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An Innovative Model Bringing International Doctoral Training Opportunities to ASEAN Students

Fiona Lacey¹, Dinh Thanh Viet²
¹Aston University; ²University of Danang

Abstract

Purpose – The aim of this paper is to inform the conference about a new model of cross-institutional doctoral training being developed between Aston University and the VNUK Institute of Research and Executive Education (VNUK) in Da Nang.

Design/ Methodology/ Approach - Aston University and VNUK are delivering a Higher Education Partnership (HEP) project, co-funded by the British Council Vietnam, researching doctoral training models and governance. The project has focused on identifying and sharing best practice in university governance and quality assurance procedures between the UK and Vietnam. During the research phase of this project the rules and procedures governing doctoral training in the UK and in Vietnam were compared and discussed with various stakeholders, both institutional and national. This process led to the development of new proposals for transnational co-operation in doctoral training, with the potential to increase the options for high quality doctoral training in Vietnam and the wider ASEAN region. Initial findings from the HEP project are shared as a basis for discussion of the need for and benefits of the proposed transnational doctoral training “hub”.

Findings – A cost-efficient model of high quality, transnational doctoral training leading to the award of a UK PhD is proposed. The doctoral training “hub” model is suggested to ensure sufficient capacity to provide multidisciplinary research training and to generate sustainable research networks for the future.

Research limitations – The proposal is based on a small scale, mainly qualitative study of participants in doctoral training in Vietnam, and discussions with similar stakeholders in the UK. Proposals made are for preliminary discussion and require development and approval by institutions and national agencies before they can be implemented.

Originality/ Values – This presentation (and the proposal for a new, partnership driven model of transnational doctoral training herein) has relevance for the education ministries in ASEAN countries who provide scholarships for doctoral training, as well as for universities and students in Vietnam and the UK.

Keywords: Transnational; Doctoral training centre; Doctoral training hub; Higher education; Innovation

1. Introduction

Research everywhere is dependent upon funding, and this includes the need for funding of the training of future researchers to doctoral level. In Vietnam, the Vietnam International Education Department (VIED) which is part of the Vietnamese Ministry of Education and Training (MOET) provides lecturers in Vietnam with opportunities to undertake research training abroad through its Project 911. In addition, there has been bilateral co-operation between the funding organisations in the UK and Vietnam with the launch of 911-Newton PhD Scholarships in 2015, administered by the British Council Vietnam. Project 911 has the objective to upskill existing lecturers to doctoral level, and for the duration of the scheme (2010 to 2020) aims to send up to 1,500 persons per year abroad for training (MOET website) to institutions with a signed agreement with MOET.

Doctoral training programmes in the UK are often of a shorter duration than those of other international destinations for 911 scholars; however, MOET data showed that out of 1,300 students...
funded in one year, only 80 came to the UK for study. One factor in this could be the comparative cost of studying in the UK. This paper proposes one way in which this potential barrier to UK doctoral training could be overcome.

1.1 Transnational education (TNE)

Transnational education (TNE) was defined by HE Global as “education delivered in a country other than the country in which the awarding institution is based”. Some definitions of TNE include the assumption that students will be able to study for awards without leaving their own country, whereas the proposition made in this paper has a looser definition, whereby students can be awarded a UK degree after undertaking a significant proportion of their home country.

Transnational education programmes awarded by UK higher education institutions cover the whole range of possible awards; undergraduate, postgraduate masters and doctorates. Indeed, the UK has led the world in TNE for over 20 years (McNamara and Knight 2015). Overall, the proportion of UK awards made through TNE is weighted in favour of undergraduate awards, with 47% of programmes overall and 66% of TNE students enrolled on undergraduate programmes in the latest survey from 2014/15 (HE Global 2016). In the same survey, 44% of programmes and 28% of student enrolments were postgraduate taught. The balance of TNE programmes at UG or PG level does vary with subject area, however, with postgraduate programmes being in the majority for subjects such as medicine, other science subjects and education, whereas UG TNE programmes are more common in the fields of Arts and humanities, maths and computing.

In all fields of study, there are relatively small numbers of postgraduate research programmes—which would include doctoral programmes. The field of Medicine and related subjects had 8% of TNE programmes at postgraduate research level, and similar figures were found for engineering (7%) and Arts and Humanities (6%). Education had 13% of its UK TNE programmes delivered at PG research level whereas Business and management (which represents the field with by far the greatest total number of UK TNE programmes) had very few (<1%). HESA records show that there were at total of 4,965 students enrolled on UK TNE research doctorates in 2014/15, out of a total of 665,995 students enrolled on UK TNE awards (British Council, 2016).

The proposals here come from the partnership between VNUK at the University of Danang, and Aston University in the UK.

UK TNE partners
Two countries in the ASEAN regions are consistently amongst the top three countries that are recipients of UK TNE programmes: Malaysia and Singapore. Students in recipient countries can study for UK awards in many ways, from distance learning, to blended learning supported by local tutors or UK “flying faculty”, to fully franchised programmes taught by the host partner organisation (HE Global 2016). Such models of UK TNE are being developed with other countries in the ASEAN region such as Vietnam, but the proposal here will focus on a model of postgraduate research TNE that involves study in both the UK and the host country.

1.2 Models of doctoral training

Doctoral training in the UK
The training of PhD students in the UK is intimately linked to the way research is funded in the
country. Initially, the higher education sector in the UK was funded primarily by the state, and research funding came from two main sources. Firstly, funding for research infrastructure at Universities came from the University Grants Council (which was abolished in 1989) and secondly, funding for training and projects came from the UK Research Councils. This system ensured that peer reviewed research of the highest quality was supported, as well as providing well-maintained facilities. (Lunt et al, 2014).

Moves to ensure accountability for the use of UK public funds, along with pressures on public funding in general have led to many changes in the funding of research since these early days. Introduction of quality-related funds to institutions from the Funding Councils based on the outcome of the “Research Assessment Exercise” in the 1980’s replaced the block grants from the University Grants Council. The four main Research Councils created in 1965 joined together in 2000 as Research Councils UK (RCUK), which today continues to award PhD studentships every year. However, the individual Research Councils are moving from the award of stand-alone studentships towards supporting research through themed Centres for Doctoral Training (DTCs) or through Doctoral Training Partnerships.

UK Doctoral Training Centres:
Doctoral training centres (DTCs), as recognised and supported by the UK Research Councils, are institutions (or groups of institutions,) which provide the expertise and facilities to train researchers in specific themed, interdisciplinary areas. Students are funded at these DTCs for a period of 4 years, during which they will receive training in technical and transferrable skills as well as the research element of a UK PhD award. This is compared to the more “traditional” expectation that a UK PhD will be completed within 3 years.

The benefits to doctoral students is that they are not be trained in isolation therefore building research networks for the future. Also, because of the integrated nature of the training received the students develop a range of personal and professional skills in addition to their research development, which prepare them for their future careers. The research capacity provided at a doctoral training centre also allows a multi-disciplinary approach to research priority areas, thus providing the best use of funding resources.

Aston Universities support for doctoral training.
Aston University is a partner the Midlands Graduate School Doctoral Training Partnership, a doctoral training network funded by the ESRC. Aston also supports the training of its entire postgraduate student population through the Aston Graduate School, thus ensuring that students have the opportunity to access a variety of training opportunities as well as undertaking the research component of a UK PhD award.

The proposals for a transnational doctoral training “hub” discussed later are based around the support already provided by the Aston Graduate School, and the quality procedures for doctoral training already in place at Aston. They also reflect the multidisciplinary nature of the research undertaken at Aston, and the experiences of co-operative research between Aston academics and researchers at VNUK and other institutions in Vietnam.

2. Preliminary findings from the HEP Project

2. 1. Methodological considerations.
A small scale survey was undertaken in Vietnam to inform the discussions during the project phase at Aston. The survey was given to participants at meetings held at VNUK, allowing some limited opportunity for discussion. 143 PhD students were invited to the meeting, 37 attended and responses were obtained from 36. A further meeting was held for supervisors: 60 were invited, 55 attended and all completed the survey. Although the survey was predominantly quantitative in design, the responses allowed several themes to be identified for exploration at Aston.

### 2.2 Survey Results

The themes identified from the survey were:

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<th>Sub themes</th>
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### 2.3: Issues highlighted during workshops at Aston.

A series of workshops with Aston academics with experience of PhD supervision, Graduate School support staff and experts from Aston Registry were held to discuss the themes identified in 2.2. In addition, a session was held to explore the role of a UK National Standards agency in the UK. Representatives of the UK Quality Assurance Agency with experience in transnational education attended to consider aspects of the UK Quality Code applicable to doctoral training (QAA).

### 2.4 Main issues identified: Doctoral training in Vietnam and the UK.

At present the regulations and procedures governing the award of a PhD in Vietnam and the UK are similar in purpose and structure, but very different in duration and detail. Both systems have periods of training, of interim assessment before progression, of research and of final assessment and award. However, the duration of the training and qualifying phase, and the total time taken to complete doctoral studies in the UK is much shorter than in Vietnam, with the expectation that a student will
complete their work and submit their thesis for examination within 3 years. The qualities expected of a doctoral candidate are similar in both countries systems, but the way in which the students are assessed during and for award differ markedly. These differences present barriers to the “co-tutelle” model of joint doctoral training that might lead to a dual PhD award.

The proposals here come from the partnership between VNUK at the University of Danang and Aston University, and the joint Higher Education Partnership project they are completing.

3. Proposed model
The model we propose can be considered a form of transnational education at doctoral level, where a UK PhD award can be made to student who have undertaken their research project partly in the UK, and partly in Vietnam. The proposal is not for single isolated projects however, but for the formation of a doctoral training “hub” similar in purpose the the DTC model preferred by the UK funding councils. This “hub” will be based at a UK centre with sustainable and appropriate research links in Vietnam, so that scholarship providers could fund groups of students on multi-disciplinary projects addressing projects of relevance to national and international priority research areas.

Students would apply for a project at the UK institution and be registered for a PhD. The doctoral training taught courses and initial phases of the research would be undertaken at the UK institution, and the student would remain in the UK until successful completion of their qualifying report (usually 1 year). The student would then return to Vietnam to undertake the main body of their research project under the supervision of the associate supervisor at the Vietnamese research institution, with continued supervisory support from the UK. The student will return to the UK to write up their thesis and for examination at the end of the three-year period.

The advantages of this proposal for transnational doctoral training are:
A UK doctoral award available to more Vietnamese students
Reduced overall costs (fees and living costs) as around 50% of the research will be undertaken at the partnering Vietnamese research institution or university.
Deepening collaborative research activity between Vietnam and the UK, addressing projects of value to Vietnam and elsewhere.
Increased number of joint publications in international journals for the Vietnam and UK research supervisors,
Maximising value gained for those funding scholarships for doctoral training.

The importance of funding projects through a doctoral training hub are:
Ability to address research priority areas in a multidisciplinary manner
Students do not develop their skills in isolation,
Scale of projects addressed by research hubs or centres can be greater than that in isolated projects
Students engaged in a busy research environment will develop networks for the future.

This proposal has been discussed by representatives of university governance procedures and doctoral training, and key features for success were identified. These include:

Synergistic or complementary research interests of the UK principle supervisor and the Vietnamese associate supervisor.
A history of joint research activity between the UK and Vietnamese partners.
Understanding of both supervisors and institutions as to the requirements of a UK doctoral award, and
of the standards and outcomes expected for the award of a PhD. Infrastructure and academic support at both institutions appropriate for the needs of the project. Studentships, or other funding, which provide adequate resources to support the student and the project. Identification of research projects that not only address the research priorities of Vietnam, but where possible are of wider interest with the potential of leading to international publications.

This proposal for transnational research training was developed by VNUK at the University of Danang, and Aston University, and builds on the existing relationships in teaching and research between the two institutions. Indeed, many of the indicators for success already exist in this partnership (including understanding of UK governance procedures, and existing research collaborations), making the Aston/ VNUK partnership an ideal location for the development of such a transnational doctoral training “hub”. As another presentation at this conference shows, there are many risks involved with transnational educational initiatives, especially between counties of differing regulatory cultures and language (Phung et al 2016), so the VNUK/Aston history of successful cooperation will help mitigate these. Finally, the importance of attracting high quality Vietnamese scholarship students to the initiative is key to its success.

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* Fiona Lacey: f.m.lacey@aston.ac.uk
* Dinh Thanh Viet: dtviet@ac.udn.vn
Catalysts and Deterrents of Innovation in Indian Firms and the Way Forward

Pawan Budhwar

Aston Business School, United Kingdom

Abstract

Innovation is the driving force that is crucial for firms to sustain their competitive advantage and for economies and industries in general to surge forward. In comparison to developing economies, developed economies have always maintained more focus on national innovation systems while the firms from such economies have been investing considerable effort on promoting organisational innovation. However, as firms became increasingly global, consumers across the world, especially from the emerging economies, are also getting a taste of more sophisticated products and services. There is also an infusion of knowledge pertaining to cutting edge technologies, innovations, processes and management systems into such parts of the world. The changing global business scenario and the resulting international competition also saw the firms from emerging economies developing global ambitions. This has led to a renewed and growing focus on organisational innovation in firms from such economies and hence to need to explore this phenomenon in the context of firms from the prominent and big emerging market viz. India. A literature analysis suggests that studies on organisational innovation have largely been confined to firms from developed economies to understand the effects of its determinants. Given the differences in the socio-cultural milieu between the developed and emerging economies, more nuanced understanding of the factors affecting and the processes associated with innovation in emerging markets is required. This paper reports on the the scenario on innovation in the Indian context in general and the findings of a cross sectional survey of 133 Indian R&D managers in as many firms regarding the factors promoting and hindering innovation. The findings have useful implications for both researchers and policy makers/practitioners.

1. Introduction

At present a strong emphasis is laid on innovation and it is considered as the driving force that is crucial for firms to sustain their competitive advantage and for economies during slow economic growth as a panacea to surge forward. The existing evidence suggests that in comparison to developing economies, developed economies have always maintained more focus on innovation via dedicated investments and initiatives. However, as firms became increasingly global, consumers across the world, especially from the emerging economies, are also getting a taste of more sophisticated products and services. Due to globalisation (amongst other factors), there is also an infusion of knowledge pertaining to cutting edge technologies, innovations, processes and management systems into these parts of the world. However, studies on organisational innovation have largely been confined to firms from developed economies to understand the effects of its determinants (Anderson et al., 2004; Choi and Williams, 2014; Li et al., 2013). Given the differences in the socio-cultural milieu between the developed and emerging economies, more nuanced understanding of the factors affecting and the processes associated with innovation in emerging markets is required.

Several of the globally leading MNCs (multinational corporations) from developed countries like
IBM, GE and Honda have set up R&D operations in emerging markets. India, one of the big emerging markets has close to 1000 R&D centres owned by MNCs and accounts for 23 per cent of the overall global engineering R&D outsourcing market (IBEF, 2013). However, in spite of such developments, emerging markets like India still lag behind their western counterparts when it comes to innovation and some of its related indicators. India’s R&D expenditure (as % of GDP) has been on a gradual rise from 0.7078 in 2003 to 0.7571 in 2007, but still lags behind its western counterparts. Similar trends can be noticed when it comes to patent indicators as well. However, innovations are not necessarily limited to these indicators alone and there could be innovations that still add value but could be much smaller in scope and scale. While western economies typically rely more on a planned and systematic approach to organisational innovation that involves huge R&D budgets, emerging economies like India rely more on low cost improvisations that adopt a more flexible and open approach towards innovation that is based on ingenuity and resourcefulness (George et al., 2012; Govindarajan and Ramamurti, 2011). This is especially valid in the context of emerging economies who have limited resources at their disposal. Frugal innovations, often referred to as ‘Jugaad’ in India, are vital to the innovation ecosystem in these countries (Radjou et al., 2012). These innovations focus on creating value for the consumer while still being affordable and relatively cheap since they are based on simple ideas developed by leveraging the available resources (that are scarce) and adapted suitably to the local environment. This creative improvisation helps turn adversity into opportunity and is something that the Western firms are also increasingly endorsing since several of their customers have also been facing economic crunch in the recent past (Guardian, 2013). Instances of this flexible and open mindset to innovation could be found in SELCO’s environmentally and economically sustainable energy distribution system, the world’s cheapest car, Nano, launched by Tata and the low cost water purifier (Radjou et al., 2012).

All of these aspects make India an ideal setting for a study on organisational innovation and in particular what helps firms and what does not to innovate. Accordingly, the main aim of this paper are to highlight the key hindrances and facilitators of innovation in India. Such information should be helpful for both researchers and practitioners. In order to address this research aim, this study employs a cross sectional survey of 174 Indian firms to understand the factors promoting and hindering innovation. The findings throw light on the main factors promoting and hindering innovation along with their relative importance, from a managerial perspective. The remaining paper is structured as following. Next, the relevant literature is analysed. This is followed by a brief of the methodology adopted for the study, key findings, discussion on the same and key implications of the study.

2. Innovation

Innovation is vital to the growth of any economy (Fagerberg, 2003). Following the pioneering work of Schumpeter (1942), the interest in the study of innovation gained momentum in the 1970s (Freeman, 1974; Nelson & Winter, 1982; Pavitt, 1984; Rosenberg, 1976, 1982; Kline and Rosenberg, 1986; Henderson & Clark, 1990). The early stages of research were mostly confined to social sciences, economics and sociology (Fagerberg et al., 2012) with business and management scholars also getting gradually more involved. Innovation is defined “as the intentional introduction and application within a role, group or organization of ideas, processes or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization or wider society” (West & Farr, 1990, p. 9). Much research has examined innovation, especially in the western economies. Our purpose is to extend this literature through the study of innovation in the context of an emerging economy.
High end innovations, specifically patents and trademarks, mostly originated in the triad (US, Japan & Europe) over most of the 20th century (Godinho & Ferreira, 2012). However, other economies like South Korea (in late 1970s) and then later China & India (in mid 1980’s) started catching up. Analysis of IPR data by Godinho & Ferreira (2012) shows that China is well on its way to close the gap with the triad countries. The study also shows that India’s position is formidable as well. Linear extrapolation shows that India could also possibly catch up although it may happen only later when compared to China. The global aspirations of the firms from emerging market and specifically from India, have also been discussed widely especially when it comes to their overseas acquisitions (Bonaglia et al., 2007; Bhaumik et al., 2010). Further, it has also been studied how these overseas associations and networks have helped them evolve into firms with better innovative capabilities (Chittoor & Ray, 2007). Given the rapid development of the emerging market economies and the differences in trajectories of development compared to that of the developed nations, it is important to understand the innovation process with specific focus on such economies. Hence we locate this study in the Indian context to analyse organisational innovation in an emerging market focussing specifically on the R&D departments in these organisations.

The innovation literature (Damanpour, 1991; Henderson & Clark, 1990) varies in terms of the scope of innovation viz. product and process, radical and incremental, administrative and technical, component and architectural. The adoption of innovation consists of the stages of “generation, development and implementation of new ideas or behaviours” (Damanpour, 1991, p.556). The first stage deals with the generation of the idea (suggestion or awareness phase), which has more to do with the creativity (Axtell et al., 2000; Amabile, 1988). The second stage deals with the development of the same followed by the third stage that involves the implementation of the generated idea. It has been widely accepted that individual, organisational and environmental aspects play a crucial role in influencing organisational innovation (Damanpour, 1991). The focus has been largely aimed at looking into the effects of the determinants at individual and organisational level (Anderson et al., 2004). A critique of the literature points out the relevance of having more multi-level studies in this stream of research (Anderson et al., 2004). Nevertheless, the extent to which innovation is encouraged in firms comes to the way key resources (i.e., human resources) are managed and allowed to innovate.

3. People Management and Innovation

In the current business environment which is very dynamic, firms need to constantly adapt to the environment and sustain their competitive advantage by being innovative. It is now widely accepted that most high performing firms are very innovative (Damanpour, 1991; Weerawardena et al., 2006). What does it mean when we say firms are innovative? Innovative firms “develop or frequently adopt products, services, programs, or innovative ideas (innovation as discrete elements) that need a series of stages (innovation as a process) to be sources of competitive advantage” (Lopez-Cabrales et al., 2009, p. 486), which means this is an organisational capability. The adoption of innovation consists of the stages of “generation, development and implementation of new ideas or behaviours” (Damanpour, 1991, p.556). Firms rely on the knowledge and competencies of their employees (human capital) as the main drivers of innovation (Mumford, 2000) that can enhance organisational performance. It is the employees who generate ideas that are novel and creative, find innovative solutions/approaches to problems and tap into emergent opportunities. Hence the statement that people are an innovative company’s major assets and not the products (Gupta and Singhal, 1993) establishes the importance of the links between people management (HRM) and innovation.
Traditional people management may not be very effective in the current highly competitive business scenario to manage and retain the best of talent and achieve positive organisational outcomes like innovation (Jimenez-Jiminez and Sanz-Valle, 2008). This is where Strategic HRM (SHRM) has emerged, integrating HRM with strategy (Chadwick and Dabu, 2009) to deal with issues arising from volatile and demanding business environments (Ubeda and Santos, 2007). This stream of literature has explored the relationship between HR practices and firm level outcomes (Lau and Ngo, 2004). Strategic HR practices can improve the willingness and motivation of employees to engage effectively with activities pertaining to innovation (Chen and Huang, 2009; Scarbrough, 2003) and aids in the creation and utilisation of knowledge in the firm. As per the SHRM literature, high involvement HR practices have the potential to influence employee’s behaviour and attitudes, hone their skills and competencies to motivate them to contribute towards organisational innovation (Collins and Smith, 2006; Prieto and Perez-Santana, 2014). There are others who also refer to ‘innovative or new HRM practices’ (Chen and Huang, 2009; Jiang et al., 2012; Zhou et al., 2013).

It needs to be noted that the advantages emerging from human capital could wade out or become obsolete in the long term and hence effective HRM is required to ensure that they evolve and develop with time and are properly managed (Lopez-Cabrades et al., 2009). Human resources also have strategically relevant characteristics like uniqueness, non-depletion with use and free will, which makes them strategically valuable and at the same time inconsistent in terms of what they can potentially offer to firms (Chadwick and Dabu, 2009). Of these characteristics, free will is the most unique to human resources and it has both cognitive and emotional aspects to it (Wright et al. 2001). This governs the manner in which individuals think, behave, perceive and react to their work environment which in turn creates a firm-level heterogeneity that makes HRM even more challenging.

At individual level, HR practices should help enhance employee’s competencies which includes skills and attitudes like risk seeking, tolerance to ambiguity, personal initiative/drive and openness to change that are likely to influence innovative behaviour (Amabile, 1998). Synergy effects cannot be ruled out, with the individual efforts aggregating to group/team and organisational level innovation (Zhou et al., 2013). Thus, given that innovation is mostly an outcome of collaborative efforts (Lepak and Snell, 2002), group/team and organisational level focus is also equally important. In this context, social capital also plays a prominent role in organisational innovation (Cabello-Medina et al., 2011). Hence firms need to focus on HR practices that create a team/organisational environment that creates a positive environment for knowledge creation and utilisation. In addition to internal collaboration, it is equally important for firms to focus on external collaborations that can drive innovation. This is based on mutual learning and sharing knowledge with business partners, research bodies, academic institutions and so on (Zhou et al., 2013). Most of these HR practices are the most effective not when they are adopted in isolation, but when they complement each other as mutually reinforcing practices (Jiménez-Jiménez and Sanz-Valle, 2008).

4. Methodology

The Indian firms that were chosen for this study were selected from ORBIS database, which had more than 50 employees. Emails/questionnaires were sent to the contacts of these selected Indian firms. The respondents were asked (open ended question) “In your opinion, what are the key factors that facilitate innovation within your organisation? Please mention the top 5 factors below (repeated for inhibitors)”. The responses to this question included answers like “capital investment”, “management support”, “attitude” and “shortage of skilled resources”. These questions were part of a bigger data
collection exercise (questionnaire) which had several other questions (mainly Likert scale) related to innovation in the Indian context. Since the response rate was very low (<1%) from this process, the above sample was also augmented with convenience sampling/snowballing from other Indian firms that also met the basic criteria. A cover letter was sent initially stating the purpose of the research and assuring them confidentiality and anonymity in regards to their responses. Following this, the questionnaires were emailed to the R&D/Production/General Operation managers of the Indian firms who agreed to participate in the survey. The respondent managers then emailed the completed questionnaires back to the authors. Finally, responses were received from 174 Indian firms (managers were from R&D (33%), general operations (37%) and production (30%)). The sectoral distribution of these firms indicated that the majority of them were from Automotive & Transport (20.5%), Engineering (19%), Fuel, Power & Energy (12%), Pharmaceutical (8%), IT & ITeS (8%), Chemicals & Fertilizers (8%), Electrical & Electronics (4%) and Financial Services (4%). The average tenure of the respondent manager in their respective firm was 9 years and 12 years in the industry.

5. Results and Discussion

The top 5 facilitators and inhibitors were coded to group them into a few broad categories to aid the analysis. The main categories that were identified and their descriptions are provided in table 1.

Table 1 Facilitators & Inhibitors - Categories & Description

<table>
<thead>
<tr>
<th>Main categories of Facilitators/Inhibitors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisory/Management Support</td>
<td>Providing encouragement, demonstrating involvement and focus of the supervisors/senior management towards innovation in terms of motivating employees and the leadership provided and not the least, their receptivity to change</td>
</tr>
<tr>
<td>Personal Attitude</td>
<td>Individual traits like openness to change new ideas, personal innovative drive, oriented towards creative and novel ideas, ability to take risks, tolerance for ambiguity and proactively seeking solutions to problems</td>
</tr>
<tr>
<td>Market &amp; customer demands</td>
<td>Customer or market requirements that drive new initiatives or changes in products/services</td>
</tr>
<tr>
<td>Reward &amp; Recognition (R&amp;R)</td>
<td>Motivational mechanisms that organisations employ to encourage staff by recognising their efforts and rewarding them appropriately</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Main categories of Facilitators/Inhibitors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure/Assets</td>
<td>Facilities like labs, equipment and materials to test ideas and implement them as well</td>
</tr>
<tr>
<td>Skilled &amp; experienced manpower</td>
<td>Staff with adequate skills and experience that can drive innovation</td>
</tr>
<tr>
<td>Collaborative Environment</td>
<td>An environment that caters to knowledge exchange and working together in teams effectively sharing experiences and ideas (teamwork)</td>
</tr>
<tr>
<td>Financial Resources</td>
<td>Finance required for investing in innovations</td>
</tr>
<tr>
<td>Autonomy</td>
<td>Empowerment of employees, freedom to take decisions</td>
</tr>
<tr>
<td>Alliances, Clusters &amp; Tie-ups</td>
<td>External networks – Alliance or Joint Venture partners, research institutions, universities and other external stakeholders</td>
</tr>
<tr>
<td>Government policies and regulations</td>
<td>Restrictive policies, EPR regimes etc.</td>
</tr>
</tbody>
</table>

The main categories of facilitators that have been identified across the five listed respondent choices along with their distribution have been depicted in Figure 1. The first choice is presented as ‘Facilitator 1’ and the second choice as ‘Facilitator 2’ and so on in the figure. Amongst the first, second and fifth choices, management/supervisory support figures as the most influential facilitator (15.1%, 11.4% & 10.8%) of organisational innovation. Reward and recognition (R&R) is the most influential factor (9.9% and 6.7%) when it comes to the third and fourth choices. Besides the above prominent factors, in general, amongst the first three choices, personal attitudes, market & customer demand, infrastructure/assets, communication, collaborative environment and skilled and experienced manpower figure as the main facilitators of organisational innovation. In terms of the last two choices, there are a few other facilitators, like competition and benchmarking, training and learning, financial resources and focus on value creation, which cater to organisational innovation.
Figure 1: Facilitators of Org. Innovation – top 5 choices (N=174)
The aggregated percentages of the different categories of facilitators of organisational innovation across the five respondent choices have been presented in Figure 2. The percentages have been depicted across the different categories of respondent managers to indicate the differences in their perception. With regards to the total percentage, it could be seen that the management/supervisory support is the most dominant facilitator (10%). This is followed by personal attitude (9%), market & customer demands (7%), R&R (7%) and infrastructure/assets (7%).
Figure 3: Inhibitors of Org. Innovation – top 5 choices (N=174)
As far as R&D managers are concerned, management/supervisory support, personal attitudes and R&R are the most important facilitators. For production managers the most vital were management/supervisory support, market & customer demands, personal attitudes, collaborative environment and R&R. For operations managers, personal attitudes, management/supervisory support and infrastructure/assets are the main facilitators. The trends displayed by these different respondent categories are more or less in agreement with the overall trend.

Figure 3 presents the distribution of the main categories of inhibitors that have been identified across the five listed respondent choices. As explained earlier on, the first choice is presented as ‘Inhibitor 1’ and the second choice as ‘Inhibitor 2’ and so on. Personal attitudes (that hinder innovation) turn out to be the most influential inhibitor (15.3%, 12.5% & 13.4%) of organisational innovation in the first three choices. Lack of skilled & experience manpower (11.9%) and lack of financial resources (22.9%) are the most prominent inhibitors in the fourth and fifth choices respectively. In addition to the above main factors, overall, amongst the first three choices; lack of collaborative environment, lack of supervisory/management support, lack of a clear vision/strategy, lack of focus on research & innovation and lack of adequate infrastructure/assets are the main inhibitors of organisational innovation. In terms of the last two choices, there are a few other inhibitors like lack of knowledge & skill and issues with government policies and regulations are found to hinder organisational innovation.

The aggregated percentages of the different categories of inhibitors across the five respondent choices have been presented in Figure 4. As with Figure 2, the perceptions of the different categories of respondent managers have been captured here. The most prominent inhibitor is found to be personal attitudes (13%). This is followed by lack of financial resources (11%), lack of skilled & experienced people (9%), lack of vision & strategy (7%), and lack of focus on research & innovation (7%). As far as R&D managers were concerned; personal attitudes, lack of financial resources and lack of skilled & experienced people were the main inhibitors. For production managers, the key inhibitors were; personal attitudes, lack of financial resources and lack of skilled & experienced people. Lack of financial resources, personal attitudes and lack of vision & strategy were the important inhibitors for operations managers. The patterns displayed by these different respondent categories are more or less in agreement with the overall pattern.

Figure 4: Inhibitors of Org. Innovation – Aggregated across 5 choices (N=174)
It is interesting to note that the lack of financial resources is seen to hinder organisational innovation but the mere presence of this factor does not facilitate organisational innovation drastically. It could also be seen that R&D managers do not consider this to be a major facilitator or hindrance when compared with the other respondent managers. This suggests that financial resources are definitely necessary for innovation but is not one of the prominent factors that drive the same in the Indian context. This could be due to the fact that emerging markets like India are focussed more on frugal innovations because of the limited resources at their disposal, which prevents them from being any more innovative than absolutely necessary. The innovations in such countries are mostly differentiation-related innovations rather than novelty-related innovations (Bradley et al., 2012). Weak institutional environments prevailing in such countries also limit the availability of finances due the uncertainties associated with these environments and weak intellectual property regimes (IPR). In addition to financial resources, many of these countries also work with limited facilities that include labs, equipment and other materials that are required for R&D (Research & Development). This offers additional constraints on their ability to innovate and also the extent of innovation.

Personal attitudes turn out to be one of the most influential facilitators, while the lack of the same is also one of the major dampeners. This could be the reason why individual traits is also one of the major aspects that traditional innovation research has focussed on (Amabile, 1998, Freese et al., 1999; George and Zhou, 2001), especially by organisational psychologists. This is based on the view that personal traits could predispose individuals to innovative behaviour subject to the cognitive limitations that they have. Innovation-related projects and activities are risky by nature and there is lot of uncertainty surrounding the outcome and the future turn of events. Such projects need individuals have a continuous focus, perseverance and a thirst for knowledge and novel ideas. Hence for organisational innovation, it is vital to have individuals who are more proactive, creative, always on look out for a challenge, have the capability to take risks and also to deal with ambiguity. High involvement HR practices can play an important role in organisations in shaping employee’s behaviour and attitudes (Collins and Smith, 2006, Prieto and Perez-Santana, 2014). They could be used effectively to encourage these personal attitudes by promoting a culture within the organisation that recognises and endorses these traits, and provide more opportunities and resources for such individuals to engage in research based activities.

Supervisory and management support figures as one of the main facilitators while the lack of this is not a major dampener. R&D managers view this as more important in comparison to the other respondent managers. The support could be in terms of encouraging and motivating employees to engage with innovation-related activities. This could also include empowering the employees in a more participative type decision making wherein the views of the employees are heard and acted upon (Allen et al., 2003). A supportive supervisory style signals a concern for your employees and a good understanding of their issues and expectations, whereas a controlling supervisory style hinders creative performance and reduces intrinsic motivation (Beugelsdijk, 2008). Various HR practices like having flexible job designs, providing training, opportunities for competence development, accepting and rewarding novel ideas could improve the employee’s perception of management support. A supportive management style is found to be an important determinant of employee’s innovative behaviour (Parker et al., 2006; Scott and Bruce, 1994).

Reward and recognition systems are also found to be a major facilitator of organisational innovation. Compensations (merit-based) and incentives are a big part of R&R and are also very closely linked to the performance management system. Most R&R systems are closely tied in with performance metrics and should not be used as a means to control employee behaviour but to enhance and promote certain
behaviours, attitudes and outcomes that are vital to innovation (Cabello-Medina et al., 2011; Chen and Huang, 2009; Jiang et al., 2012). R&R could include non-financial rewards as well. R&R acts as one of the main motivational mechanisms that HR managers can use effectively in firms to nurture innovations (Jiang et al., 2012). However, care should be taken to see that extrinsic rewards do not conflict with intrinsic satisfaction that employees seek (Chadwick and Dabu, 2009).

Lack of skilled and experienced people is another main inhibitor of organisational innovation. As discussed earlier, Indian firms face skill and talent shortage to a large extent. Hence HR practices that are focussed on retaining good talent are crucial to sustain innovation. This may include appropriate career progression plans, attractive compensation schemes, flexible working hours and taking care of the employee well-being in general. To address this issue with lack of talent, another important aspect that HR managers need to focus on is learning and development (Jiang et al., 2012; MacDuffie, 1995; Tannenbaum and Dupuree-Bruno, 1994), which includes providing adequate training, opportunities for higher education and overseas experience, especially in developed markets. Opportunities to interact and share experiences and knowledge within the organisation as well as with external stakeholders and working in cross-national or multi-disciplinary teams can enrich employee’s experience and skills. A combination of commitment-oriented and collaboration-oriented HR practices could prove to be very effective in achieving this (Zhou et al., 2013). HR managers also need to focus more on recruitment and staffing approaches in such situations where they are competing for the best and skilled professionals.

Other than the above discussed factors, there are several other aspects that influence organisational innovation. Driving innovation in organisations also requires a clear focus and strategy at the organisational level, which needs to be supported by well-designed organisational processes and mechanisms and the HR function could play a vital role here. Innovation needs a nurturing organisational/team environment for it to be sustained in the long run. A collaborative environment where knowledge is shared, new ideas are discussed and evaluated and working together as team is encouraged is vital for organisational innovation. For this, employees need to be motivated to share knowledge so that hoarding tendencies are discouraged (Chadwick and Dabu, 2009) and team performances need to be recognised and rewarded in addition to individual performances.

Innovativeness of firms also varies across industries. Some industries are more stable and mature than others which mean that the demand for innovation is much less in these industries when compared to some of the very dynamic high-technology and knowledge-intensive industries. High-technology and knowledge-intensive sectors typically lay a lot of emphasis on R&D and their centres of excellence act as the hub for innovation. Industries also form clusters like the Silicon Valley in US which also make them “pockets of innovation”. The firms within such industrial clusters also tend to be more innovative than others. IPR regimes that are prevalent in countries also have an influence on innovation. If the property rights are not stringent enough to protect those who invest in innovations, from piracy, then this may prevent innovators from investing in those countries (Bradley et al., 2012). This has a negative effect on innovation. Government policies also influence national innovation systems and R&D managers perceive unfavourable policies to be more of a hindrance when compared to other respondent managers. To encourage and promote innovations, governments need to get involved in a range of activities that include setting up research bodies and institutes, offering funds, sponsoring research projects, promoting industry-academia and cross-national collaborations to name a few. R&D managers also feel more restricted by time constraints when compared to the other respondent managers.
6. Conclusion

This study explores the main drivers and deterrents of organisational innovation in Indian firms. Given the limited literature that is available on the influence of HR practices on organisational innovation, this study offers valuable insights on what works and what doesn’t in an emerging market context. The results indicate that while management & supervisory support, personal attitudes, market & customer demands and R&R are the main facilitators of organisational innovation, personal attitudes, lack of financial resources, lack of skilled & experienced people and lack of focus on research & innovation are some of the main inhibitors of organisational innovation. It is essential that effective HR practices need to be designed, developed and implemented to cater to an organisational environment that motivates employees, encourages collaboration and learning, improves employee commitment and promotes teamwork to achieve positive innovation-related outcomes. Some of the factors that are more influential than the others like lack of financial resources and lack of skilled and experienced people are characteristic of any emerging market like India. India has renewed its efforts on boosting innovation with the President declaring the next ten years as the “decade of innovation”. Indian corporates are also equally focussed on catching up with their Western counterparts and innovation is definitely high on their agenda if they have to be globally competitive. However, the national innovation systems as well as firm-level innovations in India have a long way to traverse. The success in the journey ahead depends on how effectively they address some of the stumbling blocks in their way, which act as dampeners for innovation.

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Entrepreneurship: From Formation of Intentions to Alertness for Opportunity

Dam Son Toai, Vu Hoang Nam, Nguyen Huy Trung, Mac Thi Hai Yen

National Economics University Vietnam

Abstract

We extend the theory of planned behaviour (TPB) (Ajzen, 1991) in studying entrepreneurial intentions (EI) (Liñán & Chen, 2009) by examining the influence of EI, a future-directed intentions by reference to the causal theory of action (CTA) (Pacherie, 2006), on entrepreneurial alertness as actual behaviour in the pre-launch phase of the process of new business venture creation. We surveyed 473 undergraduate business students of a university in Hanoi, Vietnam and adapted scales available in the literature to measure their entrepreneurial intentions (Liñán & Chen, 2009) and alertness (Tang, Kacmar, & Busenitz, 2012). Our results from hypothesis testing using SEM shows that social norms has positive impacts on both personal attitudes and perceived behavioural control. Personal attitudes and perceived behavioural control in turn, strengthen entrepreneurial intentions. More importantly, EI was confirmed to have positive direct effects on all three dimensions of entrepreneurial alertness: scanning and search, association and connection, and evaluation and judgement. Overall, our study not only affirms the applicability of the TPB to the surveyed student sample in the context of Vietnam but also extends the discussion on EI by treating EI as future-directed intentions by reference to CTA, that specify entrepreneurial alertness needed for make the intentions a reality. Implications for entrepreneurship promotion are discussed.

Keywords: entrepreneurial intentions; entrepreneurial alertness; theory of planned behaviour; casual theory of actions; Vietnam.

1. Introduction

Entrepreneurial intentions (EI) has recently attracted increasing academic attention (Liñán & Fayolle, 2015) and the the theory of planned behaviour (TPB) (Ajzen, 1991) has been a recent dominant thesis used to explaining how EI develops from three antecedents: social norms (SN), personal attitudes (PA), and perceived behavioural control (PBC). Nevertheless, the link from EI to actual entrepreneurial behaviour has not been thoroughly investigated (Liñán & Fayolle, 2015). This present study offers a discussion on extending EI research by treating EI as future-directed intentions by reference to the causal theory of action (CTA) (Pacherie, 2006). EI was then explored for its direct effect on entrepreneurial alertness as actual behaviour in the pre-launch phase of the process of new business venture creation (Frese & Gielnik, 2014).

This present study set in Vietnam, a fast-developing economy with abundant opportunities for small business creation (World Bank, 2015). Business start-up is of importance in the country as the private enterprises are dominant (General Statistics Office of Vietnam, 2015) and serve as a key source of employment and income for the entrepreneurs and their families (Benzing, Chu, & Callanan, 2005; Ronnäs, 2001). Therefore, this country provides a useful locale for this present study on intentions to start a new business venture.

We surveyed 473 undergraduate business students studying towards bachelor degree at a university in Hanoi, Vietnam and adapted available scales in the literature for the study variables. All measures used in the present study were examined using CFA and hypothesis testing was conducted using SEM.
The findings not only affirm the applicability of the TPB but also shed light on the intention-behaviour link by reference to CTA.

The next section of this paper will present a theoretical framework on which three hypotheses were developed, followed by a description of the method used in the present study and results from data analysis. The paper will then discuss the results regarding the hypotheses, implications, limitations, and suggestions for future research. The last section will summarise main conclusions of the present study.

2. Theoretical Framework and Hypotheses

EI refers to “the intent to start a business, to launch a new venture” (Krueger, 2009, p. 55). Broadly speaking, an intention indicates “how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behaviour” (Ajzen, 1991, p. 181). Bird and Jelinek (1988) and Krueger and Carsrud (1993) argue that entrepreneurship in nature is an intentional process towards creating value through organisation of resources. The intentions-based approach developed in the psychology has been widely applied to entrepreneurship scholarship to explore individual-level entrepreneurial potential (Bird & Jelinek, 1988; Liñán & Chen, 2009). According to Robinson, Stimpson, Huefner, and Hunt (1991), this approach offers a more effective prediction of individual-level entrepreneurship than does the personality/trait approach (e.g., being designed to measure general tendencies and losing efficacy when applied to studying entrepreneurship) or the demographic approach (e.g., static demographic characteristics failing to explain entrepreneurship as a dynamic multifaceted phenomenon). Research on entrepreneurial intentions is also a complementary to a focus on actual entrepreneurs’ functional behaviours and achievements (Palmer, 1971). This present study adopted the intentions-based approach to examine the development of entrepreneurial intentions from its precursors and its implications for actual behaviour in the discovery of entrepreneurial opportunity.

An intention to perform a behaviour, by reference to theory of planned behaviour (TPB) (Ajzen, 1991), is determined by three determinants: social norms (SN), personal attitudes (PA), and perceived behavioural control (PBC). That is, the individual’s intention to start a new business venture is dependent on how much the new business venture is favoured by the individual (PA). The individual also perceives how difficult the process of business start-up (PBC) that contributes to the individual’s decision on getting involved in the process. The more control the individual believes to have over the entrepreneurship process, the higher tendency the individual has towards initiating the process. On top of PA and PBC, the individual is under social pressure to perform the behaviour (SN). The social context that favours entrepreneurship may induce the individual to think more about pursuing the entrepreneurial career, such as “The people around me admire the successful entrepreneurs and I must include myself in this entrepreneurs’ community.” That thought not only promotes the individual’s entrepreneurial aspiration (PA) but also causes them to proactively strengthen their entrepreneurial capability (PBC). Several recent empirical studies of entrepreneurial intentions provide support the TPB (e.g., Davey, Plewa, & Struwig, 2011; Kautonen, van Gelderen, & Fink, 2015). This present study aims to confirm applicability of the TPB in the study context of Vietnam and uses the above argument for the relationships between EI and its determinants under the TPB to postulate:

Hypothesis 1: SN will be positively related to (a) PA and (b) PBC
Hypothesis 2: (a) SN, (b) PA, and (c) PBC will be positively related to EI.
Although it can predict the individual’s tendency towards becoming an entrepreneur, EI is potential in nature. Implications of EI for actual entrepreneurial behaviours should be explored (Krueger, 2009). However, the intention-behaviour link has still lacked sufficient academic attention (Liñán & Fayolle, 2015). This present study aims to contribute to filling this gap by investigating how EI causes actual behaviour in identifying entrepreneurial opportunity for starting a new business venture.

EI from the psychological perspective is an internal mental state of having a desire to found a new business entity (Davis, 2010; Krueger, 2009). By reference to the CTA, the individual motivated by entrepreneurial aspiration, belief, and desire, carries out the process of creating a new venture (Davidson, 1963; Davis, 2010; O’Connor, 2010). In other words, EI helps in explaining why the individual performs behaviours to make the person an entrepreneur. Moreover, Pacherie (2006) distinguishes between different categories of intentions: future-directed intention (reasoning ends, plans and means and specifying a type of action consistent with the intention), present-directed intention (inherited from the future-directed intention, reasoning temporal action at the present), and motor intention (guiding and controlling an action in progress) (Pacherie, 2006). As the individual’s strong desire to become an entrepreneur overwhelmingly drives the person in making decisions that define the nature of their career (i.e., being self-employed vs. being employed), this present study treats EI as future-directed intentions. That is, the individual with high EI sets creation of a new business venture as a primary goal and performs entrepreneurial behaviours in pursuing this goal.

Kirzner (1979) argues that the entrepreneur perceives a business opportunity from the constant market disequilibrium and pursues the perceived opportunity by doing business for entrepreneurial profit. Baron (2006) proposes that the individual performs various tasks in different phases of this process of entrepreneurship: pre-launching phase (e.g., identifying opportunity and assembling resources), launching (e.g., choosing legal form and developing initial marketing plans), and post-launching (e.g., handling conflicts and retaining quality employees). As Kirzner (1979) emphasises the opportunity alertness in the process of entrepreneurship, we focus on this construct, the opportunity alertness, as the most important entrepreneurial behaviour that is guided by EI in the pre-launching phase.

Tang et al. (2012) argues that the entrepreneur performs different behaviours in the discovery of market opportunity, such as acquiring information from the surrounding environment (social media and interactions with other people), spotting links from various pieces of information, identifying and evaluating potential profitable opportunity. Tang et al.’s (2012) studies confirmed that entrepreneurial alertness is a complex construct encompassing three dimensions: (1) scanning and search, (2) association and connection, and (3) evaluation and judgement. Although they are all about the discovery of potential business opportunity, each of three dimensions shows its uniqueness. While the first dimension (scanning and search) focuses on acquiring information, the second dimension (association and connection) is about linking the acquired information for something uncovered and the third dimension (judgement and evaluation) reflects the process of identification of profitable opportunities to pursue. These entrepreneurial behaviours are all performed in the pre-launch phase of the entrepreneurship process (Baron, 2006) and are argued in this present study to be guided by EI, the future-directed intentions as explained by reference to the CTA (Pacherie, 2006). As such, we adopt Tang et al.’s (2012) multidimensional approach to entrepreneurial alertness and suggest the relationships between EI and three dimensions of entrepreneurial alertness as the following:

Hypothesis 3: EI will be positively related to (a) scanning and search, (b) association and connection, and (c) evaluation and judgement.
The theoretical framework and three hypothesized relationships among the constructs under investigation are illustrated in Figure 1.

![Figure 1 The conceptual model](image)

This present study set in Vietnam, a fast-developing economy with abundant opportunities for small business creation (World Bank, 2015). Business start-up is of importance in the country as private enterprises are dominant in the country (General Statistics Office of Vietnam, 2015) and serve as a key source of employment and income for the entrepreneurs and their families (Benzing et al., 2005; Ronnås, 2001). Thus, Vietnam provides a useful locale to test these relationships and the results may suggest important implications for entrepreneurship education as well as macro policies for entrepreneurship development.

3. Method

Sample and Procedure
We surveyed 473 undergraduate business students of a university in Hanoi, Vietnam. They were attending their four-year courses towards bachelor degree. The target students were approached in their classes with permission from the university management and the instructors of the classes. The students were asked for their voluntary participation in the survey. Each voluntary respondent was given a hard copy of the survey specifically designed for this present study and requested to return the answered survey within one hour time. Overall, from 700 surveys sent out, we received 518 answered surveys (response rate of 74%) and eliminated 45 surveys which did not provide answers to the key questions. We then used 473 completed survey for analysis.

The sample for analysis consisted of 351 females (74.2%) and 115 males (25.8%). Four hundred and fifty-five students in the sample (96.2%) aged from 20 to 22 while 18 others (3.8%) aging from 23 to 25. Three hundred and eighty-two students (80.8%) were in their second year of study, 61 students (12.9%) in their third year, and 30 students (6.3%) in their fourth year.

Measures
We adapted scales available in the literature to measure entrepreneurial intentions and its determinants as well as entrepreneurial alertness. All items of these measures were rated on a Likert 7-point scale (1 = strongly disagree to 7 = strongly agree).
Entrepreneurial Intentions (EI) was measured by four items adapted from Liñán and Chen (2009). These items collectively refer to an individual’s desire to start a new business venture. Sample item is “I am determined to create a business venture in the future.” The measured used for this study shows a very good reliability ($\alpha = .83$).

Social Norms (SN) was measured by three items from Liñán and Chen (2009). This scale helps to measure levels of expectation that other people in the same social context (family, close friends, and classmates) have for the respondent’s future business start-up. The respondent also rated the importance of the items. Each item was then weighted by the importance that the respondent attached to the item. This scale shows a very good reliability ($\alpha = .82$).

Personal Attitudes (PA) was measured by three items from Liñán and Chen (2009). These items refer to the respondent’s opinion about the entrepreneurial career. Sample item is “A career as an entrepreneur is totally attractive to me.” These items have an adequate reliability ($\alpha = .75$).

Perceived Behavioural Control (PBC) was measured by three items from Liñán and Chen (2009). This scale measures the levels of the respondent’s ability to control the process of starting a new business venture. Sample item is “I am able to control the creation process of a new business.” This measure shows an adequate reliability ($\alpha = .70$).

The scale of entrepreneurial alertness was adapted from Tang et al. (2012) that measure three dimensions of entrepreneurial alertness: scanning and search, association and connection, and evaluation and judgement. Scanning and Search was measured by four items on investigation into new information and ideas that may contribute to the process of starting a new business venture. Sample item is “I always keep an eye out for new business ideas when looking for information.” The four-item scale of scanning and search has an adequate reliability ($\alpha = .77$). Association and Connection was measured by three items on application of the acquired information, for example “I see links between seemingly unrelated pieces of information.” The scale of association and connection shows an adequate reliability ($\alpha = .79$). Evaluation and Judgement was measured by three items on assessing possible business opportunities based on the acquired information. Sample item is “I can distinguish between profitable opportunities and not-so-profitable opportunities.” The scale of the evaluation and judgement dimension provides an adequate reliability ($\alpha = .74$).

All the scales used in this present study are included in Appendix.

Measurement model
We confirmed the separate dimensions of the various constructs by testing the measures using SEM in AMOS. We followed Williams, Vandenbarg, and Edwards (2009) recommendations of three goodness-of-fit indexes and thresholds levels to assess model fit: (1) the comparative fit index (CFI > .95), (2) the root-mean-square error of approximation (RMSEA < .08), and (3) the standardized root mean residual (SRMR < .10). Overall, the hypothesised measurement model fit the data: CFI = .951, RMSEA = .047, and SRMR = .049. These results help to confirm convergent and discriminate validity of the multiple-item measures used in this present study.

4. Analysis
We tested the hypotheses using SEM in AMOS and adopted again the levels of model fit suggested by Williams et al. (2009) as above.
5. Results

Table 2 shows the descriptive statistics and bivariate correlations of the study variables. SN was significantly related to PA ($r = .34, p < .001$) and PBC ($r = .27, p < .001$). All SN, PA and PBC were significantly related to EI (SN: $r = .34$, PA: $r = .51$, both at $p < .001$; and PBC: $r = .47, p < .001$). EI in turn, was significantly related to three dimensions of entrepreneurial alertness (Scanning and Search: $r = .32$, Association and Connection: $r = .21$, Evaluation and Judgement: $r = .26$, all at $p < .001$).

Although three dimension of entrepreneurial alertness were significantly related ($r$ ranging from .35 to .38, all at $p < .001$), the strength of the relationships highlights that they were weakly related and thus are distinctive.

Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Scale</th>
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<tbody>
<tr>
<td><strong>Entrepreneurial Intentions</strong></td>
<td>Source: Liñán and Chen (2009)</td>
</tr>
<tr>
<td>I am ready to do anything to be an entrepreneur.</td>
<td></td>
</tr>
<tr>
<td>My professional goal is to be an entrepreneur.</td>
<td></td>
</tr>
<tr>
<td>I am determined to create a business venture in the future.</td>
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</tr>
<tr>
<td>I have a very high intention of ever starting a business.</td>
<td></td>
</tr>
<tr>
<td><strong>Personal Attitudes</strong></td>
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<td>A career as an entrepreneur is totally attractive to me.</td>
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<tr>
<td>Being an entrepreneur would give me great satisfaction.</td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Behavioural Control</strong></td>
<td>Source: Liñán and Chen (2009)</td>
</tr>
<tr>
<td>Starting a firm and keeping it viable would be easy for me.</td>
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<tr>
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</tr>
<tr>
<td><strong>Social Norms</strong></td>
<td>Source: Liñán and Chen (2009)</td>
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<tr>
<td>My immediate family would approve of my decision to start a business.</td>
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<tr>
<td>My classmates would approve of my decision to start a business.</td>
<td></td>
</tr>
<tr>
<td><strong>Scanning and Search</strong></td>
<td>Source: Tang et al. (2012)</td>
</tr>
<tr>
<td>I have frequent interactions with others to acquire new information.</td>
<td></td>
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<tr>
<td>I always keep an eye out for new business ideas when looking for information.</td>
<td></td>
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<tr>
<td>I read news, magazines, or trade publications regularly to acquire new information.</td>
<td></td>
</tr>
<tr>
<td>I am always actively looking for new information.</td>
<td></td>
</tr>
<tr>
<td><strong>Association and Connection</strong></td>
<td>Source: Tang et al. (2012)</td>
</tr>
<tr>
<td>I see links between seemingly unrelated pieces of information.</td>
<td></td>
</tr>
<tr>
<td>I am good at “connecting dots.”</td>
<td></td>
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<tr>
<td>I often see connections between previously unconnected domains of information.</td>
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</tbody>
</table>
The analysis of the model for hypothesis testing produced good fit indices: CFI = .952, RMSEA = .047, and SRMR = .071. Figure shows the results of hypothesis testing. SN was found to positively related to both PA and PBC (path coefficient to PA = .54 and path coefficient to PBC = .20, both at $p < .001$). However, the path of SN to EI was insignificant. PA and PBC in turn, were found to be significantly related to EI: path coefficient of PA = .28 and path coefficient of PBC = .48, both at $p < .001$.

EI was confirmed to have positive relationships with three dimensions of entrepreneurial alertness. The path coefficient from EI to scanning and search was .46 at $p < .001$, to association and connection was .20 at $p < .05$, and to evaluation and judgement was .27 at $p < .001$.

Our model accounts for a large amount of variance towards EI ($r^2 = .591$), yet moderate size amounts of variance towards Scanning and Search ($r^2 = .193$) and Evaluation and Judgement ($r^2 = .094$), and small amount of variance towards Association and Connection ($r^2 = .046$).

![Diagram](source: Tang et al. 2012)

I can distinguish between profitable opportunities and not-so-profitable opportunities.

I have a knack for telling high-value opportunities apart from low-value opportunities.

When facing multiple opportunities, I am able to select the good ones.

6. Discussion

The present study set in the context of Vietnam, a developing economy, using a student sample ($n = 473$) to test the relationships between EI and its determinants under the TPB (Ajzen, 1991) and explore how EI, be reference to the CTA (Pacherie, 2006), may link to entrepreneurial alertness in the entrepreneurship process. The CFA results confirm the convergent and discriminate validity of the multiple-item measures used in this study. Regarding the entrepreneurial alertness as actual behaviour in the pre-launch phase of the entrepreneurship process, the CFA results confirmed that the multidimensional approach to entrepreneurial alertness that Tang et al. (2012) invented in the context.
of developed economies (United States and South Korean) worked for the Vietnamese student sample used in this present study.

The SEM hypothesis testing results give support to Hypothesis 1, i.e., SN was positively related to both PA and PBC. But Hypothesis 2 was partially supported: both PA and PBC were positively related to EI (H1b and H2c), but SN was not (H2a). With a large amount of variance towards EI ($r^2 = .591$), these findings strongly affirm the applicability of the TPB to the Vietnamese student sample and echoes Davey et al.’s (2011) conclusion that supports the TPB in both developed and developing countries.

More importantly, this present study found support for Hypothesis 3: EI was positively related to all three dimensions of entrepreneurial alertness (scanning and search, association and connection, and evaluation and judgement). Thus, EI, as future-directed intentions under the CTA (Pacherie, 2006), does help in explaining the individual’s behaviours in the discovery of entrepreneurial opportunity for starting a new business venture. Nevertheless, our results suggest that EI is more useful in explaining the students’ scanning and search for information and evaluation and judgement on potential opportunity (moderate size amounts of variance $r^2 = .193$ and $r^2 = .094$, respectively) than in explaining association and connection (small amount of variance, $r^2 = .046$). A possible explanation to this finding is that most of the undergraduate business students in the surveyed sample were in their third or fourth year of their study and, therefore, had gained confidence in searching for market information and techniques for evaluating a business opportunity through their business courses. But they may have never experienced processing acquired information in order to identify an opportunity that they would seize for real.

7. Future Research

This present study shed light on the links between EI and actual behaviours in the discovery of opportunity that the individual performs in the pre-launch phase of the process of entrepreneurship. Future study is encouraged to explore how EI may guide and control other behaviours in this phase as suggested by Baron (2006), such as making decision to proceed further (i.e., whether to pursue the identified opportunity or not) and assembling resources (both tangible and intangible resources) needed for creating a new business venture. While this present study investigated the direct influence of EI on entrepreneurial alertness, future research may explore whether the links between EI and actual entrepreneurial behaviours may be moderated by the individual’s commitment towards the goal of creating a new business venture and/or the surrounding environment (e.g., social networks, supports from institutions like banks and incubators). A longitudinal design may study if EI results in actual achievement (e.g., number of identified opportunity, scales of assembled resources) as well as actual business start-up. This design could help in testing whether the intention-link relationship is reciprocal (Krueger, 2009), for example, the actual achievement in the pre-launch phase might reinforce EI.

8. Implications

The presented findings suggest the importance of EI to actual behaviour in the discovery of business opportunity in the pre-launch phase of the business start-up process. Entrepreneurship education should not only focus on guiding and coaching conduct of activities in the pre-launch phase (i.e., how to do) but also help to strengthen aspiration, belief, and desire that induce actual entrepreneurial behaviour (i.e., internal mental state that drives the behaviour). Every participant in an entrepreneurship program should be guided to carry out a regular self-assessment of entrepreneurial
intentions as well as aspiration and capability. This helps the participants to self-reflect entrepreneurial potential in terms of desire, attitude, and competency that drive the participant’s actual behaviours towards the goal of creating a new business venture. The participants will then be aware of their strengths and, more importantly, weaknesses that they need to address in order to start their new business venture successfully. For example, an individual who is actually unable to prepare a business plan to submit for financial supports should be aware of the lack of this skill. An improvement in this skill could reinforce the entrepreneurial aspiration and pursue of new business creation. A focus on strengthen the intention-behaviour link would, therefore, increase the rate of actual start-up among the participants but also the likelihood of success of the start-ups.

The results from this present study also suggest that institutions (e.g., banks and incubators) that give support to business start-up should examine the true reason for an individual to create a new venture before deciding whether to financial a business project or not. As such, the support can go to those who have a true entrepreneurial desire (i.e., starting a new business for long-term development), not aiming to exploit the support for other purposes.

There is also implication for entrepreneurship development policies. That is, the policies designed to promote business start-up should not limit to measures to increase number of start-ups, such as tax exemption. More importantly, they should contribute to creating an environment that encourages aspiration and desire for the entrepreneurial career among the local community – the main driver of entrepreneurship in the long term.

9. Limitations

This present study used a cross-sectional design and the relationship among the study variables were explained by reference to theories. Our analyses using SEM help to address the potential disturbance of common method variance (Kenny, 2008) and show the robustness of the measures used. Therefore, there is solid evidence to suggest the presented findings are genuine and not due to common method issues.

10. Conclusion

Overall, our study not only affirms the application of the TPB (Ajzen, 1991) but also extends the discussion on EI by treating EI as future-directed intention (Pacherie, 2006) that that guides and controls the actual behaviour in the discovery of opportunity for future creation of a new business entity. Our study empirically highlights the importance of EI to the alertness for market opportunities that potential entrepreneurs need to be aware of in making the decision on whether to pursue the endeavour towards future start-up of a new business venture upon the self-assessment of EI. The findings also have implications for entrepreneurship education and policies that promote entrepreneurship development.

References


## Table 1 Descriptive statistics and inter-correlations of study variables

<table>
<thead>
<tr>
<th></th>
<th>$M$</th>
<th>$SD$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Social Norms</td>
<td>5.33</td>
<td>1.24</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Personal Attitudes</td>
<td>5.59</td>
<td>1.19</td>
<td>.34**</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived Behavioural Control</td>
<td>3.50</td>
<td>1.22</td>
<td>.27**</td>
<td>.22**</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Entrepreneurial Intentions</td>
<td>4.31</td>
<td>1.45</td>
<td>.34**</td>
<td>.51**</td>
<td>.47**</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Scanning &amp; Search</td>
<td>6.81</td>
<td>1.48</td>
<td>.43**</td>
<td>.34**</td>
<td>.28**</td>
<td>.32**</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Association &amp; Connection</td>
<td>4.56</td>
<td>1.26</td>
<td>.20**</td>
<td>.14**</td>
<td>.31**</td>
<td>.21**</td>
<td>.35**</td>
<td>–</td>
<td></td>
</tr>
<tr>
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<td>4.34</td>
<td>1.05</td>
<td>.23**</td>
<td>.16**</td>
<td>.37**</td>
<td>.26**</td>
<td>.36**</td>
<td>.38**</td>
<td>–</td>
</tr>
</tbody>
</table>

Note: $n = 473$, $M$: mean, $SD$: standard deviation, **$p < .01$.  
Figure 1 The conceptual model

**Entrepreneurial Intentions**

- **Personal Attitudes**
  - $H1a$ (+)
  - $H2b$ (+)

- **Social Norms**
  - $H1b$ (+)
  - $H2a$ (+)

- **Perceived Behavioural Control**
  - $H2c$ (+)

**Theory of planned behaviour**

**Causal theory of action**

- **Scanning & Search**
  - $H3a$ (+)

- **Association & Connection**
  - $H3b$ (+)

- **Evaluation & Judgement**
  - $H3c$ (+)
Appendix Scales of the study variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurial Intentions</td>
<td>Source: Liñán and Chen (2009)</td>
</tr>
<tr>
<td></td>
<td>I am ready to do anything to be an entrepreneur.</td>
</tr>
<tr>
<td></td>
<td>My professional goal is to be an entrepreneur.</td>
</tr>
<tr>
<td></td>
<td>I am determined to create a business venture in the future.</td>
</tr>
<tr>
<td></td>
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<td>Personal Attitudes</td>
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<td>I always keep an eye out for new business ideas when looking for information.</td>
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</table>
I read news, magazines, or trade publications regularly to acquire new information.
I am always actively looking for new information.

**Association and Connection**

*Source:* Tang et al. (2012)

I see links between seemingly unrelated pieces of information.
I am good at “connecting dots.”
I often see connections between previously unconnected domains of information.

**Evaluation and Judgement**

*Source:* Tang et al. (2012)

I can distinguish between profitable opportunities and not-so-profitable opportunities.
I have a knack for telling high-value opportunities apart from low-value opportunities.
When facing multiple opportunities, I am able to select the good ones.

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* Toai Son Dam *Email Address:* toaids@neu.edu.vn
* Nam Hoang Vu *Email Address:* namvh@neu.edu.vn
* Trung Huy Nguyen *Email Address:* trungnh@neu.edu.vn
* Yen Hai Thi Mac *Email Address:* haiyen.qlkt@gmail.com
Measuring Efficiency of R&D Activities in Drug Entrepreneurs in Vietnam By Integrated Framework of BSC and DEA

Nguyen Thi Hanh

Quy Nhon University

Abstract

This article presents the development of a comprehensive framework to measure technical efficiency of R&D activities in drug entrepreneurs in Vietnam. The proposed conceptual framework combines the Balanced Scorecard (BSC) method with the non-parametric technique known as Data Envelopment Analysis (DEA) by using five interconnected DEA models which try to encapsulate four perspectives of R&D efficiency (learning and growth, internal processes, customers, and financial). The study selected 140 drug entrepreneurs which have R&D activities in more than 3 years for empirical investigation. The results indicated that major drug entrepreneurs in Vietnam have low level in Efficiency of R&D activities While almost of the firm’s success in perspectives of learning and growth, a lot of them were not good at performance customers, internal processes. Furthermore, many of drug entrepreneurs in Vietnam have low efficiency in using financial results to improve R&D abilities that enable maintain their long-term success in R&D.

Key words: R&D activities, technical efficiency, drug entrepreneurs, Balanced Scorecard, Data Envelopment Analysis

1. Introduction

According to OECD (2011), the pharmaceutical industry is one of the sectors with highest degree of R&D investment. Research and development of new drugs is a long, complicated, risky and costly process. Time spent for a new drug R&D ranges from 10 to 15 years and the total cost of this process is up to thousands of millions of dollars. EvaluatePharma (2015) finds that worldwide pharmaceutical R&D totalled expenditure is $141.6bn in 2014, increasing of 3.1% on the previous year. If the process is performed successfully it will bring huge profits for branded drug companies. In contrast, the failing of it will create huge losses to these company. Patrice T. (2010) suggested that the pharmaceutical industry is currently facing many challenges such as reducing success rates in innovation, rising research costs, the decline in profit from following the expiration of patent protection, and great expense to bring a new drug to the market according to the schedule prescribed by law.

Costs for new drug development is rising but success rates in drug R&D from discovery to commercialization are low and getting worse in last decades. So in industrial context and managerial logic, question of efficiency of investment in R&D is necessary to be clearly answer for making decisions how much and for which object pharmaceutical companies invest or continue to invest in R&D. Efficiency measurement can supply required scientific basis for these inquiries. Evaluating the effectiveness of R&D in the drug production enterprises is interesting not only pharmaceutical companies, but also researchers and administrative officers.

In this article, I am going to find out how is R&D activities in pharmaceutical industry in general. And, I will focus to measure technical efficiency of drug entrepreneurs of Vietnam by using the integrated tool of Balanced Scorecards (BSC) and Data Envelopment Analysis (DEA). I will also discuss some of approaches to improve efficiency of drug entrepreneurs of Vietnam in the future. Data of 140 drug entrepreneurs in over the country in three years (2012-2014) is collected for the main
research.

2. R&D activities in the pharmaceutical enterprises of Vietnam

According to a survey of General Statistics Office Of Vietnam (GSO, 2015), counted until 31/12/2014, Vietnam has 5,517 pharmaceutical enterprises are operating. Statistics pharmaceutical enterprises by sector and by type of business enterprises as follows:

Table 1. Pharmaceutical business statistics

<table>
<thead>
<tr>
<th>Fields of pharmaceutical business</th>
<th>Type of business</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>State enterprises</td>
<td></td>
</tr>
<tr>
<td>Growing medicinal plants</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>Producing pharmaceutical chemistry and pharmaceutical materials</td>
<td>3</td>
<td>80</td>
</tr>
<tr>
<td>Producing drugs</td>
<td>9</td>
<td>317</td>
</tr>
<tr>
<td>Producing equipment, medical instruments, dental</td>
<td>1</td>
<td>164</td>
</tr>
<tr>
<td>Producing orthopedic devices, rehabilitation</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Wholesale of drugs</td>
<td>10</td>
<td>2727</td>
</tr>
<tr>
<td>Wholesale of pharmaceutical of machinery, medical equipment</td>
<td>2</td>
<td>1443</td>
</tr>
<tr>
<td>Retail sale of pharmaceutical products, medical equipment in specialized stores</td>
<td>6</td>
<td>731</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>5517</td>
</tr>
</tbody>
</table>

*Source: GSO, 2015*

The country has grown 34 growing medicinal plants enterprises (accounting for 0.62%), 582 pharmaceutical manufacturing enterprises (including enterprises producing drugs for human and veterinary drugs, agricultural chemicals, drugs and pharmaceuticals, business production of medical equipment and orthopedic equipment, accounting for 10.55%) and 4901 enterprises with pharmaceutical commercial functions (including wholesale and retail sale of drugs and medical equipment, accounting for 88.83%). Number of pharmaceutical commercial enterprises make up the majority, more than 8.42 times the number of manufacturing enterprises shows that Vietnam is an attractive market, but pharmaceutical companies producing drugs in the country is difficult to compete with imported drugs.

Result of a research performed by experts of the WHO/UNIDO (Drug Administration of Vietnam, 2014a) showed that 82.1% of pharmaceutical companies surveyed said that their businesses have necessary internal capacity to conduct R&D activities. However, investment of pharmaceutical enterprises for this activity is very low. Most pharmaceutical manufacturing enterprises (accounting for 67.9%) do not invest or invested only in low, under 5% of their revenue for R&D activities. Specifically, 3.6% of enterprises do not invest for R&D function. With such a low level of investment led to a shortage of facilities and resources for R&D.
According to the Drug Administration of Vietnam (2014a), the total number of registered drugs manufacturing in the country is 10,692 with a total of 500 active ingredients. Thus, there are average 21 number of registered drugs for an active ingredient. It means that drug enterprises have overlap invested on research and development, focus on drugs with the same active ingredient typically leads to fierce price competition when the product is brought to market.

National Strategy Vietnam to pharmaceutical development until 2020 and vision to 2030 set a target by 2020, drug production in the country will account for 80% of the medicines consumed in 2030 and domestic drugs production basically will meet drug demand. And, in planning development oriented pharmaceutical industry Vietnam (Drug Administration of Vietnam, 2014b), Vietnam will develop the pharmaceutical industry to encourage scientific research and focus on fundamental research, applied research, research and development and pilot production; develop effective linkage between research and actual production, especially in the cases of high-tech medicine, vaccines and biological products, packaging and modern equipment.

Development objectives are defined at a high level but the investment situation of pharmaceutical companies for R&D in both terms of means and people are very low, and actual results from the R&D is not high. This is the problem that the pharmaceutical industry in general, the pharmaceutical enterprises and management agencies in particular sectors of interest. Quantitive assessment of R&D efficiency in drug enterpirose is nessesary to not only business for investement decision making but also administrators for policy issuance.


To cover this research gap, in this article, the author present an quantitative measurement and evaluation technical efficiency of R&D in drug enterprises by using integrated tool of BSC and DEA.

3. Methodology, data and descriptive statistics

3.1 Overview of R&D

Research and development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. (OECD, 2002).

According to OECD (2002), the term R&D expresses a process of three activities: basic research, applied research and experimental development. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. Applied research is also original investigation undertaken in order to acquire new knowledge. Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed. R&D covers both formal R&D in R&D units and informal or occasional R&D in other units.
An R&D organization is seen as a production system with inputs, the process of change and its output. Process R & D in the study by Brown and Svenson (1988) is described in Figure 1.

![R&D Process Diagram](Image)

**Figure 1. R&D process**  
*Source: Brown and Svenson (1988)*

Inputs: are the resources and the stimuli that R&D system received and processed, including: human resources, information, ideas, equipment, facilities, the specific requirements and budget necessary to carry out R & D activities vary. As part of the provision of services, R&D work is mostly done in response to specific requests from the marketing department, production, manufacturing and other departments within the enterprise.

The process of change: is the activity that takes place in the system of R&D, R&D laboratories, in order to transform R&D inputs into R&D output. It included: writing proposals, conduct research, testing hypotheses, results reporting, ...

Output: normally patents, new products, new processes, publications are published, or the truth is found, or the principles, knowledge has never known before.

The result: the valuable achievements of the organization, was created by the receiving system using the output of the process of transformation of the R & D system. Thus, if we analyze a manufacturing enterprise with R & D system standards such as Figure 3.1, the receiving system can be considered a client of R & D. In an organization operating for profit, the result of R & D could be a new product, the reduction of cost, improve sales, increase market share, and avoid financial risks.

R&D technical efficiency is a measure of how well an input is converted into an output. R&D technical efficiency is measured as the ratio of physical output to physical input. Enterprises should evaluate the efficiency of R & D not only to supply a basis to make decision on R&D investment but also to collect because feedback information in R&D for in time adjustment. R&D activities should be linked closely with the vision, goals and strategies of the business, and focus our efforts to realize them in practice.
However, the measurement of R&D activities is difficult and complicated work. According to Bremser and Barsky (2004), the businesses should develop a wise R&D strategy designed to gain competitive advantages and growth, but the strategic performance is a governance challenge.

### 3.2 The concept and perspectives of Balance Scorecard (BSC)

Balanced Scorecard (BSC), a set of performance measures derived from the vision and strategy of the organization, expressed through a scorecard system was stratified to the level of management and individuals. BSC was first introduced in 1992 by Dr. Robert Kaplan and David Norton as a measurement system that allows additional non-financial metrics in the system of traditional financial metrics to deliver administrators and operators a more balanced perspective on evaluation of the activities of the organization.

BSC introduced an evaluation of 4 perspectives: financial, customer, internal processes and learning & development; development of performance metrics; and collect and analyse relevant information. According to Kaplan and Norton (1996), the BSC retains traditional measures but these measures only reflect the results of operations in the past, while a full picture of the long-time business needs reflects from the performance of the investments in the long-term potential to the customer relationship for success. Therefore, the four perspectives and the main question to be posed and answered to determine the measure of BSC model as shown in Figure 2.

![Figure 2. The four perspectives of BSC](Source: Kaplan and Norton (1996))

Balancing character in the BSC approach embodied in: Balancing the evaluative criteria of success in terms of financial and non-financial; Balance between the elements inside and outside the organization; And, the balance between the front and rear indicator processes intrinsic activity, i.e. between the results of operations and factors that generate results.

**Perspective of Finance:**
Evaluation of the financial perspective will indicate likely the profitability of the organization. The financial measures will only result in cash held last achieved sales growth, cash flow, ... (Kaplan and
Norton, 1992). The financial assessment is focused on establishing a system for measuring the economic impact of previous activities and is used as a measure of all other perspectives of the BSC model. (Kaplan and Norton, 1996)

Perspective of Customer:
When selecting the evaluation criteria for the customer perspective, organizations must answer two important questions: Who are the target customers of the organization? What is the real value that the organization serves customers? Perspective of customer is often assessed with the use of KPI such as customer satisfaction, customer loyalty, market share, the number of new customers (Kaplan and Norton, 1996). These indicators relate to the organization's strategy and direct impact on the long-term financial goals of the organization. (Kaplan and Norton, 2004).

Perspective of Internal operational processes:
Organizations need identify key processes to take to increase the value for customers and shareholders (Kaplan and Norton, 1992). The assessment in this regard represents a clear difference between the BSC and other measurement systems. Organizations need to determine the primary process and choosing the most appropriate measure. According to Kaplan and Norton (1996), organizations need to focus on assessing the resources to improve or expand the capacity. Thus, product development, development or improvement of manufacturing processes, production, delivery and after-sales services can be considered in this respect.

Perspective of Learning and Development:
Kaplan and Norton (1996) said that the goal in this regard is often related to one of three groups: the capacity of the staff; the capacity of the private system; motivation, decentralization, and links. When implementing measure performance in terms of financial, operational processes and internal customers, managers will see the gap between the expectations of the organization with the current situation. The main purpose of the assessment of learning and development for the organization is to improve skills or what additional knowledge, properly manage resources to achieve these goals in the future and ensure effective sustainability.

3.3 Technical efficiency and data envelopment analysis (DEA)

Technical efficiency was first introduced by Farrell in 1957 based on research by Debreu (1951) and Kopman (1951). Farrell said that the efficiency of a production unit consists of two components: technical efficiency and allocative efficiency. Technical efficiency (TE) can be defined as a unit ‘s capable to maximize production output with a set of inputs and technology in advance. Allocative efficiency (AE) reflects the production that units can use the inputs in accordance with the optimum ratio corresponding to the given price. Economic efficiency (EE) is a combination of two effective ingredients mentioned above.

Method of efficiency evaluating Farrell has then received attention of some researchers as Sherparl (1970), Afriat (1972), ... and when Charmes, Cooper and Rhodes (1978) introduces data envelopment analysis (DEA), it actually expanded and today has become a big application in economic analysis. DEA uses the best output variable input level new applicants determined to form a boundary envelope and see it as technical efficiency limitation of the industry.

