EXAMINING THE RELATIONSHIP BETWEEN INNOVATION ORIENTATION AND ITS ENABLERS AMONG UNDERGRADUATE STUDENTS IN MALAYSIAN HIGHER EDUCATION INSTITUTIONS

by

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Abbreviations used in this study are listed below for reference:

MOHE	Ministry of Higher Education Malaysia
NHESP	National Higher Education Strategic Plan
IO	Innovation orientation
EO	Entrepreneurial orientation
ESE	Entrepreneurial self-efficacy
CR	Creativity
IM	Innovation motivation
SEM	Structural Equation Modeling
Cov	Covariance
CR	Critical Ratio
RMSEA	Root Mean Square Error of Approximation

MENGUJI HUBUNGAN ANTARA ORIENTASI INOVASI DAN FAKTOR-FAKTOR PENYUMBANGNYA DALAM KALANGAN PELAJAR SARJANA MUDA DI INSTITUSI PENGAJIAN TINGGI DI MALAYSIA

ABSTRAK

Kajian ini bertujuan untuk menguji hubungan antara orientasi inovasi dan faktor-faktor penyumbangnya dalam kalangan pelajar sarjana muda di institusi pengajian tinggi di Malaysia. Hipotesis bagi perhubungan ini berdasarkan Teori Komponen Kreativiti dan Inovasi. Penyumbang kepada orientasi inovasi ialah kreativiti, motivasi inovasi, orientasi keusahawanan, dan efikasi-kendiri keusahawanan. Model ini diuji menggunakan teknik Pemodelan Persamaan Struktural. Kajian ini turut menguji kesan jantina sebagai moderator terhadap model struktural untuk mengesahkan Teori Kemalaran Jantina. Teknik Perbandingan Pelbagai Kumpulan telah digunakan. Kajian ini juga menguji kesan efikasi-kendiri keusahawanan sebagai mediator terhadap kreativiti, orientasi keusahawanan dan motivasi inovasi dalam membentuk orientasi inovasi. Pendekatan *Causal-Steps* dan *Bootstrapping* telah digunakan untuk menguji kesan tidak langsung mediator ini. Keseluruhan kajian ini menggunakan reka bentuk kajian bukan-eksperimen dan melibatkan seramai 2,507 mahasiswa. Kajian ini mendapati orientasi inovasi berhubungan positif dengan orientasi keusahawanan, kreativiti, motivasi inovasi dan efikasi-kendiri keusahawanan. Model struktural penuh bagi orientasi inovasi menerangkan 61.2% varians dengan Ketepatan-Padanan bernilai 0.958. Kajian ini telah menentusahkan kewujudan kesan moderasi jantina terhadap model orientasi inovasi, justeru mengesahkan Teori Kemalaran Jantina. Kesan mediasi bagi efikasi-kendiri keusahawanan menunjukkan bahawa faktor-faktor penyumbang bagi orientasi

inovasi boleh dioptimumkan dengan memupuk efikasi-kendiri keusahawanan mahasiswa.

Kata kunci: Orientasi inovasi, pelajar sarjana muda, Pemodelan Persamaan Struktural, moderator, mediator

EXAMINING THE RELATIONSHIP BETWEEN INNOVATION ORIENTATION AND ITS ENABLERS AMONG UNDERGRADUATE STUDENTS IN MALAYSIAN HIGHER EDUCATION INSTITUTIONS

ABSTRACT

This research aimed to examine the relationships between innovation orientation and its enablers among undergraduates in Malaysian higher education institutions. The hypothesized relationship is based on the Theory of Componential Creativity and Innovation. The innovation orientation enablers are creativity, innovation motivation, entrepreneurial orientation, and entrepreneurial self-efficacy. The model was examined using Structural Equation Modeling technique. The research also examined the moderating effects of gender on the structural model to confirm the Gender Constant Theory. A Multiple Group Model Comparison Technique was adopted. The research also examined the effect of entrepreneurial self-efficacy in mediating creativity, entrepreneurial orientation and innovation motivation in developing innovation orientation. The Causal-Steps and Bootstrapping approach were adopted to test the significance of the indirect effects. A non-experimental research design was employed in the research and 2,507 undergraduates were sampled. It was found that innovation orientation is positively associated with entrepreneurial orientation, creativity, innovation motivation and entrepreneurial self-efficacy. The full structural model of innovation orientation explained 61.2% of the variance with Goodness-of-Fit equals to 0.958. The research also ascertains that innovation orientation model is moderated by gender, and thus confirms the Gender Constant Theory. The mediation effects of the antecedent factors posit that the causal

effectiveness of the factors can be maximised by addressing entrepreneurial self-efficacy.

Keywords: Innovation orientation, undergraduates, structural equation modeling, moderator, mediator

CHAPTER 1

INTRODUCTION

1.0 Introduction

The people are the key to innovation (Bessant & Tidd, 2011) and the undergraduates in Malaysian higher education institutions are the prospect of Malaysian innovators (Ministry of Science, Technology and Innovation, 2012; Ministry of Higher Education, 2012). Nurturing nations' innovation orientation that creates value and positive changes to the country is very important for economic sustainability and competitiveness (Ministry of Higher Education, 2012; Bessant & Tidd, 2011). Therefore, efforts related to innovation orientation nurturing in Malaysia especially in the higher education institutions has started since 2010 (Ministry of Higher Education, 2012).

