1. Rationale and objectives

After nine years of war between Viet Minh and the French, the Geneva Agreement signed on 20 July 1954 divided Vietnam into two parts from the 17th parallel. The Republic Democratic of Vietnam was in the North under the leadership of Ho Chi Minh and the Vietnamese communist regime with strong support from the Soviet Union and China. In the South Ngo Dinh Diem established the Republic of Vietnam and became its first President and received strong support from the United States.

On 30 April 1975, the Vietnam war ended. Vietnam was reunited and commenced rebuilding its country after 20 years of division. However, with the American embargo, Vietnam had to fight another war, the war against poverty.

In 1986, the Sixth Congress of the Communist Party of Vietnam decided to replace the centrally planned economy with a regulated market economy and the “Doi moi” policy (economic renovation) was proclaimed. Since “Doi moi”, Vietnamese higher education system has taken important steps to move away from the Soviet model in an attempt to meet the demands of market-oriented economy.

Twenty years after the end of the Vietnam war, in 1995 the United States lifted its embargo. From 2001, Vietnam started to implement for the first time the national policy on science and technology development together with the national policy on social economic development. By the end of a decade of implementation with its potential progresses and in order to consolidate its development, Vietnam continued to build and implement the second ten-year programs on science, technology and innovation for the period from 2011 to 2020.

This study aims to analyse the existing and major causes of Challenges of Science, Technology and Innovation in Vietnamese Higher Education with some suggestions in an attempt to improve and advance Vietnam’s science, technology and innovation policy.

2. Higher education and research in higher education

Up to late 1980s, the higher education system in Vietnam was designed similar to the Soviet’s model. This model separated research activities from universities and allowed single disciplinary universities and colleges installing in various ministries and departments.

In 1986, the Sixth Congress of the Communist Party of Vietnam decided to replace the centrally planned economy with a regulated market economy and the policy “Doi moi” (economic renovation) was proclaimed. Since “Doi moi”, the Vietnamese higher education system has taken important steps to move away from the Soviet model in an attempt to meet the demands of market-oriented economy. Accordingly the economy was
shifted from a planned centralized economy based on the public ownership to a multi-sectoral economy based on the market. As a result, Vietnam’s higher education institutions today are comparatively better organized, better funded, more diversified, but far behind in science, technology and innovation.

The Higher Education Law was approved by the Congress in 2012. As stated in the Higher Education Law, there are four types of higher education institutions: (a) “Trường cao đẳng” (Junior College); (b) “Trường đại học, Học viện” (University/ Academy/ Institute/ College); (c) “Đại học vùng, đại học quốc gia” (Regional Universities/ National Universities), which are Vietnam National University Hanoi (amalgamated from three universities and in the Hanoi area) and Vietnam National University Ho Chi Minh (amalgamated from nine universities and colleges in Ho Chi Minh City) (Nguyen Xuan Thu, 1997); (d) The research institutes are permitted training doctoral degree.

In 2013, there were 1,447,167 students enrolling in 204 universities. There were 61,674 lecturers working in universities and 26,008 in colleges. The ratio of lecturers holding doctoral degrees was 14.4% in universities (MOET, 2013). There are 153 public universities which were publicly funded universities or state owned universities, and 54 Non-Government which was privately owned universities (MOET, 2013). Vietnamese higher education institutions in term of management is centralized under various ministries and departments. Except for the two national universities that under the supervision of the office of the Prime Minister, most colleges and four-year multi-discipline universities are manage by the Ministry of Education and Training. Other ministries manage mono-discipline universities in their respective fields. Regardless of their ownership, all universities must follow MOET guidelines governing admissions, organization of instruction. The public universities must follow rules of ministries or provincial People’s Committees on budgeting, spending and personnel management.

Besides, there are two international universities are RMIT Universtity and Vietnamese British University which were foreign owned universities. These universities operate within the realm of Law on Foreign Investment in Vietnam and Decree No.73/2012 / ND-CP on cooperation, foreign investment in the education sector.

Vietnam currently has about 9,000 professors and associate professors, 24,000 doctors and more than 100,000 lecturers holding master degrees, but the scientific publications of Vietnam over the past 15 years is less than one fifth of the publication of the University of Tokyo (69,806 publications) and a half of the National University of Singapore (28,070 publications) (Duong, 2013). According to ISI Web of Science of Thomson Reuters, the number Vietnam’s ISI articles increased from 908 in 2008 to 1776 in 2013. However, it is still lower than Singaporean, Thailand, Malaysia.

