Determinants of Innovation Culture amongst Higher Education Students

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ABSTRACT
Globalisation has made many higher educational institutions reassess their educational contents and research activities in order to enhance innovation culture amongst students of higher education. Many universities now focus on research activities and research funding in raising their reputation and ranking which in turn will improve student intakes, external funding, and student marketability. This paper aims at developing a model of innovation culture which leads to desirable student innovative behaviours. Using a literature-derived questionnaire, data were collected from 1,008 undergraduate students from five public research universities in Malaysia. Findings from structural equation modelling analysis indicate that self-efficacy, effective communications, and climate for innovation are the determinants of innovation culture. While no differences were found for climate for innovation, the findings revealed that self-efficacy, effective communication, and innovation culture to have significant effect on innovative behaviour, indicating the importance of communication and self-belief in building innovation culture and moulding intended behaviour regardless of the situations or environmental conditions.

Keywords: Innovation; innovative behavior; organizational culture; higher education; determinant; Malaysia.

1. INTRODUCTION
Innovation is the introduction of something new, or changes of doing or seeing things (Rubio, 2012). This 'something' could be ideas, behaviours, knowledge, skills, products, services, processes, methods of production, or management systems. As technological innovations are more observable (such as new machines, equipment, and tools), non-technological innovation is more abstract, less obvious, and slightly difficult to grasp. This type of innovation includes organisational innovation, management innovation, and marketing innovation.

Studies on innovation culture are mostly found in the management field but not many in higher education settings. The universal definition of innovation culture is yet to be established (Jucevičius, 2007), while the applicability of this concept in education is also under-researched. Innovation culture as a concept is no doubt a part of organisational culture and management concepts. There are three cultural aspects of these concepts: culture has many layers (i.e., values, norms, beliefs, and basic assumptions); these layers need to be shared among members of the institution (students, faculty members/academics, support staff, administrators, and board members); culture is socially influenced by environment and history that shaped the member behaviour. New ideas or innovations might challenge the traditional or usual way of teaching and learning activities or application of theories in educational settings.

This gap in the existing literature provides the basis of this research which reviews the literature on innovation culture from management and business organisations, and later tests the hypothesised framework on the actual public university population. There is a dire need to assess student innovativeness, receptiveness to new ideas and innovation culture, and the implementation of innovation ideas as outcomes.

Hence, the study aims at developing a model to assess innovation culture from the student perspective. It seeks to understand the roles of effective communications (EC), climate for innovation (CLM), and self-efficacy (SE)

in the adoption and embracement of innovation culture (IC). It is also intended to examine how innovation culture influences students' innovative behaviour (IB).

2. DEVELOPMENT OF THE RESEARCH MODEL

Innovative behaviour in students is likely to manifest itself in response to the environment in which the university cultivates an innovation-oriented culture. Domain-relevant skills (expertise, technical skills, talent) are important for learning and improvement. Therefore, willingness to change and adopt new ways of doing things is a requirement for innovativeness. Literature review suggests that the specific cultural dimensions that influence innovation, innovativeness, and behaviour may include differences in the applied terminology, levels of analyses, and operationalisation of variables (Jaakson, Jørgensen, Tamm, & Hämmal, 2012). Through rigorous literature review, this study has identified five components or dimensions that form the basis of the proposed theoretical model of innovation culture. They are (1) effective communications, (2) climate for innovation, (3) self-efficacy, (4) innovation culture, and (5) innovative behaviour. The conceptual model for the study is shown in Figure 1.