Một cách đơn giản, hiệu quả (mang tính kỹ thuật) của việc sử dụng các yếu tố đầu vào xi để thu được...
Simply, efficiency (technical) of the use of inputs $x_i$ to obtain outputs $y_j$ can be measured according to the formula:

$$
TE = \frac{\text{Total outputs}}{\text{Total inputs}} = \frac{\sum_{i=1}^{m} p_i y_i}{\sum_{j=1}^{n} w_j x_j}
$$

Applying for a business (referred as DMU) that uses $k$ inputs and produces $m$ outputs, it should be calculate at the price $p_i$ and $w_j$ of the inputs / outputs. However, the determination of prices of inputs/outputs individually are often complex, so, we can simply assume that each DMU will use certain weight $u_i$ and $v_j$ to get as high as possible TE score, in other words, $u_i$ and $v_j$ are the weights that help DMU get closest to production possibility frontier (PPF). So $u_i$ and $v_j$ are called "hidden price" to distinguish them from $p_i$ and $w_j$ is the real prices and serves as prices in the calculation of technical efficiency (TE).

Generally, in the case of problem of $n$ DMU while each DMU uses $k$ inputs $x_k$ to generate $m$ output $y_m$, technical efficiency (TE) of a DMU is determined by the following approach:

$$
\max_{u,v} \ TE_o
$$

With conditions:

$$
\frac{\sum_{i=1}^{m} u_i y_{ai}}{\sum_{j=1}^{n} v_j x_{aj}} \leq 1, \quad \alpha = 1, \ldots, n
$$

$$
U_i, v_j \geq 0, \quad i = 1, \ldots, m, j = 1, \ldots, k
$$

Charnes et al. (1978) has applied non-parametric linear optimization on the settlement of the such a general formula with the assuming of constant efficiency of scale (CRS). Then, Banker et al. (1984) has developed this problem for the case of variable return to scale (VRS). Until now, many other DEA models such as Malmquist DEA, network DEA, SBM DEA,… have developed and applied in economic analysis.

Using DEA in the estimating and evaluating the effectiveness is more and more popular in many domestic and foreign researches, and in many levels: country, industry, enterprises, specific functional area, project, and individual. For example, a number of important studies such as the study of the Serrano-Cinca et al. (2005) in evaluating the effectiveness of internet companies; Akazili et al. (2008) in the field of health care; Feroz et al. (2008), Hashimoto and Haneda (2008) in evaluating the effectiveness of national, Min et al. (2008) measure the effectiveness of the luxurious hotels of Korea, Delis and Papanikolau (2009) in banking sector. In many countries, there are studies assessing the efficiency of DEA applications like Nguyen Khac Minh City (2004) study on the efficiency of the economy, in the processing industry; Vu Hoang Dat (2004) study on the efficiency of the textile industry, Dang Tai An Trang (2004) study on the efficiency of the construction industry. Thai Thanh Ha (2009) studied the effect of natural rubber production of the household; Ton Nu Hai Au et al.
(2012) evaluate the effectiveness of aquaculture activities.

3.4 The integrated tool of BCS and DEA using R&D efficiency measurement

BSC and DEA have many advantages in evaluating the effectiveness of the organization, but they both have great limitations in this evaluation. The combination of BSC and DEA in evaluating the effectiveness in a variety of research has been promoting the advantages and overcome the disadvantages of both techniques. Researches of Eilat et al. (2008), Najafi et al. (2009); Serrano-Cinca et al. (2005) show that limitations of BSC can be cover when used in integration with DEA. Chen&Chen (2007) suggest that DEA can supply clear and useful information for balancing efficiency evaluation in BSC model.

BSC-DEA combination offers a new approach to improve the analysis capabilities. It allows for the simultaneous analysis of multiple inputs and multiple outputs, while pointing out how much input should be reduced in order to achieve the defined output and the output can be increased to a level much given input determined to achieve the effect. (Rickards, 2003).

Some researches using integrated tool of BSC – DEA in efficiency measurement:
- Rouse et al. (2002): Estimating and evaluating the change effectively and the impact of learning on the change of efficiency in an international airline (called KASM), the period from 1993 to 1996.
- Chen and Chen (2007): Estimate and evaluate the business effectiveness in 30 businesses in semiconductor industry of Taiwan, the period from 2002 to 2005.
- Min et al. (2008): Evaluate the financial performance of 6 luxurious hotels in South Korea.
- Chiang and Lin (2009): Testing the hypothesis about the relationship between the evaluation criteria in the four perspectives of BSC model, evaluate the effectiveness of businesses in two sectors: automotive (39 companies) and banks (30 companies) in the US in 2007.
- Marcedo et al. (2009): Evaluate business performance of 34 branches of the Bank of Brazil, second quarter of 2006,

Among them, Amado et al.’s research is successful in using combined BSC-DEA to evaluate the efficiency of R&D projects. The complexity of the project R&D has been comprehensively review in order to develop a system of 20 indicators in BSC model. And, DEA models are built on the causality between perspectives and indicators of BSC model to assess efficiency of these R&D projects.

3.5 Intergrated model BSC-DEA in measuring efficiency in R&D activities of Viet Nam huaman drug enterprises

This research suggests that the multidimensional nature of R&D activities should be assessed by using several DEA models. Furthermore, it also suggests that relationships between different perspectives of BSC model developed should be controlled in R&D activities evaluation. In this respect, the author find that the family of network DEA models proposed by Amado et al. (2012) have many advantages than other researches listed above and can help to reach such research objectives. But, in study of Amado et al. (2012), cause – effect relations are limited at the final objective – financial benefits, so they can not show a circle process of investing and harvest in R&D field. So, the author use the fifth
DEA model to measure efficiency of re-investment financial results to improve R&D capacities of enterprises.

The research concepts and metrics are defined as follows:

- Develop new business
- Support present business
- Develop and improve technical capacity
- Reduce cost
- Increase profit
- Link R&D with general strategic objectives

Figure 3. Integrated model BSC-DEA in measuring efficiency in R&D activities of Viet Nam human drug enterprises

- The level of technical equipment (muctb):

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The level of technical equipment is the ratio comparing the total value of fixed assets with a total workforce of an enterprise at a time (early or late) or in a period (annual average). The equipment and fixed assets per one employee of the business may be calculated at cost of fixed assets (initial value) or the remaining value of the fixed assets.

In this study, the level of equipment engineering is fixed averaged value per employee of the business during the period studied (2012-2014) and was calculated using the formula:

\[ nuctb = \frac{\text{Remaining value of fixed assets}}{\text{Total workforce}} \]

- Income per labour

Income per labour is calculated by dividing the total cost of salaries, salary-like-expenses, and other expenses of employees for a total average employment in the enterprise. The average income in this study was calculated for 3-year period (2012-2014) according to the formula:

\[ \text{tnb} = \frac{\text{Total cost for labour}}{\text{Number of labourforce}} \]

- Development level of R&D organization and culture

Development level of R&D organization and culture is based on the actual survey in enterprises and the levels of importance of the variables component counted from data of a small survey of the author with support of AHP technique. The value of the explanatory variable is 1 if the fact is true in actual survey, 0 if the fact is contrary.

\[ mdtc_{vh} = \sum_{i=1}^{5} \text{Value of variable}_{i} \times \text{Level of importance of the variable}_{i} \]

- Labour’s qualifications

Level of labour’s qualifications is evaluated by the ratio between highly qualified workers and the total labor force. In particular, highly qualified employees are workers who trained from college level. In drug enterprises, workers can participate in R&D activities concluding researchers, technicians or support staff.

\[ tdl\overline{d} = \frac{\text{Highly qualified employees}}{\text{Total labor force}} \times 100\% \]

In this equation, the total number of employees with high qualifications and total workforce is calculated by taking the average value for each year. Then labour’s qualifications 2012-2014 period is calculated by the average value of the labour’s qualifications of 3 years.

- Productivity of R&D system

Productivity of R&D system is measured by the ratio between the number of R&D completed and successful registrated products for 3 years (2012-2014) and the average number of highly qualified workers in the same period. This index indicate how many averagely R&D completed and successful registrated products by a highly qualified labor in the 3-year.

The formula for calculating is:
Revenue growth rate index
Revenue growth rate index is calculated by calculating net revenue growth rate in the period 2012-2014, then comparing net revenue growth rate of a certain surveyed enterprise (i) with the highest and lowest net revenue growth rate of the surveyed enterprises.

\[
t_{dt}dt(i) = \left( \frac{DTT_{(i,2014)} - DTT_{(i,2012)}}{DTT_{(i,2012)}} \right) \times 100 \%
\]

\[
cst_{dt}dt(i) = \frac{(t_{dt}dt(i)) - t_{dt}dt_{\min}}{(t_{dt}dt_{max}) - t_{dt}dt_{\min}}
\]

Relative market share
Relative market share is calculated by comparing the average net sales of each enterprise in period of 2012-2014 with the average net sales respectively of the strongest competitors in the market (the enterprise which has the highest average net sales in the market).

\[
t_{pt}td(i) = \frac{dttb_{(i)}}{dttb_{(max)}} \times 100 \%
\]

Profit growth rate index
Profit growth rate index is calculated by calculating net profit growth rate in the period 2012-2014, then comparing net profit growth rate of a certain surveyed enterprise (i) with the highest and lowest net profit growth rate of the surveyed enterprises.

\[
t_{dt}ln(t(i)) = \left( \frac{LNT_{(i,2014)} - LNT_{(i,2012)}}{DT_{(i,2012)}} \right) \times 100 \%
\]

\[
cst_{dt}ln(t(i)) = \frac{(t_{dt}ln(i)) - t_{dt}ln_{\min}}{(t_{dt}ln_{max}) - t_{dt}ln_{\min}}
\]

The average efficiency is calculated by the average formula:

\[
H_{th} = \frac{1}{5} \left( H_{(R-P)} + H_{(P-OP)} + H_{(OP-OC)} + H_{(OC-F)} + H_{(F-R)} \right)
\]

After calculating the average efficiency, the author identify new marginal efficiency and adjust efficiency a for each business by dividing the average effective index of each enterprise for the highest average efficiency observed in the survey. The enterprise has the highest average efficiency (Hdc = 1)

The way to develop models to estimate R&D efficiency of the author basically similar to modeling BSC-DEA in the study of Amado et al. (2012), however, there are some differences from the research of Amado et al. (2012). The BSC-DEA model in the study of Amado et al. (2012) is used to evaluate efficiency and choose R&D projects while in the author ‘s research BSC-DEA model is applied for
evaluating efficiency of R&D activities (at R&D function level). So that, variables used in BSC-DEA are chosen from some important studies and researches on researches (ROR) of many other authors in over the world as well as the author’s survey results for experts’ opinions in evaluation the efficiency of R & D activities (aggregated and presented in Table 4.4). DEA Model 5 is the author’s addition to evaluate the success of the R & D strategy while the financial benefits are used to finance the development of potentials and resources in R&D and thereby improve the output and results of R&D in future.

The author uses the average formula is made to the average efficiency. Then, a marginal value of efficiency is determined and based on which the author made adjustments efficiency index by dividing the average efficiency index of each enterprise for the highest average efficiency observed in sample (marginal efficiency).

Table 2. Explanation on variables of the integrated BSC-DEA model

<table>
<thead>
<tr>
<th>Chi tiêu đánh giá</th>
<th>Cách tính</th>
<th>Nguồn tham khảo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of technical equipment (muctb)</td>
<td>The ratio of the total value of fixed assets and a total workforce.</td>
<td>Tipping et al. (1995), adjustments proposed by the author and experts’ opinions</td>
</tr>
<tr>
<td>Monthly income per labour (tntb)</td>
<td>The ratio of of the total cost of salaries, salary-like-expenses, other expenses of employees and a total average employment in the enterprise</td>
<td>Chiang &amp; Lin (2009)</td>
</tr>
<tr>
<td>Development level of R&amp;D organization and culture (mdtc_vh)</td>
<td>Value of the variable is counted with data collected from surveyed enterprises and the levels of importance of the explanatory variables counted with data from another small survey of the author with support of AHP technique.</td>
<td>Schein (1985), Roussel, P., et al. (1991), Jain et al. (2010)</td>
</tr>
<tr>
<td>Labour’s qualifications (tdld)</td>
<td>Ratio (%) of the number of highly qualified labor in the total labor force</td>
<td>Schwart &amp; ctg (2011), Chen &amp; Chen (2007)</td>
</tr>
<tr>
<td>Productivity of R&amp;D system (nsRD)</td>
<td>The ratio between the number of R&amp;D completed and successful registrated products and the average number of highly qualified workers in the same period</td>
<td>Adjustments proposed by the author and experts’ opinions</td>
</tr>
<tr>
<td>Revenue growth rate index (cstdtdtt)</td>
<td>Revenue growth rate index is net revenue growth rate. Revenue growth rate index is calculated by comparing net revenue growth rate of a certain enterprise with the highest and lowest net revenue growth rate of the surveyed enterprises.</td>
<td>Cooper &amp; Kleinschmidt (1996), adjustments proposed by the author and experts’ opinions</td>
</tr>
<tr>
<td>Relative market share (pttd)</td>
<td>The ratio of the average net sales of each enterprise and the average net sales respectively of the strongest competitors in the market</td>
<td>Tipping &amp; ctg (1995), Schwart &amp; ctg (2011), Chen &amp; Chen (2007)</td>
</tr>
<tr>
<td>Profit growth rate index (csttlnt)</td>
<td>Profit growth rate index is net profit growth rate. Profit growth rate index is calculated by comparing net profit growth rate of a certain enterprise with the highest and lowest net profit growth rate of the surveyed enterprises.</td>
<td>Cooper &amp; Kleinschmidt (1996), adjustments proposed by the author and experts’ opinions</td>
</tr>
</tbody>
</table>
3.6 Data and descriptive statistics

From the list of 317 enterprises producing medicines nationwide in 2014, the authors review and filter out 179 enterprises which produce medicines for people, conduct surveys and collect data on these enterprises. There are diverse data sources:
- Data from the government administrative offices such as the Department of Intellectual property, Drug Administration and the General Department of Taxation;
- Data compiled from the financial statements and the annual report of the enterprise;
- Data obtained originally from the author’s surveys: go and search, telephone interview, e-mail exchange.

After removal of the businesses that do not have the report, have incompletely report, are inaccessible in the author’s surveys, a final list of 140 human drug enterprises is used for data collecting in the main research.

Statistics value of variables used for 5 DEA model is presented in Table 5.5. Variable statistics show a drug-manufacturing enterprises surveyed had average levels of technical equipment for work of 457 million / person, the average labor income of 6.48 million / person. The organization and development of the culture of R & D is 76.62% compared to the highest level available.

Table 3. Variable statistics of 5 DEA models

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muctb</td>
<td>140</td>
<td>457.0511</td>
<td>440.3006</td>
<td>3.9500</td>
<td>3575.3900</td>
</tr>
<tr>
<td>Tntb</td>
<td>140</td>
<td>6.4800</td>
<td>3.5072</td>
<td>1.0300</td>
<td>19.5530</td>
</tr>
<tr>
<td>mdtc_vh</td>
<td>140</td>
<td>0.7662</td>
<td>0.3279</td>
<td>0.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>Tdld</td>
<td>140</td>
<td>22.5644</td>
<td>15.3290</td>
<td>0.5200</td>
<td>109.7500</td>
</tr>
<tr>
<td>nsRD</td>
<td>140</td>
<td>0.7713</td>
<td>1.2595</td>
<td>0.0000</td>
<td>7.2000</td>
</tr>
<tr>
<td>Cstdtdtt</td>
<td>140</td>
<td>0.0176</td>
<td>0.0869</td>
<td>0.0001</td>
<td>1.0000</td>
</tr>
<tr>
<td>Tptd</td>
<td>140</td>
<td>7.2084</td>
<td>12.7331</td>
<td>0.0000</td>
<td>100.0000</td>
</tr>
<tr>
<td>Cstdtlnt</td>
<td>140</td>
<td>0.5436</td>
<td>0.0826</td>
<td>0.0000</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Source: Survey and calculation of the author

The average percentage of highly qualified labor in the total labor force in the survey is 22.56%. A highly qualified employee of businesses surveyed in the 3-year average (2012-2014) created 0.77 R&D’s product accomplished and successfully registered. The average net revenue growth index was 0.0176 and the the average net profit growth index was 0.5436 profits. The average is relative market share (compared with Hau Giang Pharmaceutical Joint Stock Company) is 7.21%.

The fact that the standard deviation of the level of technical equipment for labor is huge shows the difference between firms in investment and equipment for their labor. The large standard deviation of the relatively market share indicates that market positions of firms are very differentiate.

4. Results and findings

4.1 Results from the intergrated BSC-DEA model
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Results of efficiency estimation from 5 DEA models are presented in Table 4.
Table 4. Results of efficiency estimation from five DEA models
DMU
1
2
3
4
5
6
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8
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27
28
29
30
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41
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45

H(R-P)
1.0000
1.0000
0.5710
1.0000
1.0000
1.0000
1.0000
0.4882
0.5710
1.0000
0.9590
1.0000
1.0000
0.8400
1.0000
1.0000
1.0000
1.0000
0.8400
1.0000
0.9590
1.0000
1.0000
1.0000
1.0000
1.0000
1.0000
0.5710
1.0000
0.3880
0.4286
1.0000
1.0000
1.0000
1.0000
0.8400
1.0000
1.0000
1.0000
1.0000
1.0000
1.0000
1.0000
1.0000
0.8400

H(P-OP)
0.0404
0.1053
0.6756
0.3704
0.2439
0.0124
0.0700
0.0005
0.2019
0.0463
0.1594
0.0344
0.0479
0.0900
0.5706
0.2057
0.1824
0.1033
0.0001
0.0656
0.2045
0.1997
0.0001
0.1408
0.0308
0.1588
0.0258
0.0621
0.0444
0.0147
0.0001
0.0063
0.2531
0.0506
0.1389
0.0016
0.0025
0.0096
0.1633
0.0015
0.0083
0.4130
0.1749
0.1567
0.0001

H(OP-OC)
0.5258
0.1050
0.0520
0.0185
0.0524
0.3341
0.0988
0.0639
0.1250
0.1841
0.1189
1.0000
0.1384
0.0510
0.1392
0.0435
0.0341
0.0457
0.2237
0.0458
0.0791
0.1503
0.0985
0.1667
0.0646
0.0326
0.1782
0.0091
0.0788
0.0186
0.0033
0.8975
0.0697
0.0174
0.0387
0.3470
0.6717
0.1218
0.0389
1.0000
0.5019
0.0187
0.0941
0.1266
0.0412

H(OC-F)
0.7344
0.7512
1.0000
0.8199
0.7012
0.6766
0.6642
0.9733
0.6674
0.6640
0.6595
0.6582
0.6560
0.6669
0.6576
0.6863
0.8445
0.6674
0.8941
0.6939
0.6635
1.0000
0.9367
0.6770
0.6611
0.9579
0.6505
0.9665
0.7663
0.9496
1.0000
0.6630
0.6369
0.4698
0.7074
0.6956
0.6652
0.6450
0.4317
0.6600
0.6539
0.8365
0.7102
0.6656
0.9975

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H(F-R)
0.4488
0.2329
0.3548
0.2074
0.3835
0.3379
0.6281
0.1447
0.5207
0.3243
0.5694
0.9451
0.5293
0.3232
0.7513
0.3224
0.2500
0.3334
0.3056
0.3507
0.4079
0.4049
0.2644
0.3499
0.3578
0.1930
0.6269
0.2863
0.9055
0.5986
0.3228
0.6710
0.6710
0.9799
0.8489
0.6921
0.4735
0.6317
0.7456
0.6765
0.9539
0.4784
0.5846
0.6747
0.3076

DMU
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97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115

H(R-P)
1.0000
1.0000
0.5867
1.0000
1.0000
0.8400
1.0000
1.0000
1.0000
1.0000
1.0000
0.1288
0.8400
1.0000
0.9733
1.0000
1.0000
0.2567
1.0000
1.0000
0.4640
1.0000
0.2690
0.8400
0.8400
1.0000
1.0000
1.0000
0.4290
0.7143
1.0000
0.5710
0.8400
0.4277
1.0000
1.0000
1.0000
1.0000
1.0000
0.8629
0.8300
0.5070
0.3089
0.4569
1.0000

H(P-OP)
0.0047
0.0001
0.0001
0.1389
0.1296
0.0100
0.0001
0.0417
0.0001
0.0574
0.4921
0.0008
0.0002
0.0001
0.0005
0.0585
0.1250
1.0000
0.3200
0.0060
0.0001
0.0926
0.0006
0.0705
0.0001
0.0001
0.0039
0.0674
0.0002
0.0083
0.0642
0.1588
0.0306
0.0001
0.0903
0.4085
0.1961
0.0285
0.0001
1.0000
0.0002
0.0002
0.0002
0.0005
1.0000

H(OP-OC)
0.2577
0.0593
0.0833
0.0140
0.0142
0.0407
0.9615
0.0983
0.4265
0.0581
0.1038
0.3693
0.1668
0.7109
0.0469
0.1176
0.0434
0.0924
0.0498
0.0473
1.0000
0.0555
0.1114
0.0287
0.3795
0.2140
0.2197
0.1450
0.8232
0.1175
0.3992
0.0229
0.0233
0.0454
0.1555
0.1078
0.2338
0.1217
0.9275
0.1413
0.0498
0.1335
0.4405
0.0444
0.0635

H(OC-F)
0.6509
0.9492
0.9648
0.8959
0.9472
0.8206
0.7469
0.6814
0.8581
0.6500
0.6415
0.8705
0.9362
0.6620
1.0000
0.6685
0.6487
0.9639
0.6593
0.8798
0.7172
0.7245
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0.9907
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0.9822
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0.9563
0.8983
0.8041
1.0000
0.9296

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0.2382
0.2343


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<td>0.0929</td>
<td>0.9241</td>
<td>0.1257</td>
</tr>
</tbody>
</table>

Source: Survey and calculation of the author

Figure 3 represented the estimated efficiency from the five DEA models $H_{(R-P)}$, $H_{(P-OP)}$, $H_{(OP-OC)}$, $H_{(OC-F)}$, $H_{(F-R)}$ with efficiency valued 0 in the center and 1 at the edge of the circle.
The picture shows the difference of efficiency of the enterprises in causal relationships between the four perspectives of BSC model. Most businesses have high efficiency in learning and developing R&D capacity and financial efficiency (concentrating in the border of the circle), while many businesses have very low efficiency level in internal R&D process and marketing (concentrating in the center of the circle).

The adjusted average efficiency are presented in Table 5, and these results grouped according to the levels of business efficiency are presented in Table 6

Table 5. Adjusted R&D average efficiency of human drug enterprises

<table>
<thead>
<tr>
<th>DMU</th>
<th>Hdc</th>
<th>DMU</th>
<th>Hdc</th>
<th>DMU</th>
<th>Hdc</th>
<th>DMU</th>
<th>Hdc</th>
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<td>106</td>
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<td>74</td>
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<tr>
<td>5</td>
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<td>40</td>
<td>0.9176</td>
<td>75</td>
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<td>110</td>
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<td>0.8571</td>
<td>76</td>
<td>0.5464</td>
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<td>0.7550</td>
<td>77</td>
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<td>44</td>
<td>0.7212</td>
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<td>0.7022</td>
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<td>81</td>
<td>0.7230</td>
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<td>15</td>
<td>0.8573</td>
<td>50</td>
<td>0.4241</td>
<td>85</td>
<td>0.6139</td>
<td>120</td>
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The adjusted average efficiency: \( \text{Mean } H_{dc} = 1140(i=1140H_{dc(i)}) = 0.6520 \)
DMU_{13} have the R&D adjusted efficiency \( H_{dc13} = 0.6520 \) equalling the average R&D adjusted efficiency, surveyed 69 enterprises in the author survey have higher levels of efficiency and the other 70 enterprises have lower levels of efficiency. DMU_{54} has the lowest adjusted R&D efficiency, \( H_{dc54} = 0.4144 \) this means DMU_{54} gained 41.44% over the marginal efficiency (\( H_{dc} = 1 \)). Based on the highest level \( H_{dc\text{max}} = 1 \), the lowest level \( H_{dc\text{min}} = 0.4144 \), and the average \( H_{dc\text{tb}} = 0.6520 \), the author classify surveyed businesses into 4 groups: efficient, high level of efficiency, rather high level of efficiency, average level of efficiency and low level of efficiency (showed in table 6).

Table 6. Classification of surveyed businesses on level of R&D efficiency

<table>
<thead>
<tr>
<th>Hdc</th>
<th>Firms classification</th>
<th>Quantity</th>
<th>Density (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient (( H = 1 ))</td>
<td>1</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>High level of efficiency (0.85=( H &lt; 1 ))</td>
<td>10</td>
<td>7.14</td>
<td></td>
</tr>
<tr>
<td>Rather high level of efficiency (0.7=( H &lt; 0.85 ))</td>
<td>32</td>
<td>22.86</td>
<td></td>
</tr>
<tr>
<td>Average level of efficiency (0.55=( H &lt; 0.7 ))</td>
<td>73</td>
<td>52.15</td>
<td></td>
</tr>
<tr>
<td>Low level of efficiency (( H &lt; 0.55 ))</td>
<td>24</td>
<td>17.14</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey and calculation of the author

Result of grouping human drug enterprises according to the level of R&D efficiency shows that only one enterprise reach efficient level (DMU_{12}, \( H = 1 \)) in R&D activities and other 10 enterprises stand at high level of R&D efficiency (from 85% to less than 100% in comparing to the DMU_{12}. 17.14% of surveyed enterprises stay at low level of efficiency (lower than 55% in comparing to the marginal efficiency. More than half of enterprises surveyed (representing 52.15%) are in the group of average
level of efficiency (from 55% to 70% in comparing to the marginal efficiency).

4.2 Findings and Discuss

By search such reaching results , there are some important findings:

- From the four perspectives: R&D learning and capacities developing, R&D internal process, R&D market, and finance from R&D, DHG Pharmaceutical Joint – Stock Company reach effective level in R&D activities (H = 1). This is consistent with the fact that JSC DHG is now the pioneer in investment on R&D conditions and environment, successful in organizing and implementing the R & D internal processes, profitably exploiting R&D results not only in domestic market but also overseas market. copyrighted medicinal products by the firm has always been the leading products in terms of revenue with the high quality rate. And, the firm has always focused on reinvesting to expand and improve R&D capacities for the long-term and sustainable development objectives.

- There are only 11 enterprises efficient or at high level efficiency (85% or more compared to effective border). These are the drug manufacturing firms that succeeded in R&D activities. Meanwhile, the majority of enterprises (accounting for 52.15% of companies surveyed) focus in the range from 55% to 70% compared to marginal efficiency.

- Almost of surveyed human drug enterprises are effective in R&D learning and capacities developing with 79 enterprises (accounting for 56.43% of the surveyed enterprises) effective (H_{RP} = 1). The average efficiency index reach 0.8370. This suggests that the drug production enterprises in Vietnam have been very active in investing and improving the capacities of research and development.

- Financial efficiency performance (H_{OC-F}) of the drug manufacturing enterprises in Vietnam is quite high with 8 effective enterprise (H_{OC-F} = 1), the average reach 0.7850. H_{OC-F} is focused from 0.6286 to 0.9413. A lot of drugs producing enterprises were exploiting successful the R&D results and market potential for the achievement of financial targets.

- The efficiency of R&D internal process (H_{P-OP}) and the efficiency on perspective of R&D market (meet customer demand) (H_{OP-OC}) are very low, with the average value at 0.1587 and 0.1860. Only 8 firms are effective on aspext of R&D internal process and 5 firms are effective on perspective of market. Level of efficiency on R&D internal process (H_{P-OP}) distributed from 0.0001 to 0.4197 and level of efficiency on R&D H_{OP-OC} distributed from 0.0033 to 0.4357. This shows that drug production enterprises Vietnam is very weak in organizing and implementing drug R&D activities. This result is consistent with the reality and supply quantitative assessment to prove the overall statement of the experts of WHO/UNIDO in their research 4 year ago (Drug Administration, 2014). Besides limitation of R&D capacity, the drug manufacturing companies also failed to satisfy the customer's wishes. Low level of efficiency in terms of market consistsents with statements from the Drug Administration Department on the fact that Vietnam pharmaceutical companies use their R&D capacities on the same kind of drugs, focus on generic drugs, the conventional medicines with the same active ingredient leads to strong price competition when the product is launched.
• Efficiency on reinvest profits for improve R&D capacity ($H_{FR}$)low, only 4 businesses effective ($H_{FR} = 1$) and the average reached 0.4057. $H_{FR}$ allocates value from 0.2120 to 0.6881. This suggests that majority of drug businesses are not using effectively financial results from R&D to reinvest and improve their R&D activities thereby ensuring that businesses can pursue and achieve goals R&D in the long term and sustainable.

5. Conclusion

I have developed a integrated model of the two tools (BSC and DEA) to measure efficiency of R&D activities in human drug enterprises of Vietnam. A survey on 140 human drug enterprises over the country are carried out to supply data for the research. A BSC model is developed on 4 perspectives: R&D learning and capacities developing, R&D internal process, R&D market, and finance. Then, 5 DEA models are used to measure efficiency in casual relationship of these perspectives and 8 variables are inputs and outputs of the five models including level of technical equipment (muctb), monthly income per labour (tntb), development level of R&D organization and culture (mdtc_vh), labour ‘s qualifications (tdld), productivity of R&D system (nsRD), revenue growth rate index (cstdtdtt), relative market share (tptd), and profit growth rate index (cstdtln). Among the them, development level of R&D organization and culture (mdtc_vh) is determinded with the application of AHP.

I explored DHG Pharmaceutical Joint – Stock Company is at the highest leve of R&D effeciency and 10 other firms do their R&D activities well. But a large number of surveyed firm are focus in the range from 55% and 70% in comparing with marginal efficiency. Among them, a lot of human drug enterprises are good at improve R&D learning and capacities developing and finance aspext while almost of them are unsuccseful in R&D internal process, and finance. Low level in financial shows that many firms use uneffectively financial results from R&D to reinvest and improve their R&D activities for long term and sustainable R&D objectives.

From my analysis it appear that human drug enterprises should focus on improvement of their R&D internal process to largern their R&D product and choose the right range of products to maximize their market efficiency. Additionally, reinvestment for R&D should be done as a strategic approach for increase R&D efficiency in drug firms.

References


Chen, T., and Chen, L. (2007). DEA performance evaluation based on BSC indicators incorporated (The case of


The Design of an Innovation Research Led, Undergraduate Programme for Effective Development of R&D Skills and Learning

Daniel Keppie McCluskey, Loic Coudron, Mark Christopher Tracey, Christabel K L Tan, Ian David Johnston

University of Hertfordshire, United Kingdom

Abstract

Engineering education has suffered a shift in focus between research led fundamental engineering and vocational training that has resulted in many graduate engineers equipped without a thorough grasp of either skill set. Furthermore the belief that these two components of education can be explicitly separated appears to undermine the notion of what a graduate engineer is. The purpose of this paper is to outline the development of a research informed, undergraduate, module that incorporates the principles of the Massachusetts Institute of Technology developed approach to engineering education where the core components of study are formed around the concept of CDIO (Conceive, Design, Implement, Operate). We outline our initial starting concept for the taught module and systematically break down the CDIO approach, applying the outcomes of this process to the design of the engineering module. The resultant module structure incorporates the majority of the CDIO principles, and highlights the mechanisms by which research can inform undergraduate teaching without straying away from the development of practical skills required by the graduate engineer. This work suggests that the CDIO approach, with minor modification, can be tailored to a single isolated module structure as well as a whole curriculum provided that there is a clear objective outlined at the start.

1. Introduction

Engineering has long been taught as an undergraduate subject across a wide range of institutions, each with their own specialism within the field. In many cases these institutional specialisms are the result of new emerging industries. In turn this leads to the development of taught courses aiming to equip graduates with the necessary specific skills required for these up-and-coming industry sectors.

In many cases the incremental development of a degree course can result in fragmentation or broadening of the taught material becoming disassociated from the practice of engineering (Crawley, 2002) in part due to time constraints but also due to a change in focus towards research. This change is considered to result in students having a detailed top level approach to simple engineering problems, but lacking a thorough understanding of the underlying principles required to resolve more complex issues. Research conducted by both Jenkins (2000) and McNay (1999) suggests there is further fragmentation between the research and teaching aspects in higher education.

As a result of this apparent increasing fragmentation associated with engineering education, researchers at the Massachusetts Institute of Technology identified and codified a set of goals for engineering education. These goals were developed with the intention of providing a basis for curricular improvement and outcome based assessment, the result being “The CDIO Syllabus: A Statement of Goals for Undergraduate Engineering Education” (Crawley, 2001; Crawley, 2007).
CDIO (Conceive, Design, Implement, Operate) aims to provide the necessary structure to create a rational and complete set of goals that are considered to be both universal and capable of general application. Specifically the system focuses on personal, interpersonal and system building skills with complimentary structural placeholders to allow for the inclusion of any discipline specific subject knowledge that may be required.

Fundamentally the CDIO initiative aims to address the growing tension between the two primary factors governing undergraduate education – that of ever increasing subject specific technical knowledge and the wide array of personal, interpersonal and system building knowledge required of a young engineer in a real world environment.

The focus of this paper centres on recent developments at the University of Hertfordshire (UoH). This University offers a number of engineering courses across a variety of disciplines including aerospace, mechanical, electrical and design engineering. To compliment the undergraduate and postgraduate taught courses there is also the opportunity to further specialise within a number of applied research groups, each covering a more specific subset of the engineering field. The Microfluidic and Microengineering Research Group (MMRG) is one of these groups. Consisting of five post doctoral researchers from five separate engineering disciplines the MMRG, spearheaded by Professor of Microtechnology Mark Tracey, research and develop novel microfluidic solutions for the biochemical and microfluidic industries. The multidisciplinary, integrated nature of this group is considered atypical, whereby most other research groups have a more homogenous focus. It is this distinction that will be examined to determine whether the MMRG group structure can be embodied in a taught module and whether this lends itself well to the principles of the CDIO syllabus. The MMRG developed Microengineering and Microtechnology final year undergraduate module will be a test case for the approach. In addition while research focus has been attributed by Crawley as one of the possible reasons for the decline in engineering capability of undergraduate students (Crawley, 2002), it is the long established view, as echoed by Humboldt (1810, translated 1970) that Universities should treat teaching as a subset of research itself, whereby “learning always consists of not yet wholly solved problems”, including researchers in the teaching programme clearly lends an added skill set to the learning programme.

2. Aim

The objective statement derived during the development of MIT’s CDIO approach is particularly true for the emerging field of microfluidics and microtechnology whereby the assumption is that students should be able to:

“Conceive, design, implement & operate complex value-added engineering systems in a modern team-based environment”

With the expectation that Universities should, where possible, review and refine their undergraduate offerings on a continuous basis the aim of this study is to investigate whether the application of the concepts embodied by the CDIO approach can be applied to the development of a new, research informed, undergraduate module targeted at the final year engineering student at the UoH. To add further complexity the module will reflect the interdisciplinary nature of a real world engineering department and as such will be offered across two dissimilar engineering disciplines (Mechanical and Electrical Engineering). The result of this process will be the development, delivery and support of the taught module Microengineering & Microtechnology (MTech).
3. Background

While it is often true that first year undergraduate engineering students share common components of study, generally the expectation is that the teaching becomes more subject specific and promotes enhanced specialism with each successive year. While this mode of academic study may develop graduates that reflect the needs of larger industrial organisations, where large departments of specialism may be found, it can result in skills gaps for the graduate employee of smaller, high tech start-up industries of which the Biotech industry is a prime example.

As a result of this potential skills gap a new multidisciplinary module was proposed. The aim in this instance was to incorporate the various specialisms of an already well established diverse research group into the undergraduate engineering syllabus. The module developed would be proposed as an elective module for both mechanical and electrical cohorts with the respective alternative modules: Manufacturing strategy and Telecommunication Systems. An initial framework for this module was developed centring on a number of principles of good practice as outline by Chickering and Gamson (1987) and incorporating the expectations of the UK Professional Standards Framework (The Higher Education Academy, 2006). In particular the interactions between student and faculty was considered to be a primary focus and thus the module was constructed around a backbone consisting of a group project case study, centred on one of the internationally recognised research outputs of the MMRG (Johnson et al. 2005). In small groups with dedicated, interconnected, roles the initial aim of the proposed structure was to encourage reciprocity and cooperation, a view enhanced by the opinion of Springer et al (Springer, 1999) who report that the implementation of various different methods of small-group learning are effective in promoting greater academic achievement, more favourable attitudes toward learning, and increased persistence in particular in relation to science, mathematics, engineering and technology. Furthermore by providing access to the entire MMRG research team it was anticipated that further interaction between the students and the faculty could be achieved. Lecture sequencing was designed to allow flexibility and remove potential barriers to success. A single point of contact, the Module Lead, oversees the delivery of the programme ensuring coherence in the structure and message conveyed by staff.

Another fundamental principle of the proposed module structure was to communicate a high expectation; thus students would be tasked with developing a variant of a device that was itself developed by a team of post-doctoral researchers, the challenge in this instance being one of pitching the objective appropriately such that it wouldn’t become too daunting or onerous a task while maintaining the ethos of a cutting edge development. Additionally the initial scene setting for the module centres on an analysis of two seminal works within the field, that of Nobel Laureate Richard Feynman (Feynman, 1992) and Stanford Professor George Whitesides (Xia, 1998).

It was anticipated that the module would naturally incorporate a wide range of teaching styles and learning opportunities due to the diverse coverage of subject material and the inclusion of specialist researchers on the teaching body. The use of hands-on laboratory practical sessions coupled with an informed lecture series would further allow students to put theory into practice. Finally complimentary tutorial sessions covering analysis tools, both computational development tools and experimental metrological equipment, would be built-in providing an opportunity for students to find an area in which they excel. The initial concept, as shown in figure 1, was considered to be sound though potentially lacking “punch” in its intended outcomes.
As a result of the post development analysis it was perceived that the model followed by the Massachusetts Institute of Technology’s CDIO syllabus could be implemented to further strengthen the modules structure and emphasise the core principles of the module with the aim of reinforcing the intended learning outcomes of the MTech module.

4. Applying the principles of CDIO

The CDIO Initiative is designed as a template which can be adapted and adopted by any university engineering department. As an open architecture “framework” CDIO is available to all university engineering programs and the platform can be adapted to their specific needs. Participating universities (often referred to as “collaborators” within the CDIO literature) regularly develop materials and approaches that are shared across a multitude of universities.

For the purpose of this study it is not our aim to fully apply CDIO but rather to encompass the philosophy of the approach. It may be considered that this process may form an initial trial in advance of further analysis of CDIO and its application to the engineering courses at the UoH. In this regard while CDIO is considered to be a whole programme approach; a means of developing a series of modules each targeted and developed in order to achieve a specific aspect of the overall CDIO aim, this study will instead distil the concepts and processes embodied by CDIO, condensing them where possible and applying these to a single module structure. This study will assess whether this distilled process can successfully be applied to a single module, or whether the CDIO approach can only be applied on a whole programme basis.

In order to extract the core information of the CDIO approach it is necessary to appreciate the complete CDIO adoption process (see figure 2).
The adoption process as highlighted in figure 2 provides a clear managerial structure for the adoption of CDIO. The starting point for this lies in the application of twelve successive standards. Broadly these are as follows (Crawley, 2001):

- **CDIO as Context**: Adopt the principle of Conceiving, Designing, Implementing, and Operating as the context for engineering education.
- **Syllabus Outcomes**: Specific, detailed learning outcomes for personal, interpersonal, and product and system building skills, consistent with program goals and validated by program stakeholders.
- **Integrated Curriculum**: A curriculum designed with mutually supporting disciplinary subjects, with an explicit plan to integrate personal, interpersonal, and product and system building skills.
- **Introduction to Engineering**: An introductory course that provides the framework for engineering practice in product and system building, and introduces essential personal and interpersonal skills.
- **Design-Build Experiences**: A curriculum that includes two or more design-build experiences, including one at a basic level and one at an advanced level.
- **Workspaces**: Workspaces and laboratories that support and encourage hands-on learning of product.
- **Integrated Learning Experiences**: Integrated learning experiences that lead to the acquisition of disciplinary knowledge, as well as personal, interpersonal, and product and system building skills.
- **Active Learning**: Teaching and learning based on active experiential learning methods.
- **Enhancement of Faculty CDIO Skills**: Actions that enhance faculty competence in personal, interpersonal, and product and system building skills.
- Enhancement of Faculty Teaching Skills: Actions that enhance faculty competence in providing integrated learning experiences, in using active experiential learning methods, and in assessing student learning.
- Skills Assessment: assessment of student learning in personal, interpersonal, and product and system building skills, as well as in disciplinary knowledge.
- Program Evaluation: A system that evaluates programs against these twelve standards, and provides feedback to students, faculty, and other stakeholders for the purposes of continuous improvement.

The MMRG employed both top down and bottom up approaches to the application of the 12 standards. With the exception of standards 11 (Skills Assessment) and 12 (Programme Evaluation) the remaining standards can be applied and assessed during the development stage of the module. Standards 11 and 12 have been implemented at the design and development stage however by default these are reflective standards and successfully attaining these can only been achieved at the end of the planned delivery period for the MTech course (May 2012).

5. Adopting the standards

5.1 Standards 1 and 2

The initial process requires that standards 1 and 2 are adopted at a corporate philosophical level, subsequently the context, program aims, and specific goals for learning should be outlined.

In this instance the MTech module is positioned as a second semester final year module, thus it should be considered as one of the last remaining taught modules before students graduate and either enter further education or engineering employment. In this context the MTech module emphasises that each student is expected to work in collaboration with all other group members, to identify technical issues and solutions together, and to share the decision-making processes – key skills required for industrial collaborative engineering work. Group work is managed through an online repository of group discussions, working documents and meeting information (agenda and minutes as required). Individuals allocate team members an anonymous Peer Assessment mark (moderated by the teaching body) related to the involvement, attitude and output of each member in the team. It is also clearly communicated to students that it is not sufficient for each student to do their own work in isolation – each student should also take part in the group discussions and decision making, provide work at the agreed time and to help others within their group as required.

The programme aim as indicated by the Definitive Module Document (School of Engineering and Technology, 2011) are set out as follows:

- To develop an understanding of the principles required for innovative, integrated microengineering design and manufacture.
- To further develop students’ ability to work in multidisciplinary teams to design a microengineering product.

Furthermore the specific learning outcomes are split into two primary categories, Knowledge & Understanding and Skills & Attributes, whereby a successful student should be capable of the following in order to satisfying the Knowledge and Understanding outcomes:
Demonstrate an understanding of the engineering principles appropriate to the design of a microengineering product

Demonstrate an understanding of the manufacturing considerations particularly appropriate to a microengineering product

and capable of the following in order to satisfy the Skills & Attributes outcomes:

- Apply appropriate analysis techniques to assessing the performance of a microengineering product.
- Work effectively in a multi-disciplinary team and communicate the development and outcomes of individual, as well as group project, work.

Subsequently the initial program outline was benchmarked against four key components: overall curriculum, use of workspaces, specific approaches to teaching & learning and finally assessment practices.

5.2 Standards 3 to 12

While Standards 1 and 2 are primarily philosophical, standards 3 – 12 require the practical implementation of the module design and the identification of key themes and resources was the primary driver. In each of the key areas (Curriculum, Workspaces, Teaching & Learning and Assessment) the module design was analysed and restructured, areas for improvement where identified and redesigned leading to activities that satisfy the CDIO Standards 3-8. Specifically, the resultant Microengineering & Microtechnology module provides both mechanical and electrical engineers with a base understanding of the principles required for innovative, integrated microengineering design and manufacture. The core of the module is a case study led group project focussing on the design of a microfluidic pump (itself a research output from the MMRG). The individual members of the project groups follow a documented plan that integrates CDIO required skills with technical disciplinary content and exploits the appropriate disciplinary linkages. This is supported by appropriate inclusion of learning outcomes in both formal and informal study requirements. In this instance formal study is taken to mean study which dictates a specific structured process and submission, informal study only dictates the submission requirement encouraging students to develop the process required to satisfy the outcome. Both faculty staff and students alike are aware of the intended learning outcomes of the curriculum, reiterated at the start and end of each formal teaching session.

Figure 3. Diagram outlining the complete CDIO adoption process
The group project aspect of the module incorporates learning experiences that introduce essential personal, interpersonal, and product and system building skills where students acquire the learning outcomes described in CDIO Standard 2. The MTech module, being an elective course, engages students at the highest level in their chosen field of study; this is encouraged by the application of directed class discussion and guided by formative assessment of understanding via survey or electronic voting system (EVS) during seminar sessions, the use of this technology has been found to promote interactive engagement, helping to launch peer discussions and enable contingent teaching (Draper, 2004). In the case of the MTech course the opportunity for contingent teaching is of high importance based on the mixed background and prior knowledge of the student body.

The group project leads to one fully realised design-build experience during the course of the module curriculum; this design-build exercise requires co-curricular support at a peer level for design-build and includes support from the research laboratory staff. Finally concrete learning experiences are emphasised by the self-directed group roles which provide the foundation for subsequent learning of specific disciplinary skills. Throughout the module students have access to adequate spaces equipped with modern engineering tools, in particular computer aided software analysis tools, however the students are also encouraged to develop an understanding of the manufacturing processes of Microtechnology via access to a class 1000 microfabrication clean room.

Students are encouraged to be active learners, directed by a project brief and intended outcome but with student led flexibility in the means of satisfying the brief. Furthermore students are required to accurately document this process and self-report as well as self-assess (via moderated peer assessment). This inclusion of self and peer assessment processes has been shown to be an effective method of encouraging student learning (Falchinov, 2000; Sadler, 2006).

To ensure further comprehensive completing on the CDIO requirements additional measures where put in place to strengthen the program and enhance faculty competence in teaching, learning and assessment (Standards 9 and 10). By design the MTech module incorporates the output of research staff that have themselves shown competence in personal, interpersonal, and product and system building skills. This is demonstrated to students through the use of previous research outputs and publications relevant to the MTech project. Being able to draw upon physical engineering output communicated the experience in engineering practice of the teaching staff. Furthermore each member of staff teaching on the MTech has attained post doctorate level academic qualifications; to support this staff have undergone additional Continuous Professional Academic Development (CPAD) in learning and teaching.

The final requirements for satisfying the CDIO criteria are centred on assessment and evaluation (standards 11 and 12). The assessment process applied to MTech includes continuous assignments from the outset, each targeting a specific skill and building on the concepts embodied by the formal teaching session, in all cases the students are informed of the specific learning outcomes targeted by the assessment. Furthermore to encourage diverse ways of learning a variety of separate assignment types cover each of the learning outcomes and provide a number of mechanisms to instil these learning outcomes in each of the students. The overall module classification attained by the student is determined based on reliable and valid data gathered during the course of the module. Two individual assignments are allocated in weeks 1 and 3, these marks are used to form a baseline of the individual and to identify potential areas of weakness. These are flagged and individual feedback is provided for
general development (applicable to all assessed modules) and specific development within the MTech module. Continuous learning is assessed via weekly class test using the electronic voting system (EVS). Group work consists of submission of key components at appropriate developmental milestones (Concept development, theoretically analysed designed ready for manufacture, group report, and final presentation). The final report is submitted jointly with each individual contribution clearly identified. In this way individuals are recognised not only for their own abilities but also their contribution to the success of the project.

Finally the MTech module has been constructed with the input from a wide range of key stakeholders, each of whom has individual responsibility for the evaluation of key components of the course. Program evaluation methods, such as EVS, are built into the core of the module to gather supporting data from students during the course. Instructors, program leaders and other key stakeholders have identified mid points during the module where an evaluation of progress can be evaluated and documented; this will form the basis of data-driven changes as part of a continuous improvement process.

6. Result of the process

Based on an initial design for a research informed module in microengineering and microtechnology and we have systematically applied the concepts embodied by each of the standards outlined by the CDIO approach. The application of the CDIO structure highlighted limitations in the initial consultancy process for the module design.

Specifically a number of principles of good practice as outline by Chickering and Gamson (1987) required further consideration, these being:

- encouraging active learning
- providing prompt feedback
- emphasizing time on task

The application of the CDIO standards has resulted in an undergraduate module that now incorporates all seven of the principles of good practice including those outlined above. The module communicates a high expectation of the students, with directed study and assignment commencing with the start of the module, feedback is provided both formatively and summatively as appropriate to the development of both the assignment structure during the course as well as the student interest level and promotes further reading with directed key texts. The final structure for MTech delivery is shown in table 1.

Table 1. Final schedule for Microengineering and Microtechnology as developed using the CDIO
The result of this process was the successful creation of a Microengineering & Microtechnology module, offered as an elective course for final year engineering students studying mechanical and electrical engineering at the University of Hertfordshire from 2011. The initial uptake has resulted in 40 students opting to study Microengineering & Microtechnology in 2011, more students than either of the alternative two elective modules running at the same time. The module has subsequently averaged 42 students per year over the 5 years the course has been running.

Alongside pass average and external examination of the programme the University also collates individual module feedback from current students via end of programme questionnaires. This process provides a qualitative assessment of the programme from the student perspective. During the 5 year period discussed two variations of the questionnaire have been used, the Module Feedback Questionnaire and the Student ViewPoint Questionnaire. In both cases specific, module related, questions were identical, scored by students from 0 – 5 and their application and implication on the module can be compared. The relevant questions from the MFQ/SVP questionnaires, question 1 – 8, are as follows:

Table 2 End of programme questionnaire (across all modules at the University of Hertfordshire).
- The module provides learning opportunities which enable the learning outcomes to be achieved.
- The module is well organised and running smoothly.
- E-learning facilities (e.g. StudyNet) are contributing usefully to my learning on this module.
- The module is intellectually stimulating.
- The criteria used in marking have been clear in advance.
- Feedback on my work is helping me to clarify things I did not understand.
- Feedback on my work is prompt.
- I am able to contact staff when needed (including email and telephone as well as face to face).

Student feedback was sought at the end of each semester for all engineering modules using either SVP (Student View Point, 2011/12 & 2012/13) or MFQ (Module Feedback Questionnaire, 2013/14, 2014/15 & 2015/16) with the CDIO based MTech module recording an average of ~18% higher that departmental average for the first four year period, by comparison the module received an average score ~15% higher than the University as a whole for the period. Initial indications are that changes made to the programme during 2015-16 academic year concerning feedback delivery mechanisms (online delivery) have potentially affected the module score for both questions 6 & 7.

Table 2. End of programme questionnaire results compared from 2011 through 2015. U=University wide average, S= School wide average & M= Module average collated from MFQ and SVP data. Light Green – Dark Green represents lowest to highest score per academic year. (University of Hertfordshire Centre for Academic Quality Assurance (CAQA), 2016 [unpublished, personal communication])

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While the final distribution of module classification is indicative of the work ethic and input from individual students it is clear to see that the expectation on students can be considered “challenging but achievable”. This is evidenced by the average grade achieved by students, falling into the lower segment of the 2nd Class category (60 – 69%) but with a zero failure rate over the 5 years of the programme (below 40%). The average student mark for this module has remained consistent from the outset and averages 63% with an absolute standard deviation of 0.64 (Chart 1).

Chart 1. End of programme grade distribution over the first 5 years of Microengineering &
7. Conclusion

We have designed and developed a research informed module in microengineering and microtechnology and we have successfully implemented the concepts embodied by the CDIO approach;

“Conceive, design, implement & operate complex value-added engineering systems in a modern team-based environment”

However during development of the course it was necessary to distil the fundamental concepts embodied by CDIO as the approach is primarily design to be applied on a “whole curriculum” level. The final proposal has resulted in a module structure that embodies a number of principles of good practice from the education literature. The inaugural run of the Microengineering & Microtechnology module was offered as an elective course for final year engineering students studying mechanical and electrical engineering at the University of Hertfordshire. The initial uptake resulted in 40 students opting to study Microengineering & Microtechnology, more students than either of the alternative two elective modules running at the same time. The module has subsequently continued to attract a similar proportion of students from both mechanical and electrical cohorts. The programme was offered exclusively to these cohorts from 2011-2012 until 2013-14. From 2014 onwards the programme has been extended and is now included as a compulsory component on two new degree programmes MEng/BEng Mechanical Engineering & Mechatronics (inaugural year 2014) and MEng/BEng degree in Biomedical Engineering (inaugural year 2015). With positive feedback from students, staff, external examiners and validation teams this module, with the aim to be innovative and research led, can be considered a success. The implementation of CDIO approaches coupled with research informed teaching can lead to the development of research and development skills and learning as evidenced by
the results of the individual students on this programme.

8. Further work

To further validate the teaching of research skills and learning it is recommended that a future review of the Destinations of Leavers from Higher Education (DHLE) data could be conducted. This would aim to establish whether graduates from this programme are more likely to enter into research orientated further study or employment. With low graduate numbers at present it is anticipated that this study may only provide relevant data once graduate numbers from the MEng/BEng Mechanical Engineering & Mechatronics and MEng/BEng Biomedical Engineering are included in the assessment.

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References

The Importance of Innovation in the Development of Transnational Education (TNE) From The UK to Vietnam

Nam Phuong Phung, Helen Higson, Paul Bartholomew

Aston University, United Kingdom

Abstract

Purpose – This scoping paper is based on research being undertaken as part of a PhD thesis. This research aims to design an innovative TNE programme for Vietnam students within a UK context. The appropriate perspectives, theories as well as research methods intended to use in the research are presented in this scoping paper.

Design/ Methodology/ Approach - Mixed method will be conducted in this research. In the first stage, qualitative semi-structured interviews will be selected to explore respondents’ feelings and perspectives on factors affecting the effectiveness of TNE based on their knowledge and experiences. Ten of these interviews will be conducted with students who took TNE programmes and ten will be with universities’ lecturers and managers who had experiences in TNE. In the second stage, a quantitative approach will be adopted to examine the relationship between those factors explored in the first stage and the effectiveness of TNE programmes as well as the correlation between cultural differences and those factors. The target group of the survey will be formed of about 100 UK students and 100 Vietnam students who took TNE programmes.

Findings – A model consists of factors affecting the effectiveness of TNE programmes will be explored.

Research limitations - In qualitative semi-structured interviews, the accessibility to respondents and archival data, for interviews and document analysis, respectively, may be limited. Furthermore, the adoption of a qualitative approach may reflect subjective or emotional bias of participants. On the other hand, in a quantitative survey, a model may suffer from the lack of test and retest reliability.

Originality/ Values - These findings have relevance for British Council and UK universities as well as universities and students in Vietnam, concerned with how to develop the innovative TNE programmes for Vietnam students within a UK context.

Keywords: Transnational education; Higher education; Innovation

1. Introduction

1.1 Research background and rationale

The globalisation of higher education has been blooming as a result of the increasing demand from students all over the world for international education and credentials. More and more students across the world are choosing to study international higher education programmes without having to travel to the country awarding the qualification/providing the academic oversight to study the entire programme (Chan, 2011; Chen, 2015; Healey, 2015). There are a number of terms used to describe this international mobility of providers and programmes, the most common being TNE (Baskerville et al., 2011).

In many recent years, there has been a growing demand for higher education (HE) in Vietnam (McNamara Economic Research (MCER), 2014). Furthermore, the Government recognises the importance of improving both the quality and quantity of HE in Vietnam and has openly stated that it considers participation from foreign providers essential to the achievement of this agenda (Nguyen and Shillabeer, 2013). As a result, the number of TNE providers and programmes in Vietnam...
continues to increase. However, surprisingly, as the leading provider of TNE programmes in the world, the UK still represents a small fraction in Vietnam.

While almost all UK Higher Education Institutions (HEIs) have considerable experience in the field of international recruitment and can point to successful alumni in positions of responsibility and influence around the globe, for many their engagement with a broader international agenda has been more limited and/or more recent (Baskerville et al., 2011). If UK’s TNE providers expand Vietnam market, therefore, there will be a question about whether HE programmes designed for UK students can fit well under other conditions outside the UK (specifically for this study, this is Vietnam). Specifically, new challenges for UK educators are created when exploring differences in knowledge, languages, practices, identities, value systems, and cultures of foreign students (Mizzi and Rocco, 2013). There are, as a result, calls for research on how students who come from non-western backgrounds, like Vietnamese students, prepare for the TNE experience and how transnational learning and teaching affect students. Besides, cultural differences do matter. Educators who cross national borders are faced with differing administration systems, adapting a standardised curriculum, working with colleagues and students from across the globe, and realizing their identity-backgrounds (e.g., gender, sexual orientation, race) and value systems will have a different impact in the new work situation (Mizzi, 2015). Educational practices such as teaching, learning, leading, advising, recruiting, and planning, as a result, need to now take transnational realities into account.

1.2. The importance of the study

This paper reflects on the importance of innovation in the development of HE programmes in order to maximise TNE activity between the UK and Vietnam. It present some initial scoping research which examines some key factors which influence the development of excellent TNE programmes and explains why these are important. This work is based on research being undertaken as part of a PhD thesis. The researcher has experienced first hand TNE as a student and as a teacher, and is using these experiences to develop some proposals which will have significant influence on the development of TNE in Vietnam. The outcome of the study will be useful for the British Council in general and for UK universities in particular. Based on the results of the survey, UK universities will have a better understanding about the Vietnam education market and thus they will be able to come up with a coherent, and long-term development strategy in order to make TNE work. The research findings are also valuable for Vietnamese students who are looking for world-class education programmes. This study is also expected to help Vietnam universities realise their potential for developing a new education model for the home country. This not only provides them with the financial benefits but also contributes to the development of the whole society.

2. Overview of TNE

2.1 Definition of TNE

TNE refers to the movement of HE providers and programmes across national borders, allowing students to study foreign programmes without having to leave their home country (Busby, 1993; Watson, 1999; Pimpa, 2009; Fang, 2012; McBurnie and Ziguras, 2006). Furthermore, in the British Council 2013 TNE report, TNE was specifically defined not merely “as an export activity” but also including “collaborative arrangements such as joint and double degrees.” (British Council, 2013, p.12). This definition seems most suitable for this research because of two reasons. First, it was first
established in 2013 so it is the most updated definition of TNE. Second, it has been composed and used by British Council - the UK's international organisation for educational opportunities and cultural relations; therefore, it is supposed to convey the full meaning of a UK education-based TNE programme.

2.2. Transnational Higher Education in the UK from the home country perspective

The UK is the leading provider of TNE programmes in the world, with over 20 years’ experience of exporting its higher education programmes (McNamara and Knight, 2015). The UK’s partner countries are Botswana, China, Malaysia, Mexico, Pakistan, Russia, Singapore, South Africa, UAE and, Vietnam recently. There were approximately 360,000 students actively enrolled in UK TNE programmes in 2013–2014 and this figure increased by 50 per cent in 1999-2000 (Mellors-Bourne et al., 2014). As a result, the UK has become the world’s fastest growing provider of international education with 13 per cent of the market, and worth approximately £18bn to its economy. The economic and political significance of TNE is evident and growing with an estimate of £496 million on TNE revenue in 2012-2013 (Mellors-Bourne et al., 2014).

As stated by Mellors-Bourne et al. (2014), analysis of country-specific programmes showed that 49% of programmes were delivered in countries in Asia, and 25% in countries within the European Union. The Asian programmes were predominantly delivered in Malaysia (30%), China (22%), Singapore (14%) and Hong Kong SAR (13%). Malaysia could be seen to host a wide range of different types of TNE provision and partnership, whilst Chinese enrolments were dominated by branch campus provision involving a small number of UK universities offering relatively large numbers of programmes. The European Union programmes were more widely spread but with a strong TNE presence in Greece (31% of European programmes), Ireland (14%) and Germany (13%) (Mellors-Bourne et al., 2014; McNamara and Knight, 2015).

In fact, UK’s TNE programmes are growing rapidly due to the help of the government’s strategies. In the first decade of the 21st century, the UK government issued two Prime Minister Initiatives (PMI1 and PMI 2) summarising its strategies in international education. According to Department for Business Innovation and Skills (2013), in PMI 1 (1999-2005), the focus was narrowly defined as to increase international student recruitment domestically and overseas (TNE activities). PMI 2 (2006-2011) attached greater importance to the development of international partnerships in expanding its market quota and the influence of UK higher education globally. The Conservative-Liberal Democrat coalition government, which formed in May 2010, also attached great importance to the economic benefits of TNE (Department for Business Innovation and Skills, 2013). The total contribution of education export was estimated to be £17.5 billion in 2011 and “a targeted plan” was set out to strengthen the position of the UK in the international education market (Department for Business Innovation and Skills, 2013).

Over the last decade a number of UK universities have opened branch campuses. According to HEGlobal (2016), the UK’s existing and currently planned branch campuses are concentrated quite heavily in the UAE, China, Malaysia and Singapore, though single campuses have been established in less well known locations such as Uzbekistan (Westminster). Although 49% of TNE programmes were delivered in countries in Asia, the share of Vietnam is insignificant. Carrying out, therefore, this research that contributes to the development of TNEs in Vietnam is logically necessary.

2.3. Transnational Higher Education in Vietnam from the host country perspective
2.3.1. The context of Vietnam education market
As stated by McNamara Economic Research (MCER) (2014), in 1987, only 87 Vietnamese academic institutions provided HE; this number grew dramatically to 386 in 2011, of which 40 were established between 2007 and 2010. This dramatic growth can be attributed to the enactment by the Vietnamese authorities of the “Comprehensive Reform of Higher Education Act” in 2005, which was designed to address the dynamic relationship of supply and demand between the country’s HE and ever-increasing economic development. This essential Act envisages a complete overhaul of the HE system by 2020, and is designed to substantially elevate its overall quality and accessibility (Chen, 2013).

It is clear that there is growing demand for HE in Vietnam and despite significant increases in both provision and enrolments in recent years, there are still many areas of unmet demand (EduWorld and Group, 2013). United Nations Educational, Scientific, and Cultural Organization (UNESCO) reported that in 2011, there were 52,285 students from Vietnam studying abroad in programmes of one year or longer, almost double the number four years earlier (EduWorld and Group, 2013). In the US, Vietnam is currently one of the fastest growing sources of international students for US HE institutions. In the academic year 2011/12 Vietnam was the eighth largest sender of tertiary students to the US. Since 2,000 Vietnamese enrolments in US HE institutions has increased by 675 per cent from 2,000 students to more than 15,500 in 2012. In Australia, Vietnamese students numbered 26,015 or 4.8 per cent of all Australian international HE students in 2013, showing consistent increases from the 1.5 per cent level (4,083 students) in 2002 (EduWorld and Group, 2013).

Very much like in most of Asian societies, pursuing HE and academic degrees in Vietnamese communities are both highly valued and respected. This prompts parents to prioritize investing in their children’s education as a culturally deep-rooted heritage (Chen, 2013). While more than 50,000 Vietnamese students had to travel overseas each year to pursue a college degree, those who could not afford the luxury of doing this, either due to financial limitations or something else, found serious constraint receiving higher education domestically (Chen, 2015). As a result, improving higher education system becomes more and more important and urgent than ever. One of solutions is to make TNE programmes in Vietnam work effectively.

2.3.2. Vietnam regulatory environment of TNE
In 2001 the Ministry of Education and Training issued Decree No.18/2001/ND-CP regarding the setting up and operation of Vietnam-based foreign cultural and/or educational establishments (Ministry of Education and Training, 2011). This decree, however, suggests that there are a number of levels of governance over TNE providers and their operations and some overlap exists between functions and definitions (Nguyen and Shillabeer, 2013). This creates a complex and often ambiguous environment in which to operate and naturally attracts the potential for unintended non-compliance unless there is a very clear definition of the jurisdiction prior to commencing operations. Where the incoming provider does not have the capacity to work within the Vietnamese language, culture and legal systems the landscape is fraught with danger and it is little surprise that many are now experiencing critical issues to their Vietnamese presence (Nguyen and Shillabeer, 2013).

In order to overcome these legal flaws, the Ministry of Education and Training issued Decree 73/2012/ND-CP regulating cooperation and foreign investment in the field of education for educational institutions in 2012 to tighten regulations and ensure the quality of educational investment and cooperation over the life of the operation. According to Hayden and Thiep (2015), Vietnamese
regulation of TNE is currently moving towards a moderately liberal model and is actively involved in licensing and accrediting transnational providers at a number of levels but further definition through a control framework is required for this to become operationally effective. This will enable a sustainable, stable and implementable regulatory environment in which foreign education providers can successfully operate. Without this, Vietnamese students will continue to be the victims of poor practice and will not be able to realize the significant benefits that TNE can provide (Nguyen and Shillabeer, 2013). The lack of sustainable governance also creates a negative trading environment that will over time lead potential investors to seek easier trading partners further reducing the potential for education maturity and increased options for the Vietnamese population (Harman et al., 2010).

There is a key difference, however, in the host governments’ attitudes towards private education (Bui and Nguyen, 2014). Malaysia and Singapore, for example, allowed private colleges that cannot confer their own degrees to partner with foreign universities as a way quickly to grow the capacity of the domestic higher education system. This made use of the existing capacity of local providers, with the view that over time these colleges would develop the capacity to offer their own programmes and would eventually be granted degree-awarding status. As claimed by Bui and Nguyen (2014), for Singapore and Malaysia, the development of TNE and branch campuses acted as a form of import substitution, and has subsequently led to the development of successful export- oriented private education sectors. According to London (2010), in Ho Chi Minh City (southern Vietnam), by contrast, the state has retained close control over all educational institutions, and is determined to avoid the inequalities in access that private education markets can foster.

2.3.3. The development of TNE in Vietnam

According to The Law on Higher Education 2012, joint training programmes at diploma level or higher must be approved by the Minister of Education, and a register of these programmes is maintained on the Vietnam International Education Development (VIED) website. Understanding the scale of this form of cross-border education, however, is difficult. Unlike for degree mobility there is no intergovernmental agency that collects data on transnational enrolments, and only two “exporting” countries, the UK and Australia, regularly publish enrolment data. The Vietnamese government, like most others, does not collect data on students enrolled in foreign programmes, but does maintain lists of foreign programmes offered in Vietnam.

As at June 2014, there were 246 such TNE programmes listed, up from 173 in 2012 and 119 in 2010 (HEGlobal, 2016). In addition, five designated universities (two national and three regional) are permitted to approve their own joint training programmes and these do not appear to be listed on the register (McNamara and Knight, 2015). Furthermore, for higher education, offshore enrolments increased by 2.5 percent to 82,468 students in 2012 from 80,358 in 2011—and in contrast to declines in onshore international student enrolments over the same period (McNamara and Knight, 2015). In conclusion, despite of its gradual growth, TNE programmes in Vietnam has not met the demand of higher education.

2.4. Factors affecting the effectiveness of TNE in the host-country

2.4.1. Definition of the effectiveness of TNE programmes.

According to Barr (1981), “It is important not simply to match learners with teachers but to develop an educational system in which parents, students, and teachers can choose the type of programme they believe to be in their best interests” (p. 571). Miliszewska and Szendur (2011) also concluded that a TNE programmes is perceived to be effective if it fulfils the needs of its participants to such an extent
that they would be happy to enrol in another similarly designed programme.

According to Mercado and Gibson (2013), TNE key participants can be categorised into academic partners as providers, faculty and staff engaged in delivery, students and their families as consumers, government as enablers and regulators, employers and the community as beneficiaries and local institutions as potential competitors and collaborators. Different stakeholders will have different perspectives of the effectiveness of TNE programmes.

Students perceive a programme to be effective if they pass examinations, feel that the content of the programme is relevant to their needs, have an opportunity to network with other students, feel part of the class and connected to teachers, have opportunities for participation, receive support when needed, experience few technical problems, and feel comfortable with the technology (Beard and Harper, 2002; Kenny, 2003; Simonson et al., 2000).

On the other hand, teachers perceive a programme to be effective if students are motivated, complete assessment tasks and participate in discussion, use the technology to communicate, pass examinations, and few students drop out from the programme. Teachers also perceive the programme to be effective if the programme content meets the students’ needs and if the institution provides financial, personnel and technical support (Miliszewska and Sztendur, 2011).

From the perspective of programme developers, effective programmes are designed to meet diverse needs of students (Miliszewska and Sztendur, 2011). Students in TNE programmes represent a wide variety of backgrounds, experiences, and needs which make it impossible to identify the typical distance student; therefore, an effective programme has to cater for varied student profiles. Schonfeld (2005) suggested that standardised programme content and student ability to revisit course material can help overcome this problem. Others have stressed the need to provide for strong personal connections between students and between students and teachers as well as the use of visual media wherever possible, reliable two-way channels of communication, and clearly defined parameters around technical issues and course assessments (Lei and Gupta, 2010; Reeder, 2010). The effectiveness of a programme can be further enhanced if developers understand and apply learning theories to its development and delivery (Miliszewska and Sztendur, 2011). From an educational perspective, an effective programme should support the universal principles for good practice in education. It should encourage and maximise contacts between students and teachers, develop relationships and promote collaboration among students, incorporate active learning, give rich and rapid feedback to students, stress time-on-task, set high standards for students’ performance, and respect individual differences and allow students opportunities for learning that acknowledge those differences (Chickering and Ehrmann, 1996; McLoughlin et al., 1999). In other words, it is essential that programmes delivered at a distance enable students to “fit in”.

In detail, several factors affecting the success of TNE in previous studies are presented in the following section.

2.4.2. Factors affecting the effectiveness of TNE

a. Students’ learning styles

The diverse student populations in the branch campuses sometimes makes the teaching task more complex and difficult (Wilkins et al., 2012). In Wilkins et al. (2012)’s research, for example, students who have completed a UK or US secondary education are likely to have experience of student-centred
learning, writing essays and preparing coursework. In contrast, cultural and historical traditions, as well as the teaching methodologies used in the United Arab Emirates (UAE) secondary education generally lead UAE students to expect to be passive recipients of taught information and to not have to adopt an independent approach to learning and problem solving.

Wang and Moore (2007) examined the learning style preferences of Chinese students in two Australian TNE programmes, and analysed the links between group characteristics and preferred learning styles. They suggested that students’ learning style preferences should be considered when developing a culturally sensitive learning environment for transnational students. It is essential for academics who teach transnationally to examine their students’ specific learning preferences and needs, and to adopt appropriate teaching strategies to maximise their learning outcomes.

b. Language
It is interesting to note that across the world nine out of ten of the top exporters of HE have English language as a common dominator (Lemke-Westcott and Johnson, 2013). It is therefore a key factor in both the recruitment of students and also the export of educational services. A few institutions work around the issue by teaching in multiple languages. Babeş-Bolyai University in Romania, for example, offers online business courses in four different languages: Romanian, Hungarian, German, and English (Tutnea et al., 2009). This approach is interesting, but not always practical. Virtually all of the teaching at international branch campuses is conducted in the English language (Tutnea et al., 2009). Widespread use of the English language in TNE is a culturally complex matter. A student’s ability to read and write fluently in English, therefore, usually has a significant impact on their overall academic attainment. Similarly, Lemke-Westcott and Johnson (2013) stated that language issues may be a barrier or obstacle to overcome in TNE where cultural components play a major role.

c. Cultural differences
In addition to the issue of language itself, one must consider the impact of cultural context on the effectiveness of TNE programmes. The English-speaking nations of Australia, UK, and US, which are also home to the predominant TNE provider institutions, are low context and individualistic cultures (Tharapos, 2015). According to Hall (1976), in low context cultures, presentation of information is explicit, and almost all meaning is conveyed in actual, literal words. In stark contrast, many of the Asian and Middle Eastern nations in which large numbers of transnational students live are high context and collectivist cultures. In high context cultures, presentation of information is often implicit, with meaning conveyed through gesticulation and other social cues as much as in actual words (Hamdan, 2014). Learners from high context and low context cultures are particularly challenged when their effort to reach understanding with one another take place in a virtual environment (Hall, 1976). The relative lack of body language and heavy reliance upon written words in online learning environments can pose a challenge to learners from high context cultures, many of whom are already challenged by learning in a non-native English language environment (Bannier, 2016).

Cultural differences are reinforced in any education system. These become more evident as one country exports its education system at post-secondary level to a host country with a different culture and secondary school system (Lemke-Westcott and Johnson, 2013). Heffernan et al. (2010), for example, discuss the impact of cultural differences, learning styles and TNE for Australian institutions exporting their education to China. Culture underlies and affects values within education and the
work-place, as well as learning and teaching styles in the classroom. Those findings seem relevant to the author’s study because the TNE between UK and Vietnam has the same cultural differences as above research findings (Lemke-Westcott and Johnson, 2013; Heffernan et al., 2010).

Furthermore, academics in TNE work in environments and culture that are very different to those of their home countries. Classroom culture and the extent and style of student-staff interaction can vary considerably across countries as can students’ preferred learning styles. Besides, (Wilkins et al., 2012) emphasized in their research that cultural differences may influence students’ motivation for studying at international branch campuses.

d. Quality of lecturers and teaching
In Wilkins et al. (2012) discussing students’ satisfaction and student perceptions of quality at international branch campuses, it is notable that for the item “Quality of lectures and teaching” had the high score. This indicated that students in their surveys generally have high concern about the importance of quality of lectures and teaching to their study. There are advantages and disadvantages of employing local staff as opposed to expatriate teachers from the country of origin of the institution. On the one hand, many students (and parents) expect that if they enrol on a foreign programme they will be taught by lecturers from that country, but academics employed locally often have a better understanding of student needs and are better able to make course content relevant to the local context (McBurnie and Ziguras, 2006). In a survey of students undertaking Australian TNE programmes in South East Asia, it was found that in programmes taught by both university and local instructors, students reported higher overall satisfaction with the university lecturers (Miliszewska and Sztendur, 2010).

3. Research methodology

3.1 Research questions

The general objective of this research is to provide ideal and practical ways to design TNE programmes for Vietnam students in a UK context. There is a growing body of literature on TNE such as quality assurance in TNE (Dos Santos, 2002), motivations and decisions of universities to engage (or not) with the establishment of international branch campuses (Wilkins and Huisman, 2012), or student satisfaction in TNE (Wilkins and Stephens Balakrishnan, 2013). However, relatively little empirical research has been conducted to examine the successful TNE programmes. Similarly, many studies have examined the effects of cultural differences on learning styles (Evans et al., 2008; Ramburuth and Tani, 2009; Cools et al., 2009) or the relationship between cultural differences and academic motivation (Cokley et al., 2007; Osei Akoto, 2014) from students are studying outside their home-countries perspective but little to none has been conducted on cultural differences in transnational education. Therefore, unsurprisingly, there is not much is known yet about TNE in Vietnam provided by the UK universities. This research, as a result, intends to fill that gap and the following research questions guided the study.

RQ1: What factors influence the effectiveness of TNE programmes?

RQ2: Are there any cultural differences between UK and Vietnam students which correlate with the factors influencing the effectiveness of TNE programmes?

RQ3: What are ideal and practical ways to design TNE programmes for Vietnam students in a UK
Based on the first research question, due to the limited literature review on the successful TNE programmes, this study will investigate which factors influence the effectiveness of TNE programmes. Furthermore, similarities and differences between learners in the UK (home country) and those in Vietnam (host country) (both TNEs and non-TNEs programmes) in terms of those factors will be examined. Besides, with the second research question, this research is designed based on Trompenaara’s seven dimensions of culture in order to identify typical characteristics of UK and Vietnam students. The study, therefore, attempts to find out how cultural differences exert impact on the factors influencing the success of TNE programmes. Finally, based on the results of two of the above research questions, the author will come up with several suggestions for designing the suitable TNE programmes for Vietnam students in a UK context.

3.2 Mixed method approach

The precise definition of the approach is subject of much debate among researchers (Greene et al., 1989; Creswell et al., 2003; Al-Dossary, 2008). According to Knigge and Cope (2006), mixed methods are research where the quantitative and qualitative approaches are combined. Several authors (Guba, 1987; Sale et al., 2002) claimed that qualitative and quantitative research are two distinct ways of viewing research that are incompatible with each other. Sale et al. (2002) even emphasised that “Because the two paradigms do not study the same phenomena, qualitative and quantitative methods cannot be combined” (p.43). The researcher, however, believe that mixed methods afford opportunities to use the strengths of one method to counter balance the weaknesses of another. The author also support the view of Howe (1988) that, far from being incompatible, combining quantitative and qualitative methods is a good thing, and “there are important senses in which quantitative and qualitative methods are inseparable” (p.10). Although mixed method is subject to many debates among researchers, there have been, in the last 20 years, a considerably increasing interest in mixed method (Robson, 2011).

