PES
www.ijpes.com
International Journal of Psychology and Educational Studies

# Assessment Indicators of Tertiary Student of Internship Programs Adjust Industry 4.0

**Chun-Mei Chou[1*], Chien-Hua Shen[2], His-Chi Hsiao[3], Tsu-Chguan Shen[4], Yu-Jen Tsen[5]**

[1*] Institute of Vocational and Technological Education
[2] Department of Business Administration,
[3] Department of Business Administration
[4] Sacred Hearts High School
[5] Center for General Education

ARTICLE INFO

*Article History*:
Received 01.03.2017
Received in revised form 09.04.2017
Accepted 26.04.2017
Available online 01.05.2017

ABSTRACT

The purpose of this study was to study the assessment indicators for the entrepreneurial learned by tertiary student of internship programs adjust Industry 4.0. This study used in-depth interviews and focus groups were used to develop the ability indicators and gain consistency between the ability items. The research results showed that there were three types of entrepreneurial cognition learned by students of internship programs adjust Industry 4.: start-up experience, industry-specific experience, and managerial experience. The ability content included 11 items of entrepreneurial cognition ability: entrepreneurial traits, basic commercial ability, communication ability, digital ability, professional innovative ability, financial management ability, human resource management ability, marketing management ability, operational (work) ability, and risk management ability, and there were a total of 91 ability indicators. There were 48 items of entrepreneurial cognition that had high importance and usage frequency.

Keywords:
*Tertiary students; Industry 4.0; Assessment Indicators; Entrepreneurial ability; internship program*

## 1.Introduction

Facing the impact of "Productivity 4.0" and promoting intelligence related policies have undergone major changes. The electronic machinery industry, precision machinery industry and information communication, is Taiwanese traditional strengths. Through the industry's 4.0 and innovation technology in the wisdom of robotics and Internet of things, so that Taiwan's industry will reproduce the global competitiveness (Niesen, Houy, Fettke, & Loos, 2016; Zhang, Wan, Hsu, & Rayes, 2016).

The challenge of helping the community to meet the transitional period from school to society is one of the important topics in the school to enhance student employment and entrepreneurship (Castillo-Vergara, & Álvarez-Marín, 2016). Through the workplace practice so that students access to the practical knowledge, to understand the true meaning of learning, to stimulate students positive attitude and employment will be a important issue. Due to the influence of rapidly declining numbers of students in higher education and the international financial scene, the employment problems of university students has received increased attention

[1]Corresponding author's address: Graduate Institute of Vocational and Technological Education, National Yunlin University of Science & Technology, Yunlin , Taiwan 64002, R.O.C.
e-mail: choucm@yuntech.edu.tw
http://dx.doi.org/10.17220/ijpes.2017.02.003

© 2014 International Journal of Psychology and Educational Studies (IJPES) is supported by Educational Researches and Publications Association (ERPA)

in Taiwan ( Castillo-Vergara & Álvarez-Marín, 2016; Chou & Shen, 2015;). Although Taiwan currently has an accessible higher education system, there is still a gap between the training of personnel and the demands of the workplace. Most graduates have not conducted career planning and have not prepared for employment, resulting in their inability to immediately join the workforce after graduation and an inability to adapt to the workplace environment ( Cho, Robalino, & Watson, 2016; Xaver, & Ann, 2016).

In assisting new graduates in facing the challenges of the transitional period between school and work, internship education is an important issue in schools for helping elevate the employability and entrepreneurial ability of students (Francisco, Moriano, & Jaén, 2016; Fretschner & Weber, 2013; Fukuda, 2014). Workplace internships allow students to access practical knowledge, understand the truth about learning, elicit active work attitudes and employment intentions, understand their hopes for the workplace in the future, promote their understanding for occupational life and learn occupational skills, and cultivate correct working attitudes and occupational values (Heinrichs, 2016; Kucel, Róbert, Buil, , & Masferrer, 2016). Kwong and Thompson (2016) believed that under the context of economic recession and high unemployment, university courses need effective educational content that emphasizes the importance of elevating student employability, so as to help improve the employability of students.