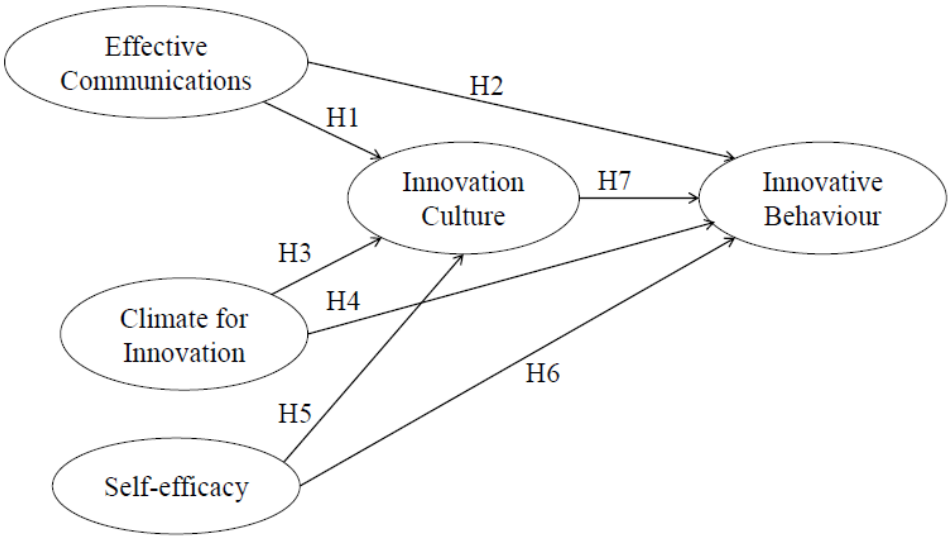

Figure 1: The proposed research model of innovation culture in higher education

2.1. Effective communications

Accordingly, the university's assumptions in the form of a corporate philosophy are communicated to its various stakeholders through internal communication. The fundamentals are often transmitted in mission statements (Dombrowski et al., 2007; Linke & Zerfass, 2011), setting challenging but reasonable goals, building its own concerns and pride, valuing success, and in striving for the highest standards of performance (Ahmed, Loh, & Zairi, 1999). A study on the impact of individual motivation on organisational innovation and performance found that motivation affected both individual effort and overall quality of the innovative endeavours (Sauermann & Cohen, 2008). The findings revealed that monetary rewards were not as important as certain aspects of motivation such as the desire to change intellectually in order to enhance innovation. Hence, by having effective communications, a culture supportive of innovation can be developed. Communication also helps in bringing out positive innovative behaviour in students. This leads to the following hypotheses:
H1: Effective communications of an institution is positively related to innovation culture.
H2: Effective communications of an institution is positively related to innovative behaviour in students.

2.2. Climate for innovation

The key to innovation culture is to institutionalise innovation and possess continuous desire to improve. Students new to the environment should be welcomed and supported but not to the point where they are unable to independently assimilate. Highly innovative universities nurture not only technical abilities and expertise but also promote a sense of sharing and togetherness. Good interpersonal relations support and encourage motivation, teamwork, and innovative behaviour. Therefore, the presence of adequate infrastructure, provision of rewards and recognition, good work nature, high teamwork spirit (Dombrowski et al., 2007), availability of support from friends and lecturers, and warm interpersonal relations between members (Yahyagil, 2004), help in establishing a supportive innovation culture and behaviour in students. This leads to the following hypotheses:
H3: Climate for innovation is positively related to innovation culture.
H4: Climate for innovation is positively related to innovative behaviour in students.

2.3. Self-efficacy

Abilities to execute tasks successfully generate a sense of confidence. Pursuing an idea or a dream requires energy. The feeling of empowerment, self-confidence, and self-assurance, which is developed through a process of social learning, is called self-efficacy (Bandura, 1994) which relates to one's perception of one's ability to reach a goal (Zhang et al., 2017). In this research, we define self-efficacy as a student's perception of his/her ability to explore and envision the development of ideas to solve problems, and to adopt and adapt suitable strategies when making decisions.

In this research, five abilities characterise self-efficacy namely curiosity, creativity, flexibility, autonomy, and pro-activeness. Self-efficacy is the expectation that one can master a situation and produce a positive outcome that will bring out positive performance. Such socio-cognitive skills are learnt through observation, imitation and experience which lead to mastery (Chell & Athayde, 2009). Hence, expectations and aspirations affect self-confidence and self-efficacy, thus cultivate innovative thinking and behaviour. This leads to the following hypotheses:

H5: Self-efficacy is positively related to innovation culture.

H6: Self-efficacy is positively related to innovative student behaviour.

2.4. Innovation culture

Innovation culture supports the creation of new ideas and their implementation. Values and beliefs are verbally and non-verbally communicated which shape the individual and organisational behaviours. In this context, these behaviours are conveyed and transmitted through stories, rituals or institutional norms, and spoken language (Fralinger & Olson, 2007; Hogan & Coote, 2014). Stories might include, for example, information about outstanding accomplishments of past alumni, charismatic chancellors and vice-chancellors, outstanding academic staff track records, and prolific research findings, innovations, and achievements. University rituals including convocations, graduations, welcoming and initiating new students, and society activities recognise the importance of rewarding and acknowledging desired student behaviours. They are repetitive activities that reinforce the values of the university, emphasise the important goals, and the people who were and are most important. Such rituals depend on a system of vocal signs or language, to communicate important ideas and feelings, but also a system for organising information and releasing thoughts and responses in other organisations. The use of appropriate language is often thought to be highly influential on students as they observe how others speak, write, and otherwise perform. This is especially true with respect to how they unconsciously learn by example (Fralinger & Olson, 2007; Kuh & Whitt, 1988). This leads to the following hypothesis:

H7: Innovation culture of an institution is positively related to innovative behaviour of the students.

2.5. Innovative behaviour

An individual or personal attribute, innovative behaviour is defined as the behaviour that is likely to manifest itself in response to environments in which universities practise innovation-oriented culture (Scott & Bruce, 1994). In the context of this study, it is students' abilities and willingness to be innovative. A student may have the capability to respond to change and new ideas; have tolerance for errors and different views; have freedom to experiment and take calculated risks; and be willing to adopt change and new ways of doing things.

