

# The Relationship between Students' Background and Their Off-Campus Internship Conditions for Departments of Electrical Engineering & Computer Science in Technological Universities

Taking Years as Reference

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**Abstract**— The purpose of this study was to investigate the relationship between students' background and their off-campus internship conditions for departments of Electrical Engineering & Computer Science (EECS) in technological universities. This study used the stratified random sampling method to select 678 students from 32 electrical engineering & computer science of technological universities in Taiwan. There were 667 valid questionnaires, and the data were analyzed by using the descriptive statistics, Chi-square test. Findings of this study provided the evidence that the status quo of internship on EECS in technological universities were higher years students with higher participate rate; higher years students with more important position in cooperative institute, and with more of them into small and mediate enterprise (SME). But there was non-significant relationship between academic performance and internship performance. And, whether or not students attend "program of innovation and entrepreneurship (PCIE)", there was non-significant difference with their internship performance.

**Keywords-** *background variables; off-campus internship; Electrical Engineering & Computer Science (EECS); technological universities*

## I. INTRODUCTION

One of the major objectives of higher education is to cultivate students' capacities in their career development for the future [1]. The early success in job seeking regarding university graduates exerts significant influence on their future

development, including their life-long incomes and the risks of unemployment. Off-campus internship is also regarded as an important channel for acquiring actual work experience [2]. It is also an activity for students to work in an actual work environment [3]. Beggs et al. mention that it is necessary to allow students to review their career development during their internships and feel and complexity of the job market [4]. Learning in their internships, they can be cultivated to promote their own innovative abilities and competitiveness. More importantly, they can put the theories they learned at school into practice. Simply put, students can accumulate their work experience during their internship so that they can know more about their strengths and weaknesses and make up their deficiencies in their education as soon as possible to enhance their competitiveness in the job market or start their own businesses [5].

Through off-campus internships, students can have the opportunities to put the theories they learned at school into practices in different workplaces to enhance the results of learning and teaching. Internships are also regarded as the collaboration between the university and industry aiming to cultivate students' competitiveness [6]. According to the research, the students highly valued the off-campus internship experience and recognized that it is highly conducive to their future career development [7]. Students also believe that off-campus internships are helpful to their futures. According to the project, British students feel more confidence, and know

more about business operations and skills when returning to schools from their internship venues [8]. Therefore, the design of off-campus intern courses should be closely related to the industry so that students can learn more about professional knowledge and skills [9].

According to Ministry of Economic Affairs statistics show, Taiwan's four manufacturing to information and electronic industrial output was the highest in recent years and there is a growing trend. Internationally, the electronic information industry in Taiwan occupies the fourth largest producer in the world, only after the United States, Japan, China, the world's manufacturers of procurement information centre, with more than 15 market shares in the world. More control of the production value, and encloses the world's fourth largest semiconductor producer, the world's largest flat panel display production-winning country [10]. Therefore, the purpose of this study was to explore the relationship between students' background and their off-campus internship conditions for departments of EECS in technological universities. This study used the stratified random sampling method to investigate by questionnaire; it aims to explore the relationship between students' background and their off-campus internship conditions for departments of electrical engineering & computer science in technological universities in Taiwan.

## II. LITERATURE REVIEW

### A. Definition and purpose of off-campus internship

#### 1) The definition of off-campus internship

Wu points out that off-campus internship can be defined in both narrow and broad senses. Broadly speaking, off-campus internships are an economic system designed in accordance with the national economic development and the development of human resources [1]. In order to plan educational trainings and cultivate talents, schools implement a series of measures in accordance with the policies. In a narrow sense, it is the collaboration between academia and industry. Through off-campus internships, students can have the opportunities to put the theories they learned at school into practices in different workplaces to enhance the results of learning and teaching. In addition, Both He & Gao define off-campus internships as cooperative education, a branch of academia-industry collaboration [11]. The collaboration between the school and enterprise is regarded as a kind of "strategic alliance." Internships are also regarded as the collaboration between the university and industry aiming to cultivate students' competitiveness [6].