In order to improve the work maturity and experiences of students, Japan has used workplace experience methods to cultivate occupational consciousness in areas such as student views on labor, occupations, and social responsibility (Kucel, Róbert, Buil, & Masferrer, 2016; Kwong, & Thompson, 2016). Advanced countries of the world such as the United States, United Kingdom, Europe, Australia, and Canada are also working to promote entrepreneurial education. It has been shown that the gap between student learning and utility is decreased through theoretical know-how and by practicing the learning contents (Lanero, Vázquez, & Muñoz-Adánez, 20151). The European Union assists students to use internships, and more than 200,000 high school students have established student companies to learn entrepreneurial skills, comprising 15% of the population (Lanero, Vázquez, & Muñoz-Adánez, 2015; Miao, Qian, & Ma, 2016). Singapore uses the entrepreneurial university model to recommend students for one-year internships in overseas high-tech companies. At the same time, students learn entrepreneurial courses at partner universities through strategic alliances, which allow the students to be apprentices in tech companies while learning about corporate entrepreneurship, foreign culture, and global economic knowledge (Kucel, Róbert, Buil, & Masferrer, 2016; Kwong, & Thompson, 2016; Miao, Qian, & Ma, 2016).

An overview of internship education in the West and Japan shows that it is still mainly based on experiential learning. In Singapore, even though students take entrepreneurial education courses during internships, there are no entrepreneurial courses or cultivation of the entrepreneurial spirit and abilities such internships. Other than general basic courses, internship education courses should also include entrepreneurial courses that allow students to engage in entrepreneurial learning and "learn by doing." This would benefit the cultivation of the entrepreneurial spirit and realize entrepreneurial motivation (Miao, Qian, & Ma, 2016; Nabi, Walmsley, Liñán, Akhtar, & Neame, 2016). Thus, the purpose of this study was to use dimensions such as educating about successful industrial entrepreneurs and experts to construct assessment indicators for the entrepreneurial cognition learned by university students in internship programs, to plan and incorporate entrepreneurial spirit and entrepreneurial cognition in internships, and to assist students in socializing entrepreneurial behavior.

**2. Purposes of this study**

The object of this study was to understand tertiary students' assessment indicators for the entrepreneurial learned by tertiary student of internship programs adjust Industry 4.0 that as a reference for course development and evaluation of abilities of entrepreneurs. The purposes of this study are to address the 3 following issues.

1. To analyse assessment indicators for the entrepreneurial learned by tertiary student of internship programs adjust Industry 4.0.
2. To induct types of entrepreneurial cognition learned by students of internship programs adjust Industry 4.
3. To analyse students' ability indicators that that had high importance and usage frequency of internship programs.

## 3. Methodology

### 3.1 Research method and subjects

In-depth interviews were used to understand the views of successful entrepreneurs on the cultivation of entrepreneurial cognition courses in domestic educational industrial internship programs, as well as the extent to which these traits are incorporated into internship programs. This study treated seven successful entrepreneurs with and internship backgrounds. For successful entrepreneurs in the , this study used individuals who had founded or were in charge of cultural enterprises and cram schools under the category "education and academics" in the Taiwan Bigbook, to explore how entrepreneurs conduct internship programs adjust Industry 4.0and feasible methods for on-site internships (Taiwan Business Directory Service 2013). This study used purposive sampling and snowball sampling to conduct in-depth interviews with seven entrepreneurs with more than five years of experience in entrepreneurship in order to depict the narrative nature of the entrepreneurial spirit and content of entrepreneurial cognition as given by entrepreneurs. The researcher used start-up experience, managerial experience and industry-specific experience in education as the focuses to construct the entrepreneurial cognition of entrepreneurs.

Focus groups were used to concentrate on the results of the in-depth interviews in order to confirm entrepreneurial cognition and the content of its incorporation in internship programs, as well as the educational content that should be constructed. This study used two entrepreneurs, internship institution representatives, internship advising teachers, industry teachers, and educational experts, for a total of 10 participants. The Kolmogorov-Smirnov One Sample Goodness of Fit Test was used to evaluate the expert's consistency in their views of entrepreneurial cognition.

### 3.2 Research tools and data analysis

The in-depth interviews were used to analyze the start-up experience, managerial experience, and industry-specific experience of entrepreneurs in the , in order to confirm the abilities that internships program adjust Industry 4.0 should have. The interview questions included the entrepreneurial motivation of the entrepreneurs and the entrepreneurial cognition and elements for entrepreneurs in entrepreneurship. The in-depth interview data was processed using protocol analysis and ATLAS.ti qualitative analysis software to complete the data encoding and analysis. Three encoders used encoder reliability to test the reliability (Wimmer and Dominick 2000). The questions in the interview outline included:

(1) Are the items in entrepreneurial cognition suitable for students in internship programs?
(2) Is the bidirectional detailed list in entrepreneurial cognition suitable for students in internship programs?
(3) Is the content of the items in entrepreneurial cognition clear for students in internship programs?
(4) Are the ability levels in entrepreneurial cognition suitable for students in internship programs?
(5) Can the items in entrepreneurial cognition reflect the current circumstances for students in internship programs?

