

Employability Assessment by Establishing Employment Competence Index System According to Academic Performance

Shu-Chen CHENG, Hong-De CHANG & Hui-Ming PAN
Department of Computer Science and Information Engineering
Southern Taiwan University, Taiwan
kittyc@mail.stut.edu.tw

Abstract: In the society nowadays, the number of highly educated people grows day by day, dramatically impacts the current job market, comparatively the employment problem to be faced by the students also gradually becoming one of the important issues to be discussed. While the students are pursuing their studies in schools, the schools should place emphasis on equipping the students with essential abilities for competency in their future workplaces; design courses that would put these teachings into effect, and thus, develops the employability of these students. This is the core idea of E-Map “Employment Competence Index System” to be discussed in this study. Through establishing E-Map enables the students to understand the effects of self-learning and plan for the directions of abilities for future development, also provides the students referential basis of different dimensions on oneself, schools and business owners. In our study, we are exploring whether the statistical data is consistent with the indices developed by the schools, and to make use of T-test analysis method to summarize the effectiveness of E-Map.

Keywords: Employment Competence, Employability Map, Self-assessment

1. Introduction

Academic results of a normal student are no longer the main criteria for recruitment by the enterprises, these enterprises focus on “Personal Attributes” and “Work Attitude” [3]. For this reason, before entering the job market, every candidate must understand themselves; analyze their own attributes and expertise, so as to develop their abilities for competency accordingly. E-Map (Employability Map, E-Map) is a student employment competence index system with combination of the courses. By splitting solely on the results into various competency indices, to assist the students from the beginning on selecting the courses to the stage of attending these courses, through multi-diversified assessments and revisions of the directions to achieve these indices, and during the process to strengthen personal attributes and further enhance the employability and competitiveness [4].

2. Related Works

2.1 Core Employability

Harvey (2002) suggested that Core Employability consists of the three major items: (1) Personal attributes and work attitude that are beneficial to employability, (2) The ability of self-management and career planning, (3) The willingness of continuous learning, ability to reflect and correct mistakes [1]. Core Employability in terms of techniques can also be

segregated into professional information, self-management, problem solving, cooperation and communication, creative thinking, organizational integration, abilities of planning.

2.2 E-Map Framework

There are ten major E-Map Employment Competence Indices as developed by schools, which are further grouped into two categories as “Professional Ability” and “General Ability” [2]. Abilities that belong to professional ability are professional knowledge, practical skills, information capability, integration and innovation, foreign language skills; abilities that belong to general ability are enthusiasm and stress-resistance, presentation and communication, dedication and teamwork, cultural literacy, services and care. The details of school indices are illustrated in Table 1.

Table 1. Descriptions of School Indices

Professional Ability	PA1	Professional Knowledge	Professional knowledge and working ability equipped by the students, having a leading advantage in the field of self-expertise, create self-value.
	PA2	Practical Skills	After building up concepts of multi-dimensional professional knowledge, the ability to combine theories and practices and to master them.
	PA3	Information Ability	Correct and effective use of computer information software, to achieve optimum performance through the aid of information technology tools.
	PA4	Integration and Innovation	With insight that oversees the entirety, assess problems from various dimensions, and straighten out the issues and to conclude after method of prudent study.
	PA5	Foreign Language Skill	Application of multiple foreign languages to demonstrate understanding of international and cultural learning, in response to the earnest demand of globalization trend.
General Ability	GA1	Enthusiasm and Stress-Resistance	To maintain high degree of ambition on new things and new ideas, the ability to effectively adjust one's adaptability, to avoid influencing the working willingness to enable oneself to quickly adapt to the working conditions.
	GA2	Presentation and Communication	To present and communicate in an organized and coherent manner, attentive on listening to the contents of the communicating counterparty, and to give positive feedbacks.
	GA3	Dedication and Teamwork	To maintain good interactions with learning partners, in order to achieve work performance; and to comply with the organizational disciplines and systems, to self-reflect, transcend and continuous improve oneself.
	GA4	Cultural Literacy	With literature and arts virtues and moral characters, understand the significances of cultures and histories, and to exhibit the abilities of humanistic reflection, rational thinking and criticism in living.
	GA5	Services and Care	To build up the habits of respect and care for others, to provide assistance and support for the needed ones, and to care and serve with empathy.