#### 2) Goals of off-campus internships

The "Guidelines for the Opening of Off-campus Internship Courses in Institutes of Technology and Universities of Technology," encourages institutes of technology and university of technology to open off-campus internship courses to achieve the following goals [12]: 1. Allow students to experience the workplace at an earlier time in order to cultivate a proper working attitude. 2. Increase practical teaching resources at schools and job opportunities for students. 3.

Minimize the enterprise's cost in orientation training and reserve potential employees.

Overall speaking, students, universities, and enterprises are the three sectors involved in off-campus internships [13]. According to the research of Hite & Bellizi, the students highly valued the off-campus internship experience and recognized that it is highly conducive to their future career development [7]. Students also believe that off-campus internships are helpful to their futures. According to the project of Lucas et al., British students feel more confidence, and know more about business operations and skills when returning to schools from their internship venues [8]. Off-campus internships offer students not only the skills in the workplaces by applying what they have learned at schools but also chances to simulate their career choices and career planning [14]. Technical and vocational schools should take the initiative to bridge communication between internship institutions and internship students, providing appropriate counseling to internship students. On the other hand, off-campus internship advisors may gain an insight into students' internship conditions through visitations. Internship students are also required to complete oral/written reports, or other assignments, through which the learning effectiveness of students can be examined [18]. Therefore, the design of off-campus intern courses should be closely related to the industry so that students can learn more about professional knowledge and skills [9].

### B. Implementation of off-campus internship in Taiwan

In the "Guidelines for the Opening of Off-campus Internship Courses in Institutes of Technology and Universities of Technology" announced by Ministry of Education, it mentions that off-campus internships are either required or elected courses opened by institutes of technology or universities of technology, enumerated as follow [12]:1. Summer courses, 2. Semester courses, 3. Academic year courses, 4. Medical and nursing courses and 5. International internship courses. Up to 2014, about 24.51% of the academic departments opened internship courses, indicating that the funding of the government institutions enhanced the intentions of the schools to implement internship significantly.

## III. MEASURES

### A. Procedure

For each variable several items were formulated based on literature review and the previous research. The first part of the questionnaire consisted of general information about institutes of departments of Electrical Engineering & Computer Science (EECS) students. The second part of the questionnaire included the measures of the status quo of student's off-campus internship for departments of EECS of Technological Universities. The stratified proportional sampling method was used in the study. At the end of the process, 678 questionnaires retuned, though 11 required elimination, so the final sample consists of 667 valid questionnaires, for a recovery rate of 68.4%. The descriptive statistics and Chi-square were conducted as the statistical methods in this study. The

descriptive statistics was used to analyze participates' background data. Moreover, in response to the research questions, Chi-square was used to find the relationship between different years of students and off-campus internship program.

#### B. Students' Background and Off-Campus Internship Conditions

The purpose of this study was to investigate the relationship between students' background and their off-campus internship conditions for departments of Electrical Engineering & Computer Science (EECS) of technological universities. Thus, we investigated the students' background included: 1. study years, 2. major field, 3. the job position when they into the internship institute, 4. learning courses of innovative and entrepreneurship, and 5. academic performance. All items were rate by multiple-choice. Sample item was "How about your major filed?" The answers were offered: (1) Dept. of Electrical Engineering, (2) Dept. of Electronic Engineering, (3) Dept. of Photonics Engineering, (4) Dept. of Computer Science and Information Engineering."

We also investigated the institutes' conditions when they attended off-campus internship included: 1. the type of off-campus internship, 2. the scale of institutes of off-campus internship, 3. the job position when the students into the internship institute, 4. Academic performance, 5. internship performance, and attend the program of innovative and entrepreneurial education. All items were rate by multiple-choice. Sample item was "what the job position when you attended off-campus internship?" The answers were offered: (1) Unimplemented, (2) customer service, (3) exhibition service, (4) different department assistant, and (5) project assistant.

