CTCI

Transformology

The Secret of How John Yu and His Team Built Trust

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Discover how CTCI emerged as a global top 100 and Taiwan's No.1 engineering brand—a remarkable journey through petrochemical, non-petrochemical, and high-tech industries.

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Foreword

Taiwan's Beacon, Relentlessly Surpassing Itself

Vincent Siew, Former Vice President of the Republic of China (Taiwan)

Amid rapid global economic changes, Taiwan's engineering services industry has also undergone significant challenges and transformations. Against this backdrop, CTCI Group's exceptional performance truly stands out. Founded with an initial donated fund of NT$450,000, it has grown into Taiwan's leading engineering services group and is ranked as the 55th largest globally. Their achievements, both domestically and internationally, represent not only the growth of a single company but also the broader progression of Taiwan's engineering services sector. These accomplishments hold great significance for Taiwan's engineering industry and its overall economic development.

CTCI began its journey in the petrochemical industry, significantly contributing to Taiwan's economic growth during the era of the "Ten Major Construction Projects." Over time, the company expanded into non-petrochemical sectors, including environmental services, electric power, transportation, general industries, and more recently, high-tech fields. I am particularly impressed by CTCI's contributions to building gas-fired power plants and LNG terminals, which have been pivotal to Taiwan's energy transition. Their early investment in waste management and development of modern incinerators also stand out as notable contributions. These initiatives have benefited the nation and demonstrate CTCI's foresight in adapting to industry trends.

I take great pride in CTCI's achievements and deeply admire Group Chairman John Yu's vision and leadership. My connection with Chairman Yu dates back to 2000 when I had just stepped down from the Executive Yuan and was invited to join the Foundation through Mr. Wei-De Liu, then-CTCI Foundation Chairman and my former superior at the Bureau of Foreign Trade. During that time, Chairman Yu left a lasting impression on me.

Chairman Yu's methodical and diligent approach was remarkable. Whenever assigned a task by Chairman Liu, he would take notes and execute it with unwavering commitment.

In early 2000, as CTCI Foundation was considering

its next leader, Chairman Liu consulted various advisors, including me. John Yu was the first name that came to my mind.

Observing CTCI's continuous transformation and growth, I believe Group Chairman Yu deserves immense credit. He possesses a far-reaching global vision and excels at identifying and nurturing talent. From his early efforts in collaborating with the government to enter the Saudi Arabian market, to expanding into Southeast Asia, the United States, and other regions, Group Chairman Yu has strategically built international partnerships. By emulating the success of global industry leaders and internalizing those lessons, he has driven CTCI's relentless self-improvement.

As the saying goes, "When the wind sweeps through, the grass bows." Under Group Chairman Yu's leadership, CTCI's employees have embraced a resilient, never-give-up spirit. This, combined with a corporate culture rooted in integrity and an uncompromising commitment to engineering quality, has enabled the company to achieve consistent success.

To me, CTCI's growth story is a testament to how a company can capture the pulse of its era, building a strong brand and technical expertise. From its early contributions to Taiwan's petrochemical boom to today's challenges

of digital transformation, low-carbon energy, and ESG imperatives, CTCI has consistently stayed ahead of the curve. With its unwavering dedication to engineering excellence and a global perspective, CTCI has earned the trust of clients worldwide.

From its humble beginnings, CTCI has turned into a thriving multinational group that continues to grow. I have no doubt that, with its visionary leadership, technical expertise, and global outlook, CTCI will continue to surpass itself, demonstrating Taiwan's engineering capabilities to the world.

Foreword

Harnessing the Formula for Success and Moving Forward

Wenent Pan, Chairman of CTCI Foundation

In 1959, visionary leaders K.T. Lee and Kai-Ying King brought together 23 public and private enterprises, including China Petroleum Corporation (CPC) and Taiwan Cement, to establish the CTCI Foundation with NT$450,000. The goal was to introduce foreign engineering technologies and nurture local talent.

The Foundation's growth has mirrored the development of Taiwan's economy. Later, in 1979, through the efforts of Mr. K.C. Wang and others, the business division was spun off to form CTCI Corporation.

I have known John Yu, CTCI's Group Chairman, for over 30 years, dating back to my tenure as CPC Corporation's Vice President.

In 1997, a groundbreaking ceremony was held in Qatar for a gasoline additive plant spearheaded by CPC Corporation and contracted to CTCI. John Yu, then serving as Vice President, represented CTCI at the event. Later, I was invited to deliver a speech at the groundbreaking ceremony for CTCI's second headquarters building, highlighting the frequent interactions and our enduring friendship.

The growth of both CPC Corporation and CTCI reflect the dedication of professional managers; step by step they introduced technology, gradually growing and thriving.

CTCI's transformation stems from several key factors, starting with its shift from a non-profit to a profit-driven organization.

In addition, CTCI expanded into non-petrochemical sectors, branching out from refinery and petrochemical construction to power, steel, transportation, environmental engineering, and high-tech industries. Furthermore, CTCI expanded internationally, operating in the Middle East, India, China, Southeast Asia, and the U.S.

Along the way, CTCI developed the capability to manage large-scale EPC projects, setting high barriers for entry for competition.

Above all, virtuous and visionary leadership — Mr. Kuo-Chi Wang and John Yu have played an indispensable role.

From my perspective, Group Chairman Yu is not only

a professional manager but also a person of exceptional diligence and unwavering integrity. This is reflected in his approach to golf, where nearly every week he plays and keeps meticulous records, noting his exact number of strokes without ever altering the score or moving the ball improperly.

He also uses these sessions as opportunities to strengthen client relationships and gain inspiration from conversations with fellow golfers, which he applies to corporate management.

This disciplined approach has enabled him to navigate the complexities and risks of leading a company successfully.

CTCI's true internationalization began when John Yu took up the President role. Driven by a strong sense of mission to contribute to Taiwan through engineering, CTCI has built "the most reliable" brand that enjoys global recognition, not only for its engineering excellence but also as a proud ambassador of Taiwan.

CTCI Transformology chronicles Chairman Yu and CTCI, detailing the challenges faced, the solutions found, and how the company has navigated complex international projects with effective localized management.

Their careful expansion and risk management serve as valuable reference for anyone seeking to understand CTCI's journey. CTCI has harnessed its formula for success, and

I am confident that it will continue to thrive and expand moving forward.

Foreword

Embracing Transformation with Unwavering Beliefs

Eugene Chien, Ambassador-at-large, Republic of China (Taiwan), and Chairman of the Taiwan Institute for Sustainable Energy

In 2015, CTCI established its Education Foundation, and in 2017, at the kind invitation of Group Chairman John Yu, I became the Chairman of the CTCI Education Foundation, a position I still hold today.

Reflecting on 2008, when the Taiwan Institute for Sustainable Energy (TAISE) hosted the inaugural Taiwan Corporate Sustainability Report Awards, CTCI participated and earned well-deserved recognition. From that moment, I was deeply impressed by the company's achievements, driven by its relentless efforts to grow. Over the years, through closer observation and interaction with CTCI's team, my admiration for their distinctive culture, innovative spirit, and unwavering commitment to excellence has only grown stronger.

