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Gender Moderated Model of Innovation Orientation among Malaysian Undergraduates

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Abstract: This research examined the moderating effects of gender on the structural model of innovation orientation among university undergraduates in Malaysia. This research connected the constructs' relationships to the gender moderating effect in order to explain innovation orientation phenomenon and to confirm the Gender Constant Theory. The research employed the multiple group model comparison technique using AMOS. For female (n = 1.522), all seven path coefficients associated with the paths linking the four antecedents to innovation orientation and paths linking the three antecedents to entrepreneurial self-efficacy are significant. For male (n = 985), four path coefficients are significant: innovation motivation to entrepreneurial self-efficacy, entrepreneurial orientation to entrepreneurial self-efficacy, entrepreneurial orientation to innovation orientation and innovation motivation to innovation orientation. Male demonstrated a significantly stronger path coefficient from innovation motivation to entrepreneurial self-efficacy (Male: $\beta = 0.374$, Female: $\beta = 0.175$) whereas females demonstrated a significantly stronger path coefficient from creativity to entrepreneurial self-efficacy (Male: $\beta = 0.039$, Female: $\beta = 0.297$). Male structural model explained 65.0% variance. Female structural model explained 59.4% variance. The research ascertains that innovation orientation model is moderated by genders and thus confirms the Gender Constant Theory.

Key words: Multiple groups comparisons, innovation orientation model, undergraduates, gender, Malaysia

INTRODUCTION

Innovation behavior among undergraduates in Malaysian higher education institutions is a major concern for both researchers and practitioners. An important effort in this research is to identify causal relationship differences between gender's innovation behaviors antecedent factors. Based on literature in Malaysia innovation behavior lacking is more prevalent among female than male undergraduates. Empirical findings suggest that entrepreneurial orientation, creativity, innovation motivation and entrepreneurial self-efficacy factors contribute to the emergence of innovation behavior. Consequently there is a risk of assuming that innovation behavior model is equally applicable to both gender. Therefore, further research is needed to examine gender differential effects on the model of innovation orientation in Malaysia.

Gender is the state of being male or female; typically used with reference to social and cultural differences rather than biological ones. Based on Gender Constant Theory cognitive consistency is gratifying, so individuals attempt to behave in ways that are consistent with their self-conception (Bussey and Bandura, 1999). In this view, individuals' conducts are designed to confirm their gender identity. This research, uncovers whether innovation orientation's enablers relationship to innovation orientation are significantly different between genders. If this is true therefore, gender stereotype exhibited (by the sampled population) through the relationship can be used by the instructors to nurture innovation orientation better for specific gender.

Gender moderation analysis on the structural model of innovation orientation is also important to advance the model of innovation orientation and uncover its practical implication as well as potentials, thus, moving beyond basic correlational relationships. Questions involving moderations address for whom, a variable is most strongly predicts or causes an outcome variable. More specifically, gender as a moderator variable has the possibility to alter the direction or strength of the relation between a predictor and an outcome (Baron and Kenny, 1986; Frazier *et al*., 2004).

Based on research, educators and instructors need to aim on removing barriers to growth through the connection of innovation and gender. The core statement made in relation to the innovation orientation case for gender diversity are gender diversity as driver of

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creativity and innovation and gender as a means of design innovation. A theoretical framework and evidence-based arguments for both statements are to increase competitiveness in human resource sector by applying gender perspective. The result of this research can be applied and incorporated into gender equality strategies, change process and innovative management practices. This research finding also provides educators and instructors ideas for strategies to mobilize actors for gender diversity and tools for bridging the gap between policy aspirations and the implementation of new practices in innovation education.

