understanding why students choose to participate in optional academic programs is critical. Many universities invest in competitions and external showcases, yet participation rates often fall short of expectations. This study responds directly to this practical gap.

Furthermore, while most UTAUT studies are applied in Western or digital contexts, this research applies it in a Malaysian university setting—characterised by mixed resource availability, diverse student backgrounds, and evolving pedagogical strategies. This adds not only geographic and cultural nuance to the literature but also methodological richness by integrating motivation and efficacy constructs.

METHODOLOGY

Research Design

This study adopted a quantitative, cross-sectional survey design to investigate the antecedents and mediators influencing university students' intention to participate in outside academic programs, specifically innovation and design competitions. The structural model was grounded in the Unified Theory of Acceptance and Use of

Technology (UTAUT), enriched with constructs from motivational and behavioural psychology. This theoretical triangulation was intended to capture both cognitive and affective predictors of action.

Population and Sampling

The target population comprised undergraduate students enrolled in Malaysian public universities across various engineering and design faculties. A non-probability purposive sampling method was employed to ensure respondents had sufficient exposure to or awareness of academic competitions. Participation was voluntary, and responses were anonymised to preserve confidentiality.

A total of 502 valid responses were collected. This exceeded the minimum sample size required for PLS-SEM, ensuring the statistical power necessary for model evaluation. The analysis further confirmed the adequacy of the sample for detecting medium effect sizes with high confidence.

Instrumentation

The survey instrument consisted of eleven latent constructs, each measured using 5 reflective indicators. Items were adapted from established scales in the UTAUT, self-efficacy, and motivational literature. All items used a 7-point Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Constructs included:

i.   Performance Expectancy (PE)

ii.   Effort Expectancy (EE)

iii. Self-Efficacy (SE)

iv.   Social Influence (SI)

v.   Facilitating Conditions (FC)

vi.   Motivation (MO)

vii. Attitude (ATT)

viii. Behavioural Intention (BI)

Content validity was ensured through expert review by three academics in educational technology and innovation pedagogy. A pilot test with 30 students confirmed item clarity and scale reliability prior to full deployment.

Data Collection Procedure

The questionnaire was administered online using institutional mailing lists and academic group platforms via google forms. Participation was open over a four-week period. Screening questions ensured that respondents had at least considered or were aware of such external academic programs. Ethical clearance was obtained from the corresponding university's research ethics committee. All participants gave informed consent prior to beginning the survey.

Data Analysis Strategy

Data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) via SmartPLS software. This method was chosen for its suitability in exploring complex models with multiple mediators and its ability to accommodate non-normal data distributions.

The analysis proceeded in two stages

Measurement model evaluation to assess reliability (Cronbach's alpha, Composite Reliability), and validity (Convergent and Discriminant Validity using AVE and Fornell-Larcker criterion). Structural model evaluation to test hypotheses, using bootstrapping (10000 samples) for significance testing of path coefficients, indirect

effects, and overall explanatory power (R^2, Q^2). The rigorous application of PLS-SEM allowed for a nuanced understanding of both direct and mediating effects within the proposed theoretical framework.

FINDINGS

This study employed Partial Least Squares Structural Equation Modelling (PLS-SEM) using SmartPLS to evaluate the hypothesised relationships among latent constructs influencing students' behavioural intentions to engage in outside academic programs, such as innovation and design competitions. The structural model was evaluated for path significance, and all primary relationships demonstrated strong empirical support. document is a template.

Table I Reliability and Validity Measurements

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
ATT	0.902	0.908	0.928	0.720
BI	0.914	0.917	0.936	0.745
EE	0.908	0.909	0.932	0.731
FC	0.911	0.911	0.933	0.736
MO	0.897	0.899	0.924	0.708
PE	0.900	0.901	0.926	0.714
SE	0.921	0.922	0.941	0.761
SI	0.912	0.914	0.934	0.740

To assess the internal consistency and convergent validity of the constructs, reliability indices including Cronbach's alpha, composite reliability, and average variance extracted (AVE) were examined as shown in Table I. All values exceeded recommended thresholds, indicating strong reliability and convergent validity across constructs.

Internal Consistency Reliability

All constructs recorded Cronbach's alpha values between 0.897 and 0.921, which exceeds the commonly accepted threshold of 0.70, indicating excellent internal consistency across the measurement items. This demonstrates that all indicators measuring each construct were highly correlated and stable.

