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A Survey of the Relationship between Quality Assurance and Employability for Graduates of Japanese Engineering Programs.

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Abstract: Engineering Faculties at Japanese universities augment the high level of economic development in Japan. Though the capacity of these faculties and the ratio of advancement to Master's courses are growing, Bachelors of Engineering comprise 15.7% of all Bachelor students, and Master's of Engineering comprise 41.5% of all Master's students, currently.

Several financial crises have resulted in recessions and reduced levels of employment. Recently, many new employees have been hired without the use of conventional networks such as referrals by alumni. Also, structural changes in industry and the globalisation of the economy have upset university students' conventional career development paths, making it difficult for them to make suitable choices. Employment rates for Engineers are currently 78.7% for Bachelors and 92.7% for Masters.

These changes have been observed in various spheres of higher education, and the University Council of Japan has begun promoting the introduction of "career education", which consists of courses designed in collaboration with companies, short term internships at companies, and support services. These have been introduced as a part of university education to help students get jobs.

As the Japanese custom is for graduation from university and employment at a company to occur simultaneously, students have to look for the most appropriate jobs before they graduate. These job searches require from six months to a year, often causing faculty members to question whether this contributes to or detracts from academic activities, and whether this is consistent with the calibre of higher education in the rest of the world.

1. Introduction

As part of their activities, Engineering Faculties at Japanese universities promote economic development in Japan. Therefore, Engineering Faculties play major roles in regional development. Also, both the capacities of the faculties and the ratio of advancement to postgraduate courses are growing. Several financial crises have had negative influences on the economic and employment situations in Japan. In particular, the last two decades in Japan have often been called "the lost 20 years", and the years immediately after 2000 have been called the "employment super ice age". In general, these phenomena have influenced graduates' employability throughout all areas of business. Notwithstanding this, overall the employment of engineering graduates in Japan is believed to be stable. On the other hand, conventional Japanese companies expect universities to indicate the aptitude level of graduates, because priority is given to the on the job training (OECD, 2009). The labour market's dramatic changes to work and professional life for both working adults and new university graduates affects the whole social system, not just these involved in higher education.

To illustrate the current situation at Japanese universities, the following topics will be addressed in this manuscript.

- (1) The current employment situation for Engineering graduates
- (2) Assurance of the quality of graduates and the overall university system of education
- (3) Development of a performance evaluation methodology for new graduates
- (4) Career education requirements

2. Current indices for Japanese universities of Engineering

In Japan, three fourths of high school students receive additional formal instruction of some kind after graduating. Currently, half of these graduates attend university. The number of university students increased dramatically during the period of high economic development. The number of universities was regulated until the 1990's. Though the number of universities has continued to increase since then, the number of students entering university peaked at 810,000 in 1993 (MEXT, 2006).

In the area of Engineering, the number of graduates as part of the overall total increased. In particular, the capacity of the Master's course grew in the 1990's to adapt to the

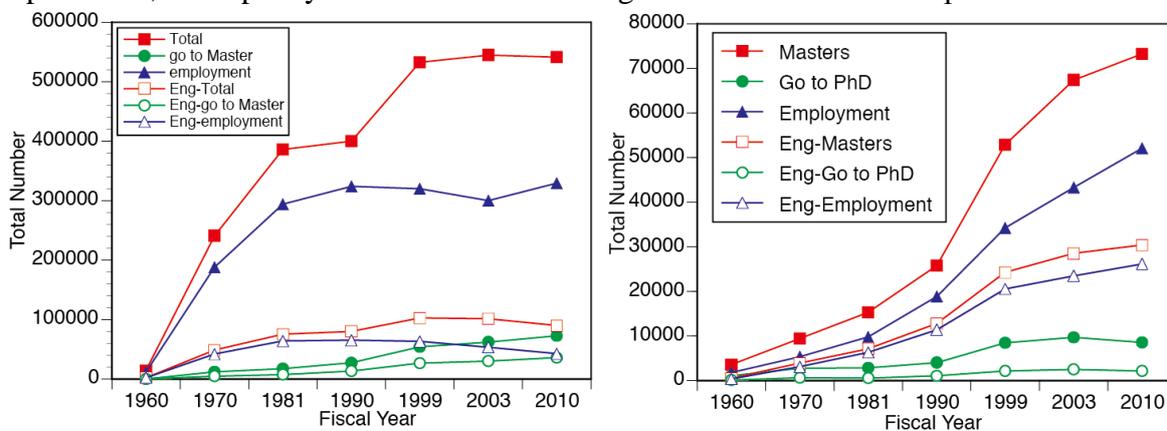


Figure 1. The number of graduates and types of employment for Bachelors (left side) and Masters (right side).