3. METHODOLOGY

This study adopts a cross-sectional study designed to test specific hypotheses, and examined specific relationships. The data obtained were subjected to quantitative analyses. The target participants consist only of undergraduates instead of all degree levels. This is to ensure homogeneity of the samples, which in turn reduces the sample bias (Zikmund, Babin, Carr, & Griffin, 2010). Small stationery gifts were given out to respondents as a token of gratitude and to increase the likelihood of respondents' participation as well as to tackle the non-response issue (Leary, 2014).

3.1. Population, sampling technique and analyses

Data were collected from five public research universities (RUs) in Malaysia. These RUs were chosen due to their active role in research, publications, development and commercialisation activities as compared to the normal universities. Most RUs have strategies in exploring new research ideas, investigate innovative methods, and participate in intellectual initiatives to continuously expand cutting edge knowledge.

This study employed cluster-sampling technique across all five RUs (the cluster). The cluster sizes (number of undergraduate students of each RU) were not equal, hence probability-proportionate-to-size (PPS) sampling was used (Malhotra, 2007).

The collected data were entered into SPSS version 20 for statistical analyses. Subsequently, AMOS version 21 was used for model validation through structural equation modelling (SEM) techniques. Multivariate techniques were used in this study, comprising exploratory factor analysis (EFA) and confirmatory factor analysis (CFA using SEM).

Scale reliability or internal consistency demonstrates the degree of togetherness of items in a scale by which they should be measuring the same underlying construct (Leary, 2014; Pallant, 2005). Indicators used are inter-item correlations and Cronbach's alpha coefficient (α).

Construct validity was established using factor analysis (in SPSS) and SEM (using AMOS). Additionally, construct validity was established in two ways, convergent validity and discriminant validity. To establish convergent validity, the composite reliability (CR) was calculated. A value of .7 or above is deemed acceptable. Discriminant validity on the other hand, is established by measuring the average variance extracted (AVE). A value of more than 0.5 is deemed acceptable and when the square root of the AVE is greater than its correlations with all other constructs, discriminant validity is established (Ramayah & Lee, 2012).

3.2. Instrumentation

This study generated its data by using questionnaire through surveys. The questionnaire used measurements and scale items obtained from the literature based on previous empirical studies (see Table 1). The questionnaire consisted of three sections – Part A, Part B, and the Demographic Section. The 41 items in Part A measured four factors: effective communications (EC), climate for innovation (CLM), self-efficacy (SE) and innovative behaviour (IB). Part B of the survey contained 7 items to measure the artefacts of innovation culture (IC). All 48 items (in Parts A and B) used a six-point Likert-type scale ranging from Strongly Disagree (1) to Strongly Agree (6). The equal number of favourable and unfavourable categories makes for a balanced scale. This is to obtain objective data as well as to compel the respondents to answer (Malhotra, 2007; Zikmund et al., 2010). The Demographic Section of the survey was dedicated to collecting students' demographic data including the area of study (stream), gender, ethnicity, and age group. Table 1 displays the number of items for each factor and its sources.

Table 1: Number of items and sources for factors of innovation culture

Factor	Number of items	Sources
1. Effective Communications (EC)	8	Dobni (2008); Yahyagil (2004)
2. Climate for Innovation (CLM)	12	Hogan & Coote (2014); Yahyagil (2004)
3. Self-Efficacy (SE)	12	Chell & Atahyde (2009); Craig & Ginter (1975); Dawson, Tan, & McWilliam (2011); Denison, Haaland, & Goelzer (2003); Dobni (2008); Hogan & Coote (2014); Yahyagil (2004)
4. Innovative Behaviour (IB)	9	Calantone, Cavusgil & Zhao (2002); Craig & Ginter (1975); Dawson, Tan, & McWilliam (2011); Denison, Haaland, &Goelzer (2003); Dobni (2008); Yahyagil (2004)
5. Innovation Culture (IC)	7	Hogan & Coote (2014)
Total	48	

4. RESULTS

4.1. Descriptive analysis

1,110 questionnaires were distributed with 1,059 responses returned accounting for a 95.4% response rate. 51 participants were excluded from analysis because 36 were postgraduate students (eliminated as they were not the target samples) and 15 were dismissed due to unengaged responses by which there was very little variance in answer across all 48 items in the survey questionnaire (the dismissal was based on very low standard deviation values of between .0 and .2). The remaining 1,008 responses (95.2%) were usable for subsequent analyses. Science-based respondents accounted for 56.8% as compared to the non-sciences (43.2%). This reflects the normal composition of degree courses offered in Malaysian research universities. There were more females (62.4%) than males (34.8%) respondents, while some refused to disclose their gender (2.8%). The majority of respondents (88.2%) were Malay (65.7%) and Chinese (22.5%) students. In terms of age group, the majority of respondents were between 21 and 24 years old (78.3%) and those aged 17 to 20 (17.1%). Again, this reflects the normal composition of gender, ethnicity, and age group in Malaysian undergraduates. A summary of the demographic profile of respondents is as shown in Table 2.