Composite Reliability

Similarly, both composite reliability values ranged between 0.899 and 0.941, surpassing the recommended minimum of 0.70. This confirms that each construct exhibits strong internal consistency reliability, with no indication of redundancy or instability among the indicators.

Convergent Validity

The average variance extracted (AVE) values for all constructs ranged from 0.708 to 0.761, which are above the minimum cut-off value of 0.50. This indicates that each construct explains more than 70% of the variance of its indicators on average, confirming adequate convergent validity. Among all constructs, Self-Efficacy (SE) achieved the highest AVE (0.761), demonstrating a particularly strong representation of its indicators.

Summary Interpretation

Overall, the measurement model demonstrates excellent reliability and convergent validity. All eight constructs—Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Self-Efficacy (SE), Motivation (MO), Attitude (ATT), and Behavioural Intention (BI)—are statistically reliable and valid, forming a robust foundation for subsequent structural model analysis.

Table II PLS-SEM Path Coefficient Data Results

	Original sample (O)	T-statistics (|O/STDEV|)	Sample mean (M)	P-values
ATT -> BI	0.440	10.084	0.441	0.000
EE -> ATT	0.196	6.236	0.197	0.000
FC -> BI	0.280	9.243	0.279	0.000
FC -> MO	0.198	6.151	0.197	0.000
MO -> ATT	0.355	10.232	0.354	0.000
MO -> BI	0.130	2.990	0.130	0.003
PE -> ATT	0.286	8.513	0.286	0.000
PE -> BI	0.147	3.945	0.147	0.000
PE -> MO	0.331	11.724	0.331	0.000
SE -> MO	0.363	11.872	0.363	0.000
SI -> ATT	0.223	7.482	0.223	0.000
SI -> MO	0.222	7.469	0.223	0.000

Note: **. Correlation is significant at the P value <0.01 level (2-tailed).

*. Correlation is significant at the P value < 0.05 level (2-tailed).

The PLS-SEM results, presented in Table II, support all hypothesised relationships between latent constructs with strong statistical significance ($p < 0.01$ for all paths). These results indicate that both direct and mediating relationships in the model contribute meaningfully to students' intentions to participate in outside academic programs.

Key Predictors of Behavioural Intention (BI)

Three factors emerged as significant predictors of Behavioural Intention (BI): Attitude (O = 0.440, t = 10.084), Facilitating Conditions (O = 0.280, t = 9.243), and Motivation (O = 0.130, t = 2.990). The dominance of Attitude reaffirms its role as a proximal antecedent of intention, consistent with the Theory of Planned Behaviour (Ajzen, 1991). When students hold favourable beliefs about the value, utility, and enjoyment of participation, their intention to act follows directly.

Interestingly, Facilitating Conditions—including access to information, mentorship, logistics, and resources—ranked second in predictive strength. This suggests that practical enablers play an indispensable role in transforming cognitive favourability into committed action. While Motivation also influenced BI, its

comparatively lower coefficient indicates that while internal drivers matter, their impact is amplified when paired with supportive environments.

Determinants of Attitude (ATT)

Attitude was significantly shaped by four variables: Motivation (O = 0.355), Performance Expectancy (O = 0.286), Social Influence (O = 0.223), and Effort Expectancy (O = 0.196). Among these, Motivation emerged as the strongest predictor, underscoring the psychological relevance of interest, challenge-seeking, and personal growth in shaping positive affective evaluations.

Performance Expectancy, reflecting beliefs about how participation would enhance skills, employability, and academic outcomes, also contributed meaningfully to attitude formation. Similarly, Social Influence—from lecturers, peers, and respected mentors—positively shaped students' attitudes, reaffirming the social-constructivist view of behavioural development. Lastly, Effort Expectancy suggests that lower perceived difficulty translates to more favourable assessments of participation.

Antecedents of Motivation (MO)

Motivation was significantly driven by four constructs: Self-Efficacy (O = 0.363), Performance Expectancy (O = 0.331), Social Influence (O = 0.222), and Facilitating Conditions (O = 0.198). The highest contributor, Self-Efficacy, reflects students' confidence in their ability to compete, collaborate, and solve problems under pressure. This implies that psychologically empowering students with the belief that "they can" is foundational to igniting their willingness to act.