As stated by Robson (2011), mixed method’s defining characteristics in this research are cited as:

1. Quantitative and qualitative methods within the same research project. There are three research questions in this study. On the one hand, the first question focuses on determining which factors affecting the effectiveness of TNE. The literature, however, do not provide any direct answers. Hence, the best way to explore these factors is gaining an understanding of underlying reasons, opinions, experiences and motivations of key stakeholders of TNE programmes. The different stakeholders have different perspectives of the effective TNE programmes. Through qualitative approach, key participants will share their opinions and their experiences about what the effectiveness of TNE programmes is, what their motivation and expectations in TNE programmes are, which factors affecting to the success of TNE programmes, and so on. This information will be obtained verbally. This kind of questions, therefore, appears to call for a qualitative approach.

On the other hand, the second question concentrates on effects of cultural differences between UK and Vietnam students on the factors were explored in the first question. This research question is suitable for quantitative approach. In detail, a model consists of factors affecting the success of TNE programmes will be examined via a survey. The aim of the this stage is not only to measure the effects...
of those factors on the effectiveness of TNE programmes, but also to investigate the correlation between cultural differences and those effects. In other words, accuracy and precision of measurement between factors affecting TNE programmes, cultural differences between UK students and those in Vietnam and the success TNE programmes is sought. According to Robson (2011), if one research question seems to call for a qualitative data collection method and another for a quantitative one, the answer is to follow a multi-strategy design (mixed method).

(2) A research design that clearly specifies the sequencing and priority that is given to the quantitative and qualitative elements of data collection and analysis. This study focuses on sequential exploratory design characterised by an initial phase of qualitative data collection and analysis followed by a phase of quantitative data collection and analysis (Creswell et al., 2003). Therefore, a qualitative approach is applied for the first stage to build a model that consists of factors affecting the effectiveness of TNE programmes. Later, a quantitative approach is applied for the second stage to test the model. The findings are integrated during the interpretation phase. Furthermore, priority is given to the qualitative aspect of the study and the primary focus of this design is to explore factors influencing the success of TNE programmes.

3.3 Research design

3.3.1. Qualitative semi-structured interview

Qualitative semi-structured interviewing is selected for this study to explore respondents’ feelings and perspectives on the factors affecting the effectiveness of TNE based on their knowledge and experiences.

Ten of these interviews will be conducted with students who took TNE programmes and ten will be with universities’ lecturers and managers who had experiences in TNE. Firstly, an interview guide that serves as a checklist of covered topics will be prepared. The guide has a default wording and order for the question, but the wording and order are often substantially modified based on the flow of the interview. The different categories of interviewees will have different lists of questions. Students, for example, may perceive a programme to be effective if they pass examinations, or feel that the content of the programme is relevant to their needs, or have an opportunity to network with other students, or feel part of the class and connected to teachers, or have opportunities for participation, receive support when needed, or experience few technical problems, or feel comfortable with the technology (Beard and Harper, 2002; Kenny, 2003; Simonson et al., 2000). Therefore, key questions to ask students will focus on the collaboration between students and teachers or between students and students, on the support that they received from faculties or universities, on the relevant between the contents of TNE programmes and their expectation, and so on. On the other hand, teachers may perceive a programme to be effective if students are motivated, or complete assessment tasks and participate in discussion, or use the technology to communicate, or pass examinations, or few of them drop out of the programme. Teachers also may perceive the programme to be effective if the programme content meets the students’ needs or if the institution provides financial, personnel and technical support (Miliszewska and Sztendur, 2011). Consequently, key questions to ask teachers will concentrate on the collaboration between teachers and students, on teachers’ experiences in moving from place to place, on how teachers feel about the cultural differences, on how teachers satisfy students’ requirements, the support from HEIs/ universities, and so on. During the interview, additional unplanned questions are asked to
follow up on what interviewee says.

3.3.2. Quantitative data collection
The results from qualitative interviewing suggest a variety of factors which can influence the success of TNE programmes. Hence, the aim of a quantitative approach to examine the relationship between those factors and the effectiveness of TNE programmes as well as the correlation of cultural differences on those factors.

Convenience sampling will be used in this study involving selected sample members who could provide required information and who will be more available to take part in the study (Cooper et al., 2003). This sampling method also enabled the researcher to complete a large number of interviews cost effectively and quickly. The population of quantitative questionnaire survey consists of Vietnam students who took TNE programmes and UK students at the undergraduate level. The target group of the survey will be about 100 UK students and 100 Vietnam students who took TNE programmes.

This study will use two methods of collecting quantitative data, including face-to-face and online survey. Because of the constraint of time and cost, respondents of each country will be divided into two groups. In the UK, UK students living inside Birmingham will be asked to participate in a written questionnaire and those living outside Birmingham will be asked to participate in an online survey. In Vietnam, similarly, Vietnam students who live in Hanoi capital, Danang city and Ho Chi Minh City will be asked to participate in a written questionnaire and those who live in other places will be asked to take part in an online survey.

3.4. Pilot study
A series of pilot studies will be carried out to develop and test the research instruments for this research.

Firstly, in order to test the validity of the qualitative interviewing, a pilot study will be employed before administering this method in the main study. Two participants in the pilot qualitative interviews will be the final year students of different UK TNE programmes. The third one will be teacher who had experiences in TNE programmes. These interviews will play significant roles in this research, providing essential data to the first research question, which are modified into interview questions.

Secondly, before administering a quantitative survey (written questionnaire as well as online survey), a pilot test utilizing the questionnaire will be developed. The pilot test will carried out through ten students to assess the questionnaire’s clarity and length. The students will be asked to give comments and opinions on statements used in the questionnaire in term of clarity and completeness. After conducting the survey, revisions will be made for unclear questions. This will be necessary to increase the validity of the questionnaire before embarking on a full-scale survey.

To conclude, as a part of the author’s Ph.D thesis, the aim of this research is to design an innovative TNE programmes for Vietnam students within a UK context. Mixed method will be carried out in the study. The first step of this process is to investigate the factors influencing the successful of TNE programmes through qualitative semi-structured interviews with key participants of TNE programmes. The second step, conducted by quantitative survey, is to test the model consists of those factors explored in the first step as well as the correlation between cultural differences and those factors. Based on the results of this research, the British Council and UK universities will be able to develop a
coherent and long-term strategy in order to make TNE work in Vietnam. Furthermore, Vietnam universities and students also can obtain benefits from this research. The ideally practical TNE programmes suggested will bridge the skills gaps of Vietnam by engaging in collaboration with UK universities and will help to broaden the range and to boost the quality of courses for Vietnam students.

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* Nam Phuong Phung, Email Address: phungpn@aston.ac.uk
* Helen Higson Email Address: helen.higson@aston.ac.uk
* Paul Bartholomew, Email Address: p.bartholomew@aston.ac.uk
The Quintuple Helix Innovation Model as A Policy Instrument of Climate Change Adaptation in Vietnam

Ha Thu Pham, Thu Thi Nguyen*

School of Government, University of Economics, Ho Chi Minh City, Vietnam

Abstract

Linking theories on three arenas: innovation for competitiveness in cities and urban regions, climate change adaptation by innovation, and Quadruple Helix Innovation Model/ System (QHIM/S) can initiate an integrated analytical framework sufficient to consider the coordination of university – industry – government – and public to adapt climate stimuli in urban areas by knowledge-based innovation. The first part of this paper will provide a short review on these theories to see how well the QHIM/S can be analytically framed as an innovation system that is about to be adapted to urban climate change. Vietnam ranks among the top five most severely affected countries by climate change, and climate change is also becoming more and more an urban issue due to an increasing share of the population living in cities. The steps cities take now to cope future uncertainties and city vulnerabilities will have a major impact on the Vietnam’s future. In the second part, this paper questions the extent to which the QHIM/S has been utilised as a policy instrument to deal with urban climate change adaptation in Vietnamese context. It does this by exploring the system of climate change international commitment and policies that have been adopted at national, ministerial and local levels in Vietnam and find that Vietnamese government does recognize the importance of all components in QHIM/S as well as strive to cooperate them to tackle urban climate change adaptation. However, the policies fail to adequately consider relationships between these actors so that the overall function of QHIM/S – knowledge and innovation generation, diffusion and use – cannot be realized to be a potential solution for climate change adaptation in urban areas in Vietnam.

Keywords: The Quintuple Helix Innovation Model/ System; Urban Climate Change Adaptation; Vietnam

1. Introduction

Linking theories on three arenas: innovation for competitiveness in cities and urban regions, climate change adaptation by innovation, and QHIM/S can initiate an integrated analytical framework sufficient to consider the coordination of university – industry – government – public to adapt climate stimuli in cities by knowledge-based innovation. Innovation can be defined as converting knowledge creation and production to knowledge application, diffusion and use. Innovation is popularly recognized as the most essential source of competitiveness and economic success in nation and region wide. Cities which are economically successful have concentrations of specialized knowledge, support institutions, rival firms, related enterprises and sophisticated customers. These concentrations are in close proximity to special access, closer relationships, better information and powerful incentives to innovate. Climate change puts pressure on economic, social and ecological systems, especially in urban areas. This pressure raises complex and multi-faceted challenges that can only be tackled by collaborative and distributed innovation development processes. Urban adaptation can be defined as all adjustments in behaviour and economic structure of urban systems in response to actual or expected climate stimuli, their effect or impacts in order to reduce the vulnerability of society. These adjustments to climate change often involve finding innovative ways of dealing with climate change because existing technological, economic, legal and institutional forms no longer adequately counter climate change. Triple Helix Model focuses on the network overlay of communications and
expectations reshaping the institutional arrangements among universities, industries, and governmental agencies to neutrally coordinate for knowledge creation, production, application, diffusion and use. The original version of Triple Helix Model has been extended to gain explanatory power by adding the fourth helix of public and the fifth helix of natural environment. Therefore, QHIM/S can be served as an analytical framework for sustainable development by conceptually relating knowledge and innovation to meet the context of natural environment. Vietnam ranks among the top five most severely affected countries by climate change, and cities are particularly vulnerable. The extreme weather events (floods, drought, typhoons, and heatwaves) can be especially disruptive to complex urban systems. The steps cities take now to cope future uncertainties and city vulnerabilities due to climate change will have a major impact on the national future. QHIM/S are gradually recognized, implying the success of coordinated innovation for urban climate change adaptation and generally for sustainable development. However, this five helix collaborative innovation is still a peripheral activity in Viet Nam and much needs to be done to foster government - university - industry - public linkages in the context of natural environment issues.

This paper will: (1) Develop QHIM/S to an analytical framework for urban climate change adaptation, in an attempt to answer the question how well the QHIM/S can be analytically framed as an innovation system that is about to be adapted to urban climate change; (2) Provide a more profound understanding of the newly developed conceptual construct by questioning the extent to which QHIM/S has been utilised as a policy instrument to adapt urban climate change in Vietnamese context.

The first part of this paper provides a short review on these theories to see how well the QHIM/S can be analytically framed as an innovation system that is about to be adapted to urban climate change. This analytical construct can be defined as a set of elements, relations and dynamics/ functions which provides a systemic interaction framework between stakeholders in QHIM/S in an attempt to generate and facilitate the flow of new knowledge and resources to adapt climate change in cities. This framework is also potential to identify existing blockages and gaps in a particular context. In the second part, this paper questions the extent to which the QHIM/S has been utilized as a policy instrument to deal with urban climate change adaptation in Vietnamese context. It does this by exploring the system of climate change policies that have been adopted at international, national, ministerial and local levels in Vietnam and find that the government does recognize the importance of all components in QHIM/S as well as strive to cooperate them to tackle urban climate change adaptation. However, the policies fail to adequately consider relationships between these actors so that the overall function of QHIM/S – knowledge and innovation generation, diffusion and use – cannot be realized to be a potential solution for climate change adaptation in urban regions in Vietnam.

The research will identify the gaps and blockages of Vietnamese policies to tackle urban climate change adverse under the conceptual construct of QHIM/S. Consequently, it creates opportunities for Vietnam to enhance this configuration for innovation-based climate change adaptation through government policy. This research has focused on QHIM/S as a policy instrument of urban climate change adaptation in Vietnam, however the results and analysis will be broadly applicable to other areas and sectors in Vietnam as well as around the world, where the government strives to realize innovation power to commit to environment friendly socio-economic development.

Below is a review of the literatures on innovation for competitiveness in cities and urban regions, climate change adaptation by innovation, and QHIM/S to rational that QHIM/S can be developed to be a potential framework to innovatively deal with climate change adaptation based on the cooperation
between five helices: university – industry – government – public and climate change issues. This is followed by a description of research methods and limitations, then a description of QHIM/S as an analytical construction and an analysis of Vietnamese policies to respond to climate change under the light of QHIM/S. A discussion and recommendation will finalize the paper by focusing on existing gaps and constraints and some suggestions to improve.

2. Literature Review

- **Innovation in urban regions**

Innovation can be defined as converting knowledge creation and production to knowledge application, diffusion and use (Carayannis & Campbell 2010, p. 44; Lundvall 1992, p. 2). Innovation is popularly recognized as the most essential source of competitiveness and economic success in nation and region wide (Carayannis & Grigoroudis 2016; Berg & Braun 1999; Porter 1995, 1998). The traditional advantage of cheap labor or economics of scale are being substituted by a new kind of advantages, called ‘innovation advantages’ that enables the effective production and commercialization of new knowledge. Porter and Berg propose two similar terms ‘cluster’ and ‘knowledge location’ – the where of innovation creation through openly interacted actor networks for the free flow of ideas, knowledge, information and experiences (Bekkers, Edelenbos & Steijn, 2011).

Why innovation is mostly mentioned in the settings of urban? The root cause is that the large majority of ‘clusters’ or ‘knowledge locations’, prerequisite for innovation, locates within large urban regions (Luis de Carvalho 2013). Van den Berg’s (1987) theory of urban dynamics provides theoretical scope to understand the emergence and development of knowledge locations within cities. First, a new knowledge location are ultimately motivated by the conditions offered in urban regions (amenities, leisure, consumption and new, more interactive working-living arrangements) and by the requirements of their actors (access to expertise, skill, information, connections, and infrastructure in a given field to learn and exploit to their own advantage). Secondly, new infrastructure development actually is a demanding-following government’s provision accommodating the changing demands and requirement of urban actors through deliberated planning attempts by public and private parties. Thirdly, the concentration of skills, knowledge institutes, entrepreneurs and innovative companies in large urban regions also pushes the development of knowledge locations.

Porter (1995, 2008) identifies four true advantages for innovation in inner-city locations: strategic location, local market demand, possibilities of integration with regional job clusters, and industrious labor force that is eager to work. He also argues that cities which are economically successful have concentrations of specialized knowledge, support institutions, rival firms, related enterprises and sophisticated customers. These concentrations are in close proximity to special access, closer relationships, better information and powerful incentives to innovate.

- **Urban climate change adaptation by innovation**

Cities have a key role to play in tackling the climate change challenge. Cities are home of more than half of the global population and much of the global industry (OECD 2014, p. 3). Climate change has a profound impact on the economic, social and physical development of urban areas in terms of heat stresses, declining living conditions, water safety… The most climate sensitive activities are primary economic sectors including agriculture, forestry, and fishery as well as other climate sensitive sectors such as water management, energy, nature conservation, coastal protection, health, tourism and
transport (Osberghaus et al., 2010). Besides, bigger proportion of the world’s urban population live in low-lying coastal areas, particularly in Asia. Vulnerability to storm surges and rising sea levels will increase rapidly over the coming decades. Climate change puts pressure on economic, social and ecological systems. This pressure raises complex and multi-faceted challenges that can only be tackled by collaborative and distributed innovation development processes. On the contrary, the pressure also raise exceptional opportunities to pursue climate action in ways that generate growth, employment, and well-being for urban inhabitants (OECD 2014, p. 3).

City governments all over the world acknowledge these problems related to climate change, and develop policies to mitigate and adapt to climate change (Alber & Kern, 2008). Especially climate adaptation is stressed in order to anticipate climate change that cannot be avoided (Duit and Galaz, 2008). Adaptation to climate change can be defined as all adjustments in behavior and economic structure of urban systems in response to actual or expected climate stimuli, their effect or impacts in order to reduce the vulnerability of society (Smith et al, 1996). Climate adaptation can be reactive or anticipatory and adaptations can take technological, economic, legal, and institutional forms (Smit et al, 2000; Duit and Galaz, 2008). These adjustments to climate change often involve finding innovative ways of dealing with climate change; existing technological, economic, legal and institutional forms no longer adequately counter climate change (Smit et al, 2000). In other words, climate adaptation requires innovation.

Climate change is therefore an additional opportunity rather than a threat for innovation and the development of attractive, healthy and economically vital urban communities. The future a city or a state is being determined by the potential to balance new knowledge, know-how and innovation with nature (Carayannis & Rakhmatullin 2014, p.239). Two theoretical perspectives from urban economics and urban governance can be utilized to explore how innovation and climate adaptation are related and how innovation can be a solution to climate adaptation and economic vitality of cities. On the economic side, innovation for environmental pressure can bring offsets: creating/ upgrading jobs, using inputs better, improving productivity and products’ quality, distinguishing companies from competitors, and winning clients’ appraisal (Porter 1998, p. 352; Porter & Kramer 2011; Edelenbos et al 2013, p. 174). On the governance side, climate change adaptation in urban areas should be facilitated by cities and urban regional governments. Urban governments need to create a local environment that stimulates developing and implementing innovation to handle the climate change uncertainties and to utilize economic opportunities of climate adaptation (Folke et al., 2005; Bekkers et al 2011).

- Multi - Helix Innovation Models to QHIM/S

Triple Helix Model focuses on the network overlay of communications and expectations reshaping the institutional arrangements among universities, industries, and governmental agencies to neutrally coordinate for knowledge creation, production, application, diffusion and use. (Etzkowitz & Leydesdorff 2000, p. 109). The triple relationship denotes two main ideas: internal transformation within each spiral (Etzkowitz & Leydesdorff 2000, p. 118) and the trilateral interaction between three factors (Etzkowitz 2008, p. 9). Multi helix model theoretically coincides the concepts of ‘national innovation system’ (Lundvall 1992, p. 2) and ‘multi-level, multi-actor systems of innovation’ (Kuhlmann 2001, p. 970). The Triple Helix model represents tri-lateral networks and hybrid organizations to generate a knowledge infrastructure and creative knowledge environment, currently provides most countries the crucial frame of knowledge and innovation. The configuration offers an
important insights for innovation, because the intersections of strands create favorable environments for innovation. Moreover, ‘innovation in innovation’ process begins when the actors ‘take the role of the other’ in ‘an endless transition’ (Etzkowitz and Leydesdorff, 1998), in order to continuously enhance innovation.

The original version of Triple Helix Model has been extended step by step and as needed to gain explanatory power. Carayannis & Campbell (2009, p. 206) adds the fourth helix “media-based, culture-based, and values-based public” to develop a more analytically broader Quadruple Helix model. Users or citizens here own and drive the innovation processes, the development of innovations that are pertinent for users (Arnkil et al 2010). QHIM was introduced by Carayannis and Campbell (2010), embedded the Quadruple Helix Model by extending this architecture of innovation to the environment and social ecology. Adding the fifth helix of natural environment, knowledge and innovation become sensible to environment, or met the context of natural environment. The pivotal question of QHIM/S is ‘How do knowledge, innovation and the environment (natural environment) relate to each other?’ (Carayannis & Campbell 2010, p. 42). Carayannis et al (2012, p.5) identify the goal of the QHIM/S that accomplishing through the resource of knowledge to produce additional value for society and lead in the field of sustainable development. Therefore, QHIM/S can be served as an analytical framework for sustainable development by conceptually relating knowledge and innovation to the environment (Carayannis at al, 2012; Baccarne et al 2016).

Under the construct of QHIM/S, climate variability refers to natural environment helix, a challenge but also a driver for knowledge and innovation. In this case, climate change adaptation means design incentive compatible mechanism for the integration of university, government, industry and public to ensure knowledge and innovation creation sensible to the climate change context. Mechanism design is the role of government by policy making to create incentives for expected action that will be followed by the targeted result. Empirical guidelines for policy makers can be derived from this analytical framework, in order to strengthen collaboration among QHIM/S actors and enhance urban climate change adaptation for regional sustainable development. Policy makers should ensure that both top-down, bottom-up, and mid-level out government, university and industry policies, practices and initiatives indeed help better shape, fine-tune and make more effective and efficient government, university and industry relationships to achieve smart, sustainable and inclusive development in the settings of urban climate catastrophe (Park 2014, p. 205).

- Rationale for the case of Vietnam

Vietnam ranks among the top five most severely affected countries by climate change, and cities are particularly vulnerable. The extreme weather events (floods, drought, typhoons, and heatwaves) can be especially disruptive to complex urban systems. Storm surges and rising sea levels danger 55% of Vietnam’s population lives in low lying areas, of which 38% lives in urban areas. With an increasing share of the population living in cities climate change is also becoming more and more an urban issue in Vietnam. The steps cities take now to cope future uncertainties and city vulnerabilities due to climate change will have a major impact on the national future. Cities show the potential capacity to minimize natural catastrophe since they have already been adapting continuously to drastically changing conditions and increasingly competing economic activities and investments. The right policies which are embedded in the current wave of rapid urbanization will result in an unprecedented opportunity to create sustainable, liveable and dynamic cities in Vietnam (OECD 2014, p. 3).

Government of Vietnam (2012) confirms that proactively responding to natural disasters for large
cities is one of the main tasks of the National Action Plan for period 2012 - 2020 including upgrading and building works for flood control in large cities and for the prevention of natural disasters (floods, hurricanes, landslides, drought, salt water intrusion) in order to deal with the disaster situation increasing due to climate change and improve the capacity to cope with the emergency disaster situations.

QHIM/S are gradually recognized, implying the success of coordinated innovation for urban climate change adaptation and generally for sustainable development. The promotion of QHIM/S is underpinned by various policy initiatives and government-funded innovation projects in developed countries. This model can be particularly relevant in the context of developing countries (Ranga & Etzkowitz 2010). These countries are seeking lessons from the experience of developed countries, and also looking for new models and solutions that could be better adapted to the realities and challenges of their own environment. The newly emerged innovation models including ‘pro-poor innovation’, ‘grassroots innovation’, ‘frugal innovation’ and ‘inclusive innovation’… have common objectives that are the creation of new contexts and new locations for innovation as well as new markets for innovative goods and services. The knowledge-based development model that developing countries committed to also aim to a shift from an exogenous to an endogenous regional development approach to increase their innovation potential (Ranga & Etzkowitz 2013; Etzkowitz & Ranga 2010). However, this five helix collaborative innovation is still a peripheral activity in Viet Nam and much needs to be done to foster government - university - industry - public linkages in the context of natural environment issues (OECD & WB 2014). The research will obtain a comprehensive understanding of the key elements, relationships and dynamics that drive QHIM for urban climate change resilience and create opportunities for Vietnam to enhance this configuration for climate adverse adaptation through government policy.

3. Methods and Materials

The research had two components. The first was a literature review on the theories of innovation for competitiveness in cities and urban regions, climate change adaptation by innovation, and QHIM to develop an integrated analytical framework sufficient to consider the coordination of university – industry – government – and public to adapt climate stimuli in urban areas by knowledge-based innovation. Based on this framework, the second part is a policy review in which relevant national, sectoral, and provincial-level strategies and plans, as well as international agreements will be assessed to answer how well QHIM has inspired this system to deal with climate change adaptation in cities in Vietnam.

Both primary and secondary data will be collected to develop the knowledge required by the research objectives. The primary data covers all related official documents including policy and legislative documents regulating urban climate change adaptation. The policies, strategies, and plans reviewed are presented in Box 1. The secondary data involving scholarly research reports, books, and journal articles that is gathered mainly through library and internet research. Ten in-depth, semi-structured interviews with key informants from the relevant ministries, department of environment and natural resources in some related cities, as well as from non-government organisations (NGOs) and international organisations. These interviews were used to explore issues of adaptation coordination, in the context of Vietnam’s adaptation policy framework, and particularly to get expert viewpoints on Vietnam climate change policies.

Box 1: List of policies, strategies and plans
International Communication and Commitment

National Strategies and Action Plan
Vietnam Communist Party, 2013. Resolution No. 24-NQ/TW on “Pro-actively responding to climate change, enhancing natural resource management and environmental protection”.

Ministerial Level
Ministry of Science and Technology 2016, Decision 172/QĐ-BKHCN to approve “The Program of Science and Technology to respond to Climate Change, resource and environment management for the period 2016 – 2020.
Ministry of Natural Resources and Environment 2010, Decision 2418/QD-BTNMT to approve the action plan to respond to Climate change for the period 2011- 2015.
Ministry of Industry and Trading 2010, Decision 4103/QD-BCT to approve the action plan to respond to Climate change for the period 2011- 2015.
Ministry of Construction 2014, Decision 209/QD-BXD to approve the action plan to respond to Climate change for the period 2014- 2020.
Ministry of Labour, Invalid and Social Affairs 2010, Decision 403/QD-BKHCN the action plan to
respond to Climate change for the period 2011-2015.

**Provincial level**

4. The framework of the QHIS for climate change adaption

- From triple, quadruple, to QHIM/S

The core model of the Triple Helix emphasizing the intersections of three helices including academia/universities (higher education and research), industry (economy), and state/government (multilevel) originated in the 1990s by Etzkowitz (1993) and Etzkowitz and Leydesdorff (1995). The institutional perspective researches distinguish between three main constructs that define the university, industry and government institutional spheres in the relationship with each other: (1) A statist configuration with government in the leading role, regulating university and industry spheres, but also limiting their capacity to initiate and develop innovative transformations; (2) A laissez-faire configuration with industry as the dominant driving force and the other two spheres acting as supporters with marginal influence in innovation – providers of skilled human capital (academia) and a regulator of social and economic mechanisms (government); and (3) A balanced configuration transits university and other knowledge institutions to partnership with industry and government and even take the role of the leader in joint initiatives (Etzkowitz and Leydesdorff, 2000). This configuration results in the most favourable climate for knowledge and innovation at the overlaid spaces of three spheres. A process of ‘innovation in innovation’ creates new venues for interaction and new organizational formats for individual and organisational actors ‘take the role of the other’ when the other is underperforming. The relationships among the institutional spheres of university, industry and government are continuously reshaped in ‘an endless transition’ in order to enhance innovation by bringing forth new technologies, new firms and new types of relationships (Etzkowitz and Leydesdorff, 1998, 2000; Etzkowitz, 2003, 2008).
The Triple Helix is broadened within the Quadruple Helix through by adding the fourth helix of a media-based and culture-based public as well as the civil society (Carayannis and Campbell 2009, 2012), requiring the public becomes more integrated into knowledge creating and innovation application. The public uses and applies knowledge, so public users are also part of the innovation system. However, public is being constructed and communicated by the media is also influenced by culture. In the context of the Quadruple Helix Model, the media-based public supports the diffusion of knowledge while the culture-based public promotes knowledge for the knowledge society, influencing every national innovation system.

Carayannis and Campbell (2010) developed the Quadruple Helix further in the perspective of the natural environments of society. The Quintuple Helix emphasizes that the natural environments should be conceptualized as drivers for the further advancing of knowledge production and innovation systems. A sustainable balance between the paths of development of society and the economy, with their natural environments, is essential for the further progress of human civilizations. With the Helix of Natural Environment, ‘sustainable development’ become constituents for social innovation and knowledge production (Carayannis and Campbell 2010, pp. 58–62). Therefore, the exchange of knowledge in a Quintuple Helix of the five helices, will promote knowledge-production-based sustainable development or “The Quintuple Helix can be proposed as a framework for transdisciplinary (and interdisciplinary) analysis of sustainable development” (Carayannis and Campbell 2010, p. 62).
From an innovation model to an innovation system

When initiating the triple, quadruple, and the QHIM, the authors consider them as models for knowledge and innovation, resulting from interactions in knowledge production referring to universities (higher education), industries (economy), governments (multilevel), public (media-based and culture-based public and civil society), and natural environment (Etzkowitz and Leydesdorff 2000; Carayannis and Campbell 2009, 2010). Recently, the research on N-helix Innovation theories has significantly change to provide an explicit analytical framework for conceptualizing N-Helix interactions into an “innovation system” based on system theory. Systems theory can be defined as a theoretical perspective that analyzes a phenomenon seen as a whole and not as simply the sum of elementary parts and focusing on the interactions and on the relationships between parts in order to understand an entity’s organization, functioning and outcomes (Mele et al 2016). The authors in two below-mentioned articles approach N-helix innovation framework under the systematic perspectives that concentrate on the components/ elements/ subsystems, the relation between them to function as innovation resources.

Ranga and Etzkowitz (2009) introduces the concept of Triple Helix systems that synthesizes the key features of university–industry–government (Triple Helix) interactions into an ‘innovation system’ format, defined according to systems theory as a set of components, relationships and functions. Among the components of Triple Helix systems, a distinction is made between (a) R&D and non-R&D innovators; (b) ‘single-sphere’ and ‘multi-sphere’ (hybrid) institutions; and (c) individual and institutional innovators. The relationships between components are synthesized into five main types: technology transfer; collaboration and conflict moderation; collaborative leadership; substitution; and networking. The overall function of Triple Helix systems – knowledge and innovation generation, diffusion and use – is realized through a set of activities in the knowledge, innovation and consensus spaces.

Carayannis et al. (2012) also considers Quintuple Helix as a system in which the most important constituent element is the resource of ‘knowledge’, which, through a circulation (i.e., circulation of knowledge) between social (societal) subsystems, changes to innovation and knowhow in a society and for the economy. Thereby, the Quintuple Helix visualizes the collective interaction and exchange of knowledge in a state (nation-state) by means of the following five subsystems (i.e., helices): (1) education system, (2) economic system, (3) natural environment, (4) media-based and culture-based public (also civil society), (5) and the political system (Carayannis et al. 2012, p.6).

The QHIS as the analytical framework for climate change adaptation

The QHIS configuration can be described as a theoretical and practical model for the exchange of the resource of knowledge, based on five social (societal) subsystems with ‘capital’ at its disposal, in order to generate and promote a sustainable development of society (Carayannis et al., 2012, p. 6 – 7; Carayannis and Campbell, 2010, pp. 60–62). With the adding of the “fifth helix of the (natural) environment/environments” to knowledge creation, production, application, diffusion and use, knowledge and innovation are transformed to a knowledge and innovation that is sensitive or at least potentially sensitive for environment: knowledge and innovation, contextualized by natural environment, meets the context of the environment. Therefore, the QHIS has the potential to serve as an analytical framework for sustainable development, by conceptually relating knowledge and innovation to the environment. Climate change is currently a threat facing people all over the world, to
which the QHIS can be applied with greater potential. The following part will develop QHIS as the analytical framework for climate change adaptation based on two article of Ranga and Etzkowitz (2009) and Carayannis et al. (2012). By which, QHIS as the analytical framework for climate change adaptation can be defined as a set of the following:

**Components:** QHIS embeds five subsystems in corresponding to five helices (Carayannis et al 2012).

2. The economic system (EcS) focuses the economic capital of ‘industry/industries’, ‘firms’, services and banks.
3. The natural environment (NE) is decisive for a sustainable development and provides people with a ‘natural capital’ (for example: resources, plants, variety of animals, etc.) In this model, the natural environment will only concentrate on climate change issues that are the challenges as well as opportunities for sustainable development.
4. The media-based and culture-based public and society (PuS) integrates and combines two forms of ‘capital’, both communities in general and organized public groups.
5. The political system (PoS) is crucially important as political and legal capital, it formulates the goals as well as the organization and administration of the state (nation-state).

**Relationships:** Ranga and Etzkowitz (2009) focus on five types of relationships between helices in a N-helix system including technology transfer or acquisition, collaboration and conflict moderation, collaborative leadership, substitution, and networking. Technology transfer (TT) is recognized as the core activity in an innovation system (Carlsson et al, 2002, p 234). It is also important in the QHIS because it results in the knowledge diffusion to other spaces out from the single space where knowledge is generated. Therefore, the knowledge can be applied in different forms for diversified purposes and the knowledge also can be continuously updated, modified and advanced.

**Collaboration and conflict moderation (CCM)** is a specific form of interaction within five entities. In the context of climate change, and the demand for climate change adaptation, each subsystem in the society has its own interest and sometimes conflicting incentives for adaptation activities. The QHIS harmonizes these distinction and transform tension and conflict of interest into converging interests based on common objectives and ‘win–win’ situations. Collaborative leadership (CL) is an integral part of the collaboration and conflict moderation capacity. ‘Innovation organizers’ as individual or institutional leaders play a key role in this type of relationship. They can connect people from different sectors to bridge gaps, bring together differing views, generate consensus and balance conflicts of interest. Substitution (SU) arises when one institutional sphere fills gaps or “takes the role of the other”
that emerge when another sphere is weak. Networking (NW) is a manifestation of the collective nature of science, technology and innovation in formal and informal structures at national, regional and international level. Networking reflects the growing non-linearity and interactivity of innovation processes (Kaufmann and Tödtling, 2001).

**Functions:** The main function of the QHIS refer to generate, diffuse and utilize knowledge and innovation. It incorporates a broader set of knowledge, learning, entrepreneurial, societal, cultural and policy competencies that are achieved in what Ranga and Etzkowitz (2009) labelled: the knowledge, innovation and consensus spaces. The knowledge space (KS) encompasses the competencies of knowledge generation, diffusion and use of the Quintuple Helix components. Mechanisms for the creation of a knowledge space includes putting some national public research resources to less research-intensive regions, relocation of existing research resources, creation of new university resources, and networking of existing knowledge-based organisations and creation of new ones through collaboration. The innovation space (IS) consists in particular of the competencies of the ‘multi-sphere’ (hybrid) organizations and entrepreneurial individuals and institutions. The creation of an innovation space can take place through various mechanisms, including, the creation of a university in regions without higher education capacity, building an integrated environment for university technology transfer and entrepreneurship or relocation of artists to declining urban districts to stimulate arts/technology-based economic renewal. The consensus space (CS) is the set of competences that bring together the QHIS components to engage in thinking, discussing and evaluating proposals for advancement towards a knowledge-based regime. There are some common mechanisms for the creation of a consensus space, ranging from creation or transformation of an organization to provide a home for brainstorming, analysis of problems and formulation of plans, to provision of access to the resources required to implement a project and providing solutions to conflict or crisis situations.

5. The QHIS embedded in the Vietnam system of climate change policies

In this section of this paper, relevant international agreements and national policy (strategies, action plan at national, ministerial and provincial levels) are outlined with respect to their attempt to utilise the QHIS to deal with climate change adaptation in Vietnamese urban regions. The result will cover all these facts. The discussion follows the results, analysing gaps and inconsistencies which impact on five helices coordination for innovative adaptation in cities in Vietnam. The recommendation will suggest some solution to deal with the failure of applying the QHIS in Urban Climate change Adaptation in Vietnam.

1. The result

The extent to which relevant international agreements and national policy (strategies, action plan at national, ministerial and provincial levels) considered the QHIS as policy instruments for urban climate change adaptation will be assessed at three levels:
- Policies identifies the component of the QHIS
- Policies identifies the relations between five helices in the QHIS
- Policies identifies the functions of the QHIS

1.1 Components

The table 1 summarize the components of the QHIS in the International Communications and
Commitments of Vietnam; National policies and strategies; ministerial policies, and provincial policies. Filled cells mean “mentioned” whereas blank cells means “did not mention”.

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**International Communications and Commitments**

- Vietnam's Initial National Communication to the UNFCCC
- Vietnam's Second National Communication to the UNFCCC
- The Biennial Updated Report of Vietnam to the UNFCCC
- Intended Nationally Determined Contribution of Vietnam

**National Policies and Strategies**

- The National Target Program to Respond to Climate Change - 2008
- The National Climate Change Strategy - 2011
- The National Target Programme on Climate Change period 2012 - 2020
- The National Action Plan on climate change for the period 2012 - 2020
- Resolution No. 24-NQ/TW on “Pro-actively responding to climate change, enhancing natural resource management and environmental protection” - 2013
- The Action Plan to implement Resolution No. 24 - NQ/TW - 2014
- The Scheme of Urban Development Vietnam responding to Climate Change in the period 2013 - 2020

**Ministerial policies**

- Ministry of Natural Resources and Environment 2010
- Ministry of Science and Technology 2016
- Ministry of Construction 2014
- Ministry of Industry and Trading 2010
- Ministry of Labour, Invalid and Social Affairs 2010

**Provincial level**

- The Action Plan to Respond to Climate Change of Ho Chi Minh city to 2015 (2013)

*UK-ASEAN INNOVATION CONFERENCE 2016*
The Action Plan to Respond to Climate Change of Ha Noi city (2012)


The Action Plan to Respond to Climate Change of Da Nang city

The Action Plan to Respond to Climate Change of Hai Phong city to 2025 (2014)


All policies mention political system as the decisive role in climate change management (Intended Nationally Determined Contribution of Vietnam, the National Target Program 2008, and the National Climate Change Strategy - 2011) or actively responding to climate change is one of the most important tasks of the entire political system (Resolution No. 24-NQ/TW - 2013). The political system in Vietnam concludes Vietnam National Government (Vietnam's Initial National Communication to the UNFCCC); governmental agencies, specialist bodies (Vietnam's Second National Communication to the UNFCCC); line ministries: Natural Resources and Environment; Finance, Planning and investment, Foreign Affairs; Science and Technology; Agriculture and Rural Development; Industry and Trade; Transportation; Construction, Information and communication with provincial government (The Biennial Updated Report of Vietnam to the UNFCCC representatives - 2008); ministerial-level agencies, governmental bodies, provincial-level People’s Committees (The National Target Programme on Climate Change period 2012-2020), all party members, the executive committees and party organizations officials at all levels from central government to localities (Resolution No. 24-NQ/TW – 2013). Political system also covers additional legislation system, policy, standards, regulations, provisions and capacity building for leaders and professional staff at all levels of management. Effective implementation of this Scheme requires the coordination of Political system including ministries, branches and People’s Committees of provinces and centrally run cities (The Scheme of Urban Development Vietnam responding to Climate Change in the period 2013 - 2020). Emphasizes the main action of improving managerial capacity of governmental agencies, the Action Plan to Respond to Climate Change of Ho Chi Minh city to 2015 (2013) the action plan targets at developing sufficient policy and institutional system as well as the cooperation between governmental agencies to respond to climate change, the action plan.

Natural Environment system are also included in all relevant policies. The natural environment system in these policies is characterized by climate change issues. The climate change adaptation is considered not just a challenge but also an opportunity to promote the growth pattern transformation towards sustainable development (The National Climate Change Strategy - 2011; The Resolution No. 24/NQ-TW - 2013).

Public and society are mentioned in nearly 91% of policies regulating climate change. Public and society include communities and people. Society covers Climate Change Working Group (PuS), political-social organizations, socio-professional organizations, mass organizations unions, non-government organizations (The National Target Program to Respond to Climate Change – 2008, The National Climate Change Strategy - 2011; The National Action Plan on climate change for the period 2012 - 2020).
Economic system is focused in nearly 73% of related climate change policy documentation. Economic system can be mentioned as major economic sectors of energy, forestry, agriculture or manufacturing industries (Vietnam's Initial and Second National Communication to the UNFCCC). Besides, economic system can be generally referred as private sector, enterprises, businesses (The National Target Program to Respond to Climate Change – 2008; The National Climate Change Strategy - 2011; The National Target Programme on Climate Change period 2012-2020; The National Action Plan on climate change for the period 2012 - 2020; Resolution No. 24-NQ/TW; The Action Plan to implement Resolution No. 24-NQ/TW - 2014; Ministerial and provincial policies). Especially, the Action Plan to Respond to Climate Change of Can Tho city (2015) consider economic sector participation. However, this action plan pays more attention on encouraging the investment of private sector on climate change adaptation by tax reduction and exemption or climate change insurance.

Education system can be identified in only nearly 23% of Vietnam policy system on climate change at international, national, ministerial, and provincial levels. While in international commitment and communications, the education system have classified educational system as science academies, relevant research institutions, university (Vietnam's Second National Communication to the UNFCCC; The Biennial Updated Report of Vietnam to the UNFCCC). The National Policies, Strategies or action plans only generally mention this system, like training and education system (The National Target Program to Respond to Climate Change - 2008), scientists of scientific institutions (The National Climate Change Strategy - 2011; The National Target Programme on Climate Change period 2012 - 2020; The National Action Plan on climate change for the period 2012 - 2020).

![Figure 4: The components of the QHIS in Vietnam Climate change policies](image-url)

### 1.2 Relations

The table 2 summarizes the relations of the QHIS in the International Communications and Commitments of Vietnam; National policies and strategies; ministerial policies, and provincial policies. Filled cells mean “mentioned” whereas blank cells means “did not mention”.

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**UK-ASEAN INNOVATION CONFERENCE 2016**
Vietnam's Second National Communication to the UNFCCC

The Biennial Updated Report of Vietnam to the UNFCCC

Intended Nationally Determined Contribution of Vietnam

National Policies and Strategies

The National Target Program to Respond to Climate Change - 2008

The National Climate Change Strategy - 2011

The National Target Programme on Climate Change period 2012 - 2020

The National Action Plan on climate change for the period 2012 - 2020

Resolution No. 24-NQ/TW on “Pro-actively responding to climate change, enhancing natural resource management and environmental protection” - 2013

The Action Plan to implement Resolution No. 24-NQ/TW - 2014

The Scheme of Urban Development Vietnam responding to Climate Change in the period 2013 – 2020

Ministerial policies

Ministry of Natural Resources and Environment 2010

Ministry of Science and Technology 2016

Ministry of Construction 2014

Ministry of Industry and Trading 2010

Ministry of Labour, Invalid and Social Affairs 2010

Provincial level

The Action Plan to Respond to Climate Change of Ho Chi Minh city to 2015 (2013)

The Action Plan to Respond to Climate Change of Ha Noi city (2012)


The Action Plan to Respond to Climate Change of Da Nang city

The Action Plan to Respond to Climate Change of Hai Phong city to

Technology transfer is the most popular relation between five helices mentioned in Vietnamese policy regulating climate change. Nearly 64% of these policy mentioned technology transfer as dominant relation of education system – economic system, natural environment system, public and social society, and political system. Sometimes, technologies transfer is mentioned in general such as environmentally sound technologies development and transfer (Vietnam's Second National Communication to the UNFCCC) or ten priority technologies transfer to adapt to climate change in agriculture, land use, land-use change and forestry, water resources and coastal zone management (The Biennial Updated Report of Vietnam to the UNFCCC). Other policies mentions the process of technology transfer from develop and effectively implement a national science and technology program on climate change (The National Target Program to Respond to Climate Change - 2008) to the development of advanced science and technology to cope with climate change through boosting researches, encouraging technological transfer and effectively applying modern scientific and technological achievements (The National Action Plan on climate change for the period 2012 - 2020). Last but not least, Resolution No. 24-NQ/TW and The Scheme of Urban Development Vietnam responding to Climate Change in the period 2013 - 2020 identifies the specific task to study and apply new technologies to adapt to climate change in urban construction, developing and using energy, transportation, building materials, water drainage… Promoting scientific research, innovation of production technology towards environmentally friendly and energy-saving, developing and receiving transfer of advanced technology, application of scientific and technological advances in response to climate change also facilitate adaptation process (TT).

Collaborative leadership has been concentrated in 27 percents of Vietnam climate change policies. The National Climate Change Strategy - 2011 gets its strategic viewpoints that response to climate change is a responsibility of the whole apparatus in which the State’s decisive role in management must be highlighted (PoS, CL). The strategy’s missions include strengthening the key role of the State in responding to climate change (CL) by embedding climate change topic in strategies, schemes and plans and improving institutions. The state (PoS) will take the leading role (CL) in establishing an advisory agency in researching and proposing strategic guidelines and resolutions; mobilizing, regulating and monitoring all resources for implementing strategies and programs in response to climate change; Designing synchronous regimes, policies and laws on climate change in conformity with the country’s specific stages of development, global policies and international conventions on climate change; Resolution No. 24-NQ/TW on “Pro-actively responding to climate change, enhancing natural resource management and environmental protection” - 2013 in which the state plays a key role (CL), under the leadership of the Party and the participation and monitoring of the entire society in the viewpoint and objectives section. Another solution focuses on strengthening state management (PoS) in response to climate change by building and improving the law, consolidating the structural organization and perfecting mechanisms in order to create a favourable legal environment for the implementation of the tasks.

Substitution (SU) is confirmed in more than 18% of these policies. Most of the substitution imply the action of governmental activities to take the role of educational systems to do research and create knowledge and innovation. Vietnam's Second National Communication to the UNFCCC describes the substantial amount of research carried out by governmental agencies and NGOs with international
assistance; Ministry of Natural Resources and Environment (2010) do researching for climate change influences assessment and policies proposal. Ministry of Science and Technology 2016 do researching to propose solution for changing growth model and restructuring economics sectors to green economy, green industry, green urban and smart urban to respond to climate change. Ministry of Construction 2014 do researching for green urban model and construction. This decision reflexes the substitution relationship in the QHIS in which the sphere can take the role of the other when the other becomes weak. In this case the political system take the researching role of education systems.

Collaboration and conflict moderation (CCM) is identified in only 9% of all related policies. Resolution No. 24-NQ/TW on “Pro-actively responding to climate change, enhancing natural resource management and environmental protection” - 2013 and The Action Plan to implement Resolution No. 24-NQ/TW - 2014 attempted to improve settlement mechanism of dispute and conflict in response to climate change, amending and supplementing the administrative, economic, criminal sanctions on natural resource management and environmental protection, ensuring sufficient deterrence.

Figure 5: The relations of the QHIS in Vietnam Climate change policies

Because technology transfer is the most popular relation between five helices mentioned in Vietnamese policy regulating climate change, the paper will have a detailed look at the list of specific stream, projects, programs, and task attached below the policies to answer two questions: Whether technology transfer are specialized into detail streams, projects, programs, or tasks? If yes, to what extend the five systems of education, economy, natural environment, public and society, and politics are embedded in these specific projects? The finding can be summarized in the table 3. Filled cells mean “mentioned” whereas blank cells means “did not mention”.

<table>
<thead>
<tr>
<th>Policies</th>
<th>Any specified projects</th>
<th>Embedded five helices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vietnam's Second National Communication to the UNFCCC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Biennial Updated Report of Vietnam to the</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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UNFCCC

The National Target Program to Respond to Climate Change – 2008

The National Climate Change Strategy - 2011

The National Action Plan on climate change for the period 2012 – 2020

Resolution No. 24-NQ/TW on “Pro-actively responding to climate change, enhancing natural resource management and environmental protection” - 2013

The Action Plan to implement Resolution No. 24-NQ/TW - 2014

The Scheme of Urban Development Vietnam responding to Climate Change in the period 2013 – 2020

Ministry of Construction 2014

Ministry of Industry and Trading 2010

The Action Plan to Respond to Climate Change of Ho Chi Minh city to 2015 (2013)

The Action Plan to Respond to Climate Change of Ha Noi city (2012)


The Action Plan to Respond to Climate Change of Da Nang city

The Action Plan to Respond to Climate Change of Hai Phong city to 2025 (2014)

Out of 15 policies that refer to technology transfer, the detailed list of specific stream, projects, programs, and tasks can be find in only 11 policies. Vietnam's Second National Communication to the UNFCCC, The Biennial Updated Report of Vietnam to the UNFCCC, The National Climate Change Strategy - 2011, Resolution No. 24- NQ/TW on “Pro-actively responding to climate change, enhancing natural resource management and environmental protection” - 2013 did not attached any detailed list with them. Almost all of policies only identify the leading role and the prime responsibility of political system, the other system are mention generally like “other ministries, sectors and localities” (The National Target Program to Respond to Climate Change - 2008) or “relevant agencies” (The National Action Plan on climate change for the period 2012 - 2020). These system are specified into Education system and Economic System in Ministry of Construction (2014), and

1.3 Functions
Functions of the QHIS have not mentioned in any international communications/ commitment or Vietnam climate change policy system (the strategies/ action plans from national - ministerial - provincial levels)

2. Discussion and recommendation:

The leading role of political system and the hidden role of education and economic systems: The policy analysis above apparently confirms that the Innovation System in general and Innovation system for climate change adaptation in particularly is following the Statist Model with centralised planning and governance. The government played a decisive role on agenda for innovation, financial supporters and public research institutes conducted most of basic and applied research; the universities had limited involvement in basic and applied research or they only involve in as requested or contracted by the governmental agencies; R&D units in enterprises nearly do not deal with innovation for environmental protection purposes. There was little interaction among different research entities, mostly popular the one-way interaction between government offices, as owners and university or enterprises' research groups, as contractors. The government served as the pivot for knowledge flows. In the context of developing country, the university and the industry are so young and weak, the leading role of the government is vital to create environment for these actors to nurture, grow up and take their functions.

Notably Vietnam has changed sharply thirty years after “Doi moi”. There are currently 460 universities and colleges in Vietnam (The Decision to approve the Plan for Higher Education Network in Vietnam). The Law on Higher Education also emphasizes the national strategy for higher education in which education should be integrated to research, and technology application through strengthening the coordination between universities, other research institutions, and enterprises. Moreover, the Vietnamese economic sectors, especially private sectors, is taking more and more dominant role in economic growth as well as sustainable development thirty years after “Doi moi”. In the other words, educational and economic system in Vietnam has rapidly developed and they can effectively take the leader’s role in economic process, and innovation process as well.

The figure 6, on the left side, shows the real situation of Government - University and Enterprises configuration in Vietnam in which university and enterprises are rapidly developing and significantly changing in both size and functions. However, in an innovation system, they are framed by government that really unfits them anymore. Moving from this model to overlapping model (on the right side) is essential for knowledge and innovation creating, diffusing, and utilising in Vietnam.

Figure 6: The moving from Vietnamese current model to the overlapping model
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There is a global tendency to move towards an overlapping model in which the three institutional spheres overlap and collaborate with each other. The model represents a change: “…from one of strong boundaries between separate institutional spheres and organisations to a more flexible overlapping system, with each taking the role of the other (Etzkowitz 2002, p. 2). Cai & Liu (2014, p.4) indicate that the core idea in such an ideal Triple Helix model is that academia should be closely linked with the industrial world. In general, the education and research activities in universities should be more integrated into the development of a knowledge economy. Specifically, universities should form direct links with industry to maximise the capitalisation of knowledge. They also propose three options for universities to commercialise knowledge including: (1) patenting and licensing technology innovation; (2) direct cooperation with enterprises through contract-based R&D cooperation; (3) setting up spin-off enterprises or university-run enterprises.

In the case of Vietnam, the government can utilise these options to offer incentives and encourage academic institutions to go beyond performing their traditional functions of education and research. So that they can integrate their research contribution to the real production life, strengthening the relation of universities and enterprises. On the other hand, the government should gradually give up their leading role in innovation system, therefore, the other spheres can have enough spaces/ opportunities to take the superior role and upgrade national innovation system into a new level based on their comparative advantages.

The root causes underlined in the policy making process

According to Kraft & Furlong (2015), a policy making process includes 6 logical sequence of activities: agenda setting, policy formulation, policy legitimation, policy implementation, policy and program evaluation, and policy change (p. 114) in which all the policy actors should involve on all stage of policy making process in order ensure that public policies to be consistent with public preferences and to meet the needs of citizens (p.492). Based on this viewpoint, the paper argues that the climate change policy making process has not involved all related actors (five subsystems of education, economy, natural environment, public and society, and government), resulting the failure of utilising the QHIS as a policy instrument for climate change adaptation in urban areas. This argument will be supported by reviewing two legal documents that give instruction to formulate related climate change policies as well as by in depth interview with Vietnamese public servants who directly involved in these policies’ making process.

The Ministry of Natural Resources and Environment has issued two decisions: Decision No. 3815/BTNMT-KTTVBDKH dated 13/10/2009 to give the instruction to formulate the action plan to respond to climate change; Decision No. 990/BTNMT-KHTVBDKH dated 24/3/2014 to give the instruction to update the action plan to respond to climate change. In these decision, the policy making process can be identified as well as the involvement of related policy actors. The table 4 summarizes the stages and the involvement of policy actor identified in decision of The Ministry of Natural Resources and Environment in comparison to the process of Kraft & Furlong (2015, p. 114)

<table>
<thead>
<tr>
<th>Policy making process</th>
<th>Policy actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kraft &amp; Furlong</td>
<td>MONRE</td>
</tr>
<tr>
<td>EdS</td>
<td>EcS</td>
</tr>
<tr>
<td>NE</td>
<td>PuS</td>
</tr>
<tr>
<td>PoS</td>
<td></td>
</tr>
</tbody>
</table>
The table 4 shows some weaknesses of climate change policy making process in Vietnam. Firstly, the policy process is insufficient without mentioning the stages of implementation, evaluation, and change. Secondly, the government is the leading actor in policy making, the involvement of other actors limited in giving ideas/opinions/suggestions on draft versions in open seminar/conference organized by state offices. Interviews with policy maker in provincial level informs that the actors participated in these seminars/conferences includes mostly the mass organizations like farmer’s organization, women’s organization, youth’s organizations… Whereas interviews with related policy maker in ministerial level emphasizes that the actor involved in open seminars/conferences for ministerial policies often cover these political-social organizations, the NGO, and some universities or research institutions. The enterprises and businesses normally are not willing to take part in these meetings even they are sometime invited. When all the subsystems of the QHIS have not fully involved in policy making process, it is obvious that they will not be adequately embedded in climate change policy. Therefore, this innovation framework cannot be utilised as policy instrument to tackle climate change adaptation the context of Vietnamese cities.

6. Conclusion

The paper has made some contributions to the literature. Firstly, it attempted to rationale for the construction of the QHIS Framework for Climate change adaptation (in the literature review). Then, it has strived to develop the QHIS to an analytical framework for urban climate change adaptation, including three main sets: (1) Five components of education subsystem, economic subsystem, natural environment, public and society, and political subsystem; (2) Five relationships of technology transfer, collaboration and conflicts moderation; collaboration leadership, substitution, and networking; (3) Three functions of Knowledge space, Innovation space, and Consensus space. Last but not least, the
paper has reviewed all climate change policy system of Vietnam under the light of the newly
developed conceptual construct and found that Vietnamese government does recognize the importance
of all components in QHIS as well as strive to cooperate them to tackle urban climate change
adaptation. However, the policies fail to adequately consider relationships between these actors so that
the overall function of QHIS – knowledge and innovation generation, diffusion and use – cannot be
realized to be a potential solution for climate change adaptation in urban areas in Vietnam. The root
causes underlined in the leading role of state over other policy actors like universities, or industries as
well as the close policy making process. Some recommendations can be made to strengthen the role of
universities and enterprises in innovation system as well as open more spaces for involvement of all
related policy actors in climate change policy making.

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Vietnamese relevant policies

International Communication and Commitment


Vietnamese relevant policies

International Communication and Commitment


National Strategies and Action Plan


Vietnamese relevant policies

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Ministerial Level
The Ministry of Natural Resources and Environment 2009, Decision 3815/BTNMT-KTTVBKHCN to give the instruction to formulate the action plan to respond to climate change, available at The Ministry of Natural Resources and Environment 2014, Decision 990/BTNMT-KHTVBKHCN to give the instruction to update the action plan to respond to climate change, available at http://www.dmhcc.gov.vn/upload/services/1172487086_990%20cap%20nhat%20KHHD.pdf

Provincial level

*Ha Thu Pham Email Address: hapt@ueh.edu.vn; phamthuha80@gmail.com
Absorption Studies of Bamboo Charcoal for Removing Ferrous Ions From Aqueous Solution

Iep Keovongsa
National University of Laos, Lao PDR

Abstract
Groundwater is a very important source for potable water but most of the sources are contaminated with heavy metal which makes it difficult to isolate them. To adsorb the metals, modern technologies such as adsorption techniques are needed. This study used bamboo chopstick garbage from restaurants and noodle shops to remove Fe(II) from aqueous solution using bamboo charcoal, obtained from bamboo chopstick. The study was conducted in a batch adsorption system, to find the efficiency of bamboo charcoal on removal of Fe(II) and any effects on removing process. The bamboo charcoal was characterized by physico-chemical tests and prepared as an activated charcoal through a simple chemical activation method. The experimental data showed that the pH solution was a very important parameter in controlling this system, the removal increased with the increase in the pH solution, if the pH is over 5 it causes precipitation rather than adsorption. Moreover, the removal of Fe(II) improved as the adsorbent dose increased due to the bigger number of active sites. The results showed that the sorption of Fe(II) ions onto bamboo charcoal was fast equilibrium, as a low concentration. The adsorption data has been analyzed and discussed by using the Lagergren-pseudo-first-order and pseudo-second-order kinetic models. The results were well represented by the pseudo-second order kinetic model. The overall adsorption process can be controlled by ion exchange and physical sorption. Langmuir and Dubinin-Radushkevich sorption isotherm were applied and linked to the equilibrium data and it was found that the best fit was obtained with Langmuir isotherm which indicated the maximum sorption capacity of 5.506 mg g⁻¹. Moreover, the D-R isotherm demonstrated that the mean free energy (E) of adsorption process follows chemisorption. In conclusion, bamboo charcoal can represent a low-cost material which effectively removes Fe(II) from aqueous solution.

Keywords: Adsorption; Bamboo charcoal (BC), Ferrous ion, Chemisorption

1. Introduction
Human activities are related to water. The amount of fresh water is limited. Even though, there is a bit amount but some part of it was contaminated by the heavy metals, especially groundwater, industrial discharge as well. However, the water consumption of human activities is surface water such as from streams, lakes, rivers but the major source of potable water is from groundwater (Ahmad and Jawed, 2010). In Europe and US consume approximately groundwater 75 % and 51 % for drinking water, respectively. (Sharma et al., 2001).

Iron is commonly found in the groundwater (Wilkes University, 1995) and related industrial discharge as well. However, the groundwater was served as a source for drinking water and other activities, especially in developing or/and least developed countries they are consuming the contaminated water by iron such as Sri Lanka, Ghana, Burkina Faso, Argentina, South Africa, Uganda, Cambodia, Indonesia and India, etcetera (Ahmad, 2005; Andersson and Johansson, 2002; Chibi, 1995), especially in Lao PDR, the dwellers dug well or/and bore-hole and extracted groundwater for consumption, as drinking water and gardening. The concentration level of iron in groundwater ranges from 0-50 mg/L (Lenntech, 2016), while the WHO recommended level is < 0.3 mg/L (WHO, 2007). Moreover, in Indonesia, as in Bandung, it was found that the iron contaminates in groundwater around 13.74 mg/L (Zahra, 2015).
The problems caused by iron are aesthetic problems, indirect health concerns, and hemochromatosis, if not treated, it can lead to heart disease, liver problems, and diabetes (Garvin, 2015).

There are various methods such as precipitation, ion-exchange, solvent extraction, membrane filtration etc. have been employed to remove heavy metals from aqueous systems (Saroj et al., 2013). Adsorption method is one of them, which effective, economical, easy to handle and no sludge.

Activated charcoal is very popular in wastewater and potable water treatment as well. This adsorbent as a cheaper, eco-friendly and readily available material can be used to remove Fe(II) from aqueous solution.

The objective of this study was to determine the potential and the effectiveness of bamboo charcoal in removing Fe(II) from the aqueous water and the feasibility of using bamboo charcoal. The adsorption characteristics will be investigated under operating variables, such as solution pH, adsorbent dose, initial Fe(II) concentration, and adsorbent particle size. Batch test was conducted to investigate within two empirical models Langmuir and D-R adsorption isotherms and kinetic model, Pseudo-First order, Pseudo-Second order kinetics commonly

2. Materials and Methods

2.1 Materials

Chemicals and tools
All other chemicals used in the study viz., ammonium iron (II) sulfate hexahydrate Fe(NH₄)₂(SO₄)₂·6H₂O; 1, 2 phenanthroline solution (C₁₂H₈N₂H₂O); ammonium acetate buffer solution (NH₄C₂H₃O₂); HCl, NaOH, etc, were supplied by Water quality laboratory of ITB. The shaker water bath; pH meter (Φ40 pH meter (Beckman)); automatic balance; Spectrophotometer UV-VIS Optizen 2120UV; and other necessary glasses were used in present study.

2.2 Methods

Chemical activation
Bamboo chopsticks, were washed by tap water to remove dirt then exposed in the sun to remove moisture, then cut to 3-5 cm in length and contained into a stainless can. The pyrolyzed bamboo was chopped to 2-3 mm in length. The chopped sample was washed with distilled deionized water until clarified water to remove any leachable impurity.

Then sample was treated with 2% (v/v) H₂SO₄ then placed in oven at 110°C for 24 h after that soaked with distilled water until the solution pH was stable. Then the adsorbent was soaked in 2% (w/v) NaHCO₃ till any residual acid left was removed. The acid activated charcoal obtained was dried overnight in an oven at 110°C to constant weight. The sample was ground and sieved as the needed diameter by sieve shaker then the sample was kept in an air tight vial for the various experiments. The method was adopted from Amuda & Ibrahim.

Characterization of adsorbent
The qualitative analysis of constituents in samples was characterized by Fourier Transform Infrared Spectrometer (IRprestige-21, Shimadzu, Japan). FTIR spectra were recorded within a range of 400-4500 cm⁻¹. The scanning electron microscopy (SEM) and Energy Dispersive Spectroscope (EDS) analysis performed using a JSM-6510 Series, to identify morphological surface structure and
elemental compositions. The physical and chemical tests were conducted to describe more characterized such as: the moisture content was carried out by modified method of Ekpete and Horsfall. The Bulk density was determined using Archimedes’s principle by weighing a 10cm$^3$ measuring cylinder before and after filling with the samples. pH, Ash content and volatile matter were processed in similar method, according to standard test method of CEFIC, (1986).

**Preparation of aqueous solution**

According to standard method, phenanthrolene method which edited by Rice et al., (2012). Ammonium iron(II) sulfate hexa-hydrate ((NH$_4$)$_2$Fe(SO$_4$)$_2$.6H$_2$O) was used to prepare a stock solution of concentration 200 mg/L. From this stock solution different working solutions were prepared by dilution method. For a particular solution, the pH was kept at 5.10±0.1, 100 rpm of agitation and 25°C (298 K) of temperature.

**Varied parameters for investigation**

Equilibrium study was carried out by various concentration: 5, 7, 10, 14, 17 and 20 mg/L$^{-1}$. Different particle size of BC were: 0.106, 0.150, 0.212, 0.425 and 0.800 mm. Various pH values were: 2.74, 3.72, 4.11, and 5.10. Adsorbent doses were: 0.01, 0.10, 0.15, 0.25 and 0.30 g.

**Batch adsorption experiment**

In 50 mL of aqueous solution desired concentration of Fe(II) taken in different conical flasks, 0.15 g of BC of desired particle size was added. The pH of the solution was adjusted using 0.1 M HCl or 0.1 M NaOH as required. The samples were taken at time 20 mins, it is enough for reaching equilibrium and filtered by Syringe filter (0.45 μm pore size).

To determine the amount of Fe(II) ions adsorbed (q$_e$) in mg/g$^{-1}$ and for removal percentage following mass balance equations were used:

\[ q_e = \frac{V(C_0 - C_e)}{m} \]  
\[ A\% = 100 \left( \frac{C_0 - C_e}{C_0} \right) \]  

Where $C_0$ and $C_e$ are the initial and equilibrium concentrations (mg/L$^{-1}$) of Fe(II) solution respectively; $V$ is the volume of solution (L); and $m$ is mass (g) of the adsorbent.

**Kinetic study**

Kinetics experiment was conducted to decide time needed to reach adsorption equilibrium. Batch experiment was conducted with 0.45 g of adsorbent and contacted with 150 mL of ferrous ion aqueous solution of varied concentration of 10, 14 and 20 mg/L. Each sample vibrated by a shaker water bath. Sample was withdrawn at time 1, 2, 4, 6, 8, 10, 15, 20, 25 and 30 min.

**Figure 1** Schematic operational process of adsorption step

\[ q_e = \frac{V(C_0 - C_e)}{m} \]  
\[ A\% = 100 \left( \frac{C_0 - C_e}{C_0} \right) \]  

Where $C_0$ and $C_e$ are the initial and equilibrium concentrations (mg/L$^{-1}$) of Fe(II) solution respectively; $V$ is the volume of solution (L); and $m$ is mass (g) of the adsorbent.
3. Results and Discussion

3.1. Bamboo charcoal characterization

The best activated charcoal must have low ash content. Typical ash content of activated charcoal is around 5-6 % or less than (Nwabanne and Igbokwe, 2012). A small increase in ash content causes a decrease in adsorptive properties of activated charcoal. High ash content is undesirable for activated charcoal since it reduces the mechanical strength of carbon and affects adsorptive capacity. Ash content obtained in this study is 4.82%. The ash content is well below condition.

Normally, moisture content decreases as the temperature increases. Jinhe and Tesfaye Hunde, (2012) produced the charcoal as product and reported that volatile of different type of bamboo charcoal was 17%. Valix et al., (2004) obtained pH between 6.4 of bamboo charcoal.

**Table 2** Physical and chemical characteristics of bamboo charcoal

<table>
<thead>
<tr>
<th>Properties</th>
<th>Bamboo</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.45</td>
</tr>
<tr>
<td>Moisture content (%)</td>
<td>1.73</td>
</tr>
<tr>
<td>Bulk Density (g/cc)</td>
<td>0.62</td>
</tr>
<tr>
<td>Ash Content (%)</td>
<td>4.82</td>
</tr>
<tr>
<td>Volatile matter (%)</td>
<td>27.33</td>
</tr>
<tr>
<td>Particle size (mm)</td>
<td>&lt;0.106</td>
</tr>
</tbody>
</table>

**FTIR analysis**

The FTIR spectrum obtained in Figure (2) for the adsorbent displayed the following major bands of hydroxyl and carbonyl group (symmetric and asymmetric): 3408.22 cm\(^{-1}\) and 617.22 cm\(^{-1}\): O-H stretch; 2920.23 cm\(^{-1}\): C-H stretch; 1111 cm\(^{-1}\): C-O stretch; O-H twist. The peak found at 1687.71 cm\(^{-1}\) and 1595.13 cm\(^{-1}\) originated from the group of carbonyl (C=O) stretch vibration. It is reflecting the structure of adsorbent and shows significant band slightly shift due to losing of hydrogen bonds through hydrolysis process (Young Sung et al., 2008; Mondal et al., 2008; Song-lin et al., 2003; Bardhan et al., 2014; Wenjing and Rui 2014). More clearly explanation, the band at the peaks of carbonyl. The carbon surface will be deprotonated at high pH resulting ligands, that will attract to the positive charge of Fe(II). Whereas at low pH, such carbonyl protonated so positive charge and will not interact with the cation Fe(II) (Diagboya et al.,2014).

**Surface morphology**

The surface morphology and elemental compositions of the Bamboo charcoal were studied by Scanning Electron Microscope (SEM) and Energy Dispersive SpectroscopySpectroscopy (EDS), respectively. As shown in Figure (3a), it can be observed that the particles presented as a smoothly surface, a wide range of macropore distribution. Whereas, the forms and sizes of the particles are very irregular after ferrous treatment as Figure(3b), demonstrated that Fe(II) ions attracted on the bamboo charcoal due to influence of functional group on adsorbent surface.
Figure 2 FT-IR spectra of bamboo charcoal: (a) before adsorption, (b) after adsorption

Figure 3 SEM image of bamboo charcoal (A) and Fe-load (B)

Figure 4 Energy dispersive spectra of BC (A) and Fe-loaded BC (B)

Energy Dispersive Spectroscopy (EDS) use of the X-ray spectrum emitted by a solid sample bombarded with a focused beam of electrons to obtain a localized chemical analysis. Quantitative analysis of the elements in charcoal with higher accuracy can be determined from atomic emission spectroscopy (Zhu et al., 2012).

The data showed in Figure 4a, identified the energy position of elements such as C, N, O, Na and Fe at 0.277, 0.392, 0.525, 1.041 and 6.398 keV, respectively. These elements are found in the aggregate adhered on the pore surface of the bamboo charcoal. However, the signal of Fe(II) ions before...
sorption. It could be described by the location of bamboo tree and commonly abundant iron in soil and groundwater as well (Jiangtao et al., 2014; Zhu et al., 2012). However, in Figure (4b) clearly demonstrated that percent mass of iron increases from 0.05 to 1.10%, it was a perfect result that could draw a conclusion on the significance of functional group on surface which involved the ionic exchange by inter-molecule forces.

**Batch study**

**Effect of pH**

Solution pH has been identified as the most important variable factor governing ferrous adsorption, as it strongly affects metal sorption, surface charge of the adsorbent (Tan et al., 2003). The adsorption was investigated by varying the pH from 2 to 5.

The result has been shown in Figure (5), as showed that the removal of Fe(II) increases, as the increasing of pH solution. Whereas the uptake of ferrous ion was very low at pH below 2. It was found that increasing of pH over 5 may cause precipitation rather than adsorption. The optimum for maximum uptake of 4.75 mg/g for ferrous ion was achieved at pH 5.10. This can be explained based on the fact that at low pH the surface of adsorbent got protonated, which restricts the approach of metal cations as a result of the repulsive force, whereas the pH increased causes to carrying the negative charges that are attracted to the metal ions Fe$^{2+}$ (Srivastava and Hasan, 2011). McCafferty (2010), has given more description by the pH PZC value of bamboo charcoal indicating that surface become fast negative above 3.0, which facilitated easily the attraction of positive charge ions (Fe$^{3+}$) to negative adsorbent surface. This phenomenon is similar to the reports of (Jiang et al., 2006; Charles and Odoemelam, 2010; Abdel-Ghani et al., 2007).

**Effect of adsorbent dose**

The results are shown in Figure (6). It was conducted with varied amount of 0.01 to 0.30 g of adsorbent, it had seen that the percentage removal of the ferrous iron further increase, as increase in dosage. As the adsorbent dose 0.01 g the percent removal was obtained only 21.15 % with 14.524 mg/g of adsorption capacity and continued increase reached the optimum at 0.15 g of adsorbent with the maximum of efficiency removal of 99.87 %. Therefore, increasing the adsorbent dose, increases the removal percentage due to more active sites. This phenomenon is similar to studies reported by Hamza, (2013).

**Effect of initial concentration**

The concentration was ranged from 5 to 20 mg/L of Fe(II). The result showed in Figure (7). It is apparent that by increasing the adsorbate dose the percentage of Fe(II) removal decrease from 99.84 % to 80.97 %
with the uptake capacities 1.92 to 5.39 mg/L, respectively. This can be described on the basis that at lower initial ferrous concentrations, the ratio of the initial moles of ferrous ion to available surface area was low, so the sorption becomes independent of initial concentration (Srivastava and Hasan, 2011). However, at higher concentrations, the active sites are available for adsorption became less in comparison to the moles of ferrous ion present in solution, and hence, the removal of metal ion is strongly dependent upon the initial solute concentration. Based on experimental data indicated the possibility of the formation of monolayer coverage of ferrous ion at the interface of adsorbent.

**Effect of particle size**

The experimental results for the adsorption of ferrous iron on bamboo charcoal with different particle sizes were plotted in Figure (8). From the plot, it was observed that as the particle size increases from 0.106 to 0.8 mm, the percentage removal decreases along with the particle size increased. The smaller particle size gives a greater removal percentage because of the larger surface area or/and more number of active sites, as the particle size is bigger, the number of macropores is less (Charles and Odoemelam, 2010).

**Effect of contact time**

The effect of contact time on adsorption was presented in Figure (9). It shows contact time effect on the removal of Fe(II) which found that the highest removal efficiency is 99.93 % with 4.54 mg/g of amount of solute on adsorbent. Removal increases with time changed and reaches a maximum or equilibr-ium condition after 20 minutes. A short time to reach the saturation stage and the maximum
amount of the metal ion sorbed at equilibrium indicate the rapid transport of metal ion from the bulk to the outer and inner surface of the adsorbent. Thus, the period of saturation condition is very important factor which to consider the feasibility of an adsorbent for its use in water quality control.

3.2. Kinetic study

The Lagergren pseudo-first order and pseudo-second order rate equation (Kalavathy, 2005) expressed as Eq. (3) and Eq. (4), respectively. Both of them were investigated and described the solute uptake rate in order to determine the efficiency of Fe(II) adsorption onto BC.

The kinetic parameters for the adsorption process were studied on the batch system using different initial Fe(II) concentrations, pH at 5.10±0.1, in the room temperature at 25°C.

The linear form of pseudo-first order was expressed as:

$$\log(q_e - q_t) = \log q_e - \frac{K_1}{2.303} t$$

(3)

Where q_e and q_t are the amounts of Fe(II) adsorbed (mg g⁻¹) at equilibrium and at time t, respectively. K_1 is the Lagergren rate constant (min⁻¹).

The plot of log(q_e-q_t) against t (Figure 10). The K_1 and q_e values were obtained from the slope and intercept of the straight line. These values have been given in Table (2). The experimental data of adsorption kinetics were analyzed by applied the pseudo-second order kinetic model, which is expressed as the linear form:

$$\frac{t}{q_t} = \frac{1}{K_2 q_e^2} + \frac{1}{q_e}$$

(4)

Where K_2 is the pseudo-second order kinetics constant (g mg⁻¹ min⁻¹). The fit of this model was examined by the linear plot of t/q_t against t (Figure 11) and K_2 and q_e values were obtained from the linear have been given in Table (2). The correlation coefficient, first-order rate expression model is not fully valid for present system. The results of K and q_e values were shown in Table (2). As can be seen, the correlation coefficient value (R²) for the pseudo-second order model was above 0.99

4. Table 3 Kinetic parameters for adsorption of Fe(II) onto bamboo charcoal

<table>
<thead>
<tr>
<th>Conc (mg/L)</th>
<th>K_1 min⁻¹</th>
<th>q_exp mgg⁻¹</th>
<th>q_cal mgg⁻¹</th>
<th>R²</th>
<th>K_2 g/mg/min</th>
<th>q_cal mgg⁻¹</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.496</td>
<td>3.443</td>
<td>2.395</td>
<td>0.994</td>
<td>0.621</td>
<td>3.512</td>
<td>0.999</td>
</tr>
<tr>
<td>14</td>
<td>0.386</td>
<td>4.723</td>
<td>3.059</td>
<td>0.992</td>
<td>0.315</td>
<td>4.856</td>
<td>0.999</td>
</tr>
<tr>
<td>20</td>
<td>0.197</td>
<td>5.384</td>
<td>1.565</td>
<td>0.913</td>
<td>0.304</td>
<td>5.503</td>
<td>0.999</td>
</tr>
</tbody>
</table>
of all initial concentration. It is evident that the kinetic data fit better in pseudo-second order kinetics model. Moreover, \( q_e \) value in term of second order is agree better with the experimental data. However, the values of the determination coefficient \( (R^2) \) indicate the applicability of the pseudo second-order model for describing the experimental results to a higher degree of accuracy \( (R^2>0.99) \) for all studied ferrous ion concentrations. Moreover, the experimental data shows that the \( q \) values \( (q_{e,\text{cal}}) \) determined from the pseudo second-order model were closer to the experimental \( q \) values \( (q_{e,\text{exp}}) \) than those determined from the pseudo first-order. In Table (2), it was found that \( K_2 \), the rate constant, declines from 0.621 to 0.304 \( (\text{g/mg/min}) \) when the initial concentration increases from 10 to 20 \( \text{mg/L} \). A larger \( K_2 \) value suggest that adsorption system with low concentrations will required a shorter time to achieve a specific functional uptake (Albadarin et al., 2012; Hameed and El-Khaiary, 2008). The linear form of the pseudo second-order equation showed the relationship between the initial \( \text{Fe(II)} \) concentration and the rate constant indicates that mechanisms such as; ion exchange and physical sorption are involved in the adsorption process. Thus, the overall rate of adsorption is controlled by these mechanisms, or mixture both of them. Hameed and El-Khaiary attributed that there is uncertainty in relation to how the process variables make one model describe an adsorption process more favourably compared to others. Khezami and Capart suggested that process kinetics are affected by the properties of the adsorbent. They also report that the pseudo kinetic models should be considered as empirical equations that do not provide an accurate picture of the chemical and physical processes which are taking place.

