

Art, Design & Communication in Higher Education
Volume 9 Number 1

© 2010 Intellect Ltd Article. English language. doi: 10.1386/adch.9.1.21_1

MING-YING YANG

National United University

MANLAI YOU AND CHING-YI HAN

National Yunlin University of Science and Technology

A study of industrial design students' employment preparation and choices in Taiwan¹

ABSTRACT

This study surveys industrial design (ID) students' employment preparation in Taiwan, including career awareness, competency required, working attitudes and values and vocational choices. Both qualitative and quantitative approaches were adopted and data were collected in three stages: literature review, in-depth interviews and questionnaire survey. The findings show that approximately 37 per cent of 904 participants decide not to enter the ID profession after graduation. ID students' career awareness is fairly good in terms of knowledge, values, preferences and self-concepts, but approximately one-fourth of the surveyed items received low mean ratings. The students' awareness of some of the job tasks and competencies required of industrial designers does not match the reality, and their perception of the lifestyle tends to be unrealistically negative, which is an observation not previously reported in the literature. The above, perhaps unrealistically negative, perception might be related to the high proportion of students rejecting an industrial design career after graduation. The authors discuss these results in the contexts of the national and international design employment markets. The

KEYWORDS

design education
higher education
industrial design
employment
preparation
employment choices
career guidance

1. A shortened version of this article was presented at the 2008 Conference of The Design History Society, Networks of Design, 09/3–6, University

College Falmouth,
Cornwall, United
Kingdom.

findings could help design educators to understand what information needs to be provided to ID students, and help plan career guidance programmes.

INTRODUCTION

Industrial design (ID) education in Taiwan has a history spanning more than a half century. At the beginning of this period, due to a deficiency of design awareness in the local manufacturing industry, it was difficult for ID graduates to find a design job, and thus some of them had to change their careers. In recent years, the Taiwan government has committed significant effort and resources to the promotion of the creative and design industries, and to the cultivation of design talent to improve national competitiveness. Enterprises in Taiwan are placing increasing importance on product design, and consequently industrial designers are in great demand.

Although the number of ID graduates in Taiwan has increased annually, industrial design departments have claimed that finding qualified ID staff is difficult (Weng 2003). Overall, the quality of ID graduates in Taiwan and the ratio of those staying in the design profession are below expectations (Yan 2003). The reasons behind this phenomenon are worth exploring. The authors conducted a series of studies on the learning situations and career guidance needs of ID students in Taiwan, and published some findings about ID students' career guidance needs (Yang et al. 2005a), career difficulties (You et al. 2007a), learning attitudes (You et al. 2007b), and the qualifications required by recruiters for industrial design jobs (Yang et al. 2005b). This article mainly focuses on ID students' employment preparedness, including their awareness of ID tasks, required competencies and values, as well as their preferences and choices for the future. Table 1 summarizes the research plan,

Stage	Approach	Purpose	Method
First	Qualitative	<ul style="list-style-type: none"> to collect vocational information about the ID profession to collect references about the surveyed items of vocational awareness as a framework for designing a questionnaire in the third stage 	Literature review
Second	Qualitative	<ul style="list-style-type: none"> to collect and compare viewpoints of ID practitioners and students, on the ID profession, and to compare these findings with the literature to supplement the questionnaire survey items on ID vocational awareness, as part of questionnaire design 	In-depth interviews
Third	Quantitative	<ul style="list-style-type: none"> to design a questionnaire about the vocational awareness of ID students to revise the questionnaire before a formal survey 	Questionnaire design & pre-test
		<ul style="list-style-type: none"> to investigate ID students' vocational awareness and choices 	Questionnaire survey

Table 1: Summary of approached, purposes and methods used by this study.

including the approaches, purposes and methods adopted during the various stages. Details are provided in the research design section. It is hoped that the findings could provide an understanding of students' perception of the ID career, relative to the reality of the ID job market in Taiwan, and abroad.

ID DEVELOPMENT IN TAIWAN

Since 1989, the Taiwan government has had an annual budget to promote design and its industrial application. Between 2004 and 2007, the 'Taiwan Design Industry Take-off Plan' was executed. Between 2008 and 2011, the Taiwan government has a budget of £108 million for six separate plans to promote the cultural and creative industries, including £16 million for the 'Taiwan Design Industry Soaring Plan,' £1.9 million for the 'Plan for Developing Creative Life Industries,' and £46 million for the 'Plan for Developing Crafts and Creative Industries'. In addition, the government supports international activities held in Taiwan. For example, the 1995 ICSID (International Council of Societies of Industrial Design) World Design Congress was held in Taipei, and the 2011 International Design Alliance World Congress will also be held in Taiwan. The year 2011 has been declared Taiwan's 'Year of Design'. Among the annual design events, the world's largest student design fair – The Young Designers' Exhibition, started in 1982, is a degree show that brings together more than 100 thousand visitors from Taiwan and abroad every year for a 5-day exhibition. Another annual design event started in 2003, Taiwan Design Expo, aims to raise the aesthetic standard and design awareness among the general public, and attracted nearly 400,000 visitors last year. The Taiwan government has devoted significant resources to promoting and supporting design, in the hope of encouraging corporations and citizens to acknowledge the value of design and be willing to spend more money on it.

The turnover (including domestic and export income) of the design industry in Taiwan has been increasing year on year: £931 million in 2004 and £1,075 million in 2006. The number of design houses and practicing designers has also grown yearly: 1925 design houses in 2004 and 2239 in 2006, employing 17,159 and 23,184 designers, respectively (Lin 2007). Many large corporations, including international brands such as Acer, Asus and BenQ, have expanded their design departments and upgraded the status of the design function within the organization. Taiwanese products won a total of 651 awards between 2003 and 2008 in the four major international design competitions (i.e. iF, Reddot, IDEA, and G-Mark), increasing from sixteen awards in 2003 to 201 awards in 2008.