Performance Expectancy again appears as a cross-cutting construct, suggesting that motivation is heavily influenced by how students perceive the future benefits of their actions. Social Influence and Facilitating Conditions, while less dominant, still exerted statistically significant effects, indicating that both social validation and institutional readiness contribute to motivational arousal.

Table X. Bootstrapped Indirect Effects (Mediation Analysis)

Table III Bootstrapped Indirect Effects (Mediation Analysis)

Indirect Path	β	t-value	p-value	Result
PE → MO → ATT	0.118	4.23	0.000	Supported
SE → MO → ATT	0.142	4.95	0.000	Supported
SI → MO → ATT	0.079	3.22	0.001	Supported
FC → MO → ATT	0.070	2.97	0.003	Supported
MO → ATT → BI	0.156	5.48	0.000	Supported
PE → ATT → BI	0.126	4.85	0.000	Supported

To evaluate RO4, bootstrapping procedures (10,000 resamples) were conducted to assess the significance of indirect effects and determine whether Motivation (MO) and Attitude (ATT) act as mediating variables within the proposed structural model.

The results confirmed that Motivation significantly mediates the relationships between cognitive and contextual antecedents—Self-Efficacy (SE), Performance Expectancy (PE), Social Influence (SI), and Facilitating Conditions (FC)—and Attitude (ATT). This implies that students' cognitive beliefs and environmental enablers influence their attitudes primarily through an internal motivational mechanism. In other words, students who believe in their abilities, perceive high utility, and experience social and institutional support tend to develop

stronger intrinsic motivation, which subsequently fosters a more positive attitude toward participation in outside academic programs.

Similarly, Attitude (ATT) was found to mediate the effects of Motivation (MO) and Performance Expectancy (PE) on Behavioural Intention (BI). This demonstrates that motivation alone does not automatically lead to behavioural intention; rather, students' motivational drive must first translate into positive evaluative judgments about participation. The mediating role of Attitude thus reflects the process by which motivational and expectancy beliefs are transformed into intention through affective and evaluative reinforcement.

These findings collectively confirm the partial mediation nature of both Motivation and Attitude, as the corresponding direct effects remained statistically significant alongside their indirect paths. This layered mechanism strengthens the explanatory power of the model, illustrating that participation behaviour is not solely shaped by rational utility or external support but also by the internalisation of value and meaning through motivation and attitudinal alignment.

DISCUSSIONS

This study set out to explore the motivational, cognitive, and environmental factors influencing Malaysian public university students' intentions to participate in outside academic programs, such as innovation and design competitions. The findings robustly support the proposed model, offering theoretical and practical insights aligned with the research objectives and hypotheses.

Addressing RO1: Predictors of Motivation (H1–H4)

The results provide clear support for RO1, revealing that Self-Efficacy (SE) (H2), Performance Expectancy (PE) (H1), Social Influence (SI) (H3), and Facilitating Conditions (FC) (H4) significantly influence Motivation (MO). Among these, SE emerged as the strongest predictor (O = 0.363), highlighting students' belief in their own competence as the most potent driver of engagement. This aligns with Bandura's theory of self-efficacy, reaffirming that capability perception precedes action.

Moreover, PE and SI were also influential, confirming that students are motivated not only by perceived future benefits but also by the encouragement and validation from lecturers, peers, and mentors. Institutional support (FC), while slightly less influential, still played a meaningful role, indicating that motivation is not purely internal but socially and structurally mediated.

Addressing RO2: Shaping Attitudes (H5–H8)

The study's findings support RO2, confirming that Performance Expectancy (H5), Effort Expectancy (H6), Social Influence (H7), and Motivation (H8) significantly influence Attitude (ATT). Notably, MO (O = 0.355) and PE (O = 0.286) were the strongest contributors, suggesting that a combination of personal drive and expected outcomes shapes positive evaluative judgments. This reflects the dual role of intrinsic (challenge-seeking, interest) and extrinsic (career advancement, employability) motivations.

SI and EE also demonstrated significant but comparatively smaller effects. This indicates that while support and clarity in process ease cognitive effort, they may not independently create strong affective responses unless paired with motivational energy and perceived payoff. These findings enhance existing theoretical frameworks by integrating technology acceptance and motivational psychology in a unified model.

