CHAPTER I
INTRODUCTION

I.1. Background

Department of Chemical Engineering, Faculty of Engineering, Widya Mandala Catholic University Surabaya oblige its entire student to have internship experience as a requirement to graduate also as part of the student quality improvement program. In this program, students may choose a public or private company as their internship place. Students also have the opportunity to internship aboard in National Taiwan University of Science and Technology (NTUST) Taiwan, National Chung Cheng University (NCCU) Taiwan, and De La Salle University Dasmarinas Philippine. In 2018 Department of Chemical Engineering, Faculty of Engineering, Widya Mandala Catholic University Surabaya collaborate with CTCI Advanced System Inc. Taiwan to provide new internship experience aboard a company.

The purposes of internship aboard program provide an opportunity for the student to experience overseas work environment including the culture and language, to get mindset and scope of work life in office especially in multi-national company, to develop adaptation skill of student into all new environment. This program is beneficial for undergraduate students to face incoming challenges of globalization era.

CTCI Advanced System Inc. (CTCI ASI) is a subsidiary company of CTCI, largest engineering group in Taiwan. CTCI ASI provides modern industry 4.0 system such as intelligent energy management system, industrial internet of things, smart E&M for railway transportation. CTCI ASI becomes an excellent place for the internship because CTCI ASI is industry 4.0 system designer and provider, where various company system is designed. Inside the company, we can learn the process of system making despite only part of its long process.

I.2. CTCI Advanced System Incorporation

I.2.1. Company History

CTCI was founded in 1979, is a leading engineering, procurement, and construction (EPC) company in Taiwan. With years of experience working with many system service company, In 1987, CTCI established Advanced Control & System Incorporation (ACS), as its own system service company with service scope includes communication, control detailed design, and system integration. In 2015, ACS changed its name into Advanced System Incorporation (ASI).

I.2.2. Company History: Brief Timeline

- 1988: The first chemical process dynamic simulator in Taiwan was published.
- 1995: Kaohsiung branch was established & Mr.Safety, a product of hazard analysis
      Module system was published.
- 1999: Developed the artificial neural network design software – ANNDOE.
- 2000: SIMACS 2000 Dynamic Process Simulator released.
- 2001: Developed the information integrating and monitoring platform (ScadACS).
- 2002: ► ACS stocks listed on OTC (over-the-counter) market
      ► Xiamen (Shanghai) was established.
- 2007: Obtained the information services development plan of the Industrial
      Development Bureau of the Ministry of Economic Affairs on the export of Advanced
      Process Solutions.
- 2008: Obtained CMMI Level 3 certification.
- 2010: Mr.Safety, the safety and risk assessment software was published.
- .2012: Mr.Energy 50001, energy management system software was published.
- 2013: Power Monitor, power monitoring system was published.
- 2016: ►Obtained ISO 14001 (environment protection) and OHSAS18001
      (occupational health and safety assessment) Certifications.
      ► Obtained Corporate Sustainability Report (2015) Certified with AA1000 and
      GRI G4 Standards by British Standards Institution.
- 2017: ►Obtained ISO-9001 2015 quality assurance certification
      ►Advanced Control System Inc. changed its name into Advanced System
        Incorporation (ASI).

II.2.3. Company Profile

Figure I. 1. CTCI ASI Company Logo

CTCI Advanced System Inc. is an industrial intelligent services provider established by CTCI to satisfy the Industry 4.0 demand. CTCI ASI business includes Main Automation Contractor (MAC), intelligent manufacturing, transportation system solutions, electrical & mechanical works, and solution sales. CTCI ASI keeps developing new intelligent manufacturing technology to improve production performance, energy savings, plant safety, reduction in emission and cost through. With years of experience, CTCI ASI has been trusted by Taiwan government to take part in the construction of public facilities such as MRT line and airport.

CTCI ASI has the motto "Discover Reliable". It contains vision from CTCI as largest engineering group in Taiwan to become the world's most reliable engineering services provider. Six concepts what makes CTCI ASI reliable: safer & healthier workplaces, cooperation, smart engineering, ensure high quality, pushing technical boundaries and global responsiveness.

CTCI ASI obtains several certifications to ensure delivering services with global standard quality. CTCI ASI got OHSAS 180001:2007, a health and safety management certification as part of the manifestation of "Discover Reliable" motto. As part of Taiwan's policy to keep on environmental sustainability, ASI also got ISO 14001:2015, an environmental management certification. One of the proofs of "Discover Reliable", CTCI ASI also got ISO 9001:2015, a quality management certification. CTCI ASI obtained CMMI Maturity Level 3 as a sign of 'maturity' on software and system company.