Table 2: Demographic profile of respondents

Variable	Category	Frequency (N=1,008)	Percent (%)
Stream	Sciences	573	56.8
	Non-sciences	435	43.2
Gender	Male	351	34.8
	Female	629	62.4
	Not specified	28	2.8
Ethnicity	Malay	662	65.7
	Chinese	227	22.5
	Indian	69	6.8
	Malaysian	41	4.1
	Not specified	9	0.9
Age group	17-20	172	17.1
	21-24	789	78.3
	25-28	38	3.8
	29-32	7	0.7
	33-36	1	0.1
	37 & above	1	0.1

4.2. Exploratory factor analysis (EFA)

All 48 items were factor analyzed using Principal Component Factor Analysis, by Promax Rotation with Kaiser Normalization. The EFA results indicated that the pool of items captured seven distinct factors, including the dependent variable. However upon consulting the scree plot to find a point at which the shape of the curve changes direction and becomes horizontal (Pallant, 2005), only four to five factors should be retained. The Pattern Matrix further confirmed this as it showed three items loaded on Factor 6 while only one item loaded on Factor 7. Fixing the number of factors at five (in tandem with the research model), all items were subjected to EFA again. Upon inspection of this Pattern Matrix, eight items (i.e. SE2, SE3, SE4, IB3, SE8, SE1, CLM7, CLM5) were deleted (no longer included in the subsequent analyses).

The result of the KMO value was well above 0.9, at 0.958, exceeding the recommended value of 0.6 (Kaiser, 1974). The BTS reached statistical significance ($p < .001$) thus supporting the factorability of the correlation matrix. The loadings of the 40 items of a 5-factor solution accounted for 59.1 percent of the total variance, as shown in Table 3.

Table 3: Loadings of the EFA

Items	Component				
	CLM	IB	IC	EC	SE
CLM10	0.804				
CLM9	0.759				
CLM11	0.759				
CLM1	0.745				
CLM4	0.724				
CLM2	0.723				
CLM3	0.708				
CLM12	0.629				
CLM8	0.593				
CLM6	0.544				
IB8		0.839			
IB5		0.827			
IB4		0.792			

IB6	0.761		
IB9	0.693		
IB7	0.656		
IB1	0.587		
IB2	0.525		
IC2		0.885	
IC1		0.857	
IC4		0.817	
IC3		0.812	
IC5		0.773	
IC6		0.746	
IC7		0.682	
EC5			0.818
EC4			0.817
EC3			0.754
EC2			0.724
EC6			0.718
EC1			0.707
EC7			0.692
EC8			0.561
SE6			0.802
SE5			0.773
SE7			0.630
SE11			0.615
SE10			0.605
SE12			0.592
SE9			0.580

The factors and items were then subjected to convergent validity (loading on a single factor) and discriminant validity checks (cross loading). Since all items loaded only on a single factor, the convergent validity of this pattern matrix is established. Thus, this matrix of factor is reliable.

Based on the interpretation of the items in each factor and the underlying theory behind the hypotheses, the following terms were deemed suitable for the five factors as the dimensions of innovation culture construct:
F1: Dimension 1 – Climate for Innovation (CLM)
F2: Dimension 2 – Innovation Culture (IC)
F3: Dimension 3 – Effective Communications (EC)
F4: Dimension 4 – Innovative Behaviour (IB)
F5: Dimension 5 – Self-efficacy (SE)

4.3. Measurement model - Confirmatory factor analysis (CFA)

A sample of 1,008 was processed using AMOS 21. The maximum likelihood (ML) estimation method was employed with these assumptions fulfilled in order to use the ML method (Wang & Ahmed, 2004):
a) satisfactory sample size (more than 200)
b) the scale of the observed variables are continuous
c) the hypothesised model is valid (model was developed from theories and empirical findings)
d) the distribution of the observed variables is multivariate normal.

From the previous EFA results, 40 observed variables that made up five latent constructs were tested. CFA focused more on standard error, squared multiple correlations (R^2) and standardised loadings for each individual item. Upon inspection of the results, three items were deleted (CLM1, SE12, SE10) because they had relatively lower *t*-values, higher standard errors and low explained variances, as indicators of the particular constructs.

Convergent validity indicates that items of a scale are correlated with a composite reliability (CR) of .7 or above and average variance extracted (AVE) of more than .5 are deemed acceptable (Ramayah & Lee, 2012). The standardised factor loadings were evaluated to determine the relative importance of the observed variables, and the results were in a range between .60 and .82. The R^2 values for all indicators were in the range between .36 and .68. This indicated that several individual items in this measurement model failed to satisfy the acceptable threshold level of convergent validity of .5. Nevertheless, all constructs reached CR values of greater than .7. Evaluation on reliability based on AVE satisfied the recommended value of .5. All constructs satisfied the level of acceptable reliability of Cronbach's alpha values of greater than .7. Therefore, convergent validity of this model has been established as seen in Table 4.