4.1. Adsorption isotherm

The theoretical Langmuir, and Dubinin-Radushkevich (D-R) adsorption isotherms were used in the present study to evaluate and estimate the maximal adsorption capacity, characteristic and adsorption process. These models are simple, well established, have physical meaning, and are easily interpretable. For the purpose of this experiment was performed by varying initial ferrous ion concentration from 5 to 20 \( \text{mg/L} \) for \( \text{Fe(II)} \) at 25\(^\circ\)C temperature or 298 K, 0.15 \( \text{g} \) of adsorbent dose and \( \text{pH} \) 5.10±0.1. In addition to this present study, the better fit model was checked by correlation coefficient \( (R^2) \).

**Langmuir isotherm:** The Langmuir isotherm (Langmuir L., 1918) is perhaps the best known of all isotherms, which is often applied in solid/liquid system to describe the saturated monolayer adsorption of homogenous solut-ion (Alagumuthu, 2010). It is used to estimate the maximum metal sorption values at saturation that could not be reached in the experiment. The non-linear form of Langmuir
model is presented as:

$$q_e = \frac{K_{ads}C_e}{1 + K_{ads}C_e}$$  \hspace{1cm} (5)

The linear regression of this isotherm can be written as,

$$\frac{C_e}{q_e} = \frac{1}{K_{ads}Q_0} + \frac{C_e}{Q_0}.$$  \hspace{1cm} (6)

Where $q_e$ and $Q_0$ are the equilibrium and monolayer adsorption capacities of the sorbent (mg/g), respectively, $C_e$ is the residual ferrous concentration at equilibrium (mg L$^{-1}$), and $K_{ads}$ is the adsorption equilibrium constant (L mg$^{-1}$) related to the free energy of adsorption process.

The results obtained from the empirical studies were applied to Langmuir isotherm. The plot of $C_e/q_e$ against $C_e$ was shown in **Figure (12)** and adsorption parameters presented in **Table (3)**.

The linear form of Langmuir equation for ferrous adsorption onto BC is given by the following expression:

$$C_e/q_e = 0.1816C_e + 0.0025, \hspace{0.5cm} R^2 = 0.999$$  \hspace{1cm} (7)

**Dubinin-Raushkevich (D-R) isotherm:** Langmuir isotherms is insufficient to describe the physical and chemical characteristics of adsorption process which based on the calculation of mean free energy of adsorption (Nguyen, 2001). So, the linear form of D-R isotherm is expressed as:

$$\ln(q_e) = \ln(q_s) - (\beta \varepsilon^2)$$  \hspace{1cm} (8)

Where $q_e$ is the ferrous iron amount (mg/g), $q_s$ = theoretical isotherm saturation capacity (mg/g), $\beta$ = Dubinin–Radushkevich isotherm constant (mol$^2$/kJ$^2$), and $\varepsilon$ is the Polayi potential. In which, it can calculate as:

$$\varepsilon = RT \ln(1 + \frac{1}{C_e})$$  \hspace{1cm} (9)

Where R is the gas constant (8.314 J/K mol) and $T$ is the temperature (K). The magnitude energy of adsorption ($E$) is calculated by following equation:

$$E = \frac{1}{\sqrt{-2\beta}}$$  \hspace{1cm} (10)

If the magnitude of mean free energy ($E$) < 8 kJ/mol, indicated that the sorption process is physisorption interaction, while for value of $E$ is more than 8 to 16 kJ/mol, the sorption process is of chemisorption.

The calculated values of $q_s$ and $\beta$ were obtained from the slope and intercept from the plot of $\ln q_e$ against $\varepsilon^2$ (**Figure 13**) and the obtained values showed in **Table 3**. Based on the theory is given that the mean free energy ($E$) is occurred of 8.33 kJ/mol, it is chemi-sorption. Therefore, this present study is followed chemical mechanism.

The investigation of each model on the equilibrium sorption was carried out at 25°C and pH of 5.10±0.1. The other physico-chemical parameters were determined and two adsorption isotherm models were studied.
The sorption data fitted into Langmuir > Dubunin – Radushkevich isotherms, respectively. And isotherm out of which Langmuir adsorption model was found, to be have the highest regression value and hence, the best fit. It could be concluded that activated bamboo charcoal is a potential and large active site sorbent for removal of ferrous ions from its aqueous solution. The related parameters obtained by calculation from the values of slopes and intercepts of the respective linear plots are shown in Table 3.

Table 3 Adsorption isotherm constants for adsorption of Fe(II) onto bamboo charcoal

<table>
<thead>
<tr>
<th>Metal ion</th>
<th>Q₀ (mg/g)</th>
<th>Kads (L/mg)</th>
<th>R_L</th>
<th>R²</th>
<th>E (mol²/J²)</th>
<th>qₑ (mg/g)</th>
<th>(KJ/mol)</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe²⁺</td>
<td>5.506</td>
<td>0.0726</td>
<td>0.447</td>
<td>0.999</td>
<td>0.0072</td>
<td>5.91</td>
<td>8.33</td>
<td>0.890</td>
</tr>
</tbody>
</table>

The essential features of the dimensionless separation factor (R_L) is defined as:

\[ R_L = \frac{1}{1 + K_{ads}C_0} \quad (11) \]

Where: \( C_0 \) = initial concentration (mg/L), R_L value indicates the adsorption nature to be either unfavourable. The adsorption process is favourable if 0<R_L<1 and unfavourable if R_L>1. Beside Kads > 0 indicate the favourable adsorption process. The calculated value of Kads and R_L have been given in Table 3, respectively. As Kads > 0 and 0<R_L<1, it suggests that the process is favourable.

4. Conclusion

The results of the experimental data showed that the sorption of Fe(II) ions onto bamboo charcoal was fast and the equilibrium was reached after 20 minutes. pH solution is very important factor in controlling the system of ferrous removal. It was found that increasing of pH over 5 may cause precipitation rather than adsorption. The removal of Fe(II) increases as the dose of bamboo charcoal increases, due to increase in the number of active sites. The experimental data could better fit the Langmuir isotherm. Furthermore, the adsorption kinetics of Fe(II) follow the pseudo-second order rate, which implied that the adsorption mechanism depended on the adsorbate and adsorbent and may be the overall rate of adsorption is controlled by ionic exchange and physical sorption, which involved the functional group and intermolecule forces of interaction.
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Cultivating Collaborative Innovation in Educational Services

Branks Visnjic and Geoff Parkes*

*Aston University, Birmingham, United Kingdom

1. Introduction

Recent innovations in educational services focus on curriculum redesign and enabling graduates to function in economies which are increasingly less self-sufficient and more intertwined (Clifford, 2013). In other words, rethinking higher education has become crucial in the context of internationalization of education and ensuring that graduates succeed as global citizens (Leask, 2015). According to the British Council (2016) the key signs of HE internationalisation are international student mobility, mobility of academic programmes, academics, institutions and increasing importance and value of international research collaborations. Therefore, there is a need for appreciating other HE systems’ priorities, and searching for support for greater engagement and multidirectional collaboration (British Council, 2016).

The purpose of this paper is to discuss the case study of changing strategies of Centre for English Language and Communication at Aston (CELCA), in the context of internationalization. It will focus on a model for educational service enhancement through diversification and student engagement in curriculum design (Quality Assurance Agency, 2012) in collaboration with Aston Business School and international partnerships in China.

CELCA is often seen as a small service centre, as it is not an academic unit, although it is part of the School of Languages and Social Sciences (LSS). Due to the Centre’s main roles as well as its budget nature, it not only offers English language support to international students and lecturers, but also delivers its own programmes and courses to fee paying students, which means it has the award-giving power. Consequently, it has to attract international students as part of its sustainable development strategy.

In order to meet its current targets and compete with bigger and more established universities worldwide, in particular the ones in the USA, UK and Australia, CELCA staff members need to innovate and collaborate multidirectionally within the university and with its current partners. This paper will discuss its latest developments in the International Year Abroad Programme (IYA) supported by Aston Business School in particular. His innovative engagement aims to create opportunities for collaborative work with ABS and international partners through programme diversification, research in student engagement and participation in curriculum design and development. It has also sparked collaboration with other services, such as Disability Support Services, so as to enhance learning and teaching practices through inclusion and differentiation models (QAA, 2012).

In other words, in order to establish its unique position within the University, as an academic-related centre with a relatively independent budget, CELCA needs to address the issue of sustainable relations with its international partners.
2. Background

The impetus for redesigning the IYA curriculum originated from its partner universities in China that requested access to several Aston Business School modules through this programme, which currently awards students with a Certificate of Higher Education. The aim was to design a more challenging programme so as to accommodate the needs of both average and very talented international students and support them in accomplishing multiple, individually-tailored academic goals. Therefore, there was an opportunity for a social innovation, which can be assessed against the following criteria:

- quality of the solutions to the identified educational issues (in this case more talented students’ needs),
- quality of new capabilities and developed relationships (new level of partners’ involvement in the curriculum design),
- better use of assets and resources (ABS and CELCA getting more students on the existing modules),
- new or improved services (richer services to international students), processes (sustainable process of recruitment, delivery and quality enhancement), and
- the model of ensuring social cohesion (In this case, more talented partner university students get a more challenging programme, even though they have the same core module - IELTS tailored to suit individual students’ needs).

According to the EU Europe 2020 Strategy - Horizon 2020, social innovation is one of six key themes for HE development. The main research opportunities identified in relation to social innovation are in managing diversity, overcoming health inequalities, supporting rural areas and societies, financial sector and private sector (European Commission, 2016). This also encompasses one of the key UN values: “Strive to deliver a fairer and more inclusive society” (The United Nations, 2009). Thus, the key question we as service providers need to ask ourselves is how we can develop ourselves, our clients and other interested parties, and how we can do it well.

As far as CELCA is concerned, the partners’ idea about greater inclusion and enhanced provision for more talented students was not developed enough due to different internal and external challenges which created constraints for collaboration and led to somewhat unbalanced relationships. The falling student numbers in 2014 clearly showed that a change was needed urgently. Although communication started even earlier, it was affected by the external economic and political factors, such as the UK Boarder Agency’s stricter requirements for international students’ visas in general. Furthermore, the UK was not seen as the first choice for international students because of the soaring fees and other costs. Nevertheless, it became more obvious that the IYA programme itself, being seen as a language and culture development route to postgraduate studies, did not meet all the needs of more talented students requiring a more specific path for their academic development. Therefore, a more comprehensive approach was adopted and negotiations with ABS were reinitiated. According to the model of ‘frugal innovation’ (Radjou and Prabhu, 2015), both the front and the back ends of innovation must progress in the same direction in coordination, like a convoy, if their aim is to prosper and avoid breaking apart

Compared to other similar centres, CELCA has not yet undergone any major structural changes and is still investigating its best position within the university. Academic language and communication
services at other UK universities mainly fall into three categories: A) International Academies within the universities; B) partnerships with external contractors; C) small English for academic purposes and communication centres.

**International Academies**

Some university English for academic purposes and communication centres have grown into academies, following the major university structural changes, such as The Birmingham International Academy (BIA), which provides the University's Foundation Pathways, Pre-sessional English programmes for students preparing to study at the University, Pre-Doctoral programmes, and Pre-Masters programmes, in addition to English support for students who are already at the University. The Wolverhampton University International Academy is another example of similar development. It has different preparing-for-study strands (English Pre-sessional programme, EFL courses, short and summer courses as well as pre-masters courses, pre-research course / Graduate and Professional English Language Skills Course and International Foundation Year), training courses for practicing English teachers, International Business Communication as well as modern and community languages. In these cases the centres have diversified their services and possibly merged with some other centres (e.g. modern and community languages) in order to cut the administrative costs and offer the same services to different types of international students at the same time, cutting the cost by recycling the materials and offering more blended learning opportunities as well. This is a cost effective movement that happened across the university at the same time. It is very likely that Aston University will aspire for the same model, following the establishment of individual School International Foundation programmes. At the moment, it is clear that CELCA is contributing to the existing curriculum, but it does not own the programmes. In addition, it is just one of its services and without the green light for the growth in permanent staff numbers, it does not have capacity to take too many different modules and programmes.

**Partnerships with external contractors**

On the other hand, some universities use external services, such as INTO (International Transformation), an international educational organisation which develops long-lasting partnerships with HE institutions worldwide to support their students and help the universities achieve their internationalisation ambitions. INTO University of East Anglia was the first partnership which started in 2006 in Brighton and opened the UK’s first dedicated, on-campus living and learning centre for international students in 2008. This partnership model provides not only services but “investment and access to resources beyond the scope and capacity of individual universities” (INTO, 2016). Kaplan International Colleges (KIC) (2016) works in partnership with leading universities to prepare international students for studying a bachelor’s, master’s or doctorate degree in the UK. Their preparation courses equip students with the academic skills, key subject knowledge and English language ability needed to progress to university. They are delivered on campus, but also online. In the first case they are taught at specialised international colleges, run in partnership with the following universities: University of York, University of Aberdeen, University of Brighton, Nottingham Trent University, UWE Bristol, University of Glasgow, University of Liverpool, Bournemouth University, University of Westminster; the University of Nottingham. It is obvious that these universities have taken a different approach to Aston University, where Aston Schools are developing their independent International Foundation Programmes which pay for CELCA teaching services, but also have free individual English language tutorials and school-specific academic language workshops.

**Language and communication centres**
These centres most often exist within smaller universities, such as Aston University, or Worcester University. They may combine modern languages, English for International students, IELTS preparation courses, CELTA (Certificate in English Language Teaching and Assessment), English for academic purposes, general English classes, Teaching English as a Foreign Language courses and similar. Such centres boast of friendlier atmosphere and closer tutor-student relationships, due to the student numbers and a dedicated and easily recognizable teaching and learning areas, which may not be the case on larger campuses. Although that may be the case, the increasing concentration of students and lecturers in larger universities presents both opportunities and challenges. On the one hand, cooperation with other departments is more feasible and students’ adaptation to academic life is more natural due to exposure to more opportunities, such as optional free lectures, various activities and services. There are also more opportunities for work and volunteering. Similarly, Geoffrey West’s power laws compare big cities to small towns and find that despite all the distraction caused by crowds and noises, the average resident of a metropolis can be up to three times more creative than the average people living in a small town. Large number of opportunities and exposure to information in big cities makes its residents much more innovative (Johnson, 2010).

We live in an age of accelerated lives where new patterns emerge every day and the intervals between them keep shortening, which makes us experience new products and service patterns, but also become increasingly more willing to embrace them. The wave frequencies are ever-increasing and although at the beginning it may take longer to adopt certain new habits, products or services, people become more trained surfers and in case of students start to demand or search for the latest trends. Johnson (2010) calls this 10/10 rule, a decade to build a new platform and a decade for it to find a mass audience. For small centres, the audience is already available, with the university’s raising capacity the need for a change is just around the corner. CELCA’s innovative engagement aims to create opportunities for collaborative work with ABS and international partners through: a) programme diversification, b) research in student engagement and c) participation in curriculum design and development. It has also sparked collaboration with other services, such as Disability Support Services, so as to enhance learning and teaching practices through inclusion and differentiation models.

In other words, in order to establish its unique position within the University, as an academic-related centre with an independent budget, CELCA needs to address the issue of sustainable relations with its international partners.

Foreign Universities’ Provision

Regarding the foreign universities, out of the four main English-speaking higher education markets (Canada, United States, Australia and the United Kingdom), post-study immigration is accessible in Canada and Australia at the moment. Therefore, an increasing number of students in these two countries in 2016 is likely due to the fact that education has become a gateway to post-study living, as students know they can look for work there after the completion of the studies (Graney, 2016; British Council, 2016). Although Canada and Australia have very strong academic reputation, as well as open, multicultural societies, the above mentioned opportunities irresistibly attract international students.

3. Literature Review

According to Llopis (2017) the majority of innovative solutions have been results of networking as innovation does not depend on leadership, but can originate from employees who analyse the services offered and know the needs of the company’s customers and partners. Competition analysis and the
insight into the latest trends in the industry, including brands and the use of technology are therefore crucial. Nevertheless, innovation most often comes from multiple internal and external sources, because individual experts cannot come up with the same ideas as groups of people with different experiences and visions, which means that sharing existing and creating new opportunities is necessary.

In CELCA’s case, the external sources were partner universities, whereas the internal sources were the Centre’s staff and Aston Business School leadership. It was interesting to see that reiteration of the partners’ ideas in waves through time made some impact on the partnership development - Elliot’s Wave Principle (Prtechter and Frost, 2005). Learning from the previous experiences and listening to the partners clearly expressed needs have rekindled the discussion on the IYA students’ access to ABS undergraduate modules and improved the communication channels. Consequently, the new ideas evolved out of continuous negotiation. However, although idea creation does not depend on leadership, innovative ideas still have to be fully supported by leaders; the ideas need to be followed through, and leadership and management need to control the raising financial issues, such as sources and profitability. This means that leaders do need to encourage innovation through collaborative work of teams with different points of view (top-bottom approach). Also, researchers and employees need to be in communication with the leadership to ensure a bottom-up approach as well.

In the latest IYA development strategy, sustainable growth relies on diversification, remodeling for the best fit, addressing the performance gaps and details that potentially create tension, taking ownership and initiating communication that seeks for new opportunities, avoiding complacency and making informed decisions. This coincides to a great degree with the ABS undergraduate and postgraduate programmes strategies, which has allowed initiation of quality enhancement through collaborative work. Nevertheless, this implies further work on understanding the partner universities’ goals and potential students’ aspirations, as well as developing true collaboration with them. Some joint research, projects and publications, exchange of staff members, student engagement in curriculum design and service diversification are the basis to maintain constructive negotiations to establish the best fit.

4. Alliances

Successful cooperative international alliances provide evidence that there are benefits in developing a wider range of solutions in particular to technical problems. Innovative capability through cross-border alliances thus may be one of the most important means for firms to enhance inter-firm partnering in the new age of alliance capitalism (Carlsson, 2006). Nevertheless, depending on the range of collaborations, developing alliances may also have negative effects (Parida et al, 2012) as partnerships outside the value chain can lead to high costs and situations with ‘free-riding’ unknown partners (Bessant, Kaplinsky, and Lamming 2003).

In harsh reality numerous partnerships have failed despite their good intentions (Faems, VanLooy, and Debackere, 2005; Sadowski and Duysters, 2008). Some of the reasons are differences in understanding the concepts, opposite interests, irreconcilable differences in time management of resource allocation (Mahnke and Overby, 2008), work ethics, complex risk management in uncertain conditions (Park and Ungson, 2001). Therefore, alliances are not the ideal model of collaboration, as their outcome in the globalised context is not always certain (Pittaway, Robertson, Munir, Denyer, and Neely, 2004), although

using inflows and outflows of knowledge is likely to encourage open internal innovation and expand
the markets for external use of innovation (Chesbrough et al., 2006).

5. Cooperation

The benefits of focused, and consistently result-orientated cooperation (Lu and Beamish, 2001) are among others lower costs, shared market and risk, as well as a broader access to resources (Gulati, Nohria, and Zaheer, 2000). Access to the partner’s resources such as capital, equipment, ‘network resources’ (Gulati, 1998), or other knowledge are the main benefits of alliances, which are necessitated through the need to use the shared sources more frequently. Nevertheless, finding reliable and stable partners is not easy and it is even more challenging to maintain and develop partnerships.

6. Born to operate globally

In the context of globalized organizations (Rialp et al., 2005; Knight & Cavusgil, 2004), innovation is seen as a stimulus to the internationalization processes (Dana, 2004), as it encourages more extensive international strategies. Researchers have considered the value of innovation within an international context (Lesage et al, 2012); according to the behavioural theory of the firm (Cyert and March, 1963; Aharoni, 1966) and Penrose's (1959) theory of the growth of the firm, companies gradually increase their international involvement developing understanding of foreign markets and increasing their activities and resources to such markets. Lack of market knowledge and market resources is a constraining factor at the beginning (Forsgren and Johanson, 1992), but the sequential approach process of internationalization with incremental learning (Keupp & Gassmann, 2009) in the context of available partnerships and resources (Johanson & Vahlne, 2007) is the continuation of the process. Once a company operates in several countries, it does not respond to the unknown, but uses resources on the basis of the real market conditions.

7. Networks

Love et al. (2014) indicated that for entering and succeeding in international markets managers need to develop specific managerial skills on which a company’s capability and motivation to internationalise depend. In the first stage of export-import activities, experience in management and commerce is important, but in the processes of internationalisation more Commercial and managerial experience, for example, may assist but as internationalization becomes more refined managerial education will contribute to better outcomes (Ganotakis and Love 2012). The more extensive networks will increase the likelihood of obtaining knowledge databases and technology developed outside the company (Leiponen and Helfat, 2010). Innovation partnerships (Roper et al. 2014) may also allow organisations to access technology developed elsewhere (Niosi, 1999). Moreover, having more extensive networks of partners is likely to increase the probability of obtaining useful knowledge from outside of the firm (Roper et al. 2008). In addition, partnerships may reduce the risks related to any innovation and lead to lower costs due to sharing (Roper and Xia, 2014). According to Veugelers and Cassiman (1999), innovation is increasingly associated with networks of collaboration and information exchange at relational and structural levels.

Nevertheless, Freeman (1995) insists that despite innovative activities within the context of internationalisation, innovation at the national and regional levels are crucial as they provide the necessary initial networks of relationships. For instance, the national education system, technical and
academic institutions, policies brought by local governments, national institutions and various local traditions and standards are essential for innovation as they contribute to the uniqueness of the socially constructed systems adopted by organisations through time. In reality, it is very likely that despite cooperation the particular local character of innovation systems will remain unaffected (Carlosson, 2006).

8. Resource Constraints

Resource constraints and resource commitment have been identified as key characteristics of small organisations, in particular during the periods of environmental insecurity (Erramilli and D’Souza, 1993). Using knowledge and technological advancement obtained from external sources through cooperation (Durst & Edvardsson, 2012), is key for organisations’ competitiveness in particular when they have fewer resources. Therefore, it is crucial for them to adopt explorative behaviour, for instance through explorative case studies. They are based on the interviews and aim to explore features of consumer behaviour and business planning related to a particular area of interest. Such companies often lack managerial approaches which contributes to the limited growth. According to Zucchella and Siano (2014) their best solutions are international networking and innovation. Coviello and Munro (1997) claim that it is essential for them to get a deeper insight into the relationship between innovation and international collaboration, which may enable organisations to enhancement of the management strategies and increase the international growth. Also it is beneficial for smaller organisations to participate in marketing and research alliances depending on the sets of tangible and intangible unique resources and capabilities they possess.

9. Social Network Theory

Social network theory is the study of how different forms of participation within networks may lead to different outcomes (Sullivan and Ford, 2013). It highlights the importance of the business person’s contacts in getting access to information and resources in order to assist the successful development of an organization. It is closely related to organization competitiveness and it encourages information sharing, resource exchange, and knowledge transfer (Florin et al. 2003; Hite 2005), which all lead to better financial outcomes. Stam et al. (2014) argue that social capital is essential to success and that personality traits need to be given more attention as they are the key factors in social capital. According to Granovetter (1973) “strength of ties” predict the effectiveness of networking. These factors describe the intensity and diversity of relationships. For instance, acquaintances have weak ties and are less socially involved than friends with strong ties. As for the density, a network with numerous weak ties is a low-density network as it lacks many relational lines. However, weaker ties may open opportunities to access information from a broader perspective, whereas closed and localized relationships are fragmented and less coherent, limiting the resources outside the narrow network and resulting in slow diffusion of innovation and new initiatives (Granovetter 1973).

Therefore, bridging weak ties and enrichment of resources can be achieved through connecting different individuals and groups who can provide balanced skills. This competence in balancing weak and strong ties is one of the key characteristics of successful business people. It is worth mentioning that it is not crucial to have all the necessary skills or the resources in order to seize an opportunity (Garnsey 1998) and at the beginning new entrants to markets often rely on close friends’ favours. However, in the later stage of networking they aim to shift towards weak ties (Brüderl and Preisendorfer, 1998), and further down the line, they form ties with seemingly disconnected people and selflessly support others in exploiting business opportunities (Blau, 1977). It has been identified
(Shane et al. 2003) that a business person’s social capital and networking have a direct relationship with sourcing and access to information, unattainable resources and funding.

10. Methodology

This paper applies exploratory research methods, which is a useful investigation into a situation aiming to provide more insights to the researcher, in particular where a small amount of information exists. It used various methods such as, semi-structured interviews with students, university leaders and academics, as well as administrative staff, group discussions, mini trial studies so as to gain more information (Business Dictionary, 2016). The research has also applied the Grounded Theory approach (Glaser & Strauss, 2012), to generate a solution model through own data observation and action research in the ‘community of practice’ (Lave & Wenger, 2002). It demonstrates how the International Year Abroad Programme is being developed in collaboration with Aston Business School and partner universities in China. A grounded theory approach is based on the seminal work of Glaser and Strauss (1967), which focused on systematic data collection and analysis rather than on proving an existing theory. Therefore, it is an inductive approach. Furthermore, this study is even more closely aligned to the so-called Conceptual Model which is not establishing hypotheses or relationships, but identifying a starting point and defining the area of future study. This iterative process generates concepts instead of establishing new theories. (Bryman 2008).

Data collection and analysis used in this qualitative research began with an intention to analyse the area of interest through previous records and reports about the IYA Programme, partner universities and students ideas which still remained only on paper due to different reasons. A hypothesis was generated based on the patterns that emerged and revisited in interviews and group discussions with the latest cohort of the IYA students, visiting researchers and academics and leadership during the business visits to partner universities in China in 2016. The data collected showed a clear pattern to be followed. In this inductive approach the results collected from different sources were compared and one of the key principles of grounded theory was applied: building change through a flexible, yet repetitive process which guides the researcher towards exploring the possible avenues to gaining a comprehensive understanding of the situation (Corbin and Strauss, 1990). The analysis is based on constant comparisons of data and feedback from different respondents in order to identify key similarities and differences, which will be used in modelling the bespoke solutions so as to satisfy the customers’ needs and provide the most appropriate service.

It is important to mention that the research did not use the customers only to provide the information, but the study aimed to actively engage the customers (partner universities and international students) at the front end of the innovative solution in order to increase their loyalty and reduce the product cycle times and waste. In other words, it aimed to improve the depth and breadth of customer engagement as conclusions and decisions made at this stage can make a considerable impact on the cost and speed of developing and marketing new services.

Another important characteristic of the research approach was to examine the different stages of progress and prioritize the regular patterns, taking into account variations which assist in establishing new avenues for investigation. These avenues have eventually led to the programme diversification. Therefore, the solutions and concepts were generated and revisited during the research process until they proved to be acceptable as a result of continuous consultations with the partner universities’ leadership and students. These also opened up opportunities to examine the broader social and organisational contexts (for instance, comparison of student engagement in decision making related to
11. Results

Diversification of the IYA Programme

This section will provide the information about the new services that emerged as a result of the research and active involvement of the partner universities’ leaders and academics as external collaborative party and Aston Business School as an internal partner to the Centre for English Language and Communication at Aston. Out of the original IYA Programme, the following modified and new programmes and courses have evolved: IYA Engage, IYA Challenger, IYA Explorer and IYA Bridge. There is another modified programme in view which will seek to support students from rural regions whose IELTS level is overall 5.0 (with maximum one skill 4.5) and for which the researcher aims to secure a grant from a developing state’s government.

‘IYA CHALLENGER’

This is a more challenging and engaging programme than the original IYA. The entry requirement for it is IELTS 6.5 or equivalent, with the minimum 6.0 in each assessed language skill. In each Teaching Period (TP) students will have only 1 core module delivered by CELCA and it will be Academic English (10 credits) in TP1, and Intercultural Communication Skills in TP2 (10 credits)

Teaching Period 1
A – One Core module (10 credits)
B - 20 credits (one 20-credit module which continues in TP2, or two 10-credit modules which will have been completed by the end of TP1).
C – 30 credits (ABS: three 10-credit modules, or one 20-credit module and one 10 credit module)

Teaching Period 2
A – One Core module (10 credits)
B - 20 credits (one 20-credit module which continues in TP2, or two 10-credit modules which will have been completed by the end of TP1).
C- 30 credits (ABS: three 10-credit modules from ABS, such as Entrepreneurship, or LSS: TESOL and Translation studies modules).
At the end of the Programme successful students will receive a Certificate in HE that will allow them a direct entry to the ABS Master’s programmes.
<table>
<thead>
<tr>
<th></th>
<th>CELCA</th>
<th>ELECTIVE ABS only</th>
<th>ELECTIVE LSS only</th>
<th>TOTAL CREDITS per TP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IYA (Entry IELTS 5.5)</strong></td>
<td>4 core modules (40 credits)</td>
<td>Up to 2 elective modules (20 credits)</td>
<td>0 modules (Special 2 modules on top of IYA on request)</td>
<td>Up to 2 elective modules (20 credits)</td>
</tr>
<tr>
<td><strong>IYA Challenger Entry IELTS 6.5</strong></td>
<td>1 core module (10 credits)</td>
<td>Up to 2 elective modules (total 20 credits)</td>
<td>Up to 3 elective modules (total 30 credits)</td>
<td>Up to 3 elective modules (total 30 credits)</td>
</tr>
</tbody>
</table>

Summary: IYA
Entry requirement: IELTS 5.5
4 core CELCA modules
2 elective CELCA or LSS modules
0 elective ABS
Optional 2 ABS modules for students with IELTS 6.5

Summary: IYA Challenger
Entry requirement: IELTS 6.5
1 core CELCA module
2 elective CELCA modules
3 elective ABS only or TESOL & Translation only modules

*IYA ENGAGE*

Figure 2

IYA Engage is a combination of the IYA Programme and two, bonus ABS modules for which successful students get special ABS Module Awards. These modules are only for students with IELTS 6.5 (minimum 6.0 in any assessed language skill). In case students find these bonus modules too
challenging, they can withdraw with no consequences. The IYA programme must be followed at all times and students taking the free bonus ABS modules will be closely monitored and supported by CELCA.

‘IYA EXPLORER’

IYA Explorer is a module designed for students who consider joining Aston University or any other university in the UK and would like to experience both general and academic life in the UK for 4 weeks.

The programme comprises two credit-bearing modules: Academic IELTS (10 credits) and Life in the UK (10 credits). The programme is run in coordination with ABS Summer Programmes and Pre-sessional academic programmes, so that students have access to them as part of Life in the UK module, in particular related to the topics about education, business and politics.

IYA Explorer - Timetable sample (Week 1)

<table>
<thead>
<tr>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00-12:00</td>
<td>LIFE IN THE UK</td>
<td>10:00-12:00</td>
<td>10:00-12:00</td>
<td>LIFE IN THE UK</td>
</tr>
<tr>
<td>ACADEMIC IELTS</td>
<td>VISIT TO A COMPANY</td>
<td>ACADEMIC IELTS</td>
<td>ACADEMIC IELTS</td>
<td>ALL DAY TRIP TO OXFORD/CAMBRIDGE, BATH, Warwick or Shakespeare’s Stratford Upon Avon</td>
</tr>
<tr>
<td></td>
<td>(Land Rover; Cadbury);</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>City Library and City</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Council/ Mayor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BREAK</td>
<td>BREAK</td>
<td>BREAK</td>
<td>BREAK</td>
<td></td>
</tr>
<tr>
<td>1:30-3:30</td>
<td>LIFE in the UK</td>
<td>1:30-3:30</td>
<td>1:30-3:30</td>
<td></td>
</tr>
<tr>
<td>LIFE in the UK</td>
<td>GUIDED GROUP PROJECT</td>
<td>ACADEMIC IELTS</td>
<td>ACADEMIC IELTS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>related to the visit</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Conclusion

This study proved that collaboration is one of the keys to innovative practices. Implementation of its solutions brought clear measurable value: greater value for customers, shareholders and indirectly to the society; fewer and cheaper resources due to sharing of capital, time and technology. It also proved that a business needs to operate in harmony with the system that gives it life in the first place, and cannot stand on its side-lines.

As far as CELCA and ABS are concerned, the newly developed programmes and courses have multiple benefits: they are flexible, income-generating, cost effective, credit bearing and have potential to increase the number of module users and bolt on to additional experiences. They raise the Schools’ profiles and increase inter-School collaboration. To successful students some of them offer direct entry onto ABS Master’s programmes and more varied learning opportunities. They have potential to further
the collaboration with the partner universities, particularly in research, staff exchanges and development of double degree programmes.

It is essential for organisations to identify their intellectual capital (knowledge with potential value, such as innovative ideas related to services, products, processes and customers), and skillfully manage its transition into intellectual assets (knowledge that provides value).

Reference


* Branka Visnjic *E-mail Address*; visnjicb@aston.ac.uk

Geoff Parkes *E-mail Address*; g.g.parkes@aston.ac.uk
Declining Crude Oil Prices and Some Economic Activities of Lao

Visansack Khamphengvong, Professor Enjun Xia, Houmlack Mingboubpha

Beijing Institute of Technology
Economic Division, Department of General Research, Office of Party Central Committee (KM 6), Lao PDR

Abstract

Based on the dynamic simulation approach, the economic activities of the Lao PDR seem to be least affected from the low crude oil prices in the recent years. Among the key economic activities, the investment and export are more advantageous from the crude oil price volatility. However, the household consumption, import, and GDP are minimally reflected from the low crude oil prices. Expectedly, the oil demand for domestic consumption rises by 6.83 percent if the world crude oil prices decline by 30 percent. All in all, the Lao PDR would rather rely on the period of declining crude oil prices to push quicker development and standardize the local production with a view to increase the export potentials and stay competitive in the foreign market.

Keywords: Declining Crude Oil Prices; Economic Activities; Lao PDR; Stimulation

2. Introduction

It is inevitable that every country must consume the oil in order to perform the daily economic activities; as a matter of fact, oil plays a significant role to spearhead the economic development in both developing countries and developed countries (Xiong and Wu, 2008). Given such milestone necessity, the Lao People’s Democratic Republic (Lao PDR), is postulated as one country that does not only rely heavily on the oil import but also its disadvantage of the local unavailability of oil resources. As data collected and devoted for this study, the import of oil covers around 30-50 percent of total import costs which imply that the Lao PDR needs to import the oil from the foreign countries by no choices for satisfying the local demand of oil consumption during the low or high crude oil prices in the world market. Since the less developed country status of the Lao PDR necessitates the huge construction investment embodied in the huge proportion of oil import; this fact is correspondent with the assumption of Eryigit (2009) that both urbanization and modernization related to the economy either in the short run or long run reflect the oil demand. In other words, changes in oil prices tend to have a significant effect on the economic growth as well as well being of the population in the country. For the global level, the oil prices are even more considerable because the oil market itself is really universal (Ogundipe et al 2014). This study aims intentionally to investigate the effects of the low world crude oil prices on some macroeconomic activities of the Lao PDR and another minor aim is to draw some facts of policy making on behalf of the sole oil importer of the Lao PDR since the crude oil is postulated as the commodity with huge strategic importance to all countries in the world (Morard and Balu, 2014).
3. Prior Literature

The initial motive of this study begins from the Rasche and Tatom (1981), Hamilton (1983), and Burbidge and Harrison (1984); indeed, they found the significant and negative impact of oil prices on the output in case of the United States of America. Similarly, some studies related to the Non-US economies reveal the negative correlation between the oil prices and economic growth, including Cavalcanti and Jalles (2013), Ju et al. (2014), Negi (2015), Okoro (2014), Morard and Balu (2014), Sultan and Wagas (2014), Gonzalez and Nabiye (2009), Kilian (2008), and Ito (2010).

In addition to the studies coming up with the negative relationship above, some studies also prove the positive relationship between the oil prices and other components of the economy such as Ono (2011), Shafi et al. (2015), Fahani (2012), Bgbame et al. (2015), Ibrahim et al. (2014), Dirzka (2015), Aanye (2012), Husain et al. (2015), and Sebestyen (2014).

On the one hand of a few unclear studies, they are the studies conducted by Aziz and Dahalan (2015), Eksi et al. (2011), Suleiman (2013), Yoshino and Hesary (2014), and Gencer and Demiralay (2013).

Conceptual Framework and Empirical Modelling

Due to a series of long lasting and abundance of studies related to the impacts of the oil prices on the macroeconomic growth, they are likely to ignore the study of individual country that could be severely rocked by such oil prices. On the other hand, most studies in the literature applied the VAR models and panel data that could be favourable and helpful for the regional policy contribution. Therefore, this study is regarded as the individually focused study of the Lao PDR, the landlocked country, sole importer of all of oil products from the overseas markets. The most significant cornerstone of this study is to apply the dynamic simulation approach by which this approach has not been taken into account. Because of the dynamic simulation approach, each behavioural equation refers to the OLS equation which gives purer and realistic findings unlike the VAR or VECM.

The following equations are the behavioural equations and they are brought to the dynamic simulations based on their pure and more realistic results:

3.1. Oil demand for domestic consumption depends on the crude oil prices, and the real economic growth; in fact, the functional form of the oil demand equation is shown below:

$$\frac{\text{Log}(\text{Oil})}{\text{PGDP}} = f(\text{world crude oil prices}, \frac{\text{NGDP}}{\text{PGDP}})$$

$$\frac{\text{Log}(\text{Oil})}{\text{PGDP}} = f(\text{world crude oil prices}, \frac{\text{NGDP}}{\text{PGDP}})$$

**Note:** PGDP refers to the GDP deflator with 2010 base year

3.2. Household consumption is mainly determined by the real income.

$$\frac{\text{Log}(\text{C})}{\text{PGDP}} = f(\frac{\text{NGDP}}{\text{PGDP}})$$

$$\frac{\text{Log}(\text{C})}{\text{PGDP}} = f(\frac{\text{NGDP}}{\text{PGDP}})$$
3.3. The Gross Domestic Product (GDP) is fundamentally dependent on the government expenditure, household consumption, Investment, export over import.

\[
\frac{\log(NGDP)}{PGDP} = f\left(\frac{E}{PGDP}, \frac{C}{PGDP}, \frac{I}{PGDP}, \frac{Export}{Import}\right)
\]

3.4. Investment is dependent on two factors such as real interest rate and real GDP.

\[
\log\left(\frac{I}{PGDP}\right) = f(\text{Real Interest rate}, \frac{NGDP}{PGDP})
\]

3.5. Export in this study is solely determined by the world export price.

\[
\log(Export) = f(WPX)
\]

Note: WPX denotes the world export prices

3.6. Import is herein determined by both GDP and import prices.

\[
\log(Import) = f(GDP, WPM)
\]

Log(Import) = f(GDP, WPM)

Note: WPM refers to world import price

4. Empirical Results and Related Discussion

4.1. Results from Behavioural Equations

4.1.1. Gross Domestic Product (GDP)
As results from the equation of the gross domestic product shown below, the most independent variables hold the satisfactory significant levels and expected signs. To determine the economic growth, the government expenditure plays the most important role to shed the light on it. That is, if the government expenditure increases by 1 percent, it causes the GDP to rise by 0.94 percent compared with other investment and trade balance which affect the GDP to increase by 0.22 percent and 0.36 percent respectively. However, this result reveals that the household consumption may not be a factor that positively and significantly affects the gross domestic product. In other words, some realities related to the small population size and actual monthly pay among the government or even the private company employees seem to be the rationales to clarify this negative and insignificance coefficient of the household consumption variable.

Table 1: Regressed Result for Gross Domestic Product Equation

<table>
<thead>
<tr>
<th>No.</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>T-Statistics</th>
<th>Adjusted R²</th>
<th>Durbin Watson Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Log(NGDP/PGDP)</td>
<td>Log(E/PGDP)</td>
<td>+0.9388</td>
<td>5.1515***</td>
<td>0.99</td>
<td>1.03</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Log(I/PGDP)</td>
<td>+0.2165</td>
<td>8.8845***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Log(C/PGDP)</td>
<td>-0.1811</td>
<td>0.8216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Log(X/M)/PGDP</td>
<td>+0.3620</td>
<td>10.2695***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Constant</td>
<td>-0.0002</td>
<td>0.6043</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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4.1.2. Household Consumption

Resulting from the findings from this equation, the economic growth has become more the significant determinant that reflects the household consumption with other factors hold. In overall, when the economic growth or the gross domestic product increases by 1 percent, 0.75 percent leads to the increase of the household consumption. At the same expected result herein, the real GDP variable is statistically significant at 1 percent level. All in all, this study focuses solely on the effect of the economic growth towards the changes of household consumption nationwide.

Table 2: Regressed Result for Household Consumption Equation

<table>
<thead>
<tr>
<th>No.</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>T-Statistics</th>
<th>Adjusted R²</th>
<th>Durbin Watson Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Log(C/PGDP)</td>
<td>Log(NGDP/PGDP)</td>
<td>+0.7566</td>
<td>516.20***</td>
<td>0.99</td>
<td>1.32</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Constant</td>
<td>-0.00111</td>
<td>2.05*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ Estimation

4.1.3. Investment

Both real interest rate and gross domestic product (GDP) are taken into account to explain the investment phenomenon of the Lao People’s Democratic Republic (Lao PDR). The key findings illustrate the expected signs and significant levels for both independent variables. By comparing both independent coefficients, the impact of the economic factor or real GDP is more vital to explain the bilateral relationship with the investment. For example, if the GDP increases by 1 percent, the investment is pushed up by 0.92 percent. While the real interest rate rises by 1 percent, the investment moves upwards by 0.003 percent which is visually regarded as the minimal impact.

Table 3: Investment Equation

<table>
<thead>
<tr>
<th>No.</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>T-Statistics</th>
<th>Adjusted R²</th>
<th>Durbin Watson Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Log(I/PGDP)</td>
<td>Log(INTEREST*CPIW/CPI)</td>
<td>+0.0038</td>
<td>2.40*</td>
<td>0.99</td>
<td>1.60</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Log(NGDP/PGDP)</td>
<td>+0.9175</td>
<td>150.76***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Constant</td>
<td>+0.00031</td>
<td>1.0007</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *** denotes significant level at 1% and * represents significant level at 10%

Source: Authors’ Estimation

4.1.4. Export

The equation of export herein contains the highly significant coefficient of export price. In the principle, a few independent variables were included in this equation; unfortunately, the results were neither respectable nor significant to shed the light on the reality of export of the Lao PDR such as the
world income and exchange rates. The results from this equation estimation shown below, when the world export prices rise by 1 percent, the exports of the Lao PDR could rise by 2.05 percent. By glancing at the constant value from the equation, it's empirically interesting that if other factors hold, the exports of the Lao PDR tend to move upwards by almost 21 percent. This result can be inferred that other factors may include the bilateral or unilateral cooperation agreements between the Lao PDR and other foreign countries or counterparts. In short, the exports of the Lao PDR are empirically dependent on the world export prices and other favourable factors.

Table 4: Export Equation

<table>
<thead>
<tr>
<th>No.</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>T-Statistics</th>
<th>Adjusted R²</th>
<th>Durbin Watson Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Log(Export)</td>
<td>Log (WPX)</td>
<td>+2.05</td>
<td>13.19***</td>
<td>0.93</td>
<td>1.65</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Constant</td>
<td>+20.59</td>
<td>29.17***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Authors’ Estimation

4.1.5. Import

Since the Lao PDR was liberalized in 1975, more imports than exports have been very accustomed and habitual in the economic activities of the Lao PDR. The findings below hint that if the economic growth accelerates by 1 percent, the imports increase by 1.60 percent. Indeed, both domestic income and imports are firmly correlated in terms of significant level at 1 percent and size of coefficient. For the impact of the import prices, it is significant at 1 percent and could pose the rise of imports by 0.72 percent. On the other hand, if case the GDP and import prices hold, the imports may be significantly declining by 29.44 percent.† To conclude both domestic income and import prices positively and statistically push the imports.

Table 5: Import Equation

<table>
<thead>
<tr>
<th>No.</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>T-Statistics</th>
<th>Adjusted R²</th>
<th>Durbin Watson Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Log(Import)</td>
<td>Log (GDP)</td>
<td>+1.60</td>
<td>9.44***</td>
<td>0.96</td>
<td>1.66</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Log(WPM*RXRATE)</td>
<td>0.72</td>
<td>2.84**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>C</td>
<td>-29.44</td>
<td>-3.43***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** *** denotes significant level at 1% and * represents significant level at 10%

**Source:** Authors’ Estimation

4.1.6. Oil Demand for Domestic Consumption

This equation of the oil demand for domestic consumption appears to be the most significant pinpoint of the study. The findings show that among three explainable variables, only the domestic income is table to demonstrate its bilateral relationship with the oil demand. According the findings, if the domestic income rises by 1 percent, the oil demand rises by 0.78 percent and this relationship is attested by 1 percent of significant level. However, the world oil prices have negative correlation with

[† According to the trade policy of the Lao government, it is essential to keep the positive trade balance and encourage the exports in order to gain the foreign currencies and streamline the SMEs]
the oil demand and insignificant to prove such correlation. In fact, the oil demand for domestic consumption of the Lao PDR is more affected by the domestic income rather than the impacts from the world oil prices.

Table 6: Oil Demand Equation

<table>
<thead>
<tr>
<th>No.</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>T-Statistics</th>
<th>Adjusted R²</th>
<th>Durbin-Watson Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Log(Oil Demand)</td>
<td>Log(GDP)/PGDP</td>
<td>+10.78</td>
<td>38.42***</td>
<td>0.99</td>
<td>1.06</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Log(World Oil Prices)</td>
<td>-0.0010</td>
<td>-0.159</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>C</td>
<td>+0.009</td>
<td>+0.09</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *** denotes significant level at 1% and * represents significant level at 10%
Source: Authors' Estimation

2. Results from the Dynamic Simulation and Empirical Discussion

The simulation provides the satisfactory results. Based on the assumption of 30 percent of world oil price decline, the oil demand for domestic consumption rises by 6.83 percent; investment by 0.90 percent; household consumption by 0.05 percent; import by 0.23 percent; and export by 0.50 percent. Nevertheless, the decline of world oil prices negatively affects the GDP at -0.03 percent.

Table 7 Stimulation of the Low Crude Oil Prices at 30 Percent on Some Economic Activities of the Lao PDR

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP (%)</th>
<th>Oil Demand (%)</th>
<th>Investment (%)</th>
<th>Export (%)</th>
<th>Import (%)</th>
<th>Household Consumption (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>1.71</td>
<td>1.11</td>
<td>4.08</td>
<td>- 3.17</td>
<td>3.30</td>
<td>0.34</td>
</tr>
<tr>
<td>2004</td>
<td>2.48</td>
<td>21.05</td>
<td>- 9.78</td>
<td>3.08</td>
<td>- 6.66</td>
<td>- 4.33</td>
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Source: Author’s Estimation, for more details, see appendix 1 on pages 14, 15, 16

4.3. Model Testing for Policy Reliability

The summary of modelling testing results showed below in the table 8. The MAPE, RMSE, and MSE provide respectably similar results of the tests for each individual endogenous variable. For the equations of the Gross Domestic Product (GDP), and Household Consumption (C), their MAPE,
RMSE, and MSE are less than 5 percent which show that the results of these equations are more reliable in respect of practical policy implication. For equations of investment (I), import (I), and export (E), they are to some extent satisfactory enough at below 10 percent of MAPE,\(^3\) RMSE,\(^8\) and MSE.\(^7\) And for the equation of the oil demand, only the RMSE test is respectable than those of MAPE and MSE. In overall, this simulation model is reliable and practically appropriate contributing to the policy making process.

Table 8: Testing Reliability of the Model Structure

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<td>Household Consumption</td>
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<td>Import</td>
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<td>2.97%</td>
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<td>6</td>
<td>Export</td>
<td>6.89%</td>
<td>5.71%</td>
<td>1.14%</td>
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Source: Authors’ Calculation

4.4. Discussion of Empirical Results

Fundamentally, the model testing tends to be very much reliable and realistic in providing informative guidelines to policy making process as a whole. As a matter of fact, the findings from the dynamic simulation may be resulted in a few empirical discussions. For the first discussion related to the impacts of the low oil prices on the gross domestic product (GDP), the Lao PDR does not gain lots of benefits or advantages since the average simulated value of the GDP series has become -0.03 percent\(^{††}\) resulted from the world oil prices drop by 30 percent (this negative relationship between the crude oil prices and economic output is similar to the findings in the case of US economy by Rasche and Tatrom (1981; Hamilton (1983; Burbidge and Harrison (1984).\(^‡‡\) On the other hand, the GDP of the Lao PDR is to some extent less boosted by the low world oil prices recently due to the fact that the economic output represented by the GDP is naturally dependent on the government expenditures (in short the government budget) unlike the household consumption, investment of private sector, or even exports. In addition to the government budget, the Small and Medium Sized Enterprises (SMEs), who are the key indicators (account for 2/3 of business firms nationwide), sustaining the national economic growth play a little role comparing with the neighbouring countries such as Thailand and Vietnam. The little impacts from the low oil prices on the economic growth can be seen from imports are still greater than exports over the recent years.\(^§§\) For imports and exports, both are obviously and with

\(^3\) Mean Average Percentage Error  
\(^8\) Root Mean Square Percentage Error  
\(^7\) Mean Square Error  
\(^††\) Comparing with -0.46 percent found by Ito (2010) showing the negative of impact oil prices on the Russian economic growth  
\(^‡‡\) For the studies engaging in the Non-US economies, they were done by Cavalcanti and Jalles (2013; Ju et al (2014); Negi (2015) and Aziz and Dahalan (2015)  
\(^§§\) As of July 2016 the imports were 29,844,224 USD and exports were 17,482,667 USD (these are monthly figures of imports and exports

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different impact sizes reflected by the volatility of oil prices. Indeed, due to the drop of world oil prices at 30 percent, the export is pushed by 0.50 percent while the import is boosted by only 0.23 percent. Due to the low oil prices, it is very much favourable to accelerate the exports. Another finding that domestically stimulates the economic growth is the investment (domestic and foreign investment). By comparing the impacts of low oil prices on the investment, imports, exports, household consumption and GDP, the investment tends to be advantageously affected by the low oil prices at 0.90 percent as the oil prices acting as the major determinant of production costs and it affects the profitability of the firms (Huang et al, 1996). This impact is regarded as the vital impact enough and a positive impact although in the reality the investment had better be dynamically boosted and brought about the benefits to the investment activities in terms of low cost for private firms and in particular the business operators in the Lao PDR. And the last significant finding, the low oil prices are likely to be pushing the oil demand for domestic consumption at even 6.83 percent resulted from 30 percent of world oil price decline which is the huge impact found in this study. In fact, this finding is consistent with the characteristics of the Lao PDR; for example, the Lao PDR itself has no natural oil resources. As a result, the Lao PDR has historically and inevitably relied on the imports of gas and oil for its domestic consumption. In summary, the low world oil prices give the minimal impacts of the economic activities of the Lao PDR.

5. Conclusion and Policy Implication

5.1. Conclusion

As the main objective of this study is to draw the impacts of low world oil prices on the economic activities of the Lao PDR, the results or findings from this study, in particular, the low oil prices provoke the different impacts of the economic activities of the Lao PDR under the dynamic simulation of 30 percent of declining world oil prices. As a matter of fact, exports, imports, household consumption, and investment are minimally increasing by less than 1 percent. For the oil demand for domestic consumption, it augments by 6.83 percent. Nonetheless, the GDP is declining by 0.03 percent. To make sure that this model is respectable, the Mean Average Percentage Error (MAPE), Root Mean Square Error (RMSE), and Mean Square Error (MSE) were applied to test the reliability of the model. As expected, almost all behavioural equations play the significant role and have respectable values of the MAPE, RMSE and MSE. In other words, the equations of the GDP and household consumption have MAPE, RMSE, and MSE less than 5 percent. For import and export, and investment have been less than 10 percent. Unfortunately, for the oil demand equation, both MAPE and MSE are least reliable, but most respectable for RMSE less than 5 percent. In short, the impacts of world low oil prices on the economic activities of the Lao PDR seem to be tiny.

5.2. Policy Implication

After findings from the dynamic simulation completed, there are a few lesson learnt for the policy implication. The first and foremost implication is that the government of the Lao PDR as well as the local business enterprises would rather avail of this opportunity of low world oil prices to cut the costs and improve the business circumstances so as to make profit and expand the business operation.

based on the MOIC report of July 2016]
Finally, the exports are supported and play an important role to gain more foreign currencies and trade balance which has never disappeared from the trade activities of the Lao PDR. This implication is similar to the investment which covers both domestic investment and foreign investment; in other words, the investment might be more favourable amidst the low world oil prices because apart from the factor of low world oil prices, other factors should be taken into account also to stimulate the economic activities of the Lao PDR such as favourable government policy, affordable labour wages, abundance of hydropower, and high demand for development projects. And second implication is related to the regional level integration. The lower world oil prices mean the preferences of the Lao PDR to compete with other foreign competitors in order to stay firm and sustainable. Eventually, the Lao PDR should strengthen itself sensitively earlier. In fact, there are no other opportunities to win unless the long years of low world oil prices.

References


### Appendix 1: Dynamic Simulation

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**Average** 0.65


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- 0.25
Digitizing traditional Lao textile to modern weave technique

L. Chidtavong¹, M. J. Winckler², H.G. Bock³, M. Ellwanger-Mohr⁴

¹Computer Science Department, Faculty of Natural Science, National University of Laos (NUOL), Laos
²,³Interdisciplinary Center for Scientific Computing (IWR), Heidelberg University, Germany
⁴Faculty of Textile and Clothing Technology, University of Applied Sciences, Germany

Abstract

Traditional Lao textiles are wealth in religious motifs, the motifs and patterns on the textiles reflect traditions, beliefs and livelihood of people. The creativity in playing with motifs and patterns represents valuable cultural heritage on clothes that seriously needs to be preserved and protected before it is depleted. The structure of Lao motifs and patterns are complicated, but weaving processes still use traditional techniques and simple floor-loom. Therefore, it takes a lot of time for making a weave-draft on the loom and percentage of losing weave-drafts is very high. In contrast, industrial textiles use electronic loom and digital weave-drafts to produce fabrics, which are suitable for fast production but lack complicated traditional patterns.

As a result, in this paper we introduce scientific approaches for digitizing motifs, patterns and weave-drafts of traditional Lao textiles. Mathematical principles of Frieze and Wallpaper groups are investigated for digital design. We present two standard files, image file format and WIF file as digital weave-draft in order to fill the gap between traditional and modern weave techniques. The standard files are understandable and usable for both hand-weavers and weaving machines. Our study show that a modern electronic TC2 loom is a suitable loom to connect between traditional Lao weave technique and modern weave technique.

Keywords: Frieze group; Wallpaper group; Lao textile; WIF file and TC2 loom

1. Introduction

Laos consists of a variety of ethnic groups that are rich in traditions and cultures. Traditional Lao textiles are a women-craft heritage on clothes which are rich in religious motifs. The structure of textiles and their elements are a method to express the characteristics of the textile and the difficulties on weaving processes. In Laos, hand weaving textile is a tradition for self-sufficiency and it provides a small income for women who have little education or who live in rural areas. There are some textile manufactures in the capital and urban areas, but textile production still uses human labour and most employed weavers are from rural areas. In fact, Lao weavers are skilful at weaving and natural dyeing, but their weaving processes are old tradition, which contains many technical limitations when compare to modern weave techniques.

The first limitation is that the weavers have no design software and electronic tools for their support; a wooden floor loom is only their main tool. A main weave technique is called “Tam Chok” represented a supplementary weft weave where a master pattern and a weave-draft are set up on the loom by using a traditional method, tying supplementary heddles on the loom. The riskiest way of this weaving tradition is highly to lose weave-drafts. Another problem arises in this traditional technique; if the weaver wants to set up a new weave-draft there are only two options. The first option is to remove the old draft from the heddles, and then set up a new draft, by this way the weaver can weave a new pattern without waiting until the weaving reaches the end part of the warp threads. The second option is to use another set of heddles, if the weaver intends to reuse this current weave-draft, but the weaver
In textile industry however, electronic looms are necessary tools for industrial textiles, especially in developed countries. Weaving processes are controlled by electronic equipment; patterns and weave-drafts are digital files, which can directly be read by electronic looms. Our study found that digital weave-drafts are a key to connect traditional Lao weaving techniques and modern weaving technologies; this connection is a first step to introducing a new technical tool to a society of hand weaving textile in Laos, it will help to improve the weaving process of local weavers. Therefore, we investigated scientific methods for generating digital motifs and patterns of Lao textile by using symmetric structure of Frieze and Wallpaper groups. We also presented two standards weave file which represent digital weave-draft which are image and WIF files. To accomplish this study we conducted three field trips from the North to the South of Laos for collecting sample of ethnic textiles and using them as a reference for pattern analysis and generation that will be explained below.

2. Pattern Analysis and Generation

To analyze stripe and two directional patterns on Lao textiles we apply the geometric principles of seven symmetry groups in Frieze group and twelve of seventeen symmetry groups in wallpaper group [4] [9]. The notation for each group, we use international notation from crystallographic groups (IUC: International Union of Crystallography) [1]. Moreover, symmetry groups of Frieze group we use names that are given by John Conway. In general Frieze and wallpaper patterns are generated by a combination of four basics symmetry operations namely: translation, rotation, reflection and glide reflection. Frieze patterns are generated by repetitive translation a motif in one direction while wallpaper patterns are generated by repetitive translation a motif in two directions. Therefore, we explore symmetry group on the textiles by study symmetric structures of the patterns, then we construct diagrams that is based on the symmetric structures of each group, so the constructed diagrams are used as guidelines for checking patterns’ structure and classifying their belonging symmetry group.

2.1 Frieze Pattern Analysis and Generation

The diagram for checking frieze groups illustrates in figure 1, it helps to check a combination of symmetry operations among the groups. Actually, the seven symmetry groups of Frieze group can be applied for woven pattern, but the pattern style on traditional Lao textiles is related to tradition and religious beliefs of local people. Thus, there is some symmetry groups of Frieze groups did not find on the Lao textiles. The analysis result of Frieze patterns on traditional Lao textiles illustrated that six of seven Frieze groups found on the textile’s samples, they are \textit{Spinning Jump (p2mm)}, \textit{Jump (p11m)}, \textit{Sidle (p1m1)}, \textit{Hop (p1)}, \textit{Spinning Hop (p2)} and \textit{Spinning Sidle (p2mg)}.
Wallpaper Pattern Analysis and Generation

Due to restrictions of weave structure, a woven motif cannot contain rotation in 60 and 120 degrees. This means that the woven pattern cannot contain rotation order of 3-fold and 6-fold. Therefore, five symmetry groups of wallpaper group cannot be applied, there are only twelve possible symmetry groups can be applied for woven pattern decoration. This limitation illustrated by V. Milasius [6]. Since the combination of symmetry operations in the wallpaper group is more complicated than in the Frieze group, so we separate symmetric structures of the wallpaper group into three categories based on number of rotation order that contained in the groups, and then we constructed three related diagrams. The first diagram is for 1-fold rotation order where there are totally 4 symmetry groups in this case, they are cm, pm, pg and p1. The diagram is illustrated in figure 2.
The second diagram is for 2-fold rotation order that includes 5 symmetry groups in the diagram, such as \textit{pmm}, \textit{cmm}, \textit{pmg}, \textit{pgg}, and \textit{p2}. Figure 3 illustrates the diagram.

![Figure 3](image)

**Figure 3.** A diagram for wallpaper pattern classification when the maximum order of the rotations equals to two

The last diagram is for 4-fold rotation order that consists of only three symmetry groups, namely, \textit{p4}, \textit{p4m} and \textit{p4g}. It is presented in figure 4. Because the most traditional motifs are quite big and some of them are symmetric, the wallpaper group cannot apply to them. As a result, the most found symmetry groups of wallpaper patterns on the samples were applied to small and medium motifs. Unfortunately, we found only four of twelve symmetry groups on the samples namely \textit{pmm}, \textit{cmm}, \textit{pm} and \textit{p1}.

![Figure 4](image)

**Figure 4.** A diagram for wallpaper pattern classification when the maximum order of the rotations equals to four

The analysis helps us to find out common symmetry groups on traditional Lao textiles, it helps to understand characteristics and design styles of Lao textiles. The result will be data to support developing design technique, the implementation of symmetry operations, the symmetry groups of the Frieze and Wallpaper groups see [2] and [3]. Moreover, the symmetry groups of the Frieze and Wallpaper groups introduce more design styles to the Lao weavers for generating a variety of patterns.

3. Digital Representation of Lao Textile

Generally, a structure of woven textile is created by interlacement of two sets of threads: set of vertical threads called warps and another set of horizontal threads called wefts, regard to this characteristic we represent the information on weaving structure by a binary matrix. Weaving values assign to matrix’s elements we modified from [6]. Our study focuses on traditional Lao textile which is form a pattern by weft-faced patterning. Thus, we defines the values of matrix’s elements to be true (or number 1) if the interlacement is warp threads under weft threads, the values are false (or number 0) if the interlacement is warp threads over weft threads. Simultaneously, we represent a graphical feature of the weaving structure by a group of binarization squares, the squares interpret as intersection points
between warps and wefts while the color of squares depends on the interlacement, if warp threads over weft threads then the color is warp’s color, and otherwise the color is weft’s color. Moreover, the woven textile has a restriction on rows and columns, every single row and every single column must contain at least one intersection point, this means each row and each column of a binary matrix must have at least one true element. To represent a woven textile in mathematics we define:

\[ M_{mxn} \quad \text{is a binary matrix of a woven textile, } m \text{ is number of rows and } n \text{ is number of columns.} \]
\[ m_{ij} \quad \text{is a matrix element, } i \text{ is a row index and } j \text{ is a column index.} \]

The values of matrix’s elements are:

\[ m_{i,j} = \begin{cases} 0 & \text{if color of square } (i,j) \text{ is warp’s color} \\ 1 & \text{if color of square } (i,j) \text{ is weft’s color} \end{cases} \quad \text{(eq. 1)} \]

Additional investigated method for pattern generation is based on the advantage of the similarity between thread loom and Lao floor-loom. We apply weave components on thread loom to construct a pattern-draft for Lao floor-loom, the four components of the thread loom consists are: threading, tie-up, treadling and pattern. This method give benefit to both weaving on thread loom and weaving on Lao floor-loom, it facilitates to design a pattern and to modify a pattern as well. Therefore, we use binary matrices to define threading, tie-up, treadling and pattern where the pattern matrix is a result from multiplication of other three binary matrices. The related study of this method can find in [10]. The mathematical notations and mathematics equation of the method are illustrated as below:

\[ P_{pwx} = T_{nxf} * I_{nxmT} * H_{mxp} \quad \text{(eq. 2)} \]

\[ P_{pwx} \quad \text{denotes a Pattern matrix, with } p \text{ warp thread and } f \text{ floating supplementary weft} \]
\[ T_{nxf} \quad \text{denotes a Treadling matrix, } n \text{ indicates number of threadle and } f \text{ indicates number of floating supplementary weft} \]
\[ I_{nxm} \quad \text{denotes a tie-up matrix, } m \text{ indicates number of shaft and } n \text{ indicates number of treadle} \]
\[ I_{nxmT} \quad \text{denotes a transpose matrix of tie-up matrix} \]
\[ H_{mxp} \quad \text{denotes a Threading matrix, } m \text{ indicates number of shaft and } p \text{ indicates number of warp thread} \]

Due to our binary matrices represent components of weave structure, so each row and each column of each matrix must contain at least one true value. On threading matrix, number of column means number of warp on the loom, so in each column must contain only one true value that means only one warp tied to one shaft. On treadling matrix, in each row contains only one true value, this means that there is only one treadle pressed or only one wooden line picked in each weaving step. For the tie-up matrix, its true values in each column interpret the tying point of shafts to each threadle. An example of pattern generation by this method illustrated in figure 5, a. is graphical feature of the Tie-up matrix, b. is a graphical feature of Treadling matrix while c. and d. are graphical features of Threading and Pattern matrices respectively. The black square on tie-up, Threading and Treadling matrices indicate true value while a white square indicates false value while the color on the pattern matrix depends on warp’s color and weft’s color. The mathematical equations (eq. 1) and (eq. 2) are implemented for generating two standards weave files that will be explained as follow.

3.1. Standard Weave File for Digital Weave-draft

As mentioned in the beginning, this paper will present two standard weave files for representing digital weave-draft, namely: image file and WIF file. Our digital weave-drafts are intended to
understandable for hand-weavers and electronic looms. The WIF file developed based on weave structure of Dobby hand floor-loom [5] and it is created by implementing equation (eq. 2) and we follow WIF specification defined in [8] as well. Due to a pattern is generated by multiplication of three binary matrices, Tie-up, Threading and Treadling matrices, so instead of directly storing binary data of a pattern, WIF stores information of these three binary matrices. According to WIF specification, WIF file consists of a set of sections and key names, the section names are in brackets such as, [Weaving], [WARP] and [WEFT] sections. The key names are followed by an equal sign and the data, such as: shafts=16 and treadles=16. The sections are defined as “INFORMATIONAL” and “DATA” sections. For example, [WIF] and [CONTENTS] sections are informational section, where the [CONTENTS] section is a special informational section that lists all other included sections. Dimension and binary data of Tie-up, Threading and Treadling matrices are stored in specific data sections, such as number of shafts and number of treadles can be found in [WEAVING] section, number of warp threads is stored in [WARP] section, and number of weft threads is stored in [WEFT] section. Binary data for Tie-up matrix is listed in [TIEUP] section, number on the left equal sign indicate column’s index while a sequence number on the right equal sign is a list of row’s indexes on that column; [THREADING] section is listed binary data for Threading matrix, number on the left equal sign indicate column’s index while a number on the right equal sign is row’s index; and [TREADLING] section is listed binary data of Treadling matrix, number on the left equal sign indicate row’s index while a number on the right equal sign is column’s index. Instead of storing all binary data of matrices, WIF file is stored only row’s index or column’s index that has true value where the row’s index or column’s index on the right equal sign indicates row or column of matrix that has true value. By reading data in these sections from a given WIF file and work together with equation (eq. 2), we are able to generate a pattern matrix. For more detail on WIF structure see [8].

The image file is a binary image that contains only two colors, file extension can be .jpg, .tiff, .bmp, etc. One color indicates warp thread and another color indicates weft thread. A binary image of woven pattern actually is a pattern matrix in equation (eq. 2).
4. Weaving Lao Style on TC2 Loom

Due to weaving machines works with digital drafts, so the digital weave-drafts in both formats, image and WIF files are input for weaving on electronic looms. The electronic looms actually are able to weave many kinds of fabrics, the complex on the weave structures depends on their given digital weave-drafts. Generally the electronic looms read only binary data on the given drafts and the drafts are read row by row in order to make interlacement between warps and wefts. Therefore, to weave textiles like traditional Lao style on the electronic looms is not a big deal if we know their weaving techniques and use the suitable looms. As a result, we use a modern TC2 loom for testing our digital weave-drafts. The TC2 loom is a hand operated loom which allows a weavers to have complete control over warp threads, it provide weave technique like weaving on Lao floor-loom. Our digital weave-drafts are generated based on characteristics of Lao textiles and two considering points of Lao weaving technique. The first point is that traditional Lao weaving technique is always used two weave structures, a ground-weave and a pattern-weave. It means, we need a weave-draft to tell a machine to weave this combination structure. The second is that the most Lao textiles are colorful fabrics which are used more than one weft for pattern-weave, so weavers have to define how many wefts are intended to use during weaving. Figure 6 shows a digital weave-draft of Siho motif with size 660x557, figure 7 shows weaving result of the given weave-draft.

Figure 6. A digital weave-draft of the Siho motif (size: 660x557)  
Figure 7. Weaving result of the weave-draft of Siho motif on TC2 loom

loom. The results show a variety of colorful motifs a hand operated loom, it provides various possibilities to decorate fabric; this property satisfies the characteristics of Lao textiles. The experiment focuses on weaving style of traditional Lao textile which consists of pattern-weave and ground-weave (plain weave). Therefore, a hand-pick decoration is used to weave a complicated pattern. The decoration is up to imagination of the designer. The produced fabrics look the same like fabrics that are woven on Lao floor-loom. Therefore, the results express a connection between traditional style of Lao textiles and modern weave technology. They fulfill the gap between traditional weave technique of Lao weavers and modern weave technique. For more details on weave result see [3].

5. Conclusion

In this paper we present scientific methods for digitizing motifs, patterns and weave-drafts for traditional Lao textiles. We introduce 7 symmetry groups of Frieze group and 12 symmetry groups of the Wallpaper group for analyzing sample of ethnic patterns and for generating woven pattern in design task. Our study found that digital weave-draft is a key to connect between traditional weave
techniques to modern weave techniques. Therefore, the mathematical equation for two standard weave files are explained, the files are used as digital weave-draft for electronic loom. We test our digital weave-drafts with a modern TC2 loom, the results show a connection between traditional style of Lao textiles and modern weave technology.

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*L. Chidtavong E-mail Address; lathsamy.chidtavong@iwr.uni-heidelberg.de mon1606@yahoo.com
*M. J. Winckler, H. G. Bock E-mail Address; michael.winckler@iwr.uni-heidelberg.de scicom@iwr.uni-heidelberg.de
*M. Ellwanger-Mohr E-mail Address; marion.ellwanger@hs-niederrhein.de
Does Chinese FDI has Spillover Effect on Local Firms?
The Case Study of Laos

Phouphet Kyophilavong, Somchith Souksavath, Bounlert Vanhnala, Piya Wongpit, Alay Phonvisay, Phanhpakit Onphanhdala

Faculty of Economics and Business Management, National University of Laos, POBOX7322, NUoL, Vientiane, Laos

Abstract

Chinese firm has been increased in Laos. Chinese firm has a positive and negative impact on Laos especially in a local firm. One of the most important issue is that whether a Chinese firm has positive spillover effects on the local firm. This is an important element in order to gain benefits from Chinese firm for long term development in Laos. Therefore, the main objective of this study is to investigate the spillover effects of Chinese firm on Lao firm. In order to respond to this objective, we conducted Lao firm survey in 9 provinces. We found out that the impact of horizontal linkages and vertical linkages on local firm is small. Therefore, the improvement of the spillover effect of Chinese firm to local is crucial in order to maximizing the benefits of Chinese FDI for long term development in Laos.

Keywords: Spillover effects; Chinese firm; Lao firm

1. Introduction

The impact of FDI on host country development especially in less developed countries (LDCs) has been debated among policy makers, international development actors and global governance organizations (Aitken et al, 1999; Gorg and Greenaway, 2002; Sinani and Meyer, 2004; Renáta Kosová, 2010). Some argue that FDI promotes economic growth through complementing domestic savings, transfer of technology, increasing competition, reducing prices and stimulating entrepreneurship. However, some researchers oppose this positive view and suggest that FDI crowds out local firms, hampers inclusiveness, and uses inappropriate technology, amongst other things. The expected technology spillovers have not been always the case. Moreover, FDI operations in LDCs often have inadequate safety standards, pollute the host countries and create sweatshop conditions. Thus, there is a need to call for better targeted policies and regulations to ensure that FDI does more good than harm.

In the last 20 years, the opening up of countries in the Laos has attracted substantial inflow of FDI from both the East Asia region as well as the West. Owing also to the favorable geographical conditions and the economic integration of ASEAN, Lao PDR have received increasingly high levels of FDI from China, Korea, Japan, Thailand and even from Vietnam whose market is considered oversaturated for FDI. It has been also due to the policy to embrace of FDI by the respective governments of Lao PDR. The Government of Lao PDR (GoL) has sought to attract FDI since 1988 and just recently completed the third set of revisions to the FDI law in 2009. The law is intended to provide more incentives to FDI in terms of exemption of limitations on importing raw materials, exemption from export duties, tax holidays, and the provision of long-term land concessions (Kyophilavong, 2009).
While the proposed study seeks to examine the whole FDI industry, it will inevitably entail a special interest to review the Chinese FDI due to its unusual aspects. Having increased most dramatically in the past few years, investment from China generally involves production of low-tech, labor-intensive and land-intensive products, which directly and indirectly affects the local labor, natural resources and local enterprises depending on the same factor and/or product markets. Efforts will be made to explore the policies in China on its FDI into the Laos. It is important to know what drives investment from China into the Laos or GMS.

Chinese FDI in Lao PDR is mainly in natural resources sectors such as mining and hydropower (Kyophilavong, 2009). In addition, small and medium Chinese investors are highly active in the country, especially in the north of Lao PDR. It is these characteristics that aroused the policymakers’ and researchers’ special interest to examine the impacts of FDI on local labor markets, local enterprise development, local people’s welfare and inclusiveness.

There has been a number of studies on Chinese FDI in Asia, Africa, and the GMS (Kaplinsky and Morris, 2009; Giovannetti, and Sanfilippo, 2009; Buckley, Tan, Xin, and Voss, 2008; Sinani, Meyer, 2004). However, the impacts of Chinese FDI are inconclusive in literatures, let alone in the real world like Lao PDR and Cambodia. Overall, the impact of Chinese FDI tends to depend highly on characteristics of the economy and characteristics of Chinese FDI in the host countries. In fact, there is still a lack of systematic framework of theoretical and empirical research and analysis on the impact of Chinese FDI on host countries.

In the case of Lao PDR and Cambodia, both countries are facing the challenge of managing, promoting and maximizing FDI benefits in order to enhance local economic development, especially through positive linkages between FDI and local enterprises. The main obstacles seem to be the lack of deliberate regulations and policy frameworks, poor enforcement of regulations if any due partly to low capacity of institutions. Indeed, good quality investors and good management of FDI could have positive impacts on host country economies in the long term but massive capital inflows from FDI might have negative impacts on the Lao PDR economy in the long run, especially in the resource sectors (Kyophilavong, 2012). In this regard, promoting the complementary linkages between FDI and local enterprises is critically important for Lao PDR. FDI could bring benefits to Lao enterprises through various routes including technology transfer and networking. On the contrary, if left unchecked, local enterprises could be seriously affected and could be outcompeted completely by FDI. Thus, the revealed and potential impacts of FDI on Lao small and medium enterprises have to be well understood and managed.

However, there is currently a significant knowledge gap in understanding such impacts of FDI on local enterprises in Lao PDR. Kyophilavong (2009) reviewed the situation of FDI and mining investment in Laos, while Kyophilavong and Toyoda (2012) investigated the impact of the mining industry on the Lao economy. Studies on enterprise development in Laos were found by (Kyophilavong, 2008; Kyophilavong, 2010) and Freeman (2001) analyzed the rise and fall of FDI in Laos from 1988-2000. However, there are currently no studies of the linkages between FDI and local enterprise development and performance in Laos. The main objective of this study is to investigate the spillovers effects from Chinese firms to Lao firm.

As there have been no studies on this issue before, the findings of this study will be very important for policymakers in order to formulate effective FDI policy, to mitigate negative impacts and to maximize positive impacts of FDI. In addition, comparing experiences from Cambodia and Laos will be interesting and useful for policymakers because of the different sectors and possibly different sets of
policy objectives in each country. There could be useful lessons to learn from each other. It will be also important to understand some of the common features, and how these features might reflect more broadly on economic development in the GMS region.

2. Literature reviews

The spillover effect of FDI could divide into two channels (horizontal spillovers and vertical spillover) as follows:

(1) **Horizontal spillovers**

Horizontal spillovers of FDI could occur when FDI increases the productivity of the local firm in the same industry. The horizontal spillovers of FDI could occur through various challenges (Teece, 1977). First channel is the demonstration effect. Local firm could learn from FDI by observing and imitating the foreign firms. Second channel is labor turnover. Workers which employed and trained from the foreign firm may join domestic firms or create their own firm. The third channel is competition effect. Foreign firms could force local firms to improve their production techniques and management. In addition, competition could hurt local firm’s output and run out of business, which called crowding-out effect. Moreover, the entry of foreign firm could increase labor cost for all firms in the labor market (Aitken et al., 1996). In theory, the net horizontal effect of FDI on local firm is inconclusive. It depends on the positive technical spillovers and negative crowding-out effect.

There are various studies on horizontal spillovers of FDI to local firms in many countries. For instance, Caves (1974) for Australia, Globerman (1979) for Canada, and Blomstrom and Persson (1983) for Mexico. Most of the first generation studies find a positive correlation between FDI and industry productivity. In addition, studies on developed countries often find evidence of positive spillovers. For instance, Castellani and Zanfei (2002) for Italy, Keller and Yeaple (2003) for the United States, and Görg and Strobl (2003) for Ireland, and Haskel, Pereira, and Slaughter (2007) for the United Kingdom. On the opposite, some studies found out that negative impact from horizontal spillovers of FDI to local firms. For instance, Aitken and Harrison (1999) find net negative benefits to domestic firms thought the crowding-out effect. Other studies that find negative spillovers included Haddad and Harrison (1993) for Morocco, Djankov and Hoekman (2000) for the Czech Republic, Konings (2001) for Bulgaria, Romania, and Poland, and Javorcik (2004) for Lithuania. It shows that there are negative spillovers of foreign firms to local firm in developing countries. From the literature review, the horizontal spillovers of FDI to local firm were inconclusive. It depends on characteristics of countries-specifics. In addition, there are few studies in developing countries in Asia.

