

VETEC Project

Tailor-Made Intervention Model for KTT Education & Policy

Hanoi University of Science and Technology, Vietnam

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<http://vetec-eu.net/>



contact@vetec-eu.net

Tailor-Made Intervention Model for KTT Education & Policy

1. Introduction

HUST is one of the biggest technical universities in Vietnam. There are many applied and basic research results at HUST annually. So far, only few of HUST's research applications have been commercialized each year. The university hasn't had its knowledge and technology transfer section yet. This makes it difficult to transfer its technology results to markets.

Furthermore, most of its students do not know how to start up a business. Therefore, the chance of setting up a new successful business after graduating from the university is limited.

Therefore, entrepreneurship and innovation (E&I) courses are necessary for technical and engineering students at Hanoi University of Science and Technology. Its engineering students lack economic and business courses, especially entrepreneurial courses. A Business model canvas (BMC) course has been developed by the HUST VETEC team. This course is ready for delivering to HUST students. By deploying the E&I course, HUST can implement its objectives towards all of its students:

- Some students will want to become entrepreneurs; all students will have to be entrepreneurial.
- Entrepreneurship and entrepreneurial attitudes are core competencies that are expected from all HUST graduates.

2. Status quo in Vietnam

Alongside India and China, Vietnam is showing the strongest GDP growth rates in the group of the Emerging Asian Economies with an impressive GDP growth of 6.8% in 2017 and a stable outlook for the next years. Real GDP has expanded by 7.4% in the first quarter of 2018, which exemplifies the strongest first quarter growth in a decade¹.

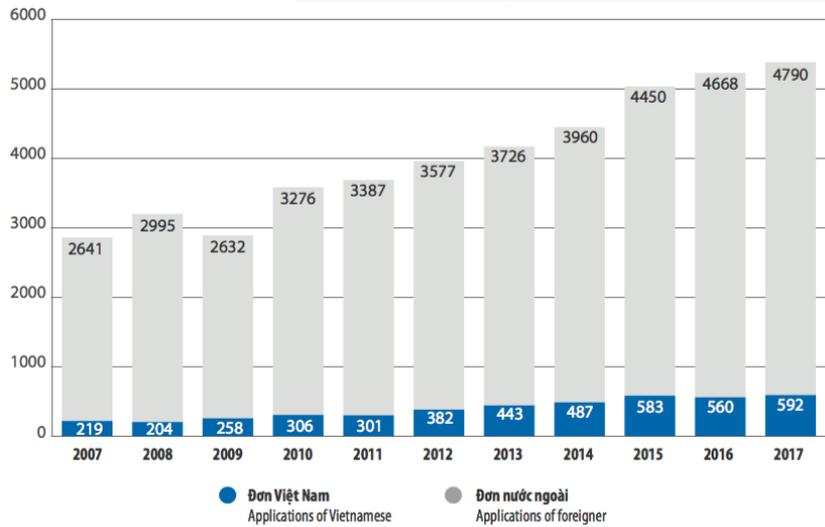
The situation of KTT in Vietnam currently can be described by following facts and figures:

Human Resource for Science and Technology: 167.746 staffs involved in R&D activity (according to Ministry of Science and Technology) 141.084 public (84,1%), 23.183 private staffs (13,8%), 3.479 FID (2,1%); 14.376 PhD, 51.128 masters. Vietnam has 1600 R&D organizations including 700 universities and colleges. According to the data from noip.gov.vn, the number of Patent applications from universities was less than 100 (2017). Data on licensing

¹ World Bank (IBRD), June 2018, p. 9.

