Final Report

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I. Introduction

After a memorable farewell party with Prof. Hiroya Seki and his students (see Fig.1) on Tuesday evening, December 4 2012, I left Japan for good on Saturday night, December 8 2012. This is the final report to conclude my participation in the research fellowship program related to the Hasanuddin University's New Engineering Campus Development Project (JICA Loan No. IP-541) offered to interested faculty members and arranged in a 6 (six) month visit to a university in Japan. The period of my participation was ranging from June 28 2012 to December 28 2012.

Fig. 1. A Farewell Party with Prof. Hiroya Seki and his students, TITECH's Cafetaria at Suzukakedai Campus, December 4 2012

As I mentioned in my Interim Report [3], the scope of my work during the 6 (six) month visiting program in Japan should cover more or less the following purposes: (1) to get a better understanding on the teaching and learning process in an engineering higher-education system in Japan, (2) to create and to develop a research collaboration activity, (3) to gather as much information as possible to prepare a proposal for the establishment of a new study program - the Engineering Physics study program - and, last but not least, (4) to collect the lessons learned from the Japanese experience in the collaboration between the academic world and the real industrial plant, which was the main goal of this visit originally [2]. In this Final Report, I am focusing only the purposes (3) and (4), since the purposes (1) and (2) have been elaborated in my previously submitted Interim Report.

II. Proposal Preparation

The Directorate General of Higher Education (DGHE) in Indonesia requires a written proposal (in Bahasa Indonesia) to propose a new study program. Basically the proposal should include 2 (two) major parts, i.e.: (1) the qualitative analysis and (2) the supporting data by a quantitative analysis. During my stay at TITECH Campus, I have nearly finished (about 90 percents) writing the first draft of the qualitative part of the proposal. I have also derived a quantitative analysis to determine the credit point proportion of the laboratory courses in the curriculum. I am planning to get the whole proposal completed before July 2014 when it is submitted to the DGHE. The next step after completing the first draft of the proposal is to send a recommendation to the Hasanuddin University Dean of Faculty of Engineering to assign a task force who will be responsible on the new study program establishment process.

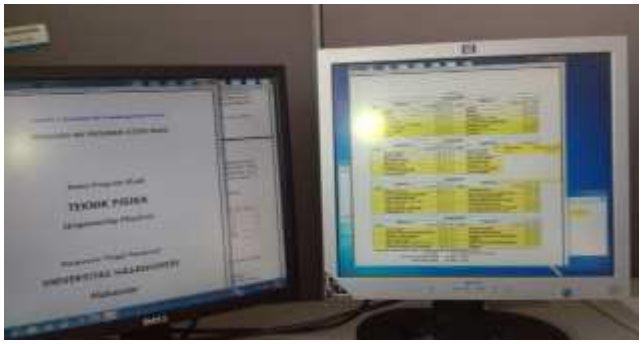

Fig. 2. The New Study Program Proposal Draft and Curriculum Plan

The idea of proposing a new study program within the Department of Electrical Engineering was derived from the current development of the Faculty of Engineering structure (see Fig. 3). The Department of Electrical Engineering is one of the 6 (six) departments in the Faculty of Engineering, the other five are namely: Department of Architecture, Civil Engineering, Mechanical Engineering, Naval Engineering, and Geological Engineering. There are currently 2 (two) study programs in the the Department of Electrical Engineering: (1) The Electrical Engineering Study Program and (2) The Informatic Engineering Study Program. The Electrical Engineering Study Program (established in 1963) has currently 3 (three) fields of study or Sub-Study Programs: (a) Electrical Energy (Power) Engineering, (b) Telecommunication Engineeering and Information Systems and (c) Computer, Control and Electronic Engineeering. Recently, there is a strong plan to establish a separately new study program of Computer Engineering, supported by a flux of fresh arriving Ph.D. graduates in Computer Engineering from Japan. This plan will leave Control and Electronic Engineering with its 2 (two) laboratories, i.e.: (1) Control Systems and Instrumentation Laboratory and (2) Electronics and Devices Laboratory, contained in a rather small field of study compared to the other 2 (two) fields of study, Power Engineering and Telecommunication Engineering.