Originally established as an initiative by the CTCI Foundation, the company has faced numerous challenges and undergone significant transformations. Today, CTCI is not only Taiwan's engineering leader but also a global player among the top 100 international EPC project firms. What might seem like a legend to some is, in my view, a textbook example of a company successfully aligning with the principles of ESG.

CTCI's culture is rooted in a strong foundation of responsibility, employee care, encouragement of innovation, and a well-defined organizational DNA focused on talent development. Through its unwavering commitment to sustainable environmental stewardship, CTCI has demonstrated that embracing sustainability not only drives growth but also spurs industry-wide transformation.

In the book *CTCI Transformology,* we see how the company has continually refined its organizational structure, diversified its business strategies, and relentlessly pursued excellence. These efforts reflect a corporate philosophy of continuous improvement. They seize every opportunity to enhance their competitive edge.

This philosophy has permeated CTCI at every level — across employees, teams, and management. It is this vision of "transformology" that has empowered CTCI to overcome challenges while maintaining its leadership in the industry.

Forty-five years have passed since its founding in 1979. Today, CTCI has over 8,000 employees globally. In the international engineering arena, CTCI has consistently represented Taiwanese enterprises on the international stage, demonstrating their competitiveness and innovative potential. CTCI's success offers valuable lessons for other Taiwanese enterprises: in a constantly evolving market, only through innovation and proactive transformation can a company remain competitive on the global stage.

The achievements CTCI enjoys today are the result of the collective efforts of its people throughout its history, and Group Chairman John Yu is undoubtedly a key driver of this success.

Although he started his career with a technical, entry-level position, Group Chairman Yu has expanded his knowledge across disciplines, honing exceptional market insight. He has led the company with decisive decision-making in complex, fast-changing international markets. What I most admire about him, however, is his humility and his commitment to sharing knowledge and mentoring the next generation.

With a well-crafted talent development system and a culture of pride, I am confident that CTCI will continue to thrive, no matter what challenges lie ahead.

Looking back on CTCI's journey — from its pivotal role in Taiwan's infrastructure boom to its proactive response to the global call for net-zero carbon emissions — CTCI has consistently adapted to the challenging times. Through its technical expertise and project management capabilities, the company has embraced transformation and innovation at every step.

Now, standing at the forefront of global sustainable development, I am confident that CTCI will continue to uphold its core values and vision, pursuing new opportunities and creating groundbreaking success stories that contribute to the sustainable future of Taiwan and the world.

Introduction

The Force Propelling the World Forward

On the shores of the Gulf of Mexico in Texas, USA, a project hailed as “the largest modular engineering project on Earth” and the world’s largest monoethylene glycol[1] plant was completed and delivered in mid-2021[2]. This achievement set a global milestone in full-plant modularization in the engineering industry.

The project, a multi-billion-dollar investment by GCGV (Gulf Coast Growth Venture)[3], was executed by a multinational team.

The primary contractor, Taiwan-based CTCI Group, partnered with U.S.-based McDermott[4] International to form the CMI[5] joint venture.

CTCI brought extensive expertise in EPC onshore petrochemical and refinery construction, while McDermott contributed advanced modularization technology for offshore oil platforms.

Strategic Alliances Driving Record-Breaking Business Growth

In contrast to traditional construction methods, this project adopted a modular design approach. The design and procurement center, located in Taipei, coordinated the entire process. Major process modules were prefabricated at modular yards in Qingdao, China, and Tampico, Mexico. On-site work in the U.S. was limited to pile foundations, base construction, and other components that could not be modularized.

The nearly 40,000-metric-ton equipment modules were divided into five massive sections and loaded onto two heavy transport ships in Qingdao. One ship crossed the Pacific Ocean and passed through the Panama Canal, while the other, carrying modules too large to pass through the canal, took a longer route around the Cape of Good Hope and across the Atlantic Ocean. After enduring two arduous months at sea, both shipments successfully reached the Corpus Christi construction site on the U.S. Gulf Coast.

The execution of the entire project spanned six regions — Taiwan, the United States, China, Mexico, India, and Malaysia — demonstrating the efficiency of the modular approach, which minimized on-site labor and construction

time. Total man-hours at the site amounted to just 2.5 million, a dramatic reduction compared to the 13 million man-hours typically required for traditional on-site installation and construction of a full plant. From contract award to completion, the project was delivered in just three years.Meanwhile, at its headquarters, across the Pacific Ocean in Taiwan, CTCI continues to excel.

In Taiwan's energy transition, the government aims to increase the share of gas-fired power generation to 50% by 2025, with power plant construction and expansion projects progressing rapidly. In this context, CTCI, with its expertise in "green engineering," plays an essential role.

One example is the Tongxiao Power Plant, where CTCI focused on "low energy consumption" as the core of its design, collaborating with local suppliers for material procurement. By applying green technologies, CTCI increased power generation efficiency to 60.7%, the highest in Taiwan, while reducing carbon dioxide emissions per kWh of electricity by 32% compared to the older units.

CTCI's partnership with GE (General Electric) for Taiwan Power Company's "Hsing Ta and Taichung Gas Combined Cycle Power Plant EPC Project" is another major achievement, with a contract value of NT$100 billion, setting a new record for the Group. These power plants not

only stabilize Taiwan's electricity supply but also reduce carbon emissions by utilizing natural gas, a cleaner, low-carbon energy source. These projects are key to meeting the government's energy diversification goals while balancing economic development and environmental sustainability.

Guided by a global vision, CTCI has forged strong partnerships, repeatedly breaking records in contract values over the past decade. In 2023, the Group's consolidated revenue surpassed NT$100 billion, with ongoing projects valued at over NT$300 billion — both historic highs.

An Engineering Pioneer Leading with the Times

Founded in 1979, CTCI started as a local company with a share capital of just NT$100 million. Over the years, it steadily expanded its capabilities, diversified its business areas, and entered the international stage. Initially operating as a subcontractor for foreign companies, CTCI gradually gained the expertise to undertake large-scale EPC[6] turnkey projects, eventually becoming Taiwan's largest international EPC firm.

EPC projects — encompassing engineering, procurement,

and construction — have always been central to CTCI's operations. Embracing the era of intelligent technology, the company has integrated innovation and advanced solutions, enhancing its services with automated and intelligent iEPC engineering services.

CTCI's roots lie in the oil refining and petrochemical sectors, where it partnered with major Taiwanese upstream and downstream clients such as CPC Corporation, Formosa Plastics, and USI Group. From there, it horizontally diversified into non-petrochemical fields, including environmental engineering, power generation, LNG, transportation, and general industries.

Throughout its journey, CTCI has been instrumental in delivering landmark projects both in Taiwan and around the world. It stands as a testament to how a company can establish a strong domestic foundation before successfully expanding internationally. By embracing innovation and staying ahead of industry trends, CTCI has not only observed but actively propelled social and economic progress. Today, it plays a pivotal yet often unseen role in large-scale engineering projects globally, shaping the future of infrastructure worldwide.

Entering High-Tech Sector with Record U.S. Contracts

In 2023, the prestigious *Engineering News-Record* magazine (*ENR*) ranked CTCI 55th among the "Top International Contractors," positioning it as the only engineering group from Taiwan alongside global leaders from Europe, the U.S., Japan, and South Korea.