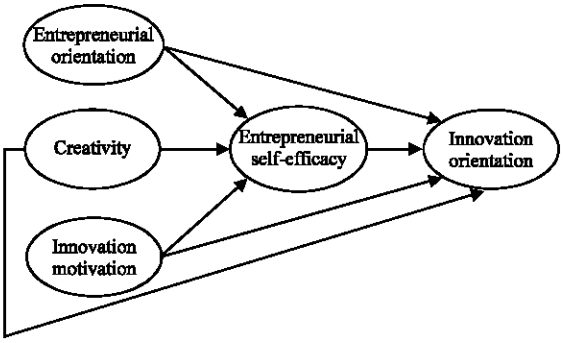

Fig. 1: Conceptual model of innovation orientation

Conceptual framework: This research embarked on the assumption that the antecedent factors of individual's innovation orientation phenomena are explained by ones' perception about their creativity, innovation motivation, entrepreneurial orientation and entrepreneurial self-efficacy. Therefore, there are five variables of research. The positive directional relationships' skeletal model between the four variables to innovation orientation is assumed based on model of Stimulus-Capacity-Performance (Prajogo and Sohal, 2006). The skeletal causal relationships are further justifies based on the Componential Theory of Creativity and Innovation. However, based on Social Cognitive Theory (Bandura, 1991) one's psychological perception of creativity, entrepreneurial orientation and innovation motivation exertion into innovation orientation are mediated by entrepreneurial self-efficacy. According to the theory, entrepreneurial self-efficacy clarifies how creativity, entrepreneurial orientation and innovation motivation affects one's innovation orientation. Theoretically, mediator variable (entrepreneurial self-efficacy) operates to take some inputs from creativity, entrepreneurial orientation and innovation motivation and translate them into innovation orientation. Therefore, the schematic diagram of the research's conceptual framework is mediated by entrepreneurial self-efficacy.

Based on the Cognitive Development Theory on influence of gender constancy gender mental framework has a moderation effect on the constructs' relationship in the model of innovation orientation. The gender moderation effect is important to advance the model of innovation orientation because moderation effect addresses 'for whom' a specific variable most strongly predicts innovation orientation in the proposed model. Gender Constant Theory theorized that changes among the construct relationships within the structural model are in response to changes in the value of moderator variable-gender (male samples' data and female samples' data). Therefore, the research aimed to assess whether the structural model varies as a function of genders (hypothesized moderator). Analysis method employs is multiple groups comparison via structural equation modeling. It is hypothesized that gender moderation effect on the structural model constructs relationship is significant, failure to support this hypothesis mean that gender do not moderate the structural model of innovation orientation. This research finding is important for the practical implication of the innovation orientation model (Fig. 1).

Gender moderation hypotheses: Our conceptual model suggests that the structural model of innovation orientation is significantly different between genders. Therefore, this research posits the following hypotheses:

- H_1: gender moderates the causal dependence relationship between innovation motivation to entrepreneurial self-efficacy
- H_2: gender moderates the causal dependence relationship between entrepreneurial orientation to entrepreneurial self-efficacy
- H_3: gender moderates the causal dependence relationship between creativity to entrepreneurial self-efficacy
- H_4: gender moderates the causal dependence relationship between entrepreneurial orientation to innovation orientation
- H_5: gender moderates the causal dependence relationship between innovation motivation to innovation orientation
- H_6: gender moderates the causal dependence relationship between creativity to innovation orientation
- H_7: gender moderates the causal dependence relationship between entrepreneurial self-efficacy to innovation orientation

MATERIALS AND METHODS

The research method employed was guided by our interest in understanding gender differences in innovation orientation structural model. Our sample was drawn from undergraduates in Malaysian universities. The samples were selected through stratified convenient sampling technique. Stratified convenient sampling technique was employed to ensure equal sample size is collected from mixture of disciplines based on gender. The gender stratum is determined based on the planned analysis to be carryout concerning the gender-moderated model (Diaz-Garcia and Cortez, 2008). Stratified convenient sampling technique is chosen because it guards against an unrepresentative sample, for example an all-male sample from a mixed-gender population. It also ensures that this research obtain sufficient sample points to support a separate analysis of gender subgroups. Based on geographical, the samples represent undergraduates from public universities located in Central, Northern, Southern, East Coast, West Coast of Peninsular Malaysia and East Malaysia. In total, there are nine public universities involved in this research. The selection of university is based on convenient and established networking with the personnel.

Participants: Sample sizes collected in this research are 2,507 undergraduates in Malaysian public higher education institutions. The research data samples' proportion to the entire population is 0.84%. Sample size of 1.0-0.5% of the population is stable and thus, stability of the parameter estimates are ensured (Moller *et al*., 2009).

All respondents are Malaysian or a permanent residence of Malaysia. There were nine public universities involved in the research namely Universiti Sains Malaysia, Universiti Utara Malaysia, Universiti Kebangsaan Malaysia, Universiti Malaya, Universiti Teknologi MARA, Universiti Malaysia Sabah, Universiti Malaysia Pahang, Universiti Malaysia Kelantan and Universiti Pertahanan Nasional Malaysia. Universiti Utara Malaysia accounted for 16.8% of the total respondents followed by Universiti Teknologi MARA; 15.9%, Universiti Malaya; 15.0%, Universiti Malaysia Sabah; 11.8%, Universiti Kebangsaan Malaysia; 11.2%, Universiti Sains Malaysia; 8.5%, Universiti Malaysia Kelantan; 7.9%, Universiti Malaysia Pahang; 6.8% and Universiti Pertahanan Nasional Malaysia; 6.2%.