Table 4: CFA results of the measurement model

Items	Standardised loadings	*t*-values	R^2	α
EC1	0.694	22.835	0.482	.901
EC2	0.753	25.121	0.567	
EC3	0.759	25.385	0.577	
EC4	0.695	22.849	0.482	
EC5	0.650	21.185	0.423	
EC6	0.759	25.376	0.576	
EC7	0.756	25.244	0.571	
EC8*	0.775	n/a	0.601	
CLM1#	0.603	17.832	0.364	.904
CLM2	0.694	20.418	0.481	
CLM3	0.696	20.481	0.485	
CLM4	0.778	22.690	0.606	
CLM6	0.737	21.586	0.543	
CLM8	0.738	21.609	0.544	
CLM9	0.725	21.269	0.526	
CLM10	0.695	20.463	0.484	
CLM11	0.701	20.623	0.492	
CLM12*	0.687	n/a	0.472	
SE5	0.738	22.092	0.544	.833
SE6	0.782	23.360	0.611	
SE7*	0.732	n/a	0.535	
SE9	0.636	19.044	0.404	
SE10#	0.637	17.877	0.406	
SE11	0.662	19.816	0.438	
SE12*#	0.660	n/a	0.436	
IB1	0.696	19.908	0.485	.895
IB2	0.661	19.008	0.437	
IB4	0.704	20.103	0.496	
IB5	0.742	21.041	0.550	
IB6	0.734	20.840	0.538	
IB7	0.771	21.761	0.595	
IB8	0.776	21.867	0.601	
IB9*	0.673	n/a	0.453	
IC1	0.786	23.723	0.617	.911
IC2	0.822	24.795	0.676	

IC3	0.804	24.257	0.646
IC4	0.813	24.538	0.662
IC5	0.744	22.498	0.554
IC6	0.714	21.605	0.510
IC7*	0.708	n/a	0.502

*Note: *Fixed parameter; #Deleted items*

Discriminant validity is established when the square root of AVE is greater than its correlations with all other constructs (Ramayah & Lee, 2012) as in Table 5.

Table 5: Discriminant validity of constructs

	CR	AVE	EC	CLM	SE	IB	IC
EC	.902	.535	**.731**				
CLM	.905	.515	.812	**.717**			
SE	.836	.507	.675	.738	**.712**		
IB	.896	.519	.646	.622	.711	**.721**	
IC	.911	.595	.635	.639	.639	.605	**.771**

EC =Effective Communications, CLM = Climate for Innovation, SE = Self-efficacy, IB = Innovative Behaviour, IC=Innovation Culture, CR=Composite Reliability, AVE=Average Variance Extracted
Values in bold=Square Root of AVE. Other readings show the correlation coefficients between constructs

4.4. Structural model

The goodness-of-fit indices of the hypothesised model were assessed and the results are shown in Table 6. The model yielded a χ^2 value of 2.911 with 1 degree-of-freedom (p >.05) indicating a marginal fit. As the sample size of this study was considered large and exceeded the minimum required of 300, the use of the χ^2 value provided enough guidance in determining the extent to which the proposed model fit the data (Byrne, 2001). In addition, other goodness-of-fit indices had been suggesting that the hypothesised model showed satisfactory fit to the data as well. A GFI value of .999 meant the model fit the data fairly well. A CFI value of .999 indicated the hypothesised model fit the sample data well. Finally, the RMSEA value of .044 was below the threshold of .05 (Byrne, 2001), indicating good fit. As a whole, the fit indices indicated that the hypothesised model was an adequate fit to the data. Hence, no modification was needed to achieve a better-fit model. As Byrne (2001) suggested, if the fit measure was adequately achieved, the tenability of the hypothesised relationship would be accepted as this implied possible linkages between the constructs. Table 6 shows the results of goodness-of-fit indices of the hypothesised model.

Table 6: Goodness-of-fit measures for the hypothesised structural model

Goodness-of-fit measures	Initial	Final
Absolute Fit measures		
Chi-square (χ^2) of estimate model	438.241 (df = 1, p = .000)	2.911 (df = 1, p = .088)
Root mean square residual (RMR)	7.603	0.257
Root mean square error of approximation (RMSEA)	0.659	0.044
Goodness-of-fit Index (GFI)	0.876	0.999
Incremental Fit measures		
Adjusted Goodness-of-fit Index (AGFI)	-0.855	0.983
Normed Fit Index (NFI)	0.833	0.999
Tucker Lewis Index (TLI)	-0.673	0.993
Parsimonious Fit measures		
Parsimony Goodness-of-fit Index (PGFI)	0.058	0.067
Parsimony Normed Fit Index (PNFI)	0.083	0.100
Comparative Fit Index (CFI)	0.833	0.999

The findings offered empirical evidence to the literature that there were relationships between EC, CLM, SE, IC, and IB. The schematic representation of this final model is shown in Figure 2.