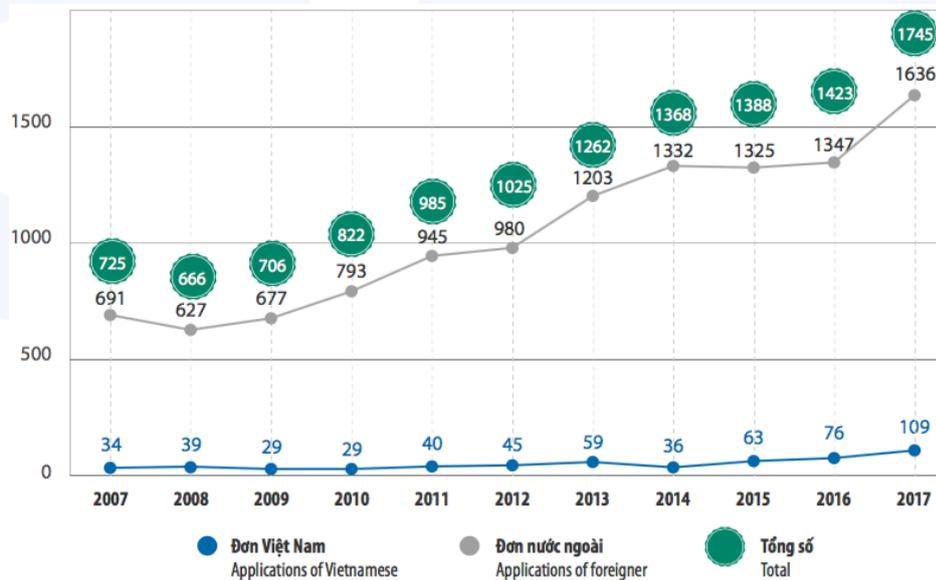
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(for Vietnamese patents) are not available. Almost no “real” spin-off companies exist from Universities.



Số lượng đơn đăng ký sáng chế từ năm 2007 đến 2017 của chủ đơn Việt Nam và nước ngoài
Invention applications filed from 2007 to 2017 by the Vietnamese and the Foreigner

Figure 1. Invention application filed from 2007 to 2017 by the Vietnamese and foreigner



Số lượng bằng độc quyền sáng chế đã cấp từ năm 2007 đến 2017 của chủ đơn Việt Nam và nước ngoài
Invention patents granted from 2007 to 2017 by the Vietnamese and the Foreigner

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Figure 2. Invention patents granted from 2007 to 2017 by the Vietnamese and the Foreigner