There are generally in the world its university faculty involved in research activities to create more links between research and teaching. But in higher education institutions in Vietnam have a majority of academics are not engaged in research activities, as measured by the number of articles and staff publications produced (World Bank’s Report, 2008). This report shows that overall there were very few publications in Vietnam, as measured per academic staff. Most were published in the public institutions, but the majority of these are published domestically, rather than in international peer reviewed scientific journals.

Of relevance to the role of research in industrial innovation in Vietnam, however, is the relatively large proportion of researchers located in research institutes but not in universities.
3. The value for research in the universities

Etzkowitz and Leydesdorff (1998) takes its point of a science-based company can no longer be an island unto itself. In a highly competitive global environment, it is necessary to use outside sources of knowledge and technology. It is focus on the relationship between academia and industry has been increasingly identified as a factor of knowledge to existing firms. The strengthening ties between the two institutional spheres is seen too as a force reshaping the mission of the university.

The example of this, U.S universities are now paying increasing attention to the value of more applied research, innovative and relevant teaching and service to the local, state, and national public and private sectors. These developments are being facilitated by more innovative linkages between the university and its external constituencies (Raymond et al, 1993). External outcomes Raymond et al (1993) show that includes applications and problem-driven research, company spin-offs, new technologies and products, regional and national economic development, job creation, technology transfer from the university to the public and private sectors, and increased global competitiveness and co-operation. Outcomes which are internal to the university include the emergence of new faculty entrepreneurs, the securing of new funding sources (especially from the private sector), development of hands-on programmes and new course development, and new criteria for faculty recognition and promotion. These external and internal drivers are precipitating different and broader evaluation and reward mechanisms within context of the traditional research, teaching, and service missions.

The Vietnam: Higher Education and Skills for Growth (World Bank’s Report, 2008) shows that in order to create a high quality higher education system in Vietnam, emphasis should be placed on expanding the role of research in universities. Research can be defined as critical and creative investigations undertaken on a systematic and rigorous basis, with the aim of extending knowledge or solving particular or theoretical problems. It can be academic work that contributes to particular discipline, tackles problems of social and economic significance, or produces original works of intellectual merit (Harmon, G. 2005).

Universities have a key role in innovation systems in a country, playing the role of incubators of technical progress, helping to train future researchers and generating and communicating new knowledge to students. Research activities may also lead to improvements in teaching and student learning. Many universities worldwide now require that all their academic staff be engaged in research activities (Harmon, K. 2005).

Thus, defining values for research and technology examines the universities in the innovation linkages for technology transfer. It was argued that university-industry partnerships have the potential to both benefit industrial expansion and enrich academic life. Universities should give a good education to their students.
4. The existing and major causes of challenges

The Vietnamese government has recognized the gravity of the situation. In 2005, the government issued Resolution No. 14/2005/NQ-CP, which called “fundamental and comprehensive reform of higher education (HERA)”. Since then, the government has released a series of policies and plans calling for reform of nearly every aspect of the system. The state has recently identified management as the core problem in higher education, which articulates the long term vision for higher education in Vietnam - to develop a modern higher education system with an effective university network that is regionally and internationally integrated. The higher education system envisaged by 2020 the enrollment rate is expected three to four times higher than in 2005, better managed, more structurally integrated, more flexible in providing opportunities for course transfer, more self-reliant financially, more research oriented, with a higher capacity for teaching and research in science and technology, more focused on the commercialisation of research and training opportunities, more attuned to international benchmarks of quality, and more open to international engagement.

The Vietnam Education Development Strategic Plan 2011-2020 period defined its objectives that by 2020, Vietnam Education system will basically innovate fundamentally and comprehensively its contents in the direction of standardization, modernization, socialization, democratization and international integration. Quality of education will be improved comprehensively, including ethical values, lifestyle, creative thinking, practical approach, foreign language and IT capability. High quality human resources are also vital, particularly in order to serve the development of industrialization, modernization and to build an intellectual economy.

The Strategy for Science and Technology Development for the 2011-2020 period gives the overall objectives to develop in a synchronized manner social sciences and humanity, natural sciences, technical and technological science; make science and technology to really become a key motive force, meet basic requirements of a modern industrial country. By 2020, a number of Vietnam’s science and technology fields will reach the advanced and modern level of ASEAN region and that of the world.