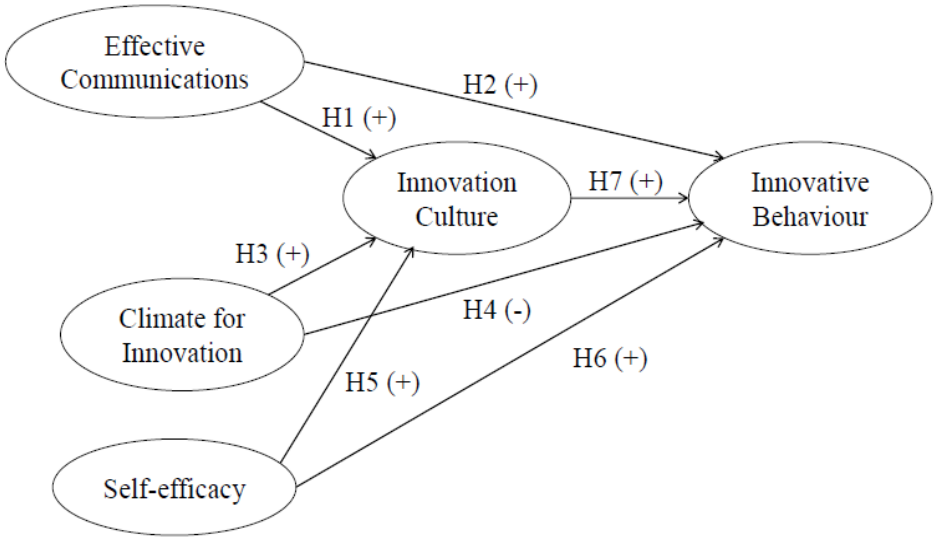

Figure 2: The final model

4.5. Hypotheses testing

The results as shown in Table 7 were with reference to the standardised estimates, critical ratio (*t*-value), and significance level. Overall, the estimation of the hypothesised model showed that six of the hypothesised paths were significant while one was not. H4 was rejected as the estimate was not significant with CR value below the 1.96 threshold (Mueller, 1996).

Table 7: The structural model and hypotheses test results

Hypothesis				Std. Reg. Weight	Critical Ratio	Result
H1	EC	→	IC	0.243	6.809***	Accepted
H2	EC	→	IB	0.238	8.012***	Accepted
H3	CLM	→	IC	0.212	5.632***	Accepted
H4	CLM	→	IB	0.060	1.707#	Rejected
H5	SE	→	IC	0.294	9.181***	Accepted
H6	SE	→	IB	0.380	12.753***	Accepted
H7	IC	→	IB	0.205	7.017***	Accepted

*Note: ***p < .001, #insignificant path*

The proposed hypotheses test results have been structured based on these constructs, effective communications (H1 and H2), climate for innovation (H3 and H4), self-efficacy (H5 and H6) and innovation culture (H7).

H1: Effective communications of an institution is positively related to innovation culture (Supported)
H2: Effective communications of an institution is positively related to innovative behaviour in students (Supported)

Table 7 shows that the relationship between EC and IC was positive and significant (*t*-value = 6.809, $p < .001$), while the relationship between EC and IB was positive and significant (*t*-value = 8.012, $p < .001$). This shows that having a shared vision and goals, and good internal communication encourage students to willingly involve with the culture of innovation. This finding was in agreement with previous findings by Pallas and colleagues (2013) where strategic innovative focus and extrinsic motivation system (equivalent to our Goals & Motivation variable) and openness in communication (equivalent to our Internal Communication variable) encourages innovative behaviour and serve as motivation for innovativeness. Clear communication with innovations as focus helps create innovative thinking, which can foster an innovative image of the institution and eventually leads to even stronger innovative behaviour within the institution (Pallas et al., 2013). A finding by Yahyagil (2004) suggested that the bureaucratic nature of organisations should be kept at a minimum level to help business channels to function simultaneously. Our finding also indicated that less formality and rigidity should

allow students to act and react with positive innovative behaviour without being intimidated by restrictions and unnecessary procedures.

H3: Climate for innovation is positively related to innovation culture (Supported)
Table 7 shows that the relationship between CLM and IC was positive and significant (t-value = 5.632, p < .001). Warm interpersonal relations between members support and encourage teamwork, presence of adequate infrastructure, provision of rewards and recognition, good work nature, availability of support from friends and lecturers, thus help in establishing a positive innovation culture. This finding was in agreement with previous study by Yahyagil (2004) which indicated that supportive culture or the provision of managerial support to the organisation members is a must. Being able to share all the resources and knowledge with others through teamwork and collaboration together with having warm interrelation among members, help in creating the right environment for innovative supporting activities.

H4: Climate for innovation is positively related to innovative behaviour in students (Not supported)
The proposed relationship in H4 was rejected (t-value = 1.707, p = .060) indicating no relationship between CLM and IB. This finding surprisingly does not contradict a previous study suggesting that support and collaboration (or teamwork) had no significant effect on innovativeness (Hurley & Hult, 1998). Values such as teamwork, stability, cooperation, and lack of conflict when highly shared do not foster innovation efforts (Jaskyte & Dressler, 2005). This could be due to the nature of current campus life. Often, students are left to themselves to figure out many things in relation to studying materials, campus layout, and details of their respective timetables. This develops their sense of independence, regardless of having support of friends or lecturers. It is also noted that the university rarely acknowledges little achievements by students especially at individual levels. When students participate in collaborative effort, it is compulsory rather than voluntary. This could be why there is no connection between climate for innovation and innovative behaviour.