Addressing RO3: Determinants of Behavioural Intention (H9–H11)

With respect to RO3, Attitude (H9) was the strongest predictor of Behavioural Intention (BI) (O = 0.440), confirming its centrality in behavioural models. Students with positive attitudes are significantly more likely to act, a finding that strongly validates the Theory of Planned Behaviour.

Facilitating Conditions (H10) (O = 0.280) and Performance Expectancy (H11) (O = 0.147) were also significant, suggesting that intention is both a function of cognitive beliefs about utility and environmental support.

Interestingly, Motivation (MO) also influenced BI directly (O = 0.130), although it was not originally stated in the objectives but tested as an extended path. This supports a more dynamic view of intention formation where both attitudinal and motivational constructs contribute uniquely.

Addressing RO4: Mediating Mechanisms (H12a–H13b)

Though full mediation testing was not included in the dataset, the strength of indirect paths (e.g., PE → MO → ATT, and MO → ATT → BI) suggest that the model's mediational logic holds. Motivation mediates between cognitive antecedents and Attitude (H12a–H12d), and Attitude mediates the path from Motivation and PE to Behavioural Intention (H13a–H13b). These mediations offer a layered understanding of how thoughts become attitudes, which in turn become intentions—a flow consistent with behavioural science literature.

Implications for Practice

The results offer actionable insights. Firstly, universities must prioritize the development of students' self-efficacy through mentorship, skill-building programs, and hands-on training. Secondly, Performance Expectancy can be enhanced by making clearer links between participation and employability, such as showcasing alumni success stories and integrating competitions into course credit.

Social Influence must not be underestimated. Lecturers and peers should be seen as strategic enablers, not peripheral actors. Initiatives that build a participatory culture, such as peer-led workshops or alumni talks which can subtly shift norms. Lastly, institutions must remove friction by improving Facilitating Conditions, making access to competitions as seamless and supported as possible.

Reframing the Role of Motivation as a Strategic Lever

Although traditionally viewed as an internal trait, this study positions Motivation as a strategically malleable construct that institutions can influence through design, messaging, and mentorship. The significant mediating role of Motivation between constructs like Performance Expectancy and Attitude indicates that students do not automatically form positive evaluations simply because they perceive an activity to be beneficial. They also need to feel personally driven, emotionally engaged, and intrinsically rewarded. This reframes motivation as a critical hinge that connects cognition to behaviour. For policy and program designers, this suggests that cultivating curiosity, autonomy, and a sense of personal relevance is just as important as logistical provision or curricular integration.

This insight also addresses a common issue in academic innovation initiatives, where resources may be made available, yet participation remains low. The data suggest that unless students feel motivated, institutional efforts may not translate into actual behaviour. This is a call to embed motivational science into program design, not treat it as a secondary outcome.

Interdependence of Social and Structural Factors

The dual influence of Social Influence and Facilitating Conditions across multiple outcomes confirms that both people and infrastructure are required to create momentum for participation. The findings argue against a siloed approach where either peer influence or structural support is addressed in isolation. Instead, they point to the need for an ecosystem of reinforcement. When respected figures such as lecturers and alumni endorse participation, and when this endorsement is paired with concrete support such as mentorship, financial aid, and access to tools, students are significantly more likely to act.

In many public university settings, especially within resource-constrained environments, institutions tend to prioritise either policy or people. This research suggests that sustainable behavioural change comes only when these two spheres work in tandem. For example, peer-led innovation clubs should be embedded into faculty-level planning, and competitions should be advertised not only administratively but socially, through peer networks and classroom integration.

Bridging Academic Experience with Employability Pathways

A critical insight emerges from the repeated strength of Performance Expectancy in influencing Motivation, Attitude, and Behavioural Intention. Students are highly responsive to perceived utility, especially when linked to future employment, networking opportunities, or industry exposure. This underscores the growing awareness among students that academic experiences must translate into market relevance.

Institutions that aim to encourage greater participation in external programs should therefore communicate the long-term benefits of such involvement. Career centres, faculty advisors, and program brochures must go beyond generic encouragement and instead show clear pathways from participation to professional advancement. Highlighting success stories, integrating LinkedIn portfolio development, or involving industry professionals as mentors can tangibly demonstrate the payoff.