The supply of and demand for ID talent in Taiwan is described below. Taiwan established the first collegiate-level ID department in 1964 and the first master and doctoral programmes in 1991 and 2000, respectively. Recently, universities in Taiwan have recruited more ID students to meet corporate demand for creative and design talent. There were six ID-related programmes in Taiwan in 1987, and today there are 29 schools with 30 programmes. The number of ID students and graduates has also increased dramatically. For the current academic year (2009–2010) there are 7616 enrolled ID bachelor programme students, and there were 1296 ID graduates the previous year. In contrast, between 1980 and 1990, there were fewer than 200 ID graduates annually (Huang and You 1985; Ministry of Education Department of Statistics 2009). The number of ID graduates in Taiwan has thus increased four- to six-fold during the past twenty years. With regard to the demand for ID talent, according to the survey done by the R.O.C. Council for Economic Planning and Development (CEPD) in 2002, there were on average four job opportunities for each ID graduate. Based

on the above survey report, the demand for ID bachelor graduates has been 4.3 times the supply between 2002 and 2007 and 3.8 times the supply between 2002 and 2011 (Yan 2003). In addition, the R.O.C. CEPD (2006) estimated that there would be a shortage of ID talent over the next ten years (2005–2015).

While industry is in need of ID talent, the quality and quantity of ID graduates from Taiwan institutions may not be sufficient to satisfy the need. According to the estimates of the Chinese Industrial Design Association, the annual demand for ID personnel in Taiwan is between 600 and 800 people, with approximately 1300 graduating each year, so the supply should be more than sufficient (Weng 2003). However, Chou (2008) interviewed three chairmen of ID programmes in Taiwan, and found that only approximately 50–60 per cent of their graduates stayed in the ID profession. In addition, a study found that 63 per cent of design professionals considered there to be a gap between the quality of design graduates and the needs of industry in Taiwan (Chang 1997). The quality of ID education and its graduates could be an important determinant of Taiwanese industrial and economic successes (Chou 2008). Therefore, in addition to teaching students the design skills required by the profession, design educators also need to note the students' employment preparations and choices, and ensure that ID students understand the ID profession and acquire the competencies required for employment after graduation.

EMPLOYMENT PREPARATION AND CHOICES

Employment preparation is about developing the necessary skills to enter the workplace. It can be divided into four general areas: career awareness, career capacity, vocational attitude and vocational information (Cao 1984). Wise et al. (1976) construct career awareness based on four aspects: (1) knowledge: 'factual information about the work and self'; (2) values: 'the notion that an object such as a routine, requisite or return has worth'; (3) preferences: 'that set of routines, requisites or returns of work which are aspired to, liked, or for which one has an interest'; and (4) self-concepts: 'the belief held about an ability one has and how successful one would be at an activity involving that ability' (Figure 1).

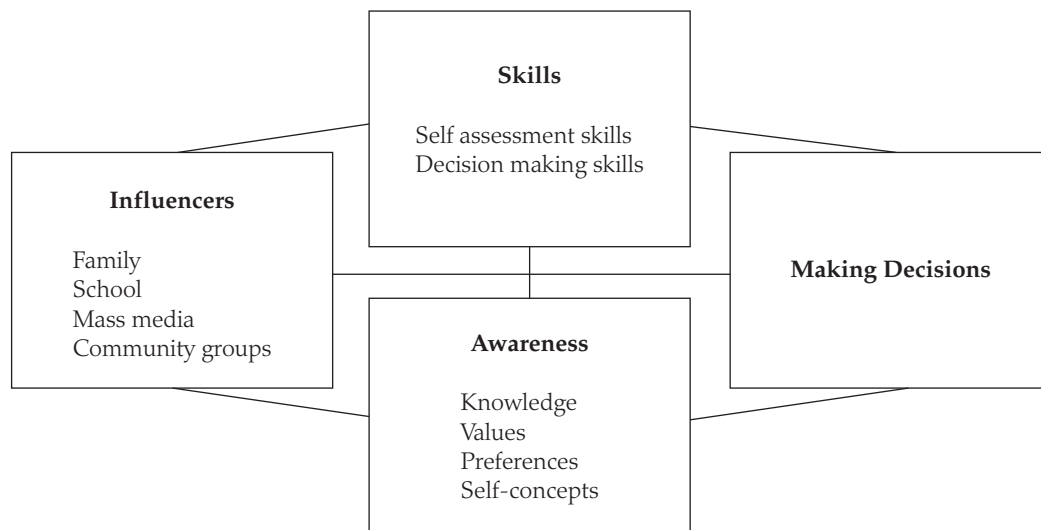


Figure 1: A framework for career awareness (Wise et al. 1976: 48).

Super (1953) claims that the collegiate stage is the significant phase for vocational development, and that sufficient information about self and work should be available for future employment. Before students can make the right career choices, they need to be fully aware of work and self (Wise et al. 1976).

Erikson claims that the critical period for individual ego development is between 18 and 21 years of age. Choices and decisions during that period have significant impacts on one's current and future life (Yang and Lin 1998). University students are at the stage of career exploration, and mainly depend on courses, extra-curricular activities and part-time jobs to find the vocation matching their own abilities, interests and values (Jin et al. 1989; Zunker 1996). Studies show that college students demand more career guidance than academic and life guidance, especially for vocational choices and career planning (Jin et al. 1989; Sie et al. 2001). Students in Taiwan spend most of their time studying and writing examinations, and consequently their career planning is not well developed (Ministry of Education Student Affairs Committee 1994). For example, students in Taiwan have to decide their majors before they enter universities, but 56.9 per cent of freshmen in Taiwan choose their university major hastily after graduation from senior high school (Liao and Jhu 2000). As a result, college students in Taiwan often feel confused and undecided about their future (Jin et al. 1989; Tian 2000).

SOME CAREER ISSUES FOR ID STUDENTS IN TAIWAN

Most industrial designers are employed by in-house design corporations, of all sizes. There were over 1,237,000 SMEs (Small and Medium Enterprises) in Taiwan in 2007, accounting for 97.63 per cent of all business enterprises in Taiwan (Small and Medium Enterprises Administration 2008). Due to the limited financial and manpower resources of SMEs, industrial designers employed by them need to undertake the full range of product development design tasks, and therefore need a comprehensive skill set, including sketching; ideation; use of 3D and 2D graphic software; knowledge of marketing, materials and manufacturing; and the ability to communicate, coordinate, organize etc. (Lin 1995; Yang et al. 2005b). Current Taiwanese university ID programmes recruit students with various backgrounds, abilities, aptitudes and motivations (You et al. 2007a). Some may lack certain abilities, perform poorly and, as a result, become frustrated, discouraged and come to regret their choice of study (Yang et al. 2005a).

Many students have limited knowledge of the ID profession before choosing it. Even if they have an interest in the subject, the pressures and frustrations of the learning process may cause them to doubt their competency for design work and become uncertain about their futures (You et al. 2007b). Some ID students may drop out of school or delay graduation due to adjustment difficulties. Other students would like to change their majors, but because they do not know which major is more suitable, they wait until after graduation to change their profession (Yang and You 2002). These situations may lower retention in the design profession.