(2) **Vertical spillover**

Blomstrom and Kokko (1998) point out that local firms could improve their productivity as a result of forward or backward linkages with foreign firms. Backward spillovers of FDI refer to the technology transfer through supply chains from foreign firms to domestic suppliers. In addition, forward spillovers occur when domestic firms gain access to new or less costly intermediate inputs as a result of the foreign investment in upstream industries.

If foreign firms have voluntarily or involuntarily help increase the productivity of local suppliers through backward linkages, it might increase vertical spillovers from foreign firm to local firm. In the opposite, if foreign firms prevented the leakage of their firm-specific knowledge to local firms in the same industry, there is no scope for intra-industry technology spillovers. The technology transfer from
foreign firm to local suppliers can take place in several ways Lall (1980). First, foreign firm might help prospective suppliers set up production capacities. Second, foreign firm provides technical assistance to raise the quality of suppliers' products and to facilitate innovations. Third, foreign firm provides training and help in management and organization (UNCTAD, 2001).

There are a number of studies on the technical transfer through vertical supply chains. For example, MacDuffe and Helper (1997) for U.S. parts suppliers from entry of Japanese car makers. Driffield et. al (2002) investigated vertical spillovers with industry-level data from the UK. Blalock (2002) investigated the vertical spillovers in Indonesian firms. Javorcik (2004) investigated vertical spillovers in Lithuanian industries, and found out positive FDI spillovers through backward linkages. Gorodnicjenko et al (2007) investigated horizontal and vertical FDI spillovers in 17 former Eastern European countries. They find positive, backward spillovers but they found that horizontal spillovers are mostly insignificant. In addition, they also find that lack of absorptive capability of local firms tends to prevent the spillovers. Girma et al (2007) finds that both horizontal and vertical spillovers depend on export orientation of foreign invested firms in the UK. From the literature, it shows that the vertical spillovers (backward spillovers and forward spillovers) is inconclusive and it depends on country-specific in term of developing countries and developed countries, absorptive capacity of local firm and characteristics of foreign firms.

There are number of studies in firms in Laos (Kyophilavong, 2008; Kyophilavong, 2010; Kyophilavong, 2011; Kyophilavong et al, 2014; GIZ, 2014). According to our best knowledge, there is no study on the spillover from foreign firm in Laos and there is no study on spillover effects from Chinese firm in developing countries in the firm level.

3. Firm survey and methods

In order to assess the spillover effect of Chinese firms on the local firm, we conducted Lao firm survey in 9 provinces. Our survey focused on production sector: (1) Manufacturing; (2) Agriculture; (3) Handicraft and other sectors. The sample did not choose natural resources exploitation and hydropower and sample did not choose the services sector (trade, whole sellers and others) because we think that it is quite difficult to capture spillover effects from these sectors. The questionnaire focuses on the impact of spillover effects of Chinese FDI on local firms in terms of (1) Horizontal linkages (2) Vertical linkages.

Training was conducted for interviewers by team members on sampling issues, how to select the firms, and how each question was meant and should be asked. Pilot survey had been conducted in 10-15 firms ensure quality of the questionnaire and understanding of reviewers. The survey strategies were as follows: (1) The survey was face-to-face interviewing of firms in the selected sample. (2) The interviewees were mostly preferably CEOs, owner, managers. (3) Each survey team had lecturers as supervision. (4) The survey team (students) must go to conduct survey together. (5) The interviewers handed in the completed questionnaire to their designated supervisor. The recall will be done when deemed necessary to rectify the problems identified by the researchers and team leader.

The sample selection strategies were as follows. (1) Collection the lists of survey in provincial office, tax department, and business registration department. (2) Selected the production firms such as manufacturing, agricultures, handicraft, and others. (3) Selected the firm which had a phone number and then tried to stratify the firms by sectors. (4) Called the firms for appointment of the survey. In order to have cooperation with the firms, we prepared the letter from our university, Industrial and Commerce Division in the Provinces. In addition, we also provided gifts for respondent of the firms.
The questionnaires were distributed to more than 500 Lao firms. However, the sample is 408 accounting for 80%, representing firm located in the South, Central and North of Lao PDR. About half of the samples are firms located in Vientiane Capital while small proportion is in the Huanphan province (table 3-1).

Table 3-1. Sample by provinces

<table>
<thead>
<tr>
<th>No.</th>
<th>Part</th>
<th>Province</th>
<th>Sample</th>
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<tbody>
<tr>
<td>1</td>
<td>South</td>
<td>Savannakhet province</td>
<td>33</td>
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<td>Champasack province</td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>Vientiane province</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>North</td>
<td>LuangPrabang province</td>
<td>23</td>
</tr>
<tr>
<td>8</td>
<td>LuangNamtha province</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Houaphan province</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>408</td>
</tr>
</tbody>
</table>

There are 11 sub-sectors of manufacturing industry in the sample. Most of samples are labor intensive industry. The majority of samples are Food & beverage, Furniture/wood & wood products and Construction material cover more than 50% of sample (Table 3-2).

Table 3-2. Sample by sectors

<table>
<thead>
<tr>
<th>Sector</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food &amp; beverages</td>
<td>121</td>
<td>25.91</td>
</tr>
<tr>
<td>Textiles/wearing apparel</td>
<td>49</td>
<td>10.49</td>
</tr>
<tr>
<td>Furniture/wood &amp; wood products</td>
<td>102</td>
<td>21.84</td>
</tr>
<tr>
<td>Rubber &amp; plastic and their products</td>
<td>7</td>
<td>1.50</td>
</tr>
<tr>
<td>Paper &amp; paper products</td>
<td>28</td>
<td>6.00</td>
</tr>
<tr>
<td>Chemicals &amp; chemical products</td>
<td>8</td>
<td>1.71</td>
</tr>
<tr>
<td>Machinery &amp; equipment</td>
<td>14</td>
<td>3.00</td>
</tr>
<tr>
<td>Growing of crops, market gardening</td>
<td>25</td>
<td>5.35</td>
</tr>
<tr>
<td>Animal husbandry</td>
<td>18</td>
<td>3.85</td>
</tr>
<tr>
<td>Construction materials</td>
<td>57</td>
<td>12.21</td>
</tr>
<tr>
<td>Other</td>
<td>38</td>
<td>8.14</td>
</tr>
<tr>
<td>Total</td>
<td>467</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Survey and authors’ estimation.

4. Characteristics of firms and respondent

4.1. Characteristics of firms

This section illustrates characteristics of firm including type of company, established year and capital for establishment. More than 75% of firms are Limited private company. The majority of firms are established less than 10 years. There are small proportions of firms continuing their business more than 20 years. The main focus of sample is Lao’s firm; therefore, 98.34% of the total is 100% of Laos’s capital (table 4-1).

Table 4-1. Firm characteristics
This section shows the characteristics of firms. Total revenue of all firms is about 8.7 billion Kip where the profit rate is 31% of revenue. The average number all staff is 23 and female staff is about 40% of the total. It is noticeable that skilled labor share small proportion while employee who has higher than junior high school education is more than 50% of total (table 4-2).

Table 4-2. Sale and employment

| Sales revenue of all goods (million kip) | 8736 |
| Profit rate of sales revenue (%) | 31 |
| Total assets (million kip) | 3992 |
| All staff (person) | 23 |
| Female staff (person) | 10 |
| Technical staff (person) | 4 |
| Marketing staff (person) | 2 |
| Management staff (person) | 2 |
| Management female staff (person) | 1 |
| Staff (Junior high school or above) (person) | 14 |

4.2. Characteristics of respondent

This section shows the characteristics of respondents. More than 63% of respondents are manager/vice manager who know well about management, accounting and production of their business. Most of respondents are male and age between 41 and 50 years. Interestingly, the percentage of respondents who has undergraduate degree or above is only 30% (table 4-2).
5. Firm performance, contribution and obstacles

5.1. Firm performance

A recent growth of Foreign Direct Investment (FDI) has made domestic firms improving their performance. According to the findings from enterprise survey indicated that Firm’s performance in recent 3 years has made a great improvement in term of profit and skill labors, in simultaneously to an increase of production costs as well. As illustrate in table 5-1, most firms reply that their production costs have increased and significantly increased about 70.02%, a recently arising in raw material and factor of inputs are important reason to make major production cost rising. As the same time, major firms report that their profit and skill workers have increased and significantly increased on average 60.38 and 59.96, respectively. A strong growth of domestic demand and high competition forces domestic firms to adjust their production, especially training to workers and importing new technology in order to improve the efficiency of their production.

Table 4-2. Responding characteristic

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>63.60</td>
</tr>
<tr>
<td>Female</td>
<td>36.40</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>&lt;30</td>
<td>11.59</td>
</tr>
<tr>
<td>31-40</td>
<td>25.11</td>
</tr>
<tr>
<td>41-50</td>
<td>33.48</td>
</tr>
<tr>
<td>51-60</td>
<td>20.17</td>
</tr>
<tr>
<td>61+</td>
<td>9.66</td>
</tr>
<tr>
<td>Nationality</td>
<td></td>
</tr>
<tr>
<td>Lao</td>
<td>100.00</td>
</tr>
<tr>
<td>Position</td>
<td></td>
</tr>
<tr>
<td>Manager/vice manager</td>
<td>63.75</td>
</tr>
<tr>
<td>Owner</td>
<td>28.78</td>
</tr>
<tr>
<td>Staff</td>
<td>4.48</td>
</tr>
<tr>
<td>Accounting</td>
<td>2.99</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Master or above</td>
<td>4.08</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>28.97</td>
</tr>
<tr>
<td>College</td>
<td>15.88</td>
</tr>
<tr>
<td>High school</td>
<td>27.47</td>
</tr>
<tr>
<td>Junior High school</td>
<td>13.95</td>
</tr>
<tr>
<td>Primary school</td>
<td>5.79</td>
</tr>
<tr>
<td>Other</td>
<td>3.86</td>
</tr>
</tbody>
</table>
5.2. Factors Affecting Performance

5.2.1. Tax policy, land use policy, investment service, and finance support services

Based on table 5-2 shows that the complexities of rules and procedures of investment is the important factor affecting firms’ performance, most firms considered it as the big and very big factor in affecting their performance, which on average of 46.00 of the total firm surveys. Meanwhile, various types of tax collection has influenced on firms’ performance, especially custom duty, value-added tax and profit tax, nearly two third of enterprises’ survey considered them as a big and very big factor on affecting their business’ performance. This finding is consistent with the fact that the corporate income tax in Laos was 28% in 2012, which was higher than the world average of 23% (2011) and the average rates in neighboring countries (e.g., Vietnam (25%), Thailand (23%), Cambodia (20%), and China (20%), see Southichack (2012). Moreover, under the previous investment policy, domestic and foreign companies paid different tax rates: 35% was the maximum rate for domestic firms and 20% for foreign firms.
In addition, unofficial payments (informal gift) are seen as problematic that affecting firms' performance, the results show that 42% of the total enterprises estimates it as a big and very big factor affecting their performance. The finding is consistent with the World Bank Enterprise surveys (2012) found that the composite index of corruption (Graft Index) that reflects the proportion of times a firm was asked or expected to pay a bribe when soliciting six different public services (permits or licenses), the Graft Index was 22 for Laos, comparing to East Asia Pacific region was 18 (WB, 2012).

5.2.2. Environmental factor affect performance

Among 12 environmental factors, majority of enterprises report that electricity (31.91), water facilities (23.13), and market potential (20.56) are considered to be a big and very big factor affecting firm’s performance, as shown in table 3-1. A weak infrastructural development causes many firms have difficulty for access to electricity and water supply, especially in rural areas. Similar to the World Bank Enterprise Surveys in 2011 indicated that major entrepreneurs identified electricity as a major constraint in several industrial sectors including wood and furniture (55%), textile (50%), construction (38%), and trade sectors (28%), respectively (table 5-3).
Table 5-3. Environmental factor affect performance

<table>
<thead>
<tr>
<th></th>
<th>No effect at all</th>
<th>Small</th>
<th>Medium</th>
<th>Big</th>
<th>Very big</th>
<th>Don't know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>The availability of resources</td>
<td>22.06</td>
<td>21.84</td>
<td>32.55</td>
<td>12.63</td>
<td>3.43</td>
<td>7.49</td>
<td>100</td>
</tr>
<tr>
<td>The market potential</td>
<td>13.28</td>
<td>23.13</td>
<td>37.04</td>
<td>17.13</td>
<td>3.43</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>Geographical location</td>
<td>25.48</td>
<td>23.34</td>
<td>32.12</td>
<td>12.85</td>
<td>1.71</td>
<td>4.5</td>
<td>100</td>
</tr>
<tr>
<td>The stability of policy and law</td>
<td>23.13</td>
<td>21.41</td>
<td>36.62</td>
<td>11.35</td>
<td>2.57</td>
<td>4.93</td>
<td>100</td>
</tr>
<tr>
<td>Government management</td>
<td>24.63</td>
<td>18.2</td>
<td>33.83</td>
<td>8.99</td>
<td>4.93</td>
<td>9.42</td>
<td>100</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>24.63</td>
<td>21.84</td>
<td>26.77</td>
<td>13.28</td>
<td>3</td>
<td>10.49</td>
<td>100</td>
</tr>
<tr>
<td>Water facilities</td>
<td>26.12</td>
<td>22.48</td>
<td>22.7</td>
<td>16.92</td>
<td>6.21</td>
<td>5.57</td>
<td>100</td>
</tr>
<tr>
<td>Electricity</td>
<td>22.48</td>
<td>18.84</td>
<td>22.48</td>
<td>20.56</td>
<td>11.35</td>
<td>4.28</td>
<td>100</td>
</tr>
<tr>
<td>Warehouse capacities</td>
<td>24.63</td>
<td>22.06</td>
<td>30.19</td>
<td>11.13</td>
<td>4.5</td>
<td>7.49</td>
<td>100</td>
</tr>
<tr>
<td>Roads</td>
<td>26.98</td>
<td>23.34</td>
<td>24.2</td>
<td>13.92</td>
<td>6</td>
<td>5.57</td>
<td>100</td>
</tr>
<tr>
<td>Transport facilities</td>
<td>24.63</td>
<td>20.34</td>
<td>29.12</td>
<td>16.7</td>
<td>3.43</td>
<td>5.78</td>
<td>100</td>
</tr>
<tr>
<td>Communication, network, telephone facilities</td>
<td>27.84</td>
<td>22.06</td>
<td>25.7</td>
<td>14.78</td>
<td>5.35</td>
<td>4.28</td>
<td>100</td>
</tr>
</tbody>
</table>

5.3. Obstacles of firm

This section will elaborate they key obstacles faced by several firms. The firms’ obstacle can be classified into three categories: (1) internal obstacle; (2) external obstacle; and (3) rule and regulation. For more detail can be summarized in table 4-1 to 4-3.

According to table 5-4, many firms have identified that lack of technically skilled labor was a big and very big internal obstacle, which accounted for 30.41% of total enterprise surveys; it was followed by lack of capital, and low level of technology development, which accounted for 29.55% and 25.70%, respectively. A shortage of skill labors has become critical issue of many firms, as indicated in the GIZ survey (2013) lack of management skills (31.82%) and lack of technically skilled labor (27.27%) were each expressed issues of “medium” severity by approximately a third of large enterprises, and a shortage of both, unskilled and skilled labor has become a significant impediment hindering the growth of most large enterprises.
The results of survey indicate that high taxes and duties are considered to be as big and very big issue of many firms, which accounted for 30.41% of total enterprise surveys. A high tax rate harms competitiveness and is less attractive for FDI, leading to less economic growth, our findings were consistent to GIZ Enterprises’ survey (2013) who found that excessively high taxes and duties were characterized as “big” issue by a substantial percentage of respondents across all enterprise sizes, including micro (27.81%), small (27.89%), medium (32.58%), and large (27.27%) enterprises. In addition, electricity (29.55%) and fuel prices (28.89%) are alternative external issues reduced firms’ performance, a high cost of access to electricity and a high electricity price are the main issues complained by several entrepreneurs (Table 5-5).

The results of survey highlights firms’ obstacles relate to rules and regulations as shown in table 5-6. The findings show that custom/foreign trade regulations are considered to be a big and very big issue of enterprises, which covered for 19.92% of total observation. A complicated custom regulation generated a high cost of doing businesses, as a result lead to less incentive firms to expand their businesses. In addition, corruption issue (19.27%) and foreign currency exchange regulations (17.13%) are the alternative issues faced by several firms. A corruption may present a major administrative and financial burden on firms; it creates an unfavorable business environment by raising the business costs and risks associated with doing business. The findings consistent to the World Bank Enterprise Surveys (2012) found that percentage of firms expected to give gifts to secure a government contract was 44%, comparing to the East Asia Pacific region (EAP) was 31%. While percentage of

**Table 5-4. Obstacle of firm (internal problems)**

<table>
<thead>
<tr>
<th></th>
<th>Very small</th>
<th>Small</th>
<th>medium</th>
<th>Big</th>
<th>Very big</th>
<th>Don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to land</td>
<td>33.83</td>
<td>20.99</td>
<td>28.27</td>
<td>6.00</td>
<td>1.93</td>
<td>8.99</td>
<td>100.00</td>
</tr>
<tr>
<td>Lack of raw materials</td>
<td>21.63</td>
<td>24.63</td>
<td>27.41</td>
<td>16.27</td>
<td>6.42</td>
<td>3.64</td>
<td>100.00</td>
</tr>
<tr>
<td>Lack of technically skilled labor</td>
<td>16.92</td>
<td>19.91</td>
<td>27.84</td>
<td>22.06</td>
<td>8.35</td>
<td>4.93</td>
<td>100.00</td>
</tr>
<tr>
<td>Lack of management staff</td>
<td>27.84</td>
<td>24.63</td>
<td>27.19</td>
<td>9.64</td>
<td>6.21</td>
<td>4.50</td>
<td>100.00</td>
</tr>
<tr>
<td>Low level of technology</td>
<td>17.13</td>
<td>18.84</td>
<td>33.19</td>
<td>18.63</td>
<td>7.07</td>
<td>5.14</td>
<td>100.00</td>
</tr>
<tr>
<td>Lack of market information</td>
<td>14.35</td>
<td>24.84</td>
<td>30.41</td>
<td>17.56</td>
<td>7.49</td>
<td>5.35</td>
<td>100.00</td>
</tr>
<tr>
<td>Lack of capital</td>
<td>17.99</td>
<td>23.13</td>
<td>24.41</td>
<td>17.56</td>
<td>11.99</td>
<td>4.93</td>
<td>100.00</td>
</tr>
<tr>
<td>High labor cost</td>
<td>10.92</td>
<td>18.63</td>
<td>41.97</td>
<td>13.70</td>
<td>8.35</td>
<td>6.42</td>
<td>100.00</td>
</tr>
</tbody>
</table>

**Table 5-5. Obstacle of firm (external problems)**

<table>
<thead>
<tr>
<th></th>
<th>Very small</th>
<th>Small</th>
<th>medium</th>
<th>Big</th>
<th>Very big</th>
<th>Don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition with domestic competitors</td>
<td>33.83</td>
<td>20.99</td>
<td>28.27</td>
<td>6.00</td>
<td>1.93</td>
<td>8.99</td>
<td>100.00</td>
</tr>
<tr>
<td>Competition with foreign competitors</td>
<td>21.63</td>
<td>24.63</td>
<td>27.41</td>
<td>16.27</td>
<td>6.42</td>
<td>3.64</td>
<td>100.00</td>
</tr>
<tr>
<td>High taxes &amp; duties</td>
<td>16.92</td>
<td>19.91</td>
<td>27.84</td>
<td>22.06</td>
<td>8.35</td>
<td>4.93</td>
<td>100.00</td>
</tr>
<tr>
<td>Other fees and unofficial payments</td>
<td>27.84</td>
<td>24.63</td>
<td>27.19</td>
<td>9.64</td>
<td>6.21</td>
<td>4.5</td>
<td>100.00</td>
</tr>
<tr>
<td>Road</td>
<td>17.13</td>
<td>18.84</td>
<td>33.19</td>
<td>18.63</td>
<td>7.07</td>
<td>5.14</td>
<td>100.00</td>
</tr>
<tr>
<td>Water</td>
<td>14.35</td>
<td>24.84</td>
<td>30.41</td>
<td>17.56</td>
<td>7.49</td>
<td>5.35</td>
<td>100.00</td>
</tr>
<tr>
<td>Electricity</td>
<td>17.99</td>
<td>23.13</td>
<td>24.41</td>
<td>17.56</td>
<td>11.99</td>
<td>4.93</td>
<td>100.00</td>
</tr>
<tr>
<td>Signal communications, internet</td>
<td>10.92</td>
<td>18.63</td>
<td>41.97</td>
<td>13.7</td>
<td>8.35</td>
<td>6.42</td>
<td>100.00</td>
</tr>
<tr>
<td>Fuelprices</td>
<td>11.9</td>
<td>22.38</td>
<td>34.56</td>
<td>18.41</td>
<td>10.48</td>
<td>2.27</td>
<td>100.00</td>
</tr>
</tbody>
</table>
firms to give gifts to get a construction permit and import license were 42% and 29% comparing to EAP was 31% and 18%, respectively.

Table 5-6. Obstacle of firm (rules and regulations)

<table>
<thead>
<tr>
<th></th>
<th>Very small</th>
<th>Small</th>
<th>medium</th>
<th>Big</th>
<th>Very big</th>
<th>Don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom/foreign trade regulations</td>
<td>16.7</td>
<td>22.91</td>
<td>26.34</td>
<td>16.92</td>
<td>3</td>
<td>14.13</td>
<td>100</td>
</tr>
<tr>
<td>Foreign investment regulations</td>
<td>19.49</td>
<td>21.41</td>
<td>24.84</td>
<td>8.78</td>
<td>2.57</td>
<td>22.91</td>
<td>100</td>
</tr>
<tr>
<td>Foreign currency exchange regulations</td>
<td>20.13</td>
<td>24.63</td>
<td>27.41</td>
<td>14.13</td>
<td>3</td>
<td>10.71</td>
<td>100</td>
</tr>
<tr>
<td>Labor &amp; safety regulations</td>
<td>17.56</td>
<td>23.55</td>
<td>38.54</td>
<td>9.64</td>
<td>2.78</td>
<td>7.92</td>
<td>100</td>
</tr>
<tr>
<td>Investment license and permits</td>
<td>21.41</td>
<td>23.13</td>
<td>30.19</td>
<td>10.92</td>
<td>2.57</td>
<td>11.78</td>
<td>100</td>
</tr>
<tr>
<td>Renew operating license</td>
<td>22.48</td>
<td>24.2</td>
<td>27.84</td>
<td>11.35</td>
<td>4.07</td>
<td>10.06</td>
<td>100</td>
</tr>
<tr>
<td>Re-registering with tax office</td>
<td>22.06</td>
<td>22.27</td>
<td>30.84</td>
<td>13.06</td>
<td>3.85</td>
<td>7.92</td>
<td>100</td>
</tr>
<tr>
<td>Corruption</td>
<td>25.48</td>
<td>20.34</td>
<td>16.92</td>
<td>11.35</td>
<td>7.92</td>
<td>17.99</td>
<td>100</td>
</tr>
<tr>
<td>Investment dispute settlement</td>
<td>25.91</td>
<td>21.63</td>
<td>20.56</td>
<td>8.35</td>
<td>5.57</td>
<td>17.99</td>
<td>100</td>
</tr>
</tbody>
</table>

5.4. Contributions to the Local Community

Most enterprises perceived inflows of FDI will contribute to local community term of an local employment (42.61%), it is followed by revenue increase (34.69%) and gender equality (28.48%), respectively. Inflows of FDI is key factor to stimulate an expansion of domestic production, many local people will benefit from foreign investment in term of employment generation, job training and more income earning. This activity has played a crucial role to improve the living condition of local people and it leads to poverty reduction.

Table 5-7. Contribution to the local community

<table>
<thead>
<tr>
<th></th>
<th>Very small</th>
<th>Small</th>
<th>medium</th>
<th>Big</th>
<th>Very big</th>
<th>Don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment generation</td>
<td>14.13</td>
<td>9.42</td>
<td>28.05</td>
<td>28.05</td>
<td>14.56</td>
<td>5.78</td>
<td>100</td>
</tr>
<tr>
<td>Gender equality</td>
<td>14.99</td>
<td>13.28</td>
<td>34.48</td>
<td>21.2</td>
<td>7.28</td>
<td>8.78</td>
<td>100</td>
</tr>
<tr>
<td>Local infrastructure</td>
<td>16.7</td>
<td>15.85</td>
<td>34.05</td>
<td>17.34</td>
<td>7.07</td>
<td>8.99</td>
<td>100</td>
</tr>
<tr>
<td>Revenue increase</td>
<td>8.35</td>
<td>12.21</td>
<td>34.05</td>
<td>26.77</td>
<td>7.92</td>
<td>10.71</td>
<td>100</td>
</tr>
<tr>
<td>SMEs scatter</td>
<td>14.99</td>
<td>14.56</td>
<td>31.91</td>
<td>17.56</td>
<td>7.71</td>
<td>13.28</td>
<td>100</td>
</tr>
<tr>
<td>Environment issues</td>
<td>19.91</td>
<td>20.56</td>
<td>27.19</td>
<td>13.28</td>
<td>7.28</td>
<td>11.78</td>
<td>100</td>
</tr>
</tbody>
</table>

6. Impact of Chinese FDI on Local Firms

After rapid growth of Chinese FDI in Laos since early 2000, there are evidences shows some spillover of the FDI on Lao local firms through learning such as applying new know how and technology. FDI slightly heat up the competition in local market, which could possible push local firm to adapt to new competition environment by finding alternative way for production efficiency. The survey data also
shows some evidences of forward linkage from Chinese FDI through buying raw material and machinery from Chinese firm. However, at this point it is still difficult to see the backward linkage.

**6.1 Learned from Chinese firm**

In general, Lao local firm learn from Chinese firm by adopting technology, management, know how and marketing strategy. According to table 6-1, over 50% of the local firms utilize equipment, and processing technology while almost 45% of the local firms learn employee’s skill development and marketing strategy from the Chinese firm. In addition, 40% of local firms apply Chinese management system.

Table 6-1. Learning from Chinese firms

<table>
<thead>
<tr>
<th></th>
<th>Totally disagree</th>
<th>Disagree</th>
<th>Do not matter</th>
<th>Agree</th>
<th>Totally agree</th>
<th>Don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment, processing technology or product innovation</td>
<td>0.81</td>
<td>4.94</td>
<td>28.63</td>
<td>53.63</td>
<td>10.89</td>
<td>1.21</td>
<td>100</td>
</tr>
<tr>
<td>Management (personnel, finance, etc.)</td>
<td>6.88</td>
<td>8.5</td>
<td>30.77</td>
<td>42.91</td>
<td>6.88</td>
<td>4.05</td>
<td>100</td>
</tr>
<tr>
<td>Employee’s skill development</td>
<td>5.62</td>
<td>7.23</td>
<td>28.92</td>
<td>44.58</td>
<td>10.44</td>
<td>3.21</td>
<td>100</td>
</tr>
<tr>
<td>Marketing strategy (pricing, product categories, marketing channel)</td>
<td>7.63</td>
<td>5.22</td>
<td>25.3</td>
<td>44.58</td>
<td>14.46</td>
<td>2.81</td>
<td>100</td>
</tr>
</tbody>
</table>

Regarding competition between Chinese firms and local firm, the data shows that the competition in the market has been increased. In table 6-2, even though 59% of local firms do not recognize the pressure competition from Chinese firms, also most 40% of the local firms do fell the intense of the competition between local and Chinese firm in the market. The results from table 6-3 confirm the intensity of the competition. In the last 3 years, almost 30% of the local firms mentioned that the level competition with Chinese firm was fierce while the level of competition is medium for almost 40% of local firm.

Table 6-2. Felt any competitive pressure from Chinese firms

<table>
<thead>
<tr>
<th>Competition from Chinese firm</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>39.90</td>
</tr>
<tr>
<td>No</td>
<td>59.10</td>
</tr>
<tr>
<td>Do not know</td>
<td>1.00</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6-3. The extent of the competition your firm has faced

<table>
<thead>
<tr>
<th>Changes of the extent of competition in recent 3 years</th>
<th>Not fierce at all</th>
<th>Not very fierce</th>
<th>Medium</th>
<th>Fierce</th>
<th>Very fierce</th>
<th>don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.49</td>
<td>14.21</td>
<td>39.15</td>
<td>29.18</td>
<td>8.73</td>
<td>3.24</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 6-4. The competitive pressures from Chinese enterprises forced you to improve at the following aspects

<table>
<thead>
<tr>
<th></th>
<th>Totally disagree</th>
<th>Disagree</th>
<th>Do not matter</th>
<th>Agree</th>
<th>Totally agree</th>
<th>Don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep updating machines and equipments, processing technologies and conducting product innovation</td>
<td>9.98</td>
<td>10.47</td>
<td>24.94</td>
<td>31.92</td>
<td>10.97</td>
<td>11.72</td>
<td>100</td>
</tr>
<tr>
<td>Keep improving managerial approaches (personnel and finance, etc)</td>
<td>11.72</td>
<td>10.47</td>
<td>25.69</td>
<td>31.92</td>
<td>8.48</td>
<td>11.72</td>
<td>100</td>
</tr>
<tr>
<td>Keep conducting labor skill development and skilled labor employment</td>
<td>9.98</td>
<td>9.23</td>
<td>22.69</td>
<td>34.66</td>
<td>13.47</td>
<td>9.98</td>
<td>100</td>
</tr>
<tr>
<td>Adjust marketing strategies (pricing, product categories, marketing channel, promotions, etc)</td>
<td>8.75</td>
<td>8.00</td>
<td>22.25</td>
<td>35.75</td>
<td>13.25</td>
<td>12.00</td>
<td>100</td>
</tr>
</tbody>
</table>

The competition between local and Chinese firms has forced the local firm to improve production technology, management, labor skill development and adjust market strategy. From table 6-4, almost 32% of the local firm keep updating machinery, processing technologies, conducting product innovation and improving management. Almost 35% keep conducting labor skill development and skilled labor employment. While almost 36% of the firms attempted to adjust marketing strategies such as pricing, production line, marketing channel and so on.

The finding shows that learning managerial experience, technologies and marketing strategies from Chinese firm mainly not through project cooperation and communication activities. From table 6-5, 67% of local firms never have project cooperation while 62% never have communication activities with Chinese enterprises. However, there are evidences that 11% and 17% of the local firms have project cooperation and communication activities with Chinese firms (table 6-6).

Table 6-5. Learned managerial experience, technologies and marketing strategies of other Chinese enterprises through following situations

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>All the time</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project cooperation with Chinese enterprises</td>
<td>67.42</td>
<td>8.52</td>
<td>5.76</td>
<td>5.26</td>
<td>1.25</td>
<td>11.78</td>
</tr>
<tr>
<td>Communication activities with Chinese enterprises (annual meeting, gathering, etc)</td>
<td>62.56</td>
<td>7.79</td>
<td>9.05</td>
<td>4.02</td>
<td>0.5</td>
<td>16.08</td>
</tr>
</tbody>
</table>

Table 6-6 The number of Chinese management staff in your firm

<table>
<thead>
<tr>
<th></th>
<th>Significantly decrease</th>
<th>Decrease</th>
<th>Not change</th>
<th>Increase</th>
<th>Significantly increase</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of Chinese management staff in your firm</td>
<td>13.25</td>
<td>3.61</td>
<td>18.07</td>
<td>4.82</td>
<td>1.2</td>
<td>59.04</td>
</tr>
</tbody>
</table>

6.2. Relationship with Chinese firm

Even though the finding shows spillover from Chinese firms in terms of using production technology, management and marketing strategies, the sign of relationship between the local firms and Chinese consumers is very weak. In table 6-7, almost 59% of local firms never have to keep improve the quality of products and service to meet up with high standards of Chinese buyers. Moreover, almost
72% of the firms never receive help from Chinese buyers regarding improving the product quality, production facilities and so on.

Table 6-7 Relationship with Chinese consumers

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>All the time</th>
<th>Don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>You need to keep improving the quality of your products and services due to the high standards of Chinese buyers</td>
<td>58.87</td>
<td>13.71</td>
<td>9.41</td>
<td>9.14</td>
<td>2.42</td>
<td>6.45</td>
<td>100</td>
</tr>
<tr>
<td>You have received the help from Chinese buyers (e.g. improving the quality of your products, conducting innovative activities, establishing production facilities, and providing you with</td>
<td>71.85</td>
<td>10.19</td>
<td>8.31</td>
<td>2.41</td>
<td>1.07</td>
<td>6.17</td>
<td>100</td>
</tr>
</tbody>
</table>

Besides buying production machinery and equipment from Chinese enterprise, the finding shows some evidences indicate that local firm may benefit from Chinese FDI through forward linkage. From table 6-8, 35% and almost 24% of local firms frequently and always purchase raw material and components while 15% of the firm sometime purchase from Chinese firm. The further research result shows that almost 56% of the local firms have never been helped or trained by the Chinese firm.

Table 6-8 Relationship with Chinese firm

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>All the time</th>
<th>don’t know</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>You firm purchases raw materials/components from Chinese suppliers</td>
<td>12.50</td>
<td>10.00</td>
<td>15.25</td>
<td>35.50</td>
<td>23.75</td>
<td>3.00</td>
<td>100</td>
</tr>
<tr>
<td>You firm purchases machines and equipments from Chinese suppliers</td>
<td>37.25</td>
<td>17.50</td>
<td>24.50</td>
<td>11.00</td>
<td>6.50</td>
<td>3.25</td>
<td>100</td>
</tr>
<tr>
<td>Your firm has been helped and trained by Chinese suppliers</td>
<td>56.61</td>
<td>13.97</td>
<td>11.22</td>
<td>8.23</td>
<td>3.99</td>
<td>5.99</td>
<td>100</td>
</tr>
</tbody>
</table>

7. Spillover effects of Chinese firm

In order to estimation of spillover effects from Chinese firm to local firm, large number of data (enterprise census) which included local and foreign firm. However, our survey focusing mainly on the local firm, therefore, assessment of spillover effect from Chinese firm to local firm could not implement likes other studies (Xu and Sheng, 2012; Lin, Liu, and Zhang, 2009).

The spillovers effect from Chinese firm to local firm is summarized in table 7-1. There are mainly two effects from Chinese firm: Horizontal linkages and Vertical linkage. In horizontal linkage divided into two effects (competition effects and labor effects).

In completion effects, there are two indicators: (1) Changed production techniques/processes due to competitive pressure from Chinese firms within the same sector; (2) Local firm ever directly adopted production techniques/processes from Chinese competitors. 38% of local firm have changed production technique/process due to competitive pressure from Chinese firms. And 20% of local firm ever directly adopted production techniques/processes from Chinese competitors. This shows that entry of Chinese firm could increase lead to increase competition effects in local firms. In labor effect, 27% of local firm faces competition from Chinese enterprises in the labor market. At the same time,
10% of local firm ever hired employees trained in a Chinese firm. It shows that local firm faces competition from Chinese firm and local firm also benefit from hiring employee trained in a Chinese firm.

In vertical linkages, there are two components such as backward linkage (customers) and forward linkages (supplier). In backward linkage, there are two indicators (1) Sales of product to Chinese firm; (2) Chinese customer relations ever resulted in technology transfer from the customer to local firms. From the survey result, there are about 18% of local firms that sale their product to a Chinese firm and only 6% of local firm receive technology transfer from Chinese firms. It shows that the backward linkage of Chinese firm to local firm is relative small.

In forward linkages (supplier), there are two indicators: (1) Local firm procure its intermediates, raw materials and other inputs from Chinese firms; (2) Chinese suppliers of intermediates ever required any special/additional investments production/technology and/or human capital upgrading. From the result of firm survey, 17% of local firm sale their product to Chinese firm, and 11% of local firm received a technology transfer from the customer. It also shows that the forward linkage from Chinese firm to local firm is relative small.

From the finding, it shows that the horizontal linkages (competition effect and labor effect) and vertical linkages (backward linkage-Customers and Forward linkages (Supplier) from Chinese firm to local firm is relative small. It shows that the competition effect in horizontal linkages seems to have bigger effects compared to vertical linkages.

Table 7-1 Spillovers effect of Chinese firm to local firm

<table>
<thead>
<tr>
<th>Horizontal linkages</th>
<th>Competition effect</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed production techniques/processes due to competitive pressure from Chinese firms within the same sector</td>
<td>38.04</td>
<td></td>
</tr>
<tr>
<td>Ever directly adopted production techniques/processes from Chinese competitors</td>
<td>20.6</td>
<td></td>
</tr>
<tr>
<td>Labor effect</td>
<td>Face competition from Chinese enterprises in the labour market</td>
<td>27.69</td>
</tr>
<tr>
<td>Ever hired employees trained in a Chinese firm</td>
<td>9.89</td>
<td></td>
</tr>
<tr>
<td>Vertical linkages</td>
<td>Backward linkage (Customers)</td>
<td></td>
</tr>
<tr>
<td>Sales of product to Chinese firm</td>
<td></td>
<td>18.67</td>
</tr>
<tr>
<td>Chinese customer relations ever resulted in technology transfer from the customer to your firm</td>
<td>6.47</td>
<td></td>
</tr>
<tr>
<td>Forward linkages (Supplier)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm procure its intermediates, raw materials and other inputs from Chinese firms</td>
<td>17.35</td>
<td></td>
</tr>
<tr>
<td>Chinese suppliers of intermediates ever required any special/additional investments production/technology and/or human capital upgrading</td>
<td>11.69</td>
<td></td>
</tr>
</tbody>
</table>
8. Conclusion

Despite having a large number of Chinese firms in Laos, studies on the spillover effects of Chinese firm to local firm are limited. Therefore, the spillover effects of Chinese firm on Lao firms is not well understood. The main objective of this study is to investigate the spillover effects of Chinese firms to Lao firms. We conducted firm survey in 9 provinces in Laos, which focused on production sector, such as manufacturing, agriculture, handicraft and others. We collected more than 400 firms in order to investigate the linkage of Chinese firm. From our analysis of the survey, we can conclude that the spillover effect of Chinese firm to local firm is small. The impact of horizontal linkages and vertical linkages (Customers -Backward linkage; Suppliers (Forward linkages) on local firm is small. Therefore, in order to gain maximized benefits from Chinese firm in Laos, it is important to improve the spillover effect of Chinese firm to Lao firm is crucial. It is important to increase absorptive capacity of local firm, and arrow the technical gap between Chinese firms and local firms.

References


*Phouphet Kyophilavong E-mail address: Phouphetkyophilavong@gmail.com
*Somchith Souksavath E-mail address: s0512svc@gmail.com
*Bounlert Vanhmala E-mail address: probounlert@yahoo.com
*Piya Wongpit E-mail address: yasahoy@hotmail.com
*Alay Phonvisay E-mail address: phonvisay@gmail.com
*Phanhpakit Onphanhdala E-mail address: phanhpakit@hotmail.com
Effects of Recognition and Usage of Point of Purchase (POP) Advertisement on Purchase Intention – Based on the mediating effect of reliability and liking

Soon-chan Park, Sand-do Oh

Graduate School of Government, Business, and Entrepreneurship, Yonsei University

Abstract

For the domestic researches of Point of purchase (hereinafter referred to as POP) advertisement, there have been no study conducted on the relationship between consumer recognition, usage, reliability, linking of advertisement and purchase intention in the stores in which consumers purchase products. The purpose of this study is to determine the relationship between the recognition and usage of POP advertisement which is intended to stimulate the purchase intention of consumers and promote sale; the reliability and linking of POP advertising; and purchase intention. For the research methods, this research has set emotional attitude (reliability and likeability) as a medicating variable and behavioral attitude (purchase intention) as an independent variable based on the factors introduced in the Learning Hierarchy Theory of Lavidge & Steinor (1961). In doing so, this research sees the effect of advertisement from the perspective of psychological phenomenon and uses a research method stereotyped based on the recognition and usage as independent variables. This research sets research hypotheses as follows:

1. The reliability and liking will mediate the effect of the recognition and usage of POP advertisement on purchase intention.

And for the effect of respective variables,

2. The recognition and usage of POP advertisement will have a positive (+) effect on the reliability, liking and purchase intention.

3. The reliability and liking of POP advertisement will have a positive (+) effect on the purchase intention.

For an empirical research and data analysis, a questionnaire survey was conducted with 250 customers who used a specific brunch café selling new items from Jun 29 to Jul 5 2016(5 days). The questionnaires returned were verified based on multi-parameter model using Hayes (2013)’s Process Model 4. The results of this empirical research demonstrated that the purchase intention is affected by the recognition and usage of POP advertising, followed by reliability and likeability. In short, an increase in the recognition and usage of POP advertisement increases the reliability and linking of POP advertisement, which in turn increases purchase intention. In addition, it was also found that the reliability and linking of advertisement has a mediating effect. This implies that the effect of cognitive response on purchase intention—which is behavioral response - is mediated by emotional attitude. In other words, the effect of the recognition and usage of POP advertisement is a variable that affects the reliability and liking, implying the recognition and usage of advertisement have a positive effect on the consumer purchase intention.

Keywords: Point of Purchase advertising; advertisement attitude; recognition and usage; reliability; linking; purchase intention
I. Introduction

As part of communication process, advertisement delivers product information, stimulates the needs of consumers or induces consumer purchase behavior through advertisement massages. Advertisement motivates consumers to have linking and reliability toward products and services (Lee, Seong Gu, 1999). As such, advertisement seeks to deliver the contents and information to consumers effectively for the purpose of persuading them. The purpose of advertisement is to persuade the recipient and thereby maximize communication efficiency.

Consumers are exposed to many advertising every day. However, due to the limited ability of processing advertising, consumers tend to pay attention to the advertisement massages associated with them directly or indirectly. In this respect, POP advertisement reduces the time and mental cost for consumers to search information by providing more direct information compared to other advertisement media and thereby attracts consumer attention, so it receives the attention of the retail industry.

According to the existing researches, POP advertisement simplifies the decision making process of consumers, affects the information processing process and directly stimulates the purchase behavior of consumers (Kim, Jang Hyeon, Lee, Jae Eun, 2011; Park, Jong Mi, Ko, Han Jun, Kim, Min Jeong, 2008). For the products that do not require complicated purchase decision making process, the purchase intention can be easily formed through POP advertisement (Park, Jin Pyo, 2014), and the effectiveness of promoting purchase is raised when various information about the composition and advantages of products is provided (Choi, Seon Mi, 2011). Additionally, the directions and objectives of advertisement facilitate more powerful and direct communication for delivering information in the stores (Lee, Kin Guy, 2008).

In particular, POP advertisement is easy to implement and its cost is low, so small businesses that handle retail items use it as an advertisement tool instead of conventional advertisement media such as TV, newspapers and so on. However, the marketing environment for small businesses is so poor even if it varies depending on the business types. Due to a lack of manpower, marketing knowledge and the limited time for omnidirectional marketing activities, small businesses cannot implement marketing activities (Kang, Si Chul, Kim, Ade Guy, Lee, Seung Hyun, Lee, Yong Gyu, 2014). Therefore, it is essential that small businesses entrepreneurs use POP advertising-which is useful as a marketing tool- to overcome financial and situational limitations.

“Small Business” refers to a business where less than 10 permanent employees are working (Small Business Protection and Support Act, Law No. 13850, Jan 27, 2016). Small businesses supply general goods and services and the purchase occurs in a face-to-face manner. In most cases, less than 5 employees are working in the business (Small and Medium Business Administration, 2007). Small Business Entrepreneurs run relatively small businesses among SMEs (Choi, Se Chul, Gwon Yong Joo, 2014). Most of them lack technical information and management skills (Hwang, Bo Yoon, 2009) and these businesses have a vulnerable structure with low productivity and innovativeness due to a lack of information and marketing activities (Ji, Jeong Hoon, Kim, Hye Jeong, 2010). Furthermore, they start businesses for the purpose of living and run their businesses in small size stores with limited capital (Woo, Dae Il, Lee and Sang Yoon, 2011). Until now, researches on the effect of advertisement have been focused on four major media such as TV, newspapers, magazines and outdoor advertising. In recent years, many researches have been conducted on internet advertising, but most of these researches have been focused on corporate marketing for large companies that can afford to pay a considerable amount of marketing cost. However, from the perspective of POP advertisement used...
mostly by small business entrepreneurs who are the subjects of this research, it is difficult to apply the same criteria for analysis.

Therefore, this research seeks to analyze the advertisement effect focused on the POP advertisement as a communication tool that stimulates purchasing behavior and simplifies decision making process by providing the consumers with the information needed for information processing. As revealed in the existing researches (Kim, Jang Hyun, Lee, Jae Eun, Park, Jong Mi, Ko, Han Jun and Choi, Yoon Gyung), POP advertisement is effective in terms of the advertisement effect such as immediate advertisement effect, economy of media utilization and access to media operation and so on, so it is worth using actively. In this context, this research seeks to analyze the effectiveness of POP marketing empirically.

In particular, this research approaches the research subjects based on the perspective of theoretical researches claiming that the effect of advertisement attitude among the factors affecting the advertisement effect is great (Shimp, Mitchell, Olson and Gardener). In particular, to analyze the effect of various emotions that consumers experience when exposed to POP advertising, this research analyzes the recognition and usage of advertisement and advertisement attitude for consumers at the point of purchase.

Additionally, to determine the interactivity on the advertisement effect, this research addresses how the advertisement attitude will change depending on the recognition and how it will act on the purchase intention depending on the degree of attitude. Until now, domestic researches on POP advertisement have been mostly focused on analyzing customer attitude in relation with the type, function, and mechanism of advertising, such as ‘Types and Logical and Emotional Advertisement (Lee, Chul Won, Chung, Pil Won, 1993; Yang Song Hee, 2009)’, ‘Function and Role of Advertising’(Cho, Mi Na, 2009 and Kim, Choong Hyun, 2010), ‘Interactivity of Advertising’ (Choi Yoon Gyung, 2004), ‘Properties of Massage’(Park, Jong, Mi and Ko, Han Joon, 2010), and these researches were conducted through indirect experiments or questionnaire surveys. However, there have been no research conducted on the interactivity of POP advertisement in the business places where specific products are sold and consumers purchase the products from the perspective of consumers.

Therefore, this research investigated the interconnected effect of the items sold in the retail shops of small business entrepreneurs on the recognition and usage of the advertisement, reliability and linking of the advertisement, and purchase intention of the customers at the point of purchase. This research is meaningful in that it investigates and analyzes advertisement attitude through not just theoretical explanation but in actual business places. More specifically, this research investigated the inter-relationship between the variables through an empirical survey conducted in a state of POP advertising.

For the approach method, seeing the advertisement effect from the perspective of psychological phenomenon, this research set the emotional (reliability and likeability) attitude as mediating variable and behavioral (purchase intention) attitude as independent variable based on the factors introduced in the Learning Hierarchy Theory of Lavidge & Steino (1961) and used a research model stereotyped based on the independent variables- recognition and usage. A questionnaire was constructed based on the existing researches and preliminary survey to collect data.

Furthermore, seeing that other factors, such as product, price and distribution as well as besides the effect of advertisement act on the advertisement effect in a complex manner, this research was based
on a claim that the advertisement effect must be measured by communication effect (Gwon, Ik Hyun, 1996).

In order for the advertisement to fulfill its original function from the perspective of marketing communication for persuading consumers, it is important to investigate how consumers in general recognize and use POP advertising. Therefore, this research seeks to help small business entrepreneurs implement marketing activities in an efficient manner by investigating consumer recognition of marketing and the effectiveness of POP advertisement.

II. Theoretical Background

2.1 Definition, functions and usage of POP advertisement

2.1.1. Concept of POP advertisement

POP advertisement refers to a communication means to deliver the information on products or services at the point of purchase.

Graham (1952) said: “POP advertisement is the advertisement message appearing in various forms inside or in front of retail shops, aiming to induce passersby as well as customers inside shops to purchase. The word “POP advertising” came from the meaning of advertisement approaching the consumers at the point of purchase.” William H Bolen (1984) said: “POP advertisement affects consumers at the point of purchase, changes their attitude and strengthens the purchase intention which is advantageous to advertiser, including various forms of advertisement which is near the point of purchase.”

POP advertisement is used to attract the attention of consumers to specific products or services inside or outside retail shops. It is particularly used for special events such as bargain sale or price discount events with the aim to strengthen the messages that consumers come to know through advertisement (Robinson & Schulz, 1989).

Tokyo Marketing Research Society(Japan) has organized the definitions of POP advertisement in Japan as follows: Gobayashi Tasaburo(小林太三郎) said: Manufacturers, produces and distributors of products use POP to promote and increase the sales of products, and POP includes the store display by retailers. Sometimes, the product itself or the container of the product is very important.” (Chung, Hee Soo, 2011).

POP advertisement has been existing for a long time during the existent of stores. For the usage of POP advertising, in ancient Pompeii, shops used the sings made of stone or clay. Since the global depression in the 1930s, consumers need to choose products themselves in the self-service supermarket and store owners put various signs to help consumers choose products, which is known as the start of POP advertisement (Shin, Yong Sam, 2985).

Kim, Moon Hwa (2003) said that unlike the mass media providing information indiscriminately in a state where consumers are not faced with products, POP advertisement stimulates the purchase intention of consumers in the business places where consumers are faced with products to induce them to purchase products. In other words, POP differs from ordinary advertisement media. Broadcast media advertisement (e.g. TV commercials) and printed media (e.g. newspapers and magazines) target unspecified individuals including overall consumers and potential consumers comprehensively, whereas POP advertisement is conducted in business places and produces an instantaneous effect. For
the types of POP advertising, it is manufactured and installed both typically and atypically inside and outside the stores. For the method of advertising, POP advertisement delivers the information about products or services to consumers directly or indirectly.

POP advertisement is divided into an emotional execution means inducing specific behaviors, a receptive and persuasive communication for the purpose of marketing and sales promotion to deliver massages to consumers directly (Park, Jong Mi). And, POP advertisement is conducted inside or in front of retail stores to attract the attention of consumers and induce them to purchase (Chang, Joon Seok, 1999). It is a method of advertisement for the manufacturers to have direct contact with consumers in stores with the aim to increase sales.

The reason why POP advertisement becomes important in these days is because marketing approaches are diversified according to the changing economic environment. More specifically, purchase patterns change; products are diversified, promotion activities targeting consumers take place often; the ability of executing advertisement in business places is activated; and the motivation for consumer purchase decision becomes complex.

POP marketing is persuasive communication for the purpose of marketing and is one of sales promotion means to deliver massages to consumers directly. At the point when consumers purchase products and services and users sell products and services, the products and services are advertised through a communication means to deliver the information on products and services (Primers, 1950), and during this process, the advertisement containing the information affect the purchase behavior of consumers. POP marketing is used to attract the attention of consumers to specific products or services inside or outside retail stores. Particularly, it is used for promotional events such as bargain sales, discount sales and other special events for the purpose of strengthening the messages that consumers come to know through advertisement (Robinson & Schulz, 1989).

Choi, Yoong Gyung (2004) said: “POP advertisement stimulates the purchase psychology of consumers in the store and induces consumers to process information immediately through visual stimulation and delivery of information in a simple manner.” Park, Jong Mi and Ko, Han Joon (2010) said: “POP advertising, as an advertisement and sale promotion tool inside the store, delivers the information on services or products as a communication means. Kim, Jang Hyun and Lee, Jae Eun(2011) said: “POP advertisement is an advertisement sign inside or in front of the store for the purpose of promoting sales and is designed to attract the attention of consumers and thereby induces purchase needs of consumers.

POP advertisement induces consumers to process information immediately through visual stimulation and delivery of simple information, thereby increasing the purchase of products. Lee, Jin Guy (2008) said in his research: “POP advertising, as a communication tool to deliver impulsive and powerful massages to consumers directly, must have directions and objectives according to the targets established in advance to achieve effective communication inside stores. Unlike the mass media providing information indiscriminately in a state where consumers are not faced with products, POP advertisement stimulates the purchase psychology of consumers in the store and induces them to purchase.

2.1.1. Roles and functions of POP advertisement

POP advertisement serves to simplify the decision making process of consumers and thereby reduce their efforts at the point of purchase. In other words, POP advertisement helps consumers recognize
products and services, and is an indication to guide them about a series of process for them to decide purchase, affecting the information processing process at the point of purchase by providing simple information. Unlike the mass media providing information indiscriminately in a state where consumers are not faced with products, POP advertisement stimulates the purchase psychology of consumers in the store and induces them to purchase (Chung, Hee Soo, 2011).

POP advertisement provides information to consumers at the point of purchase in the place of purchase for the purpose of helping their purchase, and stimulates their purchase needs, helping them make decision quickly and surely. Furthermore, POP advertisement increases the purchasing needs of consumers at the point of purchase, and assists and represents the sales activities of sales staff. The POP advertisement installed inside and outside the store attracts the attention of consumers compared to competing products, promoting sales more actively.

Schultz (1989) classified the functions of POP advertisement into 4 categories: ‘guiding products’, ‘providing extra information on products’, ‘inducing impulsive purchase’ and ‘reminding the product missing from the shopping list’. Yoo, Boong Roh (1993) summarized as follows: POP advertisement strengthens the mass media advertising, assists the reception of customers, provides the indexes or criteria for purchase to consumers, and creates the opportunities and the possibilities of purchasing products. Furthermore, POP advertisement advertises the products in front of the store. POP advertisement is needed by manufacturers to assist retailers. Last, POP advertisement serves as an information source to provide consumers with a range of knowledge and information on the products.

Shin, Seung Hoon (1996) explained POP advertisement from the perspective of the main agents of advertisement such as consumers, advertisers (food makers) and stores. For the functions for consumers, POP advertisement introduces new products, introduces product features and how to use, and thereby helps consumers compare products and recall the product information they already acquired. For the functions for the advertisers (manufacturers), POP advertisement provides consumers with the information on new products, increases attention to products in the store, explains product functions and features and assists in introducing products. Last, for the functions for stores, it helps consumers choose products, assists sales staff in notifying product features, induces consumers to visit the store and creates an atmosphere to promote sales and induce impulsive purchase.

Cho, Hye Jin (2007) said in her research that POP advertisement stimulates the purchase needs of consumers by providing sales points, reduces the efforts of sales staff and thereby increases sales efficiency. Furthermore, it provides consumers with the information on product functions and price information, and brings sales promoting effect.

Chung Hee Soo (2010) said that POP advertisement is a communication process between products and purchasers, notifying the launch of new products and creating a seasonal atmosphere. Furthermore, unlike existing advertisement media such as TV, radio, newspapers and magazines, it draws consumer attention immediately in the store, displaying its function as a means of marketing communication.

In general, consumers are estimated to consciously pay attention to only 5-25% of advertisements to which they are exposed. To achieve successful communication in these selective circumstances, POP advertisement must make consumers act and induce them to participate through communication to achieve cognitive effect, which can be achieve through media advertisement, in the store (Choi, Yoon Gyung, 2004).

2.2 Theoretical review
2.2.1 Research of the advertisement attitude

Advertisement attitude refers to the emotional response to the advertisement. It can be defined as the acquired tendency of responding to the advertisement consistently.

Attitude is can be defined as an amount of positive or negative affect of a person toward certain object (Lee, Hak Sik, An, Gwang Ho and Ha, Young Won, 2004). Predisposition which is learned to react to a certain object favorably or unfavorably is most frequently cited as the concept of POP advertisement (Fishbein & Ajzen 1975). In other words, attitude is the liking or disliking, evaluation, emotion or behavioral tendency of individuals toward a specific object or idea (Kolter, P. 2000). It is important because it draws our thoughts (cognitive function), affects our emotion (emotional function) and behaviors (active function).

The researches of the attitude addresses cognitive, behavioral and emotion factors at the same time. Three-attribute attitude model among research models is a multi-dimensional model. The attitude is composed of cognition, emotion and will, and these affect the behaviors despite the difference in the degree. And single-dimensional model is based on cognitive factors (knowledge and belief) as precedent factors and emotional factors (liking and preference) and behavioral factors (will and intention) as lagging factors.

The recipient exposed to the advertisement does not react immediately. They pay attention to the stimulus called advertisement and accept and interpret the stimulus through their senses. They cognitively evaluate the attributes of brand delivered by the advertisement based on the advertisement information they perceived and acquire the knowledge about the brand and form their attitude toward the advertisement through emotional response.

The advertisement attitude refers to an emotional response to advertisement-in other words, an emotional response felt while or after watching the advertisement (Ray & Batra 1983, Choi, Ho Gyu, 1995). Full-fledged researches on the mediating role of the attitude toward advertisement were conducted in the 1980s. Advertisement attitude is an important variable in the formation process of consumer attitude (Mitchell & Olson, 1981; Mackenzie & lutz, 1989). It attracted a lot of attention for the researches on the effects of the attitude toward advertisement (Mackenzie et al, 1986; Petty & Cacioppo, 1983; Lee, Yoo Jae, 2009).

These researches showed the two-sided effect of the advertisement-in other words, the advertisement delivers attributes and information of brand and thereby affect the brand attitude and links the favorable feeling about the advertisement to the brands, thereby affecting the attitude. Advertisement attitude plays a mediating role, determining the advertisement effect (Mitchell & Olson 1981).

Researches on the casual relationship between the advertisement attitude and other criteria for the advertisement effect (brand awareness, brand attitude, purchase intention, etc.), in general, give casual mediating role to advertisement attitude. Since the emotional response of consumers to advertisement draw attention, advertisement attitude emerges as an important process variable in the formation of consumer advertisement attitude. In particular, since the researches reporting that the casual mediating role of advertisement attitude determines the advertisement effect, advertisement attitudes are known to affect the brand awareness process as well as brand attitude, and the consumer liking of advertisement will increase the tendency of accepting advertisement massages (Mackenzie, Lutz & Belch, 1986). Looking into these researches a bit further, these researches assume that the advertisement attitude (A ad) is a mediating variable in the process where the advertisement affect the
attitude to the brand (A_b) and the intention of buying (I_b), and then prove the relationship between
the two. First, the advertisement awareness affects the attitude to the brand and the intention of buying
via advertisement attitude (emotion transition hypothesis); second, the advertisement awareness
indirectly affects the intention of buying via the brand attitude and the attributes of brand (dual
mediation hypothesis). Of the two, the dual mediation hypothesis receives a lot of response from the
academic world.

Moore & Hutchison (1985) said that the influential relation between advertisement attitude and the
brand attitude decreases over time, indicating a positive linear relationship. Petty & Cacioppo (1986)
said that the cognition-related information on the subject for the attitude in the casual relation model is
proceeded through the center-related information, and the emotion-related information is processed
through peripheral pathways in the casual relation shop model. According to the Cognitive Response
Theory of Greenwald (1968) and Wright (1973), consumers may or may not agree to the contents of
the messages after understanding advertisement massages, and advertisement attitude is formed
according to their response when they are exposed to the massages for consumers. Kim, Wan Seok
(2005) recognized the attitude as the decision making variable in the decision making process that
determines the consumer recognition and behavior for the products – a concept preceding behavior.

Lee, You Jae et al. (2009) verified the differences in the relative influences between the recognition
(brand awareness) and emotion (advertisement attitude) that occur in the formation of the brand
attitude for respective product types. The results demonstrated that advertisement attitude has a
significant effect on the brand attitude and the brand awareness also has a significant effect on brand
attitude.

The advertisement has a dual effect- in other words, the advertisement delivers a range of attributes
and information about brand and affects the brand attitude and links consumer liking of the
advertisement to the brands, thereby affecting the brand attitude, and advertisement attitude
applied hierarchical brand attitude change model to their research. The results showed the
advertisement attitude has a critical effect on brand attitude, brand awareness and purchase intention.
Since then, Moore and Hutchison (1983) emphasized in their research that the advertisement attitude
mediates the brand attitude and behavior intention. Ray and Batra (1983) also said that the consumer
brand attitude has the unique emotional element -liking of brand- which cannot be explained, as well
as the evaluative elements related to the belief in the brand, and the advertisement attitude forms this
emotion of liking.

2.2.2 Research of hierarchical effect model

In the researches on the effectiveness of the advertisement, according to the perspective of the ultimate
purpose of the advertisement, approaches are classified as the measurement of the effect on sales and
of the effect on communication. Gwon, Ik Hyun (1996) claimed that various factors such as products,
price and distribution besides the effect of advertisement act on the advertisement effect, so the
advertisement effect must be measured by communication effect such as recognition and attitude
changes.

In short, exposed to advertisement communication, consumers acquire various recognition about
brands and products (knowledge or information); make emotional evaluation on the brands and
products(attitude); and then establish actions plans (purchase intention or volition).
For the theories about the advertisement effect taking place linearly through a series of phased response of consumers exposed to the advertisement, there are AIDA model, AIDMA model and Gary A. Steiner’s model as well as Robert J. Lavidge model. These models explain the sequential steps for the communication process claiming. According to this theory, in the communication process, communication affects the thinking and behavior of the recipients and this process takes place through sequentially phased processes.

And these models explain that the explanation of the behaviors of consumers must go through 3 dimensions: Thank, Feel and Do.

<table>
<thead>
<tr>
<th>Phase/Model</th>
<th>AIDA Model</th>
<th>DAGMAR Model</th>
<th>Lavidge &amp; Steiner Model</th>
<th>Innovation Diffusion Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Phase</td>
<td>Attention</td>
<td>Awareness</td>
<td>Awareness Knowledge</td>
<td>Awareness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comprehension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Phase</td>
<td>Interest</td>
<td>Conviction</td>
<td>Liking Preference Conviction</td>
<td>Interest Evaluation</td>
</tr>
<tr>
<td></td>
<td>Desire</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Behavioral Phase</td>
<td>Action</td>
<td>Action</td>
<td>Action</td>
<td>Trial Adoption</td>
</tr>
</tbody>
</table>

Source: Advertisement and Science, Nanam Publishing Company 1988, Lee, Dae Ryong

These models explain consumer response to the advertisement from initial recognition to actual purchase. The advertisement effect does not induce immediate purchase. But it entails other effects, which induces consumers to purchase. Therefore, these models claim that a survey on the advertisement effect must be conducted in such a way as to be able to measure the respective phases.

Judging from this point of view, the advertisement effect is a series of phased response of the consumers exposed to the advertisement. In a word, the advertisement effect refers to the effect provided to consumers by the advertisement. The advertisement effect refers to every results whether or not they are intended, so every results of advertisement must be addressed (McQuail, 1984). Furthermore, the advertisement effect refers to the distinctive effects that affects the recognition, emotion and behavioral responses of the recipients (Seong, Young Shin, 2007).

The advertisement effect can be classified using memory index and persuasion index. The memory index is to measure the amount of information about the advertisement that consumers store in their memory, and persuasion index is to measure how much consumers believe and accept the information contained in the advertisement (Kim, Wan Seok, 2005). Consumers acquire the information about products through the advertisement and then form their attitude accordingly. In other words, if they like the advertisement, they tend to have a favorable attitude toward the product, and thereby purchase the product. Consumers have favorable or unfavorable attitude toward the advertisement. This is because consumers tend to gain satisfaction through the role description of the advertisement reflecting the belief or the self-image consumers prefer (Lim, Hyun Joo, 1985).

However, there are limitations in uncovering the process from the acquisition of product information to the purchase of the product through simple surveys or experiments. As explained in the hierarchical effect model, consumers do not make a decision to purchase just because of the advertisement. They are influenced by a variety of variables.
2.2.3 Concept and roles of consumer attitude

Since the 1980s, many researches have been conducted on the consumer attitude toward the advertisement. These researches aimed to develop the marketing strategies to win favor from target consumers and enhance consumer’s brand attitude through favorable advertisement attitude, thereby affecting the consumer behavior.

2.2.3.1 Concept and roles of recognition and usage

The dictionary meaning of recognition is a mental process to recognize and recall objects, derive conclusions through reasoning and then resolve problems that occurred due to the objects. According to Naissier (1976), it is a process where sensory input is modified, reduced, stored, restored and used. The awareness in the advertisement is a factor that can change the advertisement effect by activating the prior knowledge about the product and brand that consumers are face with at the point of purchase. It is formed the product attributes or advertising information. Cognitive element is composed of the knowledge and belief of consumers about the subjects of attitude.

Brand awareness means target consumers heard or read the advertisement, and what they know does not need to be absolutely correct and true. The belief is not natural. It is formed through socialization process and learning process. Therefore, the recipient forms the belief in various subjects through the process of acquiring the information from various sources such as culture, family, media and so on (Kassarjian. H & Roberton. T, 1980).

No, Jin Nam (1993) defined the advertisement awareness three-dimensionally as follows:

First, the attention is how much the recipient exposed to advertisement massages pay attention to the massages; second, the recall is how much the recipient can recall the brand name in the advertisement; third, the interest is how much the recipient is interested with the advertisement. Cacippo & Petty (1982) said the cognitive attitude is the inner pleasure which can be acquired during the process of processing information through efforts. Seong, Min Gyung (1995) said the cognitive attitude is the outcome of the active thinking process taking place before or during communication, and the effect can be predicted or measured by researching the initial cognitive response.

The cognitive response to advertisement is the process of knowing, thinking, understating and reasoning when faced with the advertisement. For the measurement of this response, there are the degree of attention to advertisement, brand or advertisement contents; the degree of recognition; the degree of unaided recall; the degree of aided recall; the degree of comprehension; the contents of belief; the cognitive response supporting or rebutting the advertisement contents recalled during the process of processing advertisement information or when exposed to the advertisement; the formation or supplementation of brand image; and the expected hypothesis formed by oneself regarding brand (Han, Hee Min and Chang Dae Ryun, 1994).

Furthermore, this research is based on a concept of posterior usage of advertisement by consumers and thereby discretionaly applies it to the parts where the advertisement is used as cognitive behavior affecting the advertisement attitude.

2.2.3.2 Concept and roles of reliability

Reliability means the affirmative expectations, beliefs, guarantee for a certain person or object. Many researches have been conducted on the belief in the extensive organizational and social background
and definitions are made in various ways. It is the psychological state containing the intention of voluntarily accepting the expectations for the intention or behavior of a certain person or object (Rousseau, Sitkin, Burt & Camerer, 1988). From the economic point of view, it was defined as the prediction or expectation of the results in a risky situation, and from the sociological point of view, it was defined as the relationship between actors in the exchange relationship and the belief in the general conditions surrounding it such as social rules, norms and practices (Granovetter, 1985).

The reliability of the advertisement is the degree of the reliability of the assertion of the advertisement (Mackenzie & Lutz 1989) and determines the words, behavioral intention and action of individuals under the cognition and emotional influence such as individual perception and belief in information source, and fun (Appel 1987).

For more comprehensive definition of reliability, first, the reliability reflects the expectations or belief in the action of other people in good faith; second, the concerned persons cannot force or control the reliability; third, the reliable results of a person affect the behaviors of other persons (Whitner, 1998). The reliability is a set of communicator characteristics, so it is recognized, judged and evaluated by respective recipients. Therefore, it must be understood as a subjective concept that inevitably varies depending on respective recipients (Cho, Mi Na).

The reliability increases the acceptance for the long-term orientation and independence, and serves to reduce the perceived risk of the consumer (Morgan & Hunt, 1994). Therefore, the reliability can be used as the indexes to reduce the complexity of consumer behaviors, and the uncertainty occurring according to the types of transaction and types of transactions and purchase process.

Assuming that consumers can respond to certain information positively or negatively, they positively respond to the information provided by reliable information source and negatively respond to the information provided by less reliable or unreliable information source.

If accurate product information and the guidelines for prudent purchase are provided to consumers to meet their needs, it will be compensated with sales increase, and the resulting economical consumption of consumers will maximize the reliability of POP advertisement (Park, Jong Mi, 2011).

**2.2.3.3. Concept and role of liking**

The dictionary definition of the liking is a good feeling about other parties. The liking is the degree of positive/negative/favorable/unfavorable/agreeing/disagreeing attitude to a certain object (Fishbein & Middlestadt, 1995). The linking for the person or the product showing more positive and favorable attitude for the object that one likes is increasing. The positive and favorable attitude toward the object that one likes is because of the liking for it. In other words, the liking for specific person or product that one likes are higher the that for the person or product that one dislikes (Kim, Woon Han, 2007).

The liking manifest as behaviors through an image forming process. The image used in this research is the term frequently used in the psychology since the 1950s, and it is widely used in various fields as well as marketing. In these days, the image means photos, pictures, drawings in various fields such as design and the complication of books. Therefore, the image can be defined as the world of the subjective mind of people believing truthful things and it is formed based on the comprehensive results of experiences (Boulding 1961).
Ohanian (1990) said the attributes of liking include professionalism, confidence and charm. In the advertisement, if the information source can give liking and reliability based on expertise, the reliability of the information and product from the information source will increase. The role of liking in the advertisement is to provide factors that will form reliability. The importance of liking is emphasized in that the advertisement affects the evaluation of the advertised products, so the favorable attitude toward the advertisement induces favorable evaluation of the advertised brand (Thorson, 1991). The favorable attitude toward the brand leads to the positive and favorable feeling toward the brand, thereby inducing consumers to purchase the brand (Cho, Mi Na).

2.2.3.4. Concept and roles of purchase intention

The intention refers to the anticipated or planned future actions of consumers—in other words, the probability that the belief and attitude lead to actions (Engel, Blackwell & Miniard, 1990) The purchase intention refers to the probability that the intended and planned future actions of individuals to purchase a certain product are put in practice. The purchase intention can be defined as consumer will to purchase the product when it is commercially available. Given that the behaviors of individuals are affected by the intention of doing such behaviors, Fishbein & Ajzen (1985) emphasized the importance of intention, suggesting the intention as a factor that directly determines the purchase behavior.

According to the exiting researches on the purchase behavior, the favorable response to the advertisement develops into the favorable attitude toward the advertised brand of product, leading to the purchase intention (Lipstein & Neelankavil, 1984). Consumers may have favorable attitude or negative attitude toward the advertisement, which will greatly influence the purchase motivation (Lee, Ki Won, 1986). The purchase intention is consumer’s intention to purchase the product. It refers to the individual thoughts or plans for specific behaviors and sometime includes the intention of recommendation (Jeon, Hye Yeon, 2009, p.20 ~ 21). The purchase intention literally refers to the degree of purchase intention toward a specific brand (Lee, Doo Hee, 2006, p.135)

Since the purchase of the product is affected more by the purchase intention then the purchase attitude, the purchase attitude enables it to predict the behaviors more accurately than the attitude towards the subjects (Engel, JF & Blackwell RD 1982). Therefore, the purchase intention is a link between purchase attitude and purchase behavior in understanding consumer’s purchase behavior. The existing researches point out that there is a positive (+) relationship between purchase attitude and purchase behavior, and purchase intention can be used as the predictive value of actual purchase behavior. 29)

Researchers of consumer behaviors believe that consumers are unlikely purchase according to their purchase attitude and they are more likely to purchase when they have purchase intention. In other words, purchase intention mediates purchase attitude and purchase behavior, and purchase behavior can be predicted more accurately by purchase intention than purchase attitude.

III. Research

3.1. Research design

This research seeks to examine the consumer attitude toward POP advertisement and consequent purchase behavior. To achieve the purpose of this research, a questionnaire survey was conducted with the purchasers at one franchise store (brunch café) run by small business entrepreneur for less than 5
years. The research is intended to investigate the overall consumer attitude toward the advertisement in the dimension of recognition, emotion and behavior through a questionnaire survey.

3.2. Sample design and data collection

To investigate the consumer attitude toward POP advertisement, an on-site questionnaire survey was conducted with the consumers by changing the types of POP advertisement according to the types of information delivery based on consumer sense. The types of POP advertisement included 5 types of information provision: ‘main menu board information’, ‘visual mini board information at the counter’, ‘acoustic audio file information at the counter’, ‘visual mini board information at the counter+ acoustic audio file information at the counter’ and ‘sales staff information’.

The franchise store (brunch café, 38 Pyeong) was opened in 2003 for the purpose of making a living. It was located in Gangseo-gu, Seoul. This store frequently implemented marketing activities and sales promotions using LED displays, banners, placards and flyer-type menu board. The store implemented POP advertisement as follows:

A. Advertisement information: Fruit juices as seasonal items (plums, bananas)

B. Location of advertisement: Counter (store counter, menu board)

C. Delivery of information: Visual type A (printed materials), Visual type B (menu board), Acoustic type (audio file recorded by sales staff), Mixed type A (sales staff delivers advertisement information using visual advertisement), Mixed type B (sales staff delivers information using visual advertisement and acoustic advertisement)

For empirical research and data analysis based on the advertisement information which was not notified before experiment, POP advertisement was produced for the new items that the store did not handle previously. Data was collected through a questionnaire survey with 250 actual purchases and from the sales data of the store. The survey was conducted for 5 days from Jun 29 till Jul 4 2016.

3.3. Research hypotheses

This research seeks to investigate the relationship between the responses to the attitude experienced by the consumers exposed to POP advertisement and the mediating effect of POP advertisement in the relationship between these variables. The research had two main subjects: the investigation of the casual relationship between variables and the investigation of the relationship between POP advertisement attitude and purchase intention.

Unlike the collective communication characteristics of general media advertisement, POP advertisement directly communicates with consumers at the point of purchase. First, this research seeks to investigate the mediating effect of advertisement attitude on consumer recognition and usage of POP advertisement. The advertisement messages that consumers are faced with are delivered by a variety of types of appeal. The degree of interest in advertisement massages varies depending on how much the massages are associated with consumers and how much important consumers think they are. Consumers consider POP advertisement to be helpful for the inducement of interest, purchase, selection through comparison, comprehension of contents and provision of information. First, this research seeks to investigate the mediating effect of the advertisement attitude on the process where consumer recognition and usage of POP advertisement lead to purchase intention.
According to the existing researches on the advertisement effect, consumer’s liking of the advertisement increase the tendency of accepting advertisement massages (Mackenzie, Lutz & Belch, 1986); the advertisement that make a favorable impression affects the emotional components, so it has a greater effect on persuasion (Miller & Marks, 1992); the advertisement attitude mediates brand attitude and behavioral intention (Moore and Hutchison, (1983); the advertisement has dual effect—in other words, if consumer’s favorable emotion toward the advertisement is linked to the brand, it will affect the attitude, and the advertisement attitude mediates advertisement effect (Mitchell & Olson 1981). Based on these researches, the following hypotheses were established.

**Hypothesis 1.**

The reliability and liking will mediate the effect of the recognition and usage of POP advertisement on purchase intention.

And the effects of respective variable were predicted as follows:

The favorable response to the advertisement can develop into the favorable attitude towards the advertised products and brands, leading to the purchase intention (Lipstein & Neelankavil, 1984); the reliability of advertisement increases the acceptance of long-term orientation and independence and enables immersion, reducing the risks perceived by consumers (Morgan & Hunt, 1994); the execution of advertisement based on advertisement attitude forms consumer’s favorable attitude toward the advertisement, so the consumers have positive feeling after being exposed to advertisement (Shimp, 1981); consumers have favorable or unfavorable attitude toward the advertisement when exposed to advertisement, which greatly affects their purchase intention(Lee, Ki Won, 1986). Jeon, Ho Sung (2005) has summarized the attitude formation process as follows: From the point of view of Hierarchy-of-effects theory, the relationship between attitude and other concepts is the relationship between recognition-attitude-purchase intention, and both cognitive response and emotional response affects the attitude formation process at the same time. In the research of the relationship between internet advertisement attitude and purchase intention, Park, Hee Seok and Kim, Young Hwa (2001) claimed the advertisement attitude has a positive (+) effect on the purchase intention. Par, No Hyun (2002) said in his research of website advertisement attitude that the advertisement attitude has a positive effect on the purchase intention.

Based on these researches, this research established the second and third hypothesis relating to the relationship between POP advertisement attitude, reliability, liking and purchase intention as follows:

**Hypothesis 2.**

The recognition and usage of POP advertisement will have a positive (+) effect on the reliability, liking and purchase intention.