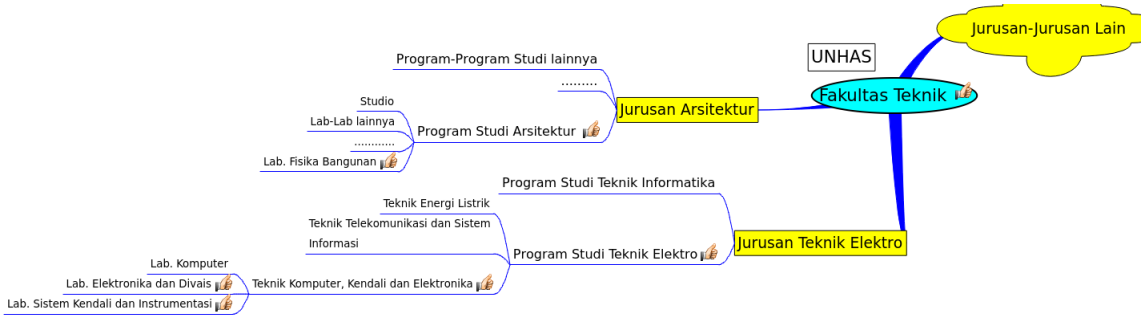

Fig. 3. The Current Departmental Structure of the Faculty of Engineering in Hasanuddin University

The Department of Architecture has a sophisticated Laboratory of Building Physics whose research area of studies include at least acoustics, illumination and building conditioning systems - just to mention a few - and many other applications of physics in engineering and industries. The combination of this laboratory and the other two previously mentioned laboratories in the Department of Electrical Engineering will certainly form a new study program, the proposed Engineering Physics Study Program. On the establishment of this new study program, at least 4 (four) major fields of study will start and run right away, i.e. (1) Measurement, (2) Instrumentation, (3) Process Control Engineering and (4) Building Physics Engineering, as seen in Fig. 4.

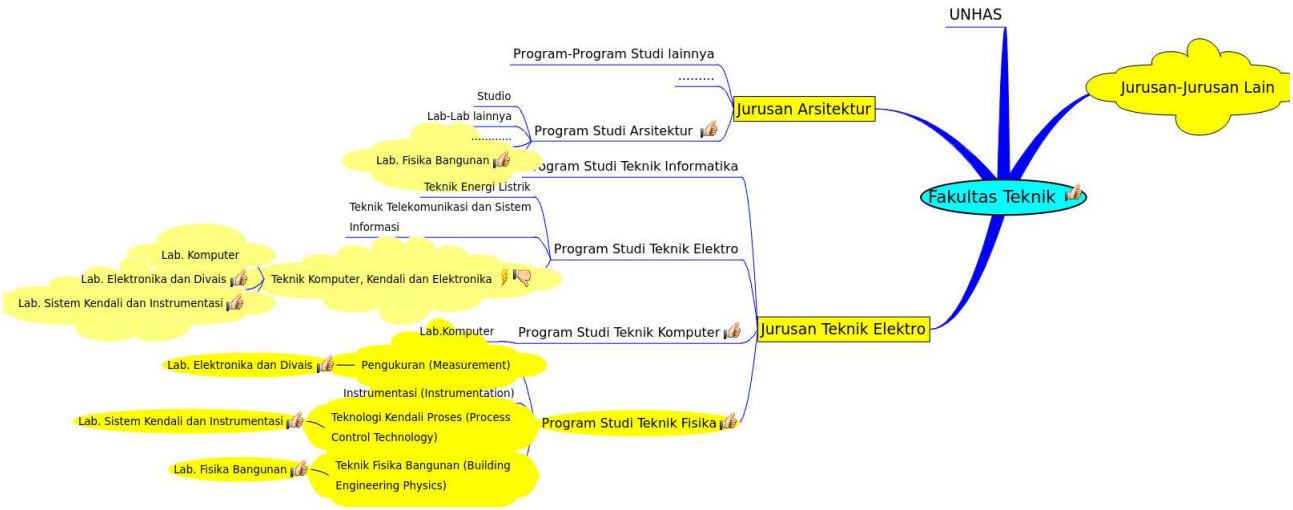

Fig. 4. The Future Departmental Structure of the Faculty of Engineering in Hasanuddin University

The curriculum structure of the newly proposed study program will adopt the Japanese way of Laboratory-based Education system. In classroom course-works only mainly available until the third year (or the sixth semester) of undergraduate study, continued at the fourth year and beyond emphasizing on the laboratory course-works. The new study program will be more oriented toward research, rather than teaching activities.

III. University and the Industrial Relation

In the final weeks of my stay in Japan, I was granted opportunities to visit Tokyo University of Agriculture and Technology (TUAT, nicknamed: Nokodai) campus at Koganei twice, and the Asahi KASEI Chemical Corporation Research and Development facility at Shin-Fuji, about 2 (two) hours by Shinkansen southward from Tokyo. The visits completed my missions in this six month program.

The first visit to Nokodai campus at Koganei was arranged by Prof. Hiroya Seki and his colleague Prof. Yoshiyuki Yamashita from the Department of Chemical Engineering at Nokodai. Prof. Yamashita made it possible for us to visit Prof. Mingcong Deng's laboratory in the Department of Electrical and Electronic Engineering - also at Nokodai campus of Koganei - who has a very deep interest in the area of Process Control Technology. While Prof. Seki, Prof. Yamashita and I myself have shared interest in the modeling and simulation of process control systems, Prof. Deng and his students are interested in building the physically real prototypes of several basic process control plants. Prof. Deng's works in his laboratory have inspired me to initiate the newly proposed Engineering Physics Study Program from within the Department of Electrical Engineering in the new campus of Hasanuddin University Faculty of Engineering. Prof. Yamashita also showed us around his laboratory, especially the teaching laboratory of basic chemical engineering processes, which are very similar to basic engineering physics processes in most parts.