The ID profession includes various specialties, and there are diverse employment opportunities for ID graduates in Taiwan. For example, some large companies (e.g. Acer, Asus, BenQ) have recruited ID graduates to specialize in different design tasks, including the job titles of design (concept) researchers, design project managers, computer aided industrial designers

(CAID), industrial designers, mechanism designers, human factor researchers, user interface specialists, etc (Yang et al. 2005a). However, ID students might not be aware of the diversity of employment options and thus may not adequately prepare themselves for the job market. For design educators to provide career guidance to ID students, they need to identify areas where their knowledge is lacking. This article mainly focuses on investigating ID students' employment preparations and choices for the future.

RESEARCH DESIGN

The study was conducted in three stages: a literature review, in-depth interviews and a questionnaire survey. First, there was a need to systematically collect and sort the vocational information about the ID profession. The authors considered some international literature (i.e. IDSA 2004; U.S. Department of Labor 1991, 2008) and domestic studies about the ID profession from the government (R.O.C. Council of Labour Affairs 2000, 2006) and from academic researchers (Chou et al. 2003; Wang and Bian 2003). Available information about industrial designer job tasks, required competencies and work benefits was compiled. Related research on other disciplines was used as a source for survey items on career awareness, employment preparations and choices (Hsu 1990; Kuo 2002; Wen 2003; Wu et al. 2002). The questionnaire design was mainly structured around the four aspects addressed by Wise et al. (1976), comprising knowledge, values, preferences and self-concepts.

Second, to fill in any information gaps left by the literature review, in-depth interviews were conducted with ID practitioners and students establishing and comparing their views on the ID profession. Each interview was recorded and transcribed for later analysis. The above findings were used (in combination with the literature survey) as a source of vocational awareness survey items for questionnaire design.

Finally, a questionnaire was designed, pilot tested, revised again with input from the pilot survey, and then used in a formal survey conducted in Taiwan.

ANALYSIS OF INTERVIEWS

Participants

Information published by government, professional or academic sources about the tasks, required competencies and work benefits and rewards for industrial designers was compiled. To supplement this, fifteen in-depth interviews were conducted, with seven ID practitioners and eight ID students. A semi-structured outline was used to collect their views on the ID profession. The profiles of the practitioner interviewees (two women and five men) are shown in Table 2. The seven design practitioners come from six companies: four from the information and communication technology (ICT) industry, one from domestic appliance manufacturing and one from the shoe industry. The profile of sampled companies is shown in Table 3, where the column 'Teams' signifies that the company has divided the design personnel into special task teams, CAID signifies that the company has established a special division using such CAID systems in the design process, and the 'Non-IDer' signifies that the design department employs specialists from non-industrial design backgrounds.

This study used snowball sampling to recruit ID students and selected a variety of senior high schools backgrounds and university entrance channels.

Code	Title	Field	Sex	Experience (yrs)
A1	Manager	ID*	M	7
A2	Associate Manager	CAID**	F	12
B1	Senior Manager	ID	M	14
C1	Associate Manager	ID	M	9
D1	Design Director	ID	M	7
E1	Department Head	ID	M	29
F1	Designer	ID	F	10

* Industrial design

** Computer Aided Industrial design

Table 2: Profile of practitioner interviewees.

The profiles of the eight student interviewees (five women and three men) are shown in Table 4. Student 4 graduated from a 5-year junior college and is in the upper 2-year ID programme, Student 8 graduated from general high school, while all others are from vocational high schools with various specialisms. Note that Student 7 entered a non-design department at the university through a recommendation channel and later on transferred into the ID department.

Summary of interview results

There was broad consistency between interviewees' viewpoints and the literature on the work content of the ID profession. However, views on design tasks and required competences varied, based on the type of industry and the scale of the enterprise. These detailed differences are not reflected in currently published information about the ID profession. For example, most large enterprises such as the ICT industry have set up various task teams to design and develop new products together; therefore, there is a greater need for a variety of specialists in the design domain. In contrast, designers working in traditional industry or SMEs usually have to handle all aspects and phases of a design project and thus are expected to have more generalized skills. The summary of the interviews with the students is as follows: (1) Students have different perceptions of the ID profession before and after entering the university; (2) Students seem to have a

Co.	Industry type	Capital (NTD\$)	Employees	Teams	CAID*	Non-IDer
A	ICT**	26.2B	20,000	x	x	x
B	ICT	32.8B	20,000			
C	ICT	NA	100,000	x		x
D	ICT	25.9B	5,600	x		x
E	Home Appliance	8.7B	1,700			
F	Shoe	15M	15			

*Computer Aided Industrial design

**Information and Communication Technology

Table 3: Profile of sampled companies.

Code	Sex	High school background	Programme (Yr)	Entrance channel to University
1FD	F	Industrial Arts	4	Recommendation
2MD	M	Drafting	4	Recommendation
3MD	M	Drafting	4	Exam, United
4FN	F	Business Administration, 5YC	2	Exam, United
5FN	F	Mechanical Engineering	4	Exam, United
6FN	F	Civil Engineering	4	Exam, United
7FN	F	Die Casting	4	Recommendation/Transfer
8MH	M	General High School	4	Application

Table 4: Profile of student interviewees.

limited grasp of the range of job titles that ID graduates can be qualified for; (3) Students perceive an unequal ratio of female designers to male designers and unequal opportunities for promotion between the genders; (4) A proportion of the female students claim they are uncomfortable with mechanical design; and (5) Students perceive a variation between regions in industrial activity, employment opportunities, salary and the availability of information. In addition, there is inconsistency amongst the interviewed students about what tasks industrial designers should be responsible for. Some students claim industrial designers should be responsible for all aspects of a design project, such as model-making, advertising, package design and marketing, while others consider industrial designers to have responsibility only for their core expertise. The interviewed students generally thought that the life of an industrial designer was characterized by long work hours, staying up all night occasionally, unclear division between work days and holidays, and irregular work schedules.

In summary, the practitioners and students interviewed agreed on most of the descriptions of the ID profession, but their responses established that there is a need to supplement the students' understanding of the range of ID tasks, working environments, salaries and competencies, and their dependence on type of industry and the scale of the enterprise. In addition, student interviewees are curious to know more about the industrial designers' actual working situations and lifestyles. For example, how do designers cooperate within a design team? How do they manage their schedules to meet deadlines and maintain a regular schedule for work and rest? If disagreements or arguments occur between colleagues, or the design proposal is rejected, how do designers deal with these situations?