Based on gender fraction, 985 respondents (n = 2.507) are male and they accounts 39.3% of the total respondents. Female respondents are 1.522 undergraduates and they accounts 60.7% of the total respondents. Stratified sampling plan employed but in the end, the actual gender disproportion in the population prevails. Looking at the ethnicity of the sample, 77.5% of the respondents are Malay, 11.4% are Chinese, 2.8% are Indians and the remaining 8.3% are other ethnics. Based on sample religion demographic, 82.4% of the samples are Muslim, 10.6% of the samples are Buddhist, 4.8% of the samples are Christian and the remaining 2.2% of the samples are Hindu.

Measures: Focal dependent variable of research is innovation orientation. Based on theory, independent variables (innovation orientation) are hypothesized to positively associate with creativity, entrepreneurial orientation, innovation motivation and entrepreneurial self-efficacy. All of these variables are latent and thus, each variable are measured by a number of observed variables. These five latent variables are called constructs to differentiate them with the measured variables. In total, 24 measured variables represent five latent constructs.

The 24 measured variables are adapted from established instruments. All of these measured variables are selected based on its high factor loading to the constructs from the adapted instrument. In this research, adaptation of the instruments that measured each constructs was done through Delphi study process. Minimal adaptation was done to the instruments to guarantee the consistency of the measures. Then all measured variables of all constructs were arranged in a survey questionnaire. This self-administered survey was the medium for the data collection process. In the survey, a section on demographic information of the respondents was placed in the first section.

This is a theory-based research therefore this research hypothesis is the medium to draw conclusion about how one construct influences another construct. Conclusion made based on empirical associations among various measured variables. The test of theory uses measured variables but the conclusions we wish to draw are about the constructs. Scores on the measured variable are presumed to be produced by the underlying construct an essential assumption that links the theoretical realm to the empirical world. In operationalization, the conceptual definition of the construct is transformed into a measurement instrument. This tool then is used to generate a set of measurements which is called measured variables. Detail explanations of each construct and their measured variables are discussed in the following section.

Innovation orientation: Innovation orientation is an endogenous variable. Innovation orientation is measured by four items adapted by Kuratko *et al*. (1990).

Operational definition of innovation orientation is one's perceived tendency in implementation of ideas into practice. The perceived tendency to implement ideas into practice are manifested by four measured variables interest to initiate new ideas, committed to learn and accumulate knowledge, courage to pursue one's own unique interest and producing new things to benefit others. The measured variable items are presented in four point Likert scale ranging from 1 = Strongly disagree, 2 = Disagree, 3 = Agree and 4 = Strongly agree.

Entrepreneurial orientation: Entrepreneurial orientation is an exogenous variable. Entrepreneurial orientation is defined as a person's perceived willingness to turn ideas into money-making potential (either economic value or social value) (Antoncic and Hisrich, 2003; Lumpkin and Dess, 1996). Entrepreneurial orientation construct is measured by five measured variable items and adapted by Bolton and Lane (2012). This construct is measured by ability to recognise new opportunity, incline to think ahead of trend, sensitive to the demand and needs of the community, Wanting to put up ideas into business and Willing to put effort to gain knowledge and skill to run a business. Measured variable items are presented in four point Likert scale ranging from ranging from 1 = Strongly disagree, 2 = Disagree, 3 = Agree and 4 = Strongly agree.

Creativity: Creativity is an exogenous variable. Creativity construct is defined as ones' perceived their ability to generate ideas. The construct is measured by four items adapted from creativity dimensions developed by Amabile and Gryskiewicz (1989). The measured variables are actively seek to learn new and interesting things, interested in exploring new ideas, like to do things differently and like to focus and dwell on the positives in other people idea. These items are presented in four point Likert scale ranging from 1 = Strongly disagree to 4 = Strongly agree.