3. Study Methods

3.1 Development process of E-Map

The operating process for developing of E-Map is shown in Figure 1. First of all, collect the general features required by the academic researches and the enterprises, through prudent

discussion and assessment of the features of these multi-diversified competencies, and incorporate with the educational philosophy to propose the ten major Employment Competence Indices [5], which are further classified into the two categories of school professional ability and general ability.

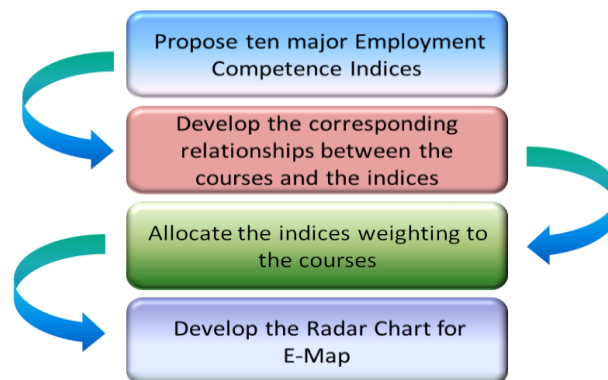


Figure 1. Chart of Operating Process

Once the proposal for the school indices is completed, it is followed by the coordinations by the relevant personnel of each faculties in this research project, incorporate with the professional and general abilities, which are built in accordance with the standards of these school indices. For the allocation of the indices weighting, taking the Computer Science and Information Engineering Department as an example. Table 2 shows the Statistical Table for Courses Weighting. For instance, the overall weighting of “Professional Ability” (PA1) is 24.36% which is also the most remarkable ratio among all the indices. This implies that at the planning stage of the schools, this area is given considerable weighting.

Table 2. Statistical Table for Courses Weighting

School Indices (%)	1	2	3	4	5	6	7	8	9	10
	PA1	PA2	PA3	PA4	PA5	GA1	GA2	GA3	GA4	GA5
	24.36	16.67	16.67	14.1	2.56	7.69	8.97	5.13	1.28	2.56

Table 3 has illustrated and to correspond the allocated ratios to the school indices. Taking Engineering Mathematics Course as an example, such course has three academic credits, “Professional Ability” weighting is 20%, and therefore, the computation for the percentage distribution of competency index as corresponding to such course is shown as below.

$$3(\text{Academic Credits}) * 20(\%) = 0.6$$

Therefore, we replicate this approach to sum up the ratios for all the courses of the faculties, which will be the referential basis for the schools indices weighting, and can be retrospective on revising such weightings.

Table 3. Allocation Table of the Courses Competencies Indices Weightings

Courses Name	PA1	PA2	PA3	PA4	PA5	GA1	GA2	GA3	GA4	GA5
Engineering Mathematics	20	10	20	20	10	10	10	0	0	0
Computer Programming	20	10	30	40	0	0	0	0	0	0
Data Structure	20	20	20	20	0	10	10	0	0	0

E-Map is to sum up the weighting distributions of the courses of each faculty, and to combine them with the general ability courses, finally to transform them into Radar Chart [6]. Figure 2 showed several faculties whose differences of the competencies indices are more significant. Apart from the Computer Science and Information Engineering Department, others are Mechanical Engineering Department and Accounting Information Department. From there, it can be seen that there will be different planning for the indices according to the requirements by each department. In respect to the students, by providing a visual referential basis enables them to clearly understand of the stages of development of own abilities; which is also the core cogitation of E-Map. Here we use the E-Map of Computer Science and Information Engineering Department and other relevant information to assess its effectiveness.