ANALYSIS OF QUESTIONNAIRE SURVEY

Participants and instruments

A questionnaire was pre-tested by forty ID students. The authors then selected three universities (two private, located in northern and central Taiwan, respectively; one public in southern Taiwan) and three technological universities (two public, located in northern and central Taiwan, respectively; one private in southern Taiwan) for a formal survey. Nine hundred and four ID students completed the questionnaire, a return rate of nearly 60.2 per cent.

The profile of the participants is shown in Table 5. There were slightly more female respondents than male students. The numbers of freshman,

Personal variables	Item	Total	University						Subtotal	Per cent
			N1	N2	C1	C2	S1	S2		
			137	111	147	148	208	153	904	100
Sex	Male		67	55	69	67	90	79	427	47.2
	Female		70	56	78	81	118	74	477	52.8
Year in University	Freshman		42	42	50	40	80	42	296	32.7
	Sophomore		31	20	39	46	55	47	238	26.3
	Junior		26	38	21	21	50	27	183	20.2
	Senior		38	11	37	41	23	37	187	20.7
Background in High School	General		18	109	20	85	19	151	402	44.9
	Vocational		98	1	102	47	154	1	403	45.0
	Comprehensive		21	1	24	14	30	0	90	10.1
Academic performance	Upper 10%		16	10	27	21	34	23	131	14.5
	Upper 25%		28	38	35	42	53	31	227	25.1
	Middle 50%		31	29	42	49	66	45	262	29.0
	Lower 25%		17	11	27	26	13	16	110	12.2
	Lower 10%		15	7	14	5	13	14	68	7.5
	Other		30	16	2	5	29	24	106	11.7
Entrance channel to university	Examination, United		80	91	81	65	89	118	524	58.5
	Recommendation, General		37	5	40	22	71	10	185	20.7
	Recommendation, Skills		3	15	5	1	3	2	29	3.2
	Application		14	0	20	30	26	13	103	11.5
	Transfer, School		2	0	0	1	17	1	21	2.3
	Transfer, Department		1	0	1	3	1	7	13	1.5
	Examination, Independent		0	0	3	23	0	0	20	2.2
Information sources	Parents		15	34	14	34	23	34	154	5.4
	Relatives		12	17	5	22	22	18	96	3.4
	Teachers		96	49	72	86	126	47	476	16.7
	Senior Students		53	28	37	51	72	54	295	10.3
	Fellow Students		72	47	47	69	101	68	404	14.2
	News Report		61	31	44	57	76	64	333	11.7
	Internet		78	43	47	79	109	76	432	15.1
	Organizations and Institutions		25	4	16	15	25	14	99	3.5
	Newspaper and Magazines		98	68	81	84	133	99	563	19.7

(Continued)

Motives to major in ID	Parent Expectation	18	11	12	24	16	20	101	7.1
	Relative Encouragement	11	7	5	15	8	15	61	4.3
	Friend Encouragement	22	17	18	24	34	23	138	9.6
	Self Interest in Design	105	93	87	104	175	127	691	48.3
	Exam Outcome Allocation	41	23	23	52	46	38	223	15.6
	Teacher Encouragement	88	14	23	37	46	9	217	15.2
Part time job experience	Yes	103	74	114	113	160	95	659	73.0
	No	33	37	33	35	48	58	244	27.0
Part time job type	Design Case or General	21	75	82	131	162	94	565	66.0
	Short Term Intern	19	30	11	27	59	28	174	20.3
	Industrial Project	92	4	7	11	1	2	117	13.7
Future plan	Advanced Study	58	76	72	69	97	94	466	54.1
	Employment	65	29	65	45	101	38	343	39.8
	Neither Study Nor Employment	3	1	1	1	3	1	10	1.2
	Other	11	5	5	4	7	11	43	5.0
Plan's design relation	ID	76	33	104	93	128	82	516	63.4
	Design Related	35	71	16	30	55	35	242	29.7
	Non-Design Related	12	0	10	7	15	12	56	6.9

Table 5: Profile of the questionnaire respondents.

sophomore, junior and senior respondents were about equal. Of the respondents, 44.9 per cent were from general high schools and 45 per cent from vocational high schools (including those from vocational programmes in comprehensive high schools). The academic performance of respondents mostly fell into the categories of the upper 25 per cent and middle 50 per cent within a class. Nearly 60 per cent of the respondents entered ID programmes through a unified selection mechanism administered by the ministry of education; 20.5 per cent entered the programmes due to the recommendations of their high schools, and 11.4 per cent through self applications. The top three sources from which students obtained ID information before they entered the university were newspapers/magazines, teachers and the Internet. The top three motives of respondents studying ID were personal interest, exam outcome and teachers' encouragement. Of the respondents, 73 per cent had part-time job experience. The future career intentions of the survey respondents were as follows: 54.1 per cent chose to study at graduate schools while 39.8 per cent of them chose employment. Of the respondents, 63.4 per cent intended to stay in the ID field, 29.7 per cent to enter other design disciplines, such as graphic

Aspects	N	Min	Max	Mean	SD
Knowledge	904	2.09	3.91	3.07	.23
Values	904	1.23	5.00	3.67	.50
Preferences	904	1.50	4.75	3.69	.39
Self-concepts	904	1.42	4.95	3.32	.46

Table 6: Statistics of item means in awareness aspects.

or spatial design, and 6.9 per cent to switch to non-design related areas. In other words, approximately 37 per cent of participants decide not to enter the ID profession after graduation. This survey is restricted to future intentions. It seems likely that the actual retention in the ID profession will be lower, but a follow-up survey would be required to confirm this.