Innovation motivation: Innovation motivation is an exogenous variable. Innovation motivation is defined as one's perceived drive towards innovation. Innovation motivation construct are measured by five items. The items are adapted from by Sauermann and Cohen. Perceived innovation motivation are measured by the drive to commercialize my own product, the drive to contribute to the society, the drive to increased my financial independence, the drive to heighten the level of responsibility and to benefit human kind. These items are measured in four point Likert scale ranging from 1=Strongly disagree to 4 = Strongly agree.

Entrepreneurial self-efficacy: Entrepreneurial self-efficacy is an exogenous variable. Entrepreneurial self-efficacy construct is defined as one's perceived self-confidence on their standard of performance in entrepreneurship. Entrepreneurial self-efficacy construct is measured by six measured variable items adapted by Chen *et al.* (1998). The measured variables are coping with unexpected challenges, ability to create opportunity, ability to define core purpose, ability to develop human resource, ability to create innovative environment and ability to imitate investor relationship. The items are presented in four point Likert scale ranging from 1 = Strongly Disagree to 4 = Strongly Agree.

Scores on these 24 measured variables are presumed to be produced by the underlying five constructs namely innovation orientation, entrepreneurial orientation, creativity, innovation motivation and entrepreneurial self-efficacy. These measured variables are essential as they are the operational definition for each construct and the union that links the theoretical realm to the empirical world. These 24 tools then are used to generate a set of measurement model for innovation orientation phenomenon.

Reliability analysis: Preliminary data analysis of the pilot study confirmed the general reliability of the survey items. Internal consistency ensures that the individual items of a scale measure the same concept and are highly correlated (Hair *et al.*, 2010). Cronbach's alpha, a coefficient of internal consistency was used to measure the reliability of the instrument through a score ranging from zero to one with a score closer to one indicates higher reliability. Reliability indicates the stability and consistency by which a survey questionnaire measures the constructs and helps to assess the goodness-of-fit of a measure (Hair *et al.*, 2010; Sekaran, 2006). Hair *et al.* (2010) argued that preferably the coefficient should be 0.70 or higher. Hair *et al.* (2010) indicated that a coefficient greater than or equal to 0.50 is acceptable for exploratory research. Sekaran (2006) suggested that 0.60 is the lowest acceptable in this type of study. Refer test result is summarised in Table 1.

The Cronbach alpha values that fulfill the requirement are all above 0.7 (Hair *et al.*, 2010). The result shows all items have high reliability and can are use in the actual research later. The actual analysis for this research

Table 1: Reliability analysis of the pilot test

Construct	No. of items	Cronbach alpha
Entrepreneurial self-efficacy	6	0.98
Innovation motivation	5	0.88
Creativity	4	0.93
Entrepreneurial orientation	5	0.94
Innovation orientation	4	0.90

will be using Confirmatory Factor Analysis (CFA) in the Structural Equation Modeling (SEM) to identify good quality questions from the aspect of validity and reliability.

Procedures: The research aim is to model the phenomenon of innovation orientation among the Malaysian undergraduates. The first research procedure is to select a theory that is best describes the innovation orientation phenomenon. Through literature reviews, theory of Componential Creativity and Innovation is selected. Theory of Componential Creativity and Innovation contains abstractions such as constructs, populations and relationships that best explained innovation orientation phenomenon. On the other hand, the observation encompasses entities such as measured variables, samples and empirical associations. To achieve the research objective, the following are the research procedures.

First, abstract elements of theory are transformed into entities that can be studied in the real world. Constructs are translated into measured variables. Populations are represented as samples. Relationships are estimated as associations. This transformation is known as operationalization. Operationalization is the process of making the abstract components of theory transformed into the concrete components of research methods. As a result this enables the estimation of associations among measured variables within a sample in order to test the theory.

After the model is conceptualised, data are collected from the sampled population. The data are checked for normality and the measurement model validity is assessed. This is to ensure its measured item validity in measuring the constructs. The assessment of the measurement model adhered to the Goodness-Of-Fit (GOF) guidelines. In this research, the guidelines and replication of research data analysis design for SEM adapts by Ho (2006) and Byrne (2013). Only if the measurement model is valid, the research process will advance to examination of the innovation orientation structural model or else, the measurement model is review and re-conceptualisation. This process has to be repeated until measurement model goodness-of-fit is satisfactorily achieved.

Lastly, the comprehensive model that comprises of the relationship of all the research variables is generated. This is called the structural model of innovation orientation. The structural model validity are assess with the goodness-of-fit guidelines. Analysis of all variance for the components of each observed variable are done.