After the documentary analysis and in-depth interviews, all the necessary entrepreneurial knowledge indicators were converted to the "Checklist of entrepreneurial cognition that should be possessed by students in internship programs adjust Industry 4.0", after which focus group symposia were held to confirm the required entrepreneurial knowledge items and create a catalogue of the abilities in entrepreneurial cognition that should be present in internship programs. The data analysis and statistical procedures used in this study were frequency distribution and the K-S single-sample fit test, in order to understand the consistency of samples for the descriptions of various abilities. The statistical significance level of this study was set at 0.05.

## 4. Results

### 4.1 Entrepreneurial cognition items that should be cultivated in internship programs adjust Industry 4.0

The entrepreneurial cognition items that should be cultivated in internship programs adjust Industry 4.0included the three major areas of start-up experience, industry-specific experience, and managerial

experience, with a total of 91 items. The content is shown in Table 1. There were 12 items for entrepreneurial cognition ability, 13 items for entrepreneurial traits, eight items for basic commercial ability, eight items for communication ability, four items for digital ability, ten items for professional innovative ability, nine items for financial management ability, eight items for human resources management ability, nine items for marketing management ability, 15 items for operational (work) ability, and five items for risk management ability.

Table 1. Entrepreneurial cognition indicators that should be possessed by students in internship programs.