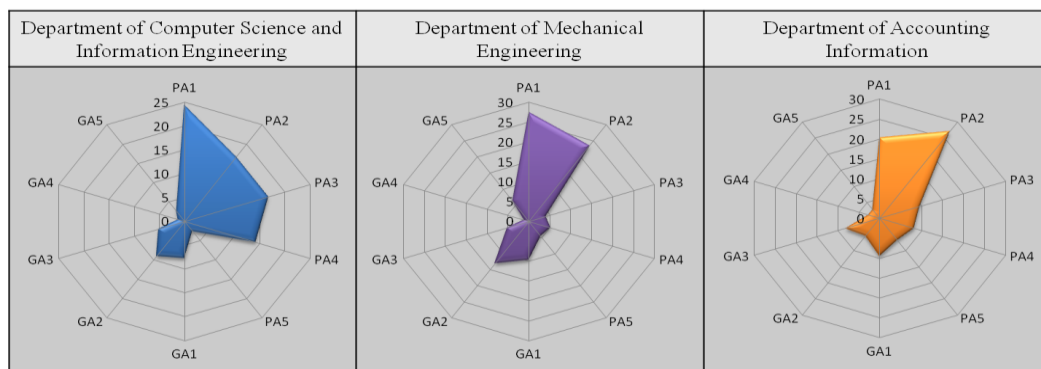


Figure 2. E-Map Radar Chart of Various Faculties

3.2 Principle of Analysis

The processes of analysis of this study are divided into three stages of preparation, collation and result. Such research framework is illustrated in Figure 3. First, by the approach of filling in the questionnaires, students are given self-assessments for questions designed to correspond to the ten major competencies indices.

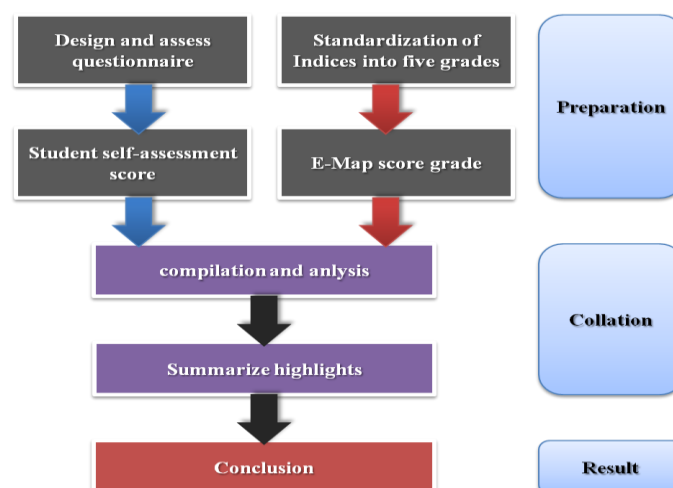


Figure 3. Chart of Research Framework

The assessment responses are designed into five grades: Totally agreed (5 scores), Agreed (4 scores), Acceptable (3 scores), Disagreed (2 scores), Totally disagreed (1 score). Weighted scores are computed by accumulating the scores of each question, then, by deriving the average score of each question to apply them as the basis for assessing this

questionnaire [9]. The results obtained from the completed questionnaires by the students. The average scores range from 2 to 4 scores, implies that the results filled in for this questionnaire are rationale. By standardizing the school indices into five grades, identify which grades do the actual scorings of these students fall into. By using the Radar Chart to determine whether the actual scores are consistent with the scores by self-assessments. By using the results obtained from the comparison as the basis for dual perspective analysis of the student as an individual and the faculty as a whole. Make use of T-test to determine whether such differences are significant enough to be summarized as highlights. On the side of the student as an individual, the main observation is to determine whether the competence levels of these students after completing the courses are too high or too low, by corresponding the actual scores of the students to their self-assessments scores; the faculty as a whole through these scores to determine whether they are consistent with the school indices and to examine the rationality of the competencies indices planning.

4. Study Results and Analysis

The subjects of this study are 51 students from the Computer Science and Information Engineering Department of some university. From the statistics obtained from the questionnaires provided by the school and the scores derived from the students in every competencies of the E-Map, through analyzing the results of the information collected, examined and elaborated the students and faculty in dual perspectives.

4.1 Perspectives of the Students

By using the E-Map scores and the self-assessment scores of the students to individually study the grading of the students in terms of the competencies indices, by applying the Single sample t-test to derive the results as shown in Table 4.