CTCI has firmly established itself as a leader in refining, petrochemicals, environmental engineering, power generation, liquefied natural gas, transportation, and general industries. Building on decades of accumulated expertise and experience, it has also successfully ventured into the high-tech sector.

In 2020, John Yu, Group Chairman of CTCI, observed that nearly all of Taiwan's top 50 companies in *Commonwealth Magazine's* "Taiwan Top 2000 Enterprises Survey" were high-tech firms, signaling an inevitable trend. Yu understood that CTCI could not afford to stand aside.

That same year, CTCI established Advanced Technology Facilities Business Operations (ATFBO), marking its official entry into the high-tech sector. In March of 2021, it opened an office in Arizona, USA, and by July, secured an EPC contract for a semiconductor plant in the region.

The highly anticipated Arizona project set a new record for CTCI's contract value in the U.S. engineering market, establishing a pivotal milestone in the group's expansion into the high-tech engineering sector.

Today, the high-tech division has become a major contributor to CTCI's performance, accounting for over 20% of the group's total contract value and revenue. In 2023, CTCI debuted at 9th place in *ENR's* "Top Manufacturing Contractors"[7] list, securing a spot among the global top 10 in its first year on the rankings.

The high-tech sector has grown into a substantial part of CTCI's business, solidifying its foundation for long-term growth.

Building Advanced Green Engineering Solutions

In a competitive environment, CTCI remains steadfast in its commitment to social development and corporate responsibility. As ecological challenges intensify, governments, corporations, and individuals are increasingly prioritizing sustainability alongside economic growth. A 2004 UN report emphasized environmental protection, social responsibility, and corporate governance, cementing ESG (Environmental, Social, and Governance) as a core business principle worldwide.

CTCI has integrated ESG principles into its core business, turning sustainable development into a competitive edge through advanced green engineering.

In 2017, CTCI launched a new brand, ECOVE, as a subsidiary with over 20 years of expertise dedicated to leading the sustainable resource recycling industry. Leveraging the strength of CTCI's international reputation, the company has effectively promoted resource recycling concepts worldwide through its dual-brand strategy.

Indeed, whether it's metro systems, water resource management, waste treatment, gas-fired power generation, or solar photovoltaics, CTCI serves as a quiet yet essential force driving the realization of green living in everyday life.

In Taiwan, CTCI has laid a stable foundation for economic growth, while overseas, it has helped global companies build world-class production plants. As "Number 1 in Taiwan, Top 100 Worldwide," CTCI bridges Taiwan and the world, driving economic development and environmental sustainability.

With its engineering expertise and commitment to sustainability, CTCI has appeared on the Dow Jones

Sustainability Emerging Markets Index[8] for nine consecutive years, the only Taiwanese engineering firm to win this honor. In 2024, CTCI was further honored in the S&P Global[9] Sustainability Yearbook, ranking in the top 1% worldwide among engineering firms. Under Group Chairman John Yu's transformative leadership, CTCI has been featured on the *Harvard Business Review Complex Chinese* edition's "Top 100 CEOs" list for five consecutive years.

When receiving awards, John Yu consistently credits the team's collective efforts, humbly stating, "I stand on the shoulders of giants." He firmly believes that a company can only reach new heights through teamwork and collaboration.

Harnessing the Power to Reach the Summit

Group Chairman Yu often acknowledges the contributions of CTCI's trailblazers, including founder K.C. Wang, second President Ya-Moh Tung, third President J.T. Lin, engineering design leader Gen-Shin Lin, and Si Bei, head of the Electrical Design Division, who interviewed him for his first job. While their leadership laid the groundwork for CTCI's success, John Yu has been pivotal in transforming the company into the global powerhouse.

John Yu began his career in 1973 with the predecessor of CTCI Corporation, the CTCI Foundation, marking the start of a journey that has spanned over 50 years in the engineering industry. Starting as an electrical design engineer, he later transitioned to procurement, moved into business operations, and steadily rose through the ranks. After his tenure as President, he became Chairman in 2001 and, in 2016, was appointed Group Chairman of CTCI, a role he continues to hold today.

Over the past half-century, John Yu has driven CTCI's expansion into new markets and its rise to global prominence. With Yu at the helm, CTCI now operates in over 50 locations across more than 10 countries and has evolved from a company generating tens of billions in revenue to a group achieving hundreds of billions.

Internally, Group Chairman Yu introduced the "Colonel and Commander" system, a dual-track career development model that fosters both technical specialists and managerial talent. He founded CTCI University to provide employees with comprehensive career development through online learning and implemented a robust succession plan to ensure leadership continuity within the Group.

Today, CTCI employs over 8,000 people across more

than a dozen countries. Through continuous challenges and trials, the company has cultivated a unique organizational DNA that drives its growth and sustains its leadership at the summit of the global engineering industry.

Notes:

1. Synthetic liquid substances widely used in industries such as textiles, packaging, food and beverages, automotive and transportation, and cosmetics.
2. Refers to mechanical completion, an internationally recognized and widely used engineering completion inspection mechanism, indicating the completion of the construction phase.
3. Gulf Coast Growth Venture is a joint venture between ExxonMobil (USA) and SABIC (Saudi Basic Industries Corporation).
4. A global supplier of engineering and construction solutions for the energy industry.
5. CTCI McDermott Integrated.
6. Refers to Engineering, Procurement, and Construction (EPC), which covers the full-service approach from project design, procurement, to construction.
7. This ranking includes the semiconductor manufacturing facility construction sector.
8. The Dow Jones Sustainability™ Emerging Markets Index comprises emerging-market sustainability leaders as identified by S&P Global.
9. S&P Global, an American financial information company providing ratings, market intelligence, and data analysis.

1

A Reliable Leader in Engineering

CTCI started as a local company and has steadily enhanced its capabilities through continuous innovation. It is not only a leader in refining, petrochemicals, and LNG, but also a key player in general industry, transportation, environmental engineering, and high-tech sectors. Today, it is a reliable partner for many international clients.

Chapter 1

A Mission for the Times

In the 1970s, Taiwan's economy was flourishing, driven by the government's ambitious public infrastructure policy. In 1973, Premier Ching-Kuo Chiang unveiled the "Ten Major Construction Projects," featuring ten groundbreaking initiatives such as the North-South Freeway, railway electrification, the North Link Railway, CKS International Airport, Taichung Port, Suao Port, a large shipyard (China Shipbuilding Corporation), an integrated steel mill (China Steel Corporation), an oil refinery (CPC Corporation), and nuclear power plants.

The slogan "Act today, or regret tomorrow" symbolized the nation's determination to modernize. It marked the start of Taiwan's economic boom and laid the foundation for its industrial growth.

Industrial Beginnings: A Need for Fresh Talent

During its early industrial development, Taiwan faced a severe shortage of engineering expertise, relying heavily on foreign talent and technology. During this period, CTCI Foundation supported government projects by introducing foreign engineering technologies and establishing them locally, cultivating outstanding talent, and injecting new blood into the industry. Among this new generation of skilled professionals was John Yu, a promising young talent of that era.