| Target level | Objective level | Trait level | Indicator level | Single-sample K-S fit test Z value | Importance | Frequency |
|---|---|---|---|---|---|---|
| **A. Start-up experience** | A1 Entrepreneurial cognition ability | A1-1 Evaluate entrepreneurial opportunities | ● Understand the developmental trends of the industry. | 1.45* | H | L |
| | | | ● Produce entrepreneurial ideas. | 1.89* | H | H |
| | | | ● Analyze the feasibility of entrepreneurial ideas. | 1.56* | H | H |
| | | A1-2 Evaluate market trends | ● Describe factors that should be considered in entrepreneurship. | 1.99* | H | L |
| | | | ● Analyze the tools necessary to make money in entrepreneurship. | 1.89* | H | H |
| | | | ● Describe usable resources in entrepreneurship. | 1.56* | H | H |
| | | A1-3 Fundraising | ● Estimate the amount of funds needed for entrepreneurship. | 1.65* | H | L |
| | | | ● Plan the source of entrepreneurial funds. | 1.45* | H | L |
| | | | ● Describe how entrepreneurial funds would be raised. | 1.89* | H | L |
| | | | ● Determine human resource needs and conditions. | 1.56* | H | L |
| | | A1-4 Equipped with knowledge of relevant industrial and commercial regulations | ● Industrial and commercial regulations. | 1.89* | H | L |
| | | | ● Fire safety regulations. | 1.56* | H | L |
| | A2 Entrepreneurial traits | A2-1 Leadership | ● Eagerness to accept new innovation and suggestions. | 1.99* | H | H |
| | | | ● Approval of hard work by others. | 1.89* | L | L |
| | | | ● Guiding others in using positive narratives. | 1.56* | L | L |
| | | A2-2 Bearing risks | ● Evaluating investment risks. | 1.45* | H | H |
| | | | ● Establishing business strategies. | 1.89* | L | L |
| | | | ● Authorizing at suitable times. | 1.56* | L | L |
| | | A2-3 Innovativeness | ■ Teaching and learning about psychology. | 1.52* | H | H |
| | | | ● Classroom management. | 1.88* | H | H |
| | | | ● Student management practice. | 1.76* | H | H |
| | | A2-4 Proactiveness (love, patience) | ● Honesty, integrity, and responsibility. | 1.52* | H | H |
| | | | ● Describing character traits of entrepreneurs in the industry. | 1.88* | H | L |
| | | | ● Creating a personal professional image. | 1.89* | H | L |
| | | | ● Time management and establishing personal goals in career development. | 1.56* | H | H |
| **B. Industry specific experience** | B1 Basic commercial ability | B1-1 Having the concepts of corporate management | ● Describing the characteristics and importance of corporate ethics. | 1.45* | L | L |
| | | | ● Understanding concepts of financial management. | 1.89* | H | L |
| | | | ● Understanding concepts of risk management. | 2.01* | H | L |
| | | | ● Understanding basic concepts of strategic management. | 1.47* | H | L |
| | | B1-2 Having concepts in marketing | ● Understanding the functions of marketing management. | 1.88* | H | H |
| | | | ● Understanding the characteristics of service management. | 1.76* | H | H |
| | | | ● Describing forms of commercial activity in | 1.45* | H | L |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | relevant industries. | | | |
| | | | ● Explaining the opportunities for industries to create additional value. | 1.89* | L | L |
| | B2 Communication ability | B2-1 Text communication | ● Writing business letters. | 1.88* | L | H |
| | | | ● Giving employees work guidance. | 1.89* | H | H |
| | | | ● Holding efficient employee meetings. | 1.56* | L | L |
| | | B2-2 Interpersonal relations | ● Listening. | 1.42* | H | H |
| | | | ● Telephone communication skills. | 1.32* | H | H |
| | | | ● Conducting oral briefings. | 1.66* | H | H |
| | | B2-3 Communication ethics | ● Developing different types of clientele. | 1.76* | H | L |
| | | | ● Stress management. | 1.45* | H | H |
| | B3 Digital ability | B3-1 Basic computing ability | ● Producing basic webpages. | 1.42* | L | L |
| | | | ● Operating computer accessories. | 1.32* | H | H |
| | | B3-2 Computer application ability | ● Maintaining customer consumption records. | 1.61* | H | H |
| | | | ● Maintaining consumption and transaction records for the day. | 1.50* | H | H |
| | B4 Professional innovative ability | B4-1 Product innovation | ● Developing a good educational human resource development system. | 1.88* | H | L |
| | | | ● Installing a professional academic advancement competition system | 1.89* | H | H |
| | | | ● Establishing a system to guarantee customer service quality. | 1.56* | H | L |
| | | B4-2 Technical innovation | ● Innovation in educational recruitment. | 1.78* | H | H |
| | | | ● Teaching innovation. | 1.90* | H | H |
| | | | ● Curricular innovation. | 1.29* | H | H |
| | | | ● Performance auditing. | 1.34* | H | L |
| | | B4-3 Service innovation | ● Having a convincing educational position. | 1.61* | H | H |
| | | | ● Possessing a profit base for education. | 1.54* | H | H |
| | | | ● Evaluating learning effects. | 1.71* | H | H |
| **C. Managerial experience** | C1 Financial management ability | C1-1 Fund management | ● Able to estimate needs for cash flow. | 1.26* | H | L |
| | | | ● Able to read an asset and liabilities chart. | 1.92* | H | L |
| | | | ● Able to read an income statement. | 1.47* | L | L |
| | | C1-2 Product purchase, sales, and inventory management | ● Supervising and becoming familiar with accounting procedures. | 2.18* | L | L |
| | | | ● Explaining the concept of opportunity cost. | 1.83* | L | L |
| | | | ● Describing price concepts. | 1.41* | H | L |
| | | C1-3 Cost-benefit analysis | ● Describing cost-benefit analysis. | 1.78* | L | L |
| | | | ● Evaluating factors that affect operational risks. | 1.89* | H | H |
| | | | ● Understanding tax-saving measures. | 1.55* | H | H |
| | C2 Human resource management ability | C2-1 Human resource management | ● Developing human resource rules for companies. | 1.36* | H | L |
| | | | ● Developing benefit and incentive systems. | 1.72* | H | H |
| | | C2-2 Human resource development | ● Interviewing jobseekers. | 1.83* | H | H |
| | | | ● Interviewing people leaving positions. | 1.88* | L | L |
| | | | ● Developing a team spirit. | 1.79* | H | L |
| | | | ● Establishing work teams. | 1.65* | H | L |
| | | C2-3 Human resource management | ● Implementing employee education and training. | 1.78* | H | H |
| | | | ● Evaluating employee performance. | 1.46* | H | H |
| | C3 Marketing management ability | C3-1 Sales ability | ● Determining products or services that satisfy customer needs. | 1.69* | H | H |
| | | | ● Planning product combinations. | 1.76* | L | H |
| | | | ● Determining market differentiation. | 1.45* | H | H |
| | | | ● Choosing target markets. | 1.67* | H | L |
| | | | ● Executing market analysis. | 1.88* | H | L |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | C3-2 Promotional ability | ● Establishing marketing strategies. | 1.79* | H | H |
| | | | ● Establishing customer relations. | 1.65* | H | H |
| | | C3-3 Pricing ability | ● Computing costs for advertising media. | 1.90* | H | H |
| | | | ● Pricing strategies. | 1.29* | H | H |
| | C4 Operational (work) ability | C4-1 Target market management | ● Choosing store locations. | 1.56* | H | L |
| | | | ● Naming and registering a store. | 1.79* | H | L |
| | | | ● Determining decorating ideas. | 1.34* | H | L |
| | | | ● Planning service paths at the business location. | 1.78* | H | L |
| | | C4-2 Customer service | ● Standardizing service procedures. | 1.91* | H | H |
| | | | ● Maintaining instruments, equipment, and machinery. | 1.80* | L | H |
| | | | ● Managing product inventory. | 1.44* | L | L |
| | | | ● Implementing quality improvement techniques. | 1.69* | H | H |
| | | C4-3 Daily operations management | ● Implementing analysis of competitors. | 2.07* | H | H |
| | | | ● Predicting monthly and annual sales. | 1.85* | L | L |
| | | | ● Developing tax-saving strategies. | 1.67* | H | L |
| | | C4-4 Strategic planning | ● Establishing company operational targets and missions. | 1.60* | H | H |
| | | | ● Implementing SWOT analysis. | 1.76* | H | H |
| | | | ● Developing strategies to enter markets. | 1.62* | H | H |
| | | | ● Developing strategies to withdraw from markets. | 1.77* | L | L |
| | C5 Risk management ability | C5-1 Property and personnel safety | ● Explaining methods of how to transfer risks. | 1.36* | L | L |
| | | C5-2 Disaster management | ● Understanding related legal knowledge. | 1.89* | L | L |
| | | | ● Human and material resource management. | 1.47* | L | L |
| | | C5-3 Dealing with emergencies | ● Ability to deal with emergencies. | 1.62* | H | H |
| | | | ● Safety management of students. | 1.36* | H | H |