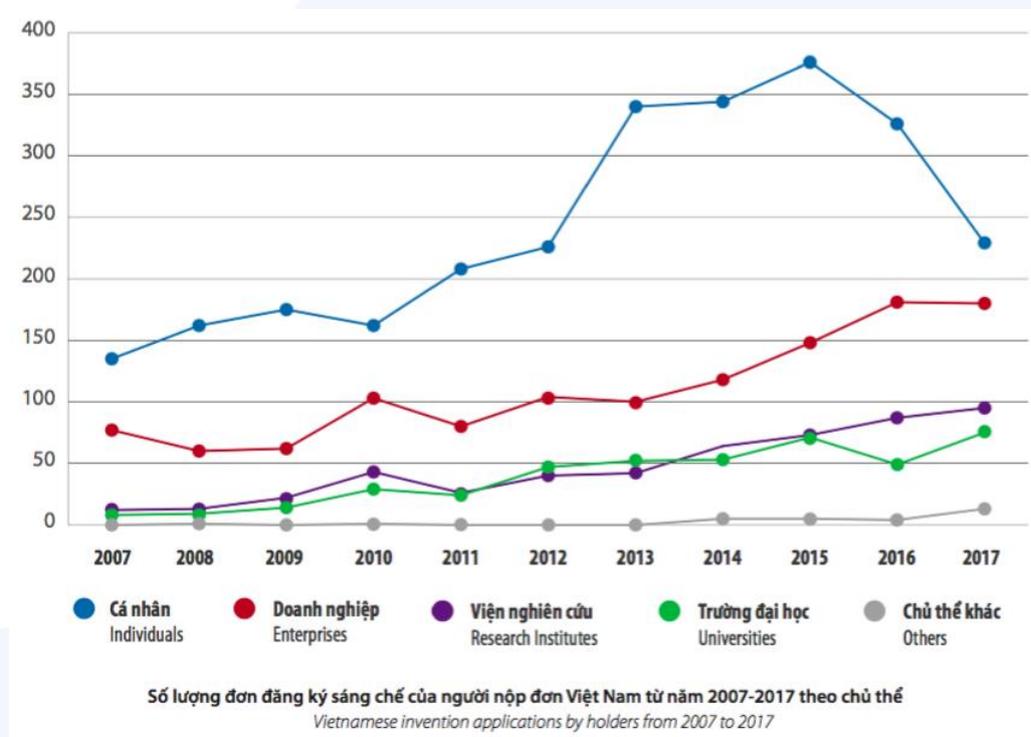


Figure 3. Vietnamese invention applications by holder from 2007 to 2017

Regarding governmental regulation, different laws and degrees on technology transfer are currently developed and effective. It can be named: The Law On Science And Technology 29/2013; DECREE No. 08/2014/ND-CP Dated January 27, 2014, guiding the implementation of a number of articles of the Law On Science And Technology INCLUDING guidelines on Transfer of Ownership, Right to use the Result of Scientific Research and Technological Development, Appraisal of Scientific Basis and Technology in Investment Projects and Social-Economic Development (Circular 15/2014/TT-BKH-CN); the Law on Technology Transfer 2007 (modified in 2017), guiding Decree 76 (15th May 2018) and take effect 1st July 2018, and recently effective Modified Law on High Education in which mention that Public University can establish the enterprise/company on Technology.

On the other hand, the public (governmental) and private sector's support and promotion are strengthened. For example, the Resolution No. 20-NQ/TW (2012) focused on development of Science and Technology. With the support from the Vietnamese Government, several projects

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and programs focusing on E & I were launched, such as Vietnam-Finland Innovation Partnership Program (IPP) phase 2 (2014-2018) (ipp.vn), the fostering of innovation through Research, Science, and Technology” (FIRST) (100 mil USD, World Bank) (2013-2019) (first-most.vn) and 844 projects along with the Decision No. 844/QD-TTg dated May 18/2016 which supports the national innovative startup ecosystem through 2025 (the first call was in 2018).

Besides, VCs/Funds for startup are also numerous. In 2018, there were around 60 (national and international) VC and Fund in Vietnam (startup.gov.vn), in which several funds are supported by the government, for example: NATIF (The National Technology Innovation Fund (MOST) launched in 2015: 1000 bil. VND); SpeedUp program (US\$ 520,520) (DOST, from Ho Chi Minh City) (dost.hochiminhcity.gov.vn) and Startupcity.vn (online platform launched by Hanoi’s People Committee). The startup community in Vietnam is expanding and in 2018 there were around 3,000 startups (involving in fintech, food tech, healthcare, and e-commerce). In 2017, US\$ 291 million were invested in 92 startups.

3. Status quo at focal University

Hanoi University of Science and Technology was founded in 1956 with the mission of human development, high-quality workforce training, scientific research, technological innovation and knowledge transfer that serves our country and global society. The HUST vision is to become a leading research university rooted in the technical and technological fields; to make significant contributions that develop a knowledge-based economy and maintain national peace and security; and to be a pioneer in growing and sustaining Vietnam’s higher-education system.

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UNIVERSITY'S QUICK FACT

- Year of establishment: **1956**
- Number of faculties and schools: **20**
- Number of institutes and research centers: **14**
- Total area: **25,6** ha
- Number of classrooms: **>260**
- Number of laboratories for training and research: **>200**

STUDENT

- More than **28,000** full-time students
- Estimated annual enrolment: **6,000** students
- More than **2500** Master's and **500** Doctoral postgraduates
- **70%** of students being employed right in the final year

STAFF AND LECTURERS

- Number of staff: **1,887**; consisting of **1,168** lecturers, in which there are:
- **23** Professors
- **216** Associate Professors
- **770** Doctors
- Average age of teaching staff: **36.02**

TRAINING

- Undergraduate training system: with nearly 70 majors that are offered in:
- **35** Engineer training programs
- **45** Bachelor's training programs
- **20** special training and international cooperation programs:
- **78** Master's training programs
- **60** Doctoral training programs

Figure x: figures on HUST

3.1 General (Research, Teaching, Focus)

Nowadays, HUST is a public autonomous technical university, and is among top four universities in Vietnam. It has 21 faculties, schools and institutes with 1869 staffs including 26 professors, 237 associate professors and 514 PhD holders. The budget for research obtained The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

mainly from the government is about 2-3 million USD/year. The number of publications annually is 200-250 ISI articles. The number of annual enrolled student is 5500 - 6000 students.

HUST is applying a three-level administration model: University, Faculties-Schools-Centers and Departments. The University has three Faculties, 17 training Schools, 14 research Institutes and Centers, 11 key concentrated investment laboratories, over 200 laboratories and workshops to serve training.