H5: Self-efficacy is positively related to innovation culture (Supported)
H6: Self-efficacy is positively related to innovative student behaviour (Supported)
Table 7 shows that relationship between SE and IC was positive and significant (t-value = 9.181, p < .001) while the relationship between SE and IB was positive and even more significant (t-value = 12.753, p < .001). Being curious, creative, flexible, pro-active, and having freedom from external control help in cultivating a positive innovation culture. Yahyagil (2004) put emphasis on personal freedom to become more creative as to encourage and enable members to take risks, make business decisions independently. Another study stated that creativity alone is not sufficient to foster innovation. It has to be complemented by curiosity, self-belief, self-assurance, feelings of empowerment, and social confidence in order to exploit opportunities, generate innovation ideas, and manage risks (Chell & Athayde, 2009).

H7: Innovation culture of an institution is positively related to innovative behaviour of the students (Supported)
Table 7 shows that the relationship between IC and IB was positive and significant (t-value = 7.017, p < .001). How students react towards or perceive stories, rituals, and supporting language used in their respective university campus affects their subsequent innovative behaviour. This finding was in agreement with previous study that found innovative behaviour frequently depends on artefacts that support such behaviours although empirical support for a direct link between the two is mixed. In particular, the study also found that expectations of behaviours for innovation which appeared in stories, rituals, and language supporting innovative behaviours are important in eliciting such behaviours (Hogan & Coote, 2014). Another study found critical importance of artefacts for guiding market-oriented behaviour (Homburg & Pflesser, 2000), which in the context of our study, is reflected by the innovative behaviour of students.

5. DISCUSSION

The results suggested that self-efficacy (SE) is a major determinant of innovation culture (IC) followed by effective communications (EC) and climate for innovation (CLM) (see Table 7). The findings are within expectation as several previous studies have found the same effects of EC, CLM and SE on the culture supportive of innovation (Cantwell, Aiman-Smith, & Mullen, 2007; Dobni, 2008; Pallas et al., 2013; Yahyagil, 2004).

SE was found to significantly influence IC. In this study, empowerment is one of the key contributors to behaviour. Students' abilities to carry out tasks successfully within and outside the campus supported the Bandura (1994) SE theory. This finding supported Dobni's study (2008) which found that the main dimension contributing to IC was the implementation context. In essence, Dobni's study explained that personal level of

energy and determination is essential for students in carrying out plans and action to innovate and make use of available infrastructure and innovation tools.

EC was found to influence IC by which this finding validates Yahyagil's (2004) argument about how institutions with open internal communication probably have greater access to communication channels and information. This availability or accessibility in turn will minimise restrictions on information exchange and determine how such information is interpreted and evaluated (Calantone et al., 2002; Homburg & Pflesser, 2000; Yahyagil, 2004). The universities must apply open and effective information exchange to disseminate their goals and philosophy. A clear goal and plan, high teamwork spirit along with supportive environment for innovation, provide much needed support for innovation-related activities that would engage students to be more pro-active and creative.

The study found that CLM influenced IC. Hence, a university campus with diverse student intakes is more likely to produce a stimulating environment for innovation (Chell & Athayde, 2009). This is also in agreement with Ahmed's theory (1998) which demonstrated that the presence of adequate infrastructure, provision of rewards and recognition, good work nature, high teamwork spirit, availability of support from friends and lecturers, and warm interpersonal relations between members, would help in establishing a supportive IC. This finding is supportive of previous finding by Yahyagil (2004) which concluded that interaction between cultural and climatic elements logically tends to create suitable platforms for institutional functioning.

The results also clearly distinguished that SE is a major determinant of innovative behaviour (IB) followed by EC, whilst CLM had no significant direct effect on behaviour (see Table 7).

SE partly governs the motivating influence on outcome expectancies and behaviour in students. This finding is very much in line with previous findings by Bandura (1977, 1994), and Staples, Hulland, and Higgins (1999) suggesting that SE is a good predictor of subsequent behaviour. With growing independence during university years, some experimentation with risky behaviour could be cultivated to expand and strengthen students' sense of efficacy by enabling them to learn to deal with potential troubles instead of being protected from real world problems.

A clear communication (EC) with innovations as focus helps create innovative thinking as this can foster a better university image and further encourage student innovative behaviour. This finding is consistent with the findings of Hogan and Coote (2014) on the positive and significant relationship between IB and norms and values (EC in this study). Another study by Verschuere, Beddeleem, and Verlet (2014) showed that IB is strongly developed when institutions entered into strategic alliances, and later proactively anticipated developments and opportunities in their environment. By adopting goals students set for themselves, academicians and support staff should provide direction to their behaviour and create incentives to persist in their efforts until they reach or fulfil their goals.