Many scholars associated innovation with the ability to make change (Scott & Bruce, 1994; Tang, 1998). In fact, all form of change is the catalysts of innovation. Based on Bessant and Tidd (2011), types of changes in innovation are segmented into four main dimensions. It is either product innovation, process innovation, position innovation or paradigm innovation. Product innovation is the most commonly associated with innovation. In which it defines changes made to the product or services. While process innovation is changes in the technique something is produced and delivered. Whereas position innovation is changes made in term of segmentation of its' introductory. Lastly, paradigm innovation is changes in the fundamental intellectual perspective about how organisation operated.

Based on behavioural scientist, people usually experience several tendencies simultaneously and committed to multiple goals everyday. Most people will process all stimulation in their surrounding, then anticipate consequences and finally act upon it. Consistency of one's action towards achieving the anticipate purpose is defined as their orientation (Kuhl, 1985). Orientation is defined as one's behavioural intention towards achieving certain goals (Ajzen, 1991). Based on Webb, Webster and Krepapa (2000), orientation is defined as type of a person's intellectual tendency toward an issue. Vallacher and Wegner (1987) defined orientation as the receptive attitude of a person and it regulates one's action related to achieve a mission. Orientation is indicated through the intensity of one's behaviour and action (Ajzen, 2002). Concisely, orientation is defined as one's behavioural inclination and action towards a subject (Kuhl, 1985; Ajzen, 2002; Webb et al., 2000).

Innovation orientation connotes a high degree of receptivity and willingness to engage in value creation activity. In Malaysia National Innovation Strategy, the term innovation orientation is coined as Innovating Malaysia that brings the connotation of innovation orientated Malaysian (Agensi Inovasi Malaysia, 2012). The pairing of innovation and orientation which, latter called innovation orientation of a person is one's behavioural and attitude to create new product, process or service that offers demanded value to the market. Therefore, innovation orientation is one's receptive behaviour towards creating new solutions to achieve specific objectives, thus it outcome possesses the potential to be commercialised. In term of subject, this research is contextualised to undergraduate students in Malaysian higher education institutions.

Undergraduate students are perceived to be in the most suitable point to be groomed as the future innovators. This view is shared by industries and multinational companies that operated in the country. These companies and industry believed their involvement in nurturing innovation culture among the undergraduates would eventually help the sustainability of innovative human capital supplies to the industry. Other than eyeing for that returns, this is also one way of fulfilling their community service responsibilities through sharing their expertise with the university undergraduates through internship programs. In addition, the manufacturing and industries operators in Malaysia hold competitions related to innovation to promote active participation among the undergraduates. The innovation competitions are one of the platforms for undergraduates to exercise and experiment their innovation knowledge.

Innovation competition fosters innovative human capital among undergraduates (Malaysian Administrative Modernisation and Management Planning Unit, 2010). However, the dependency of innovation on competitions is only an aspect of sustaining innovation endeavour. Entrepreneurial orientation is another important catalyst for lasting innovation orientation. Entrepreneurial orientation is a self-willingness to involve in commercialising innovation and take charge of the risk for the sake of making profits.

In higher education institution landscape, the Ministry of Higher Education had made it compulsory for all undergraduate in the public universities to enrol in an introductory course on entrepreneurship since 2010 (Ministry of Higher Education, 2012). The idea of introducing the entrepreneurship course is to instil entrepreneurial

mind-set and thus generate more creation of new products, processes, services and technologies to the nation through innovation commercialisation (Norasmah & Faridah, 2010). It is believed that innovation and entrepreneurship is the essence of Malaysian socio-economic sustainability and improvement (Agensi Inovasi Malaysia, 2012; Asian Development Bank, 2012). This is because entrepreneurs react to market opportunities to generate business income by introducing solutions to the market either, through consumer goods or services by exercising their innovation orientation (Drucker, 1985; Miller, 1983; Iversen, Jorgensen & Malchow-Moller, 2008).

1.1 Background of the Study

Throughout East Asia, the urgency of nurturing innovation oriented human capital is pressing (The World Bank, 2012; Asian Development Bank, 2012). Thus, the Malaysian government policy was shifted from resources based to innovation-oriented economy (National Economic Advisory Council, 2010; Agensi Inovasi Malaysia, 2012). The Malaysian government believes innovative human capital is the antecedent that will help Malaysia achieve high-income status by the year 2020 (Ministry of Finance, 2012; Agensi Inovasi Malaysia, 2012). Innovation will boost new value creation manifested in terms of new products and services thus create competitive edges in the gross-national-product market competition for Malaysia. Although the importance of innovative human capital factors in innovation is recognized, there are fewer attempts to draw human factors together into one coherent model or framework (Gunnarsdottir, 2013).