In the 1970s, a popular saying in Taiwan was, "Come, come, come to NTU (National Taiwan University); go, go, go to the USA." This phrase captured the aspirations of a post-war generation eager to enter the top university and study abroad, particularly in the US, which was seen as the gateway to success.

"MediaTek Chairman Ming-Kai Tsai and Garmin founder Dr. Min Kao were among my classmates at National Taiwan University." John Yu recalls. At that time, many NTU electrical engineering alumni pursued further studies abroad, often entering industries such as semiconductors, electronics, telecommunications, and software.

However, coming from a large family with three younger siblings, Yu took it upon himself to ease his parents' financial burden. "During college, I tutored up to three students simultaneously to ease my family's financial

burden," he recalls. While his classmates pursued studies abroad, Yu understood his family's financial limitations and chose not to consider that path.

In 1973, after completing his military service as a reserve officer, Yu joined CTCI Foundation, his first job as he began his professional career.

"After completing military service, a fellow soldier enthusiastically mentioned to me that he was applying to CTCI Foundation and the salary was NT$4,500, plus NT$400 for transportation." At the time, Taiwan's industrial sector was in its infancy, attracting foreign companies to invest. "The salary was higher than what multinational companies like Philips, Motorola, and General Electric were offering," Yu recalls.

He openly shares: "At the time, I joined CTCI Foundation primarily for financial reasons, but the work still matched my major in the field of electrical engineering."

Founded in 1959 with an initial donated fund

John Yu's dedication and commitment to the company's mission earned him recognition from his superiors, paving the way for his transition from a specialist to a generalist.

of NT$450,000 from 23 public and private entities, including Taiwan Cement and Sesoda Corp., CTCI Foundation became Taiwan's first private engineering management consulting firm, primarily focused on refining and petrochemical projects. Later, it established CTCI Corporation as an investment venture. John Yu witnessed the birth and growth of CTCI firsthand, and led its transformation from a local enterprise into a global powerhouse.

Bridging Theory and Practice In the Field

During the late 1960s and early 1970s, CTCI Foundation actively recruited talent. John Yu was part of this wave, clearly recalling his employee number — 325 — and his role as an electrical design engineer.

"The person who interviewed me was Mr. Si Bei, my senior by 13 years from NTU's Department of Electrical Engineering and the head of the Electrical Engineering Division," John Yu recalls. At the time, NTU graduates were rare at CTCI Foundation, and he was quickly hired as an electrical design engineer.

Yu's career as a design engineer lasted three years.

During this time, CTCI worked on building a steel plant for China Steel Corporation, a major part of "Taiwan's Ten Major Construction Projects." Due to a shortage of site supervisors, China Steel turned to CTCI Foundation for support, requesting electrical and mechanical experts for the project. In 1976, Yu was among those assigned to work at China Steel as a construction supervision engineer.

"The site manager, Chao-Hua Oh, was a year older than me; he held a master's degree in electrical engineering from NTU, and later became the President of China Steel," Yu recalls, vividly reflecting on the experience from nearly five decades ago.

During this experience, Yu was struck by the stark gap between theoretical knowledge and practical application.

"What I had been doing felt like it was 'divorced from reality' — I understood the 'how' but not the 'why,'" he admitted. "I had never seen a real plant or its equipment before. It wasn't until I arrived on-site that I realized certain design flaws could create operational challenges for the plant." While office work was comfortable, life on the construction site was grueling. "Fieldwork was tough — every day meant enduring the sun, rain, wind, and dust," Yu recalls with a wry smile.

Despite the challenges, the transition from design engineer to construction supervisor gave him valuable hands-on experience within just one year and ultimately paved the way for him to eventually shift from a specialist to a generalist.

The key figure behind John Yu's transition into a generalist role was Chiu-Ching Lin, then the Department Head of Business and Procurement, who invited him to join the procurement team. As CTCI Foundation enhanced its engineering expertise and began expanding overseas, Lin sought to strengthen his team. He transferred John Yu to the Procurement Department and appointed him as a procurement representative.

This role marked a significant shift — from engineering to construction, and now to procurement — a major cross-disciplinary transition. But why was he repeatedly chosen by his superiors? "At that time, there was a shortage of manpower," Yu modestly recalls. "I went wherever the

With more than 50 years in the engineering industry, John Yu advanced from a junior engineer to President, Chairman, and Group Chairman, steering CTCI into one of the world's top 100 engineering firms.

company needed me." He fully embraced the company's culture, committing himself to every assignment with a mission-driven spirit.

The Prevailing Trend of Foreign Language Learning

Why did Chiu-Ching Lin, as a supervisor, hold John Yu in such high regard? Lin once shared with colleagues that he admired John Yu for his intelligence, integrity, and diligence. Yet, there was another quality that set Yu apart — his exceptional command of English. Lin, who was born into a prominent family in central Taiwan during the Japanese colonial era, had received a Japanese education and was fluent in Japanese.

Around 1977, when CTCI Foundation undertook a small engineering, procurement, and construction (EPC) project for the desalting system at the Cilacap Refinery in Indonesia, the company needed a procurement officer fluent in English. Recognizing John Yu's language skills, Lin appointed him to manage the procurement work in Singapore.

During this role, Yu oversaw tasks such as placing orders, expediting deliveries, inspecting goods, coordinating shipping, and handling customs clearance. Singapore marked his first overseas role, where John Yu worked tirelessly. "Each day was spent meeting suppliers, receiving and inspecting the procured equipment and materials, consolidating them at the local warehouse, and loading them onto a cargo barge[1] bound for Indonesia."

After one and half months in Singapore, Yu successfully completed his mission and returned to Taiwan. Lin highly praised Yu's debut performance and entrusted him with another critical task. This time, he was sent to the United States as a business representative, overseeing overseas procurement for the styrene monomer (SM) plant of Ta Te Chang Petroleum, the predecessor of Grand Pacific Petrochemical Corporation.

It makes one curious how John Yu, who never studied abroad, developed his English proficiency. He candidly admitted that he used the most rudimentary method—memorizing the dictionary.

"There are about 40,000 words in a standard English dictionary. I knew 10,000, and that was good enough;" Yu stressed, "the key to mastering English is to build your vocabulary first, then make sentences, and finally grammar. Once you have grammar down, the rest falls into place."

John Yu's diligent effort in memorizing vocabulary built a solid foundation for his English skills. His dedication and perseverance also led to his admission to Taiwan's top university, giving him a significant advantage in his career. Inspired by this experience, when he became the Group Chairman of CTCI, he prioritized developing colleagues' foreign language abilities, fostering a culture of language learning within the organization.

Founding of CTCI Corporation and Its Global Debut

Between 1969 and 1979, CTCI Foundation expanded its engineering expertise both domestically and internationally by completing projects like Singapore Refining Company, Bangchak Corporation[2] in Thailand, and Saudi Aramco Riyadh Refinery.

However, operating as a foundation constrained its growth and international expansion. To address this, CTCI Corporation was incorporated on April 6, 1979. CTCI Foundation transferred engineering operations and 800 employees to the newly formed CTCI, with Kuo-Chi Wang appointed as the first Chairman and CEO. This visionary

decision set the stage for CTCI's global expansion.