Note: H, L refer to the importance (frequency) in entrepreneurial cognition; H indicates highly important (high usage frequency); L indicates not important (low usage frequency).

### 4.2 Core entrepreneurial cognition that should be cultivated in university internship programs

The core entrepreneurial cognition that should be cultivated in industry internship programs adjust Industry 4.0were described based on their importance and usage frequency, as shown below in Figure 1:

(1) The internship programs should cultivate 48 high importance and usage frequency ability items in entrepreneurial cognition, among which 11 refer to start-up experience, 17 refer to industry-specific experience, and 20 refer to managerial experience. The high importance and usage frequency ability items are generally entrepreneurial traits and professional innovative ability, followed by marketing management ability and operational (work) ability.

(2) The internship programs should cultivate 31 high importance and low usage frequency ability items in entrepreneurial cognition, among which 10 refer to start-up experience, eight refer to industry-specific experience, and 13 refer to managerial experience. The high importance and low usage frequency ability items are generally entrepreneurial cognition abilities, followed by operational (work) ability and basic commercial ability.

(3) The internship programs should cultivate three low importance and high usage frequency items in entrepreneurial cognition, among which one refers to industry-specific experience and two refer to managerial experience. The low importance and high usage frequency items are communication ability, marketing management ability and operational (work) ability.

(4) The internship programs should cultivate 19 low importance and usage frequency items in entrepreneurial cognition, among which four refer to start-up experience, four refer to industry-specific experience, and 11 refer to managerial experience. The low importance and usage frequency items are entrepreneurial traits and financial management ability, followed by operational (work) ability and risk management

ability.