However, up to now, these expectations are difficult to achieve. In the Global Competitiveness Report 2014 - 2015, Vietnam ranks 68th out of 144 countries in the global competitiveness index (WEF, 2014). The country ranks no higher than 74th in any of the pillars concerning science, technology and innovation capacity except company spending on R&D (63rd), including capacity for innovation (95th), quality of scientific research institutions (96th), availability of scientists and engineers (87th), country capacity to retain talent (84th), country capacity to attract talent (74th), and university - industry collaboration (92nd). It is worthy of mention that higher education and training ranks 96th, out of 144 countries recently surveyed, putting Vietnam behind countries such as Singapore, Malaysia, Brunei, and Thailand. Poor rankings were particularly found in both the quality of the institutional management and the availability of research projects of local and national significance and research training programs.

4.1 Issues:

The causes of this problem are from shortcomings of science, technology and innovation in higher education as “Higher education institutions are independent of Research
Institutes; Research activities in Research institutes are disconnected with those in the universities"

Beside the higher education system, in 2011, Vietnam had appropriate 700 research institutes under line ministries and more than 1000 research and development units belonging to local governments or business firms (Luong Hoai Nam, 2014). Research activities in the research institutes are disconnected with universities. Universities have focused mainly on teaching. Research has been exclusive from teaching. There had no mechanisms for postgraduate students (master or doctorate programs) to actively participate in scientific research. Many of these research topics in universities are not associated with university’s research activities.

Historically, research and teaching have been separate functions in Vietnam. Research projects were conducted primarily at different research centers but not at higher education institutions (World Bank’s Report, 2008). It is a concern that developing research capacity particularly in science and technology is also important for Vietnam as a transitional economy seeking to transform itself into a more modern, industrialised nation. According to the above report, China and other economies in the region are moving towards the new direction, which is to integrate research and teaching into universities to elevate the quality of their universities and enhance national economic competitiveness.

These problems have also raised by Nguyen Xuan Thu (1997) that “to improve teamwork within research, teaching and industry activities, Vietnam is in great need of assistance from experienced institutions and individuals outside the country. The presence of over 300 institutes of research and over 100 universities and colleges which have not carried out any major research is another issue that the Vietnamese government would need to look at in term of management effectiveness of the system. Teaching and research should go together side by side to serve industry and production. The amalgamation of research institutes, teaching universities and colleges would be the most effective way to improve the quality of both research and teaching and should be done without delay”.

Thus, in order to design and develop advanced policies on science, technology and innovations it is vital that a university should consist of both teaching and research. Teaching would complete research and research would enrich teaching. A university cannot fulfil satisfactorily its task if it does not have research.

4.2 The science, technology and innovations are required visions, policies, programs, regulations and funding

Vietnam is currently in great need of long term vision, policies, strategies, programs and budget to foster and develop science, technology and innovations if Vietnam would like to build a strong and sustainable economy. Science, technology and innovations and the backbone of a nation and universities are the place where STI grow, develop and prosper. In a university, the key drivers for STI development are teachers-researchers. At present, Vietnam’s science, technology and innovation are in serious lack of instrument, modalities and funding allocation. It makes young people find no interest in science research. Many members of the scientific council do not know much research and research role in higher education and in the economic development. As research criteria are not well developed, they could not select good research projects to fund.
There are many research projects deserving funding but not funded; conversely, there are projects sponsored a huge amount of fund but they are not feasible. There are investments in scientific research projects in Vietnam but insufficient. Some other research projects have not been complete. The key problem is how to distribute fairly funding and what are its scientific standards” (Nguyen Van Tuan, 2013).

In addition, there was a limit faculty’s involvement in academic research. High teaching loads, high student numbers, lack of appropriate working conditions and the absence of financial incentives to engage in research. The World Bank’s report (2008) notes that in order to achieve high quality status, higher education institutions need to invest in the development of their faculty. Faculty is an important resource of higher education institutions and thus institutions should make faculty development an importance focus, in particular if they wish to develop their research capacity.

The existing management mechanism is not able to establish a science and technology market, and does not encourage enterprises to invest in science and technology in order to strengthen competitiveness training scale which has been experienced relatively rapid expansion without solutions to increasing the number of necessary teaching staff, leading to the problem that many of them suffer from heavy workload with little or no time for research. The investment into science and technology is not proportionate with university potentials and only makes up small proportion of total investment into science and technology. (HERA, 2005).

This HERA addresses the need for increasing the role of universities in research, it does not discuss how this will occur and the extent to which more financial support will be provided to universities to undertake research. Thus, it is necessary to clarify how universities should increase their research capacity if the ambitious goals of its are to be attained.