Building Connections to Drive Business Expansion

John Yu served as a procurement representative in the United States during the early days of CTCI's establishment. Just a year earlier, CTCI Foundation had secured an EPC contract for the construction of Ta Te Chang Petroleum's second styrene plant.

"At that time, Ta Te Chang Petroleum received a US dollar loan with a condition — sourcing equipment from American suppliers," Yu explained. The procurement process involved frequent communication with US manufacturers, prompting the need for a procurement representative in the US.

"On my first day back in Taiwan from Singapore, I was immediately assigned as a procurement representative in the U.S.," John Yu recalled. At the time, he was unquestionably the best English speaker in the department, and the natural choice for this overseas assignment in New Jersey.

At the time, the Ta Te Chang Petroleum styrene plant utilized the renowned Monsanto process technology, licensed to the U.S. engineering firm Lummus[3]. That year,

Lummus secured contracts for several major projects in Taiwan, including CPC's Fourth Naphtha Cracker, FCC (Fluid Catalytic Cracking) unit, AN (Acrylonitrile) plant, and Acetic Acid plant, as well as the Ta Te Chang Petroleum styrene plant. CTCI partnered with Lummus, handling engineering, procurement, and construction.

"Four of us from Taiwan worked together at Lummus' New Jersey office and shared a rented house," John Yu recalled. "To save money, there were times when over twenty people crammed into the house. We took turns cooking and cleaning, commuted to work together, and hung out." As he recounted those days, Yu seemed transported back to his early thirties, enthusiastically sharing the bittersweet memories.

While most of his colleagues returned to Taiwan after three months, John Yu stayed for nearly two years. Friendly and sociable, he enjoyed playing the role of driver, welcoming his colleagues and seeing them off. Eager to learn, he attended night courses in business management at the New Jersey Institute of Technology, though he couldn't complete his master's degree due to the time constraints of his assignment.

Nearly two years abroad broadened John Yu's horizons, enhancing his cultural and professional understanding. He learned to engage with Westerners and adeptly navigate cultural, professional, and business differences. There was even an unexpected twist: "Toward the end of my assignment, Lummus extended an attractive offer for me to stay," Yu recalled. "However, I believed my future was with CTCI, so I politely declined." Those years not only enriched his perspective but also helped him forge valuable connections with industry leaders, which proved crucial to his rise at CTCI.

Challenging Global Markets: The Journey to Top 100

John Yu's extensive international EPC experience positioned him as a prominent industry leader and a key figure in CTCI's global expansion. Reflecting on major achievements, he recalls, "We were involved in major projects from CPC's No. 2 to No. 5 Naphtha Cracking Plants, the No. 3 Plant upgrades, and Formosa Petrochemical's No. 6 Naphtha Cracking Project." In its early years, foreign engineering companies undertook refinery and petrochemical plant projects in Taiwan. Initially a subcontractor for international firms, CTCI honed its

skills and transitioned to EPC projects, establishing itself internationally.

John Yu's career evolved in tandem with CTCI's growth. In 1985, he was posted to the Middle East as the Business Manager for CTCI Saudi Arabia. In 1987, he was transferred to Thailand to establish CTCI's operations there, serving as the Managing Director of CTCI Thailand. Two years later, he returned to Taiwan and was promoted to Manager of the Business Division at CTCI headquarters.

Chiu-Ching Lin, who had mentored John Yu throughout his career from procurement to business development, retired in 1992 as Senior Vice President, passing the baton to Yu. From that point on, Yu's career soared. He was promoted to Executive Vice President, President, and finally Chairman, leading the company to expand global footprint, earning recognition as one of the world's top 100 engineering companies.

Five-Time "Taiwan's Top 100 CEOs" Honoree

With over 50 years in the engineering industry, John Yu has advanced from junior engineer to Group Chairman,

leading CTCI to achieve global recognition and numerous accolades. In 2000, he earned the prestigious gold medal from the Chinese Institute of Engineers, the highest honor in the field. In 2009, he was honored with the "K.T. Lee Administration Medal" by the Chinese Management Association.

In 2016, the Taiwan Institute for Sustainable Energy awarded him the "Sustainability Outstanding Individual Award."

Since 2016, *Harvard Business Review Complex Chinese* edition has hosted the biennial "Taiwan's Top 100 CEOs" awards. Yu has been honored on this prestigious list five times.

The year 2017 marked a particularly notable period for John Yu. He received the "Technology Management Award" and Fellowship from the Chinese Society for Management of Technology, as well as the "National Outstanding CEO Award" from Chinese Professional Management Association.

That same year, the Taiwan Institute of Chemical Engineers honored him with the "Lifetime Achievement Award." In 2020, John Yu received the "World-Class Outstanding Professional Award" from the Global Corporate Sustainability Awards (GCSA).

On November 17, 2023, at the Chinese Petroleum Institute Annual Conference, he was presented with the "Mr. Kai-Ying King Award" by Wenent Pan, Chairman of CTCI Foundation. This award symbolizes the highest honor and lifetime achievement in the petroleum industry. In 2024, Enterprise Asia awarded him the "Asia Corporate Social Responsibility Award."

These accolades, recognizing excellence in engineering, management, and sustainability, highlight John Yu's contributions and CTCI's influence in the global engineering industry- achievements that are truly well-deserved.

Notes:

1. Commonly used for transporting large, heavy cargo, with a flat bottom and wide hull for shallow water operations.
2. Bangchak Corporation Public Company Limited, a major petroleum company in Thailand.
3. Founded in 1907, with many process patents in oil, gas, refining, and petrochemicals.

Chapter 2

On the Frontlines: Testing the Waters Overseas

For refining and petrochemical companies, the Middle East, with Saudi Arabia at its core, represents the heart of the global market. Success in Saudi Arabia often opens doors to regional expansion, making it a crucial battleground for top engineering firms.

CTCI entered the international market 40 years ago through Saudi Arabia, achieving early success. Two decades later, it made a comeback in the region, with Qatar as its new base.

No longer a subcontractor, CTCI re-entered as a main contractor, expanding its territory and making substantial progress in the frontline battlefield.

Now, as the "post-oil era" looms, the Middle East remains a vital region for CTCI's global operations. The company continues to earn accolades, marking milestone after milestone in international EPC projects.

With abundant oil and natural gas resources, the Middle East has long been a highly contested market for refining and petrochemical engineering companies. As early as the 1980s, it served as a strategic focus for CTCI, ushering in its first golden era.

Collaborating with Japanese Industry Leader into the Middle East

"CTCI entered the Middle Eastern market through an alliance with Japan's Chiyoda Corporation," explains John Yu. At the time, CTCI did not yet have the capacity to act as the main contractor for large-scale EPC projects. Partnering with Chiyoda provided the opportunity to break into the international market.

This collaboration began in the 1970s, during Taiwan's "Ten Major Construction Projects" era, which spurred rapid petrochemical industry growth. Against this backdrop, Chiyoda and CTCI worked together on several major projects in Taiwan, including CPC Corporation's Residue Desulfurization (RDS) project, China Petrochemical Development Corporation's Caprolactam (CPL) project, Taiwan Cement Corporation's Bisphenol A (BPA) facility, and the USI Corporation's Purified Terephthalic Acid (PTA) plant.