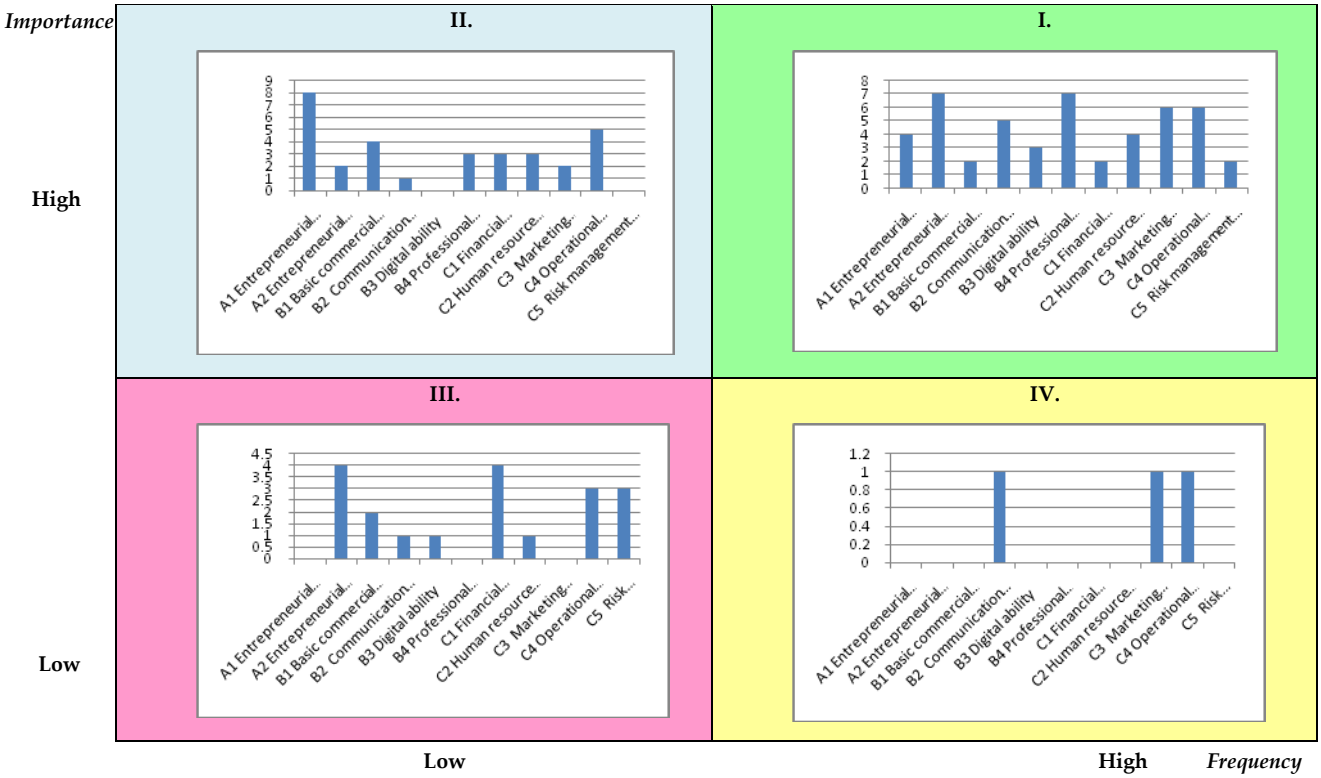


Figure 1. Importance and frequency of entrepreneurial cognition assessment indicators in university internship programs.

## 5. Conclusions

The above research showed that the entrepreneurial cognition assessment indicators of internship programs adjust Industry 4.0included the three types of start-up experience, industry-specific experience, and managerial experience, with a total of 91 items. However, according to the actual results, internship programs adjust Industry 4.0should cultivate 48 high importance and usage frequency items in entrepreneurial cognition, among which 11 referred to start-up experience, 17 referred to industry-specific experience, and 20 referred to managerial experience. The high importance and usage frequency ability items were generally entrepreneurial traits and professional innovative ability, followed by marketing management ability and operational (work) ability.

Through internship programs, university students can learn the entrepreneurial cognition perspective. Entrepreneurship is an activity that requires massive amounts of internal and external network resources. In initiating entrepreneurship, entrepreneurs will devote themselves to constructing social networks that benefit the development of their new business and use these network relationships to elevate the probability of success in their business. Industry-specific experience accumulated in the entrepreneurial process will be very helpful to entrepreneurs in the continued discovery of business opportunities and in promoting the growth of the new business (Pfeifer, Šarlija, & Sušac, 2016; Uy et al.,2015; Weinberger, 2016).