Upon satisfactorily adhere to the guidelines; discussion, conclusion and recommendation based on the findings are made.

Data analytic plan: In structural invariant assessment this research aims to examine the moderating effects of genders on the structural model of innovation orientation. Moderation intervention on the structural model's constructs relationship between female and male employs multiple group model comparison technique. The result is important to answer whether innovation orientation structural model proposed in previous section is significantly different between male and female undergraduates. Gender moderation effect on the structural model was tested employing multiple group model comparison (Arbuckle, 2007).

In order to test for gender differences in the path model, it is necessary to firstly, set up separate but identical path models for the male and female samples (Ho, 2006). Thus, Critical Ratio test is carried out on the regression weights obtained from the variant group measurement model to point-out which measured variables is different for males and females data. Variant measurement model is scrutinized because regression weights from the invariant group measurement model are set to equality therefore, it cannot be the basis to compare gender differences.

From the variant group measurement model's critical ratio test it is found that two pairwise comparisons (males vs. females) for regression weights denoted by path m10-f10; (path CR-Q6) and path m19-f19; (path IM-Q18) are significantly different, $CR>\pm1.96$, $p<0.001$. Meaning there are differences in regression weights associated within the measurement variables denoted by measured variable Q6 and Q18. This information are incorporates into the multiple group comparisons. The factor structures confirmed to be significantly different in the critical ratio test above are uses as the foundation for the structural path model estimation where these measured variables Q6 and Q18 are not being constraint in the multiple group model estimation.

Secondly, male and female models are link to their respective data sets. Thirdly, an invariant path model is sets up in which males and females are hypothesized to share the same path coefficients. Then a variant (different) path model in which males and females are hypothesized to have different path coefficients are directly compares to their model-fit (Ho, 2006). Finally, the Critical Ratio test employed to check for gender differences in the path coefficient.

RESULTS AND DISCUSSION

In the output for structural model of multiple group comparisons there are two data sets; male undergraduates and female undergraduates' data sets. Each contains 19 measurement variables. The two covariance matrices generated from the two data sets contain 600 sample moments. For the group-invariant model there are 92 parameters to be estimated. This model therefore has 508 (600-92) degrees of freedom and yielded a significant Chi-square value, χ^2 (N = 2507, df =508) = 1540.682, $p<0.05$. For the group-variant model there are 116 parameters to be estimated. This model therefore has 484 (600-116) degrees of freedom and yielded a significant Chi-square value, χ^2 (N = 2507, df = 484) = 1505.991, $p<0.05$. The Chi-square values for both path models are statistically significant (i.e., both models yielded poor fit by the Chi-square goodness-of-fit test) however, the baseline comparison fit indices of NFI, RFI, IFI, TLI and CFI for both models are above 0.90 (range: 0.912-0.945).

These indices compare the fit of the hypothesized model to the null or independence model. With the incremental fit indices ranging from 0.912-0.945, the possible improvement in fit for the hypothesized model (range: 0.055-0.088) appears to be small as to be of little practical significance (Bentler, 1980; Bentler and Bonnet, 1980). The RMSEA fit index which takes into account the error of approximation in the population, yielded values for the group-invariant and group-variant path models of 0.028 and 0.029, respectively. Values ranging below 0.08 are acceptable (Browne and Cudeck, 1993; MacCallum *et al*., 1996). Thus, the RMSEA values for the group-invariant and group-variant path models suggest that the fit of these two models is adequate. The fit of the two competing models can be directly compared. From the Nested Model Comparisons statistics it can be seen that the Chi-square difference value for the two models is 15.772 (1540.682-1524.910). With 7 degrees of freedom (508-501) this value is significant at the 0.05 level ($p<0.001$). Therefore, variant model indicate better fit than the invariant model.

The results of nested model comparison are also supported by the AIC measure. In evaluating the hypothesized model this measure takes into account both model parsimony and model fit. Simple models that fit well receive low scores whereas poorly fitting models get high scores. The AIC measure for the group-invariant model (1724.682) is higher than that for the group-variant model (1722.910) indicating that the group-variant model is both more parsimonious and better fitting than the group-invariant model. Based on the model comparisons findings and assuming that the group-variant model is correct, the group-variant model's estimates are preferable over the group-invariant model's estimates.