**Hypothesis 3.**

The reliability and liking of POP advertisement will have a positive (+) effect on the reliability, liking and purchase intention.

**3.4. Research Model**

When consumers are exposed to a certain advertisement, their recognition and usage of the advertisement and the advertisement attitude are formed, which in turn lead to the changes in purchase
intention. This research seeks to verify this process. To do this, this research has modeled the relationship between the advertisement attitude, consumer attitude and purchase intention. Under the premise that overall attitude (e.g. recognition, liking, reliability and purchase intention) toward the advertisement will manifest according to the individual psychological factors of consumers, this research has established the research model as below.

3.5. Operational definition of variables and measurement

To conduct an empirical analysis, this research constructed a questionnaire for the recognition and usage of POP, reliability, liking and purchase intention by categorizing them according to consumer’s attitude and demographic characteristics and measured the replies to respective questions using Likert 5-Point Scale (‘Not at all (1)’ ~ ‘Very much so (5)’).

In this research, the recognition and usage of POP advertisement are defined as follows: the recognition and usage of POP advertisement entails a process of thinking as cognitive phase, and serves to draw attention and deliver information in this phase, and consumers pay attention or trust the contents and acquire new information. The questionnaire consists of 5 questions regarding the recognition and usage of POP advertisement. The 5 questions (e.g. interest, affirmation at the point of purchase, usage for the comparison of products, the comprehension of contents and the provision of information) used in the research of POP advertisement conducted by Choi, Yoon Gyung (2004) and Choi, Seon Mi (2011) were used and Likert 5-Point Scale (‘Not at all (1)’ ~ ‘Very much so (5)’) was used for measurement.

The reliability of advertisement is affected by cognitive and emotional factors such as the individual recognition, reliability and fun of the information source or media, and determines future behavioral intention or actual behaviors (Appel, 1987)

In this research, the reliability of advertisement is defined as the belief or favorable attitude toward the advertisement after being faced with POP advertisement. For the questions, a total of 3 questions (2 questions (e.g. reliability and belief) used in the research conducted by Min, Bok Ki (2006) and Choi, Seon Mi (2011), and one question modified by the researchers for taste) were used and Likert 5-Point Scale (‘Not at all (1)’ ~ ‘Very much so (5)’) was used for measurement.

The liking of advertisement refers to the positive/favorable/unfavorable feeling of a person toward one object (Fishbein, 1966). In this research, the liking was defined as the degree of the linking for the
advertisement after being exposed to POP advertisement. 3 questions (liking, interest and satisfaction) used in the research conducted by Kim Soo Jin (2009) and Choi, Seon Mi (2011) were used and Likert 5-Point Scale (‘Not at all (1)’ ~ ‘Very much so (5)’) was used for measurement.

The purchase intention is the concept that synthesizes consumer’s interests in the subjects of purchase and the possibility of purchase (Appel, 1987). For the questions regarding the purchase intention, 3 questions (e.g. ‘feeling like to purchase’, ‘the possibility of purchase is high’, ‘feeling like to recommend’) were used and Likert 5-Point Scale (‘Not at all (1)’ ~ ‘Very much so (5)’) was used for measurement.

Additionally, to measure the effect of POP advertisement on sales, the researchers constructed 1 question regarding whether the product was purchased using the question used in the research conducted by Cho, Mi Na(2009) and 2 questions relating to the contents of the advertisement implemented by the store which was the subject for experiment to ask the questions for the effect on purchase and for whether the item was purchased. For a demographic analysis, the respondents were asked to describe their gender, age and professions.

4. Results

The hypotheses were tested. The effects of POP advertisement on consumer recognition and advertisement attitude and purchase intention are summarized in the table below.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>The reliability and liking will mediate the effect of the recognition and usage of POP advertisement on purchase intention.</td>
<td>Adopted</td>
</tr>
<tr>
<td>The recognition and usage of POP advertisement will have a positive (+) effect on the reliability, liking and purchase intention.</td>
<td>Adopted</td>
</tr>
<tr>
<td>The reliability and liking of POP advertisement will have a positive (+) effect on the reliability, liking and purchase intention.</td>
<td>Adopted</td>
</tr>
</tbody>
</table>

To verify whether the recognition and usage of POP advertisement (α = .871) affects the reliability (α = .883) and the liking (α = .827) of POP advertisement and these two variables affect the purchase intention (α = 0.850), this research verified the multi-parameter model using Hayes (2013)’s Process Model 4 (2013).

The results of analysis showed that the recognition, usage, reliability, and liking provided a better explanation for the purchase intention (R²=.5659, p<.000) compared to the logic between the reliability (R²=.3928, p<.000) and liking (R²=.4218, p<.000) of advertising. The recognition and usage of recognition showed positive effect on the purchase intention, indicating a significant direct effect (β=.1699, p=.0036). Additionally, the indirect effect of reliability and liking also showed a significant level.

The indirect effect by reliability is expected to be .1757 (95% CI = [.0994, .2746]). In other words, the purchase intention between two persons with one unit of difference in the usage and recognition shows the difference of .1757 through the reliability, indicating the greater recognition and usage the greater the purchase intention. In other words, with an increase in the recognition and usage, the reliability of
the advertising is increased ($\beta=.6157$, $p=.0000$), which in turn increases the purchase intention ($\beta=.2854$, $p=.0000$).

In addition, the indirect effect by liking is expected to be $0.2539 (95\% \text{ CI} = [0.1563, 0.3671])$. In this case, the purchase intention between two persons with one unit of difference in the recognition and usage shows the difference of $0.2539$ through the liking of the advertisement, indicating the greater recognition and usage the greater the purchase intention. More specifically, an increase in the recognition and usage, the liking of the advertising is increased ($\beta=.6056$, $p=.0000$), which in turn increases the purchase intention ($\beta=.4192$, $p=.0000$).

Total indirect effect of the reliability and liking is significant with the result of $0.4296 (95\% \text{ CI} = [0.3444, 0.5220])$. Due to the result of the recognition and usage affecting the purchase intention, the recognition increased by one unit shows 0.4296 of increase in the purchase intention on an average. Therefore, the total effect of the recognition and usage is significant with the result of $0.5995 (0.4296 + 0.1699; 95\% \text{ CI} = [0.4999, 0.6991])$. This can be summarized in the diagram below.

Figure.

5. Discussion & Implications

This research was conducted to verify the effectiveness of POP advertisement in the retail store using a hierarchical model of advertisement effect of POP advertisement. More specifically, this research
seeks to identify the relationship between the recognition and usage of POP advertisement stimulating the purchase intention of consumers and promoting sales, and the consumer’s reliability and liking of the advertisement and purchase intention manifesting in the process of the advertisement attitude. There have been no researches conducted on POP advertisement based on the consumer analysis regarding the advertisement attitude. This research has discriminatory significance compared to the existing researches in that it was conducted in the store where the POP advertisement was implemented based on consumer attitude and empirical sales data.

To identify the concept, roles and effect of respective variable, hypotheses were established through literature review and data was collection through a questionnaire survey. A questionnaire was constructed in the recognition and usage of the advertisement and the consumer attitude such as the reliability and liking of advertisement and purchase intention for demographic analysis and a total of 250 questionnaires were used for an analysis.

The recognition and the usage of the types of POP advertisement were set as independent variables and the reliability and liking were set as mediating variables by assuming that these variables have an effect on the dependent variable of the purchase intention. As summarized as above, the POP advertisement attitude such as reliability and liking showed a mediating effect on the relationship with the purchase intentions and the results of the purchase behavior in the store had a positive (+) effect on the mediating variables (e.g. reliability and liking) and the dependent variable (e.g. purchase intention). Furthermore, the reliability and liking of POP advertisement, which is the mediating variable, had a positive (+) effect on the purchase intention.

The results indicate that the recognition and usage of the advertisement affecting the purchase intention have the meaningful effectiveness of POP advertisement in the provision of information. In other words, as demonstrated in the existing researches on the advertisement awareness and attitude, the provision of information is critical in the determination of the advertisement attitude. In a word, the provision of information make consumer evaluate the advertisement favorably (Alwitt & Prabhaker, 1992. Mittal, 1994 and Bakeunah, 2006), and this has also been proved in this empirical research. This implies that from the point of view of the functions of POP advertisement, the recognition and usage of the advertisement for providing information pay a large part.

For the relationship between advertisement attitude and purchase intention, Park, Hee Seok and Kim, Young Hwa (2011) analyzed the relationship between the advertisement attitude and purchase intention. The results showed that the advertisement attitude has a significant positive effect on the purchase intention. In the research of the website advertisement attitude (cognitive and emotional response), Park, No Hyun (2002) demonstrated the positive effect on website advertisement attitude, brand attitude and purchase intention, and these results are consistent with the results of this empirical research of POP advertisement. In short, the reliability and liking for the recognition and usage of the advertisement sequentially affect the purchase intention.

However, conclusions about the attitude formation for the consumers exposed to the advertisement have yet to be made. Until now, there are a lot of disputes and arguments regarding which is more critical variable between emotion and recognition. In other words, the problems regarding whether the advertisement attitude is formed as emotional response or cognitive response after consumers are faced with the advertisement are limited, but in POP advertisement, the effect of cognitive response on the purchase intention, which is behavioral response, is mediated by the emotional attitude as demonstrated in this research. Therefore, it is essential that advertisers or store owners who come in contact with consumers use the contents by respective consumer attitude factors. This implies that it is
essential to utilize POP advertisement as an effective and efficient advertisement media at the point of purchase in the store by understanding the ability of POP advertisement to provide information and induce immediate consumer response.

This research has examined the cognitive, emotional and behavioral attitude of consumers based on the operational process of POP advertisement in the store. A lot of limitations were identified in the process of experiment and of analyzing the results. A few of the limitations of this research can be summarized as follows:

First, this research has failed to secure a variety of sample group. Due to the nature of this empirical research - temporal, geographical and spatial constraints, only one store was investigated. It is desirable to survey the groups with various tendencies, therefore, it is impracticable for the surveyed group to have representativeness.

Second, it was virtually impossible to have complete control in the course of the experiment. The consumer needs for the experimental items could vary according to the times zones in the measurement of the recognition and usage by the consumers exposed to POP advertisement and this research failed to control the exogenous variables that might be unnecessarily generated due to the delimited measurement process such as the psychological conditions of consumers and the physical conditions of the sales environment. These limitations were also pointed out in the existing researches.

Third, the results of comparison by respective consumer attitudes should be been measured after the measurement of the attributes of POP advertisement for a variety of items in the process of measuring the recognition and usage of the advertisement, but this research has failed to do so. Since the consumer response varies depending on the involvement at the point of purchase, to measure the various attributes of advertisement, a variety of categories that might generate the difference in the involvement of consumers in the advertised items. Due the nature of POP advertisement, the limitations in the operation of the experimental store made it difficult to approach the advertisement attribute factors in detail.

Fourth, since it was difficult to find the existing researches on the processing or consumer information by the types of POP massages and the personal characteristic variables were measured through a questionnaire survey based on Likert Scale, so the groups were categorized based on mean values by measuring the consumer needs for recognition and the strength of their emotion. This made it difficult to prove the advertisement effect according to the personal characteristics variables and the interaction of POP advertisement messages in the experimental circumstances.

Due to the limited samples and the special conditions of the site, this research has many limitations. To verify the changes in the consumer attitude and the advertisement effect, the future researches need to comprehend the purchase decision making process of consumers and consider other marketing variables that might occur when specific products are purchased for a comprehensive analysis.

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Impacts of Characteristics of Economic Sectors and Industry Sectors on Business Efficiency of Vietnamese Enterprises by the analysis of variance

Pham Quang Tin, Pham Kim Ngoc, Nguyen Tran Thuan, Doan Gia Dung

Danang University of Economics, The University of Danang, Vietnam

Abstract

Since the Sixth National Congress of Vietnamese Communist Party (1986), Vietnam has implemented several policies and plans on improving Vietnam's economy by means of diversifying both economic sectors and industry sectors. There have been some experimental studies assessing the performance efficiency of these economic sectors and industry sectors (ESIS) at macro level. However, the research about impacts of ESIS characteristics on enterprise’s efficiency is hardly found. Particularly, research into simultaneous impacts of both ESIS on enterprise’s efficiency has been limited. Hence, this article utilizes the analysis of variance (ANOVA) to grasp the impacts of ESIS on enterprise’s efficiency as a basis for implied policy proposals to related parties in promoting development of Vietnamese enterprises.

Keywords: Business efficiency; ROA; analysis of variance; economic sectors; industry sectors

1. Introduction

As part of communication process, advertisement delivers product information, stimulates the needs of consumers or induces consumer purchase behavior through advertisement massages. Advertisement motivates consumers to have linking and reliability toward products and services (Lee, Seong Gu, 1999). As such, advertisement seeks to deliver the contents and information to consumers effectively for the purpose of persuading them. The purpose of advertisement is to persuade the recipient and thereby maximize communication efficiency.

Based on characteristics of equity ownership, Vietnamese enterprises are classified into three major groups of economic sectors (ES): state-owned sector, non-state owned sector and foreign invested sector with the detailed component as below:

- State-owned sector (SOS): one-member limited liability companies with 100% of state-owned capital; joint-stock companies and limited liability companies with above 50% of state-owned capital
- Non-state owned sector (NSOS): types of cooperatives and unions of cooperatives; limited liability companies with \( \leq 50\% \) of state-owned capital; joint stock companies with \( \leq 50\% \) of state-owned capital.
- Foreign invested sector (FIS): enterprises with 100% of foreign direct investment; private enterprises or state-owned enterprises joint venture with foreign partners.

process of monitoring the nation, there have been changes in Vietnamese government’s and Vietnamese Communist party’s policies, allowing the multi-sector economy and facilitating the improvement of different ES, nonetheless still maintaining the development of state-owned economy sector which plays the primary role in the economy. Thus, Vietnam government has incentives to orientate the development of state-owned economy sector as compared with others.

Based on business lines, Vietnamese enterprises are divided into three major groups of industry sector, according to International Standard Industrial Classification of all Economic Activities (ISIC), as well as the rules of economic classification of Vietnamese government (Decision 10 of Prime Minister in year of 2007-10/2007/QĐ-TT) including: Agriculture, Forestry and Fishing sector (AFFS), Manufacturing sector (MS) and Service sector (SS). Determined to make SOS the primary economic sector in Vietnam, the Seventh National Congress of Vietnamese Communist Party in the year of 1991; the Eighth National Congress in 1996 and the Eleventh National Congress in 2011 have specified strategies for building Vietnam’s economy in the direction of industrialization, prioritizing the orientation of developing manufacturing and service groups in preference to agriculture, forestry and fishing.

The fact that Vietnam has various incentives and policies in monitoring resources for the growth of state-owned economic sectors, manufacturing and service sector has affected all business activities. In fact, there have been some experimental studies assessing the business performance of different economic sectors and industry sectors in Vietnam as below:

- About the investment efficiency of different economic sectors: according to the research findings of Nguyen Tran Que (2004), Nguyen Thuy Huong (2009), Pham Minh Chinh – Vuong Quan Hoang (2009), Hoang Sy Dong (2014); the investment efficiency of different economic sectors in Vietnam was not the same
- About the investment efficiency of different industry sectors: according to the research findings of Nguyen Thi Canh (2012), Nguyen Thi Thanh Tuyen (2012), Doan Lien Diem (2012), Bui Quang Binh (2010); the investment efficiency of different industry sectors in Vietnam was not the same

Although there have been many experimental studies into the business performance of economic sectors and industry sectors by the investment efficiency ratio, the rigorous studies into how enterprise’s detail business performance affected by economic sector or industry sector in Vietnam, especially affected by both criteria of economic sectors and industry sectors have not been studied. For this reason, this article used quantitative approaches to study impacts of characteristics of economic sectors and industry sectors on enterprises’ business efficiency to form the basis for suggestions of better development of Vietnamese enterprises indifferent economic sectors and industry sectors. The rest of this study is organized as follows: section 2 provides related literature; section 3 presents research design; section 4 shows the research findings and section 5 concludes the study.

2. Literature review and research questions

To analyze the impacts of economic sectors and industry sectors on enterprises’ business efficiency in Vietnam, the authors mainly investigate the theory of comparative advantage of David Ricardo (1817). According to David Ricardo, enterprises with different characteristics in equity ownership would have different advantages, which results in the difference in business efficiency. In other words, enterprises in different economic sectors should have their own competitive advantages that will contribute to different business performance.
According to Hymer’s research in the United States (1976), foreign invested enterprises enjoy the benefits of capital, technology and management skills. Meanwhile, domestic enterprises have advantages of tradition and understanding of consumption market. As a result, foreign invested enterprises and domestic enterprises will tend to have different business efficiency.

The research of Loree – Guisinger (1995) mentioned “The Government’s advantage of the investment incentives”. Loree – Guisinger asserted that there have been various preferences of government investment to different ES in different countries; as a result, investment efficiency among economic sectors varies. This means that enterprises of SOS, NSOS and FIS have dissimilar preferences of investment causing the divergence in business performance.

In order to assess impacts of economic sectors on business performance of enterprise, it is necessary to answer question (01): “Do Vietnamese enterprises of different economic sectors perform differently?”

In addition to the impact of economic sectors, enterprises from different industry sectors in the same economic sector will have advantages which cause the variance in business efficiency. Based on the National Economic Classification according to System of National Accounts (SNA) of United Nations (1989) and the System of Vietnam’s National Economic Classification by the decision number: 10/2007/QĐ-TTg, all economic activities are classified into 21 primary groups pertaining to 3 main industry sectors: Agriculture, Forestry, Fishing; Manufacturing and Service. The business process of each industry sector would have different requirements and features; implying enterprises from different industry sectors would have different advantages leading to the variation in their performance.

In order to assess impacts of industry sectors on business efficiency of enterprise, it is necessary to answer question (02): “Do Vietnamese enterprises of different industry sectors perform differently?”

The research questions (01) and (02) can explain the separate impacts of economic sector characteristics and industry sector characteristics on enterprises’ business efficiency but fail to explain the simultaneous impacts of ESIS on it. Lilach Nachum (2004) studying 345 companies at developing countries showed the impacts of different business areas and ownership structures on business efficiency. Somnath Lahiri and Saptarshi Purkayastha (2015) after studying Indian companies in the period 2004-2008 showed business efficiency was affected by their business lines and economics sectors. Besides, there are experimental studies of authors: Kwangmin Park – Soo Cheong (Shawn) Jang (2012) and Chiung Jung Chen – Chwo Ming Joseph Yu (2012) supporting the mentioned opinion.

With the aim of explaining the simultaneous impacts of ESIS on Vietnamese enterprises’ efficiency, it is essential to answer (03): “Do Vietnamese enterprises of different economic sectors or different industry sectors perform differently?”

In other words, does this means Vietnamese enterprises of different economic sectors but similar industry sectors, or similar economic sectors but different industry sectors, or enterprises of difference in both perform differently?

Enterprise’s business efficiency is compared between its outputs and inputs. In this research, enterprise’s business efficiency is measured with Return On Assets (ROA). ROA is one of the ratios reflecting business efficiency where the higher value indicates the higher business efficiency. Therefore, impacts of characteristics of EST on enterprise’s ROA can be referred to as impacts on their business efficiency.
3. Research design

3.1. Analysis methods
The research uses variance of analysis (ANOVA) to analyze the data. ANOVA is a statistical analysis technique used to examine if the null hypothesis of population means are equal (at least 3 populations) by means of sample data and the purpose of examining effects of reasons and results.

Conditions of reliable results of ANOVA according to Anderson (2014):
- For each population, the response variable is normally distribution.
- The variance of the dependent variable (result variance) must be equal.

3.1.1. One-way ANOVA
One-way ANOVA is a technique examining impacts of an independent variable (qualitative variable) on a dependent variable (quantitative variable). Results of one-way ANOVA are to conclude the population means are equal (01):
\[ H_{0.1}: \text{Population means are equal.} \]
\[ H_{1.1}: \text{Population means are not equal.} \]

Population of hypotheses (01) is specified based on characteristics of an independent variable (a qualitative variable). In order to fit one-way ANOVA, the independent variable (qualitative variable) has to have at least three separate characteristics to form 3 different research populations. Results of one-way ANOVA are illustrated in table (01):

Table 01: Results of One-way ANOVA in a general format:

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of squares</th>
<th>Degree of Freedom</th>
<th>Mean squares</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between-groups</td>
<td>SSG</td>
<td>k-1</td>
<td>MSG=SSG/(k-1)</td>
<td>F=MSG/MSW</td>
</tr>
<tr>
<td>With-groups</td>
<td>SSW</td>
<td>n-k</td>
<td>MSW=SSW/(n-k)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>SST</td>
<td>n-1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SSG: Sum of squares between groups; K: number of groups; SSW: Sum of squares within groups; n: observed sample; SST: total sum of squares.

Comparing the value of F ratio with the F value of standard normal distribution table to make a foundation for disproving or not disproving the equivalence of population means of general hypothesis (01)

In order to assess impacts of characteristics of economic sectors on business efficiency of Vietnamese enterprises with one-way ANOVA, research question (01) should be replaced with a research hypothesis (02):
\[ H_{0.2}: \text{ROA of enterprises whose characteristics of economic sectors are different are equal.} \]
\[ H_{1.2}: \text{ROA of enterprises whose characteristics of economic sectors are different are not equal.} \]

The independent variable (qualitative variable) in hypothesis (02) is characteristics of economic sectors of enterprises. In Vietnam, based on the classification of economic sectors, all enterprises classify into 3 groups (3 populations): SOS, NSOS and FIS, which match one-way ANOVA.

Likewise, in order to assess impacts of characteristics of industry sectors on enterprises’ business efficiency with one-way ANOVA, research question (02) should be replaced with a hypothesis (03) studying:
\( H_{0.3} \): ROA of enterprises whose characteristics of industry sectors are different are equal.
\( H_{1.3} \): ROA of enterprises whose characteristics of industry sectors are different are not equal.

The independent variable (qualitative variable) in the hypothesis (03) is characteristics of business lines of enterprises. In Vietnam, based on the classification of business sectors, all enterprises classify into 3 groups (3 populations): Agriculture, Forestry, Fishing; Manufacturing and Service Industry, which matches one-way ANOVA.

3.1.2. Two-way ANOVA

One-way ANOVA can only answer research questions (01) and (02), in order to answer research question (03), it is necessary to utilize two-way ANOVA. Two-way ANOVA is a technique examining impacts of two independent variables (qualitative variables) on a dependent variable (quantitative variable). Results of two-way ANOVA are to conclude the populations' means are equal of general hypotheses (04):

\( H_{0.4} \): Population means are equal.
\( H_{1.4} \): Population means are not equal

Populations of the hypothesis (04) are specified based on characteristics of two independent variables (qualitative variables). The first independent variable (qualitative variable) has \( K \) feature (\( K \) groups) and the second one has \( B \) features (\( B \) groups), which form \( K \cdot B \) different research populations. Results of two-way ANOVA are illustrated in table (02):

Table 02: Results of two-way ANOVA in a general format

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of squares</th>
<th>Degree of Freedom</th>
<th>Mean squares</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between-groups</td>
<td>SSG</td>
<td>K-1</td>
<td>MSG=SSG/(K-1)</td>
<td>F1=MSG/MSE</td>
</tr>
<tr>
<td>Between-blocks</td>
<td>SSB</td>
<td>B-1</td>
<td>MSB=SSB/(B-1)</td>
<td>F2=MSB/MSE</td>
</tr>
<tr>
<td>Interaction</td>
<td>SSI</td>
<td>(K-1)(B-1)</td>
<td>MSI=SSI/(K-1)(B-1)</td>
<td>F3=MSI/MSE</td>
</tr>
<tr>
<td>Error</td>
<td>SSE</td>
<td>n-(BK-1)</td>
<td>MSE=SSW/(n-(BK-1))</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>SST</td>
<td>N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( SSG \): Sum of squares between groups formed from \( K \) groups; \( SSB \): Sum of squares between groups formed from \( K \) groups. \( SSI \): Sum of squares interaction formed from \( K \cdot B \) groups; \( SSE \): Sum of squares error; \( SST \): Sum of squares total, \( n \): observed sample

Comparing the value of \( F_3 \) ratio with the \( F \) value of standard normal distribution table to make a foundation for disproving or not disproving the equivalence of population means of hypothesis (04)

In order to assess simultaneous impacts of EST on enterprises’ business efficiency with two-way ANOVA, research question (03) should be replaced with a research hypothesis (05):

\( H_{0.5} \): ROA of enterprises whose characteristics of economic sectors or industry sectors are different are equal.
\( H_{1.5} \): ROA of enterprises whose characteristics of economic sectors or industry sectors are different are not equal.

Population of the hypothesis (05) is specified based on the combination of economic sectors (3 groups) and industry sectors (3 groups), which forms the sum of 9 research populations.
3.2. Research data

Data resources of this research based mainly on data of enterprise-investigating 2015 of four regions: Hue, DaNang, QuangNam and QuangNgai, all of which are included in the enterprise-investigating program held by The General Statistics Office Vietnam (GSO) in the year 2015.

According to the result of investigation program in Hue, Da Nang, Quang Nam and QuangNgai in 2015, there have been some startup companies since 2014, which lead to the lack of information for involving ratios. Thus, enterprises without full data will be eliminated to guarantee the representativeness of estimates and testing conducted in the research.

Table 03: Distribution of sample research enterprises of economic sectors and industry sectors

<table>
<thead>
<tr>
<th>Industry sectors</th>
<th>Economic sectors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>State-owned sector</td>
<td></td>
</tr>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>222</td>
<td>580</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>253</td>
<td>2,137</td>
</tr>
<tr>
<td>Service</td>
<td>133</td>
<td>2,016</td>
</tr>
<tr>
<td></td>
<td>Non-state owned sector</td>
<td></td>
</tr>
<tr>
<td></td>
<td>301</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,602</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,565</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foreign invested sector</td>
<td></td>
</tr>
<tr>
<td></td>
<td>57</td>
<td></td>
</tr>
<tr>
<td></td>
<td>282</td>
<td></td>
</tr>
<tr>
<td></td>
<td>318</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,733</td>
</tr>
</tbody>
</table>

The total number of enterprises surveyed in the research is 4,733 enterprises distributed as data shown in table 03. Results of survey sample distribution inherit from the structure of enterprise survey samples by the GSO in Vietnam, apportioned based on the proportion of Vietnamese enterprises of economic sectors and industry sectors, therefore data of survey samples ensures the representativeness of estimates and testing in this research.

4. Research findings

The research data have been tested the variance equivalence of the populations based on the Homogeneity testing standards and each analyzed group always has more than 30 observations (Data shown in table 03) thus average values follow the standard distribution, meeting the requirement of ANOVA. To decrease complicated calculating work, this article uses results drawn from statistical analysis software in an attempt to form a basis for assertions of testing results and statistical estimates.

4.1. Impacts of characteristics of economic sectors on enterprises’ business efficiency.

Table 04: ROA estimated results of enterprises of different economic sectors

<table>
<thead>
<tr>
<th>Types of enterprises</th>
<th>N</th>
<th>Mean (% )</th>
<th>95% Confidence Interval for Mean (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State owned</td>
<td>608</td>
<td>-0.23</td>
<td>Lower Bound = -1.58, Upper Bound = 1.11</td>
</tr>
</tbody>
</table>
ROA estimated results of Vietnamese enterprises by point estimate being 2.64% with confidence interval of 95% by interval estimate from 2.24 – 3.03%. In which, ROA of enterprises in the non-state owned economic sectors is the highest with the point estimate being 3.35% and the interval estimate between 2.95 – 3.75%. ROA value of enterprises of foreign invested economic sectors comes second with 1.53% and interval estimate between 0.13 – 2.94%. What should be noticed is that enterprises of state-owned economic sectors has very low average ROA value of -0.23% which shows that their business performance is far less efficient than those other types of economic sectors. Meanwhile, Vietnamese government’s orientation is to develop SOS as main role in the economy, which is unsuitable for the rule of value.

Table 05: Results of ANOVA about impacts of characteristics of ES on ROA

<table>
<thead>
<tr>
<th>Between Groups</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>7,566.510</td>
<td>2</td>
<td>3,783.25</td>
<td>20.080</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>891,194.645</td>
<td>4,730</td>
<td>188.413</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>898,761.155</td>
<td>4,732</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data in table 05 has \( \text{sig}=0.000<5\% \) (The probability of making errors when disproving null hypothesis) therefore the research has the foundation of disproving the null hypothesis \( H_0 \). In other words, with the significant level of 5%, it is possible to conclude that “characteristics of ES have an impact on enterprises’ ROA”. This means that in the condition factors affecting enterprises’ business efficiency are alike but business efficiency of enterprises whose characteristics of economic sectors are different is unequal.

Table 06: Results of ROA estimated deviation of economic sectors

<table>
<thead>
<tr>
<th>(I) Types of enterprises</th>
<th>(J) Types of enterprises</th>
<th>Mean Difference (I-J) (%)</th>
<th>95% Confidence Interval (%)</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-state owned</td>
<td>State-owned</td>
<td>3.58</td>
<td>2.17</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td>Non-state owned</td>
<td>Foreign invested</td>
<td>1.82</td>
<td>0.45</td>
<td>3.18</td>
<td></td>
</tr>
<tr>
<td>Foreign invested</td>
<td>State owned</td>
<td>1.77</td>
<td>0.04</td>
<td>3.58</td>
<td></td>
</tr>
</tbody>
</table>
There is a huge difference between the average values of ROA of enterprises in different economic sectors. In point estimate, non-state owned enterprises are 3.58% higher than state owned ones and 1.82% higher than those with foreign investment. Based on interval estimate with confidence level being 95%, average ROA of non-state owned enterprises is 2.17 – equivalent to 5% higher than state owned ones and 0.45 – approximately 3.18% higher than those with foreign investment. ROA of enterprises with foreign investment is higher than state-owned enterprises by point estimate being 1.77% and by interval estimate being 0.04 – about 3.58%.

Ignoring other elements and simply considering enterprise’s efficiency of business activities based on ROA, Vietnam should orientate priority for development: Non-state owned enterprises, enterprises with foreign investment respectively. State-owned enterprises should not be prioritized to invest budget in, resources should be poured on efficient types of other economic sectors.

### 4.2 Testing impacts of characteristics of industry sector on enterprises’ business efficiency

Table 07: ROA Estimated results of enterprises of different industry sectors

<table>
<thead>
<tr>
<th>Industry sector</th>
<th>N</th>
<th>Mean (%)</th>
<th>95% Confidence Interval for Mean (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
</tr>
<tr>
<td>Agriculture, Forestry and Fishing</td>
<td>580</td>
<td>2.77</td>
<td>1.73</td>
<td>3.80</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2137</td>
<td>2.59</td>
<td>2.03</td>
<td>3.16</td>
</tr>
<tr>
<td>Service</td>
<td>2016</td>
<td>2.65</td>
<td>2.01</td>
<td>3.28</td>
</tr>
<tr>
<td>Total</td>
<td>4733</td>
<td>2.64</td>
<td>2.24</td>
<td>3.03</td>
</tr>
</tbody>
</table>

Considering enterprise’s industry sector, there is not so high deviation of ROA value among enterprises of different industry sectors. According to point estimate, the average value of ROA of enterprises in the field Agriculture and Forestry – Fishery is highest at 2.77%, followed by Service Industry at 2.65% and the lowest value of ROA belonged to Manufacturing Sector at 2.59%.

Besides, results of ANOVA in table 08 show the value of Sig = 0.964 > 5% thus have no ground of disproving the null hypothesis H0.3 of hypothesis (03). In other words, with the significant level of 5% it is possible to conclude: “ROA of enterprises whose characteristics of industry sectors are different is equal”. This reflects that in Vietnam, characteristics of industry sectors do not have much of an impact on enterprise’s business efficiency.

Table 08: Results of ANOVA of impacts of industry sector on ROA

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>13.744</td>
<td>2</td>
<td>6.872</td>
<td>.036</td>
<td>.964</td>
</tr>
<tr>
<td>Within Groups</td>
<td>898747.411</td>
<td>4730</td>
<td>190.010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>898761.155</td>
<td>4732</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3. Testing impacts of ESIS on enterprise’s business efficiency

Results of One-way ANOVA in table 05 and table 08 only allow research on separate impacts of economic sector or industry sector on enterprises’ business efficiency but fail to reflect the simultaneous impacts of characteristics of their ESIS on their business efficiency.

Values of sig in table 09 are all smaller than 5%. Therefore disproving the null hypothesis H0.5 means approving H1.5 of the hypothesis (05): “ROA of enterprises which ESIS are different is unequal”. This means enterprises whose ESIS are different would as a result have different business efficiency.

Table 09: Results of ANOVA of impacts of ESIS on ROA

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic sector</td>
<td>7,062.227</td>
<td>2</td>
<td>3,531.113</td>
<td>18.834</td>
<td>.000</td>
</tr>
<tr>
<td>Industry sector</td>
<td>2,602.990</td>
<td>2</td>
<td>1,301.495</td>
<td>6.942</td>
<td>.001</td>
</tr>
<tr>
<td>Economic sector x Industry sector</td>
<td>4,842.172</td>
<td>4</td>
<td>1,210.543</td>
<td>6.457</td>
<td>.000</td>
</tr>
<tr>
<td>Errors</td>
<td>885,669.885</td>
<td>4,724</td>
<td>187.483</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>931,672.510</td>
<td>4,733</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Detailed research into ROA of enterprises according to ESIS shown in table 10 illustrates that:

For Agriculture, Forestry and Fishery: enterprises with foreign investment have the highest ROA at 3.98%; followed by state-owned enterprises at 2.67% and non-state owned enterprises have the lowest at 2.61%. This is a worrying concern to Vietnam, since its economy is traditionally agricultural though business effectiveness of state-owned enterprises is not as high as those with foreign investment. The reason for this is that Vietnamese enterprises of Agriculture and Forestry – Fishery industry have not prioritized the application of technology in Agriculture - Fishery, thus that fields have not created as high value added products. Enterprises with foreign investment with advantages of experience and technology have created high value added products. Especially, with production in a large scale, the efficiency of foreign invested enterprises becomes higher than enterprises of other sectors.

For Manufacture and Service Industry: non-state owned enterprises are having the highest ROA at 3.26% and 3.58%, respectively higher than general average value at 2.59% and 2.65%. In the meantime, the business efficiency of state-owned enterprises is extremely low and remains at a loss. Characteristics of Vietnamese non-state owned enterprises are small scale and low business capital, which suits the flexibility of Service Industry thus puts their ROA above other industry. ROA value of state-owned enterprises in Service Industry is worrying as it is -4.99%, which makes it obvious that those enterprises’ performance in that field is inefficient and incompetent compared with other sectors. Therefore, state-owned enterprises should not be orientated to get promoted in such industry. Besides, in manufacture industry, the average value of ROA of the aforementioned enterprises is dramatically low at -0.28%, in comparison with the non-state owned enterprises at 3.58% and those with foreign investment at 1.39%. Hence, state-owned enterprises should also not involve in manufacture industry unless any breakthrough improvement is made so they could compete with their counterparts in other economic sectors.
## 5. Conclusion

As can be viewed from research results, if the Vietnamese enterprises’ business efficiency is based on ROA ratio, non-state owned enterprises for the highest, enterprises with foreign investment for the runner-up and the most worrying - state owned enterprises are in dire financial straits as their ROA has been below 0. By simply considering the difference in industry sector, there is not a huge difference in business efficiency among these enterprises, or in other words, industry sector do not bring about advantages of making such a great difference.

Combining the two characteristics of economic sectors and industry sectors, it can be clearly seen that Vietnamese enterprises’ performance differs greatly. In other words, their business effectiveness is under the influence of characteristics of both economic sectors and industry sector at the same time.

If we direct the enterprise development based on business efficiency, the rule of value says:

- State-owned enterprises should invest in Agriculture, Forestry and Fishing on the ground that their performance in this industry is better than in other fields namely Service and Manufacturing.
- Non-state owned enterprises should invest in Service industry and Manufacturing since their performance in these fields is better than in Agriculture, Forestry and Fishing.
- Enterprises with foreign investment has the highest business efficiency in Agriculture Forestry and Fishing at present, but their performance on Manufacturing and Service industry has not come up to expectations triggered by their potentials. Vietnam should take into account certain fields of Service industry and Manufacturing industry to attract investment of foreign enterprises. Additionally, it is necessary to investigate methods of accounting bookkeeping in these enterprises so as to accurately yield business performance to avoid “fake loss but real profit” as well as tax evasion.

This article has utilized the ANOVA, in particular Two-way ANOVA which is a statistical approach generating accurate research results in terms of quantifying the influence of ESIS on enterprises’ business efficiency. However, the research team could only approach resources of survey data of 4 regions: Hue, Da Nang, Quang Nam and QuangNgai, which leads to the limit in generalization of the whole Vietnamese enterprises. In the future, our team will broaden the survey data of sample enterprises to all provinces and cities under the central, in an attempt to boost the reliability of estimated results and testing.

### References

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14. UN (1989); System of National Accounts.
Impacts of University’s Credit-acquisition Regular Course on Start-up on Changes in the Psychological Characteristics of Students: Comparative Study on University’s Credit-acquisition Regular Course on Start-up and Non-regular Course on Start-up

Park Sang-ho, Jeon Ki-suk

Graduate School of Government, Business & Entrepreneurship, Yonsei University

Abstract

According to a belief that it can be a very meaningful study to examine changes in psychological characteristics of students of college’s credit-acquisition regular course on start-up at this point in time when the importance of start-up is increasing day by day, this study aims to compare and analyze the impacts of college’s credit-acquisition regular course on start-up as compared to a non-regular course on start-up on changes in the psychological characteristics of students.

As for research samples, for credit-acquisition type regular course on start-up, a survey was conducted with 200 students who were taking a course on start-up at major universities located in Gangwon-do, where entrepreneurship education has been vitalized, and the factors of changes in the psychological characteristics of students were analyzed based on 179 valid responses were analyzed. Also, for non-regular course on start-up, the factors of changes in the psychological characteristics of students were analyzed based on 150 valid responses collected from the participants in “Gangwon Global Youth Start-up Camp.”

As a result of the research, it turned out that credit-acquisition regular course on start-up had a more significant influence on changes in the psychological characteristics such as locus of control, need for achievement, ambiguity tolerance and creativity than the general entrepreneurship education not for credit acquisition. It can be noted that this finding shows the efficacy and importance of systematic entrepreneurship education, simultaneously, and since entrepreneurship education systematically prepared for one semester has a more significant impact on changes in the psychological characteristics of students of entrepreneurship education than non-regular, short-term entrepreneurship education like start-up camp, it is necessary to make more systematic preparations for this.

Keywords: Credit-acquisition course on start-up; changes in psychological characteristics

1. Introduction

At this point in time when people’s average life expectancy gradually increases with the advancement of technologies and the development of medical technologies, and also, the concept of jobs for life becomes invalid due to the development of uncertain economic environments, many people jump into start-up in order to maintain their livelihood, find and create their own jobs. In parallel with this interest in start-up, demand and necessity of entrepreneurship education tend to increase gradually. This study would be conducted in order to carry out entrepreneurship education more effectively for the reduction of failure of start-up and trial and error and to examine the impacts of this entrepreneurship education on entrepreneurs’ psychological characteristics.

In order to increase the performance of start-up, the Republic of Korea generally focuses on 3-to 4-day basic education to about 1-to 3-month short-term entrepreneurship education for prep entrepreneurs.
and beginning entrepreneurs by the Small and Medium Business Administration. In addition, the government departments centered around the SMBA, local governments and start-up-related institutions are carrying out entrepreneurship education with programs for characteristics, and universities such as Soongsil University and Hoseo University established and have operated start-up-related courses since the end of the 1990s for more systematic entrepreneurship education.

In the situation where a variety of entrepreneurship education is made and increasing, it is judged that it is necessary to think about the impact of entrepreneurship education on entrepreneurs once. Especially, according to a belief that it can be a meaningful study to examine changes in the psychological characteristics of students in university’s credit-acquisition course on start-up, this study aims to analyze the impact of university’s credit-acquisition course on start-up on changes in the students’ psychological characteristics. Along with this, this study would conduct a comparative study of changes in the psychological characteristics of the students between the two types of entrepreneurship education by comparing and analyzing changes in the psychological characteristics of the students of non-regular course on start-up, not for credit acquisition for general students, such as start-up academy and start-up camp.

Thus, this study would carry out research based on the item of creativity in addition to the generally known elements of entrepreneurs’ psychological characteristics, including locus of control, risk-taking intention, need for achievement and ambiguity tolerance. This study aims to compare and analyze how much impact the credit-acquisition entrepreneurship education and non-regular entrepreneurship education has on changes in their psychological characteristics.

2. Literature Review

2.1. Status of entrepreneurship education in the Republic of Korea

Since entrepreneurship education is a means of cultivating entrepreneurs and promoting start-up, university’s entrepreneurship education should expand. As universities began to set up courses on start-up in earnest, the domestic entrepreneurship education is expanding at a fast speed (Lee, Woo-jin & Hwang, Bo-yun, 2015). Education related to start-up carried out in the Republic of Korea can be divided broadly into two types. First, there is a course of formal education with general students at education institutions like university or graduate school, and second, there is a short-term education course given mainly to the existing entrepreneurs or preliminary founders at university or industry. The number of short-term education courses given in formal education course or industry at university or graduate school tends to increase gradually, and the number of short-term courses on start-up given mainly to preliminary founders and employees given in university, too, is increasing. There are more courses if special graduate schools operating courses having contents similar characters are included, and it seems that the number will increase further in the future (Ji, Yong-seok, 2005).

2.2. Preceding studies of entrepreneurs’ psychological characteristics

According to a preceding study conducted by Oh, Hae-yeong (2014), which investigated entrepreneurs’ psychological characteristics in the impact of preliminary founders’ psychological characteristics on the type of start-up, there were a lot of studies of business performances, start-up result and business feasibility. However, in many studies, sub-variables of psychological characteristics did not show significant impacts.
Jeong, Seong-han & Kim, Hae-ryong (2001) investigated the relationships among monthly sales, monthly net profit and satisfaction by looking at entrepreneurs’ psychological character as one factor of the personal characteristics, of the success factors of small business start-up. As a result of the study, entrepreneurs with a higher need for achievement felt greater satisfaction, and the other factors did not have significant impacts.

Kim, Wan-jae (2007) set up a hypothesis that entrepreneurs’ psychological characteristics would have a positive (+) impact on the financial performances and non-financial performances of the business performances of small enterprises, and as a result of the study, entrepreneurs’ psychological characteristics did not have a significant impact on financial performances while had significant impact on non-financial performances.

Kim, Jong-ha (2009) studied an impact on business performance with the psychological characteristics of young entrepreneurs as an independent variable. He set up a hypothesis that young entrepreneurs’ psychological characteristics would have a significant impact on business performance, and as a result of the study, each characteristic had statistically significant impact on business performance; however, as a result of a multiple regression analysis, only need for achievement had a statistically significant impact on business performance.

Lee, Seung-jae (2009) studied the impact of entrepreneurship education on changes in entrepreneurs’ psychological characteristics. He set up a hypothesis that changes in their psychological characteristics would differ depending on preliminary founders’ age and educational background, and the frequency of education. As a result of the study, it was found that entrepreneurship education changed preliminary founders’ psychological characteristics, but the extent of the changes did not reach a significant level. Age, educational background and the frequency of education were rejected, as well.

Jeong, Seong-yeong (2011) studied the impact of preliminary founders’ psychological characteristics on their entrepreneurial intention and the regulatory role of their satisfaction with entrepreneurship education in the process. He set up hypotheses that preliminary founders’ psychological characteristics would have a significant impact on their entrepreneurial intention and that their satisfaction with entrepreneurship education would have a regulatory impact in the relationship between preliminary founders’ psychological characteristics and their entrepreneurial intention. As a result of the study, of the psychological characteristics, all except for ambiguity tolerance were adopted while satisfaction with entrepreneurship education did not play a regulatory role.

Shin, Yong-il (2011) studied the impact of technology-based entrepreneurs’ psychological characteristics on their business performances. He set up a hypothesis that technology-based entrepreneurs’ psychological characteristics would have a positive (+) impact on the business performances. As a result of the study, all the hypothesis was rejected, and it was found that they did not have positive (+) impacts.

Park, Jong-woo (2011) investigated the impacts of CEO’s psychological characteristics on corporate strategies and business performances. He conducted the study, setting up hypotheses that CEO’s psychological characteristics would have significant impacts on corporate strategies and that CEO’s psychological characteristics would have significant impacts on business performances. As a result of the study, some of need for achievement and risk-taking intention were rejected, so both were partially adopted.
Kim, Min-soo (2009) investigated the impacts of the characteristics of entrepreneurs of start-up childcare enterprises on business performances. He considered psychological characteristics one of the entrepreneurs’ characteristics along with behavioral characteristics, career characteristics and entrepreneurship education experiences and used only need for achievement and risk-taking intention as psychological characteristics. His hypothesis was that entrepreneurs’ psychological characteristics would have impacts on corporate performances, and as a result of the study, it was concluded that psychological characteristics had impacts on business performances.

Yang, Ji-dong (2008) in his empirical study of the impacts of entrepreneurs’ characteristics set up a hypothesis that entrepreneurs’ psychological characteristics would have impacts on sales and their satisfaction. His hypothesis was partially adopted as a result of the study.

2.3. Entrepreneurs’ psychological characteristics

CEO’s psychological characteristics in the previous studies are described with variables such as locus of control, risk-taking intention, need for achievement and ambiguity tolerance and Lee, Seung-jae (2009) conducted a study, adding the variable, creativity to them.

2.3.1. Locus of control

Locus of control refers to the degree at which individuals feel that they can control a certain event themselves in their lives or feel that they cannot control it since it is unrelated to them. Persons with an internal locus of control trust their actions and do not depend on external powers such as fate, fortune or influential others. In contrast, those with an external one refuse the creed that their effort is a priority influence factor of the result (Seligman,1975). Locus of control representing the belief that the result of one’s action is internally controlled or externally controlled is one of the concepts most widely studied among the personal characteristics related to start-up (Brockhaus,1982). Persons with an internal locus of control believe that they can control the result of their action themselves through their ability, skill and effort while those with an external locus of control have a thought that there is almost no part in which they can have an impact concerning the result of their action (Rotter,1966). The belief that most things differ depending on what they do would induce an active action and high result. On the other hand, those who think that everything does not depend on themselves show a passive behavior of avoiding risks. Taking into consideration that start-up is accompanied by the risks of failure in uncertain environments and that it is a process in which they should bear almost all of the responsibilities, entrepreneurs would be greatly influenced by the locus of control. In other words, it is very likely that the people with an internal locus of control, who believe that the progress of surroundings around them depends on themselves would have a stronger entrepreneurial intention than those with an external locus of control, who do not believe in their control power (Lee, Ji-woo, 2000)

2.3.2. Risk-taking intention

Smith and Miner (1983) argue that risk aversion appears stronger among the entrepreneurs who lead a high-growth company than those who lead low-growth company. In the meantime, Begley and Boyd (1987) found that, although excessively high risk-taking intention might reduce financial results, moderate risk-taking intention was related to an increase in financial performances. If at least some risk to a certain degree cannot be avoid in any start-up and management processes, how actively entrepreneurs can cope with such risk and how well they can organize and manage the company would
be the basic factors for successful start-up and operations as well as the individuals’ psychological stability. (Kim, Wan-jae, 2007)

2.3.3. Need for achievement

Modern meaning of need for achievement derives from Murray’s study, and according to him, need for achievement is defined as a hope or trend to carry out things as fast and nicely as possible (Murray, 1938). In addition, need for achievement not only is an important motivator to entrepreneurs but also determines the level of the economic development of society. In other words, persons with a high need for achievement tend to come forward for troubleshooting, suggest a goal and make a passionate effort to achieve the goal. Steers (1975) in his study of the relationships among satisfaction with work, performance and need for achievement with laborers noted that workers with a high need for achievement were more satisfied with what they were doing and had more accomplishments regarding what they were doing. Studies have been conducted on the many different psychological characteristics of entrepreneurs, and it turned out that, generally, entrepreneurs had high autonomy, independence and patience and low need for assistance and compliance (Kim, Wan-jae, 2007).

2.3.4. Tolerance of ambiguity

Ambiguity tolerance refers to the degree of patience for an uncertain situation. Individuals perceive ambiguity when they do not have enough information, and they feel ambiguity when they come across a new or complex thing or a problem difficult to solve. The endurance concerning the tolerance of ambiguity makes people feel an obscure situation desirable while they accept such a situation as a threat if they do not have or lack the ability to tolerate the ambiguity (Bunder, 1962).

Gasse (1982) noted that successful entrepreneurs could accept and overcome an uncertain and ambiguous situation as one of the stimuli. Thomas & Dacid (1987), too, proved the facts that motivational action of endurance concerning the tolerance for ambiguity would accelerate entrepreneurial success and that founders would have a higher ability of the tolerance for ambiguity than non-founders. In this context, Behley & Boyd (1987) investigated the difference in the endurance of ambiguity between entrepreneurs and managers in small business and found that the entrepreneurs’ endurance of ambiguity was higher than that of the managers. In addition, Bunder (1962) noted that ambiguity comes from unfamiliarity and complexity, and receptivity of ambiguity means the tendency to perceive an ambiguous situation as a desirable one. In addition, the tendency of the tolerance for ambiguity refers to the perceived degree of patience for an uncertain situation (Park, Young-bae & Yun, Chang-seok, 2001), and Sexton & Bowman (1985) argued that entrepreneurs have a stronger disposition of patience of ambiguity than general public (Gu, Eon-hoe, 2007).

2.3.5. Creativity

According to Piirto, in Webster’s Dictionary published in 1964, the word, ‘creativity’ is not listed, and there is only the word, ‘creative.’ In Webster’s Dictionary revised in 1988, creativity is stated as ‘creative ability: artistic or intellectual invention,’ and Oxford Dictionary published in 1990, ‘creativity’ is described as the noun form of the adjective, ‘creative,’ and defined as “being inventive, imaginative, creative or able to create.” Like this, the concept of creativity is defined in various ways according to the literature and the scholar’s point of view. Because of the differences in the perspectives on creativity, the definition of creativity, too, is various. Jeong, Beom-mo (2001) defined creativity as a force to create new and rewarding things; Lee, Jong-lok (2003) defined it as “human’s fundamental nature and the origin of human life.” He continued that creativity is the driving force of
human thinking and activities, the nature of value creation to realize a new value, with a comprehensive property that combines several properties of human.” Seo, Hye-ae (2002), emphasizing the aspects of its socio-cultural context and trouble-shooting capability, defined creativity as valuable and practical original thinking or product in the socio-cultural context and problem-solving skills, which is an ability to solve problems (Lee, Seung-jae, 2009).

3. Methods

3.1. Research model and hypothesis

This study focused on credit-acquisition regular course on start-up given in undergraduate courses of universities, of a variety of entrepreneurship education and conducted a comparative analysis of changes in the psychological characteristics of students of non-regular course on start-up, not a credit-acquisition regular course in terms of locus of control, risk-taking intention, need for achievement, ambiguity tolerance and creativity. Through this, this study would investigate what impact the type of entrepreneurship education had on changes in the psychological characteristics of the students. In order to conduct such a study, a research model like Fig. 1 was developed.

![Research Model](image)

Figure 1. Research Model

Hypotheses set up to conduct this study are as follows:
Hypothesis 1. A credit-acquisition regular course on start-up would have a positive (+) impact on changes in the psychological characteristics of students;
Hypothesis 2. A non-regular course on start-up would have a positive (+) impact on changes in the psychological characteristics of the students; and
Hypothesis 3. There would be a difference in changes in psychological characteristics between the students of credit-acquisition entrepreneurship education and the students of entrepreneurship education, not for credit acquisition.

3.2. Operational Definition and Measurement of Variables

This study would measure changes in the psychological characteristics of students of entrepreneurship education, centered around credit-acquisition courses on start-up and non-regular courses on start-up among a variety of entrepreneurship education at universities. In this study, a credit-acquisition course on start-up refers to a formal education course to which a credit is given, established to enhance university students’ entrepreneurship and build up start-up and management capability, which covers the course details such as the cultivation of entrepreneurship, the establishment of business models, the excavation of business items, the preparation of business plans, the establishment of marketing strategies and the practice of start-up. In addition, a non-regular course on start-up means entrepreneurship education held not regularly such as start-up academy and start-up camp for university students. All the courses on start-up used as subjects in this study are operated by inviting
outside specialist instructors, and the type of the courses is divided into a form in which the course is operated for one semester by a single instructor and a form in which the course is operated for one semester by several instructors for each specialty.

Changes in the psychological characteristics of students in this study were measured, centering around locus of control, risk-taking intention, need for achievement, ambiguity tolerance and creativity. The survey was composed of self-reporting, and the questionnaire was composed of 6 parts. It consisted of 7 questions about locus of control, 6 about risk-taking intention, 7 about need for achievement, 5 about ambiguity tolerance, 6 about creativity, and 7 about the students’ personal information.

3.3. Subjects and Methods

In order to achieve the purpose of this study, as research samples, for credit-acquisition regular course on start-up, this study conducted a survey with 200 students in the courses on start-up at the major universities, including Yonsei University Wonju Campus holding LINC Project Group and Kangwon National University designated as a leading start-up university, located in Gangwon-do, where entrepreneurship education has been vitalized, and of the collected 187 questionnaires, based on 179 valid responses, this study analyzed the factors of changes in the psychological characteristics. In addition, for non-regular course on start-up, this study analyzed the factors of changes in the psychological characteristics of students at the universities located in Gangwon-do, based on 150 valid survey responses, of the 153 questionnaires collected from participants in “Gangwon Global Youth Start-up Camp” carried out to vitalize start-up of college students and youth and cultivate their entrepreneurship by area (Chuncheon, Wonju and Yeongdong areas) from August 30 through September 10, 2016

As an analysis method of the data collected through the survey, in order to verify the relationships among the individual variables drawn from the research model, based on the measurement of the variables and the questionnaires consisting of questions, SPSS V.23.0 was used for the statistics of the measured data. First, in order to test the credibility of the questionnaires, an Alpha-test was conducted, and in order to verify the validity like questions, a factorial analysis was conducted.

4. Findings

In order to test changes in the psychological characteristics of students of credit-acquisition entrepreneurship education and entrepreneurship education, not for credit acquisition, sample analysis method, paired samples t-test was conducted. Table 1 shows the corresponding sample statistics, all the means of the variables including locus of control, risk-taking intention, need for achievement, ambiguity tolerance and creativity increased in credit-acquisition entrepreneurship education more than in entrepreneurship education, not for credit acquisition.

Table 1:

<table>
<thead>
<tr>
<th>Group Statistics</th>
<th>Type of course on start-up</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Deviation of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locus of control</td>
<td>Credit-acquisition type</td>
<td>179</td>
<td>3.6608</td>
<td>.44894</td>
<td>.03356</td>
</tr>
</tbody>
</table>
In order to verify this, the findings of an independent-samples test of changes in the psychological characteristics of student after taking credit-acquisition entrepreneurship education and general entrepreneurship education, not for credit-acquisition are as follows:

<table>
<thead>
<tr>
<th>Risk-taking intention</th>
<th>Credit-acquisition type</th>
<th>179</th>
<th>3.2821</th>
<th>.63034</th>
<th>.04711</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-credit-acquisition type</td>
<td>150</td>
<td>3.1756</td>
<td>.54471</td>
<td>.04448</td>
<td></td>
</tr>
<tr>
<td>Need for achievement</td>
<td>Credit-acquisition type</td>
<td>179</td>
<td>3.8516</td>
<td>.48983</td>
<td>.03661</td>
</tr>
<tr>
<td>Non-credit-acquisition type</td>
<td>150</td>
<td>3.4333</td>
<td>.51266</td>
<td>.04186</td>
<td></td>
</tr>
<tr>
<td>Ambiguity tolerance</td>
<td>Credit-acquisition type</td>
<td>179</td>
<td>3.4804</td>
<td>.52554</td>
<td>.03928</td>
</tr>
<tr>
<td>Non-credit-acquisition type</td>
<td>150</td>
<td>3.3307</td>
<td>.44990</td>
<td>.03673</td>
<td></td>
</tr>
<tr>
<td>Creativity</td>
<td>Credit-acquisition type</td>
<td>179</td>
<td>3.3631</td>
<td>.55535</td>
<td>.04151</td>
</tr>
<tr>
<td>Non-credit-acquisition type</td>
<td>150</td>
<td>3.1667</td>
<td>.52598</td>
<td>.04295</td>
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</tr>
</tbody>
</table>
Table 2

Independent-samples test

<table>
<thead>
<tr>
<th></th>
<th>Levene’s test of equal variance</th>
<th>t-test of the equality of means</th>
<th>95% confidence interval of difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Significance probability</td>
<td>t</td>
</tr>
<tr>
<td><strong>Locus of control</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variance assumed</td>
<td>4.074</td>
<td>.044</td>
<td>5.041</td>
</tr>
<tr>
<td>Equal variance not assumed</td>
<td>4.982</td>
<td>.044</td>
<td>5.041</td>
</tr>
<tr>
<td><strong>Risk-taking intention</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variance assumed</td>
<td>3.725</td>
<td>.054</td>
<td>1.624</td>
</tr>
<tr>
<td>Equal variance not assumed</td>
<td>1.645</td>
<td>.054</td>
<td>1.624</td>
</tr>
<tr>
<td><strong>Need for achievement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variance assumed</td>
<td>1.248</td>
<td>.265</td>
<td>7.551</td>
</tr>
<tr>
<td>Equal variance not assumed</td>
<td>7.521</td>
<td>.265</td>
<td>7.551</td>
</tr>
<tr>
<td><strong>Ambiguity tolerance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variance assumed</td>
<td>1.872</td>
<td>.172</td>
<td>2.747</td>
</tr>
<tr>
<td>Equal variance not assumed</td>
<td>2.785</td>
<td>.172</td>
<td>2.747</td>
</tr>
</tbody>
</table>

UK-ASEAN INNOVATION CONFERENCE 2016
<table>
<thead>
<tr>
<th>Creativity</th>
<th>Equal variance assumed</th>
<th>.899</th>
<th>.344</th>
<th>3.274</th>
<th>327</th>
<th>.001</th>
<th>.19646</th>
<th>.06001</th>
<th>.07840</th>
<th>.31453</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variance not assumed</td>
<td></td>
<td>3.289</td>
<td>322.110</td>
<td>.001</td>
<td></td>
<td>.19646</td>
<td>.05973</td>
<td>.07896</td>
<td>.31397</td>
<td></td>
</tr>
</tbody>
</table>
According to Table 2 above, there were changes in locus of control, need for achievement, ambiguity tolerance and creativity at a significance level of 5%. In other words, it is noted that locus of control and need for achievement increased. Also, tolerance of ambiguity, too, increased and creativity increased as well. However, it turned out that there was little difference in risk-taking intention.

5. Discussion and Implication

This study aims to analyze the impact of entrepreneurship education on changes in the psychological characteristics of students. The psychological characteristics of the students include locus of control, risk-taking intention, need for achievement, ambiguity tolerance and creativity, and this study has significance in that it conducts research and analysis of how much impact entrepreneurship education has on changes in these psychological characteristics. As a result of the study, credit-acquisition regular course on start-up has a more significant impact on changes in psychological characteristics including locus of control, need for achievement, ambiguity tolerance and creativity than the general entrepreneurship education, not for credit acquisition. These findings show the efficacy and importance of systematic entrepreneurship education simultaneously, and thus, it would be necessary to make more systematic preparations for this since the entrepreneurship education systematically prepared for one semester has a more significant impact on changes in the psychological characteristics of students of entrepreneurship education than non-regular, short-term entrepreneurship education like start-up camp.

This study conducted research with the students in regular courses on start-up at Kangwon National University and Yonsei University Wonju Campus located in Gangwon-do for the first semester 2016 for credit-acquisition entrepreneurship education, and for the general courses on start-up, not for credit acquisition, this study conducted comparative research on the impact of the courses on changes in the psychological characteristics including locus of control, risk-taking intention, need for achievement, ambiguity tolerance and creativity with participants in “Gangwon Global Youth Start-up Camp” carried out to vitalize start-up of youth and university students and cultivate entrepreneurship for students at the universities located in Gangwon-do from August 30 through September 10, 2016. by area (Chuncheon, Wonju and Yeongdong areas). However, since the subjects were limited to the students at several universities located in Gangwon-do, it is difficult to generalize the results of the study.

It is expected that examining whether consistent results are drawn by conducting a survey with universities nationwide where courses on start-up are given in the future will provide more meaningful information for the operation of the universities’ entrepreneurship education programs.

References


aLead author, E-mail address: ibeg@naver.com

bCorresponding author, E-mail address: jks5473@yonsei.ac.kr
Innovations in Information Flows and Quality Control in Safe Fresh Vegetable Supply Chain Management – The case of Danang City, Vietnam

Le Thi Minh Hang, Truong Duy Nhat Phuong

Abstract

Fresh food is a kind of product with specific characteristics that leads to difficulties in safety and quality control. In Vietnam, an emerging country, although the importance of “farm to fork” food control has been recognized for years, due to the fragmentation in the traditional fresh food producing and distributing processes, which are the majority, as well as the burden in public healthcare management, the efficiency of food safety control activities is still questionable. As a result, so as to effectively control the food safety in Vietnam, a new form of fresh food supply chain management which is different from the ones being used in more developed countries and provides the transparent information flows in Vietnam's conditions is necessary.

This paper aims to propose a new way of fresh vegetable supply chain information sharing and monitoring systems in Danang, Vietnam. In order to do so, a review on the previous studies has been conducted to understand the relevant academic theories as well as the experiences from other countries. Apart from that, using the approaches reviewed, the cases of food safety control in the supply chain and its relevant innovation applications in other countries and regions such as the EU, Sweden, Thailand, India are covered and analysed in this study to compare with the situations in Vietnam. Finally, the data regarding the current fresh vegetable production and distribution conditions as well as potentials and challenges in applying supply chain innovation in Danang are collected and analysed, serving the proposal of an innovative fresh vegetable safety control system with the principles based on the theory approaches and experiences from other countries reviewed.

The results of the study reveal the fresh vegetable control system with the principles as follow: (1) traceability plays a crucial role; (2) control points must be concentrated and well managed; (3) collaboration with other provinces to control the quality at the producing points must be done; (4) the number of actors in the supply chain is reduced; (5) actors in the supply chain are standardized and (6) the food quality governance responsibilities are concentrated to less parties. Not only do the implications of the paper provide information for the supply chain stakeholders in Danang on what to do to resolve the persistent problems of fresh vegetable safety, they also reveal the potential directions for future researches.

Keywords: Innovation; Food Supply Chain Management; Food Safety; Food Quality Control; Emerging market

1. Introduction

According to FAO (1996), food safety and food quality are two of the most significant concepts in manufacturing and supplying food. While food safety can be defined as the management for ensuring that food and agricultural products are safe from hazards, food quality is food with expected physical and compositional characteristics including appropriate nutritional values (FAO, 1996). From the social perspective, a food supply chain (SC) needs to aim at these concepts so as to cover the healthcare of the society. However, it is not always easy to integrate the society’s benefits and the profits of the food manufacturers or distributors. Therefore, it is crucial to establish a safe and efficient food SC where the stakeholders can collaborate to achieve the SC’s goal.
As a product, fresh food has its own specific characteristics: short product life; difficult to package; low potential to be specialized in; and the process from production to distribution involves various stakeholders (FAO & WHO, 2003). As a result, fresh food safety and quality control faces a number of obstacles. In Vietnam, an emerging country, although the importance of “farm to fork” food control has been recognised for years, due to the fragmentation in the traditional fresh food producing and distributing processes, which are the majority, as well as the burdensome in public healthcare management, the efficiency of food safety control activities is really a persistent problem. Most of the quality control systems in the fresh food SCs which are considered to be successful in more developed countries cannot be duplicated in Vietnam because of these features. Therefore, in order to effectively control the food safety in Vietnam, a new form of fresh food supply chain management which is different from those that are already implemented in more developed countries and provides the transparent information flows in Vietnam's conditions is necessary.

Because of the specific characteristics of fresh food, of which fresh vegetable is a part, as a product and the features of food processes in Vietnam mentioned earlier and the fact that the public healthcare management regarding food quality and safety in Vietnam, it is really easy for the stakeholders to cheat and there is hardly any solution to control over that issue. This leads to the need of traceability, supply chain management (SCM) by efficiently manage the information flows and the quality control.

For all of these reasons, this paper aims propose a new way of fresh vegetable supply chain information sharing and monitoring systems in Danang, Vietnam. In order to do so, a review on the previous studies has been conducted to understand the relevant academic theories as well as the experiences from other countries. The data regarding the current fresh vegetable production and distribution conditions as well as potentials and challenges in applying supply chain innovation in Danang are collected and analysed, serving the proposal of an innovative fresh vegetable safety control system.

2. Literature Review

2.1 Food supply chain management and quality control

A supply chain (SC) includes all the parties involved, directly or indirectly, in fulfilling the requests of the customers (Chopra & Meindl, 2007). And supply chain management (SCM) can be defined as the integrated planning, coordination and control of all business processes and activities which are necessary to produce and deliver products that satisfy the market requirements as efficiently as possible (Van der Vorst, Silva, & Trienekens, 2007). Under this view, all the parties, direct or indirectly, involved in a SC ought to cooperate and collaborate to create value, which is the amount consumers willing to pay for what they are offered (Van der Vorst, Silva, & Trienekens, 2007), and therefore need to well manage their information flows and quality control. Fundamentally, a food supply chain (FSC) carries all the characteristics of a SC, however due to the specific characteristics of food as a product, a FSC also carries its own specific ones.

According to Van der Vorst, Silva and Trienekens (2007), SCs rarely exist without being a part of more complex networks. Regarding FSCs, because of the specific characteristics of the product mentioned earlier, along with the involvement of various parties in the chains leading to the fact that a single inadequate action of a chain participant can cause the quality decay of the original products, the relationships of the stakeholders become even more complex. A food supply chain network (FSCN) consists of stakeholders such as (1) the producers that research, grow and trade food commodities, (2) the processors that process, manufacture, and market food products, (3) the distributors, including the
wholesalers and retailers, (4) the consumers and (5) governments, non-governmental organisations (NGOs) and regulators that monitor and regulate the entire FSC from producers to consumers (Deloitte, 2013; Jaffe, Siegel, & Andrews, 2010). The following figure illustrates the roles of the stakeholders along the FSC:

Figure 1. The roles of the stakeholders along the FSC

As can be seen from the figure, the ones who are in charge of food safety are the Governments/NGOs/Regulators. Nevertheless, given a food-related illness due to a mishap anywhere along the FSC can ruin the value of the end products, every stakeholder must be responsible and accountable for the sourcing, handling and quality control of food, leading to the essentiality of the collaboration among the various stakeholders along the FSC. In order to understand the collaboration between the participants on the FSCNs, one must take into consideration their characteristics, motivations and impacts on the SC activities. From Van der Vorst, Silva, & Trienekens (2007)’s point of view, on a fresh FSC, the producers have issues with long production times, seasonality in production, variability of quality and quantity of supply which results in their impacts on the FSCs through responsiveness and flexibility in process and planning; whilst the distributors have to face variability of quality and quantity of supply of farm-based inputs, seasonal supply of products requires global (year-round) sourcing and requirements for conditioned transportation and storage means leading to their effects on the FSCs regarding pricing, timing constraints, need for conditioning and pre-information on quality status of products. Meanwhile, Jaffe, Siegel, & Andrews (2010) analysed the motivations of the stakeholders on the FSC; while the Governemnts/NGOs/Regulators are motivated by the social, political and economic issues, other stakeholders are driven by the certainty of supplies, services and prices. These factors show that the relationships between the stakeholders on a FSC are complex leading to the complexity in the concepts and dimensions of innovation through a FSC to achieve an efficient food safety control system. In this paper, the authors cover the innovative concepts in FSCNs by Van der Vorst, Beulens, & Van Beek (2005) and the dimensions of innovation through FSC by Trienekens, Hagen, Beulens, & Omta (2003).
2.2 Innovative concepts in FSCNs

Because of the complex relationships between the stakeholders and so as to satisfy the increasing demands of consumers, NGOs and business partners, companies continuously have to work on innovations in products, processes and forms of cooperations in the FSCN (Van der Vorst, Beulens, & Van Beek, 2005). Van der Vorst, Beulens, & Van Beek (2005) has introduced the concepts of innovation influencing different aspects of the FSCNs which are (1) network structure innovations, (2) chain control innovations, and (3) chain resources innovations. Figure 2 summerises these concepts and the aspects of the FSCNs that they influence.

Figure 2. The roles of the stakeholders along the FSC

<table>
<thead>
<tr>
<th>Network Structure Innovations:</th>
<th>Network Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>-International FSCN</td>
<td></td>
</tr>
<tr>
<td>-Reduction supplier base</td>
<td></td>
</tr>
<tr>
<td>-Logistics/Information Service Provider</td>
<td></td>
</tr>
<tr>
<td>Chain Control Innovations:</td>
<td></td>
</tr>
<tr>
<td>-Connectivity and Transparency</td>
<td></td>
</tr>
<tr>
<td>-Pro-active chain planning concept</td>
<td></td>
</tr>
<tr>
<td>-Cross docking/Postponement</td>
<td></td>
</tr>
<tr>
<td>-Sharing Logistics Capacity</td>
<td></td>
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<tr>
<td>Chain Processes</td>
<td></td>
</tr>
<tr>
<td>Chain Resources Innovations:</td>
<td></td>
</tr>
<tr>
<td>-Consolidation centres</td>
<td></td>
</tr>
<tr>
<td>-Multi-model networks</td>
<td></td>
</tr>
<tr>
<td>-Intelligent packaging/labels</td>
<td></td>
</tr>
<tr>
<td>-Chain Information Systems</td>
<td></td>
</tr>
<tr>
<td>-Tracing Technology (RFID, GPS, Scanning,..)</td>
<td></td>
</tr>
<tr>
<td>Network/Chain</td>
<td></td>
</tr>
<tr>
<td>Source: Van der Vorst, Beulens, &amp; Van Beek (2005)</td>
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</tbody>
</table>

The figure reveals the information about the different aspects of the FSCN, which are Network Structure, Chain Processes, Chain Resources, Network/Chain Management and the innovative concepts that influence them. The Network Structure is influenced by the Network Structure Innovations, while the Chain Resources are affected by the Chain Resources Innovations, and the Network/Chain Management and Chain Processes are affected by Chain Control Innovations. The Network Structure Innovations deal with the development within the members of the supply chain and the roles they perform. The innovative concepts in this category are characterised by dynamic instantiations of the collaborations within the partners in the FSCN who are able and commit themselves to comply to performance requirements put on them (Van der Vorst, Beulens, & Van Beek, 2005). Meanwhile, the Chain Control Innovations relate to the innovations in the way business processes are managed and executed in the SC. According to Van der Vorst, Beulens and Van Beek (2005), this kind of development in the SC is heavily supported by information technology and rooted from the high demand on the flexibility and efficiency of the manufacturing and distribution processes and the organisations of SCs caused by the need of customers or demand driven SCs that are
responsive and sustainable at low cost. Finally, Innovations in Chain Resources deal with the developments in physical means, human skills, competences and information communication technology. This category of innovative concepts includes the main technological development that impact on the SCM activities driven by the increased complexity of new process technologies and process control concepts, leading to the increased education and skill level of the managers and the workforce to cope with the trend (Van der Vorst, Beulens, & Van Beek, 2005).

Reviewing the innovative concepts in the FSCNs approach by Van der Vorst, Beulens & Van Beek (2005), it can be seen that in terms of controlling food safety, the Network Structure Innovations provide the structure conditions in which quality control can be better implemented. Meanwhile, the Chain Control Innovations contribute by offering the more efficient and flexible processes throughout the chains so that the flaws can be minimised. Additionally, the Chain Resources Innovations help with the food safety control by providing the means that can keep up with the complexity in the relationships along the participants of the FSCNs, and the specific characteristics of manufacturing as well as distributing fresh food as a product. Generally, as far as we are concerned, these concepts support the main aspects of the food quality control issues along the FSC.

2.3 Dimensions of innovations through FSC

In order to improve the understanding on the areas of impact of innovation through international FSC, Trienekens, Hagen, Beulens, & Omta (2003) has introduces 4 dimensions of innovations through FSC: (1) economics, (2) environment, (3) technological and (4) social and legal. Each of the dimension reveals the distinct way that the innovation, in this case the technologies invented or adapted in the focal market, influence the FSC and its participants. The economics dimension is related to efficiency and consumer orientation. According to Trienekens, Hagen, Beulens, & Omta (2003), under the economics dimension, beside benefiting the companies from the cost perspective, the innovations helps narrowing the gap caused by the significant developments in consumers’ demand which result in the opportunities for the companies but also challenge the international standards and competitiveness of the companies. Meanwhile, the environment dimension is related to the way food is produced, traded and distributed in its ecological environment. The key issue of this dimension is the environment sustainable development which requires the collaboration along the SC and therefore needs the innovations (Trienekens, Hagen, Beulens, & Omta, 2003). The technological dimension is related to the way technology, including process and product, transport, information and communication technology, can be applied to improve production and distribution of high quality and safe food products. Finally, the social and legal dimension is related to social constrants to production, distribution and trade of food and to problems such as human well-being, animal welfare and sustainable social-economic development. The technologies can help the information on the chain become more transparent, hence enhance the social and legal control.

Compared to the innovative concepts in FSCNs by Van der Vorst, Beulens, & Van Beek (2005), the dimensions of innovation through FSC by Trienekens, Hagen, Beulens, & Omta (2003) are more concerned about the social, economic and welfare impacts of the innovations on the stakeholders, rather than the activities on the SC. Apart from this, the Van der Vorst, Beulens, & Van Beek (2005)’s concepts take into account the complexity of the relationships between the participants in the FSCNs, making it easier to evaluate the product quality control activities along the chain.
3. Cases of the innovation implementation in controlling food safety and quality along the FSC in some countries and regions

3.1 The food safety and quality control in the fruit, vegetable and fish supply chain in the EU

There are 2 aspects in the innovative connectivity and transparency concept that is related to chain management and processes by (Van der Vorst, Beulens, & Van Beek, 2005): to provide accurate and timely information on the chain and to increase the responsiveness to the dynamic market demand. Regarding the food safety and quality control, the correct and reliable information is really crucial to create trust between the stakeholders and to trace the fault when it happens. So as to synchronize the information on the chain, as well as clarify responsibilities of the participants of the FSCs in the food quality control, the EU has introduced the standards in fruit, vegetable and fish quality control and the usage of these standards at the control points. The process of safety and quality control in the fruit, vegetable and fish supply chain is illustrated in the figure 3.

Figure 3. Food safety and quality control in the fruit, vegetable and fish supply chains


*HACCP: Hazard Analysis Critical Control Point

SPS: Sanitary and Phytosanitary Standard

MRL: Maximum Residue Level

The advantage of this process of quality control is that the product is controlled on every stage of the process and therefore the fault can be prevented or recognised right when it happens and the responsibilities can be addressed accurately. In a SC where the relationships between the stakeholders are complex and the fact that a single inadequate action of a chain participant can ruin the end product of the whole chain, a process standard system like this seems to be favourable. However, in a developing country like Vietnam, the level of infrastructure and public management mechanism are
not high enough to support this idea. Because of the fragmentation in the food production and distribution, and the real-time control concept is not well-known, as well as there has been no mechanism to make sure the stakeholders commit to the process standards, it is easy for the participants to cheat and benefit their own business instead of adding value to the whole chain. In addition, the infrastructure in Vietnam is not well-developed enough to conduct these process standards efficiently.

3.2 The case of local food supply chain in Sweden

The case of local food supply chain in Sweden is about the innovations in the network structure. In the case, the existing distribution system consists of the production centres locating and running separately serving the market in where they locate. This fragmentation can lead to the burden in quality control, and because of the difficulties in changing agricultural location planning, it is not favourable to centralise these local production bases. The new supply network is the integrated one which was developed by forming clusters of producers and determining the optimum collection centre (CC) linking food producers, distributors and consumers/retailers enabling coordinated distribution of local food and facilitating the integration of food distribution in the local food supply systems into large scale food distribution channels (Gebresenbet & Bosona, 2012). Figure 4 illustrates the network of product delivery system with coordinated collection.