The resources and abilities accumulated by start-up experience are not only unique but are also irreproducible. Receiving training in start-up experience will strengthen an individual's ability to make decisions about issues under the context of great uncertainty and time pressure (Pfeifer, Šarlija, & Sušac, 2016; Shinnnar, , Hsu, & Powell, 2014). MThe study also found that management experience has the content of service market and market knowledge, and that industry-specific experience is also closely connected to customer issues and market knowledge. The special experiences of entrepreneurs can elevate the ability to withstand uncertain

risks, allowing them to be more likely to perceive market opportunities and take risks in grasping business opportunities (Shirokova., Osiyevskyy, & Bogatyreva, 2015; Xaver & Ann, 2016).
For students who want to become corporate owners, entrepreneurial education is necessary, among which entrepreneurial operational and marketing tools, as well as experiential learning activities and networking opportunities, are important parts of internship programs adjust Industry 4.0 (Xaver & Ann, 2016; Zhang et al., 2016). Zhang et al. (2016) believed that entrepreneurial education courses should include commercial economy and performance, management and law, personnel studies, and small business and retail management.

In terms of the content of entrepreneurship-embedded internships, the real content to be learned is the habits of entrepreneurs (Francisco, Moriano, & Jaén, 2016). Through school internship programs, students can cultivate the potential traits of entrepreneurs, entrepreneurial beliefs, and perceptions of entrepreneurial skills, thus enabling them to express entrepreneurial cognition (Cho, Robalino, & Watson, 2016; Fukuda, 2014; Weinberger, Patry, & Weyringer, 2016).

Weinberger et al. (2016) pointed out that in order to help student employment and the competitiveness of the employment market, teachers, educational institutions, and students need to establish a balanced structure with the employment market. In order to satisfy the different demands of employers and employment, teachers need to use more methods in entrepreneurial instruction, in order to guide students to realize their adventurous spirits. Uy et al. (2015) found that the planning of internship programs, industrial participation, and student commitment produces active influences on the overall satisfaction with the internship experience. Pfeifer et al. (2016) believed that the demand of the employment market comes from the lack of important abilities and transferable skills.

**6. Implications**

For schools planning internship programs, such programs should cultivate three categories in entrepreneurial cognition, with a total of 91 items. These items can be used when, under the arrangement and guidance of schools, students go to public and private organizations involved in the to engage with workplace personnel and customers for educational and learning activities with real contact, in order to engage in occupational experiences and actual labor and work (Denise, 2015;Miao, Qian, & Ma,2016; Nabi, 2016). The learning dimensions in entrepreneurial ability include: (1) start-up experience, which refers to technical innovations, core technical innovations, operational methods, and the creation of new value in the ; (2) managerial experience, which refers to product innovation, product operational methods in the , service innovations and the creation of new values in the ; and (3) industry-specific experience, which refers to having a customer-orientation in the and perceiving the customer needs of student parents and ways to satisfy them. Thus, entrepreneurship-embedded internship course development should first offer basic core entrepreneurial courses to students so they can have a foundational understanding for entrepreneurship.

For the incorporation of internship programs adjust Industry 4.0in schools, this study found 11 items in start-up experience, 17 items in industry-specific experience, and 20 items in managerial experience that had high importance and usage frequency. The entrepreneurial spirit that should be learned by students in internship programs adjust Industry 4.0should be defined as students being able to explore the entrepreneurial perception for market opportunities in the , bear risks, and use operational and management strategies. internship programs adjust Industry 4.0guide students and allow them to come into contact with entrepreneurs or managers, and the interpersonal interactions and real operations of internships can help students deeply understand possible problems in the entrepreneurial process.

For the implementation of internship programs adjust Industry 4.0by schools, in regards to the entrepreneurial traits and professional innovative ability with high importance and usage frequency, students can use internship work activities to learn entrepreneurial skills and experiences relating to the occupations and engage with different people such as entrepreneurs and managers, in order to experience the entrepreneurial process and management method of the . Such actions can also inspire entrepreneurial intentions and the

ability to act and understand the educational knowledge, skills, and necessary abilities in internship programs, thus creating an entrepreneurial life that trains students to become entrepreneurs or persons in charge of the.

**Acknowledgement**

This paper was written while the authors were supported by a grant from the National Science Council, R.O.C. (NSC 105-2511-S-224-001-MY3)

**References**

Castillo-Vergara, M. & Álvarez-Marín, A. (2016). Entrepreneurship perception in higher education. A comparative study among Tertiary students, faculty members and directors. *Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud, 14*(1), 221-233.

Chou, C.M., & Shen, C.H. (2015). Tertiary tertiary students' entrepreneurship learning socialization: Factor analysis and structural equation modeling. *International Journal of Psychology and Educational Studies,* 2(3), 32-38.