Out of the seven coefficients associated with the paths linking exogenous and endogenous variables for male respondents, four are significant by the critical ratio test ($CR>\pm1.96$, $p<0.001$). The three non-significant coefficients for males and are associated with the paths linking creativity to entrepreneurial self-efficacy, creativity to innovation orientation and entrepreneurial self-efficacy to innovation orientation. However, it is found that all coefficients associated with the paths linking exogenous and endogenous variables for female respondents are significant by the Critical Ratio test ($CR>\pm1.96$, $p<0.001$). The pairwise comparison CR test is carried out on the path coefficients obtained from the variant-group model. It can be seen that two pairwise comparisons between path coefficients for males and females are significant ($CR<\pm1.96$, $p>0.001$). It is found that males demonstrated a significantly stronger path coefficient from innovation motivation to entrepreneurial self-efficacy (Male: $\beta = 0.374$, Female: $\beta = 0.175$), whereas females demonstrated a significantly stronger path coefficient from creativity to entrepreneurial self-efficacy (Male: $\beta = 0.039$, Female: $\beta = 0.297$).

The squared multiple correlations, R^2 present the amount of variance in the endogenous variables accounted for by the exogenous variables. For males, the squared multiple correlations show that: 48.5% of the variance of entrepreneurial self-efficacy is accounted for by the joint influence of innovation motivation, creativity and entrepreneurial orientation. While, 65.0% of the variance of innovation orientation is accounted for by the joint influence of entrepreneurial self-efficacy, innovation motivation, creativity and entrepreneurial orientation. For females, the squared multiple correlations, R^2 shows 52.9% of the variance of entrepreneurial self-efficacy is accounted for by the joint influence of innovation motivation, creativity and entrepreneurial orientation. While 59.4% of the variance of innovation orientation is accounted for by the joint influence of entrepreneurial self-efficacy, innovation motivation, creativity and entrepreneurial orientation (Fig. 2).

Based on the result there is a significant different between male and female structural model of innovation orientation in Malaysia. The variant male model of innovation orientation explained 65% of the variance while female model explained 59.4% of the variance. As for female undergraduates, creativity, entrepreneurial orientation, innovation motivation and entrepreneurial self-efficacy are significant contributing factors to