In term of economic competitiveness ranking, Malaysia is ranked at 21 out of 142 countries (World Economic Forum, 2012). The report examined factors enabling national economic growth and countries' long-term prosperity through twelfth pillars of competitiveness: institutions, infrastructure, macroeconomic stability, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market sophistication and innovation (World Economic Forum, 2012). Two of the twelfth pillars that are related and connected in this research are higher education and training, and innovation. Earlier research shows there is a direct relationship between countries' innovation and its economic development (Bessant & Tidd, 2011; Azim & Suraya, 2010; Shavinina, 2013).

The volume of innovation oriented human capital affected innovation product, process and service outcome (Agensi Inovasi Malaysia, 2012). For higher education stakeholder, it should be acknowledged that the quantity of university-graduated skilled-worker is an important contributing factor for innovation (Asian Development Bank, 2012). Based on the World Development Indicator, the gross enrolment rate in tertiary education in Malaysia is 30.2 per cent of its total population (The World Bank, 2007). Since the gross enrolment rate in Malaysia is below 50 per cent of its total population, it is tough to obtain sufficient number of skilled and innovative human capital (IHC) in Malaysia, out of the 30 per cent university graduated population in the country (World Economic Forum, 2012; Asian Development Bank, 2012; Agensi Inovasi Malaysia, 2012). As the technology becomes more skill biased and innovation competitive pressure intensify, Malaysia needs more innovative human capital (Agensi Inovasi Malaysia, 2012). The country desperately needs larger number of university graduated skilled workers (Ministry of

Finance, 2012; Agensi Inovasi Malaysia, 2012). The shortage of science and technological skilled graduates will definitely distort the innovation-led aspiration in Malaysia (Ministry of Science, Technology and Innovation, 2010; Agensi Inovasi Malaysia, 2012).

In the recent Global Competitiveness Report (GCR), Malaysian Higher Education and Training, the fifth pillar of competitiveness is ranked 38th (in GCR 2011-2012), 49th (in GCR 2010-2011) and 41st (in GCR 2009-2010) (World Economic Forum, 2012). These 38th, 49th and 41st rankings means Malaysia's higher education and training standards are stagnant since 2009 to 2012 (World Economic Forum, 2012). For Malaysian to improve its total competitiveness further, Malaysia needs to improve her higher education and training system (World Economic Forum, 2012). Higher education stakeholders must take up this challenge and improve the university system in response to the innovation-led economy aspiration because innovation-led economy aspiration is built on competitive human capital that has gone through excellent higher education system (Malaysia Administrative Modernisation and Management Planning Unit, 2010; Agensi Inovasi Malaysia, 2012).

The Malaysian government has initiated many initiatives concerning the innovation-led economy (Malaysia Administrative Modernisation and Management Planning Unit, 2010). The Special Unit for Innovation or *Unit Inovasi Khas* (UNIK) was established under the Prime Minister's office to act as the focal point for innovation in Malaysia (Agensi Inovasi Malaysia, 2012). UNIK drives innovation strategies and policies while Malaysian Innovation Agency or *Agensi Inovasi*

Malaysia (AIM) was established to acts as the implementation arm for innovation related initiatives (AIM, 2012). At the national level, UNIK and AIM establishments are to drive the surge forward towards developing innovative human capital (Agensi Inovasi Malaysia, 2012). To support the National Innovation Strategy formulated by Agensi Inovasi Malaysia, the Ministry of Higher Education established Research Universities (RUs), Acceleration Program for Excellence (APEX) programs and Higher Institution Centres of Excellence (HICOEs) in universities (Ministry of Higher Education, 2012). These three main initiatives are to provide markers that show the development of university and specific science standard among the universities in Malaysia (Ministry of Higher Education, 2012).

To ensure higher education institutions in Malaysia remain competitive, the Higher Education Ministry in Malaysia established research, development and innovation centres within the public universities called the Higher Institution Centres of Excellence (HICOEs). The HICOEs are the forefront research institutes in selected areas. The HICOEs are considered as prominent institutes that have the reputable credibility to offer services and expertise at the national and international level. This is in parallel with the aspiration of the National Higher Education Strategic Plan to strengthen innovation orientation among academics and students in Malaysian universities. As of now, six research institutes in Malaysian public universities are recognised and awarded with HICOE status (Figure 1.1). The Ministry of Education Malaysia plans to have at least twenty HICOEs in Malaysia. Since then, many research institutes in Malaysian university have worked towards getting the HICOE status. This award was believed to have motivated many research institutes in Malaysian universities to put extra efforts in succeeding research and

innovation. It is hoped that the HICOE initiatives will change the higher education research innovation and creativity scenario in Malaysia (Agensi Inovasi Malaysia, 2012). The Ministry of Education Malaysia is working together with other ministries and supports the research institutes within the universities that have the potential to become HICOE by providing research funds, monitoring and provide guidance so that Malaysia will be competitive both regionally and internationally.