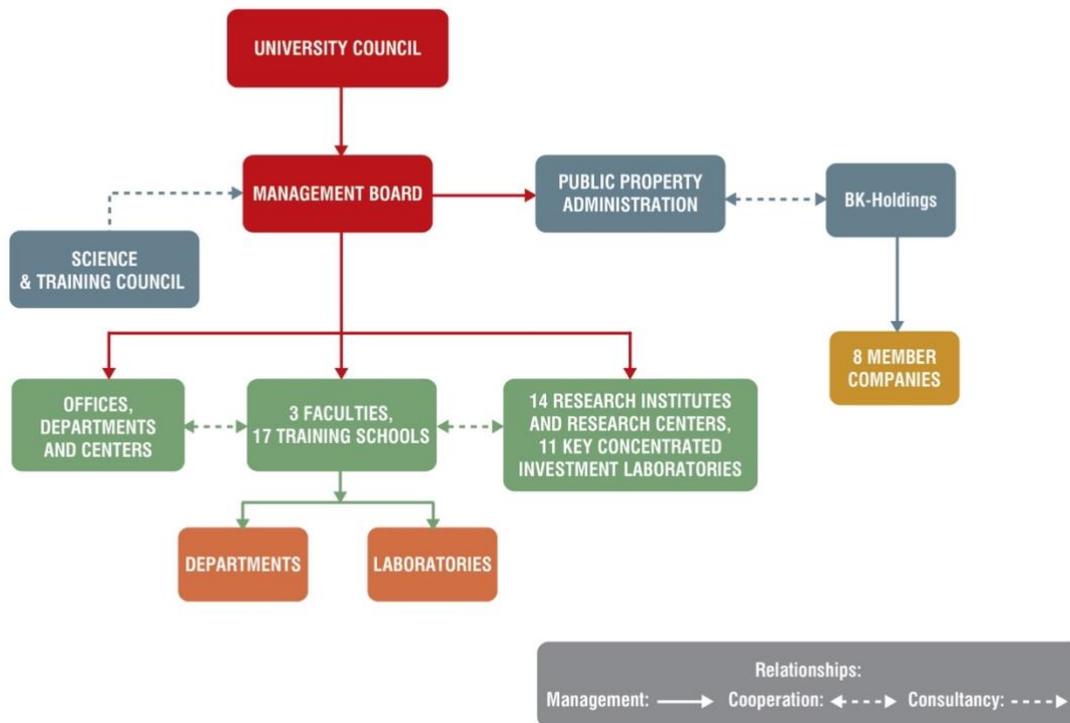


Figure X: The organization structure of HUST

Research, renovation and creativity

HUST is a multidisciplinary technical university in which scientific research is a main focus. The community of more than 1150 scientists at the university has contributed greatly in various aspects to the socio-economic and scientific development through scientific publications, innovations as well as research and technology transfer. The successful research activities have contributed strongly to the outstanding recognition of the university by regional and global partners.

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In 2012, HUST had the great honor to be in the list of over 3000 research units worldwide ranked by SCImago. The university has received the top innovation and creativity indicators nationwide in 2014 and 2016. HUST is proud to be an official member of the Asia-Oceania Top University League on Engineering – AOTULE.

Multidisciplinary research strengths

To fulfill its mission to become a qualified training and research institution, HUST has centered its investments in the development of a research-oriented university. HUST has identified eight research strengths, with a focus on key interdisciplinary research directions and fields.

- Information and Communications Technology
- Advanced Material Technology
- Mechanics – Mechatronics
- Dynamics Engineering
- Biotechnology and Life Science
- Food Technology
- Electricity, Electronics and Automatics
- Chemistry, Energy and Environment

Institutes and Centers for Research

Scientific research and technology transfer cooperation have been seen as one of the main drivers for the university to develop research strengths. With many effective training and research cooperation programs, HUST prioritizes the development of long-term and trustworthy relationships with prestigious universities, research institutes and scientific and educational organizations, networks worldwide such as Technical University Dresden, Coventry University, University of Aveiro, Francophone University Association (Agence Universitaire de la Francophonie, AUF); ASEAN-European Academic University Network (ASEA-UNINET); ASEAN University Network/Southeast Asia Engineering Education Development Network (AUN/SEED-Net); Greater Mekong Subregion Academic and Research Network (GMSARN); Greater Mekong Subregion Tertiary Education Consortium Trust (GMSTEC); South East Asia Technical Universities Consortium (SEATUC); Asia-Oceania Top University League on Engineering (AOTULE). HUST has therefore become a favorable destination for international scientists.