Table 4. Test Variances of E-Map Scores

Test Value: 5	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
PA1	-17.728	50	.000	-1.72549	-1.9210	-1.5300
PA2	-16.208	50	.000	-1.52941	-1.7189	-1.3399
PA3	-17.609	50	.000	-1.50980	-1.6820	-1.3376
PA4	-1.273	50	.209	-.07843	-.2022	.0454
PA5	-2.368	50	.022	-.23529	-.4349	-.0357
GA1	-14.600	50	.000	-1.43137	-1.6283	-1.2345
GA2	-2.063	50	.044	-.07843	-.1548	-.0021
GA3	-14.220	50	.000	-1.50980	-1.7231	-1.2966
GA4	-1.000	50	.322	-.01961	-.0590	.0198
GA5	-1.000	50	.322	-.01961	-.0590	.0198

The objective of Single sample t-test is to examine whether there is any significant correlation between each test variables and Test Value. The Test Value in the table above is configured as 5, implying that after standardizing of the school indices, we found that of the Professional Abilities field, professional knowledge, practical skills and information ability had indices with variances (Significance or p-value less than .05) which were more profound, meaning that the competency levels of the students in the Professional Abilities field had relatively wider gaps. This might be due to the difficulties on obtaining high scores for difficult courses offered by the faculty, or that the allocated courses weightings need to

be revised. In terms of General Abilities field, the competency levels for Enthusiasm and Stress-Resistance and Dedication and Teamwork were slightly inferior, whereas most of the other indices were within the standard range. Figure 4 shows the percentage distribution of the number of people for each index of the entire 51 students. From which the indices falling within the fifth grade (Blue color) whose percentages of over 80% were Integration and Innovation, Foreign Language Skill, Presentation and Communication, Cultural Literacy, and Services and Care. This implied that most of the students had achieved the standards in these five competencies.

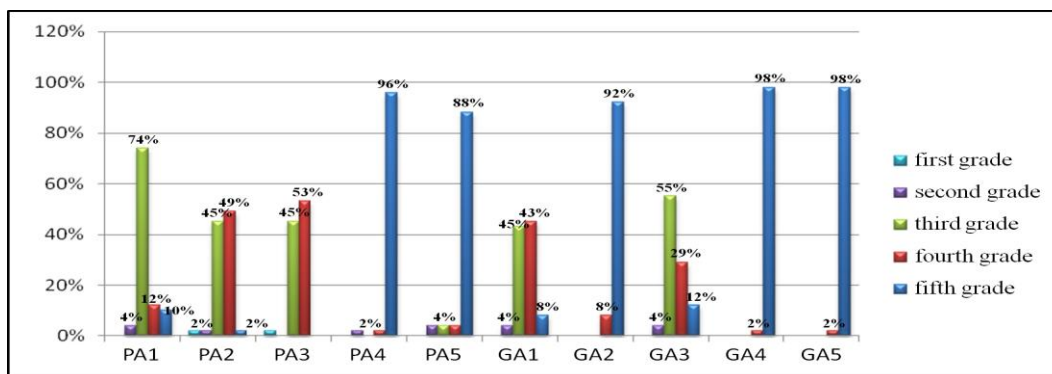


Figure 4. Percentage Distribution of Students E-Map Scores

Similarly, by using the Single sample t-test to determine the degree of variance of the students self-assessments. By corresponding the Test Value configured 5 with E-Map scores, the results are shown in Table 5. There were significant variances in each competency indices for the reason that students by their own have different thinkings, whereby the formation of this situation was reasonably explainable.