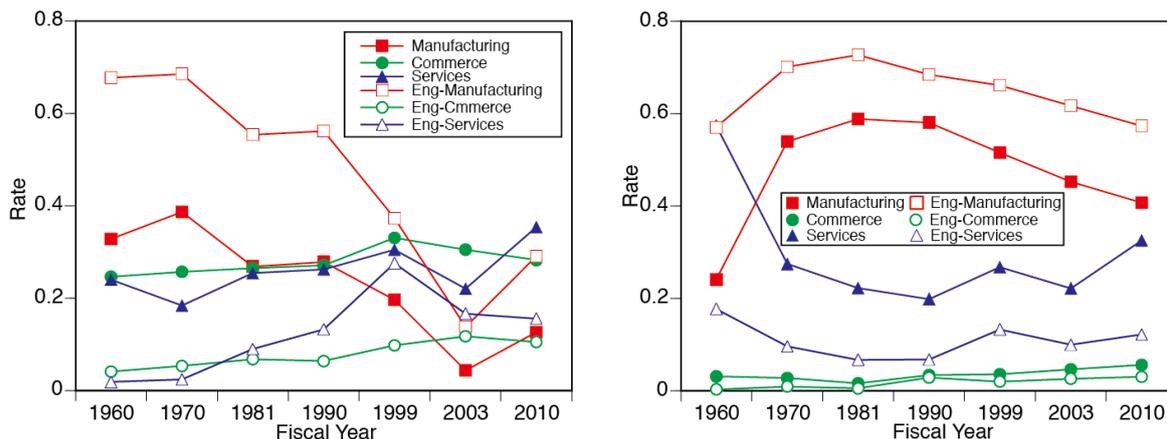


Figure 2. The rates of employments across industries for Bachelors (left side) and Masters (right side).

knowledge society (MEXT, 2006). These changes are illustrated in Figure 1(a) for Bachelors and Figure 1(b) for Masters.

Beginning in the mid-1990's, more and more Bachelors of Engineering were encouraged by social conditions to continue their studies in Masters programmes. As a result, half of engineering graduates currently go on to Master's level studies. Most students of Master's degrees in Engineering hesitate to go on to Doctorate studies, though the total number of Ph.D course students is increasing for all areas.

According to another survey of Engineering graduate employment by industry since the 1990s, most Engineers in manufacturing companies are graduates of Master's courses, but before that most have Bachelor level degrees. The changes in percentages of employment across manufacturing industries, service industries and commercial and retail industries are illustrated in Figure 2(a) for Bachelors, and Figure 2(b) for Masters. Also, the ratio of manufacturing industries for Master's employment decreased from more than 70% to less than 60% in last the two decades.

Recently, levels of employment in service industries and commercial and retail industries, including the banking and insurance sectors, are gradually increasing for Engineering graduates. This is indicative of the reformation of the industrial structure of Japan. Students' ways of applying for jobs has changed during the last two decades. Generally speaking, Engineering graduates could find jobs using their network of contacts, such as alumni who provide referrals. There are currently two ways to submit applications to companies: with and without recommendation letters. The recommendation letter is usually issued by a professor of a department. This letter indicates certain qualifications or a signal effect but often it is a formality (Hirasawa, 1997). In most cases, applications submitted to non-manufacturing companies without recommendation letters have to compete with applications of non-engineering graduates.

According to a survey of the job hunting cycle (JILPT, 2006), students in Engineering have been active in job hunting for 3.7 months as a mean. The mean is shorter than the means for other faculty graduates such as for social science students where it is 4.4 months.

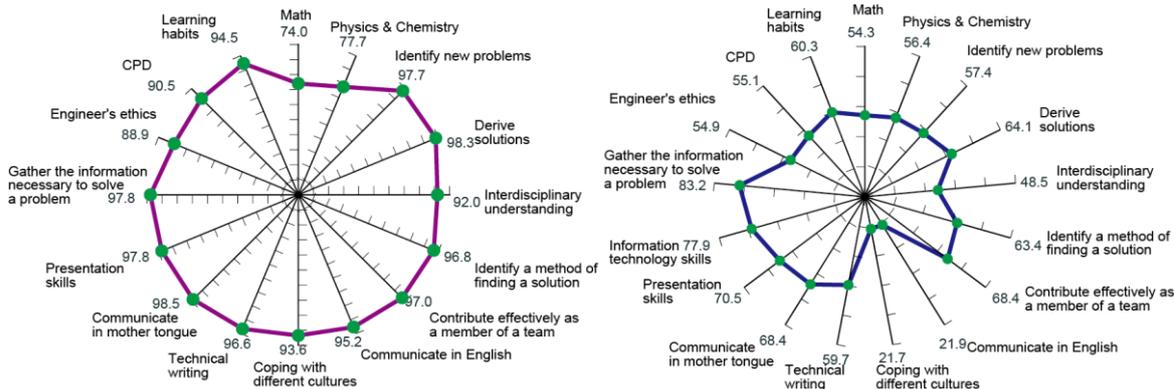


Figure 3. Results of human performance of graduates with bachelor degrees: recognition of the requirements (left side) and self-assessments of these topics (right side).