No.	HICoE	University	Focus
1.	UM Centre of Research for Power Electronics, Drives, Automation & Control (UMPEDAC)	Universiti Malaya (UM)	Renewable Energy
2.	UKM Medical Molecular Biology Institute (UMBI)	Universiti Kebangsaan Malaysia (UKM)	Cancer Biomarkers
3.	Institute for Research in Molecular Medicine (INFORMM)	Universiti Sains Malaysia (USM)	Diagnostics Platforms
4.	Institute of Bioscience (IBS)	Universiti Putra Malaysia (UPM)	Animal Vaccines and Therapeutic
5.	Centre for Drug Research (CDR)	Universiti Sains Malaysia (USM)	Behavioural Research in Addiction
6.	Accounting Research Institute (ARI)	Universiti Teknologi MARA (UiTM)	Islamic Finance Criminology

Figure 1.1 List of HICOE in Malaysian universities

The Ministry of Higher Education Malaysia had introduced Acceleration Programme for Excellence (APEX) initiatives to accelerate the quality of universities in Malaysia by focusing on the potential winners (The World Bank, 2012; Ministry of Higher Education, 2012). APEX program is to develop world-class standard

university in Malaysia. The APEX initiatives were aimed to boost the research, development and commercialisation of scientific research outputs and turn them into Intellectual Property (IP) (Ministry of Higher Education, 2012). Through the transition from teaching oriented to research oriented university, the APEX-university is also benefited from the full autonomy of the university administration (Ministry of Higher Education, 2012). Since the introduction of the APEX program, a substantial amount of research grants was given to Universiti Sains Malaysia since 2009 to 2012 (Ministry of Higher Education, 2012; Ministry of Science, Technology and Innovation, 2012).

Other than the APEX initiatives, Research University (RU) status has benefited five premier universities in Malaysia namely Universiti Malaya, Universiti Kebangsaan Malaysia, Universiti Putra Malaysia, Universiti Sains Malaysia and Universiti Teknologi Malaysia (Ministry of Higher Education, 2012). Both RU and APEX initiatives aimed to foster innovation and technological evolution in universities in Malaysia. The RUs are expected to take up basic research to generate new ideas and initiate the process of transforming their ideas into innovation with potential commercial relevance (Agensi Inovasi Malaysia, 2012).

In term of knowledge transfer and soft skills enhancements, the Ministry of Higher Education Malaysia had introduced Higher Education Entrepreneurship Development Policy or *Dasar Pembangunan Keusahawanan IPT* for all Malaysia Public Higher Education on 13 April 2010 (Ministry of Higher Education, 2012). *Dasar Pembangunan Keusahawanan IPT* emphasised on university's function as the home grown of graduates innovators and entrepreneurs (Ministry of Higher

Education, 2012). This will support the economic development through supplying the pipeline of innovators and entrepreneurs that will be the frontier of the Malaysia New Economic Model (Ministry of Higher Education, 2012). In response to the policy, all universities in Malaysia had introduced entrepreneurship subject as one of the university compulsory co-curriculum for undergraduates (Norasmah & Faridah, 2010).

In less than two years' time, most of the universities have established an entrepreneurship centre at their respective university. The centre had become an important venue for the undergraduate entrepreneurial activities that is in tandem with the Ministry of Higher Education entrepreneurship aspiration (Ministry of Higher Education, 2012). The introductory course to entrepreneurship exposed the undergraduates to entrepreneurship through academic lecture, entrepreneurship seminars and forum, theoretical examination, sale carnival and business plans exercise (Ministry of Higher Education, 2012).

Earlier research argues that the undergraduates do not possess entrepreneurial orientation (Lilia, Nor Aishah & Mohd Meera, 2009; Hynes, 1996). Without entrepreneurial orientation, the undergraduates will not exhibit innovativeness. Misconception on the purpose of entrepreneurial education among students and lecturers at the university is a problem (Nor Aishah, 2005; Norasmah & Faridah, 2009). Diagnosis on students' entrepreneurial self-efficacy proved that entrepreneurial self-efficacy among the Malaysian undergraduates is low (Nor Aishah, 2005; Norasmah & Faridah, 2009). Many research in entrepreneurship emphasised that entrepreneurial orientation and entrepreneurial self-efficacy are the

contributing factors of innovation performance in Small-Medium-Enterprise, business and profit oriented organisation (Bessant & Tidd, 2010). The statement is overgeneralised into the context of undergraduate student in university. The evidence regarding the relationship between entrepreneurship and innovation among undergraduate in Malaysia is vague.

The quantity of the Malaysian undergraduates' innovation output is unsatisfactory due to the lack of creativity (Agensi Inovasi Malaysia, 2012). The quality of undergraduates' innovation output such as their new product and service solutions rarely win the innovation challenge at the international level such as the British Innovation Convention or International Exhibition of Inventions in Geneva, Switzerland mainly due to the low score on creativity and showmanship (Agensi Inovasi Malaysia, 2012). Failure in exercising creative imagination to produce an outcome that is beyond conventional and possess differentiation is an indication of low creativity. Creative aspects such as designing something that deviates from the norms and does not compensate just technology is a skill that is absent among undergraduates.