Cho, Y., Robalino, D., & Watson, S. (2016). Supporting self-employment and small-scale entrepreneurship: potential programs to improve livelihoods for vulnerable workers. *IZA Journal of Labor Policy,* 5(7). doi: 10.1186/s40173-016-0060-2

Denise, J. (2015). Employability skill development in work-integrated learning: Barriers and best practice. *Studies in Higher Education,* 40(2), 350–67.

Francisco, L., Moriano, J., & Jaén, I. (2016). Individualism and entrepreneurship: Does the pattern depend on the social context? *International Small Business Journal.* doi:10.1177/0266242615584646

Fretschner, M. & Weber, S. (2013). Measuring and Understanding the Effects of Entrepreneurial Awareness Education. *Journal of Small Business Management,* 51 (3), 410–428.

Fukuda, K. (2014). An empirical study on entrepreneurial intentions among Japanese university tertiary students. *International Journal of Entrepreneurship and Small Business,* 21(2), 216-230.

Heinrichs, K. (2016). Dealing with Critical Incidents in the Postformation Phase: Design and Evaluation of an Entrepreneurship Education Course. *Vocations and Learning, 9*(3), 257-273.

Kucel, A., Róbert, P. Buil, M., & Masferrer, M. (2016). Entrepreneurial skills and education: Job matching of higher education graduates. *European Journal of Education, 51*(1), 73-89.

Kwong, C. & Thompson, P. (2016). The when and why: Student entrepreneurial aspiratons. *Journal of Small Business Management, 54*(1), 299-318.

Lanero, A. Vázquez, J.L., & Muñoz-Adánez, A. (2015). A social cognitive model of entrepreneurial intentions in university tertiary students, *Psychology and Learning College Tertiary Students,* 31, 243-259.

Miao, C., Qian, S., & Ma, D. (2016). The relationship between entrepreneurial self-efficacy and firm performance: A meta-analysis of main and moderator effects. *Journal of Small Business Management*. doi:10.1111/jsbm.12240

Nabi, G., Walmsley, A. Liñán, F., Akhtar, I., & Neame, C. (2016). Does entrepreneurship education in the first year of higher education develop entrepreneurial intentions? The role of learning and inspiration, *Studies in Higher Educatio*n, 1-16. doi:10.1080/03075079.2016.1177716

Niesen, T., C. Houy, Fettke, P. & Loos, P. (2016). 'Towards an integrative big data analysis framework for data-driven risk management in industry 4.0. Proc. 49th Hawaii Int. Conf. Syst. Sci. (HICSS), 5065–5074.

Pfeifer, S., Šarlija, N., & Sušac, M.Z. (2016).You have free access to this content shaping the entrepreneurial mindset: Entrepreneurial intentions of business tertiary students in Croatia. *Journal of Small Business Management*, 54 (1), 102-117.

Shinnnar, R.S., Hsu, D.K., & Powell, B.C. (2014). Self-efficacy, entrepreneurial intentions, and gender: Assessing the impact of entrepreneurship education longitudinally. *The International Journal of Management Education*, 12(3), 561-570.

Shirokova G., Osiyevskyy, O., & Bogatyreva. K. (2015). Exploring the intention-behavior link in student entrepreneurship: Moderating effects of individual and environmental characteristics. *European Management Journal.* doi:10.1016/j.emj.2015.12.007

Taiwan Business Directory Service. 2013. *Taiwan bigbook.* http://www.bigbook.com.tw/class.asp?class=03 (July 2012).

Uy, M.A., Chanb, K.Y., Samc, Y.L., Ho, M.R., & Chernyshenko, O.S. (2015). Proactively, adaptability and boundary less career attitudes: The mediating role of entrepreneurial alertness. *Journal of Vocational Behavior,* 86,115–123.

Weinberger, A., Patry, J.L., & Weyringer, S. (2016). Improving Professional Practice through Practice-Based Research: VaKE (Values and Knowledge Education) in University-Based Teacher Education. *Vocations and Learning, 9*(1), 63-84.

Xaver, N. & Ann, M. (2016). Entrepreneurial thinking in interdisciplinary student teams. *Advances in Engineering Education,* 5(1), 1-20.

Zhang, D., J. Wan, C.H., Hsu, R., & Rayes, A. (2016). 'Industrial technologies and applications for the Internet of Things. *Computer Netw, 101*,1–4.