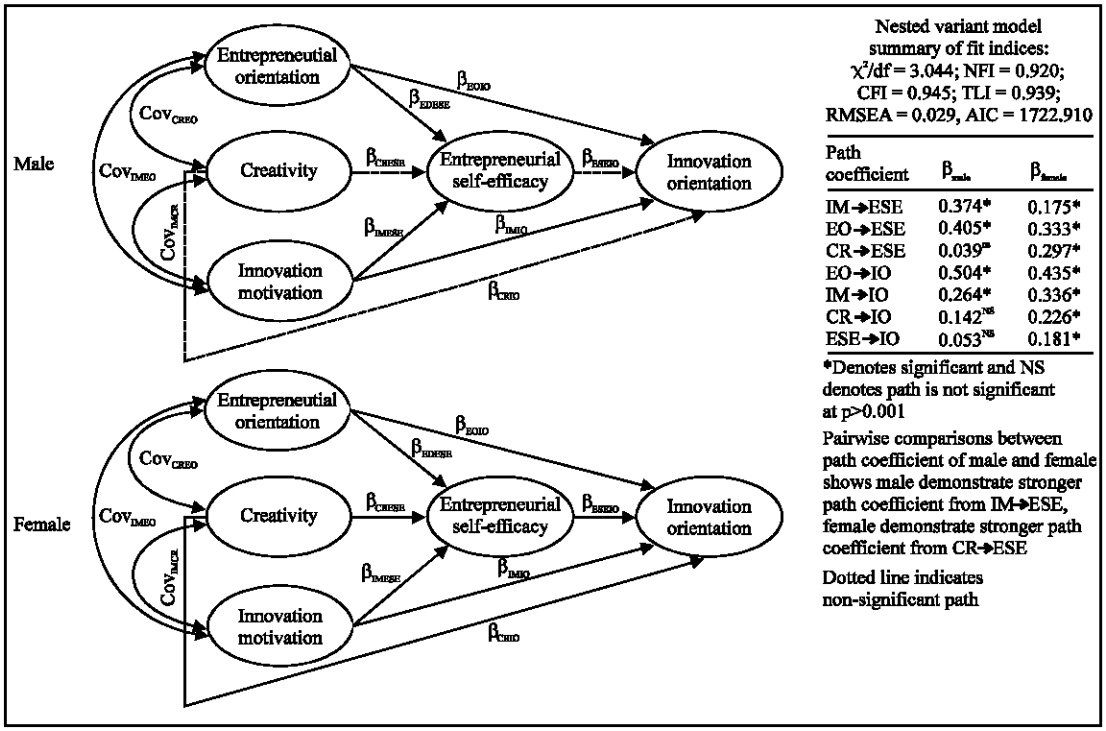

Fig. 2: Nested structural variant model decomposed into female and male

their innovation orientation emergence. However, for male structural model, creativity and entrepreneurial self-efficacy do not promote male undergraduates' innovation orientation. Innovation orientation is promoted by their entrepreneurial orientation and innovation motivation. Their entrepreneurial self-efficacy is also promoted by entrepreneurial orientation and innovation motivation. For educators' awareness, male undergraduates' barrier to innovation orientation is their stereotype perception that innovation does not related to creativity and entrepreneurial self-efficacy. To increase male undergraduates' innovation orientation competitiveness, innovation factors such as creativity and entrepreneurial self-efficacy need to be communicated and make knowledge for action.

Based on the structural model comparisons between gender, it is found that males demonstrated a significantly stronger path coefficient from innovation motivation to entrepreneurial self-efficacy (Male: β = 0.374, Female: β = 0.175). Male undergraduate students' innovation motivations contribute more to entrepreneurial self-efficacy as compared to their female counterpart. Whereas the females demonstrated a significantly stronger path coefficient from creativity to entrepreneurial self-efficacy (Male: β = 0.039, Female: β = 0.297). Female undergraduate students' perception about their creativity contributes more to entrepreneurial self-efficacy as compared to their male counterpart. This information can be used as each gender strong perspectives in promoting innovation.

These findings fill the gap of previous researches that did not test the moderation effect of gender, strength of relationship between innovation orientation and its enablers based on gender. The current finding of multiple group comparisons adds to the existing body of knowledge that gender differentiation should be considered in nurturing innovation.

CONCLUSION

Based on the gender moderation model assessment, the constructs relationship in the structural model is significantly different and moderated by gender. One of the finding implications can be interpreted as the ideal teaching and learning need to be gender-customized. Teaching and learning methods employing computer adaptive learning, computer simulation and educational games that cater to individual uniqueness is suggested. Based on Rigelman and Ruben (2012), the evolution in experience-based instructional methods has a substantial potential to address the limitation of the traditional instructional method such as overburdening the lecturer

in developing new lesson plan, cost incurred in providing real experiences to the students and establishing consistent contact with the students. This will help in customizing the different intensity of each factor.

Furthermore, to attract undergraduate students to exercise innovation, the focus should be on proper training of lecturers. Innovation lecturers and instructors that involved directly and/or indirectly in nurturing innovation should be aware of the model of innovation orientation and its enablers. Gender appropriate nurturing and self-conception about innovation orientation should be equated.

In addition to determining the general effectiveness of the hypothesized causal dependence relationships, the study also investigated which interventions work best for which gender. For example, gender is introduced as a moderator of the relation between entrepreneurial orientation, innovation motivation, creativity and entrepreneurial self-efficacy to innovation orientation. If gender is a significant moderator in this case, the intervention (on entrepreneurial orientation, innovation motivation, creativity and entrepreneurial self-efficacy) increases the innovation orientation of one gender more, than the other.

LIMITATION

The research findings generalizability is subjected to the research design. This research employs non-experimental research design also known as an ex-post facto type of research or called correlational research design (Hair *et al*., 2010); where the search for possible factors that contributes to the phenomena of innovation orientation emergence studied without manipulation on the dependent variable before the fact occurs. The design has the following limitations: constructs included in the research and its' possible causal connections are determined by selected theories, data collection technique that employs convenient stratified sampling technique is non-random sampling technique and data collected at one point in time, thus the findings generalizability is time-based. However, it is a suitable research design for an exploratory investigation of cause-effect relationships as the identified causal relationships between constructs contributes knowledge to the field of innovation orientation development in higher education and in future, these findings can be tested through true experimental research designs.

IMPLICATIONS

Gender moderation effect on the structural model constructs relationship is significant. Changes among the construct relationships within the structural model are in response to changes in the value of moderator (male samples' data and female samples' data). These conditional relationships showed that the structural model is different between genders and gives credence to the Gender Constant Theory and applies to nurturing innovation among undergraduates. The moderation effects on the constructs in the structural model relationships depicted by the Malaysian undergraduates give credence to the theory.

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