Building on this solid foundation of cooperation,

Chiyoda and CTCI extended their partnership into overseas markets. It was during this period that CTCI began establishing its expertise in the Middle East.

As early as the 1970s, CTCI's first collaboration with Chiyoda in the Middle East led to securing the EPC contract for the Jeddah Refinery EPC project of Petromin, followed by the construction of the Riyadh Refinery. Saudi Arabia, which occupies 80% of the Arabian Peninsula, is one of the world's leading producers of petrochemical products. In hindsight, the partnership between Chiyoda and CTCI can be seen as the starting point of CTCI's journey into the Middle Eastern market.

Building Strength and Milestones in the Middle East

By the 1980s, CTCI had further strengthened its foothold in the Middle East by partnering with Chiyoda on multiple petrochemical plant projects for SABIC (Saudi Basic Industries Corporation). This included the construction of the SHARQ plant in Jubail Industrial City, which produced Ethylene Glycol (EG) and Polyethylene (PE), as well as the PETROKEMYA plant, which focused on Ethylene

production and Polyethylene EPC projects. Together, these efforts enabled CTCI and Chiyoda to successfully penetrate the Saudi petrochemical engineering market.

At the same time, CTCI also made its mark in Jordan, where it worked with Hitachi on the Aqaba Fertilizer Plant Project.

In late 1982, CTCI secured its first solo project in Saudi Arabia — the YANPET[1] EO/EG (Ethylene Oxide/Ethylene Glycol) plant, a joint venture between SABIC and Exxon Mobil. This was CTCI's first independent contract in Saudi Arabia, a milestone in its Middle East journey.

To fully support the YANPET project, CTCI dispatched its most elite team, with the project manager being John Lin, the company's former Group First Vice Chairman, at the helm. In his memoir *A Wonderful Life Journey*, Lin recalls how he and his team were sent to the region to secure the business amidst fierce competition. "We drove from Jeddah to Yanbu, a distance of over 300 kilometers, at 180 kilometers per hour. We reached there in just two hours," Lin reminisced.

The urgency arose because the client requested an updated bid within 24 hours following a tender clarification meeting. To meet this tight deadline, Lin had to call on local staff to assist with updating the entire proposal before

rushing to submit it. "I didn't sleep in a bed for an entire week during that period."

However, the hard work paid off as CTCI was eventually awarded the contract. Just a few days before the Lunar New Year of 1983, Lin, along with a pioneer team, flew from Taipei to Jeddah, marking the beginning of a three-year stint at the Saudi construction site.

First Big Break: A Dedicated Team Earns Significant Profits

Thanks to the success of the YANPET project and the client's approval, in 1983 CTCI secured the contract for the Jeddah Refinery's seawater chlorination unit. Although small in scale, the project was a full-service Engineering, Procurement, and Construction (EPC) contract and a key accomplishment for the company.

"At its peak, CTCI had dozens of engineers and hundreds of workers at the YANPET site," recalled John Yu, witnessing the bustling scene. "We worked over 10 hours a day, six days a week, pushing to meet tight deadlines."

"At that time, half of CTCI's business came from Saudi Arabia," said J.T. Lin, former President of CTCI, in a video

commemorating the company's 40th anniversary. "With the full dedication of all employees, we significantly outpaced the project schedule."

"In those days, if there was a year we didn't make money in the Middle East, it would turn out to be a tough year for CTCI," John Yu reflected, highlighting the importance of the Middle Eastern market to CTCI three to four decades ago.

A dedicated team from CTCI fought hard in Saudi Arabia, achieving a stunning victory and earning their first substantial profit. They paid off bank loans ahead of schedule and purchased four floors in the CTCI Building on Dunhua South Road in Taipei. Prior to this, employees worked in two separate offices, one in the Dalu Building on Zhongxiao East Road and the other in the Reinsurance Building on Nanjing East Road. In 1984, the company officially moved its operations into the CTCI Building.

Fully Prepared for the Mysterious Kingdom

"Al-Salamu Alaykum," greeted John Yu during an interview, casually using the traditional Muslim phrase meaning "Peace be upon you," which also serves as a way of saying "hello." While it may seem like a simple phrase,

it reveals the hard work he put into preparing for his assignment in the Middle East.

At the end of 1984, John Yu was assigned to Saudi Arabia as the Business Manager. From that moment, the distant, mysterious country — 8,000 kilometers away — became much more than just a place on the map.

Before embarking on this journey, John Yu made two key preparations to navigate an uncertain future. "I studied Arabic for two months at the 'Youth Friends Association,'" he said with a smile. "I learned the alphabet, but I still couldn't communicate with Arabs in Arabic."

However, at that time, the Arabian Peninsula seemed like the center of the world, with people from all over the globe converging there. As a result, English became the common language of communication there.

Additionally, he read the recently published book *Beyond the Veil* by American physician Seymour Gray. The translator is Dahe Huang, former President of Taiwan Fertilizer. Having lived in Saudi Arabia, Gray ventured deep into the deserts and unveiled the mysteries of the millennia-old kingdom, offering an in-depth exploration of Saudi life, culture, and society.

"Today, the Middle East still has many customs and taboos that are hard for outsiders to imagine," John Yu recalled. "Let alone nearly forty years ago. Information wasn't as accessible, and Taiwanese seldom traveled abroad, so living in such a foreign land was a mixture of sweet and bitter experiences."

Life in Saudi Arabia was very simple. With half of the country covered in desert, tourist attractions and entertainment options were scarce. After work, there was little to do, aside from occasional games of bowling or table tennis. John Yu joked, "Once you're there, all you could do was count the days!"

Most of the memories, however, are fond ones. One of the most memorable leisure activities was fishing in the Red Sea.

"Mr. J.T. Lin loved fishing, and on weekends, we often accompanied him to go fishing," John Yu recalled. "The Red Sea was teeming with elephant fish — every time we cast our lines, the fish would bite immediately, and we'd fill three buckets with fish every time. Elephant fish have no scales, and when cooked, they make a rich, creamy soup that tastes delicious, and the meat is tasty. Everyone enjoyed it immensely." Fortunately, a Taiwanese chef was there to satisfy the expats' taste buds, easing some of the homesickness.

Global Strategy: Mapping the World in the Mind

In the monotony of everyday life, the entire Middle East had already been etched into John Yu's mind. During an interview for this book, as tensions escalated between Israel and Palestine, igniting the volatile situation in the Middle East, he suddenly changed the subject and asked, "Let me test you. Which countries border Jordan?"

This impromptu quiz caught everyone by surprise.

"To the west of Jordan are Lebanon and Israel, to the south are Saudi Arabia and the six Gulf countries," he gestured as if tracing a map. "Here's Oman, and over here is the United Arab Emirates, with major cities like Dubai and Abu Dhabi. Next is Qatar and Bahrain, all surrounding the large country Saudi Arabia. To the northeast, there's a small country called Kuwait. The six Gulf countries make up the Gulf Cooperation Council. North of Kuwait is Iraq, then Syria, and above that is Turkey..."