Overview of ID students' career awareness

A five-point Likert scale was used in the questionnaire, with 'strongly disagree, disagree, neutral, agree, strongly agree' as the five choices, respectively weighted 1, 2, 3, 4 and 5 for statistical analysis. The higher the value, the higher degree of participant agreement. The mean value of the four areas of career awareness ranged from 3.07 to 3.69, as shown in Table 6. ID students had a general knowledge of the ID profession, but had some perceptions inconsistent with those of practitioner interviewees, which are discussed further below. In addition, ID students had positive views on the rewards of industrial design work, such as 'creating new stuff', 'a sense of achievement' and 'challenging'. They perceived that the main reward for an industrial designer is more psychological than material, i.e. gaining respect, fame and influence. In terms of vocational preferences, the ID profession matched students' interests, such as liking for the development or improvement of products, the use of 3D and 2D graphic software to present their ideas, and a willingness to communicate and coordinate with others. In terms of self-concepts, students perceived that they were equipped with the required competences, such as a cultivation of skills in the use of colour, sketching and literacy in the presentation of ideas. They did not, however, feel confident in applying ergonomic theory to design or in executing website design. In sum, although broadly positive, the students' perception of some of the tasks, required competencies and lifestyle of industrial designers has negative aspects that do not match the reality. This may make them reluctant to commit to a design career.

The values fell between the categories of 'neutral' and 'agree'. As shown in Table 7, there are seventeen items (out of 72 items) that received low ratings (with means below 3.0). In other words, one-fourth of the surveyed items concerning the ID profession received average responses that fell between the categories of 'disagree' and 'neutral'. These low scores are generally (with the exception of statements 45, 17 and 4) indicative of a negative perception of the ID role. For example, in terms of education and training, ID students perceived that becoming an industrial designer is not difficult, i.e. it is not necessary to be educated or trained or to pass a qualification examination. In contrast, practitioner interviewees stated that most enterprises recruit designers with an ID background to participate in the design process, although design researchers might come from non-ID backgrounds.

No.	Item	Mean	SD
Q02	The Industrial designer is influential in the concept evaluation phase of a project.	2.97	0.95
Q68	I know how to apply ergonomics in design.	2.97	0.84
Q46	I am satisfied with the average salary of industrial designers.	2.93	0.86
Q06	Only educated and trained personnel are competent in doing ID work.	2.85	1.09
Q17	The experience of the industrial designer is easy to transfer.	2.81	0.94
Q72	I have the ability to design websites and web pages.	2.78	1.07
Q36	The effort put into ID work is reflected in its outcome effectiveness.	2.78	1.24
Q08	There is less opportunity for persons without a graduate degree to become design managers.	2.77	1.04
Q33	There are good promotion systems for ID.	2.73	0.84
Q32	Industrial designers work in a healthy and non-harming environment.	2.69	1.05
Q07	One needs to pass a professional examination to become an industrial designer.	2.69	0.99
Q45	I prefer to have a regular living.	2.50	0.99
Q31	The ID environment is simple; and is not likely to involve conflicts with others.	2.50	0.88
Q04	Industrial designers are draft technicians.	2.32	1.03
Q01	Corporate industrial designers seldom have extra duties to perform.	2.24	0.81
Q18	Industrial designer's daily working hours will not be over 8 hours.	2.21	0.94
Q19	Industrial designers have a regular work-and-rest lifestyle.	1.87	0.83

Table 7: Career awareness items with low ratings (<3.0).

For the promotion opportunities available to industrial designers, the students perceived that (1) there are few good promotion opportunities in the ID field; (2) a higher academic degree does not provide better opportunities to become a design manager; (3) industrial designers working in corporate in-house design departments usually perform extra duties in addition to making designs; (4) an industrial designer possesses no privilege or better ability than other colleagues in concept evaluation; and (5) the average salary of industrial designers is generally considered unsatisfactory.

With regard to the working environment for industrial designers, ID students perceived that (1) the working atmosphere might be complex and unpleasant and they might be liable to have conflicts with others; and (2) industrial designers might not work in a healthy and non-harming environment. Regarding industrial designers' working hours, students perceived that (1) the daily working hours for industrial designers would be over eight hours; and (2) industrial designers would not have a regular work-and-rest lifestyle. In addition, students worry that the task of making product models and staying up late at night for design projects would influence their health. Students projected what they had experienced in the school to their anticipated future workplace experience. For example, unpleasant interactions between instructors and learners and peer competition might influence the working atmosphere and interpersonal relationships. ID students are required to use various materials (e.g. foam) to make models, and they perceived that these materials might be harmful. However, according to the

practitioner interviewees, the task of making product models is usually out-sourced and is thus not part of a corporate industrial designers' usual role. Moreover, designers are fully in charge of design projects, and therefore since they can arrange their schedule appropriately, it is not common for them to have to stay up late.

CONCLUSION AND SUGGESTIONS

Inadequacies in the quantity and quality of the supply of design graduates have been noted and studied in both a national and an international context. Er (1997) classifies the development of industrial design in the newly industrialized countries into seven stages: (1) Proto-Design Phase, (2) Embryonic Phase, (3) Emergence Phase, (4) Development I Phase, (5) Development II Phase, (6) Take-off Phase and (7) Maturity Phase. According to Er's study in 1994, Taiwan fell between the Development II Phase and Take-off Phase. To date, the Taiwanese government policy has been to promote and support design in the national interest, and enterprises have also invested heavily in design; therefore, arguably ID development in Taiwan can now be positioned somewhere between the Take-off Phase and the Maturity Phase. Industrial designers are in great demand in Taiwan, and 90 per cent of them are employed by in-house design departments within manufacturing firms (R.O.C. Council of Labour Affairs 2006). Although the number of ID graduates in Taiwan has increased annually, the authors investigated 904 ID students from six universities in Taiwan and found that 37 per cent of them did not intend to enter the ID profession after they graduate. This high proportion rejecting the ID profession as their career should focus design educators' attention on the issues of ID students' employment preparation and choices. Our findings show that ID students have an awareness of the knowledge, values, preferences and self-concepts required of an ID. However, about one-fourth of the surveyed items suggest that students' perception of some of the tasks, the required competencies and lifestyles of industrial designers is negative and does not match the reality. For example, students do not think that there are good promotion opportunities for industrial designers. These misperceptions could have influenced students' career decision not to be an industrial designer after graduation.

The demand and quality of design graduates in industrialized countries, such as the United States and United Kingdom, are described below. In the United States, commercial and industrial designers held about 48,000 jobs in 2006, of which about 30 per cent were self-employed, 15 per cent were employed in either engineering or specialized design services firms, and the remainder were employed in manufacturing firms (U.S. Department of Labor 2008). With an oversupply of graduates and a trend for manufacturers to out-source their designs overseas (Engardio and Einhorn 2005), Liu (2005) claims that the US ID job market has become fiercely competitive. On the other hand, Kaufman (1998) reported that the quality of ID graduates in the United States did not satisfy industry's needs.