Undergraduates are not aware of the manufacturing and business constraints without focusing on these aspect leads to a mismatch in buying-in of the innovation prototype from prospects stakeholder (Agensi Inovasi Malaysia, 2012). The absence of creativity friendly education, environment and exposure in universities lead to creativity inactivated undergraduate in Malaysia. Conventional thinking such as creativity education that is bound to fine arts, performance arts and arts classes will stifle innovation related to engineering and technology. Creativity in engineering,

product design and technology based subjects should be nurtured in order to construct innovation orientation. This research attempts to uncover the association between students' creativity and their innovation orientation.

The most important prerequisite to nurture innovation orientation is to design innovation motivation among the undergraduates (Gemmell, Boland & Kolb, 2011). According to Amabile (2012), failure in innovation nurturing is because the universities resist changing their evaluation and compensation system to include aspects of innovation for their undergraduate students. When the innovation journey gets harder and the incentive model compensation is dismal, innovation activities will eventually die (Agensi Inovasi Malaysia, 2012). Ultimately, students do what they are motivated and compensated to do. This is especially significant for the Malaysian university undergraduates who claim to be examination-oriented student (Norasmah & Faridah, 2010).

Malaysia will lose good innovative students if the higher education institutions do not encourage participation in innovation activities or provide compensations or rewards for innovation other than academic performance (Agensi Inovasi Malaysia, 2012). This could lead to loss of talents at the undergraduate level to fulfil the innovative human capital aspiration. Innovation motivation is not properly designed to attract participation among undergraduates in Malaysian universities. Innovation orientation is leaning towards creating business value, and some created social value (Bessant & Tidd, 2011; Azim & Suraya, 2010).

Innovation orientation that is sensitive towards business value is motivated by business profit. While, social value innovation orientations are created by a desire to see things change and making the world a better place (Bessant & Tidd, 2011). Example of social innovation orientation are improving the quality of life, improving the access to basic resources and supporting disadvantage group. These social values or business profit values among the people who possess innovation orientation are related to ones' motivation for innovation (Gemmell, Boland & Kolb, 2011). However, motivation towards monetary rewards without equal balance with social benefit will cause 'moral hazards' among the innovation orientation nation (Agensi Inovasi Malaysia, 2012).

Bessant and Tidd (2011) defined innovation orientation as ones' ability to spot on the opportunity to do new things and the ability to convert their ideas into economic values or social values. According to Ford (1996), Drucker (1985) and Schumpeter (1963) the core of innovation is ones' inner inspiration that urge to make change in the environment or is called the creativity. Secondly, innovation is driven by ones entrepreneurial orientation (Miller, 1983). The powerful mixture of innovativeness, proactiveness and risk-taking judgement are the power that drives ones' innovation orientation (Miller, 1983). Thirdly, in innovation one must possess self-confidence to execute the innovation initiatives. The self-confidence are based on belief and prior knowledge to execute the idea into valuable product or services. This is usually called entrepreneurial self-efficacy (Bandura, 1999). Aside from ones' creative human spirit, strong entrepreneurial drive, high entrepreneurship self-confidence, innovation must be result oriented. These are the absent factors in the undergraduates to innovate.

According to Sweida and Reichard (2013), figures and statistics in the United States showed that women entrepreneur is growing. However, the irony is, they did not venture into high-growth industries, which traditionally is male dominated. Women entrepreneurs lack the ability to secure high financial capitals for high-growth industries and more risk averse than male entrepreneurs (Anna et al., 1999). Therefore, even though there are many women entrepreneurs in the United States, they are not significant contributors of innovation performance for the country.

Findings by Gupta et al. (2008) and Wilson et al. (2007) showed that in general women have lower intention to engage in entrepreneurship than men do. Innovation orientation type of enterprise is classified as the high-growth enterprise, which drives the innovation in countries (Carland et al.,1988). Nevertheless, women entrepreneurs are content with owning low-growth enterprise business (Morris et al. 2006). Some researchers found that in developing countries, discrimination on women entrepreneurs is an issue and barrier to be conquered by women entrepreneurs to venture into the high-growth business. Wilson et al. (2007) found that women undergraduate students' entrepreneurial self-efficacy is lower than the man's.

1.2 Problem Statement

The analysis of capacity and capability gaps in the Malaysian economy indicated clear shortcomings of higher education in delivering sufficient amount of innovative human capital (The World Bank, 2012). In a report by The World Bank, the issue of producing innovative human capital in higher education institutions in Malaysia is not being managed as a system, but as individually disconnected

institutions (The World Bank, 2012). Holistic or seamless approach to nurture innovative human capital at the tertiary education level is needed (The World Bank, 2012). The report from the National Economic Advisory Council (2010) concluded that innovative human capital supply from the higher education institutions are still not grasping a secure standard to enable Malaysian economy to grow.

According to National Economic Advisory Council (2010) determinations to nurture innovative graduates in Malaysia are scarce. The indicators are reflected by the comparatively tiny amount of researchers in Malaysia and frail performance of local peoples' innovation (National Economic Advisory Council, 2010). While many authoritative bodies have highlighted on the insufficient innovative human capital in Malaysia, research on modeling the antecedent factors of producing innovative human capital are limited. Many of the research related to capacity building of innovation orientation human capital are focusing on business unit, multinational companies and enterprises. Malaysian education stakeholders are in dire need of the clues to nurture innovative human capital in school and university.