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HUST has marked successful efforts during the past few years to build the model of advanced hybrid Institute/Research Center with prestigious counterparts in the world like Canon, General Electrics, Hitachi, Honda, Intel, LG, Microsoft, Nissan Techno, Panasonic, Samsung, Toyota, etc. By creating an international research environment, the units have provided opportunities for domestic and foreign students, scientists and researchers to study, research and exchange knowledge in their pursues of various advanced areas of interests.

Table X. Institutes/Center and Schools in HUST

Institutes/Centers	
1	Multimedia, Information, Communication & Applications (MICA) International Research Institute
2	International Training Institute for Materials Science (ITIMS)
3	International Collaboration Center for Research and Development on Satellite Navigation (NAVIS)
4	Institute for Computational Science and Engineering (ICSE)
5	Vietnam – Japan International Institute for Science and Technology (VJIIST)
6	Advanced Institute for Science and Technology (AIST)
7	Institute for Research and Development of Natural Compounds Applications (INAPRO)
8	Institute for Control Engineering and Automatics (ICEA)
9	Institute for Space and Underwater Technology (ISUT)
10	Center for Bio-medical Engineering (BME)
11	Polymer Center (PC)
12	Bach Khoa Internet Security (BKIS)
13	Center for Technology Innovations (CTI)
Schools	
1	School of Biotechnology and Food Technology
2	School of Information and Communication Technology
3	School of Mechanical Engineering
4	School of Transportation Engineering
5	School of Textile – Leather and Fashion
6	School of Electrical Engineering
7	School of Electronics and Telecommunications
8	School of Environmental Science and Technology
9	School of Heat Engineering and Refrigeration
10	School of Materials Science and Technology
11	School of Economics and Management

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12	School of Nuclear Engineering and Environmental Physics
13	School of Chemical Engineering
14	School of Foreign Languages
15	School of Engineering Pedagogy
16	School of Applied Mathematics and Informatics
17	School of Engineering Physics

Teaching E&I courses

Most of the activities at HUST now, are teaching, and partially research. HUST technical students accounts for 85% of the total students. They lack of entrepreneurial knowledge, shown in a recent survey carried by a HEP (higher education partners) project by British council in Vietnam.

In the following, some feedback from HUST students for the E&I course sponsored by the British Council in May, 2018 at HUST is presented. The course attracted 36 students from five engineering departments of Hanoi University of Science and Technology. All technical students from HUST could attend the course. The aims of the course were to provide technical students with an entrepreneurial mindset and change the way of thinking when developing a new research focus. A lot of personal development skills like team work, presentation and communication skills were developed during the training program. Some feedback from the students:

- “I have a lot of E&I knowledge after this course. Thank you so much for offering this course. I’m very happy and learned many useful thing. I strongly believe that I can become an entrepreneur in the future”.
- “I love this course. It helped me realize my own abilities”.
- “This is exceptional course. Thank you so much”.
- “I love this course. I hope I could take part in a class like this in the near future”.
- “I think you should extend the duration of course”.
- “This is a great course I have ever taken part in”.
- “I want to take part in the course like this once more”.
- “All is so good and meaningful. I appreciate all of your knowledge which you taught for everyone. Thank you so much”.

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From the above situation, it is necessary to provide HUST technical students further E&I courses, so they can understand how to start their own company, or at least, to develop an entrepreneurial mindset. So HUST should add an E&I course on their curriculum for technical students. This would help the University to fulfill its main aims particularly and generally. Since the university is as of driver of economic development and catching-up through their role in education and technology absorption, adaptation, and diffusion (Yusuf 2007).

3.2 TT-based

Hanoi University of Science and Technology currently has a research management department (formerly Department of Science and Technology) to manage activities related to basic and applied research. The department currently focuses mainly on research activities and administrative management of research funded by internal and external sources. Most of the technology transfer activities to industry are carried out by institutes, individual researchers, and professors themselves. Several schools and institutes organize the team focusing on TT activities (called technology transfer unit - TTU). The university gains very little benefits, if not nothing from the individual and institutional TT activities.