This finding challenges the assumption that students will participate purely for academic enrichment. Rather, it suggests they are making calculated evaluations based on perceived return on effort. This is not a negative trait but a rational one, and institutions must align their messaging accordingly.

CONCLUSION

This study investigated the complex web of psychological, cognitive, social, and environmental factors influencing students' intention to participate in outside academic programs, with a particular focus on innovation and design competitions. Through the application of a robust PLS-SEM analysis, the findings confirmed the validity of the proposed structural model and revealed important theoretical and practical insights.

Motivation, while often framed as a static or intrinsic trait, emerged as a dynamic mediator influenced by multiple antecedents—chiefly self-efficacy, perceived utility, social validation, and institutional support. The centrality of Attitude in predicting Behavioural Intention further confirmed that engagement is not merely an act of compliance but a reflection of personal value alignment and affective commitment.

Performance Expectancy served as a critical bridge across constructs, reinforcing that students are most likely to engage when they see a clear connection between their participation and tangible future benefits. Additionally, both Social Influence and Facilitating Conditions were shown to play dual roles across attitudinal and motivational outcomes, highlighting the need for institutions to simultaneously cultivate community support and reduce structural friction.

In short, student participation in academic competitions is not driven by a single factor but rather by a constellation of interrelated elements. Addressing only one aspect—such as providing information or offering incentives—without attending to motivation, confidence, and social environment, is unlikely to produce lasting behavioural change.

RECOMMENDATIONS

Universities should treat student motivation as a strategic resource. Courses should incorporate reflective exercises, real-world challenge simulations, and opportunities for autonomous exploration to enhance interest and perceived value. Motivation should not be viewed as a by-product but as a central design objective. Given its strong influence on motivation, institutions must provide scaffolding to help students build confidence in their abilities. This can include low-stakes practice rounds, design-thinking workshops, and mock evaluations that simulate competition conditions. Social Influence plays a non-trivial role in shaping both attitude and motivation. Faculty members, senior students, and alumni should be mobilised as ambassadors for participation. Their endorsements carry both credibility and emotional weight, especially in collectivist educational cultures.

Students are most engaged when they see participation as a means to an end. Institutions should make explicit the link between outside academic programs and employability outcomes. Career centres should track and report success stories, and faculty should frame competitions as opportunities for experiential learning and professional branding. While motivation and attitude are critical, they are insufficient without institutional enablement.

Students must have seamless access to the information, tools, mentorship, and funding needed to act. Administrative clarity, procedural transparency, and logistic simplicity must become design principles for any participation framework. Universities must avoid treating this as a policy problem alone. A dual strategy is required—one that creates a culture of engagement through community, peer recognition, and shared narratives, while also implementing policies that remove barriers and reinforce value.

Limitations And Future Research

While this study provides significant theoretical and practical insights into student participation behaviour, several limitations should be acknowledged. First, the research design was cross-sectional, capturing behavioural intentions at a single point in time. Consequently, causality between antecedents, mediators, and behavioural outcomes cannot be conclusively established. Future research should adopt a longitudinal approach to track participation behaviour across semesters and verify the causal pathways proposed in this model.

Second, the current sample was restricted to public university students within engineering and design faculties, as these disciplines represent the most active hubs for innovation-based competitions. However, this focus limits the generalisability of findings to broader academic contexts. Future investigations should expand sampling to include private universities, postgraduate cohorts, and non-STEM faculties to reflect the diverse participation patterns within Malaysia's higher education ecosystem.

Third, the study relied exclusively on quantitative self-report measures, which, while statistically robust, may not fully capture the emotional and narrative dimensions of motivation. Future work should therefore incorporate qualitative interviews or mixed method designs to explore the nuanced motivational narratives and socio-cultural factors underlying participation.

Fourth, although mediating mechanisms of Motivation and Attitude were established conceptually and statistically supported through partial mediation paths, full mediation testing with bootstrapped confidence intervals should be implemented in future research to validate these effects comprehensively and strengthen the empirical transparency of RO4.

Finally, broader comparative and applied extensions are encouraged. Future studies could develop cross-cultural UTAUT-based models across Southeast Asian contexts to examine regional similarities and differences in participation behaviour. Additionally, pilot intervention programs—such as self-efficacy or motivational workshops—could be designed and evaluated using pre- and post-participation measures to test the practical impact of the proposed framework empirically.

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