As in the United States, one problem with UK design education is that the number of product/industrial design jobs is shrinking, whilst the number of industrial/product design undergraduates is growing (Evans and Wormald 2005). In 2008, total employment in design was 193,969 in the United Kingdom, of which 42 per cent (81,000) worked in product/industrial design, with 31 per cent being self-employed (unknown author 2008). Seventy-nine

per cent of UK product/industrial designers reported an increase in overseas competition (Design Council 2007). Prior et al. (2007) noted that 'the 71% growth in Design Studies courses over the last decade in the United Kingdom has been spectacular; however, this has not been matched by increases in the number of jobs in the sector'. Harvey and Blackwell (1999) reported that 63 per cent of art and design graduates surveyed in 1999 worked outside the creative industries. The Higher Education Statistics Agency (2007) shows that approximately 9 per cent of Creative Arts and Design (2005–2006) graduates were unemployed. Prior et al. (2007) stated that the current situation has forced design graduates into less rewarding employment in retail and catering fields, such as waiting and bar staff. Taiwan can learn from this example of the likely effects of supply and demand changes in the later stages of industrial design development. Whether the oversupply of design students is a problem is open to debate. Though not all students studying art and design in the United Kingdom can practice as professional designers or artists after graduation, 'the transferable value of an education in design is very high – the development of visual awareness, analytical skills, creativity, and communication skills enables design students to pursue a variety of different careers after graduation, expanding the awareness of design in the wider community' (Weightman and McDonagh 2004). In other words, the surplus of designers is an asset rather than a problem. Some design professionals regard the surplus as an advantage, since it allows them to select the best design graduates. However, many others see this as a waste of manpower, resulting in a lack of career continuity for students, inappropriate allocation of educational resources and a bad reflection on the national policy for the workforce. In addition, mismatch between ID graduates' competencies and the needs and expectations of industries seems to be a common concern across both eastern and western countries. There is a lack of connection between what design students' learn in school and the real requirements in employment after graduation, which higher education should address (Ball 2002). Henderson and Bouette (2001) claim that 'Higher education thus currently holds the responsibility to develop insights into the professional roles of artists and designers and in doing so continually develop research into the careers of graduates and disseminate realistic and achievable models of practice'. In addition to the present study, some UK studies on design student employment have relevance to the situation in Taiwan. For example, the Design Council (2007) conducts continuous economic and demographic footprint research and long-term national surveys on the design industry. With a shorter-term perspective, Hall (2001) discusses the placement of design students and how teachers help students to prepare their CVs and portfolios.

Briefly, the findings of this study could help design educators to understand their students' misperceptions of the ID profession and what needs to be clarified to them. In addition, it could be a useful reference for career guidance planning. The authors make a few suggestions below.

1. Maintain up-to-date information about the ID occupation on related websites

Though ID students have a basic understanding of the ID occupation and its dimensions, they tend to have an unrealistic and generally negative perception of the industrial designers lifestyle. It would be beneficial if government agencies can update the description of the ID occupation in the Dictionary of Occupational Titles in the R.O.C (2000) and, in addition,

compile a Handbook of Occupational Outlook, including the ID occupation. The Outlook contents could be modelled on the U.S. Department of Labor (2008) and the UK Graduate Prospects (2008) websites.

2. Promote studio-based design practice through internship or workshops
This type of on-the-job training is similar to apprenticeship, which provides opportunities for ID students to gain work experience in the field, to determine whether they are really interested in the design occupation, and to know professionals in the field when they are still students. However, if internships are not available, ID departments of universities can hold design workshops for their students as a substitute. Practitioners and design educators from domestic institutions as well as from abroad can be invited to give lectures and tutor the students in the workshops. Furthermore, if students come from different departments, universities and/or countries, the beneficial effect of exchanging experiences may be enhanced.
3. Continuously renew the ID curricula and encourage interdisciplinary interactions
To enhance the ability of ID students to succeed in the future workplace, ID programmes need to be renewed regularly. Most ID programmes are based in university design schools and have curricula emphasizing art and design. Our survey suggests that ID students feel they lack knowledge in the industrial aspects of the profession, such as mechanism design, marketing, materials and processing. Interdisciplinary interaction within and outside the campus should help students to gain exposure to relevant technologies in other fields.
4. Train students in time management and personal relations development, and enhance career guidance.
The students perceived industrial designers as people working without a regular schedule especially exposed to conflict with others, and thus it is important for the students to learn how to manage time efficiently and get along with others as early as possible. In addition, there are large individual differences among ID students who come from various backgrounds and educational pathways, and therefore educators should be sensitive to these individual differences when giving career guidance.

REFERENCES

- Ball, L. (2002), 'Preparing Graduates in Art and Design to Meet the Challenges of Working in the Creative Industries: a New Model for Work', *Art, Design, & Communication in Higher Education*, 1: 1, pp. 10–24.
- Bolton, S. (2004), 'Same Recipe, Different Flavors: Asian Influence on European Educational Design Practices', The 2004 IDSA National Education Conference (CD ROM).
- Cao, C. (1984), 'A Study on Vocational Ethics Concept of Vocational High School Students (in Chinese)', Unpublished master thesis, Taipei, Taiwan: National Taiwan Normal University.
- Chang, W. S. (1997), 'Cultivation Model of Professional Design Talents – A Professional Competence Oriented Design Education (in Chinese)', Final Report for Research Projects of National Science Council.