Figure 4. The network of product delivery system with coordinated collection

Source: Gebresenbet & Bosona (2012)

*CC*: collection centre

*DC*: Distribution centre

In this case, because of the formation of a new participants, the CC and the logistics companies, the products can be centralised and therefore better monitored. This model can be suitable for the fragmented fresh vegetable growing conditions in Vietnam. With this model, the quality of the product from the beginning to end using the process standards become easier. However, so as to conduct this model efficiently along with the process standards, there need to be modern facilities and skillful managers and workforce, of which Vietnam still lacks.
3.3 The case of Tops Fresh vegetables in Thailand

Thailand is the country whose agriculture manufacturing conditions have many things in common with Vietnam. There are some problems in manufacturing fresh vegetables in Thailand that are similar to Vietnam: there were too many suppliers causing the burden in quality control, the lack of pre-cooling and cooled transportation caused the post-harvest losses, and there were no clear uniform product specifications that could be communicated throughout the SC (Boselie, 2002). In Vietnam, the post-harvest loss problem can even lead to the use of contaminated preservative to reduce the loss. To address these problems, the Tops Thailand Project, a project held by the businesses (Tops, Ahold Thailand; Syngenta; SGS; producers), research institutes (Katedestart University, Thailand; Wageningen UR, The Netherlands) and (semi-) governmental organisations, introduced and took some improvement steps: (1) a Preferred Supplier Approach significantly reduced the total number of suppliers after critically benchmarking their performance and development potential; (2) a distribution centre called World Fresh was built to perform productive functions like quality control, washing, packing and processing; (3) a Lead time reduction programme was introduced, lowering the post-harvest losses. In general, the Tops Thailand project has achieved a level of success: most suppliers, and even competitors, have accepted the standard (Trienekens, Hagen, Beulens, & Omta, 2003). However, regarding the innovations food safety control, the project remains some obstacles: there are still suppliers considering this label as a kind of window dressing without actual enforcement and so far the chain seems not to have establish any change in the network structure.

3.4 The case of the Reliance Fresh retail chain in India

Like Vietnam, Indian farming is dominated by smallholders leading to the difficulties in standardisation of products and quality control. This issue has become even more critical nowadays when the Indian food buyers and consumers are more and more health and food quality conscious (Sighn & Singla, 2010). In order to meet the increasing requirements of the consumers, some retail chains of which Reliance Fresh is one has developed the fresh fruit and vegetable chain that ensures the quality of the end products. To supply for Reliance Fresh, the farmers and other vendors have to meet and commit to its requirements. The flows of the products in the chain is illustrated in the figure 5.

Figure 5. Procurement and distribution system of Fresh Reliance in Gujarat

Source: Sighn & Singl (2010)
It can be seen from the figure that the fresh fruits and vegetables on Reliance Fresh’s chain are gathered from the suppliers at the City Processing Centre (CPC) before they are delivered to Reliance Fresh stores. On the chain, Reliance Fresh control the product quality in three ways: (1) choosing the qualified suppliers who commit to Reliance Fresh’ standards, (2) quality check at the CPC by sampling method before deliver them to the stores and (3) good product delivery services with refrigerated vehicles and the maximum time that the products are delivered from the vendors to the CPC, stay at the CPC and delivered from the CPC to the stores to prevent the fresh food and vegetables from being quality ruined. Although this can help with the quality improvement, there has been no evident that Reliance Fresh has any mechanism to control the quality commitment of its vendor beside sampling check at the CPC, creating the loopholes for cheating.

4. Danang fresh vegetable production and distribution overview

4.1 Fresh vegetable production in Danang

According to Danang Agriculture and Rural Development Department (2014), all the growing activities in town belong to smallholders and are fragmented. Due to the urbanisation, there are many farmers who no longer have farm to grow or temporary grow vegetables before the building construction plans are implemented. The manufacturing activities are temporary with no long term plan or direction and there is no investment for the agriculture manufacturing activities. As reported by Danang Agriculture and Rural Development Department (2016), there are 1650 hectares of land used for growing vegetables with the quantity of 25 000 tons a year. The city government also invested 90 billions VND (Qseap project) in safe vegetable production in places such as Cam Ne (13,7 hectares), Yen Ne (2 hecatares), Tuy Loan Tay (20 hectares); Thach Nham (9 hectares); Phu Son 2, 3 (13 hectares), Phu Son Nam (17,5 hectares) and 19/8–Hoa Khuong, 13 hectares of them meet the VietGap standards. However, so far there have only been 30 hectares of land are used for the project and the number of the household getting involved in the projects is 220, while the planned number was 794. In general, the problems in fresh food manufacturing activities in Danang are: (1) small and fragmentated productions with traditional manual methods and little technology implementation; (2) the intricate use of agriculture input without the advices of the professionals; (3) the loose management of agriculture inputs resulting in the cheating (e.g. mixing unidentified chemicals to the fertilizer) of the vendors; (4) loose agriculture production and distribution governance; (5) most of the officers who are in charge are not specialised in supervising agriculture manufacturing; (6) the agriculture cooperative societies have uncritical role with obsolete management competencies.

4.2 Fresh vegetable distribution in Danang

There are 71 registered markets in Danang, including 01 CC, 07 first-class markets, 20 second-classes, 37 third-classes and 05 temporary markets with more than 18000 households getting involved. Besides, there are still mini and temporary in the suburbs that are not yet to be statistic. In addition, the number of supermarkets, shopping malls and convenience stores grows significantly along with the economic development of the city. Today, there are 56 modern retailing points in Danang, including 06 supermarkets and 50 convenience stores. Apart from that, the number of firms joining the food distributing market rises remarkably, most of them supply the food to organisation customers such as schools, restaurants, etc. All the vegetables are gathered at the CC, where the city government establishes a checking point to sampling test the vegetables, before being delivered to retailing points or business consumers in the city. Figure 6 illustrates the existing fresh vegetable supply chain in Danang.
In general, the obsoletes of Danang fresh vegetable supply chain are:

- Most of the products do not have packing, therefore there is no brand name, product information, no documents, creating difficulties in traceability.
- Most of the participants are smallholders and hard to manage.
- The sources of vegetables are not well-managed, leading to the mixing of the vegetables from different sources.
- The vegetables from other states are not yet to be controlled.
- Most of the vegetable sellers in the markets are not registered and controlled.
- There is no mechanism controlling the retailing system, everyone can label their products “clean fresh vegetables”.
- The quality control process is burdensome, involving many parties but remains a lot of loopholes and the “farm to fork” quality control concept is not yet to be appreciated.
- There is no mechanism to control the officers who are in charge of food quality check.
- There are currently some safe vegetable SCs on the market but at small scales and facing difficulties in searching for stable and sustainable supplies as well as gaining consumers’ trust.

5. The proposed innovative fresh vegetable SC for Danang

Under the SCM view, the fresh vegetable production and distribution in Danang, Vietnam is obsolete, fragmented and full of loopholes. Clearly, to ensure the food safety and quality, there need to be a system that is able to control all the stakeholders on the chain and minimise the faults. However, with the muddle in food SCM and the lack of resources, it is not easy to improve the situation. This requires a lot of efforts in innovation. From the authors’ point of view, a comprehensive innovation in every aspects of the SC network in Danang from the chain structure, processes, resources to management is really crucial. After viewing and analysing the relevant theory approaches, the cases in other countries and applying as well as comparing them with the situation in Danang, the authors would love to
propose an innovative SC system that can help better food quality control in Danang with the following principles that relate to Van der Vorst, Beulens, & Van Beek (2005)’s network structure, chain control and network resource innovation concepts:

- The fresh vegetables must be packed and traceability must play an important role to better control the flows of products, address the responsibilities of the chain participants and gain the trust of the buyers and consumers. Nowadays there are many means of technology that can help with the traceability such as barcode, RFID, QR code.
- Control points must be concentrated and well managed instead of being fragmented and chaotic like the current situation. Because of the lack of resources, the chain in Danang cannot establish the control points at all the stage on the process like in the EU. Therefore, the authors suggest that the process standards should still be implemented, but the control points should be located at the crucial stages of the process where the faults are most likely to happen.
- There must be collaboration with other provinces to control the quality at the producing points. A significant amount of vegetables consumed in Danang is from other provinces, therefore controlling this source of vegetables become essential.
- Number of actors on the SC must be reduced in order to better manage them. The less participants, the less burdensome controlling them is. Apart from that, when the actors are selected like in the case of Reliance Fresh in India, it is easier to train them and impose the policies that ensure that the participants meet and commit to the chain’s requirements.
- The actors on the SC must be standardised. There must be standards that can be based on to select the qualified participants. This can help prevent the faults from happening.
- Food quality governance responsibilities must be concentrated to less parties. Nowadays there are too many parties who are in charge of food quality control in Danang, leading to the burden in management and the fact that nobody is actually responsible for the job. Less parties in charge will make the work more efficient.

6. Conclusion and Recommendations

The paper has reviewed the theory approaches related to the food SCM and innovations in food SCM and applied them to analyse the situation of fresh vegetable SCM in Danang and propose an innovative system that can overcome the difficulties in controlling food safety and quality in Vietnam. Besides, the paper has also reviewed the cases of other countries and regions in the world to compare with the situation in Danang, Vietnam, hence to learn from their experiences of implementing innovations in FSCs. The results reveal a proposed system with the principles related to the innovation concepts of Van der Vorst, Beulens, & Van Beek (2005). This leads to some valuable recommendations to the firms and city government. First, this system should exist along with the existing ones because with the current production, distribution and consumption complicated characteristics and the traditional habits of the Vietnamese, it is impossible to entirely replace the existing chains with the new ones. Second, there need to be collaboration between the government and the companies on the SC to implement this system efficiently. For instance, the system can be organised by a company that plays the key role on the chain who selects the participant like in the case of Reliance Fresh or by a group of businesses like the case of Tops Fresh in Thailand but should be monitored by the governments or regulators to make sure these chains are responsible for what they commit to the community. Third, the stakeholders who are in charge, e.g. key participants, governments, should heavily invest on technology as it is the key means, the backbones of the system. Finally, the stakeholders have to change their mindset in
management and understand that reaching the goal of creating the end value to consumers is more beneficial in long term for them. They should be trained and educated to become more skillful and responsible managers and workforce. Only by doing this way the system can run sustainably.

This paper also leaves questions for further researches. The first one is, in Vietnam where the traditional methods of production and distribution still dominate the market and there is still lack of resources, what the most suitable way to implement food traceability and other means of technology is. In order to answer this question one research must study the characteristics, advantages and disadvantages of each means of traceability and the conditions of the market of Danang, Vietnam. Another question is that as it is impossible in Vietnam to establish the control points at every stage of the process like in the EU, where the selected control points should be on the chain to maximise each one’s function and efficiency. The next question is that in a place that still remains the dominance of traditional production and distribution methods leading to the overlapping and complexity in the relationships between the stakeholders on a chain like Vietnam, especially with the ones from other provinces outside Danang, what kind of mechanism or network structure should be introduced to build the trust and partnerships between the SC’s members. The final question is that with the investment in technologies, modern facilities and workforce training, the price of the products from this system have to be more expensive than those from the traditional chains, whether and how much more money the local buyers and consumers are willing to pay for the belief that they consume safe and qualified fresh vegetables. Other further research directions can be the control systems of other agriculture products beside fresh vegetables, or the applications of the proposed system throughout Vietnam as well as other emerging markets that share things in common with the country.

In terms of limitations, because of the lack of time and resources, the paper has just reviewed a small number of relevant theory approaches. So as to make the proposed system sharper and persuasive, more approaches should be put into consideration and compared with each other. The study also needs more accurate and specific data of the Danang and other provinces’ production and distribution conditions to deeper analyse the situations.

References


Embedding Entrepreneurship into an Engineering Curriculum – a case study for electronic engineering

Kate Sugden*

School of Engineering and Applied Science, Aston University, United Kingdom

Abstract

This paper presents a case study where entrepreneurship has been embedded within an electrical and electronic engineering programme. The module concerned has been running since 2012 and is delivered to students in their first year of a degree programme. It has strong links to other modules within the first year and aims to develop the confidence of students to capitalize on commercial opportunities and also develop wider employability skills. Since the module has been running there has been an increase in students taking placements in small companies in the local area and starting their own companies during their placement year through the BSEEN scheme (Birmingham Skills for Enterprise and Employability Network). In addition, the overall feedback from the students has been very positive. The paper will discuss the module structure, learning outcomes, assessment methods and reflections on how to optimise the course delivery.

1. Introduction

Engineering is an important driving force behind many successful economies however entrepreneurship is often viewed as something studied by business students who have a good understanding of the process of making money but little idea how to design and make an actual product. To thrive in today’s business environment it is crucially important that engineering students graduate not just with a technical degree but also with the skills to understand the drivers of the market place and how they contribute to this. Even if they do not become entrepreneurs the associated skills will build their employability skills and their understanding of key business drivers.

We live in a society where the time between the emergence of new technologies and their implementation continues to decline. At the same time the emergence of funding organizations like Kickstarter means that it is easier than ever for a small group of people to launch a technical product. Young engineers are ideally placed to exploit new technologies since they have the skills needed to rapidly prototype products and are very aware of emerging technology trends. However for engineering students to take advantage of this exciting environment they need to have basic business skills and the confidence that they can deliver something that can be successful in the marketplace. The challenge is how to achieve this in a rewarding environment within the curriculum without detracting from teaching the fundamental engineering skills.

Around the world there are a number of institutions that stand out as centres of excellence in delivering an entrepreneurship focused engineering education including: Penn, Stanford and MIT. This paper looks at how entrepreneurship can be embedded into standard electronic engineering programme using team projects to concurrently develop engineering, entrepreneurship and employability skills.
2. Engineering Projects and Entrepreneurship EE1EPE

The primary focus for this case study is a module called Engineering Projects and Entrepreneurship that has been running at Aston University since 2012. This is a ten credit module (where the full load for an academic year is 120 credits) and it is delivered to first year university students on the following programmes: BEng/MEng Electrical and Electronic Engineering, BEng Communications Engineering, BEng/MEng Electronic Engineering and Computer Science.

The module runs over an 11-week period with four timetabled hours per week that are predominately lab based. Initially the number of students taking the class was around 30 but this has risen steadily to around 50 this year.

The key aims of the module is to:

- Engage the students in real engineering projects developing some core technical skills such as circuit design, software writing in the process, understanding of concepts such as bill of materials and issues around small volume manufacturing.
- Develop employability skills – working in teams, communication, skills auditing.
- Develop enterprise skills – including financial costings, competitor analysis and marketing.

The module allows the students to build on related modules in digital and analogue electronics, electronic systems design and computing concepts. Beyond the first year of study this module also feeds into a second year 20 credit team project and contributes to the preparation of students for applying for placements / internships as well as a final year individual project.

3. Module Organisation

The module is currently divided into two parts: in the first part the students learn about the use of Arduino for prototyping during weeks 1&2; in the second part they start the team project which runs in weeks 3-11.

In the first year we ran the module the students picked their own teams but this resulted is some issues with ineffective working and students being unhappy with friends due to personality and working style clashes. Since then the students have been allocated into teams using the results of a team working styles test (ref to Kent University vii) and the students’ selection of the type of project they wish to work on. The team working styles test characterises the students using the following categories:

- encourager
- compromiser
- leader
- summariser/clarifier
- ideas person
- evaluator
- recorder

Using this approach appears to have made a significant different in the effectiveness of the teams since it ensures only one strong leader per team and a range of skills and approaches distributed across the members.
The teams are each assigned a project that involves either the development of a new product concept or improvements on an existing product from the previous year. The most successful outcomes occur when there is an end customer. For example, in 2016 the Institution of Engineering and Technology paid for a number of interactive displays that were designed by the students. This gave the teams real specifications and a deadline to work to since the displays were to be used at the Big Bang UK Young Scientists and Engineers Fair which is an annual event reaching 70,000 school children.

The projects developed for the Big Bang UK Young Scientists and Engineers Fair were all Arduino based and detailed below:

- **Musical lights** - this display used the resistance of a circuit formed from a child touching two metal handles to control some neopixel LEDs and to trigger a musical output.
- **Interactive wall** - this set of sixteen 20x20cm square panels contained red, blue and green LEDs that were triggered by a hand moving over pairs of infrared detectors and emitters.
- **Laser harp** - this used the blocking of one of 12 laser beams to trigger a midi note emitted a sound that could be specified as anything from a harp to a drum to a grand piano depending on the software setting.
- **Colour mixers** – these handheld units that allow students to change the amount of red, blue and green lights in a display to understand how colour mixing gives the perception of different colours.
- **Mood lamps** – these neopixel based mood lamps used laser cut images of either Birmingham landmarks or a corporate logo to produce a changing advertising display panel.
- **LED cube** – this cube displayed twitter messages or pictures as moving images on an LED cube.

Alongside the technical developments the students had to understand the bill of materials, single and low volume costing, and the manufacturing time. The teams looked at and evaluated competitors to understand whether they were addressing a need in the market place. They also produced material that explained what the exhibit was and what it was made from. These explanations can be found at [www.aston.ac.uk/electronics](http://www.aston.ac.uk/electronics) and there is a video on the IET’s website IET.tv featuring the projects.

### 4. Skills audit

To tie the learning outcomes of the module to the employability skills often sought by employers, the students were required to consider the skills and behaviours listed in Table 1 (developed from “Student Employability Profiles” B.Kubler and P. Forbes (2005)) and to think about examples that they could use to illustrate these skills and rate their current level.

#### Table 1 Skills audit framework

<table>
<thead>
<tr>
<th>Skills</th>
<th>Behaviours – these are things employers will be looking for you to demonstrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning &amp; organising</td>
<td>- Plan a course of action before starting projects</td>
</tr>
<tr>
<td></td>
<td>- Sets targets according to short &amp; long term needs</td>
</tr>
<tr>
<td></td>
<td>- Considers resources (people, money, equipment) needed to achieve objectives</td>
</tr>
<tr>
<td></td>
<td>- Makes lists of tasks to do</td>
</tr>
<tr>
<td></td>
<td>- Reviews plans and adapts schedule accordingly</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Achieves tasks within required timeframe</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Teamwork</strong></td>
<td><strong>Achieves tasks within required timeframe</strong></td>
</tr>
<tr>
<td>• Co-operates with others to achieve goals &amp; values others as a way of getting things done</td>
<td></td>
</tr>
<tr>
<td>• Friendly, open and approachable</td>
<td></td>
</tr>
<tr>
<td>• Appreciates &amp; uses strengths of others in the team</td>
<td></td>
</tr>
<tr>
<td>• Listens to other people in the team &amp; builds on suggested ideas</td>
<td></td>
</tr>
<tr>
<td>• Takes time to understand other viewpoints</td>
<td></td>
</tr>
<tr>
<td>• Encourages other people to contribute</td>
<td></td>
</tr>
<tr>
<td>• Shares knowledge with others</td>
<td></td>
</tr>
<tr>
<td>• Aware of own behaviour on other people</td>
<td></td>
</tr>
<tr>
<td><strong>Problem solving</strong></td>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td>• Identifies components/root cause of problem</td>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td>• Analyses facts, figures or information &amp; can spot trends</td>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td>• Breaks down complex data from several sources</td>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td>• Can tell the difference between fact &amp; assumption</td>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td>• Relates &amp; compares data from several sources</td>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td>• Anticipates obstacles/problems</td>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td>• Identifies &amp; evaluates alternative courses of action</td>
<td><strong>Problem solving</strong></td>
</tr>
<tr>
<td><strong>Adaptability</strong></td>
<td><strong>Adaptability</strong></td>
</tr>
<tr>
<td>• Responds positively to external changes</td>
<td><strong>Adaptability</strong></td>
</tr>
<tr>
<td>• Responds quickly to new information, changes in objective/direction</td>
<td><strong>Adaptability</strong></td>
</tr>
<tr>
<td>• Recognises when current approaches are not/will not work</td>
<td><strong>Adaptability</strong></td>
</tr>
<tr>
<td>• Adjusts to take account of changing priorities</td>
<td><strong>Adaptability</strong></td>
</tr>
<tr>
<td>• Able to quickly focus on new topics</td>
<td><strong>Adaptability</strong></td>
</tr>
<tr>
<td>• Handles several tasks at one time with no loss of control.</td>
<td><strong>Adaptability</strong></td>
</tr>
<tr>
<td><strong>Innovation</strong></td>
<td><strong>Innovation</strong></td>
</tr>
<tr>
<td>• Produces new, unusual or different ideas</td>
<td><strong>Innovation</strong></td>
</tr>
<tr>
<td>• Encourages others to generate new ideas</td>
<td><strong>Innovation</strong></td>
</tr>
<tr>
<td>• Questions traditional ways of doing things</td>
<td><strong>Innovation</strong></td>
</tr>
<tr>
<td>• Builds on other people’s ideas</td>
<td><strong>Innovation</strong></td>
</tr>
<tr>
<td><strong>Decision making</strong></td>
<td><strong>Decision making</strong></td>
</tr>
<tr>
<td>• Takes responsibility for own actions &amp; decisions</td>
<td><strong>Decision making</strong></td>
</tr>
<tr>
<td>• Makes quick decisions under pressure</td>
<td><strong>Decision making</strong></td>
</tr>
<tr>
<td>• Can make decisions without referring to others</td>
<td><strong>Decision making</strong></td>
</tr>
<tr>
<td>• Takes the first step to start a new idea</td>
<td><strong>Decision making</strong></td>
</tr>
<tr>
<td>• Assesses situations and alternatives quickly</td>
<td><strong>Decision making</strong></td>
</tr>
<tr>
<td>• Makes decisions that could result in criticism</td>
<td><strong>Decision making</strong></td>
</tr>
<tr>
<td><strong>Influencing &amp; persuading</strong></td>
<td><strong>Influencing &amp; persuading</strong></td>
</tr>
<tr>
<td>• Gains commitment by putting forward arguments supported by logic, facts &amp; key benefits</td>
<td><strong>Influencing &amp; persuading</strong></td>
</tr>
<tr>
<td>• Makes fluent, concise &amp; well organised contributions</td>
<td><strong>Influencing &amp; persuading</strong></td>
</tr>
<tr>
<td>• Sells the benefits of an idea or change &amp; summarises for the benefit of others/self</td>
<td><strong>Influencing &amp; persuading</strong></td>
</tr>
<tr>
<td>• Changes the opinion of others by anticipating view-points or objections &amp; presenting counter arguments</td>
<td><strong>Influencing &amp; persuading</strong></td>
</tr>
<tr>
<td>• Wins others over &amp; sells ideas as opportunities</td>
<td><strong>Influencing &amp; persuading</strong></td>
</tr>
<tr>
<td><strong>Communication (verbal &amp;</strong></td>
<td><strong>Communication (verbal &amp;</strong></td>
</tr>
<tr>
<td>• Speaks confidently &amp; articulately without hesitation</td>
<td><strong>Communication (verbal &amp;</strong></td>
</tr>
<tr>
<td>• Makes fluent and well organised contributions</td>
<td><strong>Communication (verbal &amp;</strong></td>
</tr>
<tr>
<td>• Adapts communication so it is appropriate to people or situation</td>
<td><strong>Communication (verbal &amp;</strong></td>
</tr>
</tbody>
</table>
5. Outcomes

Aston University has high levels of students taking one-year industrial placements as part of their undergraduate studies. This translates to high levels of graduate employability since students with relevant work experience are in high demand. Since this module has been running we have achieved 50-70% levels on industrial placements for students with an

Since this module has been running we have achieved 50-75% levels on industrial placements for students (up from around 40% before this module) and high levels of graduate employability. Whilst it is not possible to establish a direct link between the two anecdotally the student report that the projects have helped them demonstrate desired skills.

It should also be noted that at least five past students from this module have gone on to form their own businesses through BSEEN. This organisation offers students and graduates a package of start-up support for new ventures where participants access a variety of workshops, networking opportunities, tailored mentoring, grant and work space at one of the partner universities. In addition, a further six students have also worked with other start up businesses on the Science Park.

The student feedback is very positive. Figure 1 shows the student satisfaction ratings with this module since it started ranging from 80 to 92%. Typically these scores are gathered on the final day when the students have an assessment so are returned from close to 100% of the students in the class.

![Figure 1 Student feedback on EE1EPE](image)

The free text responses are possibly more instructive than the overall satisfaction ratings. Table 2 summariser the positive feedback from students across all years the module has run. The comments have been split into six themes to make it easier to group ideas (team work, skills, employability, the project, organisation and enterprise). It is reassuring to see that there is good alignment with the things the students highlight as being good and the things we hope that they will learn.

Table 2 Positive comments from students

<table>
<thead>
<tr>
<th>written)</th>
<th>Explain terminology in an appropriate language</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Writes information that is well presented &amp; conforms to standards</td>
</tr>
<tr>
<td></td>
<td>Structures information appropriately with clear introduction &amp; conclusion</td>
</tr>
<tr>
<td></td>
<td>Uses correct grammar &amp; spelling</td>
</tr>
<tr>
<td></td>
<td>Does not use unnecessary words/phrases</td>
</tr>
</tbody>
</table>
| Team work                          | ● Teamwork element.  
|                                  | ● Working as group, doing the project.  
|                                  | ● I liked working in teams.  
|                                  | ● Group work and ideas forming with team, team work experience  
|                                  | ● It was both fun and challenging working in a group  
|                                  | ● The module helps me to develop a good approach in dealing in groups and sharing ideas away from the group members.  
|                                  | ● Good opportunity to develop group working skills  
|                                  | ● Working in a group which implicate working in the real work environment.  
|                                  | ● Encouraging team work  
| Skills                           | ● Learning so many new skills.  
|                                  | ● Fun, ideas and creativity are celebrated  
|                                  | ● Designing our product  
|                                  | ● The weekly presentations  
|                                  | ● Independence given in the course helped me to develop key skills, which can’t be taught  
|                                  | ● Having different ideas.  
|                                  | ● This module gave me a chance to do my own design. As well as have communication with classmate and practice the ability of hard work.  
| Employability                    | ● Extremely useful to my future career.  
|                                  | ● The independence.  
| The project                      | ● Got a chance to work on some interesting projects.  
|                                  | ● The practical work and exploring real life applications.  
|                                  | ● The work. Practical works.  
|                                  | ● Range of items to be made  
|                                  | ● Very good but hard  
|                                  | ● We were able to work with different departments, doing different processes which we have never come across before therefore the module was very intellectual and enjoyed it very much.  
|                                  | ● Hands on  
|                                  | ● Having a technical side was great. There was plenty of time to finish everything on time.  
|                                  | ● Engaging projects  
|                                  | ● Really enjoyed it, felt responsible and proud of work I put in  
|                                  | ● Challenging  
|                                  | ● Interesting and engaging project  
| Organisation                    | ● Support always there when needed.  
|                                  | ● Different from pure engineering  
|                                  | ● IT was very interesting, challenging and fun. IT was different to a normal university module.  
|                                  | ● We had a lot of freedom to do what we felt was appropriate. Other modules were much more structured.  

Different to all the other modules.
- The hand on teaching approach was exceptionally great for the types of learning we are doing.
- Really enjoyed ending on the Big Bang
- Opportunity to show at the Big Bang

Enterprise
- Actual project could lead to business
- Marketing stuff
- The entrepreneurship and hands on aspect of it
- Learning developed an idea produce it and sell it
- Business style. ‘Apprentice’ ‘dragons den’ - c’est bon!
- The fact that it brought us face to face with the Business aspect of engineering

It was noticeable that in 2016 the target of the Big Bang Fair was well received by the students despite it requiring them all to give up a day to volunteer on the stand.
The (and noticeably fewer) negative comments made by students or suggestions of things that could be improved are shown in Table 3. They comments fall into three broad categories: team work, time and organisation.

Table 3 Negative comments from students or suggestions for improvements

<table>
<thead>
<tr>
<th>Team work</th>
<th>It took us a long time to understand the idea of the project and there was a short time to finish it, while one member of the group wasn’t working at all and left the group the night before its submission.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>More time.</td>
</tr>
<tr>
<td></td>
<td>Time isn’t enough to do all this.</td>
</tr>
<tr>
<td></td>
<td>Longer timescale, more sessions/ lectures and deadlines so everyone finishes with a fully working product</td>
</tr>
<tr>
<td></td>
<td>Either less hours/ module of more credits/ module</td>
</tr>
<tr>
<td></td>
<td>Give the module more credit, a great amount of work for 10 credits</td>
</tr>
<tr>
<td></td>
<td>More credits for the module</td>
</tr>
<tr>
<td></td>
<td>Cut into time for other projects</td>
</tr>
<tr>
<td></td>
<td>Needed more support at times.</td>
</tr>
<tr>
<td></td>
<td>more time</td>
</tr>
<tr>
<td>Organisation</td>
<td>There wasn’t enough explanation for the projects, it was that easy. Don’t get enough time to understand and work on project it was totally different from what we study, so we needed to have extra work and spending more time just in this module.</td>
</tr>
<tr>
<td></td>
<td>Explaining the labs and lectures. Explaining what we’re going to do before they give us a task.</td>
</tr>
<tr>
<td></td>
<td>Have second years give a talk to encourage students earlier</td>
</tr>
<tr>
<td></td>
<td>More explanation on assessment criteria and not last minute</td>
</tr>
<tr>
<td></td>
<td>More access to project management tools</td>
</tr>
</tbody>
</table>

To address these issues we have made some changes to the module:

- For the last two years we have reduced complaints about non-contributing team members by introducing a class register that must be signed at the start and end of the session. For each missed
signing in opportunity a 5% penalty if deducted for that individual student from the group mark. So those students who do not attend regularly do not gain from the input and work of those that do attend.

- The time issues are challenging to address since the students themselves set the ultimate project aims and the amount of time out-of-class that they spend on it. However, we have modified weeks 1 and 2 so that the work is more relevant to the project work they will do and decreased the number of presentations the students give during the module so they concentrate on the project rather than on writing presentations.

- Organisationally we now give the students a full briefing at the start on the whole project and provide templates for project planning, meeting minutes and the requirements for the final submission of engineering files. These changes appear to have resulted in a further uplift in the satisfaction ratings.

6. Outcomes

When this module was launched there was some debate as to whether it was at too high a level for first year students. However, by allowing the students to learn from previous years and choosing the technical requirements to be within their capabilities they have been able to achieve notable successes.

There are some key things that help ensure success:

- Having an end-user of the products (in 2016 this was the IET) helped the students understand the importance of issues such as cost, usability and robustness and drove them to achieve the end goals.
- The exercise of linking the skills they have to the activities they are doing has given the students a greater understanding of what is required by employers and their importance. It also gives the students an excellent example, which they can use to articulate these skills.
- Since this module has been running we have achieved 50-70% levels on industrial placements for students and high levels of graduate employability and there is anecdotal evidence that this project based entrepreneurship module gives the students desirable skills.
- Using some kind of personality test and arranging the groups accordingly appears to result in more effective team working.
- Having a method of penalising students who do not attend classes minimises complaints about unfairness of awarding group marks.
- The groups need regular mentoring and feedback to ensure that they feel that they are making progress in the right direction and to set realistic goals.

Overall, this is a rewarding way to create an effective learning environment and has the potential to be extended beyond its current format to carry a more significant credit rating.

Acknowledgements

I would like to acknowledge the significant contributions made to the development of this module by Professor Jack Hynds who has generously contributed his industrial experience and time spent mentoring the students and by Sarah Warburton, Careers Consultant at Aston University, for developing the employability skills materials and offering extensive advice and input into optimising the approach.

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*Dr Kate Sugden E-mail address: k.sugden@aston.ac.uk
Abstract

At the present time, the globalization is a common tendency. It is undeniable that it brings about a good chance to push the economic growth of many worldwide countries. However, behind its advantages is a great pressure for companies, especially Small and Medium Enterprises (SMEs). Furthermore, economic crises have made numerous firms bankrupt, having negative influence on internationalization. Therefore, finding the suitable strategies to develop SMEs is one of effective solutions in that situation. Based on the fundamental theories about SMEs, this study focused on Vietnam, a developing country with approximately 500,000 SMEs creating more than two third of jobs for workers and contributing nearly 50 percent GDP each year. In other words, that kind of enterprise performs a vital role in the economy of Vietnam. Nevertheless, witnessing the significant speed of globalization these days, many SMEs are suffering the pressure of integration, and innovation is a wise method for them. The general purpose of this study was to find growth strategies adopted by small and medium enterprises, especially in Vietnam.

The results of the study demonstrated clearly that SMEs innovation progress in Vietnam are having facing some remaining problems. The study also suggests some solutions for SMEs innovation. The result of this study can be useful to the entrepreneurs in the future. It might help them to recognize the vital role of establishment the right strategies and effective plans with an aim to enhance the position and profit of their companies. It is hoped that SMEs will consider this study finding as a good reference so to achieve their goals. Equally important, the Government could apply the study information to introduce appropriate programs and strategies supporting the growth of SMEs. This will play an important part in building the reasonable economic background for the common development of Vietnam.

Keywords: small and medium enterprises; integration; renovation

1. Introduction

The globalization not only brings about a good opportunity to improve the economic growth of many countries, but also puts a great pressure on companies, especially Small and Medium Enterprises (SMEs). That economic tendency is forcing SMEs to face a harsh competition with foreign companies. Consequently, a lot of them have had to finish their business or become branches of bigger firms. However, it is noticeable that category of enterprise play a particularly important part in the economy, thus, Governments should invest more in SMEs in order to help them to find the best way to tackle this headache. In fact, that category of company have a series of difficulties coming from the limited resources such as finance, managers, skillful workforce and information. As a result, although the globalization offers a large number of opportunities to enhance potential profit margin like the reduction of barriers to international trade, internationalization of the market and the deregulation, many SMEs have not been able to overcome their challenges. In this case, innovation is a vital key helping SMEs to find their best way to compete with greater companies.

Like numerous other developing countries, SMEs account for the majority in the Vietnamese economy. Vietnam has about 500,000 SMEs which represent 99 percent of the number of businesses...
of the country; employee 77 percent of workers of the workforce and account for 80 percent of the retail market. Moreover, SMEs create more than 40% GDP each year. Thus, SMEs play an important role in the development of the country. However, under the pressure of integration, SMEs have been being forced to innovate constantly for sustainability growth. In addition, the economic criseses, difficulties in the innovation progress have negative impacts on them, leading to the bankrupt of a wide range of enterprises. Vietnamese SMEs seem difficult to choose creative ideas suitable for the change from a familiar world of marketing and production to an unfamiliar world with strange competitors, new customers’ habits, different legal environments, meanwhile the innovation is still an ambiguous concept for them. In other words, they do not discovery the best method to cope with the matter of globalization yet.

The main aim of study was to determine the innovation strategies adopted by SMEs in response to international competition with a concentration on the case of Vietnam. Based on that general goal, the objectives of this study were:

- To determine some theories relating to the globalization, SMEs and the innovation.
- To research some effective process innovation strategies adopted by SMEs in the context of global competition.
- To research the case of Vietnam based on the theories above.

2. Theoretical background

2.1. Globalization and its influences on the economy

Globalization is the process of international integration arising from the interchange of world views, products, ideas, and other aspects of culture (Albrow, Martin and Elizabeth King (eds.) (1990), Globalization, Knowledge and Society). It is not a new phenomenon. In fact, the trade and invest between different countries have been occurring since many years, for example businesses through the famed Silk Road connecting China and Europe during the Middle Age. Likewise, the wave of international corporations became a common tendency for last centuries. However, only when international policies about that matter have been gradually established have cross – border trade, invest and migration been encouraged to rise strongly. Author Thomas Friedman declared that globalization was “father, faster, cheaper and deeper”. It plays a crucial role in the economic development of nations, particularly developing countries. Thanks to the influx of skillful labors, capital, information and technology, it “promotes global economic growth; creates jobs, makes companies more competitive, and lowers prices for consumers.” (Mike Collins, The Pros And Cons Of Globalization). With the international trade, companies and consumers have chances to access the worldwide markets, raising the large number of chances to gain more money and enjoy better goods and services. However, behind a wide range of advantages do firms and workers have to face a host of difficulties. For instance, the harsh competition can make rich companies richer, leading to the increasing power of some firms in the world. In addition, the migration of workforce and high demands made on workers by companies have put a great pressure on employees who are easier to lose their job in this situation. In conclusion, globalization is still a debatable problem. On the one hand, it allow countries, especially poor nations to improve their economy and standard of living of citizens. On the other hand, it carries along many challenges. Therefore, in order to take advantage of this phenomenon, Governments need to find out the suitable ways, one of which is to strengthen SMEs through innovation.
2.2. The definition and the role of SMEs in the economic growth

Small and Medium – size Enterprises occupy a much greater part in the economy of almost all of countries in the world than other categories of companies, and each nation has their own standard about them.

For instance, according to the European Commission, (What is an SME? - Small and medium sized enterprises (SME) - Enterprise and Industry”. ec.europa.eu. Archived from the original on February 8, 2015. Retrieved 2015-06-12.), the SME are determined:

<table>
<thead>
<tr>
<th>Company category</th>
<th>Employees</th>
<th>Turnover</th>
<th>Balance sheet total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium-sized</td>
<td>&lt; 250</td>
<td>≤ €50 million</td>
<td>≤ €43 million</td>
</tr>
<tr>
<td>Small</td>
<td>&lt; 50</td>
<td>≤ €10 million</td>
<td>≤ €10 million</td>
</tr>
<tr>
<td>Micro</td>
<td>&lt; 10</td>
<td>≤ €2 million</td>
<td>≤ €2 million</td>
</tr>
</tbody>
</table>

Meanwhile, Bangladesh Bank defines Small and medium enterprises based on Fixed Asset and Employed Manpower and they are definitely not Public Limited Co. and requires these characteristics.

<table>
<thead>
<tr>
<th>Serial No</th>
<th>Sector</th>
<th>Fixed Asset other than Land and Building (Tk) SE (Small Enterprises) &amp; ME (Medium Enterprises)</th>
<th>Employed Manpower (not above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Services</td>
<td>For SE 50,000 - 5000,000 &amp; For ME 50,00,000 - 10,00,00,000</td>
<td>SE - 25 &amp; ME – 50</td>
</tr>
<tr>
<td>02</td>
<td>Business</td>
<td>For SE 50,000 - 50,00,000 &amp; For ME 50,00,000 - 10,00,00,000</td>
<td>SE - 25 &amp; ME – 50</td>
</tr>
<tr>
<td>03</td>
<td>Industrial</td>
<td>For SE 50,000 - 1,50,00,000 For Me 1,50,00,000 - 20,00,000</td>
<td>SE - 50 &amp; ME – 150</td>
</tr>
</tbody>
</table>

South Africa has a detailed definition about SMEs. In the National Small Business Amendment Act 26 of 2003, ("Republic of South Africa, National Small Business Amendment Act"). www.thedti.gov.za. Retrieved 10 October 2015.), small businesses have between 21 and 50 employees. The upper limit for turnover in a small business varies from R1 million in the Agricultural sector to R13 million in the Catering, Accommodation and other Trade sector as well as in the Manufacturing sector, with a maximum of R32 million in the Wholesale Trade sector. Medium-sized businesses usually employ up to 200 people (100 in the Agricultural sector), and the maximum turnover varies from R5 million in the Agricultural sector to R51 million in the Manufacturing sector and R64 million in the Wholesale Trade, Commercial Agents and Allied.

In the United Kingdom, a company is a SME if it meets two out of three criteria: it has a turnover of less than £25m, it has fewer than 250 employees, it has gross assets of less than £12.5m.[11](“Bridging loans UK can be used for many purposes”. www.konnectfinancial.co.uk. Konnect Financial. Retrieved 10 October 2015)

In Vietnam, SMEs can be divided into three categories: micro, small and medium-sized enterprises. Micro businesses employ less than 10 workers, small enterprises have between 10 and 200 people with
the maximum source of capital of 20 billion Vietnamese dong (VND). Medium – size kinds use from 200 to 300 employees and their source of capital fluctuates between 20 and 100 billion VND.

SMEs perform an extremely important role in the economic growth. Firstly, they help the economy to develop stably. In fact, SMEs are often subcontractors for large firm. As a consequence, in certain cases, regulating contracts of those subcontractors allows economies to keep their balance and stability. Therefore, they are considered as a method to reduce the negative influences of the economic environment. Secondly, because of their small scale, it is easy for SMEs to change the strategies of business when they recognize the difficulties, making economies more flexible. That become really necessary when financial crises menace frequently companies. Therefore, SMEs are also said to be responsible for driving innovation in many economic sectors. Thirdly, SMEs are one of factors creating supplementary industry and services that support the main ones. Many of these enterprises specialize in producing certain small parts of products. That specialization helps companies to reduce the cost and time of production. Fourthly, it is noticeable that SMEs became the backbone of the local economies. While large firms are often situated in the center of big cities, SMEs are one of the most important makers of the local budget and create jobs for people. Finally, they give a remarkable contribution to national budget yearly.

As a result, developing SMEs is a suitable solution in the case of globalization for numerous countries. However, the more internationalization occurs, the more competitive global market become. Therefore, SMEs have to suffer a permanent pressure of innovation in order to compete with their rivals.

2.3. The theoretical background of innovation

The definition of innovation is a debatable matter drawing the attention of many researchers. Traditional concepts have tendency to consider the conscious intent as the main feature, emphasize the formal, planned and deliberate aspect of innovation process. However, the modern definitions have some different points. More contemporary concepts see that matter as encompassing both education and training, formal and informal processes. According to the point of Watson, Mueni Taslim and Dr. Bichanga, Julius explaining in the research named “Innovation strategies adopted by Small and Medium Enterprise in response to global competition: a case of Nairobi County”, innovation is “the successful implementation of creative ideas within in an organization”. In other words, creativity of individuals or terms is the necessary part establishing the success of a company. Innovation is a process “involve thinking differently, and creatively to find solutions that have an impact in term of economic and social value” (Daniel Schilirò, 2015, Innovation in Small and Medium Enterprises in the United Arab Emirates). In our point of view, innovation should not be simply saw as doing the contrast to the manner in the past. In fact, the old ways can have an abundance of good things to inherit. Some individuals think that people ought to innovate by criticizing and eliminating altogether ways being used currently. Nonetheless, that thought is extreme. Innovation should be to find the suitable methods for the situations by taking full advantage of creative ideas and inheriting strong points of previous manners.

Innovation is significantly important for SMEs in case of globalization. First, it helps them to have competitive ability. The internationalization brings not only a larger market, but also a harsh competition. In that situation, SMEs have numerous drawbacks like little capital, lack of experience, a shortage of skillful workforce, thus without innovation, they might fail. Creative and critical thinking are able to support them to abandon pathways, find new directions. In other words, innovation create a gap in the race between big firms so that SMEs have opportunity to come in and achieve success.
Second, innovation also improves governance. In order to promote the growth of SMEs, the role of managers is crucial. They are people who make plans for company, therefore they must have enough competence to hold power of that position. However, it is difficult for them to lead their enterprises to success in the circumstances of strong competition. In this case, creative thought is the key to tackle the problem... Joseph Schumpeter (1934, 1942) highlighted that the fundamental strength pushing the capitalistic engine in motion results from the entrepreneur’s innovative capacity.

There is no one single best way of innovation and this matter is quite ambiguous. It is built by intangible skills such as entrepreneurial ability, communication skills, adaptability, knowledge, etc. That an innovatory strategy is either effective or not depends subjective and objective factors. Firstly, in term of SMEs, their business plan is the first element creating their success. In order to innovate effectively, they had better establish systematic processes, helping them to determine clear steps of strategy and regulate correctly them when necessary. In addition, the competence of workforce involving both leaders and employees is also important, because it is them who have to find creative ideas and realize innovation. Therefore, investing in seeking and training workforce is an reasonable stage. Furthermore, allocation of resource have considerable impacts on the effectivity of innovation, since an exact use of capital and people can save a lot of money and time for SMEs. That is one of vital factors deciding the result of innovation. Simultaneously, companies must “be aware that the business world is also driven by contention between the incumbents in every industry and the ascendancy of the challengers” (Daniel Schilirò, 2015, “Innovation in Small and Medium Enterprises in the United Arab Emirates”). Thus, a correct choice of business model is really important. Chesbrough and Rosenbloom (2002) defined that business model is a plan for organizational and financial architecture of business, which make valid assumptions about the behavior of revenues and costs, potential customers and competitor behavior. A right decision of business model help SMEs to take advantage of all their strong points and enhance their potential ability. Secondly, the success of companies suffer a great influence of serendipitous moment that comes mainly from business environment. However, that environment changes constantly due to the develop of technology. SMEs must account and understand deeply it.

3. SMEs in Vietnam and innovation
3.1. Vietnamese SMEs and the context in Vietnam

Vietnam, a developing country, is facing the pressure of globalization. Therefore, SMEs performs a vital part in Vietnamese economy. Between 2006 and 2015, the quantity of SMEs in Vietnam increased significantly. For instance, the number of SMEs in 2015 was 4,75 times as many as that in 2006, on average, this number rose 47.6% each year. In particular, the quantity of micro enterprises rocketed in that period, for example, in 2006, there were only 76.303 companies, but until 2015, they climbed 458.150 enterprises. It is undeniable that SMEs have became more and more necessary to Vietnamese economy. Looking at the percentage of that kind of company, we can partly understand its crucial role.
The period from 2006 to 2015 witnesses the rapid development of SMEs in Vietnam. After 10 years, SMEs have occupied a greater and greater proportion in comparison with that of large firms, proving their important position. That also means that if Government of Vietnam can find the right way for SMEs, the opportunity to improve the common development is easier to achieve. By contrast, a wrong decision can quickly lead to a crisis.

In addition, the contribution of SMEs to the economic growth was remarkable. According the number given by General Statistics Office of Vietnam, in 2015, SMEs created 50 percent of GDP, contributed 60 percent of national budget, accounted 49 percent of making the added value of the economy, tax and other fees’ payment from SMEs to State increased 18.4 times just after 10 years. Moreover, SMEs created 62 percent of jobs in that year. Furthermore, based on the number about the average income of employees in SMEs, we can recognize that SMEs are one of the most important part helping Vietnam to develop sustainably. The average income of a worker in 2015 was 4.900.000 VND, 3.2 times as much as that in 2006, indicating the higher standard of living of employees thanks to SMEs. It is clear that promoting the raise of SMEs is a right direction for Vietnam.

However, like other kinds of companies, SMEs had to suffer great pressure of increasing globalization, consequently its speed of development did not meet the expectation of this nation. According General Statistics Office of Vietnam, the period between 2010 and 2012 saw the continuous decline of the total number of newly established enterprises from 83.600 to 69.800. Nevertheless, the positive sign appeared in 2013 with the growth to 76.900 companies, and in 2015, this number reached the peak of 95.000 newly established enterprises. Among them, the majority was SMEs. This considerable increase carried along a hasher competition. In the circumstance of globalization, apart from abroad companies, SMEs must compete with domestic SMEs. Meanwhile, the majority of Vietnamese’s SMEs have a really small scale with only the capital of between 4 and 7 billion VND. Due to challenges of the globalization and crisises, the number of SMEs stopping doing business or is climbing. In the first half of 2016, this quantity have been more than 6.000 companies, rose 17,7 percent compared with the same period in 2015. In addition, in spite the fact that the quantity of SMEs in Vietnam is great, their contribution is not big enough in order to confirm their power in the economy. If SMEs want to exist and compete with big firms in the situation of globalization, they should consider the method of innovation.
As can be seen from the figure 2, the majority of SMEs in Vietnam participate in trade and service, followed by industry and construction (68% and 31%, respectively). However, when the cross-border trade, invest and migration have been occurring due to the impact of the globalization, SMEs have to meet a lot of obstacles, because foreign companies have more abundant capital. In addition, the sector of trade and service is quite new for Vietnamese SMEs, thus they lack experience of organization and management. In the future, if they cannot find a way to develop, they will lose gradually their market. It seems that the easiest manner for them is to innovate their products, make their goods unique that cannot be replaced by others.

The figure 3 reveals that the number of workers in large and medium companies is the minority. It is also a drawback for Vietnamese employees, since in small and micro enterprises, they do not have many opportunities to gain some skills (like team-work skill, soft skill) and knowledge about foreign languages, the state – of – the - art technology. In this case, it is difficult for them to compete with skillful workforce coming from other countries.

### 3.2. Discussion about the Innovation of SMEs in Vietnam

#### 3.2.1. Some Advantages to SMEs of Government incentive policy on Innovation in Vietnam
SMEs play an important role in the development of Vietnam’s economy. Therefore, the government pays considerable attention to SMEs’ growth. In order to promote SMEs’ innovation, Vietnam government adopt many solutions as follow:

* **Special support for SMEs and start-ups**

In order to achieve the above objectives, five solutions are offered. Most of which are designed to support SMEs, start-ups and innovative companies.

On the individual level, Vietnam plans to halve income tax for individuals working in hi-tech information technology, application of high-tech in agriculture and food processing. Universities are also to encourage their students to become entrepreneurs through a specially designed curriculum. Plans are in place to establish enterprise nurseries, support centers and programs to encourage innovation and start-up under a public private partnership.

Vietnam redesigned the SME Development fund, the National Technological Innovation Fund and other private sector funds. Ministry of Agriculture and Rural Development will also design a mechanism to improve access and use of agricultural land by businesses while by Q3/2016 the Ministry of Finance will submit revised regulations on credit guarantee for SMEs through Vietnam Development Bank and Credit Guarantee Fund.

Regarding costs, Ministry of Finance is going to study options to reduce taxes incurred by SMEs. Besides, according to Income tax law, enterprises are allowed to use 10% of their profit before tax to invest in technology innovation.

* **Financial support for SMEs’ innovation**

In order to deal with financial difficulties of SMEs, some fund are established. The first fund is A fund for small- and medium-sized enterprise (SME) development was set up with a total charter capital of VND 2000 billion (≈ USD 100 million). The move aims to enhance the competitiveness of these enterprises and to create more jobs. Functioning as a State financial organization under the management of the Ministry of Planning and Investment, the non-profit fund is responsible for managing and using financial resources to support SME development.

This fund Entrust commercial banks to provide loans for business projects/plans belong to the List of sectors entitled to prioritized support from the Fund, aimed at enhancing SMEs' competitiveness and innovation. Therefore to get the financial assistance, SMEs must meet a number of conditions, including having feasible production or business plans in line with the fund's list of priority areas. Besides, SMEs have a change to borrow money at favorable interest rate (not exceeding 90% commercial interest rate). The maximum loan for each project will not exceed VND30 billion ($1.4 million) and must be repaid within seven years.

The second fund is The National Technology Innovation Fund (hereinafter referred to as Fund for short) is a State financial institution, operates for non-profit purposes, has the function to provide preferential loans, subsidized loan interests and loan guarantees, and to grant expenses to organizations, individuals and enterprises that carry out research, technology transfer and innovation. This fund has total charter capital of VND 1000 billion (≈ USD 50 million). Among them, more than 50% for funding project and less than 50% for funding concessional loan, interest support and loan guarantee. Funding activities include Technology transfer, inclusive innovation business development, technology transfer for agricultural and rural development; technology transfer in remote area, training and inclusive innovation, consultants for enterprises.

Additionally, SMEs may approach loan via other funds such as: Venture Capital Fund for Hi-tech enterprises, Environment Protection Fund; Science and Technology Development Fund Industry Encouragement Program and Agriculture Encouragement Program.
Moreover, there are some Projects funded by international donors which finance SMEs’ innovation programs such as: VIIP: Vietnam Inclusive Innovation Project (WB), VBCF: Vietnam Business Challenge Fund or Enterprise support – Micro Financing, AFD

* **Ensuring the right to do business and equal access to resources and business opportunities**

Enterprises in industrial zones may use their land as collateral to take loans from banks and mobilize long term funding after the Ministry of Natural Resources and Environment revises land regulations in Q3/2016.

Additionally, Ministry of Finance devised a mechanism to allow revenue from land transfer to compensate for revenue from business operations.

The Ministry of Science and Technology introduced additional quality standards to help commercialize products by enterprises. Procedures to apply for intellectual property are to be simplified while also better protecting this right.

* **Reduction of operation costs for enterprises**

Land rent and fees payable by enterprises, as well as expressway toll are to be lowered. The MOF is studying to revise Corporate Tax Law to expand on costs eligible for tax exemption, including capacity building, administrative support, advertising and marketing.

Furthermore, Vietnam Chamber of Commerce and Industry is going to investigate and calculate official and unofficial costs incurred by enterprises and compare these with the region to propose a solution to reduce costs.

* **Protection of enterprise’s rights and interests**

Inspection and auditing plans must be pre-announced to avoid any overlapping and there should be no inspection without a clear legal reason, especially in the area of tax management. Furthermore, economic and civil relationships are not to be criminalized.

* **Administrative reform**

Business regulations are to be clearer and more transparent while bureaucracy is to be reduced. All business procedures and outcomes of recommendations and complaints are to be made public on the relevant government portal. The “one door” policy is to be further promoted whereby any request to submit additional paperwork has to be justified and done once in writing.

Provinces and cities organized dialogues with enterprises and the press twice a year to keep up with and resolve any bottlenecks in the area. In parallel, enterprises are able to submit queries to the local authorities via a hotline or a government portal.

Vietnam’s Ministry of Finance is looking into cutting the corporate income tax from 20 percent to 17 percent to encourage SMEs to grow and use the extra capital for further investment to improve their competitiveness.

The ministry noted that reducing the corporate income tax would not have a significant impact on state budget revenue as SMEs only make a small contribution to government coffers. About 86.2 percent of the local companies are SMEs, paying some 2.7 trillion in corporate tax each year. This would leave a hole in the state budget of around 1.6 trillion over the four-year period.

The Ministry of Finance has also proposed a plan to reduce the income tax for start-ups, making them exempt for four years and levying a rate of 10 percent for the next 15 years.

3.2.2. Some disadvantages in the innovation of Vietnamese SMEs
This section focuses on the innovation model in the Vietnamese SMEs and some obstacles for SMEs’ innovation by drawing on the data and information contained in some recent reports on innovation there.

* **SMEs’ technology is limited and outdated**

Vietnam is approaching the crossroads of development. To promote economic growth with the low level of labor and capital, the country must rely more on gains driven by productivity. This will require considerable improvements in domestic innovation capabilities. However, the weakness of science, technology is being a big drawback of Vietnam, especially SMEs. According to Dr. Vu Tien Loc, only 10 percent of Vietnamese SMEs own modern technologies, whereas more than 40 percent of them use old machines, leading to a little turnover. The fact has proved that boosting technology to innovate in SMEs is not easy.

Table 1 describes the level of technology of products in SMEs in Vietnam for the years 2009, 2012, 2015. The table distinguishes two groups of companies on the basis of the level of technology of their products: No/Low-Tech and Med-Tech/High Tech.

Table 1: Level of Technology of Products in SMEs in Vietnam

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2012</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>No/Low-Tech</td>
<td>80%</td>
<td>75%</td>
<td>72%</td>
</tr>
<tr>
<td>Med-Tech or High-Tech</td>
<td>20%</td>
<td>25%</td>
<td>28%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Source: General Statistics Office of Vietnam*

Table 1 shows, for the recent years, although the number of enterprises which are equipped with medi-tech or high-tech gradually increases, almost all SMEs in Vietnam had no or low technological levels, with only 28% being medium-tech or high-tech companies in 2015. In addition, the survey of planning and investment ministry has shown that about 80% to 90% of machines which used by SMEs is often old and inefficient. In reality, Vietnamese SMEs have small capital and profit, hence, they do not enough money to invest in modern technology.

Boosting this sector in Vietnam have both advantages and disadvantages. The World Bank gave a SWOT analysis of Vietnam’s science, technology and innovation (STI) system following.

<table>
<thead>
<tr>
<th><strong>Strengths</strong></th>
<th><strong>Weaknesses</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Strong economic performance and diminishing poverty levels.</td>
<td>- Low levels of productivity and income.</td>
</tr>
<tr>
<td>- Geographical location in one of the world’s most dynamic regions.</td>
<td>- Inadequate framework conditions and disincentives for innovation.</td>
</tr>
<tr>
<td>- Sizeable labor force and favorable demographics.</td>
<td>- Limited access to finance for enterprises.</td>
</tr>
<tr>
<td>- Substantial national education effort and good secondary education performance.</td>
<td>- Inefficiencies in state-owned enterprises.</td>
</tr>
<tr>
<td>- Attractiveness for investment by multinational enterprises.</td>
<td>- Infrastructure deficiencies.</td>
</tr>
<tr>
<td>- Export strengths in a range of sectors.</td>
<td>- Weak performance of the teaching and learning system.</td>
</tr>
<tr>
<td>- Good reputation in science and technology (S&amp;T) fields such as mathematics, and</td>
<td>- Low level of sophistication of production and exports.</td>
</tr>
<tr>
<td></td>
<td>- Little innovation and even less research and development capacity in the business sector.</td>
</tr>
<tr>
<td></td>
<td>- Weak performance of public-sector research.</td>
</tr>
</tbody>
</table>
specialization in agricultural research and biology.
- Progress in creating and sustaining a set of organizations and institutions to support innovation.
- Regional initiatives of national benefit.

- Weaknesses in the S&T infrastructure as regards laboratories and research equipment.
- Seriously underdeveloped information base for innovation policy making.
- Inadequate STI governance arrangements and policy implementation.

### Opportunities
- Further developing the human capital and skills.
- Nurturing a dynamic business sector and its innovation capabilities.
- Diversifying and upgrading the economy.
- Developing a healthy attitude to risk-taking.
- Improving effectiveness of the innovation system in terms of economic and social impact.
- Strengthening inclusive growth.

### Threats
- Improving framework conditions for innovation.
- Improving public governance of the innovation system.
- Strengthening the human resource base for innovation.
- Fostering innovation in the business sector.
- Increasing the contribution of public research.
- Fostering innovation linkages.

* **SMEs’ lack of innovative products**

Figure 4: SMEs by number of employees

Source: General Statistics Office of Vietnam

Figure 4 illustrates that currently, the majority of SMEs (85%) tend to copy products while only 15% enterprises make something new. Therefore, in general, SMEs’ products are not original and innovative as the result of a tendency to copy products and processes rather than invent or create new products. Vietnamese SMEs has low rates of innovation and they want to copy rather than invent; actually most offer products and services that are similar to their competitors’ products. This way helps SMEs reduce the cost and time when they start a business activities. However, it is no longer suitable in the globalization. With products copied, it is difficult for SMEs to compete with large firms that have more capital and experience. The market has been made larger thanks to internationalization. In fact, it is a great chance for large firms to expand companies. However, it is a big challenge for SMEs because they have to face more competition. If they cannot find the manner to innovate their products, make them unique, they will fail.

However, innovation in products in this period is not essay, particularly when the budget of Vietnam for this activity is not abundant. Moreover, the protection of copyright of initiatives in this country is not really rigid yet. Therefore, SMEs hesitate to invest in innovating their products.

* **Financial problem**
Their other problem is the lack of capital which is more serious when the internationalization is occurring strongly. It is known that SMEs have difficulty in securing finance, especially from the banking sector. Banks do not believe their capacity of returning loan. Moreover, financial markets are far from perfect and there has been a lack of SMEs equity financing in Vietnam. Therefore, SMEs mainly mobilize the capital they need through the savings and income of their entrepreneurs or other network. To deal with this problem, the Vietnam government has provided financial resources to be allocated through some banks to support SMEs in the form of loan programs and government-backed loan guarantees. However in reality few enterprises received this support. According to a survey of Enterprises development institute (Vietnam Chamber of Commerce and Industry), 55% of SMEs has difficulty with administrative bureaucracy, 50% of SMEs encounters difficulty with collateral, 80% of SMEs think that the interest rate is unsuitable. Thus, Vietnamese SMEs are facing Difficulties in accessing bank loans for R&D, technology innovation and commercializing innovative research.

*Low quality of human capital*

Human capital is another key factor that contribute to SMEs’ innovation because of the dramatic change of the economic and production environment. Despite the fact that Vietnam has large workforce (according to the data of the Planning and Investment Ministry, Vietnam has 53.9 million labor above 15 years old), quality of labor is low with low levels of education and skill.

Figure 5: Workforce in Vietnamese SMEs

![Workforce in Vietnamese SMEs](image)

*Source: General Statistics Office of Vietnam*

Vietnamese SMEs are facing barriers in management level and quality of resource including human resource. According to the result of the Planning and investment ministry’s survey, the majority of the owners have low levels of education. Among them, 62.72% owners completed upper secondary school while only 24.2% owners completed college, university or post-graduate in 2015. In the labor force, up to 75% the labors and workers in SMEs are untrained for technical expertise, resulting to the difficulties in making business plans and realizing them. In addition, the innovation is often based on the progress of technology and updating new tendencies. With the low level of quality of workforce, SMEs have numerous obstacles when they want to apply the new knowledge.
Table 2: Characteristics of the owner surveyed SMEs

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2012</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>General education: % who completed primary school</td>
<td>8.2</td>
<td>9.0</td>
<td>8.4</td>
</tr>
<tr>
<td>General education: % who completed lower secondary school</td>
<td>31.3</td>
<td>28.0</td>
<td>27.9</td>
</tr>
<tr>
<td>General education: % who completed upper secondary school</td>
<td>56.0</td>
<td>59.2</td>
<td>62.2</td>
</tr>
<tr>
<td>Professional education: % who have technical certificate</td>
<td>18.3</td>
<td>15.4</td>
<td>17.6</td>
</tr>
<tr>
<td>Professional education: % who completed college / university / post-graduate</td>
<td>1.3</td>
<td>20.8</td>
<td>24.2</td>
</tr>
</tbody>
</table>

*Source: Planning and investment ministry’s survey*

*Some other aspects of SMEs’ innovation*

Table 3: Some aspects of Vietnamese SMEs’ innovation

<table>
<thead>
<tr>
<th>Some aspects of SMEs’ innovation</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Orientation of SMEs</td>
<td>81.5%</td>
<td>10%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Orientation towards Innovation among SMEs</td>
<td>87%</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td>Focus on Human Capital Development by SMEs</td>
<td>70%</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>Scalability Potential of SMEs</td>
<td>56.6%</td>
<td>27.4%</td>
<td>16%</td>
</tr>
</tbody>
</table>

*Source: Planning and investment ministry’s survey*

In general, most small firms in Vietnam have focused on domestic markets. But some companies are becoming increasingly globalised. About 8.5% of manufacturing SMEs are now internationally competitive and this share should increase. Because networking allows SMEs to combine the advantages of smaller scale and greater flexibility with economies of scale and scope in larger markets – regional, national and global. Compare with large firms, SMEs can better respond to changing market conditions, evolving consumer preferences and shorter product life cycles by customizing and differentiating products. New communication tools make it easier for small firms to reach foreign partners. As a result, SMEs are becoming more involved in international joint ventures.

Almost SMEs in Vietnam have small scale and suffer from financial difficulty. Hence, a low rate of SMEs has orientation towards innovation (87%) and hardly do they pay attention to human capital development. For instance, only 12% SMEs focuses on workforce development.

According to the data, Scalability Potential of SMEs is low in general (56.6%). The reason for low scalability is that SMEs lack experience of cost management. As a result, when they enlarge their activities, high incremental variable costs are required.

4. Conclusions and recommendations

SMEs play a crucial role in the economy’s development. A company’s competitiveness depends on its innovativeness. The main purpose of this study has been to contribute to find out some obstacles of SMEs’ innovation in Vietnam.

In the context of technology evolution, the world is becoming more competitive every single day, leaving behind anyone who is not able to keep up with the pace. SMEs in Vietnam must enhance their
aware of this changing scenario. The first important proposition that can be derived from the analysis conducted in this study is that innovation is a key for the success of any enterprises. The second proposition is that SMEs should understand their role as enablers of innovative ideas and behaviors. In other words, the good way for them to compete in globalization should be to develop the unique characteristics of their products. In addition, investing more in technology and the quality of labors is also a manner to enhance the capacity of innovation in SMEs. Moreover, an effort must be made in Vietnam to improve and spread the culture of innovation among SMEs (such as applying policy in order to encourage creative ideas, ensuring the copyright), increasing the speed of innovation in SMEs. As for Government of Vietnam, recognizing the role of SMEs and creating funds to support them are necessary.

There are good examples of SMEs which are successfully innovating in Vietnam and becoming global players in their markets, although many SMEs in Vietnam still have a low propensity to innovate. Thus, SMEs in Vietnam have a great potential for innovation and the Vietnam Government will support them also through the National Innovation Strategy.

To sum up, SMEs must pay special attention to innovation, renovate their business models, and adapt to a changing environment, they must become more internationalized, foster the quality of their workforce and adopt modern technology.

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Does Managerial Ownership Drive Corporate Entrepreneurship in Privatised Firms: The Case of Emerging Vietnam

Huong Nguyen

VNUK Institute for Research and Executive Education, University of Danang

1. Introduction

Corporate entrepreneurship - “a process of organizational renewal that has two distinct but related dimensions: innovation and venturing, and strategic renewal” (Zahra, 1993, p. 321)—is an important tool for achieving competitive advantage (Dess and Lumpkin, 2005, Duane Ireland and Webb, 2007). As corporate entrepreneurship (CE) always involves ideas and initiatives that are new and unproven (Dess and Lumpkin, 2005), it entails a high degree of risk and uncertainty (Shimizu, 2012). Ownership rights are important to CE because they enable entrepreneurs to make decisions on the allocation of resources in a way that best supports the achievement of given levels of return. However, the entrepreneur must also bear the risks related to their decisions (Hawley Jr, 1927).

Arguably, the proportion of shares held by certain groups of investors will affect CE to some extent (Connelly et al., 2010). Along these lines, one robust area of inquiry investigates how executive ownership stimulates or hampers CE. Such research is important because ownership is more readily shaped by purposeful corporate strategy and public policy than many other factors that might influence entrepreneurial behavior. Researchers have highlighted the important role played by top management in CE activities (Dess et al., 2003, Hornsby et al., 2009, Kelley et al., 2009, Shimizu, 2012). However, Zahra et al. (2014) contend that despite the difference in ownership structure between developed and emerging economies, and the resulting agency conflicts, few studies offer explicit insights into the effects of ownership structure on entrepreneurial activities. Notably, nearly all existing research on ownership and entrepreneurship focuses on the context of highly developed economies, while very little exists for economies in other stages of development. This gap in the extant research is particularly problematic for transition economies, where both the need and motivation to foster entrepreneurship are strong. To address this gap in the extant literature, this study examines the links between managerial ownership and CE in the context of a transition economy.

Such a study requires a theoretical frame. Previous researchers have mainly relied on agency theory to characterize the relationship between corporate governance and corporate outcomes. Agency theory assumes that managers are self-serving and individualistic, and that they may engage in opportunistic behaviors at the expense of shareholders’ interests. The theory posits a high level of managerial ownership as one governance mechanism that reduces the costs arising from conflicts of interest among shareholders and agents. However, some researchers argue that agency theory fails to account for diversity in the linkages between governance and organizational outcomes (Hoskisson et al., 2000). Therefore, these researchers suggest that the integration of several theories—stewardship theory (Anderson et al., 2007), resource dependence theory (Hillman and Dalziel, 2003, Lynall et al., 2003), and institutional theory (Strange et al., 2009, Douma et al., 2006, Eisenhardt, 1989b)—would provide a more complete understanding of these linkages. Along these lines, this study adopts two key
theoretical paradigms—agency theory and stewardship theory—to examine the influence of managers on CE in privatized firms in transition economies.

Vietnam has experienced a period of rapid change and development in which the government has substantially modified the institutional arrangements applicable to business. These changes have subsequently led to dramatic economic growth. Vietnam reformed its system of state-owned enterprises (SOEs) by implementing privatization schemes. In the process, it created a wide range of ownership structures. As such, Vietnam serves as an excellent setting for a scholarly investigation of the influence of ownership structures on CE. Moreover, Vietnamese policy makers continue to devise laws, regulations, policies, and programs aimed at encouraging innovation and growth. Therefore, knowledge about the drivers of CE in Vietnam’s dynamic economic setting would be highly relevant for decision makers and researchers alike.

2. Privatization and managerial ownership in Vietnam

Privatization has been a widespread phenomenon in transition economies in recent decades. As such, it has led to radical changes in firm ownership and corporate governance with a wide range of outcomes (Zahra et al., 2000a, Uhlenbruck and Castro, 1998, Newman, 2000). In these countries, external corporate-governance mechanisms are often underdeveloped, so that internal governance becomes the main mechanism for monitoring and controlling management. In transition economies that are not only undergoing gradual privatization but are also embedded in unique historical and cultural contexts, such as China and Vietnam, corporate governance embodies several characteristics that can lead to organizational outcomes that may be significantly different from those in developed economies. For instance, the state remains a significant investor in privatized firms in these countries (Le and O’Brien, 2010). Moreover, the board of directors is often dominated by insiders, and the ownership structure is highly concentrated.

In Vietnam, privatization takes the form of “equitization,” which is defined as the transformation of SOEs into joint-stock companies through the sale of some of the company’s shares to investors. When Doi Moi emerged in 1986, Vietnam had around 12,300 SOEs, many of which were unprofitable and suffering from substantial inefficiencies. By the end of the pilot program in 2004, the number of SOEs had declined to around 6,500 (Vu, 2005). Equitization creates favorable conditions for enterprises to mobilize investment capital and clean up corporate finance, and thereby achieve better operating performance. In addition, it helps weak enterprises develop and provides a “tonic” that can promote strong enterprises.

The Vietnamese privatization program has been described as a process of top-down sales to both insiders and outsiders (Giang, 2008). Notably, the concept of equitization in Vietnam differs from that of privatization in developed countries. Vietnam was determined to retain its socialist orientation. As a result, equitization reflects the underlying ideology of a socialism-oriented economy and the government maintains monopolistic power over strategic or profitable SOEs. Not surprisingly, given the economic and political context, the largest proportion of shares in equitized companies is still held by the state and insiders, including managers and workers (Sjöholm, 2006).
3. Theoretical background and hypothesis development

Entrepreneurship in Vietnam

Vietnam’s entrepreneurs have historically operated within a hostile institutional environment (i.e., in the almost complete absence of formal institutions; (Nguyen, 2005). However, this environment has gradually become more conducive to entrepreneurship, and Vietnam has established itself as a prime example of robust growth (McMillan and Woodruff, 2002). Doi Moi has facilitated the building of market institutions and infrastructure through, for example, the issuance of various laws and regulations, and the provision of support for the private sector (Nguyen, 2005). These institutional developments have encouraged new venture creation and they have created a favorable environment for entrepreneurial firms. As a result, the number of private enterprises has increased considerably. In 1991, 414 private firms were created. That figure increased to 5,189 in 1992, followed by 15,276 in 1995, 39,180 in 1998, and 45,601 in 1999 (Nguyen, 2006). As previously noted, the 1999 Company Law led to tremendous economic growth and a remarkable increase in the number of registered businesses (VNCT-VCCI, 2009). This was supplemented with additional enterprise laws (2003 and 2005), which established more favorable conditions for the private sector, such that the number of non-state enterprises increased exponentially between 1999 and 2011 (Figure 5). Data from the General Statistics Office of Vietnam for the same period demonstrate that non-state-owned enterprises grew at a much faster rate than SOEs and foreign-owned enterprises. By the end of the 2000s, market conditions had changed remarkably, and access to markets and buyers had become increasingly favorable (Steer and Sen, 2010).
Undoubtedly, the private sector has played an important role in Vietnam’s economic growth. For example, in 2000, the private sector contributed 39.6 percent to GDP, while SOEs and the foreign-owned sector contributed 38.52 percent and 13.3 percent, respectively. By 2009 however, the GDP contributions of non-state-owned enterprises, SOEs, and foreign-investment enterprises were 41.1 percent, 35.1 percent, and 18.33 percent, respectively.

Ownership structures among privatized Vietnamese firms

The unique features of the privatization process in Vietnam and the distinctive characteristics of the shareholders mean that the ownership structures found in privatized companies in Vietnam are varied and complicated. Different types of investors—the state, institutions, insiders, individuals, and employees—are associated with various categories of shares. These shareholders differ in their interests, incentives, and abilities to monitor management.

As mentioned above, privatization in Vietnam differs from privatization typical of developed countries because, in many cases the state still holds decisive voting rights as an investor. Ultimately, the ownership structure is highly concentrated (Giang, 2008). In addition, the ownership structure is often characterized by insider ownership (Sjöholm, 2006). In fact, in 2004, insiders accounted for 46.5 percent of total assets in privatized firms (Loc et al., 2006). As part of the Vietnamese privatization practice, employees and managers typically acquire a considerable portion of shares in their firms at the time of privatization (Sjöholm, 2006). Moreover, they often purchase those shares at a significant discount (e.g., 40 percent). After a holding period of six to twelve months, the company may register with the State Security Committee to allow its employees to sell their shares on the open market. Almost all employees in privatized firms sell their shares at that point, often to managers. As a result, the main shareholders of privatized firms are typically insiders. A report from the Vietnamese Committee for Enterprise Reform indicates that, on average, insiders held 14 percent of all shares in firms privatized before the end of 2011 (Central Steering Committee for Enterprise Reform, 2011). Even though this ratio has gradually decreased over time as a result of the participation of other investors, insiders continue to hold relatively large proportions of the total shares in privatized Vietnamese firms. Therefore, although ownership structures in privatized companies in other countries tend to be institutionalized, the institutional shareholding ratio is low in Vietnam.
Managerial ownership and corporate entrepreneurship: Agency theory versus stewardship theory

Agency theory and stewardship theory are based on different assumptions about the behaviors of individuals and organizations. Agency theorists assume that the objective of principals and agents is to maximize their interests, and that those interests diverge (Eisenhardt, 1989a). They also argue that boards (principals) and agents have different objectives and incentives.

In modern public firms, owners can be a mixed group with a wide variety of goals. Therefore, stewardship theorists argue that, as stewards, managers react to the diffuse interests of various owners by focusing on the firm’s objectives and maximizing organizational success. In that regard, managers reflect the majority interest. Stewards act on the belief that their utility is maximized whenever they protect shareholder value by improving company performance and by working toward collective organizational objectives (Davis et al., 1997b). These managers are willing to sacrifice their own interests. They invest in the company to ensure that it becomes wealthy and sustainable, and they enhance the company’s value for the benefit of all stakeholders (Le Breton-Miller, 2005, Bubolz, 2001). From a risk-taking perspective, such managers are less likely to be risk-averse and more likely to invest in long-term projects with the expectation that doing so will result in benefits for shareholders.

On the one hand, agency theory focuses on the extrinsic motivations—opportunities to obtain profit from tangible, exchangeable commodities that have a market value—of organizational decision makers. On the other hand, stewardship theory focuses on the intrinsic motivations—opportunities for achievement or self-actualization—of decision makers (Davis et al., 1997b). As a result, the applicability and relevance of each theory differ (Davis et al., 1997a).

The implications of stewardship theory for corporate governance are profound, particularly because it presents an alternative view of management behaviour that challenges previous perceptions of the roles of directors and managers. Empirical evidence suggests that stewardship theory may be better able to explain organizational decisions in many cases and contexts (e.g., Fox and Hamilton, 1994, Wasserman, 2006).

Given the weakness of external corporate governance in transition economies, internal corporate-governance mechanisms become essential for mitigating the potential agency problem. However, in the majority of privatized SOEs, managers still act in the government’s best interests. In particular, they work to ensure economic stability, including job preservation. In addition, managers tend to maintain their political connections and pursue their own interests, which do not necessarily focus on economic returns. In contrast, some shareholder groups, such as private owners, business groups, and foreign investors, make higher demands related to entrepreneurship and profitability. As a consequence, the agency problems faced by privatized firms in transitional contexts may differ from those faced by firms in developed economies. In this sense, the goals and interests of different shareholders and managers in transition economies need to be carefully analyzed if we are to obtain a better view of corporate governance in this context, and a proper understanding of the impact of corporate-governance mechanisms on CE and firm performance.

I argue that the integration of stewardship theory and agency theory would improve our understanding of the roles played by boards in the context of transition economies. However, stewardship theory should not be viewed as “better” than agency theory. The two theories are complementary rather than contradictory, as each is more applicable to certain executives and situations (Wasserman, 2006).
Together, the two theories are likely to be more robust in explaining the complexities of human behavior (Davis et al., 1997a). In this study, I borrow from these two perspectives to answer the question of whether high levels of managerial ownership improve CE.