It was as if the world map had been imprinted in John Yu's mind, stretching from the Middle East, Central Asia, and Southeast Asia all the way to China — like a human GPS system. "Geography and history are fundamental knowledge. To learn geography, you must memorize maps; to learn history, you must memorize timelines," he shared his learning insights.

Indeed, geographical location not only determines a country's position on the globe but also directly impacts strategic decisions such as market development potential, logistics efficiency, and supply chain management. It is also a critical reference when leaders evaluate and manage risks. A deep understanding of geographical contexts enables more effective planning of a company's global operations and expansion.

Through countless long-haul business trips, with his eyes fixed on maps in magazines and screens on planes, the world map gradually became ingrained in John Yu's mind. It was internalized as part of his knowledge, helping him navigate the world with greater direction and clarity on his journey of global expansion.

Weighing the Options: Retreating from the Arabian Market

In the mid-1980s, Saudi Arabia's plan to build a refinery in Qassim, led by Aramco (Saudi Aramco), presented the next opportunity for CTCI after the YANPET petrochemical

project. The company once again aimed to secure a new contract independently.

John Yu actively sought to expand the business. Although Aramco had rigorous standards, he was undeterred by the challenges, making numerous trips to maintain customer relationships and promote CTCI's engineering capabilities. Eventually, the company won the bid for the Qassim Refinery project and was preparing to submit a quotation.

However, the ongoing Iran-Iraq War led to a prolonged oil crisis and widespread inflation, and the highly anticipated Qassim Refinery project was abruptly canceled. With the YANPET petrochemical project concluded and no new orders in sight, the number of employees remaining in the region dwindled to fewer than ten. The once-bustling office environment was now quiet, with high maintenance costs. Amid these challenges, John Yu began to reassess the situation and, after careful consideration, boldly suggested headquarters to close Arabian operations.

"I wrote a memorandum to the boss, suggesting that we temporarily close CTCI's Arabian operations, retain our strength, and wait for the right moment to make a comeback," he recalled. This proposal was reviewed by Senior Vice President Chiu-Ching Lin and subsequently presented to President Ya-Moh Tung, who ultimately

approved it. In 1986, CTCI ceased its operations in Saudi Arabia.

In fact, Taiwan's petrochemical industry was thriving, with new petrochemical plants emerging rapidly at that time. CTCI was overwhelmed with domestic projects, so stepping back from the distant and volatile Middle Eastern market was realistically the correct decision.

Reinvigorate: Broadening CTCI's Global Presence

In 1998, at the age of 50 and after 25 years with CTCI, John Yu was promoted to President. He immediately initiated innovative strategies, particularly focusing on expanding CTCI's presence in overseas markets. By then, CTCI had already established a foothold in Southeast Asia, securing projects in Singapore, Thailand, and Malaysia, working with both local clients and Taiwanese businesses. This helped raise the company's profile in the region.

In mid-1999, Yu further expanded the company's international business by appointing John Lin, Vice President at the Construction Division, to establish the Overseas Engineering Department. He also enlisted Michael

Yang, then working in the construction division and currently the Group Vice Chairman, to bolster the team's capabilities in overseas markets.

At the same time, opportunities in China began to emerge. During the 1980s, China's reform and opening-up policies made it an attractive destination for foreign investment, and by the 1990s, the country became a hotbed for global investment. CTCI followed the expansion of Taiwan's petrochemical industry and established CTCI Beijing in 1993.

In early 2000, world renowned energy and petrochemical companies like BP[2] from Britain, BASF from Germany, and Shell from the Netherlands began setting up production bases in China, seeking reliable engineering partners. Leveraging its international experience, strong intellectual property protections, and language advantages, CTCI quickly earned the trust of these companies.

"At that time, we were executing 13 projects of varying scales simultaneously, which was a critical step for CTCI's international expansion," recalled John Lin in his memoir.

In 2001, when Yu was appointed Chairman, he immediately promoted John Lin to President. In the face of a rapidly changing global environment, Yu's acute sense of risk led him to recognize the increasing importance of overseas

markets. He saw the rise of emerging markets, particularly China's economic growth and the growing demand for natural gas. Meanwhile, in the Middle East, the surge in oil prices and the booming demand for major projects opened up significant business opportunities, which Yu could sense from his two years of experience working in Saudi Arabia.

As the company's leader and the top decision-maker, Yu made the bold decision to re-enter the Middle East market: "No matter the challenges ahead, CTCI must move forward again," he asserted.

Qatar EP2: Gateway Back to the Middle East

After a 16-year hiatus, CTCI reentered the Middle East, establishing new branches in Saudi Arabia in 2001, and Abu Dhabi and Qatar in 2004. However, initial efforts proved more challenging than expected.

John Lin explained that Middle Eastern clients had traditionally relied on Western engineering firms for EPC contracts, but now they were seeking more cost-effective partners. Although CTCI was on the list of potential partners, doubts about its capabilities remained. In fact,

some clients explicitly told him, "No matter how low your bid is, it won't make a difference. After bidding on five projects and building mutual trust, I will consider awarding you the contract."

Indeed, CTCI's bids in Saudi Arabia were often unsuccessful, even when submitting the lowest bid twice. Despite spending significant amounts on preparation, the efforts yielded no results. It wasn't until after 2003, when CTCI successfully completed several projects in China, that the company gained international recognition, drawing increased attention from Middle Eastern clients.

In 2004, CTCI secured the Ethylene Expansion II (EP2) furnace project for QAPCO[3], a joint venture between Qatar Petroleum[4] and France's TotalEnergies Group. This project marked CTCI's return to the Middle Eastern market and established a critical foothold, signaling the dawn of a new chapter in CTCI's expansion in the region.

In 2006, CTCI secured the EPC contract for the ethylene oxide/ethylene glycol plant of Saudi Kayan, a subsidiary

CTCI's reputation and market presence continue from Taiwan to China, expanding to Southeast Asia, and returning to the Middle East.

of SABIC, one of the world's top three petrochemical groups, marking its official return to Saudi Arabia. Valued at US$500 million, the project was the largest of its kind globally at the time, setting new records for CTCI in both project scale and contract value.

This project was not only CTCI's first after reentering Saudi Arabia but also its debut as a main contractor in the country, making it a landmark in CTCI's reentry into the Middle Eastern market.

By this point, CTCI's scale and capabilities had grown significantly beyond what they once were. In 2010, when the plant successfully began operations, John Yu traveled to Saudi Arabia to personally accept recognition from the client.

CTCI had transformed its reputation in the region. The company's overseas expansion strategy, which began with Taiwan, extended to China and Southeast Asia, returned to the Middle East, and ultimately gained CTCI a strong foothold in the international engineering community.

A decade after returning to the Middle East, CTCI's projects continued to grow in both scale and value, working with national-level oil companies. These successful projects elevated CTCI to the top ranks of global engineering firms, securing a place among the global top 100 engineering

companies.

CTCI's Middle East Comeback

After 2010, CTCI's expansion in the Middle East accelerated, significantly boosting its global standing.

In 2012, the company secured the QAPCO cracking furnace and ethylene storage tank project. The following year, CTCI partnered with Chiyoda to win the US$1 billion Laffan Refinery Phase II (LR-2) project in Qatar.