#### IV. RESULTS

In this study there were 234 participants in sophomore, occupying all samples 35.08%; 224 participants in junior, occupying all samples 33.58% and 209 participants in senior, occupying all samples 31.33%. To analyze the major, there are 230 participants majoring in Dept. of Electrical Engineering, occupying all samples 34.48%; 186 participants majoring in Dept. of Electronic Engineering, occupying all samples 27.89%; 103 participants majoring in Dept. of Photonics Engineering, occupying all samples 15.44% and 148 participants majoring in Dept. of Computer Science and Information Engineering, occupying all samples 22.19%. At last, there are 234 participants learned courses of innovation and entrepreneurship, occupying all samples 34.48%; 437 participants unlearned, occupying all samples 65.52%.

TABLE I. NUMBER OF OFF-CAMPUS INTERNSHIP COURSES OPENED BY THE ACADMIC DEPARTMENTS IN 2011-2014[15]

Item	2011	2012	2013	2014
Number of departments offering internship courses	320	361	391	446
Total number of academic departments in the same year	2,262	1,849	1,817	1,820
Ratio of offering internship courses	14.15%	19.52%	21.52%	24.51%

TABLE II. NUMBER OF OFF-CAMPUS INTERNSHIP COURSES OPENED BY TECHNOLOGICAL UNIVERSITIES IN 2011-2014[16]

Academic Year	Public	Private	Technological Universities with Internship Courses	Technological Universities in Taiwan
2010	8	14	22	55
2011	12	14	36	55
2012	14	31	45	56
2013	14	40	54	57
2014	14	42	56	59

In accordance with the survey of [15], there were 59 universities of science and technology in Taiwan. In this study, the stratified proportional sampling method was used and 8 institutes of departments of Electrical Engineering & Computer Science (EECS) students were sampled. 975 questionnaires were sent, with 667 returned, for a recovery rate of 68.4%. The study sample description was shown in Table I. From Table II, most of senior students were attended off-campus internship (200/209=95.6%), but only 10.68% (25/234) of sophomore student were attended off-campus internship.

#### A. Analysis of students that participated in off-campus internships in different years and company scale

As shown in Table III, Year & Company scale of Chi-square Cross-tabulation, there were 234 participants in sophomore, among them of 209 participants unimplemented an off-campus internship program, occupying 89.3%; 9 participants implemented in large enterprises, occupying 3.8%; 14 participants implemented in small and medium enterprises, occupying 6.0% and 2 participants implemented in micro-enterprises, occupying 0.9%. There were 224 participants in junior, among them of 77 participants unimplemented an off-campus internship program, occupying 34.4%; 46 participants implemented in large enterprises, occupying 20.5%; 89 participants implemented in small and medium enterprises, occupying 39.7% and 12 participants implemented in micro-enterprises, occupying 5.4%. At last, there were 209 participants in senior, among them of 9 participants unimplemented an off-campus internship program, occupying 4.3%; 63 participants implemented in large enterprises, occupying 30.1%; 120 participants implemented in small and medium enterprises, occupying 57.4% and 17 participants implemented in micro-enterprises, occupying 8.1%. Chi-square analysis revealed that year and company scale,  $\chi^2 (6, N=667) = 336.791, p < .05$ , were significant difference.

TABLE III. SAMPLE DESCRIPTION

Year	Numbers	%	Off-Campus Internship Program		
			None attend (N)	%	attend (N)
Sophomore	234	35.08	209	71	25
Junior	224	33.59	77	26	147
Senior	209	31.33	9	3	200
Total	667	100	295	100	372
					100

*B. Analysis of students that participated in off-campus internships in different years and positions*

In Table IV, Year & Internship positions of Chi-square Cross-tabulation, there are 234 participants in sophomore, among them of 209 participants unimplemented an off-campus internship program, occupying 89.3%; 19 participants engaged in customer service position, occupying 8.1%; 4 participants engaged in exhibition service position, occupying 1.7%; 1 participant engaged in different department assistants, occupying 0.4% and 1 participant engaged in project Assistant, occupying 0.4%. There are 224 participants in junior, among them of 77 participants unimplemented an off-campus internship program, occupying 34.4%; 58 participants engaged in customer service positions, occupying 25.9%; 23 participants engaged in exhibition service positions, occupying