My second visit to Nokodai campus at Koganei was made possible, thanks to the visit of my colleague Prof. Tjandra Setiadi from Bandung Institute of Technology (ITB) in Indonesia. Actually, Prof. Setiadi had to attend an international conference at Tokyo University (Todai) campus at Hongo, but his former student from ITB - currently studying at Nokodai Graduate School - has asked him to pay a visit to Nokodai. It was really a fortunate for me that Prof. Setiadi let me accompany him there. Prof. Setiadi's former student's advisor at Nokodai is apparently an Indonesian professor, whose name is Prof. Wuled Lenggono. Prof. Lenggono's specialty is in the field of Particle Process Engineering which is a relatively

new field in the Department of Chemical Engineering. He showed us around the sophisticated facilities in his extensive laboratory of the Graduate School of Bio-Applications and Systems Engineering. Prof. Lenggono also explained to us how he could manage several research projects involving his colleagues from Nokodai campus for agriculture at Fuchu. This demonstrated the very important features of a multi-diciplinary approach in scielnce and technology research activities. We - the three of us - had a very serious discussion on many aspects of the research and development in science and technology, both in Japan and in Indonesia.

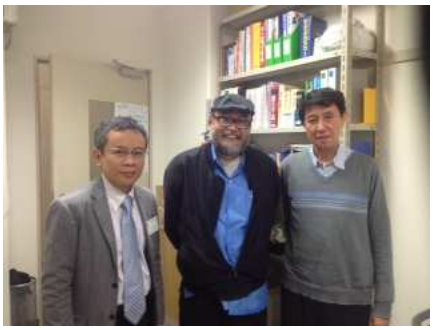

Fig. 5. From left to right: Prof. Lenggono, I and Prof. Setiadi at Prof. Lenggono's office, Nokodai campus at Koganei, TOKYO

Before he left to his home country, Dr. Shamsuzzoha shared with me all his papers on "PID Tuning" control systems, and suggested me to focus on that topic for my research activities. I followed his suggestion, and I have started to build a Simulink (of MATLAB) model of a self-tuning PID control system. We had a lengthy discussion on the possibility to implement a self-tuning PID controller algorithm design up to the micro-controller chip level to control a process control plant.

Fig. 6. The Asahi Kasei Membrane Technology Implementation at a Tofu Factory, Sin-Fuji, JAPAN

Prof. Hiroya Seki allowed me to use a modelling and design tool called "UniSim" widely used by researchers and system-designers in the process control technology. I was so unfamiliar at all with the

software package so that I should learn about it from zero. Fortunately, Dr. Shamsuzzoha showed me an e-book containing of the step by step tutorial on how to use the software. I successfully built the UniSim model of a gas processing plant described in the e-book, just by following carefully the step by step instructions in the e-book. To get a better understanding on the software package, now I am still working to build a UniSim model of my own - very simple - case. In the next step, I am planning to develop a relation between the UniSim dynamic model of that simple case and the corresponding Simulink model that I am more familiar with. Then I will continue to work on the self-tuning PID control by using both UniSim and Simulink models. I am quite certain that this work will keep me busy until the beginning of December when my visiting program comes to an end.

IV. Concluding Remarks

Originally - as stated in the statement of purpose of my visiting program (see for details in [2]) - the main goal of the 6 (six) month visit to Japan is to collect the lessons learned from the Japanese experience in the collaboration between the academic world and the real industrial world, especially in the field of process control technology. To achieve this main goal, I am still thinking of any possibility to arrange a visit to at least one of the industrial manufacturing plants in the surrounding Tokyo metropolitant area. However, even if this is not possible, I think the research activities described in the previous section will certainly keep me busy in Prof. Hiroya Seki's Process Systems Engineeering laboratory until December 2012.

References

[1] http://www.unhas.ac.id/rhiza/arsip/ke-Jepang-kah/REPORTS/Statement-of-Purpose-REVISED.pdf, available since March 11, 2012.

[2] http://www.unhas.ac.id/rhiza/arsip/ke-Jepang-kah/REPORTS/Statement-of-Purpose-ORIGINAL.pdf, available since October 29, 2011.

[3] http://www.unhas.ac.id/rhiza/arsip/ke-Jepang-kah/REPORTS/interim-report-Rhiza.pdf, available since September 6, 2012.

[4] Terms of Reference for the Candidates of the Short Term Research Program (in Japan), Fellowship Service Consultant, Hasanuddin University Engineering Faculty Development Project, JICE, 2011