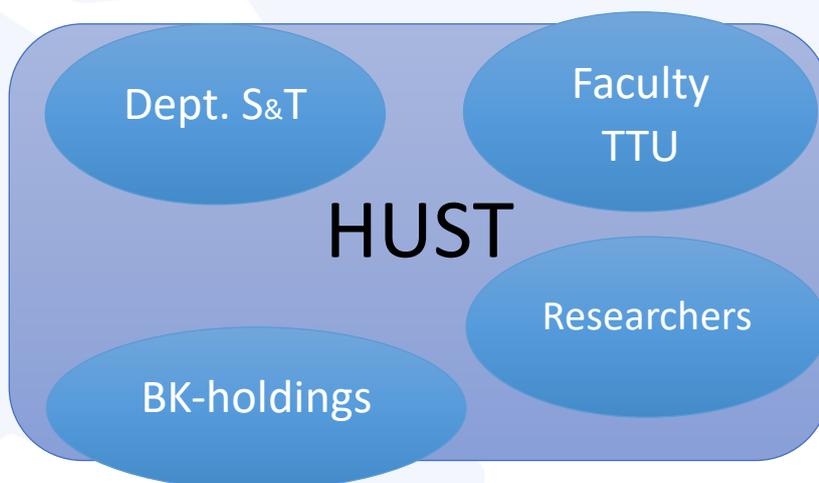


Figure X: current entities involving KTT in HUST

HUST has the BKholdings company. The company has its own co-working space, and some incubation activities to promote research and innovation activities for HUST students and researchers. BKHoldings carries out some initial steps of TT: supporting students and researchers in terms of facilities, a FAB lab for some simple experiments, and coaching and mentoring for startups.

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It is concluded that the university is just on research management. There are very limited activities on innovation and valorization at the University at the moment.

KTT FACTS AND FIGURES IN HUST

- Activities are performed by Dept of S&T (is changed the name to Dept of research management).
 - From 2006-2017: total 119 IPRs (69 patents, national level): focusing on Chemistry, Food-Biotech, Textile, Machinery...
 - No data on licensing available
- BKHoldings company (Bkholdings.com.vn)
 - Servicing and consulting in Technology Transfer
 - Vocational education
 - Organizing the activity for E&I: training, seminar, workshop (mostly nonprofit project)
 - Co-working space (BKHUB)
 - Supporting the E&I activities at HUST: annual Innovative student contest
- Researchers:
 - Lack of incentive
 - Researcher's awareness on IPR is inadequate
 - Hurdle of patenting and licensing
 - Non-market-oriented research
 - Lack of budget support for long term research
- HUST
 - Mainly focusing on research and teaching (due to the autonomy)
 - Lack of "real" TTO and resources

Most of new successful TT-based start-up companies need leaders and managers with business knowledge. The chance of failures can be very high if they don't know how to start up and run a business. Therefore, it is necessary to have business and entrepreneurial knowledge before starting your own business. The same situations accounts for technical students, in general and at HUST in particular. HUST has many different technical and engineering students from chemistry, physics, electricity, telecommunication, materials, ICT, garment and textile, polymer and food processing. They are provided with technical courses related to their fields. However, they lack entrepreneurial courses and business courses. The current curriculum at their schools and faculties has very few courses on economics and business, if not at all for some schools and faculties. Therefore, they are very new to E&I knowledge. They seem eagerto learn these economic and business topics.

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3.3 Embeddness in the region (ecosystem)

E&I courses, provided to technical students are also needed, under the perspective of an innovation ecosystem. As technical and engineering students may have good applicable research results, they don't know how to commercialize the results. Therefore, the chance of making money from their research fruits are very limited. The society lacks these potential innovations and has to wait to receive possible new application. Also, the risk of similar developments at the same or similar research results occurs. Others, with E&I knowledge may apply and commercialize their products to the markets and earn money from it. We conclude that technical students need to get E&I knowledge right at the university. They can start their own business after graduating from universities. Or they at least have knowledge on E&I so that they can aim and develop their research on marketable research application results.

4. Development of focal KTT Aspect (Entrepreneurship Training Course)

4.1 Aim / Task/ Subject

The E&I course is designed to target engineering students of the fourth and fifth year and junior researchers who are engaged in research, have ideas for a product, and want to commercialize these. The aims of the course are to help the engineering students to understand business and economics, improve their communication, group work, creative thinking, soft skills, establish connections to other institutions like incubators, startup centers and TTOs, increase the chances for further jobs after the university, learn about the link between market and product and research and know how to start their own business later. For the university in short term, the aims are to increase awareness for the engineering students; get more students and more tuition fees and get a better reputation. In the long term, the goals are aiming at ten percent of all students taking the course with connected workshops afterwards and advanced courses to improve the learned skills as well leading to more funding for the universities.