Hypotheses

Ownership structure is an effective dimension of corporate governance, and it has a clear influence on risk taking (e.g., Chen and Steiner, 1999, Saunders et al., 1990), corporate entrepreneurship (CE) (e.g., Zahra et al., 2000b), and company performance (e.g., Filatotchev and Nakajima, 2010). Prior research has relied on agency theory and stewardship theory to explain the relationship between managerial ownership and corporate strategy, and the extant findings lend support to both. This paper employs these two theoretical perspectives to examine the effect of managerial ownership in the context of a transition economy.

Agency theorists argue that managerial ownership is an incentive mechanism that helps align the interests of managers with those of shareholders (Jensen and Meckling, 1976). These theorists posit that when managers own shares, they are more motivated to make decisions consistent with wealth maximization through proactive risk taking (Saunders et al., 1990, Eisenmann, 2002). Jones and Butler (1992) argue that, theoretically, equity ownership among top executives can promote internal support for CE. Moreover, as the interests of managers and their shareholders are aligned through ownership, shareholders tend to be more willing to support innovative and risky investments suggested by the CEO, which in turn enhances the firm’s entrepreneurial orientation (Zahra et al., 2000b).

These agency-theory logics can be employed to generate a null hypothesis in the context of Vietnam:

**Hypothesis A (agency theory): In newly privatized firms in Vietnam, managerial ownership is positively related to corporate entrepreneurship.**

However, agency assumptions have been criticized by a number of researchers (e.g., Hirsch et al., 1987, Le Breton-Miller and Miller, 2009) because they ignore social forces and relationships, as well as the complexity of human behavior. Therefore, in the unique context of privatized firms in Vietnam, the applicability of stewardship theory in examinations of the effect of managerial ownership on CE is worthy of consideration. As discussed in the hypotheses supporting the relevance of stewardship theory for the relationships among CEO duality, TMT membership, or board membership, and CE, managers in Vietnam’s privatized firms possess many of the characteristics of stewards. When managers behave as stewards, ownership does not provide sufficient incentives to encourage risk taking. Notably, during the privatization process, the government allows managers to buy shares at a discount, which is based on the number of years they have worked for the SOE. In such situations, equity ownership seems less likely to serve as an incentive mechanism. I therefore propose:

**Hypothesis B (stewardship theory): In newly privatized firms in Vietnam, managerial ownership is not significantly related to corporate entrepreneurship.**

4. Methodology

This study employs a mixed-methods strategy, which involves a survey and case study. The study involves analyses of the direction and magnitude of relationships between managerial ownership and the three dimensions of CE for a sample of Vietnamese privatized firms at a single point in time. It aims to determine the extent to which those antecedents are related to CE.
In the first part of study, I utilized survey methods. Surveys are necessary in this context because data on corporate strategy are unavailable or difficult to obtain from secondary sources in Vietnam. The survey provided a good opportunity to gather first-hand data unique to the focal phenomenon. In the second part of the study, I collected qualitative data, mainly through interviews, from a number of firms (Yin, 2009). That data helps explain the findings uncovered during the quantitative stage.

Sample selection

The sample population includes all types of privatized firms in Vietnam, including those sold to the public through share issues, and firms sold to individuals and organizational investors. The sample is limited to firms that had been privatized at least three years prior to the start of the study in xxxx. Moreover, only firms with CEOs who had worked for the firm for at least one year at the time of the study were included.

To obtain information related to the variables in the model, I employed a combination of survey methods and secondary sources. A structured questionnaire survey, which collected data on the three dimensions of CE, was supplemented with archival data on board characteristics and ownership structures. These company data were collected separately in order to limit the length of the questionnaire. As Peng and Luo (2000) find a high correlation between self-reported data and archival data in China, and as the desired data is not publicly available in Vietnam, this study relied on subjective indicators for CE measures. A firm's proxy statements were used to collect detailed information about CEOs, chairmen, and board composition. For the listed companies, data were obtained through the Internet, while data for non-listed firms were collected directly from those firms. The data cover the three-year period of 2010 to 2012.

A convenience sampling method was deemed most appropriate for locating members of the focal population, as this approach enables the researcher to select the most accessible subjects. However, as convenience sampling is inevitably prone to selection bias because the sampling depends on the researcher’s social network (Van Meter, 1990), all possible steps were taken to ensure diversity in board composition, ownership structure, location, and size. Moreover, as mail and telephone surveys focused on this type of data often have poor response rates, and as face-to-face collection increases face validity (Patton and Baker, 1987), I conducted personal interviews in order to gather the data. Given the fact that the questionnaire used in this study embodies several concepts and terms that may be inconsistently understood, the face-to-face interviews helped ensure that the respondents’ understanding of the questions was consistent (Fowler, 1992). I interviewed representatives of 128 firms, and I was able to assemble complete board structure and characteristics data for 114 of those firms. Thus, 114 companies were used in the final analysis. At the end of the data-collection process, I sent thank-you notes to members of my network who had introduced me to the CEOs and other participants.

For the case studies, I used a sample consisting of six privatized firms from three industry categories. In order to capture and maximize the diversity of industries in Vietnam, I relied on an industry classification that divides industries into three categories: labor intensive, capital intensive, and knowledge intensive. The selection of individual cases was based on the level of CE. Therefore, two firms in each of three industries were included in the sample—one with high levels of CE and one with low levels of CE. I adapted the sampling of comparative cases for the purpose of interpretation, as doing so allowed me to determine the main factors that created opportunities for innovation and renewal.
Procedures

Analytical Procedures

Quantitative stage

I employed multiple regressions to estimate the models. First, I used ordinary least squares (OLS) regression for the continuous dependent variables (i.e., innovation, strategic renewal performance). I implemented the “robust option,” which computes standard errors that are robust to departures from “heteroscedasticity.” To reduce potential multi-collinearity and enhance the interpretability of coefficients, I standardized the variables used in the interactions prior to creating the product terms (Cohen et al., 2003). To address the problem of outliers, I report the results from the robust regression, which generates OLS estimates that are robust to the presence of outliers. To protect against multi-collinearity, I followed the procedures outlined by Neter et al. (1989) in terms of using variance inflation factors (VIFs) to test for collinearity. The VIFs for all regression equations were less than 2. The highest VIF was 1.35, which is well below the value of threshold of 10 recommended by Neter et al. (1985) and Chatterjee and Price (1991). These computations indicated that there was no evidence of multi-collinearity. Checks for violations of the assumptions in the regression analyses yielded no substantial results.

Qualitative stage

For each case, I employed a triangulation approach encompassing “within-method” (i.e., across multiple interviews) and “between-method” (i.e., across sources for a given case, including archives and interviews) elements to maximize the reliability of the information (Browning et al., 1995). To ensure confidentiality, I have assigned the following pseudonyms to the case-study firms based on industry type and the level of entrepreneurial activity: Capital High, Capital Low, Knowledge High, Knowledge Low, LaborHigh, and LaborLow.

5. Results

Hypothesis A, which is based on the traditional agency perspective, posits that managerial ownership is positively associated with CE. In contrast, Hypothesis B, which relies on a multi-theoretical perspective (agency and stewardship theories), argues that managerial ownership is not associated with CE. The results of the analyses are presented in Tables 2-4. They show that Hypothesis B is supported when the dependent variables are business venturing and strategic renewal. On the other hand, managerial ownership is negatively associated with innovation. However, the coefficient for this relationship (Model 1c, Error! Reference source not found.) is small and only attains conventional significance at $p < 0.10$ ($\beta = -0.01, t = -1.67$). Therefore, the impact is negligible. As such, we can conclude that managerial ownership has no impact on CE. In other words, the results fully support Hypothesis B.

With respect to managerial ownership, these results support arguments derived from stewardship theory, which suggests that equity ownership does not contribute to a higher degree of CE. Several factors may explain the failure to find positive effects of executive ownership. First, as discussed above, the majority of managers in privatized companies held similar positions while their firms were owned by the state. They may, therefore, tend to assume a stewardship role, such that their holdings in the firm may not serve as an incentive to take risks. Moreover, for these managers, building and maintaining political connections could be more important than any return they may obtain from...
holding equity in the firm. In other words, regardless of the number of shares they own, they still are driven to invest (in a non-monetary sense) in the firm’s future performance. Second, the negligible relationship between xxxx and xxxx may be due to the lack of control over the means through which managers obtain their shares (Sundaramurthy et al., 2005). Some shares may be bought at a discount owing to government policies providing for SOE employees during privatization. Some managers may buy shares from employees, while others may obtain them through official auctions. These various ways of acquiring shares may moderate the relationship between managerial ownership and risk-bearing strategies. For example, for managers who buy shares at a discount, equity ownership is unlikely to be a key incentive. Indeed, Lau et al. (2007) find that in the early stages of a transition, CEO shareholdings have no significant impact on the effectiveness of governance.

A discussion of the negative relationship between managerial ownership and innovation is worthwhile despite the low magnitude of the association and the low level of significance. Kuratko and Audretsch (2009) suggest that “innovations can represent fundamental changes from the firm’s past strategies, products, markets, organization structures, processes, capabilities, or business models.” This implies that innovation involves changes to a firm’s status-quo, which may in turn affect the positions and benefits of its executives. Therefore, unless managers directly reap benefits from innovation, the likelihood that they will opt for innovation falls as the level of equity they own increases. In other words, when managers increase their shareholdings in their own companies, they become entrenched and work to restrict innovation in order to protect their own positions (Demsetz, 1983, Fama and Jensen, 1983). This perspective is discussed in managerial entrenchment theory. Notably, however, this relationship only occurs when managers own substantial stakes in the firm. This finding is consistent with George et al. (2005), who find that TMT ownership is negatively associated with risk-taking propensity. This confirms the presence of a risk-aversion tendency among TMT members, which may prevent them from supporting innovation. Nevertheless, this explanation is only an assumption. The qualitative study presented in the following section provides more insights into the effects of executive shareholdings on risky long-term investments.

6. Discussion

The results presented here support stewardship theory, which suggests that equity ownership among managers does not contribute to a higher degree of CE. There are some possible explanations for the lack of positive effects of executive ownership. First, as discussed in section 2, the majority of managers in newly privatized companies held similar positions while their firms were still SOEs. They therefore tend to assume a stewardship role, such that their shareholdings in the firm do not serve as an incentive to take more risks. In addition, building and maintaining political connections could be more important for these managers than any return they may obtain from owning equity in their firms. In other words, regardless of their ownership in the firm, they are driven to invest (in a non-monetary sense) in the firm’s future performance. Second, the negligible relationship between xxxx and xxx may be the result of a lack of control over the means by which managers obtain their shares (Sundaramurthy et al., 2005). Some buy their shares at a discount owing to government policies that provide for SOE employees during privatization. Other managers may buy shares from employees, while others may obtain them through official auctions. These different ways of acquiring shares may moderate the relationship between managerial ownership and risk-bearing strategies. Clearly, for managers who buy shares at a discount, equity ownership does not serve as a remarkable incentive. Indeed, Lau et al. (2007) find that in the early stages of a transition, CEO shareholdings have no significant impact on the effectiveness of governance.
A discussion of the negative relationship between managerial ownership and innovation is worthwhile despite the low magnitude of the association and the low level of significance. Kuratko and Audretsch (2009) suggest that “innovations can represent fundamental changes from the firms’ past strategies, products, markets, organization structures, processes, capabilities, or business models.” This implies that innovation involves changes to a firm’s status quo, which may in turn affect the positions and benefits of its executives. Therefore, unless managers directly reap the benefits of innovation, the likelihood that they will opt for innovation falls as the level of equity they own increases. In other words, when managers increase their shareholdings, they become entrenched and work to restrict innovation in order to protect their own positions (Demsetz, 1983, Fama and Jensen, 1983). This perspective is discussed in managerial entrenchment theory. Notably, however, this relationship only occurs when managers own substantial stakes in the firm. This finding is consistent with George et al. (2005), who find that TMT ownership is negatively associated with a risk-taking propensity. This confirms the presence of a risk-aversion tendency among TMT members, which may prevent them from supporting innovation. Nevertheless, this explanation is only an assumption. The study presented in the following section provides more insights into the effects of executive shareholdings on risky long-term investments.

**Additional Analyses**

The case analysis provides evidence of the mutual roles of two theories (agency and stewardship). Moreover, it highlights the need to incorporate behavior theory to explain the effect of managerial ownership on CE.

This issue can be viewed from the CEOs’ perspective. Four CEOs stated that their shareholding in their companies was low or very low. The CEO of LaborLow referred to this statement made by an independent director regarding the CEO’s shareholding:

> You have to buy more shares. You need to own about 10-20 percent so that you feel pain when you manage the company. Otherwise, you should not be the manager. It makes little sense to assign you as CEO—a gain or a loss is the same for you.

Notable responses to questions about shareholdings were provided by the CEO of Knowledge Low, who indicated that he held a substantial proportion of his firm’s shares, and the CEO of Capital Low, who appeared to have no interest in ownership at all.

The general view among the CEOs seemed to be that small shareholdings may give rise to negative incentives, which might prevent managers from making investment decisions that are in the shareholders’ interests. One executive was asked, “If the return on investment only arises in the very long term, such as after five years, is there a conflict of interest between you and investors?” The executive replied, “It is human to be concerned about one’s own self-interest. Managers may exert insufficient effort… I feel comfortable today with my low shareholding, but I might rethink this at some point in the future.”

At the same time, several interviewees argued either that their shareholdings had little relevance to how they behaved or that they had a significant impact on their behavior. Notably, the six CEOs interviewed in this study were all former executives of SOEs who had worked for their companies since the start of their careers. The CEO of Knowledge High explained why he made every effort to improve company performance despite his small shareholding in the company:
As I have worked here since I graduated from university, I am closely attached to this company. I think that at least 100 of the 450 employees working for the company think along similar lines. The only difference is that I am the general manager. My philosophy is that I should try my best—for myself and for my “brothers and sisters” in the company... Often, I carry out work that is in the interests of my employees rather than in my own interest.

The above suggests that managerial incentives related to ownership do not necessarily arise within privatized firms in which managers engage in collective behaviors. The case study suggests that a stewardship culture prevails in privatized firms, especially among those firms in which state ownership remains high. The executives of these firms tend to retain the traditions and ideologies that preceded privatization.

Additional exploration of the CEO view of low performance may provide additional insight. One of the most productive interviews was with the CEO of Capital Low, who said, “I feel that I recognize my full responsibility for the company—or something even deeper. I feel like my work represents my responsibility to this society. I am under no pressure from the shareholders.” In particular, she voiced appreciation for the contribution and commitment of those who had worked at Capital Low for years, whom she suggested worked enthusiastically without thought of personal benefit. She added, “The leaders of our company do not make their own interests the first priority.” In general, CEOs and many other executives said that they paid little attention to their shareholdings. One commented, “I consider this company to be ‘mine.’ This is different from the thinking of those who work in a new private company.” Such views were prevalent in those privatized firms that appeared less entrepreneurial, such as Capital Low, Knowledge Low, and LaborLow.

Most of the interviewed executives stated that they paid little attention to satisfying their shareholders. Rather, they focused on their employees’ income and employment security. This highlights a potential conflict between agent and principal in the context of privatized firms. Notably, however, in five of the six case studies, the CEOs insisted that they focused all of their effort on their companies’ growth. This data is consistent with the argument that a stewardship orientation tends to lead to an emphasis on long-term, rather than short-term, objectives (Davis et al., 1997b). Nevertheless, the CEO and chairman of Capital Low stated that this ideology was not found among young, future managers. This indicates that the stewardship culture is likely to change over the organization’s life cycle. Along these lines, the chairman of Knowledge High commented: “The situation may be completely different in the future. As competition grows fiercer, managers should have more incentives to pursue risky entrepreneurial opportunities... Therefore, if the state sells its shares, the executives should have priority to buy them.”

In summary, as SOEs transition into public or private entities, the traditions and cultures that precede privatization lead to a complex principal-agent relationship. More specifically, agents consider themselves to be the firm’s stewards. In that role, they focus on the firm’s growth. On the other hand, they put the interests of certain stakeholder groups, including employees, ahead of shareholders’ interests.

The qualitative data offer several interesting insights into executive ownership. First, although agency theory offers little understanding of the behaviors of managers in privatized firms in Vietnam, it should not be neglected. Managerial ownership plays a certain role as an incentive mechanism in the context of these privatized firms. However, the managers interviewed for this study tend to pay more attention to employment risks and reputation costs than to the potential monetary benefits of their shareholdings.
Second, stewardship theory provides an effective explanation of why managerial ownership has little influence on risky, long-term investments. In this regard, the interviews highlight an important aspect: as privatized firms move towards a more market-based environment, the tenets of agency theory may become increasingly important, while the relevance of stewardship theory may diminish.

7. Conclusions

This study provides insights into how ownership structures influence entrepreneurial activities. The findings, which suggest that managerial ownership is not related to CE, point to the relevance of stewardship theory and, in part, to the role of agency theory. The study finds that most managers view themselves as their company’s stewards. They perform this role with the aim of ensuring the company’s success and survival, regardless of how much equity they own. However, higher equity shares may prevent managers from engaging in innovation projects. At the same time, the study reveals that holding an appropriate number of shares can prevent managers from engaging in entrenchment behaviors and leave them more willing to take measured risks.

8. Future Research

As the Vietnamese economy is undergoing widespread institutional transition, corporate-governance mechanisms will continue to change, moving companies toward the models seen in more developed economies (Peng, 2003). Corporate governance is a dynamic concept that changes over time. Therefore, the debate on the relationship between corporate governance and strategic choices remains promising. Future research may need to re-examine the issues raised here to see how relationships change, and to delve deeper into the black box of internal corporate governance and its effects on CE, particularly in under-researched contexts such as Vietnam.

Given the presence of a relationship between internal and external control mechanisms (Walsh and Seward, 1990), and the fact that internal corporate-governance mechanisms are embedded in a multi-level governance system (Aguilera et al., 2008), the roles of BOD members and investors interact with other elements of corporate governance, including the national governance system (Yoshikawa et al., 2014). In this regard, this study supports the call of Filatotchev et al. (2013) for research that examines corporate-governance mechanisms by focusing on the interplay among the macro, meso, and micro levels. In addition, as governance mechanisms are interdependent (Filatotchev and Nakajima, 2010), an examination of how different mechanisms serve as substitutes or complements in this context would be useful (Hoskisson et al., 2002). Future research should also seek to overcome the constraints of cross-sectional data, such as the data employed in this study. Longitudinal data may offer new insights into the complex relationships among corporate governance, ownership, and CE. Furthermore, scholars can extend the study to other types of firms, such as small public firms, and private or listed firms.

Finally, future research should refine the constructs and analyses whether the measures used here are appropriate for transition economies. Indeed, as entrepreneurial activities are complicated and vary significantly, these measures should not be used in all types of research (Zahra and Wright, 2011). For example, as investments in R&D are rare in Vietnam, the inclusion of this item in the innovation construct makes it difficult to validate the measures. Moreover, as suggested by Tian and Lau (2001), it is essential to develop better concepts and measures of corporate governance in relation to specific countries.
References

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## Appendix

### Table 1: Results of Regressions for Innovation

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*UK-ASEAN INNOVATION CONFERENCE 2016*
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<td>0.247</td>
<td>0.08</td>
<td>0.07</td>
<td>0.253</td>
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<td>$R^2$</td>
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<tr>
<td>$F$</td>
<td>3.62***</td>
<td></td>
<td></td>
<td>4.92***</td>
<td></td>
<td></td>
<td>5.17**</td>
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<tr>
<td>$N$</td>
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**Table 3: Results of Regression Analysis for Strategic Renewal**

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UK-ASEAN INNOVATION CONFERENCE 2016
<table>
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<tr>
<th>Variable</th>
<th>Estimate 1</th>
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<th>Estimate 3</th>
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<td>Firm assets (log)</td>
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<td>Leverage</td>
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<td>CEO age</td>
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<td>Type-III cities</td>
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<td>0.02</td>
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<td><strong>Board size</strong></td>
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<td><strong>0.16</strong></td>
<td><strong>0.09</strong></td>
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\[ R^2 \] 0.45 0.38 0.36  
\[ F \] 5.83*** 7.02*** 13.19***  
\[ N \] 113 113 113
Catalytic Asymmetric Cyclopropanation Reaction: Efficient Synthesis of Bioactive Compounds

Park Sang-ho, Jeon Ki-suk*

*University-Community Partnership Promotion Center, Toyohashi University of Technology, Toyohashi 441-8580

In our world today, organic chemistry has a very important role to play in our daily lives such as foods, clothing, materials and medicines etc., all of them are made from organic compounds. Furthermore, organic chemistry contributes in providing many useful items for us; in fact there is a wide range of products that is developed with the application of chemical reactions. For example, soaps, fuel cells, solar panels and cleaning agents etc. Although, there are various ways in which organic chemistry is playing a part in our daily lives, the most important applications can be classified into six major fields such as medicine, environment, energy, chemical biology, natural products and asymmetric synthesis as shown in Figure 1.

![Figure 1. The application of organic chemistry in various fields.](image)

The asymmetric synthesis is a traditional term used for stereoselective synthesis of chiral compound which always exists as a mixture of two mirror image isomers. Due to they have different bioactive properties; one may be bioactive whereas the other is bio-inactive or even harmful, two-thirds of prescription drugs are currently chiral compounds with pure single mirror image isomers. Therefore, the development of asymmetric synthesis is very important for drugs synthesis.

In our research, we succeeded in the development of the highly efficient asymmetric synthesis of cyclopropanes which are important structures found in a wide variety of biologically active molecules 1-4 (Figure 2). The chiral Ru(II)-Pheox catalyst 5 which was synthesized by our group was found to be extremely efficient in asymmetric cyclopropanation reaction of diazacetates with various olefins (Figure 3).2 In addition, we developed reusable chiral Ru(II)-Pheox catalysts, namely water-soluble Ru(II)-hm-Pheox 6 and polymer-supported PS-Ru(II)-Pheox 7 which can be reused at least five times.
in the inter- and intramolecular cyclopropanations without a considerable decrease in catalytic activity and enantioselectivity.

Figure 2. Examples of biologically active cyclopropanes

Figure 3. Ru(II)-Pheox catalysts

Since the pioneering work of Nozaki, significant efforts have been devoted to developing highly stereoselective cyclopropanation reactions of olefins 8 with diazoacetates 9, catalyzed by copper, rhodium, ruthenium, and cobalt complexes (Scheme 1). Electron-rich styrene derivatives are usually employed as the olefinic substrates because of their high reactivity toward the electrophilic metal-carbene intermediate. In contrast to the many excellent results achieved with styrene derivatives, described in more than 300 reports, vinyl carbamates, allenes, and α,β-unsaturated carbonyl compounds have been rarely used for asymmetric cyclopropanation reactions. Thus, expansion of the scope of olefins is the next challenging task in this field and the development of new powerful catalysts is required.
In our studies on this issue, we discovered a highly efficient catalytic system based on Ru(II)-Pheox catalyst for the asymmetric cyclopropanation of vinylcarbamate derivatives. As illustrated in Scheme 2, tert-butyl tert-butoxycarbonyl(vinyl)carbamate 11 was readily cyclopropanated at room temperature using only 1 mol% of Ru(II)-Pheox catalyst 5, to give the corresponding protected cyclopropylamine 13 in 88% yield with 91:9 dr and 96% ee. In addition, our direct enantioselective cyclopropanation of vinylcarbamates could be successfully applied for the preparation of a key intermediate in the reported synthesis of belactosin A. The reduction of optically active cyclopropylamine 13 with DIBAL proceeded smoothly to produce the desired intermediate 2-((tert-butoxycarbonyl)amino)cyclopropylmethanol 14 in 60% yield with excellent enantioselectivity (96% ee).

After successfully using succinimidyl diazoacetate (SDA) 16 as a carbene source for the highly trans-selective cyclopropanation, we examined an allene 15 in the asymmetric cyclopropanation of SDA 16 by using Ru(II)-Pheox catalyst 5 under the optimized reaction conditions (Scheme 3). The allene 15 cyclopropanated smoothly to give the desired product 17 in high yield (85%) with high diastereoselectivity (99:1 dr) and excellent enantioselectivity (97% ee). In order to demonstrate the utility of the obtained product 17, we have developed a highly enantioselective synthesis of cis-cyclopropanes via reduction of the chiral alkylidencyclopropane. Product 17 was readily hydrogenated with Pd/C-H2 to furnish the corresponding cis-cyclopropane 18 in high yield with excellent cis-selectivity (>99:1) and enantioselectivity (99% ee).
In addition, we developed a Ru(II)–Pheox-catalyzed asymmetric cyclopropanation of α,β-unsaturated carbonyl compounds with ketone- or ester-functionalized diazoacetates. The use of methyl (diazoacetoxy)acetate (MDA) 20 as a carbene source was found to be crucial for the Ru(II)–Pheox-catalyzed cyclopropanation of ethyl acrylate 19, producing the corresponding dicarbonyl cyclopropane product 21 in 75% yield with high diastereoselectivity (99:1 dr) and enantioselectivity (96% ee) (Scheme 4).

Scheme 4. Catalytic asymmetric cyclopropanation reaction of α,β-unsaturated carbonyl compounds

To demonstrate the utility of this general and highly stereoselective cyclopropanation, 1,2-cyclopropane dicarboxylic acid 22 and 1,2-cyclopropane dimethanol 23, which are key intermediates in the reported synthesis of PTP1B, tcprPNA, and U-106305, were prepared from dicarbonyl cyclopropane 21. The optically active 1,2-cyclopropane dicarboxylic acid intermediate 22 can be easily obtained in 85% yield and high diastereoselectivity (99:1 dr) by hydrolysis of cyclopropane 21 with KOH. On the other hand, the 1,2-cyclopropane dimethanol intermediate 23 was synthesized in 87% yield and with high diastereoselectivity (99:1 dr) by reduction of cyclopropane 21 with LiAlH4.

The efficient Ru(II)–Pheox-catalyzed asymmetric cyclopropanation of MDA 20 with α,β-unsaturated carbonyl compounds was applied to the enantioselective total synthesis of oxindole 26 containing a unique spiral cyclopropane, which was reported in 2006 by He and co-workers as an HIV-1 nonnucleoside reverse transcriptase inhibitor (Scheme 5). We performed the asymmetric cyclopropanation of 5-bromo-3-methyleneindolin-2-one 24 with functionalized diazoacetate MDA 20 catalyzed by Ru(II)–Pheox 5 complex under the optimized reaction conditions. As a result, the expected cyclopropane product 25 was obtained in good yield with high diastereoselectivity (93:7 dr) and enantioselectivity (89% ee). Subsequent hydrolysis of cyclopropane 25 readily generates the desired spiral cyclopropane oxindole 26 in 68% yield while maintaining a high diastereoselectivity (93:7 dr) and enantioselectivity (88% ee).
In conclusion, the asymmetric cyclopropanation of diazoacetates with a wide variety of olefins, including vinyl carbamates, allenes, and α,β-unsaturated carbonyl compounds, has been accomplished in high yields and with excellent diastereo- and enantioselectivities by using the Ru(II)-Pheox complex as a catalyst. Moreover, the Ru(II)-Pheox-catalyzed asymmetric cyclopropanation reaction proved to be an efficient and straightforward method for the preparation of chiral cyclopropylamines, dicarbonyl cyclopropanes, alkylidenecyclopropanes, which are important intermediates for the synthesis of many biologically active compounds.

### Experimental section

1. **Preparation of Ru(II)-Pheox complex 5**
   A two necked round bottom flask (100 mL) fitted with a magnetic stirring bar and a reflux condenser was charged with a mixture of Pheox ligand (0.3 mmol), [RuCl₂(benzene)]₂ (0.15 mmol), and KPF₆ (1.2 mmol). The reaction flask was evacuated and backfilled with argon. Through the side arm CH₃CN (5.0 mL, degassed) and NaOH (aqua) (0.3 mL, 0.3 mmol, ca. 1.0 M) was injected. The suspended reaction medium was refluxed for 24 h at 80 ºC. The solvent was removed under reduced pressure and the residue was purified by silica gel column chromatography with CH₃CN/CH₂Cl₂ (1/20-1/10 (v/v)) to furnish the desired complex 5 in 82% yield as a yellow solid. 1H NMR (400 MHz, CDCl₃)δ2.00 (s, 3H), 2.17 (s, 3H), 2.20 (s, 3H), 2.48 (s, 3H), 4.54 (dd, J = 7.3, 8.5 Hz, 1H), 5.09 (dd, J = 7.3, 9.9 Hz, 1H), 5.24 (dd, J = 7.3, 9.9 Hz, 1H), 6.83 (dd, J = 7.3, 7.7 Hz, 1H), 7.19 (dd, J = 7.3, 7.7 Hz, 1H), 7.28-7.35 (m, 5H), 7.52 (d, J = 7.7 Hz, 1H), 7.83 (d, J = 7.3 Hz, 1H). 13C NMR (100 MHz, CDCl₃)δ67.6, 77.9, 120.1, 120.3, 120.4, 121.0, 121.4, 125.9, 127.8, 128.1, 128.2, 129.3, 134.3, 138.0, 141.4, 174.9, 186.0.

2. **General procedure for asymmetric cyclopropanations of olefins 8 with diazoacetate 9 by using 5 complex**
   To a solution of Ru(II)-Pheox (1 mol%) and olefin (1.5 mmol) in CH₂Cl₂ (2 mL) under Ar atmosphere were slowly added diazoacetate (0.3 mmol) in CH₂Cl₂ (1.5 mL) over 5~11 h. The mixture was then stirred at RT for 1 h (the reaction was monitored by TLC) to give crude product, and the residue was purified by silica gel column chromatography with hexane/EtOAc as an eluent to give the
desired product. From the crude NMR, we determined the trans/cis ratio. The ees were determined by HPLC analysis.

3. Preparation of (1R,2R)-2-((tert-butoxycarbonyl) amino)cyclopropylmethanol 14

The toluene solution of DIBAL (1 mL, 1.00 mmol, 5.0 equiv) was cooled to −78 °C under argon. A solution of ethyl 2-((di-tert-butoxycarbonyl)amino) cyclopropanecarboxylate 13 (62.8 mg, 0.20 mmol, 1.0 equiv.) in toluene (2 mL) was slowly added at that temperature over a period of 1 h. Stirring at −78 °C was continued for 3 h and the reaction was quenched by successive addition of methanol (1 mL of a 10% solution in toluene), methanol (0.1 mL) and water (2 mL). The mixture was allowed to warm to RT. The white precipitate was filtered off and washed with EtOAc. The washing and filtrate were combined, dried (Na2SO4) and the solvent was removed in vacuo. The residue was purified by silica gel column chromatography with Hexane/EtOAc (3/1 − 1/1(v/v)) to afford product 14 in 60% yield (22.4 mg, 0.13 mmol). [α]21D = +19.0 (c 1.15, CDCl3). 96% trans ee. 1H NMR (400 MHz, CDCl3) δ 4.85 (br s, 1H), 3.84 (br s, 1H), 3.05−3.12 (m, 1H), 2.78 (br s, 1H), 2.28−2.33 (m, 1H), 1.44 (s, 9H), 1.18−1.27 (m, 1H), 0.78−0.83 (m, 1H), 0.69−0.74 (m, 1H) ppm. 13C NMR (100 MHz, CDCl3) δ 172.7, 80.5, 65.0, 28.6, 24.0, 11.4 ppm.

4. Preparation of cis-succinimidyl 2-(benzyl) cyclopropanecarboxylate 18

This compound was prepared by reducing succinimidyl 2-benzylidenecyclopropanecarboxylate 17 with 5 mol% of 10% Pd/C and H2 in MeOH. The resulting mixture was purified by silica gel column chromatography with EtOAc/n-Hexane (1/3(v/v) as an eluent to give the desired product 18 in 79% yield as white solid. ee = 99%. [α]23D = −85.0 (c 0.62, CHCl3). 1H NMR (500 MHz, CDCl3) δ 7.34–7.28 (m, 2H), 7.27–7.20 (m, 3H), 2.96 (dd, 1H, J = 6.50, 14.9 Hz), 2.90–2.77 (m, 5H), 2.11–2.03 (m, 1H), 1.84–1.72 (m, 1H), 1.45–1.38 (m, 1H), 1.32–1.26 (m, 1H) ppm. 13C NMR (125 MHz, CDCl3) calcd for C15H19N2O4 [M+NH4]+: 291.1344 found: 291.1342.

5. Preparation of (1R,2R)-1,2-cyclopropane dicarboxylic acid 22

To a suspension of KOH (19.6 mg, 0.35 mmol, 3.5 equiv) in distilled water (0.02 mL) and methanol (0.38 mL) was added (methoxycarbonylmethyl) ethyl 1,2-cyclopropanedicarboxylate 21 (23.0 mg, 0.10 mmol) at room temperature under atmosphere of argon. The reaction mixture was then stirred at 60°C for 4 h, and after cooling, the mixture was extracted with 0.4 M NaOH aq. (0.5 mL) and Et2O (5 x 2 mL) followed by addition of 1 N HCl aq. (5 mL) and brain (10 mL). The mixture was extracted three times with Et2O (5 x 30 mL), dried (Na2SO4), and concentrated under reduced pressure. The residue was purified by flash chromatography with EtOAc/n-Hexane to give corresponding product 22 as white solid in 85% yield. [α]22D = −293.8 (c 0.21, EtOH). 1H NMR (400 MHz, d6-DMSO) δ 12.57 (br s, 1H), 1.88 (t, 2H, J = 7.32 Hz), 1.26 (t, 2H, J = 7.32 Hz) ppm. Anal. C5H6O4, Found: C 46.11, H 5.00%; Calcd: C 46.16, H 4.65%.

6. Preparation of (1R,2R)-1,2-cyclopropane dimethanol 23

To a suspension of LiAlH4 (10.3 mg, 2 equiv) in THF (2 mL) was added (methoxycarbonylmethyl) ethyl 1,2-cyclopropanedicarboxylate 21 (31.1 mg, 0.14 mmol) at 0 °C under atmosphere of argon followed by stirring for 2 h at 0°C. The reaction mixture was quenched with distilled water (0.5 mL) and concentrated under reduced pressure. The residue was purified by flash chromatography with Hexane/Acetone to give corresponding product 22 as colorless oil in 87% yield. [α]22D = −15.3 (c 0.56, EtOH). 1H NMR (400 MHz, CDC13) δ 12.57 (br s, 1H), 1.88 (t, 2H, J = 7.32 Hz), 1.26 (t, 2H, J = 7.32 Hz) ppm. Anal. C5H6O4, Found: C 46.11, H 5.00%; Calcd: C 46.16, H 4.65%.
MHz, CDCl3) δ 66.4, 20.0, 7.6 ppm. Anal. C5H10O2, Found: C 58.43, H 10.20%; Calcd: C 58.80, H 9.87%.

References

Impacts The Determinants of Bank Capital Structure: Case Study from Vietnam

Le Thanh Tam*, Nguyen Que Ly

National University of Economics, Hanoi, Vietnam

Abstract

This paper is aimed at investigating the determinants of bank capital structure in Vietnam, using random method model (REM) with panel data of 25 biggest Vietnamese banks over 6 years (period 2009-2014), testing the hypotheses from 4 existing theories of capital structure (Modigliani-Miller irrelevance theorem, agency theory, pecking order theory, and Static trade-off theory). The key findings of this study are: First, three hypotheses of relationships between bank leverage ratio and bank size, deposit ratios & GDP growth rates are accepted and statistically significant. Second, the hypotheses on the relationships between bank leverage ratio and two other variables (dividend (+), risk (+)) are rejected for the Vietnamese bank case. Depositors/borrowers believe in depositing/lending to banks regardless the issues of bank profitability and dividends. Depositors/borrowers do not care of banks operational results, which may be due to the regulations to have no banks to suddenly collapse in Vietnam, or they do not have good knowledge for assessing bank operations. Third, tangibility is not significantly related to bank leverage. The huge investment in fixed assets does not really have strong impacts on bank borrowing and depositing. Some policy implications are proposed for Vietnamese commercial banks and policy makers to have better and more efficient capital structure.

The policy implications for Vietnamese commercial banks are (1) banks should increase its asset sizes to be more attractive to customers and to maintain the prudential ratios under Basel II better; (2) banks still need to improve its efficiency and effectiveness for having long-term sustainability and trust from customers; (3) for fixed investment, banks should utilize the soft investment for strengthening safety and improving e-banking services rather than hard investment (such as housing, branches, etc.).

On the other hand, policy makers should (1) develop more prudential regulations under Basel II principles for the system soundness, and accept the collapse of weak banks for making the banking market more transparent and responsible, less dependent; (2) developing the financial market stronger; (3) ensuring the enabling macroeconomic environment.

Keywords: Bank leverage; bank size; capital structure; determinants; tangible assets

1. Introduction

Understanding the key determinants of firms’ capital structure is the key to their efficiency and effectiveness. However, capital structure of commercial banks is different from other firms because (i) banks play the financial intermediary and payment functions, therefore equity capital is much smaller than mobilized funds; (ii) while non-financial firms can gather capital based on various preferences of debt or equity; in contrast, banks’ fund rely on mostly deposits from public that customers can draw any time, correspondingly banks are like to have a large amount of capital to firm, but also face up with liquidity risk; and (iii) firms can optimize their unlimited capital according to their preference, but banks have to follow the regulation for capital requirement and deposit insurance (Shelagh Heffernan, 2005).
It has been assumed that the more profitable banks are, the less they depend on debt in their capital structure. In contrast, although indebtedness may have a negative impact on profitability of banks, it has been argued that the more debts banks get and use them efficiently, the more profits banks make under capital structure theories. Therefore, analyzing bank capital structure is an interesting topic for practitioners and researchers, and has been carried out in several countries such as Kenya (Nairobi, 2012), 52 asian countries (Hoa Nguyen & Zainab Kayani, 2013), and Gulf Cooperation Council (Abdullah AL-Mutairi & Kamal Naser, 2015), with different results.

For Vietnamese banking system, although all banks have owners’ capital of more than USD 150 millions (Government, 2014), capital adequacy ratios (CAR) higher than 9% (SBV, 2016), but the capital level of banks are still small, CAR calculation did not fully consider all credit risk and operational risks (Tran Tho Dat, 2015). Not much studies have been done on bank capital structure. Therefore, this paper is aimed at analyzing the determinants of Vietnamese commercial banks’ capital structure. In brief, this objective can be achieved by answering the following research questions:

i. What are the key theories of capital structure?

ii. How are these theories applied to bank capital structure?

iii. What are the empirical researches on determining bank capital structure of other countries?

iv. What are the determinants of the capital structure for the commercial banks in Vietnam?

2. Literature review

2.1. Key theories of capital structure

The four main theories on capital structure are Modigliani and Miller (M&M) irrelevance theorem, Agency theory, Pecking order theory and Static trade-off theory.

Modigliani & Miller irrelevance theorem (1958) demonstrated that the capital structure decision of firm does not affect firm’s value in the perfect capital market, irrelevant to its leverage no matter how debt or equity or even both of them are used to finance the firm. Moreover, Modigliani and Miller (1963) took taxation into consideration in “an imperfect world” and assumed that the debt financing is an important advantage deciding firm’s optimal capital structure by debt tax shields.

With Agency Theory, Jensen and Mecking (1976) signified two types of agency costs: equity and debt. Agency cost of equity is arisen from the conflict of interest between managers and shareholders because of the principal-agent problem, while agency cost of debt is from conflicts of interest between debt holders and shareholders. Managers use debt-financing instead of equity-financing, which is likely to lead to a negative relation between leverage and dividend (because of a decrease in equity). The profit of debt holders is fixed, while shareholders would like to pour money into the high-risk portfolio to higher earnings. If firms fail to make interest rate payments in the due date, debt holders have legal compensation. Therefore, regarding to the term “bankruptcy cost to the managers” of Grossman and Hart (1982), this financing transformation can alleviate the deviation between the benefits of managers and shareholders, but it stresses on the benefit of debt financing (similar to trade-off theory). As a consequence, leverage has a positive relation to the value of firm.

With pecking order theory, Myers and Majluf (1984) summarized the preference order of capital used to finance their business, given the asymmetric information between the company and investors. Accordingly, the company is likely to finance investment by giving priority to firstly retained earnings.
over debt, secondly low-risk debt over long term debt and then lastly equity issued as last resort. There is the trade-off between benefit and cost of debt, because of the tax deductibility of interest payments, therefore managers give preference to debt but equity in spite of reputation on performance of firm. On the contrary, Myers and Majluf (1984) pointed out that if firms only utilize their retained earnings without issuing new security to support investment opportunities and also earn profit from bondholder, information asymmetric problem could be tackled. Issuing equity means the firms need more finance and avoids from selling under-prices securities, which therefore will create asymmetric information between company and its potential investors lead to expensive cost to issue. In addition, Baker and Wurgler (2002) suggested that firms have a particular preference to issue equity when the retained earnings are insufficient and share prices increase (also called timing the market) because they need to take advantage of favorable conditions of the market. Therefore, it can be seen that market conditions affect the pecking order theory and in other words, it also means that pecking order preferences can change based on the optimism levels of the managers (Heaton, 2002).

In the static trade-off theory, Jalilvand and Harris (1984) stated that bankruptcy costs are known as the increased costs of financing debt originating from the higher probability of bankruptcy. The exposure of the firm to bankruptcy and agency cost against tax reduction associated with debt level. These bankruptcy costs consist of direct costs and indirect costs. The direct costs include payoff costs which stand for administration cost or the loss of value after liquidating the net assets of the firm and the other one is seen as distress cost which is the cost of a firm incurs if stakeholders think that the firm will not continue. Consequently, companies are desire to look for a target debt ratio. With corporate tax case, M&M theorem (1963) shows that the advantages of tax shield could result in the optimal capital structure being 100% debt. However, the theory of optimal leverage ratio was developed by Kraus and Litzenberger (1973) when they considered it combining with the trade-off between costs and benefits of taxes regarding to decision of debt financing. Hence, they referred that borrowing from outside could save money with decrease in corporate taxes; nevertheless, if debt is at the very high level, that firm is likely to go bankrupt when tax advantage of debt cannot compensated the bankruptcy costs. Correspondingly, the static trade-off theory of capital structure reveals that firms should borrow up to the point at which marginal bankruptcy costs could be lower than marginal benefits of tax shield.

2.2. Determinants of bank capital structure

Bank capital structure means to decide the proportion of equity and liabilities, mainly deposits. The main determinants of bank capital structure are two types: banks’ internal factors (such as bank size, tangibility of assets, divident, risks); and external factors (such as inflation, GDP growth rate).

**Bank size** is measured by banks’ total assets (Abdullah, 2015; Aremu, 2013). Inspired by the trade-off theory, a large bank was seen to be unlikely to go bankrupt and the effect of size on the capacity for debt financing was positive. This relationship was found out through many researches such as Titman & Wessels (1998), Nairobi (2012), Aremu (2013). However, bank size could be negatively correlated with debt ratios in the researches of Rajan & Zingales (1995) and Chen (2004), because of asymmetric information causing banks to be more transparent and take advantage of retained earnings or equity financing instead of debt outside.

**Tangibility of assets**, such as cash, equipments, machines, factories that have long-term physical existence. These assets can be used as collateral to raise bank loans or sold to raise cash in emergency. The tangibility of assets is usually calculated by the ratio of fixed assets-to-total assets, and has strong positive relationship with bank leverage (Murillo and Erasmo, 2010). In the agency cost of debt and equity theory, Jensen and Meckling (1976) shows that the lenders are possibly face up with risk of
moral hazard and adverse selection, so more physical assets can create bargaining power to banks to borrow more. This also be proved in (Ross et al, 2008), (Myers, 1977) that the more fixed assets used as collateral, the more banks can gain debt finance.

**Dividend** is what shareholders receive from banks. The dividend payment depends on whether banks pay to investors or not after a financial year, so it can be zero sometimes or not in cash. The cost for paying dividend is higher than the borrowing cost, because investors usually request more earnings than debtor. As in pecking order theory, dividend could make investors believe in future growth signal of banks, and banks will still prefer equity finance even the cost is higher. The relationship between dividend payment and leverage is negatively demonstrated in the studies of Frank & Goyal (2005), Hoa Nguyen & Kayani (2013), but becoming positive in the research of Aremu et al (2013).

**Deposits**: If deposits increase, the liabilities of banks also increase so the equity-finance can be decreased in according to static trade-off theory. Deposit is usually one of the significant funding resources of banks. Therefore, if banks have big deposit proportion, the leverage ratio of banks is clearly increased.

**Risk**: For banks or other non-financial banks, the consequences of risk that banks have to face up with can be reflected at the profit they receive, as they get loss and have to expense more to cover risks. Correspondingly, their profit would decrease considerably. Furthermore, if banks have high risks resulting in profit reduction, it is difficult for banks to raise capital source by debt finance and equity finance as well, in particular for external financing source. This case is consistent with the pecking order theory and shown in the study of Abdullah (2015) and Amidu (2007).

**Inflation**: Inflation premium can be added up to nominal interest rate, which causes to decrease in debt and utilize retain earning instead. This relationship is demonstrated in Beck et al (2008) and Booth et al (2001). However, inflation can also be positively related to bank leverage, as it increases taxes, so banks can make full use of tax shield for debt financing. As a result, debt will be prior to equity, so leverage of banks grows up, which have been confirmed in the findings of Taggart (1986) and Frank and Goyal (2008).

**GDP growth rate**: When the economy goes down, banks will cut down the debt financing because of bankruptcy costs and wait for a better economic situation to take advantages of investment opportunities. If the economy grows up and inflation rate increase, banks are willing to gain profit from borrowing because of trade-off theory and correspondingly, the positive signal between GDP growth and leverage exists. This argument is consistent with the findings of previous studies in Booth et al (2001), Mitton (2008).

From four root capital structure theories and practical experiences from different countries/territories, the relationship of bank capital structure determinants with leverage ratio are summarized in the table 1.

### 3. Research hypotheses, methodology and data

#### 3.1. Research model and hypotheses

The model comprises an endogenous variable of bank leverage, and six exogenous variables including bank–level determinants being size (SIZE), tangibility (TANG), dividend dummy (DIV), risk growth (RISK) and country-level determinants being GDP growth (GDGP), inflation (INF). The independent variables and dependent variable are stated in the following part.
$\text{LEV}_{(i,t)} = \beta_0 + \beta_1 (\text{SIZE}_{i,t}) + \beta_2 (\text{TANG}_{i,t}) + \beta_3 (\text{DIV}_{i,t}) + \beta_4 (\text{RISK}_{i,t}) + \beta_5 (\text{DEP}_{i,t}) + \beta_6 (\text{INF}_{i,t}) + \beta_7 (\text{GDP}_{i,t}) + \mu_{i,t}$

$\text{LEV} = \text{Leverage} = \text{Total liabilities} / \text{Total assets}$

$\text{SIZE} = \text{Size} = \ln(\text{Total assets})$

$\text{TANG} = \text{Tangibility of assets} = \text{Total fixed assets} / \text{Total assets}.$

$\text{DIV} = \text{Dividend (dummy variable)} = 1 \text{ if bank pays dividend}$

$\text{RISK} = \text{Risk growth} = \text{changes in profit before tax} (\text{PBT}) = \text{PBIT}(x) - \text{PBIT}(x-1) / \text{PBIT}(x-1)$

$\text{INF} = \text{Inflation rate} = \Delta CPI$

$\text{GDPG} = \text{GDP growth(x)} = \text{GDP}(x) - \text{GDP}(x-1) / \text{GDP} (x-1)$

$\beta_0 = \text{Intercept}$

$\beta_0 - \beta_7 = \text{Parameters of the model}$

$\mu = \text{Stochastic Error Term representing all other variables not captured}$

$I = \text{Represents observations of each bank at the point of time}$

$T = \text{Represents time periods of the observations}$

The null hypotheses and alternative hypotheses have been summarized from the literature review as in table 2:

$\text{Ho: There is no significant relation between the independent variables and bank leverage}$

$\text{H1: There is a significant relation between the independent variables and bank leverage}$

3.2. Data and sample

To ensure data consistency and continuity, in this study, the sample includes 26 top commercial banks which have the biggest total assets of all banking system and their data is updated recently as much as possible. The other 9 banks are smaller and many are in process of M&A, which means that they do not update financial information recently. With time frame of 6 years (2009-2014), the panel data consists of 156 observations.

The data sources for banking sector is gathered from financial statements published on the official individual website of each commercial bank in Vietnam over the researched period, together with bank databases of Vietstock – a firm specializing in collecting bank information. The country-level data such as inflation rate, GDP growth rate of Vietnam are from the website of World Bank.

4. Empirical results
The descriptive data analysis of variables in the model shows that the sample is consistent and there is no auto-correlation issue among independent variable.

(Insert table 3 and 4 here)

The mean of LEV is 0.8828 (88.28%), showing that on average, Vietnamese commercial banks use 88.28% of liabilities to finance their activities. However, the gap between the minimum value and maximum value is quite high, meaning that some banks use their equity to finance their project more than debt. The mean of tangibility, dividend and deposit ratio is 0.0134, 0.7266 and 0.7103 respectively. These results show that, on average, the ratio of tangible assets over total assets has a mean being quite low; however the amount of deposit over total assets is high. In general, banks paid dividend over that period of time. In particular, on average, the risk growth of commercial banks in Vietnam in the period of time was -0.2701 with min -11.29 and max 3.98. Those figures reflects that on average, profits of the majority of banks had a slightly downward trend and there is a big gap in the profit change in the two consecutive year between the bank had a low risk growth and the bank had a high one. In addition, the inflation rate, on average, was very high at 9.08%

5. Discussions of research findings

Policy implications

References

Cho Yong-hyung\textsuperscript{1}, Jeon Ki-suk\textsuperscript{2}

\textsuperscript{1}Graduate School of Government, Business and Entrepreneurship, Yonsei University
\textsuperscript{2}College of Government and Business, Yonsei University

1. Introduction to IP-Star Firm Nurturing-Policy

This study is divided into two sections. In the first section, the Korean government’s Intellectual Property (IP) policies on companies are introduced while the latter section describes suggestions based on empirical analysis of those policies.

In the 21st century of knowledge-based economy, intangible assets such as technology, knowledge, information and patents have emerged as critical elements to supplement value in creation. In addition, technology is undergoing change from analogue to digital convergence. In other words, new industry with high-added value has become new growth engine for the country and company by experiencing interactive convergence within technology and industry.

At a time when industrial structure is shifting toward knowledge-based industry, nations around the world present vision for IP development at the national level, based on the understanding that IP will be the key to creating national wealth. Notably, the US, Japan, China and EU are endeavoring to strengthen industrial competitiveness through outstanding IP wealth and efficient utilization, because IP policy is an essential national strategy to ensure sustainable growth.

In 2009, Korea established the Presidential Council on National Competitiveness and established the strategy of ‘IP power house’. In May of 2011 under the national intellectual property asset committee (co-headed by Prime Minister and the private sector) enacted ‘basic act for IP asset between 2012 and 2016’. Through this, the vision titled ‘IP power house, prosperous future’ was proposed and Koreans and to create the virtuous cycle of intellectual property creation, protection and utilization.

Korean Intellectual Property Office reflected revised environment at home and abroad with diverse clients related to intellectual property. In addition it proposed its long-term vision of ‘leading the nation based on intellectual property’ and is devising ways to enhance its IP competitiveness.

Small and mid-sized enterprises (SME) account for more than 99 percent of companies operating in Korea, but due to shortage of workforce, information and fund, they lag behind large corporations in terms of IP capacity in fact, mid-sized companies and venture firms even lack the ability to take actions against IP disputes. Between October 2014 and April 2015, Korea Intellectual Property Office and Korea Institute of Intellectual Property conducted a survey on ‘Korean companies’ IP disputes’, the result of the survey indicated SMEs and venture start-ups consist of 71.3 percent of the companies were involved in IP disputes. Against this backdrop, necessity to emerge over policy, enabling deficient IP-capacity SMEs to enhance their competitiveness in the field of IP technology, they gain an advantage and explore new market channel. Thus, to facilitate IP wealth business, Korean Intellectual Property Office has selected promising SMEs since 2006 through Regional Intellectual Property Center (hereafter RIPC), and nurtured them as the region’s small but promising companies, and
provides support catered to each company’s needs of patents, design and brand for 3 years under which so-called ‘IP-Star firm-nurturing policy’

RIPC built 30 branches nationwide under Article 23 of the Invention Promotion Act, which aims to ensure balanced national development and national competitiveness through enhanced IP capacity (17 in regional zones, 13 basic centers), and it provides support for small and mid-sized enterprises’ efforts to encourage inventions and activate IP business project.

Under the ‘IP-Star firm-nurturing policy,’ Korean Intellectual Property Office provides policy support depending on IP capacity of SMEs – IP Start-up (initial stage), IP Scale-up (fledgling stage) and IP Star (matured stage). By offering phased-policy support, it seeks systemic approach and fruitful business outcome.

Notably, in the IP Star stage, RIPC branches in 17 regional zones select ‘IP-Star firms’ to provide comprehensive support, up to 10 million won a year and 200 million won in three years.

Figure 1. Supporting Programs According to Stages

Table 1. Main Programs for IP Star firms (2015)

<table>
<thead>
<tr>
<th>Name of programs</th>
<th>Main contents and Support fund</th>
</tr>
</thead>
</table>
| Prior technology search       | - Prevent overlapped investment and patent conflict in advance by surveying and investigating preliminary patents and similar technologies before development of new item and new technology of SMEs and registration of right.  
- Support fund: KRW 400,000    |
| Registration of rights in Domestic area | - In order to promote the activities of creation of intellectual property rights for SMEs and potential startup people, provide funds partly required for patent agency to register design and brand names  
- Support fund: Patent (KRW 1000,000), Utility model (KRW 500,000), Brand (KRW 250,000) |
| Registration of rights in Overseas | - In order for SMEs to secure exclusive rights of excellent rights in overseas, provide funds partly required rights required for patent agency to register overseas intellectual property.  
- Support fund: Patent (KRW 3,000,000), Patent (individual nation) (KRW 7,000,000), Design (KRW 2,800,000), Brand (KRW 2,500,000) |
Prior research has so far been mainly study on intellectual property activities and the general SME support policies. There was no study on SME support policies for intellectual property activities.

This study is to assist regional SMEs to effectively respond to rapidly changing economic environment with the help of the office’s policy, and spread necessary IP activity which is crucial to sustainable innovation and new growth engine. Also, it suggests IP business strategy for small and mid-sized enterprises through empirical analysis on the impact of the policy on business management. Additionally, this study suggests new policy that can be reflected to facilitate the office’s IP Star firm policy.

### 2. Research Data and Design

#### 2.1 Research data

The data for this study are as following. 308 IP-star firms are selected from 17 Regional Intellectual Property Centers for 2 years in 2012 (157 firms) and 2013 (151 firms).
2.2 Definition of Variables

2.2.1 Dependent variable

In this study, sales and export sales are used as the dependent variables for the measurement values of business performance. Natural logarithms are used for the Sales (In_sales) and export sales (In_Export) for normalization.

2.2.2 Explanatory variable

The explanatory variable is defined as followings, if the firm is start-up 1, otherwise 0.

2.2.3 Control variables

The control variables are the sales, export sales, the number of regular employees and the number of employees for managing IP. The number of regular employees (In_Employees) and the number of employees for managing IP (In_IP_man) are also converted into natural logarithms for normalization.

2.3 Research Design and Empirical Analysis

\[ \ln_{Sales_i} = \beta_0 + \beta_{policy_i} + \beta_{policy \times start_i} + \beta_{In_{Employees_i}} + \beta_{In_{IP\_man}} + \varepsilon \] (1)

\[ \ln_{Export_i} = \beta_0 + \beta_{policy_i} + \beta_{policy \times start_i} + \beta_{In_{Employees_i}} + \beta_{In_{IP\_man}} + \varepsilon \] (2)

3. Empirical Analysis

Table 2. Results of regression analysis

<table>
<thead>
<tr>
<th></th>
<th>dependent variables</th>
<th>In_sales</th>
<th>In_Export</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>t-value</td>
<td>p-value</td>
</tr>
<tr>
<td>Intercept</td>
<td>4.355</td>
<td>28.81</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>policy</td>
<td>0.050</td>
<td>-0.65</td>
<td>0.519</td>
</tr>
<tr>
<td><strong>policy\times start</strong></td>
<td>0.353</td>
<td>2.28</td>
<td>0.025</td>
</tr>
<tr>
<td>start</td>
<td>0.467</td>
<td>-4.03</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>In_Employees</td>
<td>1.213</td>
<td>33.74</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>In_IP_man</td>
<td>0.112</td>
<td>1.15</td>
<td>0.252</td>
</tr>
<tr>
<td>F-value</td>
<td>328.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj R-square</td>
<td>0.7406</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows that the coefficient of policy\times start is significant. This means that the effect of policy is larger in start-up than in continuing firms.

5. Conclusion
In this study, Startup firms will have more positive effect on the business performance between startup firms and continuing firms receiving IP-star firms nurturing policy of KIPO. Those results imply that the differentiated strategies should be prepared between startup firms and continuing firms for future policies of KIPO.

Thus, it need that the government’ policies are focused on the start-up firms.

*Soda Chanthamath E-mail address:cs008@edu.imc.tut.ac.jp

*Seiji Iwasa, E-mail address: iwasa@ens.tut.ac.jp
Determinants of Inter-Firm Collaboration Innovation: The Evidence from Emerging Country

Nguyen Phuc Nguyen

University of Economics – The University of Danang
Research fellow at VNUK Institute for Research and Executive Education - The University of Danang

Abstract

The goal of this research is discovering the key drivers of external cooperation in innovation from Vietnamese enterprises. The empirical analysis used an original survey of 137 companies in textile and clothing manufacturers that experienced external cooperation within the last 3 years. The results show that inter-firm trust, innovation oriented culture, similarity between partner and entrepreneurial intensity have positively and significantly affects innovation collaboration. The result should give academics and practitioners alike a better understanding of the key drivers of inter-firm collaboration in innovation and the innovation of Vietnamese business community.

Keywords: inter-firm relationship; innovation, trust; Vietnam

1. Introduction

Increasing concern on economic integration has brought great pressures for companies to collaborate with its partners in order to supply better services/products to customers. Therefore, promoting the inter-firm collaboration for innovation is a major policy priority in Vietnam. Cooperation shows a shared interest of working together towards a mutual goal. Cooperation also infers that one party gives up some immediate benefits in the hope of receiving a later payoff (Palmer, 2000). The common goals are more important than one actor’s profit maximization or opportunism. Partners contribute to the total created value in the relationships, and they are satisfied with a smaller share of the profit to maintain the relationship (Bengtsson & Kock, 2000). Further, a cooperative relationship casts a “shadow of the future”: parties treat one another as though their future relationship counted (Galvagno & Garraffo, 2010).

What is less known is that inter-firm cooperation asks for a comprehensive study on several reasons. Firstly, research findings to date have not been definitive about drivers of inter-firm cooperation in innovation. Further, inter-firm cooperation, which would be conducted by firm’s representatives, is a very specific type of human behavior. Consequently, viewing inter-firm cooperation on the base of psychology theory is very necessary. Using data from the survey on Vietnamese enterprises, the paper shows a clear understanding of where inter-firm cooperation for innovations thrives. It also has strong theoretical and practical implications.

The remainder of the paper is organized as follows: Section 2 provides an overview of the theoretical background related to the research, and establish hypotheses discussing the factors influence inter-firm cooperation in innovation within industrial chains. Section 3 describes the empirical model and the survey. Then the study presents a discussion of the methods, data analyses and results. A discussion on findings and practical implications concludes our paper.
2. Background and hypotheses

2.1. Inter-firm’s trust and inter-firm collaboration in innovation

In the present work, inter-firm trust refers to the firm’s belief that another company will perform actions that will result in positive outcomes for the firm, as well as not take unexpected actions that would result in negative outcomes for the firm (Anderson & Narus, 1990). This is similar to the definition of Nyaga et al. (2010), which states that inter-firm trust refers to a firm’s belief that the partners are reliable and predictable in fulfilling obligations and performing promised actions.

The existence of inter-firm trust suggests that firms have cooperative mindsets in business operations, which should lead to partners’ dedication to exchanging information and sharing resources (Ring & Van de Ven, 1994). Thus, they should benefit from reducing risks and increasing opportunities through the exploration of joint actions. Anderson and Weitz (1989) find evidence that trust is key to maintaining continuity in conventional channel relationships. Morgan and Hunt (1994), based on relationship marketing research, confirmed that trust and relationship commitment are the two important elements in fostering cooperation between partners. At the organizational level, a firm’s boundary spanners such as managers or team leaders are partners’ representatives. As a reflection of the collective belief of boundary spanners, inter-firm trust helps firms predict the actions of partners and makes them work collaboratively (Anderson & Narus, 1990; Handfield & Bechtel, 2002). Therefore, we propose the hypothesis:

**H1.** Inter-firm trust positively affects inter-firm collaboration with partners in innovation.

2.2. Entrepreneurial intensity and inter-firm collaboration innovation

Corporate entrepreneurship is a process by which individuals inside organizations pursue opportunities without regard to resources they currently control (Stevenson & Jarillo-Mossi, 1990). Entrepreneurial intensity is characterized by degree and frequency entrepreneurship. Miller and Friesen (1982) argue entrepreneurial firms are characterized by their strong willingness to innovate while taking risks in the process. In addition, through the strategic decision making process where entrepreneurs are willing to take risks, innovative, and proactive, entrepreneurial intensity will facilitate the solving management problems (Barringer & Bluedorn, 1999).

In competitive environment, many organizations commonly acquire ideas or innovations internally. However, there are a number of situations where some organizations seek innovative ideas externally in form of franchising, sub-contracting and strategic alliances. As a means of partial uncertainty absorption, entrepreneurial intensity in the form of environment scanning may lower the perception of risk associated with a potential entrepreneurial venture, increasing the likelihood that the firm will engage in the venture (Barringer & Bluedorn, 1999). Thus, the study expects that:

**H2.** Entrepreneurial intensity of partner’s representative positively affects inter-firm collaboration in innovation with partners.

2.3. Relationship between similarities between partners and inter-firm collaboration in innovation
A company will not success in managing alliance if it does not understand its partner. The relatively similarity between partners reduce the incentives for free riding and enhances the possibility of inter-firm cooperation (Huyber & Bennett, 2003). Similarities between partners can shape inter-firm relationship and cooperative behaviour because they can facilitate the articulated knowledge among firms (Teece, 1977; Saxton, 1997). In addition, it can help partners build inter-firm trust and inter-firm cooperation as the result. When firms are similarity in strategic decision and culture, they can get along with its partner. Based on that, it will foster innovation and product development among partners in the supply chain. Moreover, similarities between partners lead to balanced inter-firm power relationship and impact to level of cooperation in the network-firm (Chassagnon, 2014). From the survey of SME tourism enterprises in Vietnam, Nguyen (2015) confirmed that similarities among partner who involve in tourism network will enhance the chance of inter-firm relationship. Therefore, we expect that:

**H3:** Similarities between partners positively affects inter-firm collaboration with partners in innovation.

### 2.4. Innovation orientation culture and inter-firm collaboration

In the context of immense competition, every company has to determine how to achieve predominance and develop sustainably. An innovation orientation is a basic market-entry strategy (Ali et al., 1995). This will require company releasing an innovative new product to the market before other competitors do. By adopting new skills, resources, techniques, and management systems from the partners, an innovation orientation culture will provide with new paths, fresh creativity, and a tendency for change to the company (Lii & Kuo, 2016).

Innovation-oriented enterprises focus on creativity and developing new products/services to market in order to satisfy and retain customers. This culture will make enterprises can anticipate and react to customer needs quicker than their competitors, gaining prominent benefits (Siguaw et al., 2006). Faems et al (2005) reported that inter-organizational collaboration supports the effectiveness of innovation strategies to develop new products. Moreover, Siguaw et al. (2006) believed that a company's long-term success resides in company strategy dedicated to new product development. Based on Autry & Griffis (2008), while continuing to search for different approaches to obtain intelligence capital for innovation, a company with an innovation-oriented culture can produce more innovative products and value for its partners. Parker (2000), by studying South African textile and clothing manufacturers, suggested that company collaboration is perceived to offer significant benefits as a means of improving their new product development process. Generalizing from these observations, we propose hypothesis:

**H4:** Innovation orientation culture positively affects inter-firm collaboration with partners in innovation.

### 3. Method

#### 3.1. Measurement

**3.1.1. Dependent and independent variables**

A 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) was adopted as the study measure. All measures were adapted from previous studies. This study used measures developed by Saxton (1997) and Adobor (2006) for similarity. Regarding a measure of innovation orientation,
Siguaw et al. (2006) and Stock et al. (2013) believed that innovation culture creates the number of innovative ideas by innovation-oriented strategies. The details for other constructs are shown in the table 1.

Table 1: Measurement items and resources

<table>
<thead>
<tr>
<th>Constructs</th>
<th>No. of items</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Similarity between partner (SB)</td>
<td>6</td>
<td>Adobor (2006); Saxton (1997)</td>
</tr>
<tr>
<td>Entrepreneurial intensity (EI)</td>
<td>3</td>
<td>Barringer &amp; Bluedorn (1999); Covin &amp; Miles (1999)</td>
</tr>
<tr>
<td>Innovation orientation culture (IC)</td>
<td>5</td>
<td>Siguaw et al. (2006); Stock et al. (2013)</td>
</tr>
<tr>
<td>Inter-firm Trust (FT)</td>
<td>3</td>
<td>Doney &amp; Cannon (1997); Ryu et al (2011).</td>
</tr>
<tr>
<td>Inter-firm collaboration in innovation (IN)</td>
<td>4</td>
<td>Flynn et al. (2010); Zhang &amp; Wang (2014);</td>
</tr>
</tbody>
</table>

3.1.2. Control variables

Company characteristics have been proved to have significant impact on cooperation behavior and that were controlled for the empirical analysis. They conclude establishment size (measured by number of employee), type of sector, age of company. According to Fritsch & Lukas (2001), firms are engaged in R&D cooperation, tend to be large. The positive effect of firm’s size on inter-organization cooperation in R&D field can also be found in number of works (Fritsch, 2003; Okamuro, 2007). On the contrary, Felzensztein & Gimmon (2007) found the negative effect of size on inter-firm relationship. The second control variable relates to ownership. The dummy variables, which value 1 if firm is owned by specific subject (state, private or foreign owned) are added, respectively. Executives of particular type of ownership likely have different objectives and attitudes toward inter-firm relationship (Nguyen & Rose, 2009; Nguyen, 2011).

3.2. Data collection

To examine the hypotheses empirically, we conducted a mail survey of companies in textile and clothing manufacturers in 2016. The questionnaire we designed included three parts. The first part consisted of demographic questions, including corporate ownership structure, the number of employees, age, etc. The second part related to inter-firm collaboration in innovation. The last part asked the respondents about performance and achievements. The questionnaire firstly developed in English and then translated into Vietnamese. A pilot test was undertaken with 20 managers and seniors who were taking MBA program at The University of Da Nang in Vietnam.

The sampling frame consisted of 400 companies listed by the Yellow page in Vietnam. To examine the factors promoting inter-firm collaboration, we narrowly defined the observations by excluding respondents that did not answer the question or not complete. As a result, 137 of the observations were utilized for the econometric analysis.

Because this detailed survey is used for many purposes in our studies, the authors only specify the information that is directly used for this paper. From the survey, the majority of participating firms are
small size that has less than 200 full-time employees, covers 65.69% of the survey*** (medium size: 30.65% and large size: 3.65%). This can be because of Vietnamese still being transition economy.

3.3. Empirical model

The study aims to test the impacts of determinants of inter-firm cooperation in innovation. We use inter-firm collaboration to demonstrate external collaboration among partner in textile and clothing manufacturers. The empirical model is that:

\[ \ln Y_i = \alpha + \varphi_1 S_i + \varphi_2 E_i + \varphi_3 C_i + \lambda F_i + \eta X_i + \varepsilon_i \]

Where \( X_i \) is controlling vector; and \( \varepsilon_i \) is the error term

4. Analysis Results

4.1. Common method variance

Two important issues have been raised concerning the survey methodology: non-response bias problem and common method variance. As recommend by Armstrong and Overton (1977), potential non-response bias was assessed via extrapolation method of comparing early versus late respondents. A comparison of early (n=30) to late responses (n=30) revealed no difference with regard to the means of all variables, especially on company’s age and size. Therefore, the non-response bias was minimal.

To assess the possibility of common method variance, the author used Harman’s post hoc single-factor test (Podsakoff et al., 2003). If common method variance appears in the study, we would expect a single factor emerging from a factor analysis or one general factor to account for the majority of the variance. All variables of interest were entered into factor analysis. The test yielded six factors that accounted for 71.64% of the variance. The first factor accounts for the highest proportion of variance, but only at 29.14%. Because no single factor accounted for the majority of the variance in the variables, we can conclude that the common method variance does not appear to be a problem of the study.

4.2. Construct validity

The study uses two-step approach to test the proposed model. This study first conducts a confirmatory factor analysis with maximum likelihood to test measurement model by verifying the underlying structure of constructs. Then the OLS regression with inter-firm collaboration in innovation as dependent variables and its antecedents as independent variables is used to test research hypotheses.

The model specification proposed was subject to confirmatory factor analysis, which was performed using LISREL 8.80 with the maximum likelihood method to evaluate the convergent and discriminant validity of the measures. Result indicated a statistically significant (\( \chi^2 = 403.47, df = 124 \), GFI=0.91, CFI=0.96 and RMSEA=0.063). The result indicated that all constructs have adequate internal

*** According to decree No. 56/2009/ND-CP of Vietnamese Government. Small firm has less than 200 full-time employees; Medium firm has full-time employees in range 200-300 and Large firm has more than 300 full-time employees.
consistency with Cronbach’s alpha ranging from 0.72 to 0.87, ensuring adequate internal consistence of multiple items of each construct (Hair et al., 2009).

Table 2: Convergent and discriminant validity assessment

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Number of items (remain)</th>
<th>Cronbach alpha</th>
<th>AVE</th>
<th>Item dropped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Similarity between partner (SB)</td>
<td>4</td>
<td>0.82</td>
<td>0.548</td>
<td>2</td>
</tr>
<tr>
<td>Entrepreneurial intensity (EI)</td>
<td>3</td>
<td>0.87</td>
<td>0.613</td>
<td></td>
</tr>
<tr>
<td>Innovation orientation culture (IC)</td>
<td>4</td>
<td>0.81</td>
<td>0.659</td>
<td>1</td>
</tr>
<tr>
<td>Inter-firm Trust (FT)</td>
<td>3</td>
<td>0.76</td>
<td>0.595</td>
<td></td>
</tr>
<tr>
<td>Inter-firm collaboration in innovation (IN)</td>
<td>4</td>
<td>0.86</td>
<td>0.704</td>
<td></td>
</tr>
</tbody>
</table>

To test convergent validity, we checked the value of AVE and CR (construct reliability). The average percentage of variance extracted (AVE) for all constructs were greater than 0.50, suggesting adequate convergence (Fornell & Larcker, 1981). Moreover, construct reliability of all construct pass the threshold of 0.7 for good reliability (Hair et al., 2009). Therefore, the result indicates good discriminant validity of the model. (Table 2)

4.3. Hypotheses tests

Following Van Bruggen et al. (2002), the study adapts a confidence-based weighted mean to obtain construct scores. The single overall confidence score, which is standardized loading, applies for the type of weight. We tested our hypotheses using maximum likelihood estimation by STATA 14 package. To check for multicollinearity, we examined the VIF test. In our regression, the highest VIF value was 2.18. This confirmed that multicollinearity was not a problem. The result was show in table 3.
Table 3: Regression result

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Similarity between partner (SB)</td>
<td>0.018**</td>
<td>0.014**</td>
<td>0.015**</td>
<td>0.017**</td>
</tr>
<tr>
<td>Entrepreneurial intensity (EI)</td>
<td>0.182**</td>
<td>0.197**</td>
<td>0.185**</td>
<td>0.201**</td>
</tr>
<tr>
<td>Innovation orientation culture (IC)</td>
<td>0.308***</td>
<td>0.312***</td>
<td>0.343***</td>
<td>0.358***</td>
</tr>
<tr>
<td>Inter-firm Trust (FT)</td>
<td>0.230***</td>
<td>0.227***</td>
<td>0.234***</td>
<td>0.238***</td>
</tr>
<tr>
<td>Small</td>
<td>0.075**</td>
<td>0.092**</td>
<td>0.103***</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>0.043*</td>
<td>0.040**</td>
<td>0.037**</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>0.027*</td>
<td>0.019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>0.023</td>
<td>0.021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>-0.215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.019**</td>
<td>0.978**</td>
<td>1.149**</td>
<td>1.128**</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.103</td>
<td>0.213</td>
<td>0.304</td>
<td>0.312</td>
</tr>
<tr>
<td>F statistic</td>
<td>7.631***</td>
<td>11.04***</td>
<td>13.42***</td>
<td>14.18***</td>
</tr>
<tr>
<td>N</td>
<td>137</td>
<td>137</td>
<td>137</td>
<td>137</td>
</tr>
</tbody>
</table>

Note: *** p<0.01, ** p<0.05, * p<0.1.

Two steps of hierarchical regression analysis were used. In the first step, the independent variables alone was entered. In the second step, the control variables were added to the independent variables. It is very important to note that these variables are highly significant and positively affects to innovation collaboration. The fact that inter-firm trust is positively and strongly linked to the probability of innovation collaboration between partners. This variable is positive and significant for all models proposed (p<0.01). Thus, hypothesis 1 is confirmed.

Hypothesis 2 states that entrepreneurial intensity is positively associated with innovation’s inter-firm collaboration. Bases on highly significant evidence in Table 3, the hypothesis is supported. For the Vietnamese context, the attitude of managers toward entrepreneurship will facilitate the building inter-firm collaboration in innovation due to facilitating risk taking. With strong entrepreneurship-minded, the company’s representatives will have strong sense and innovation strategy, they are willing to form innovation collaboration with its partners.

The similarities between partners has a positive influence on the probability of strong inter-firm cooperation in innovation. The results also revealed that similarities between partners will facilitate innovation collaboration because it will set barrier free riding among partners. This result also supports for the findings of Saxton (1997) and Nguyen (2015). Hypothesis 3 is thus empirically confirmed.

Related to the impact of Innovation orientation culture on innovation collaboration, hypothesis 4 predicts that Innovation orientation culture positively affects inter-firm collaboration with partners in. The coefficient has positive sign and is highly. These results provide support for hypothesis 4. This finding reveals the importance of this element in explaining behaviors across wide range of theories (Siguaw et al., 2006; Stock et al., 2013).

A number of regressions have been carried out to check for the robustness of the regression results. Size (Small, Medium), type of company (Private, State) and age are added and presented from Model 2 to Model 4, respectively. Importantly, the inclusion of the additional controls does not alter the
patterns of the results. Moreover, from robustness check, we found that small and medium enterprises are more likely than large firms to undertake inter-firm innovative cooperation. These results are significant across estimations and consistent with the widespread assumption in the literature (i.e Arku, 2002; Nguyen, 2011; Jenssen & Nybakk, 2013). The small and medium firms that have fewer and less varied internal resources are likely to be particularly vital for innovative collaboration. Based on the estimation result, we do not see any significant level from the impact of age on innovative collaboration among companies. We can also conclude that type of company does not influence to inter-firm innovative collaboration. Although this evidence is contrast with finding of Tran et al. (2009), it is similar with Arku (2002).

On the one hand, the sign of all coefficients still remain in all models. On the other hand, the values of these coefficients do not change much. Further, the values of robust standard errors of all variables seem to be same in all regressions. These findings confirm the robustness of the results.

5. Discussions and conclusion
With this article, we help untangle the nature of inter-firm innovative collaboration among partners in textile and clothing manufacturers by distinguishing four key drivers. Among the determinants, Innovation orientation culture and inter-firm trust plays the most key drivers in facilitating inter-firm innovative collaboration. In Vietnamese context, trust between partners (managers or owners) will direct the potential behaviors. Based on empirical result, this study suggests that the company should focus on innovation by formulating Innovation orientation culture. They will benefit from knowledge spillover through inter-firm network. Moreover, in this paper, we argue that similarity between partners and entrepreneurial intensity are important factors for innovation. Our finding that a company’s innovation-oriented culture positively affects innovative collaboration and provides a basis for further research into this particular strategic orientation.

References


* Nguyen Phuc Nguyen Email Address: bguyennp@due.edu.vn