Overall Ranking in the Top 650 Service Enterprises

Company	2016	2017
CTCI Corporation	24	25
ECOVE Environment Corporation	250	256
ECOVE Environmental Services Corporation	358	350
CTCI Machinery Corporation	403	389
CTCI Smart Engineering Corporation	286	408
CTCI Advanced Systems Inc.	624	582

Ranking by Profitability in the Top 650 Service Enterprises

By Profitability	Company	2016	2017
Top 50 Most Profitable Companies(net profit after tax)	CTCI Corporation	28	22

Ranking by Sector in the Top 650 Service Enterprises

By Sector	Company	2016	2017
Contractor	CTCI Corporation	1	1
Contractor	CTCI Machinery Corporation	42	39
Contractor	CTCI Smart Engineering Corporation	31	41
Environmental Service	ECOVE Environmental Services Corporation	3	2
Investment Holding Company	ECOVE Environment Corporation	8	8
IT Equipment Sales and Services	CTCI Advanced Systems Inc.	42	33

Figure I. 2. CTCI Group National Taiwan Company Rank

CTCI ASI gets many awards since its establishment. CTCI ASI's achievements for the last five years are as follow :

✓ Selected to 2011 Top 500 Service Enterprises by CommonWealth Magazine, and ranked No. 32 in IC Distributor and Service Industry (2012).

✓ Awarded "One-Star Happiness Enterprise" from Department of Labor, Taipei (2013).

✓ The first Taiwan MITTELSTAND Award and Counselling Targets (2013).

✓ Label A of Taipei City Government Hiring disable employees (2013).

✓ Awarded the "Information Disclosure and Transparency Ranking A++" on Taiwan Stock Exchange (TWSE) listed of the 10th edition (2013).

✓ Excellent Company of Industry-Academic Cooperation (2014).

✓ Awarded the "Information Disclosure and Transparency Ranking A++" on Taiwan Stock Exchange (TWSE) listed of the 11th edition (2014).

✓ Awarded the "Information Disclosure and Transparency Ranking A++" on Taiwan Stock Exchange (TWSE) listed of the 12th edition (2015).

✓ Awarded the 1st edition of the Corporate Governance Evaluation TOP 5% on the Taiwan Stock Exchange (TWSE) OTC (2015).

✓ Awarded "Distinguished Construction and Business Institution Award" from the Chinese Institute of Engineers (2015).

✓ Awarded the 2nd edition of the Corporate Governance Evaluation TOP 5% on the Taiwan Stock Exchange (TWSE) OTC (2016).

✓ Awarded the 3rd edition of the Corporate Governance Evaluation TOP 5% on the Taiwan Stock Exchange (TWSE) OTC (2017).

✓ Awarded "Corporporate Sustainability Report – Top 50 of a gold medal for the service industry" from TCSA.

CTCI ASI's recent notable project as follow :

- Instrumentation and control system engineering for methyl methacrylate (MMA) and polymethyl methacrylate (PMMA) in Saudi Methacrylates Company (SAMAC) (Progressing)

- OPTC T9/T10 plant SmartPlant P&ID system implementation (Progressing).

- Linkou Ultra-Supercritical 2400 MW coal-fired power plant. The first USC technique in Taiwan (2014).

- Taichung MRT green line signaling system installation (Progressing)

- Taipei MRT SongShan XinYi line power remote control system (2014).

- Tapei MRT SongShan XinYi line passenger information display system (2014).

- Airfield ground lighting upgrade and Taxiway NV renovation as a backup runway, Taiwan Taoyuan International Airport (Progressing).

- Baggage handling system upgrade work in departure/arrival area, Taiwan Taoyuan International Airport (2015).

II.2.4. CTCI ASI's Services and Products

II.2.4.1. CTCI ASI's Services

CTCI ASI's services target markets are hydrocarbon, power plant, industry, transportation, aerospace, and high technology related. Services provided by CTCI ASI as following :

- Main Automation Contractor (MAC)

    CTCI ASI provide in-depth technical installation and integration system such as instrument installation engineering service, control system engineering service, system revamping engineering service, advanced process control system, dynamic simulation system, supervisory control and data acquisition system, calibration and loop test work, real-time database and plant information, and transportation & storage of oil and gas.

- Smart Electrical & Mechanical (E&M)

    Smart Electrical & Mechanical had been the highest percentage of CTCI ASI's revenue in 2017. ASI has been involved in Taipei MRT systems for years. Given services such as railway signaling system, railway station/depot local control system, railway ATS customization service, and passenger information display system. CTCI ASI also assists airport system such as airport baggage handling system, airport airfield runway electrical, advanced visual docking guidance system, aviation simulator electrical and mechanical, and satellite telemetry and operation instruction. CTCI ASI's Smart E&M also serve industry especially the high tech one such as electronic and biotech plants. Smart E&M industry major items are facility management and control system, production equipment central monitoring system, and advance HVAC control system.