Table 5. Test Variances of Self-assessment Scores

Test Value: 5	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
PA1	-14.318	50	.000	-1.60784	-1.8334	-1.3823
PA2	-12.989	50	.000	-1.68627	-1.9470	-1.4255
PA3	-10.341	50	.000	-1.35294	-1.6157	-1.0902
PA4	-11.691	50	.000	-1.39216	-1.6313	-1.1530
PA5	-14.907	50	.000	-2.09804	-2.3807	-1.8154
GA1	-10.473	50	.000	-1.33333	-1.5891	-1.0776
GA2	-11.951	50	.000	-1.60784	-1.8781	-1.3376
GA3	-8.577	50	.000	-1.11765	-1.3794	-.8559
GA4	-10.834	50	.000	-1.43137	-1.6967	-1.1660
GA5	-11.086	50	.000	-1.43137	-1.6907	-1.1720

From Figure 5 results, it was found that most of the students had relatively low confidence level on each competency. Suggest to introduce multi-strategies on the teaching approaches, such as designing certain adaptive tests to record the learning processes of the students; to propose more related topics of the courses for the students to discuss, to improve the level of confidence of the students population through the environment; to conduct remedial teaching for the population of students with lower scores.

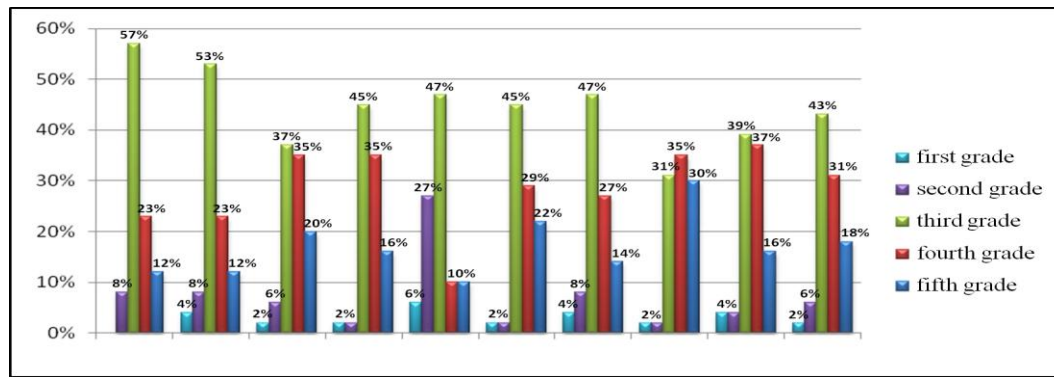


Figure 5. Chart of Percentage Distribution of Students Self-Assessments Scores

4.2 Perspectives of the Faculties

For the school indices, by using the variances between E-Map and self-assessment scores to analyze the competencies levels planned by the faculties. The most ideal situation is not to have any variance, therefore, the standard range was defaulted at 0; or at most a variance of not more than two grades. It is expressed in the formulae below.

$$| \text{Self-Assessment Grade} - \text{Actual Grade} | \leq 2$$

An absolute value of range exceeding 2, implied that the students had mis-estimated their own competencies grades. Regardless of over-estimation or under-estimation, they were all significant results derived by the test as shown in Table 6. Indices with more profound variances were Integration and Innovation, Foreign Language Skill, Presentation and Communication, Dedication and Teamwork, Cultural Literacy, and Services and Care.

Table 6. Test Variances of Competencies Indices

Test Value: 0	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
PA1	.903	50	.371	.11765	-.1441	.3794
PA2	-1.184	50	.242	-.15686	-.4229	.1092
PA3	1.212	50	.231	.15686	-.1032	.4169
PA4	-10.909	50	.000	-1.31373	-1.5556	-1.0718
PA5	-11.754	50	.000	-1.86275	-2.1810	-1.5444
GA1	.711	50	.481	.09804	-.1790	.3751
GA2	-11.066	50	.000	-1.52941	-1.8070	-1.2518
GA3	2.742	50	.008	.39216	.1049	.6794
GA4	-10.705	50	.000	-1.41176	-1.6767	-1.1469
GA5	-11.512	50	.000	-1.41176	-1.6581	-1.1654

Among the significant indices, by looking at Figure 6, they were mainly under-estimates of the self-assessments. In respect to Professional Abilities field, the variances in Integration and Innovation, and Foreign Language Skill were especially profound, whereas in the General Abilities field, variances in Presentation and Communication, Cultural Literacy, and Services and Care were more profound. As in the case above, we should then study whether the number of the courses offered was insufficient which would lead to lack of confidence in the students' self-assessments. In terms of the Professional Abilities Field, we can complement the students by offering courses relating to Integration and Innovation, and Foreign Language Skill. As for the General Abilities field, the weightings of the courses offered by the faculties were comparatively lower, which constituted the huge gaps of some competencies that could be explained.