- Chou, W. C. (2008), 'Constructing the Self-Study Criteria for Industrial Design Program at Private University of Technology in Taiwan-A Benchmarking Approach (in Chinese)', Unpublished doctoral dissertation, Graduate School of Industrial Education & Technology at National Changhua University of Education, Changhua.
- Chou, W. C., Huang, T. S., Lin, S. Y. and Li, Z. H. (2003), 'Establishment of Professional Competence Indices of Industrial Design Students in Technological Universities and Colleges in Taiwan (in Chinese)', Final Report for Research Project of National Science Council, No. NSC91-2516-S-324-002-X3.
- Design Council (2007), 'Highlights from The Business of Design, Design Industry Research 2005', http://www.designcouncil.org.uk/Documents/About%20design/Facts%20and%20figures/Business_of_design_presentation.pdf. Accessed 10 June 2009.
- Engardio, P. and Einhorn, B. (2005), 'Outsourcing Innovation', *BusinessWeek* 21 March 2005, pp. 84–94.
- Er, E. A. (1997), 'Development Patterns of Industrial Design in the Third World: a Conceptual Model for Newly Industrialized Countries', *Journal of Design History*, 10: 3, pp. 293–307.
- Er, H. A. (1994), 'The Emergence and Development Patterns of Industrial Design in Newly Industrialized Countries With Particular Reference to Turkey', Ph.D. thesis, Institute of Advanced Studies, Manchester Metropolitan University, October 1994.
- Evans, M. and Wormald, P. (2005), 'Knowledge Transfer and Industrial Design: A Program for Post-qualification Collaboration between Universities and Commerce in the UK', http://www.idsa.org/webmodules/articles/articlefiles/NEC05-M-Evans_P-Wormald.pdf. Accessed 25 November 2005.
- Garner, S. and Duckworth, A. (1999), 'Identifying Key Competences of Industrial Design and Technology Graduates in Small and Medium-Sized Enterprises', *International Conference on Design and Technology Educational Research and Curriculum Development and was held at Loughborough University*, <https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/1035/3/garner99.pdf>. Accessed 20 July 2007.
- Hall, S. (2001), 'From Trainee Graduates to Graduate Trainees: Towards an Illumination of The Teaching of Professional Practice on Design Degrees', IDATER 2001 Loughborough University, pp. 36–40.
- Harvey, L. and Blackwell, A. (1999), *Destinations and Reflections: Careers of British Art, Craft and Design Graduates*, Birmingham: Centre for Research into Quality, University of Central England.
- Henderson, D. and Bouette, M. (2001), 'Transitions in Higher Education: The Relationship Between The Thoughts And Aspirations of Students Entering Higher Education in Art And Craft Areas and The Opportunities Awaiting Them at Graduation', IDATER 2001 Loughborough University, pp. 41–6, <https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/1332>. Accessed 8 July 2008.
- Higher Education Statistics Agency (HESA) (2007), 'Table SE1: Employment Rates by Subject of Study (2005–06)', <http://www.hesa.ac.uk/pi/0506/employment.htm>. Accessed 20 July 2007.
- Hsu, H. G. (1990), 'A Study on the Basic Factors Influencing Vocational Awareness and Vocational Mature Attitude of Senior Vocational School Students in Refrigeration and Air Conditioning Departments (in Chinese)',

- Master Thesis, Department of Vocational Education, National Taiwan Normal University.
- Huang, C. W. and You, M. (1985), 'The Current Situation of Industrial Design Education in Taiwan (in Chinese)', *Industrial Design Magazine*, 49, pp. 18–24.
- IDSA (2004), 'What is ID?', http://www.idsa.org/webmodules/articles/article-files/what_is_id_brochure.pdf. Accessed 11 November 2006.
- Jin, S. R., Lin, C. S. and Tian, S. L. (1989), 'The Career Development of Chinese College Students in Taiwan (in Chinese)', *Bulletin of Educational Psychology*, 22, pp. 167–90.
- Kaufman, J. (1998), 'Why Design Education? Infrastructure Issues Affecting the Future of Industrial Design Education', The 1998 IDSA National Education Conference (CD ROM), VA, USA.
- Kuo, C. I. (2002), 'A Study of Career Preparation and Career Decision-Making of the Graduates from the Early Childhood Education Department in Vocational High Schools (in Chinese)', Master Thesis, Department of Home Economics Education, National Taiwan Normal University.
- Liao, S. M. and Jhu, K. J. (2000), 'Impacts and Responsive Measures of Multiple Entrance New Programs for Undergraduate (in Chinese)', *Student Guidance*, 63, pp. 14–9.
- Lin, H. L. (1995), 'An Identification and Validation of Competencies for Industrial Designers in Taiwan', *The proceeding of 10th National Technological and Vocational Education Conference category of industry VI*, pp. 259–70.
- Lin, R. T. (2007), 'Soaring Plan for Design Industry in Taiwan (in Chinese)', *Presentation at the Sixth National Industrial Development Conference*, <http://www.cnfi.org.tw/indmeeting/txt/4group-txt.pdf>. Accessed 24 May 2009.
- Liu, T. L. (2005), 'The Focus of Industrial Design Education: Perspectives from the Industry', The 2005 IDSA National Education Conference (CD ROM).
- Ministry of Education Department of Statistics (2009), 'Number of College Students of Various Departments', <http://www.edu.tw/statistics/search/search.htm>. Accessed 17 April 2009.
- Ministry of Education Student Affairs Committee (1994), 'Planning of Career Guidance for Undergraduate (in Chinese)', *Student Guidance*, 30, pp. 58–69.
- Prior, S. D., Shen, S. T. and Karamanoglu, M. (2007), 'The Problems with Design Education in the UK', *Proceedings of the International Association of Societies of Design Research Conference*, 12–15 November 2007, Hong Kong Polytechnic University, Hong Kong, ISBN: 988-99101-4-4.
- R.O.C. Council for Economic Planning and Development (2006), 'Analysis of the Supply of and Demand for Science & Technology Talent in Taiwan Between 2005 and 2015 (in Chinese)', <http://www.cepd.gov.tw/dn.aspx?uid=1402>. Accessed 6 March 2007.
- R.O.C. Council of Labour Affairs (2000), 'Dictionary of Occupational Titles in ROC (in Chinese)', Taipei: CLA.
- (2006), 'Bulletin of Occupation Wage Survey in Taiwan, ROC (in Chinese)', <http://statdb.cla.gov.tw/html/svy95/9502menu.htm>. Accessed 17 April 2009.
- Sie, S. W., Liao, J. M., Lin, W. S. and Cai, P. J. (2001), 'Choices-Seniors' Feelings About Their Career Decisions (in Chinese)', *Journal of Social Science*, 9, pp. 153–82.
- Small and Medium Enterprises Administration (2008), '2008 White Paper on Small and Medium Enterprises in Taiwan, Chapter 2: An Overview