- Intelligent Manufacturing

    CTCI ASI combined process simulation and IT systems that look after process plant' production and sustainability. Intelligent manufacturing services try to achieve a

6

balance between safe energy consumption with high production efficiency. There are four categories of services. They are processed optimization (P), energy saving and waste reduction (E), facility reliability (M), and plant safety and emergency planning (S). Detailed intelligent manufacturing services as below :

(P) Process Optimization

- o   Process simulation and optimization service.

- o   Package equipment optimization design.

- o   AspenTech smart solution.

- o   Process and utility operation guide system.

(E) Environment

- o   Compressor parallel energy saving

- o   Outdoor air conditioner energy saving operation

(M) Maintenance / Facility Reliability

- o   SmartPlant P&ID intelligent solution.

- o   Plant EPC projects engineering information and management solutions.

- o   Visualize plant's engineering information management solutions.

(S) Plant Safety and Emergency Planning

- o   Process safety and risk analysis.

- o   Corrosion Inspection and Failure Analysis.

- Industry Internet of Things (IIoT)

    Smart equipment, data gathering, the internet can be combined into intelligent system services. IIoT has benefits such as optimization process, early detection of an abnormal event, careful supervision. IIoT solutions offered by CTCI are Smart Water, Cyber Security, and Rotary Machine Predictive Maintenance Platform. All of them utilize the internet as a medium of data storage from the sensor then processing and signaling

for the example for Rotary Machine Predictive Maintenance Platform use the sound camera and vibration sensors to collect sound and vibration data of rotary machines, then analyze machine condition with particular logarithms. The system will give an alert if abnormal sound or vibration occurs.

II.2.4.2. CTCI ASI's Products

Beside intelligent services, CTCI ASI also provides various products in the form of software. Self-made CTCI ASI's software is Mr.Energy 50001 for energy management system that matches ISO 50001 international standard, Mr.Safety for Hazard Operational and risk management, and Mr. PSM for a process safety management system that meets the OSHC Law on "Regular Implementation Methods for Process Safety Assessment". CTCI ASI also sells industry related software made by another company. CTCI ASI is the only trade license holder for Integraph and AspenTech software. A bestseller for Integraph software is SmartPlant P&ID for e-P&ID (piping and instrumentation diagram) and Integraph Smart 3D for plant 3D design. AspenTech software is related to process simulation with the unit operation and optimization such as Aspen Plus for the mainstream process, Aspen Polymers for polymer manufacturing process, and Aspen HYSYS for petroleum refining. Basic of Integraph Smartplant P&ID and Aspen Plus are covered in this internship report.

II.2.5. CTCI ASI's Office Location

CTCI ASI headquarter address is Nangang Road Sector 3, No.52, 5th Floor, Taipei, Taiwan. CTCI ASI office divided into three floors of 2 separate building on the same office area. The main office is located on 5th floor of building A (left on the picture below), there are Intelligent Manufacturing I division, Industry Internet of Thing (IIoT) division, Accounting Division, and Human Resources division. Still, on the same building on the 4th floor, there is Intelligent manufacturing II division. Smart E&M division. On the 3rd floor of another building (right on the picture below), there is Advanced Automation Departement.

Figure I. 3. Building Office A

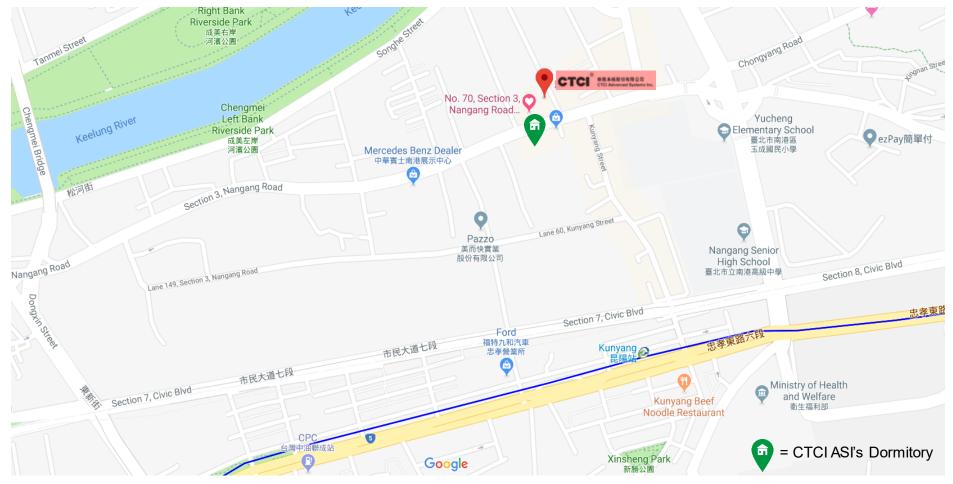**Figure I. 4. Office Area, Building A on left and Building B on right.**