4.2 Learning outcomes

Upon successful completion of this course, students and junior researchers will be able to:

- Discuss the attitudes, values, characteristics, behavior, and processes associated with possessing an entrepreneurial mindset and engaging in successful appropriate entrepreneurial behavior.
- Discuss what is meant by entrepreneurship and innovation from both a theoretical and practical perspective, and the role of the entrepreneur in the new enterprise creation process.

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- Describe the ways in which entrepreneurs perceive opportunity, manage risk, organize resources and add value.
- Develop a plan for implementing entrepreneurial activities in a globalized and competitive environment being responsible for the social, ethical and culture issues.
- Engage in a continuing learning process through the interaction with peers in related topics, as individuals and as team members.

This course is also aimed at

- Helping the engineering students to understand business/economics
- improving communication, group work, creative thinking, soft skills, connections to other institutions like an incubator and start up centers and TTOs
- increasing the chances for further jobs after the university
- helping junior researchers learn about the link between market and product/research, start their own start-up later

4.3 Course contents

The topics in this course include:

- Definitions and evolution of entrepreneurship
- Entrepreneurship ecosystems
- Definitions and evolution of innovation
- Business models, and Business model canvas
- Creativity and new ideas and application
- Design thinking
- Lean start up
- Developing your business skills
- Business strategy
- Market research

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- Root cause analysis
- Marketing
- Negotiation and pitching

4.4 Specific conditions

Hanoi University of Science and Technology has around 30000 full time students. 85% of them are engineering students. However, the current curriculum of most technical faculties and schools lacks of E&I course for students to join. They have little knowledge on how to startup a company. Creative thinking, and design thinking courses are also limited, if not absent.

The number of students wishing to start up a new business after graduating is increasing². These students, without any ideas on business start-up, will have a higher chance of failing. The products which they want to develop maybe far from consumers' real needs and expectation. In short, more market-oriented design thinking, product development courses are needed for technical students. Entrepreneurial courses are then the next step to be carried out for technical students at HUST. The rectorial members of HUST also gave green light for implementing these courses for technical students. However, no written decisions have been made on this issue officially.

4.5 Envisioned changes

By deploying E&I courses for technical students at HUST, its technical students will have more chance, and opportunities to develop their research activities toward market-oriented results. Therefore, the research results are more commercialized, or marketable than before. The chance of the successful setup of new businesses can be increased. HUST will make entrepreneurship education accessible to all students. HUST will mix students from economic and business studies with students from technical and engineering faculties with different backgrounds. The University will create teams for the development and exploitation of business ideas. By doing these above-mentioned courses and activities, HUST can implement its objectives towards its students:

- Some students will want to become entrepreneurs; all students will have to be entrepreneurial

² <http://vietcetera.com/vi-sao-nhieu-sinh-vien-chon-khoi-nghiep-khi-moi-ra-truong/>

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- Entrepreneurship and Entrepreneurial attitudes are core competencies that are expected from ALL our graduates

4.6 Future status + development

The first E&I course on BMC is being developed by the HUST VETEC team. It will be finished by end of July 2019. The course is ready to be delivered to HUST students for the fall semester, starting from September 2019. The course is conducted at some chemical engineering faculties, then it is expanded to other all technical faculties at HUST for the next semester. The evaluation of the course will be made after the fall semester and through other entrepreneurial activities and competition campaigns participating by HUST students.

5. Conclusions

Providing technical students with E&I knowledge at HUST is now a necessity. VETEC European partner universities like TUD, VJB, AU, all have their TTO office. They also provide E&I courses for their engineering students. Apart from that, a lot of startup competition campaigns, programs and support are available to their students. They even have incubation centers both at university level and municipal level to support startup students. Their students have developed many new innovative and creative products and services. Those products are market-oriented. The students want to commercialize their products. It is important to be officially accepted by HUST rector and education and training department for implement the course to technical and engineering students at HUST. By doing that HUST engineering students will have an entrepreneurial mindset, and some of them want to be entrepreneurs.

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