- of SME Development (in Chinese)', <http://www.moeasmea.gov.tw/public/Attachment/812302133871.pdf>. Accessed 4 June 2009.
- Super, D. E. (1953), 'A Theory of Vocational Development', *American Psychologist*, 8, pp. 185–90.
- The Higher Education Academy (2006), 'The Supply of and Demand for Design Skills. Produced for the Art, Design, Media Subject Centre, Teaching and Learning through Design; and the Design Council, Vanilla Research', <http://www.ukdesignskills.com/pdfs/Skills-Demand-and-Supply.pdf>. Accessed 1 June 2007.
- Tian, S. L. (2000), 'College Students, What Do You Think?—College Students' Career Secision-Making Difficulties and Career Thoughts (in Chinese)', *Guidance Quarterly*, 36: 2, pp. 22–5.
- U.S. Department of Labor (1991), 'Dictionary of Occupational Titles', 4th ed., <http://www.oalj.dol.gov/PUBLIC/DOT/REFERENCES/DOTPARTS.HTM>. Accessed 11 November 2006.
- (2008), 'Occupational Outlook Handbook, 2008–9 Ed-Commercial and Industrial Designers', <http://stats.bls.gov/oco/ocos290.htm>. Accessed 8 August 2008.
- UK Graduate Prospects (2008), http://www.prospects.ac.uk/cms/ShowPage/Home_page/p!eLaXi. Accessed 15 August 2008.
- Unknown author (2008), 'Design Impact and Footprint, Creative & Cultural Skills sector impact and footprint presentations', http://www.creative-choices.co.uk/upload/ppt/Design_Presentation_08-09.ppt. Accessed 10 June 2009.
- Wang, H. X. and Bian, S. R. (2003), 'The Establishment of Professional Competence Indices for Industrial Design (in Chinese)', Final Report for Research Project of National Science Council, No. NSC 91-MOE-S-027-002-X3.
- Weightman, D. and McDonagh, D. (2004), 'Developing Industrial Design Education: A British Perspective', The 2004 IDSA National Education Conference (CD ROM).
- Wen, X. L. (2003), 'Job Comprehensions of Students in Childcare Department of Upper-Secondary School – a Case Study of a Private High School in Taoyuan', Master Thesis, Department of Childcare, National Taipei Institute of Nursing.
- Weng, Z. Y. (2003), 'The Expectation of Transformational SME for Design Talents (in Chinese)', *NPO Newsletter*, 68, <http://www.gigabyte.org.tw/under/industry/industry-9.html>. Accessed 10 August 2008.
- Wilkinson, M. and Sale, R. (2003), 'Pressures for change in the Education of Product Designers', *5th European Academy of Design Conference Proceedings*, 28–30 April, Barcelona, Spain, <http://www.ub.edu/5ead/PDF/10/WilkinsonSale.pdf>. Accessed 19 December 2005.
- Wise, R., Charner, I. and Randour, M. L. (1976), 'A Conceptual Framework for Career Awareness in Career Decision-Making', *Counselling Psychologist*, 6: 3, pp. 47–53.
- Wu, W. H., Yang, H. W., Wang, H. M., Wang, S. H. and You, M. X. (2002), 'A Study on the Relationship of Vocational Awareness and Career Decision of the 2-year Junior College Hospitality Management Students (in Chinese)', Final Report for Research Project of National Science Council, No. NSC90-2413-H-130-002.
- Yan, X. W. (2003), 'Drop-out of ID Students and Want of Talents in Industries (in Chinese)', *Career*, 321, p. 146.

- Yang, J. S. and Lin, S. H. (1998), 'A Study on The Relationship Between Career Development and Ego Identity Status for College Students in Taiwan (in Chinese)', *Bulletin of Educational Psychology*, 30: 2, pp. 1–16.
- Yang, M. Y. and You, M. (2002), 'A Preliminary Structure of Internet-Aided Career Guidance Model for University Industrial Design Students (CD ROM) (in Chinese)', *Proceedings of 17th National Technological and Vocational Education Conference*, National Pingtung University of Science and Technology, pp. 365–74.
- Yang, M. Y., You, M. and Chen, F. C. (2005a), 'A Study on the Difficulties and Career Guidance Needs of Industrial Design Students: Implications for Design Education (in Chinese)', *Design Journal*, 10: 2, pp. 57–76.
- (2005b), 'Competencies and Qualifications for Industrial Design Jobs: Implications for Design Practice, Education, and Student Career Guidance', *Design Studies*, 26: 2, pp. 155–89.
- Yeh, W. D. (2003), 'The Demand and the Evaluation of the Industrial Design Profession from the Industries', *The 6th Asian Design Conference* (CD ROM), 14–17 October 2003, Tsukuba, Japan.
- You, M., Yang, M. Y. and Chen, F. C. (2007a), 'Industrial Design Students' Career Difficulties: from the Aspects of their Reasons for Majoring in ID and Sources of ID Information (in Chinese)', *Journal of Science and Technology*, 16, *Category of Humanities and Social Science*, 1, pp. 37–51.
- You, M., Yang, M. Y. and Liao, P. L. (2007b), 'Survey of Industrial Design Students' Learning Attitudes (in Chinese)', *Design Journal*, 12: 2, pp. 15–36.
- Zunker, V. G. (1996), *Career Counselling: Applied Concepts of Life Planning*, 4th ed., Pacific Grove, CA: Brooks & Cole.

SUGGESTED CITATION

Yang, M. Y., You, M. and Han, C. Y. (2010), 'A study of industrial design students' employment preparation and choices in Taiwan', *Art, Design & Communication in Higher Education* 9: 1, pp. 21–40, doi: [10.1386/adch.9.1.21_1](https://doi.org/10.1386/adch.9.1.21_1)

CONTRIBUTOR DETAILS

Dr Yang is an Assistant Professor of Industrial Design at the National United University in Taiwan. She holds a doctoral degree of Design Studies from the National Yunlin University of Science and Technology in Taiwan. Her research interests include gender and design, design education and e-portfolios.

Contact: Department of Industrial Design, National United University, Taiwan.
E-mail: mindy.L8285@gmail.com

Dr You is a Professor of Industrial Design at the National Yunlin University of Science and Technology in Taiwan. He holds a doctoral degree of System Design from the University of Waterloo, Canada. He has published over 50 journal papers in national and international journals such as *Design Studies*, *Applied Ergonomics* and the *International Journal of Design*. His research interests include ergonomics, e-learning and design education.

Contact: Department of Industrial Design, National Yunlin University of Science and Technology, Taiwan.
E-mail: youm@yuntech.edu.tw

Ming-Ying Yang | Manlai You | Ching-Yi Han

Han is a Master graduate of Industrial Design at the National Yunlin University of Science and Technology in Taiwan, and works as an industrial designer in Taiwan.

Contact: Department of Industrial Design, National Yunlin University of Science and Technology, Taiwan.

E-mail: cain_ys@hotmail.com