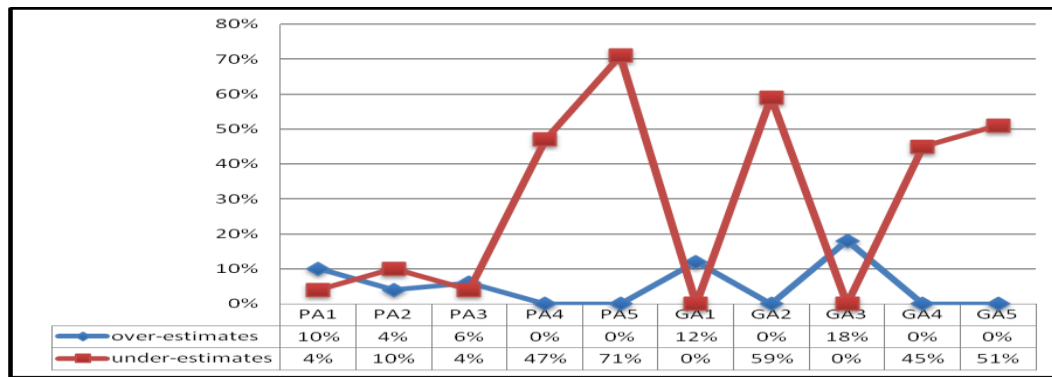


Figure 6. Distribution Chart of Students Ten Major Competencies Assessments

5. Conclusion and Prospects

Our school transformed the E-Map indices into charts, to provide intuitive referential informations for the maintenance of the mutual reinforcing relationships between the students and the courses [8]. In accordance to the results of the study, through generations of various charts and referential values by different analysis approaches, to explore the planning of courses offered by the schools, and the design of the questionnaire [7] for the graduates. From this, the effectiveness of E-Map to the schools is remarkably prominent. The only flaw was the limitation in the data resources, as currently we used only our faculty as our experimental subjects. In the future, we plan to adopt other faculty units, and even the E-Map data for the entire school students, and to include various statistical and analytical approaches, for comprehensive comparisons to enlarge the integrity of the experiment, and to feedback to the school for their referential basis as in the curriculum planning.

Acknowledgements

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References

- [1] Harvey, L., Locke, W., & Morey, A. (2002). *Enhancing Employability, Recognising Diversity*. London: Universities UK.
- [2] Ames, J., & Bicks, P. (1978). An evaluation of Title VII bilingual/bicultural program. *Community School District 22*. Brooklyn, NY: School District of New York.
- [3] Rice, J. K. (2003). Teacher quality: Understanding the effectiveness of teacher attributes. *EPI book*. Washington, D.C.: Economic Policy Institute.
- [4] Australian Chamber of Commerce and Industry, & Business Council of Australia. (2002). *Employability skills for the future*, Department of Education, Science and Training, Canberra.
- [5] Le Deist, F., Winterson, J. (2005). "What is competence?," *Human Resource Development International*, Vol.8, pp.27-46.
- [6] Yu-Chun Chang, Chi-Jui Chang, Kuan-Ta Chen, & Chin-Laung Lei, "Radar Chart: Scanning for High QoE in QoS Dimensions," *Proceedings of IEEE CQR 2010*, June 2010.
- [7] Oppenheim, A.N. (1992). *Questionnaire design, interviewing and attitude measurement*. London: Pinter Publishers Limited.
- [8] Christophel, D.M. (1990). The relationships among teacher immediacy behaviors, student motivation, and learning. *Communication Education*, 39, 323-340.
- [9] Catalano, R. F., Berglund, M. L., Ryan, J. A. M., Lonczak, H. S., & Hawkins, J. D. (2004). Positive youth development in the United States: Research findings on evaluations of positive youth development programs. *Annals of the American Academy of Political and Social Science*, 591, 98-124.