10.3%; 61 participant engaged in different department assistants, occupying 27.2% and 5 participant engaged in project Assistant, occupying 2.2%. At last, there are 209 participants in senior, among them of 9 participants unimplemented an off-campus internship program, occupying 4.3%; 27 participants engaged in customer service positions, occupying 12.9%; 37 participants engaged in exhibition service positions, occupying 17.7%; 113 participant engaged in different department assistants, occupying 54.1% and 23 participant engaged in project Assistant, occupying 11.0%. Chi-square analysis revealed that Year and Internship position,  $\chi^2 (8, N=667) = 395.033, p < .05$ , were significant difference. The higher year students (senior) more, the important position of internship more. Most of senior students play an assistant role during their internship. Most of sophomore students only participated in customer or exhibition service.

TABLE IV. YEAR & COMPANY SCALE OF CHI-SQUARE CROSS-TABULATION

Years		Company Scale			total
		None attend	large enterprises	small and medium enterprises	
Sophomore	Numbers	209	9	14	234
	%	89.3	3.8	6.0	100.0
Junior	Numbers	77	46	89	224
	%	34.3	20.5	39.7	100.0
Senior	Numbers	9	63	120	209
	%	4.2	30.1	57.3	100.0
Total	Numbers	295	118	223	667
	%	44.2	17.7	33.4	100.0
Chi-square $\chi^2$		336.791***			
df		6			
p		.000			

\*\*\* $p < .001$

*C. Analysis of students that participated in off-campus internships in different academic performance and internship performance*

In Table V, Academic performance & internship performance of Chi-square Cross-tabulation, there are 49 participants in higher internship performance, among them of 35 participants got lower academic performance, occupying 59.32%; 24 participants got higher academic performance, occupying 40.68%. There are 71 participants in lower internship performance, among them of 29 participants got lower academic performance, occupying 40.85%; 42 participants got higher academic performance, occupying 59.15%. Chi-square analysis revealed that internship performance and academic performance,  $\chi^2 (1, N=130) = 2.558, p > .05$ , were non-significant relationship. From this result, the students' performance of internship doesn't matter with their academic performance. In general, the students' performance of internship was evaluated by learning attitude, interpersonal relationship, and professional skills [17]. The result of this study is consistent with the general findings.

TABLE V. ACADEMIC PERFORMANCE & INTERNSHIP PERFORMANCE OF CHI-SQUARE CROSS-TABULATION

Internship performance		Academic performance		total
		low	high	
High	Numbers	35	24	59
	%	59.32	40.68	100
Low	Numbers	29	42	71
	%	40.85	59.15	100
Total	Numbers	64	66	130
	%	49.23	50.77	100
Chi-square $\chi^2$		2.558		
Df		1		
P		.83		

Note: internship performance: "high" means the students got the top 25% score in their class during off-campus internship, "low" means the students got the bottom 25% score in their class during off-campus internship, scored also in academic performance.

V. CONCLUSION

After analyzed the data, we got some findings as following:  
 1.the status quo of internship on EECS in technological universities were higher years students with higher participate rate; higher year's students with more important position in

cooperative institute, and with more of them into small and mediate enterprise (SME). 2. The higher year students (senior) more, the important position of internship more. Most of senior students play an assistant role during their internship. Most of sophomore students only participated in customer or exhibition service. 3. The students' performance of internship doesn't matter with their academic performance. In general, the students' performance of internship was evaluated by learning attitude, interpersonal relationship, and professional skills [17]. The result of this study is consistent with the general findings. There were some recommendations we proposed as following: 1. as positive to face the off-campus internship and attend the internship program as soon as possible. 2. The cooperative enterprises were offered several positions for students during the off-campus. Most of the professional position was depends on jobs' professions. Therefore, students must to learning more professional skills and knowledge before they attend internship program. 3. The students' performance of internship doesn't matter with their academic performance. As long as your attitude is good, your academic performance does not matter is good or not. A good working attitude and interpersonal performance is let you have a good performance in the workplace, and even have the opportunity to become full-time employees of the company.

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