Factors such as students' creativity, entrepreneurial orientation, innovation motivation and entrepreneurial self-efficacy have not been tested simultaneously as a model of innovation orientation for Malaysian undergraduate students. Innovation in Malaysia can be amplified when the factors that associate to building innovation orientation undergraduate is identified through testing the model fit in undergraduate context. There are researches on model of innovation orientation related to organizational behaviour (Mavondo et al., 2005; Lau & Ngo, 2004; Naranjo-Valencia et al., 2011; Scott & Bruce, 1994; Moulaert & Sekia, 2003). However, there

are limited model of innovation orientation related to individual psychological behaviour factors particularly in the undergraduates' context. This research attempts to close this gap. The absence of a specific model of innovation orientation focusing on psychological aspect leaves a vacuum in research of higher education innovation nurturing. Heuristic attempts on the various combinations of remedies to produce innovation-oriented student is costly and less effective. Exploratory on the appropriate model of factors that associate to building innovative human capital at the tertiary education are long overdue.

The imbalance between male and female undergraduates enrolled in Malaysian universities do affects the development of innovation aspiration. According to Treanor (2012) the issue of gender aware entrepreneurship education is currently very limited in the field of veterinary education in the United Kingdom. In a study by Henry, Baillie and Treanor (2010) the key change within the veterinary profession has been the recent gender shift of veterinary professionals. Historically, veterinary medicine was a male profession (Treanor, 2012). Treanor (2012) mentioned that based on the Royal College of Veterinary Surgeons' (RCVS), United Kingdom register; currently the number of women veterinarians in practice slightly outnumbers men. Currently, 80 percent of the undergraduate students' population consisted of female. This would suggest that sex composition within the profession will continue in future. Treanor (2012) suggested that, 'labelling' the change in sex composition with the profession as a 'gender problem' was unhelpful in solving the issue.

It can be summaries that, the model of innovation orientation among undergraduate students might differ according to gender. However, the properties associated to innovation orientation factors between gender might be similar. This gender differences is a challenge to the education system to nurture innovation among its people. Specific adjustment and customisation is needed since the two genders behave differently.

1.3 Research Aims

This research aims to test a model that exhibits a combination of factors that are associated with innovation orientation. The factors are conceptualised based on the Theory of Componential Creativity and Innovation (Amabile, 2012). They are association among entrepreneurial self-efficacy, innovation motivation, creativity and entrepreneurial orientation variables on innovation orientation of Malaysian undergraduates. Specifically, this research attempts to examine whether or not the causal dependence relationships adequately matched the Malaysian undergraduates data. This is done by simultaneously evaluating multiple relationships among the latent variables employing structural equation modeling.

Secondly, this research aims to evaluate on the innovation orientation structural model's variability as a function of gender. Analysis of multiple group comparisons is employed to test the significance of gender moderation effect. This aim is to ascertain that the structural model of innovation orientation among undergraduates in Malaysia conforms to the Gender Constant Theory (Kohlberg, 1966) i.e. innovation orientation structural model is gender specific.

Based on the Social Cognitive Theory (Bandura, 1999) entrepreneurial self-efficacy has a significant mediation effect on innovation motivation, entrepreneurial orientation and creativity variables' exertion into innovation orientation. If this condition is true, in practice perceived entrepreneurial self-efficacy should be addressed to promote undergraduates' innovation orientation. Therefore, this mediation analysis aimed to uncover whether there is a mediator effect of entrepreneurial self-efficacy in the chain of relationship between the predictors and outcome.

1.4 Research Questions

The study aimed to answer the following research questions.

1. Is there a positive association in the case of Malaysian undergraduates between innovation orientation and
    a. entrepreneurial orientation?
    b. creativity?
    c. innovation motivation?
    d. entrepreneurial self-efficacy?
2. Is there a positive association in the case of Malaysian undergraduates between entrepreneurial self-efficacy and
    a. entrepreneurial orientation?
    b. creativity?
    c. innovation motivation?
3. Does entrepreneurial self-efficacy among the Malaysian undergraduates mediates the relationship between
    a. entrepreneurial orientation and innovation orientation?

b. creativity and innovation orientation?

c. innovation motivation and innovation orientation?

4. Does gender moderates the constructs' relationship in the structural model of innovation orientation?

1.5 Hypothesised Model

The relationship between innovation orientation and its enablers in the context of Malaysian undergraduate students is based on Stimulus-Capacity-Performance Model of Innovation (Prajogo & Ahmed, 2006; Smith et al., 2012). In this research, stimulus factors are innovation motivation and entrepreneurial self-efficacy. Innovation stimulus offers a direction to expend effort towards realizing the potential to innovate (Smith et al, 2012). It is argued that efforts directed to maximise ones' innovation potential need to be adequate. In the absent of adequate effort, innovation potential will remain unleash. While the enabling factors to innovate is called the innovation stimuli.