3. Evaluation issues in Japanese Engineering Education

As mentioned above, Engineering faculties have been promoting aspects of engineering innovation and human resource development to Japanese industries. Various types of methods have been used to evaluate and improve engineering education. Due to the growth in global activity by engineers, additional qualification assessment systems are required.

In 1995, the World Trade Organization (WTO) established that and the Asia-Pacific Economic Cooperation (APEC) conference stated that engineers' mobility and qualification in jurisdictions outside their home countries should be promoted. Regarding this statement, the Japan Accreditation Board for Engineering Education (JABEE) was established in 1999. It signed the Washington Accord, which is an alliance to assure the quality of Engineering education. In 2005, JABEE's member accreditation and certification activities were approved.

In another improvement of Japanese Engineering education, 8 leading universities established a coalition for engineering education in 1996. The coalition promotes curriculum reform, the "engineering design" courses, etc. Also, the coalition measures students' achievement performance and publishes indices annually. One of the indices is the performance of undergraduates at the point of graduation; this consists of human performance and technical competence evaluations of students at all 8 universities. Human performance is measured by the degree of the recognition of the requirements and by the self-evaluation of performance as global engineers. Student's technical competence is evaluated using self-assessments of the degree of understanding of around 100 essential keywords in a specific area such as electrical engineering, mechanical engineering, etc. All survey results are feedback to each department of the universities in the coalition.

Figure 3 shows an example of the results of human performance measurement: the recognition of the required performance (Figure 3(a)) and a self-assessment using a 5-point scale (Figure 3(b)). As the results for recognition of the requirements show rates which are excessively high, students understand well while their performance is very important, the results of self-assessments indicate their performance is insufficient. Therefore, these points clearly suggest that some improvements in the current education

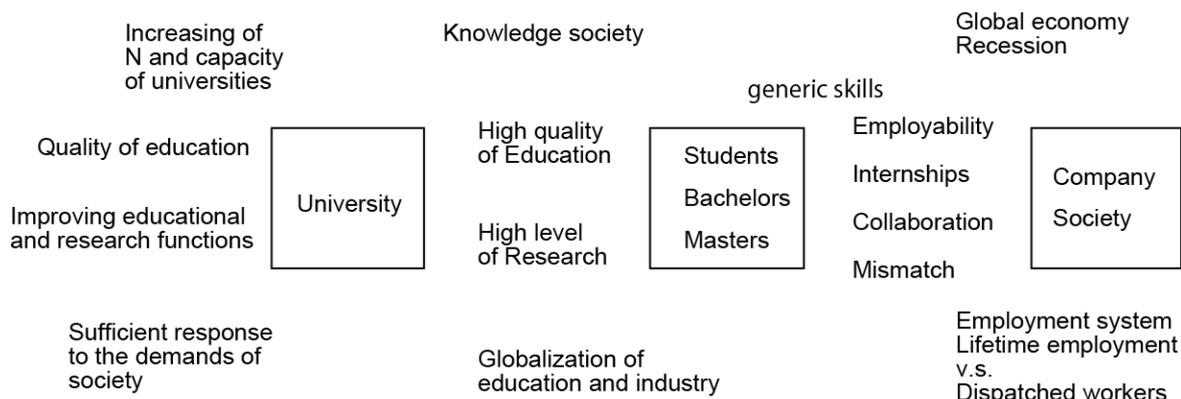


Figure 4. Factor keyword configuration for human resource development at Japanese universities.

system are needed. The results of technical competence studies also reveal the condition of the engineering education system.

4. Other related issues

4.1 Specialized programs for university instruction

Additional specialized programs have been promoted in various universities around Japan. The Japanese Ministry of Education (MEXT) has been organizing some projects using competitive funding for educational development and improvement, such as the establishment of centers of academic excellence for human resource development, and the enhancement of educational functions at universities.