Figure I. 5. CTCI Advanced System Inc. Location

II.2.6. Organization Structure

Organization structure of CTCI ASI has been changing a lot since its established, especially on department and division level. It was caused by changes in technological trends in industry 4.0 make CTCI ASI reconstruct its technical division to keep relevant. In 2017, CTCI ASI has 265 employees, 235 are R&D, and technical personnel and 30 are administrative staff.
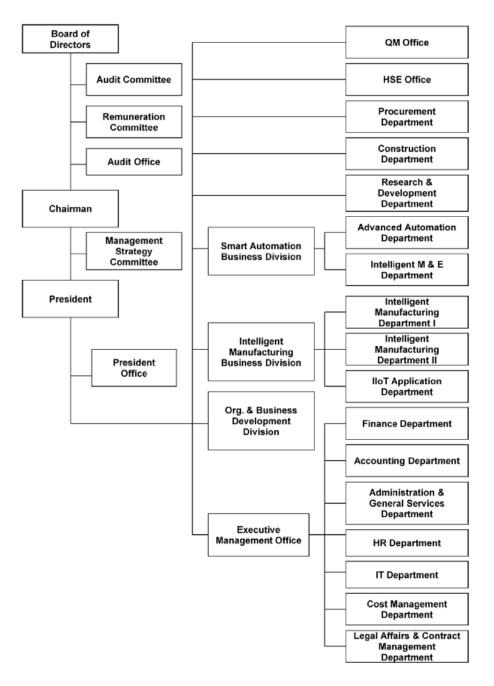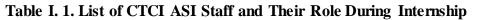

Figure I. 6. Structure Organization of CTCI ASI (2018)

I.3. Profile

The learning process of the authors during an internship in CTCI ASI cannot be separated from the support of several employees. The following list is the name of people who involved and their roles in this internship program.

Table I. 1. List of CTCI ASI Staff and Their Role During Internship

	陳振欽 **Chen-Chin Chen** Chairman CTCI Advanced Systems Inc.
	蘇宗寬 **Tsung-Kung Shu** Vice President CTCI Advanced Systems Inc.
	李亮三 **Liang-Sun Lee** Advisor of CTCI ASI The person in charge of the internship program regarding learning material
	張國峻 **Kuo-Chun Chang** Department Manager Intelligent Manufacturing Department The person in charge of the internship program regarding learning material in the IM1 Department
	胡啟華 **Stephen Hu** Department Manager Industrial Internet of Things Department The person in charge of the internship program regarding learning material in the IIoT Application Department

	張廷先 Ophelia Chang
	Engineer Intelligent Manufacturing Department I Chiesa's mentor in the first period of internship in learning Smartplant P&ID and Integraph
	黃樹琨 Roger Huang
	Engineer Intelligent Manufacturing Department I Chiesa's mentor in the second period of internship in learning Aspen Plus
	許哲豪 Seth Hsu
	Engineer Industrial Internet of Things Application Department Vania's mentor in the first month of internship
	葉洵揚 Bryant Yeh
	Engineer Intelligent Manufacturing Department I Chiesa's and Vania's mentor in learning Aspen Plus
	張文駿 Will Jang
	Engineer Intelligent Manufacturing Department I Chiesa's and Vania's mentor in learning Aspen Plus
	陳含玉 Hannah Chen
[No Picture]	Engineer Intelligent Manufacturing Department I Chiesa's and Vania's mentor in learning Aspen Plus

	楊婷雅 Tanya Yang Department Manager Human Resources Department The person in charge of the internship program regarding daily internship and life at CTCI ASI, Taiwan
	邱愉翔 Sherry Chiu Human Resources Department Staff The person in charge of the internship program regarding daily internship and life at CTCI ASI, Taiwan
	周雅真 Caren Chou Human Resources Department Staff The person in charge of the internship program regarding daily internship and life at CTCI ASI, Taiwan
	邱梅軒 Alice Chiu Human Resources Department Staff The person in charge of the internship program regarding daily internship and life at CTCI ASI, Taiwan
	Advisor Chu Presenter on regular training on PSM and risk assessment. Instructor in learning about refinery processes related to plant visit. Guide in 5th Naphtha Cracker Kaohsiung plant visit.
[No Picture]	Advisor Sun Instructor in learning about refinery processes related to plant visit Guide in 5th Naphtha Cracker plant visit