Ones' creativity and entrepreneurial orientation is referred as their innovation capacity. Innovation capacities determined ones' entrepreneurial and creativity ability and strength. We start the proposition of creativity and entrepreneurial orientation as the innovation capacity based on the suggestion that the innovation antecedents are ones' creativity and ability to convert ideas into profitable item (entrepreneurial capability). Based on Prajogo and Ahmed (2006); Smith et al. (2012), students' ability to expand and utilize new knowledge which is similar to creativity and entrepreneurial orientation is their innovation capacity.

In turn, the extent of the capacity held by students and stimulus responses determine their performance in innovation (innovation behaviour). Students' performance in innovation in the context of higher education is measured by their affective domain (self-attribute) towards innovation behaviour, which is presented in the affective model of innovation orientation. The affective model of innovation orientation in Malaysia is defined in a dynamic state, which is to portray the present state of innovation orientation environment to produce innovative human capital in the context of undergraduate student in Malaysia.

The same model has been tested to provide relationship indication between stimuli measure, capacity and innovation performance in Australia by Smith, Courvisanos, Tuck and McEachern (2012). Based on Smith et al. (2012); and Prajogo and Ahmed (2006), innovation process begins because of the stimulus responses and ones' innovation capacity.

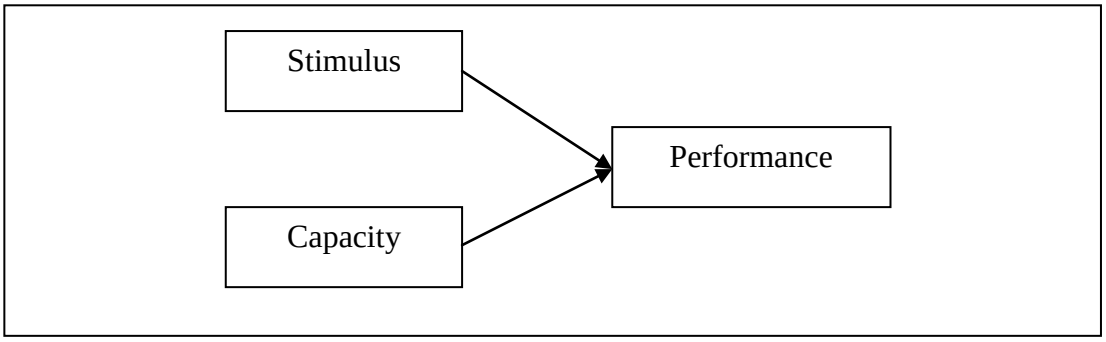

Figure 1.2 Stimulus-Capacity-Performance model of innovation (Prajogo & Ahmed, 2006)

In this framework, innovation motivation and entrepreneurial self-efficacy are regarded as the stimuli. Students' creativity and entrepreneurial orientation are regarded as ones' innovation capacity. Therefore, innovation motivation,

entrepreneurial self-efficacy, creativity and entrepreneurial orientation are the antecedent factors of students' innovation orientation. The relationships between innovation orientation, creativity, entrepreneurial orientation, entrepreneurial self-efficacy, and innovation motivation is hypothesised based on the Theory of componential creativity and innovation (Amabile, 2012). The mediation effect of entrepreneurial self-efficacy on the exertion of all predictors into innovation orientation is based on the Social Cognitive Theory (Bandura, 1999). The objective of testing the innovation orientation model is to confirm innovation orientation positive relationship with these stimuli and capacities. Gender moderation effect on the innovation orientation model constructs' relationship are also tested. These conditional relationships lend support from the Gender Constant Theory (Kohlberg, 1966).

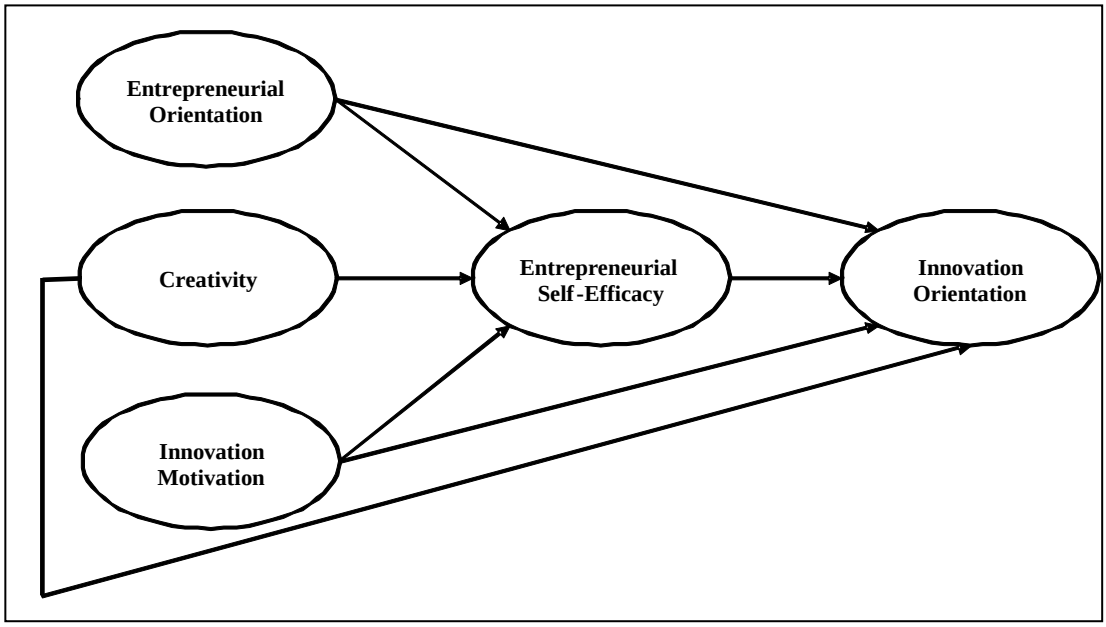

Figure 1.3 Hypothesised model

The following hypotheses are based on the hypothesised model (Figure 1.3):