4.3 A lack of connection between industry and universities

The 2014 Vietnam Development Report showed that a skilled workforce is central to Vietnam’s economic modernization. However, a challenge is the mismatch in the labour market in which employers struggle to find the right workers. There is a desperate shortage of workers with adequate skills, which hinders the activities of businesses. The survey reports that most employers attribute difficulties in hiring new workers to either the inadequate skills of job applicants (a “skills gap”), or to a scarcity of workers in some occupations (a “skills shortage”). McCornac and Dennis (2012) said that there is not a lack of demand for workers, but instead the workers cannot match their skills with those in need.

The reasons of these problems are related to science, technology and innovation in higher education as: (i) the science, technology and innovation have not been able to catch up with the current sectors of development; (ii) The proportion of research projects that have applied to socio-economic development is still low; (iii) The number of university lecturers taking part in scientific and technology research projects is small; (iv) The supporting role in the application of research outcomes played by science, technology and innovation management levels and universities is limited. There is a lack of connection between industry and universities (HERA, 2005).
According to the Triple Helix model of university-industry-government relations is ineffective. Vietnamese universities are mainly focused on teaching or basic research and incapable of satisfying the needs of industry whereas firms are not ready to take on and exploit science and technology results from research institutions. The gaps between the science, technology and innovation system and socio-economic sectors still remain.

5. Suggestions

In the situation of intensified global economic integration (economic competitive pressures of neighboring countries), Vietnam should enhance the roles of strong universities in research and development. Therefore, below are a number of recommendations that policy makers should consider to address the science, technology and innovation policy.

(1) Improve quality research

- Move the majority of institutes under the control of line ministries to Universities.
- Encourage all universities to participate in research and have international publications. The research outcomes in international publications should be as an indicator for assessment of the research funded by the State.
- Create incentives for lecturers to conduct research projects: working norms, teaching incentives, and allowances... Oriented for study to be published in the international peer to be reviewed or register a patent as a criterion for promotion the lecturers' position. To enhance scientific productivity at national level, lecturers role in universities must consist of both teaching and research and they are closely integrated.
- Promote the matching funds between business and funding bodies. Research funding from state and business should have an appropriate of allocation in which the criteria are ensured: (i) Contributions to science (innovative research and development) and (ii) Contributions to Society (adaptive research and development).
- Urge doctoral fellows to publish at least one scientific paper in the international journal before the thesis defense.
- Establish remuneration policies and reward young scientists with international projects published.
- Subscribe to more international scientific journals for libraries.

(2) science, technology and innovation policy for connecting between businesses and universities

The state puts investment into the establishment of strong research units within universities. Encouragement of academics to (should) be more active and businesses (should) make more long-term investments in science, technology and innovation projects in universities.

(3) Policy improvement
Improve science, technology and innovation policy in Vietnam to ensure quality scientific research as mentioned above. To do that, Vietnam need to have a reform in scientific research and technology to catch up with the economic development.

(4) Train more skilled officials
Develop standards for scientists, including standards for professor, assistant professor accordingly in accordance with the international standards.
Train researchers, according to their position of employment and appropriate remuneration policies.
Attract intellectuals and scientists from abroad to jointly conduct research projects of international significance.

(5) Provide more financial resources
The government should invest in basic scientific research. The applied research should require investment from business. The business has an application deployment based on research outcomes of the universities. It is necessary to have a satisfactory policies for universities to increase their revenues from activities in scientific research and technology transfer.

5. Conclusion
Despite these improvements, there is the concern regarding to the Decision No. 432/QD-TTg (2012) on approving the Viet Nam Sustainable Development Strategy for the 2011-2020 period with the content as science and technology which are the foundation and driving force of sustainable development. Modern, clean and environmentally-friendly technologies need to be widely applied in production fields. The concern has become even more important to address as the need of an science, technology and innovation policy for higher education to shift to a more knowledged-based economy. The Vietnamese government and its people understand the importance of sustainability of social and economic development based on science, technology and innovations and the important role of policy design and implementation. However, the greatest barriers at this moment are the lack of funding and the inappropriate mechanisms of science, technology and innovation in higher education system.
To resolve the challenges facing with science, technology and innovation in higher education, key issues should be focuses on so that Vietnam can have a strong public policies, which will be supported by sufficient human and financial resources, to help overcome other barriers in the medium and long terms.

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