Meanwhile, CLM was found not to affect IB which means that behaviour may not be predicted by the presence of infrastructure or physical arrangements. This finding surprisingly does not contradict a previous study that suggested support and collaboration (or teamwork) had no significant effect on innovativeness (Hurley & Hult, 1998). Scott and Bruce (1994) also found negative relationship between climate perceptions of support for innovation and IB. One explanation is that values such as teamwork, stability, cooperation, and lack of conflict hinder innovation efforts. Students with strong sense of independence can adopt and adapt even with little support from friends and supervisors. Diversity and open-mindedness improves innovativeness. This implies that EC along with strong sense of self-efficacy (SE) help in moulding the intended innovative behaviour regardless of the environmental situations or conditions. As this study proves, SE which focused on human self-beliefs was more significant in determining IB as compared to EC.

Finally, the study found that IC had positive effect and significantly influenced student behaviour. This shows that how students perceived and reacted toward related stories, university rituals, and how information is relayed (as supportive language) in the campus, affect their subsequent behaviour. Hogan and Coote's (2014) empirical study found mixed support for a direct link between artefacts of innovation (IC) and IB even though they were consistently positive and moderately significant. This might be due to method factor and different classification of organisational culture as factors contributing to this mixed support. Another study showed direct positive relationship between IB and IC (Verschuere et al., 2014), however, it had a different definition of culture in which it acknowledged culture as the importance of participation, learning, and collaboration. Therefore, this study has recognised that there is lack of empirical backing for this particular hypothesis. Figure 3 shows the model for innovation culture and innovative behaviour.

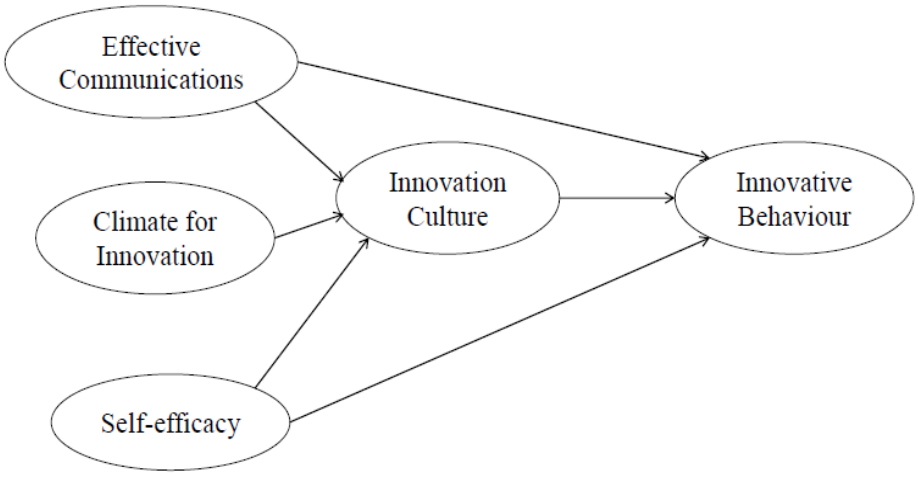

Figure 3: The model for innovation culture and innovative behaviour

The implication of the study is that it has managed to diffuse two different areas (education and business organisational culture) to be tested on an actual population, in a local setting. Innovation culture is a concept that connects cultural aspects to innovation. The combination of these two will result in a behavioural outcome and therefore, it is possible to see how individual students react to their campus surroundings, adopting, and adapting to them, while learning to make the best of their experience there to produce an outcome that would shape their future behaviour.

6. CONCLUSION

This study developed a model and empirically tested the effect of education institutional innovation culture and its determinants, on student innovative behaviour. Several limitations, however, need to be acknowledged despite the findings. Firstly, this study was conducted on undergraduate students whose perceptions of their university environment might be influenced by socio-economic background and lifestyle, thus limiting generalisation of the findings to other groups of students. Generalisation to other groups would require careful interpretations and thorough understanding of the specific campus setting and interactions between students and other members of the campus. Secondly, the study was restricted to the context of local public research universities. Therefore, caution is required when comparing the findings to that of other institutions. The final limitation concerns the respondents' comprehension of the questionnaire. The scale items were developed from various fields such as marketing, management, psychology, and education. For this reason, there might be cases of little understanding and potential inaccurate assumptions made for certain items. Hence, the evaluation of student level of understanding remains unknown.

Future research can expand this study by including other levels of students' perception of innovation culture. The model could also be improved by incorporating other relevant independent variables based on new findings from the education and management literature. Further research is also needed to see the level of applicability of this study in other institutions or contexts.

The results demonstrate that characteristics of the university and individual attitudes of students affect how they interact with the culture of innovation of their respective institutions. Subsequently the interaction influences how they do certain things with regard to fulfilling the requirements of the university and learning and social activities in campus. A significant positive influence on innovative behaviour is contributed more by the personal attribute of students, which is self-efficacy. This indicates that individual factor is more influential than other environmental factors in contributing to an individual outcome which is seen or observed in the resulting innovative behaviour.

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