Hypothesis 1: Entrepreneurial orientation is positively associated with innovation orientation.

Hypothesis 2: Creativity is positively associated with innovation orientation.

Hypothesis 3: Innovation motivation is positively associated with innovation orientation.

Hypothesis 4: Entrepreneurial self-efficacy is positively associated with innovation orientation.

Hypothesis 5: Entrepreneurial orientation is positively associated with entrepreneurial self-efficacy.

Hypothesis 6: Creativity is positively associated with entrepreneurial self-efficacy.

Hypothesis 7: Innovation motivation is positively associated with entrepreneurial self-efficacy.

Hypothesis 8: Entrepreneurial self-efficacy mediates the exertion of entrepreneurial orientation to innovation orientation.

Hypothesis 9: Entrepreneurial self-efficacy mediates the exertion of creativity to innovation orientation.

Hypothesis 10: Entrepreneurial self-efficacy mediates the exertion of innovation motivation to innovation orientation.

Hypothesis 11: Gender moderates the structural model constructs' relationship.

These relationships between innovation orientations to its hypothesised antecedents are tested applying the Structural Equation Modeling technique using AMOS software.

1.6 Significance of Research

This research is in response to the Ministry of Higher Education policies such as *Dasar Pembangunan Keusahawanan IPT* (2010), MOHE-Implementation Plan for

Development of Innovative Human Capital Plan (2012), National Higher Education Strategic Plan (2007-2010) and National Innovation Strategy-Innovating Malaysia (2010) relating to the Malaysian undergraduates' innovation orientation. In the preceding policy documents, the subject of nurturing innovative human capital is the focus. Therefore, it is timely to conduct research on examining the innovation orientation model and its enablers among undergraduate students in Malaysia.

Furthermore, the findings from this research will allows scholars in higher education to comprehend the relationships between innovation orientations to its imperatives to develop the innovation behaviour among the Malaysian university undergraduates. The policy to inculcate creativity, innovation orientation and entrepreneurial orientation in Malaysia higher education has been formulated in macro perspectives namely; HEIs Entrepreneurship Development Policy (2010) (*Dasar Pembangunan Keusahawanan IPT*), Entrepreneurship Strategic Plans at HEIs (2013) and MOHE-Implementation Plan for Development of Innovative Human Capital Plan (2012). The policies require detailing and confirmation through authoritative research before transferring these policy recommendations into actions (Ministry of Higher Education, 2012). Therefore, the value-added of this research is on uncovering the relationship between factors concerned with the imperatives of undergraduates' innovation orientation stimuli and capacities. Accordingly, the research findings provide evidence to the education stakeholder in making specific changes to foster innovation behaviour in university.

While there are numerous researches on factors that contribute to innovation orientation improvement in the Small Medium Enterprises and business profit-

oriented organisations (Boyd & Vozikis, 1994; Chen, Greene & Crick, 1998; Co & Cooper, 2011; Dermol, 2010; Fitzsimmons & Douglas, 2005; Hult, Hurley & Knight, 2004; Gibb, 1993) no research has proposed an affective model of innovation orientation among students in higher education context. The Stimulus-Capacity-Performance innovation model was tested and focused on innovative human capital building among organisations in Australia (Prajogo & Ahmed, 2006; Smith et. al., 2012). Testing the Theory of Componential Creativity and Innovation (Amabile, 2012) in the hypothesised model of innovation orientation in the context of Malaysian undergraduates will close this gap.

This research contributes a structural model of innovation orientation for undergraduates in Malaysia particularly in the field of educational psychology of innovation. The structural model depicts undergraduates' perceived creativity, innovation motivation, entrepreneurial orientation, entrepreneurial self-efficacy and innovation orientation causal dependent relationship. The proposed structural model of innovation orientation is to ascertain the Theory of Componential Creativity and Innovation (Amabile, 2012). Entrepreneurial self-efficacy's mediation effect on the predictor variables based on the Social Cognitive Theory (Bandura, 1999) are also tested. Furthermore, the change in the relationship of the structural model constructs in response to gender is to ascertain the Gender Constant Theory (Kohlberg, 1966).

1.7 Research Limitations

This research is based on the Theory of Componential Creativity and Innovation (Amabile, 2012), Social Cognitive Theory (Bandura, 1999) and Gender Constant Theory (Kohlberg, 1966). Thus, the research on the subject of innovation