4.2 University quality assurance

To assure the quality of university instruction, since 2004 all Japanese universities have to be approved by accreditation institutes. Also, all national universities have had their educational and research activities evaluated by peer reviewers (MEXT, 2011). Japanese universities are required to strengthen their organizational and management fundamentals in order to improve educational and research functions.

4.3 Career education

The Japanese Ministry of Education (MEXT, 2006) has claimed that "Corporations have come to put less emphasis on long-term employment, and individuals are increasingly responsible for establishing their own careers". According to this statements, universities are introducing services and educational programs for students in recognition of the job hunting/employment issue. For example, universities invite people from industry to provide practical courses, offer various kinds of support for students, such as job hunting, job guidance and job matching, workshops or lectures or students take internships at companies. As students' job searches are an important issue, MEXT, regional governments and industry sometimes collaborate on these activities.

5. Discussion

As mentioned above, various topics concerning the university environment, such as graduate employment, and quality assurance through globalization in both universities and companies. Some factors may affect these phenomena in relation to students, universities and employers. These factors are illustrated in Figure 4.

According to the high level of economic development and the globalisation of society, the number and capacity of universities has been growing, and the number of Masters and Bachelor students in engineering area is also increasing. Due to globalisation and the maturation of the knowledge society, most manufacturing companies prefer Masters graduates over Bachelor graduates. Japanese universities are making an effort to improve the quality of teaching and research functions to maintain global competitiveness in order to justify their effectiveness. Recent economical crises and recessions have influenced companies' employment activities for graduates, so universities need to look after graduates to help them get jobs more easily. Conventionally, most universities did not have an interest in addressing students non-academic concerns such as job hunting skills because they had to focus on academic matters in order to retain a level of teaching quality commensurate with an institute of higher education.

In Japan, "the employment super ice age" has influenced students and university professors of all disciplines. Therefore, it is not easy to improve the quality of university instruction to meet global standards while ensuring that all university students have skills sufficient to obtain appropriate jobs, because the two topics are seen to be independent of each other.

However, some British universities promote "employability programmes" which include curriculum development as an academic improvement goal, and the curricula also includes non-academic learning activities such as internships. Some Japanese researchers have already begun discussing the possibility of introducing "employability programmes" into Japanese universities (Oba, 2007; Ohmori, 2011). The feasibility of doing so should be evaluated practically by Japanese universities.

6. Summary

This paper reports on the current situation regarding graduate employment issues at Japanese universities, in particular in the area of Engineering. The economical recession and its influence on graduate employment covers two decades.

Employment of Masters rather than Bachelor of Engineering students has been preferred by manufacturing companies since the 1990s. Both engineering education and university oversight are required to provide the quality assurance universities need ensure they remain globally competitive.

Therefore the current challenge facing Japanese universities is to perform well by both maintaining the quality of the university's functions as well as by providing students with job hunting skills.

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Literature

OECD ed. (2009). *OECD reviews of tertiary education -Japan-*, OECD publisher.

Ministry of Education, Culture, Sports, Science and Technology (MEXT, Japanese Ministry of Education) (2006). *OECD Thematic Review of Tertiary Education --Country Background Report of Japan--*, Retrieved 9th July 2011 from URL <http://www.oecd.org/dataoecd/25/5/37052438.pdf>

Ministry of Education, Culture, Sports, Science and Technology (MEXT, Japanese Ministry of Education) (2011). *The Interim Report by the University Council of Japan*, Retrieved 19th April 2011 from URL <http://www.mext.go.jp/english/highered/1304955.htm>

Japan Institute of Labour Policy and Training (JILPT) (2006). *Factual survey report on university student's employment and job hunting activities*, JILPT Survey report No.17.

Hirasawa, K. (1997). University-Employer Semiformal Relations in Japan, *Annual Reports of the College of Medical Technology*, Hokkaido University, 10, 93-100.

Shinoda, S. (2009). Changes of Engineering Education Towards the Future, *Fundamental Review*, 2(3), 4-18.

Nakayama, M., Takahashi, H., Kusakabe, O., Ohtaguchi, K., Mizutani, N. (2005). Survey Result of the Engineering Undergraduate Student's "Human Performance", *Journal of Japanese Society of Engineering Education*, 53(4), 46-51.

Oba, J. (2007). Enhancement of the employability of graduates, *University Studies*, 35, 51-65.

Ohmori, F. (2011). The Enhancement of Employability in Postgraduate Education: issues emerging from the case of the United Kingdom, *"Daigaku Ronshu" Research in Higher Education*, 42, 353-369.

Statistical source:

Ministry of Education, Culture, Sports, Science and Technology (MEXT), School Basic Survey.