In 2014, CTCI secured a major contract from SAMAC[5], a subsidiary of SABIC, for the construction of the world's largest MMA/PMMA plant in Jubail.

2015 marked CTCI's entry into Oman, where it partnered with US-based CB&I[6] to form the CCJV[7] team and secured the EPC contract for the steam cracker unit at ORPIC's[8] Liwa Plastics Integrated Complex (LPIC) in Sohar Industrial Area. This was CTCI's first project in Oman, and at US$2.8 billion, it represented its largest overseas contract at the time. That year, nearly 70% of the company's total new contracts came from the Middle East.

In October 2016, John Yu traveled to Riyadh to personally accept the "22.3 Million LTI-Free Hours Award" from

Saud bin Abdullah bin Thunayan Al-Saud, then Chairman of SABIC and a Saudi prince, in recognition of CTCI's outstanding safety performance and project execution. Additionally, the SAMAC MMA/PMMA project received SABIC's "The Winner of Best Project Performer."

By 2017, the LR-2 project in Qatar was successfully completed. Qatar's Emir, Sheikh Tamim Bin Hamad Al Thani attended the inauguration, underscoring the significance of these projects to both the client and the government. CTCI's reputation in the Middle East continued to grow, solidifying its position as a leader in the region's engineering sector.

Reaching the Summit Through Execution and Reputation

"We build our reputation through project execution, and then we leverage that reputation to build relationships," said David Chung, Deputy CEO of Group Engineering Business and President of CTCI's Refining & Petrochemical Engineering Division. Chung, who served as a project manager in Saudi Arabia from 2015 to 2017, understands firsthand how crucial this approach is to success.

The Middle East, often described by CTCI employees as a "battlefield of epic-level competition," has also become a key market for the company's growth and for sharpening its team's expertise. In 2016, CTCI won the EPC contract for Saudi Kayan's ethylene cracker furnace and the front-end engineering design (FEED) project for the ethylene oxide/ethylene glycol capacity expansion, reflecting strong client trust. It later secured multiple FEED projects from SABIC, achieving successful vertical integration of its EPC services.

By 2015 and 2016, the Middle East had become CTCI's second-largest global market, after Taiwan, in terms of business revenue. CTCI also made significant strides in Oman, reaching a US$2 billion milestone and setting a new safety record of 77 million safe man-hours, taking its achievements to the next level. In early 2023, the company secured the US$2.5 billion Ras Laffan Petrochemicals Project (RLPP) from QatarEnergy's RLP[9], marking a new high for CTCI.

Two decades ago, CTCI made the bold decision to re-enter the Middle East, and under the leadership and foresight of John Yu, the company set new records in global expansion. Their outstanding performance earned them recognition as a model partner of SABIC and helped build their reputation across the region. Today, CTCI has a

global footprint, with operations spanning the Middle East, Singapore, Thailand, Malaysia, India, Vietnam, and the United States. Wherever there are major projects, CTCI's presence is felt.

As Michael Yang remarked frankly, "The Middle East remains the main battleground for the global refining and petrochemical industries." CTCI is actively bidding for large-scale refinery and petrochemical projects in Qatar, Oman, and Kuwait. In the foreseeable future, CTCI's market territory is expected to expand across the six Gulf countries, solidifying its position as a leader in the global engineering services industry.

Notes:

1. Yanbu Petrochemical Company.
2. Formerly British Petroleum (BP).
3. Qatar Petrochemical Company, one of the world's key low-density polyethylene producers.
4. Engaged in oil and gas exploration, extraction, refining, transportation, and storage, now renamed QatarEnergy.
5. Saudi Methacrylates Company.
6. Chicago Bridge & Iron Company, merged with McDermott in 2018.
7. CB&I-CTCI B.V. Joint Venture.
8. Oman Refining and Petrochemical Industries Company.
9. Ras Laffan Petrochemicals, a joint venture between QatarEnergy and Chevron Phillips Chemical.

Chapter 3

Honing Skills on the Shoulders of Giants

Late one night on U.S. Highway 181, self-propelled modular transporters (SPMT) carried enormous plant modules packed with pipelines and towers, filling the entire roadway as they inched forward at less than 3 kilometers per hour.

This was no movie scene.

It was part of a modular plant built by CTCI for GCGV in the United States, contributing to the world's largest monoethylene glycol (MEG) facility. After a long ocean journey, the modular units were transported by land to the construction site for assembly. This marked a significant milestone in modular engineering as the largest MEG plant of its kind globally.

Partnering with McDermott: Building a Modular Plant

This modular plant was a collaboration between CTCI and the U.S.-based McDermott, setting a record as CTCI's largest contract in the U.S. engineering market at the time. Working alongside McDermott, CTCI expanded its expertise, evolving from individual equipment modularization to whole-plant modularization.

McDermott, renowned for its expertise in modular offshore drilling platforms, brought its specialized expertise, while CTCI contributed its vast experience in EPC refinery and petrochemical construction. This strategic alliance combined the core competencies of both companies, marking a pivotal moment for CTCI.

Modular construction follows a "building block" approach, where plant facilities are prefabricated and assembled offsite before being transported and integrated onsite. While this technique has gained traction in building construction, its application in plant settings — particularly in the chemical industry, where pipelines are intricate and interwoven — remains relatively rare. CTCI's work on the massive 1.1-million-ton MEG plant was groundbreaking, setting a new standard for plant modularization.

Modular construction has become a key focus for CTCI in recent years. Its advantages include shorter construction timelines, higher efficiency, better quality control, and enhanced safety. Furthermore, it effectively addresses

challenges like labor shortages and adverse weather conditions, making it a critical trend for the future of engineering and construction.

This plant was the first collaboration between CTCI and McDermott, a partnership that has its roots in Oman.

In 2015, CTCI partnered with American company CB&I to form the CCJV team for a project in Oman for the first time. Unexpectedly, CB&I was acquired by McDermott in 2018. What initially seemed like a challenge due to the change in partnership turned out to be an opportunity, culminating in the joint construction of the world's largest monoethylene glycol plant in Texas.

Creating a New Learning Curve, Fearless of Challenges

CTCI's first major venture into Oman was a meaningful moment, bringing with it significant opportunities and considerable risks. From the high-value contract to changes in partners, process technologies, and procurement models, every aspect of the project presented new challenges.

"The Oman project was a landmark for CTCI, representing its highest-value contract and a milestone in managing

large-scale EPC projects," said M.L. Lee, the then-project manager and now Deputy CEO of Group Engineering Business/ President of EPC Operations, CTCI Corporation.

"A decade ago, we could confidently handle projects under US$1 billion, but larger contracts required joint ventures to be competitive," said Group Chairman John Yu. The Oman project broke records with a US$2.8 billion contract value (around NT$87.5 billion). Therefore, a collaborative team was formed to bear the risks and share the profits.

Nevertheless, the project was ten times the size of CTCI's capital, and the team calculated that even a 10% cost overrun could result in a loss equivalent to the company's entire share capital, posing significant risks.

But the complexity didn't stop there. As the client secured financing from export credit agencies (ECAs) in South Korea, Italy, Germany, the UK, and the Netherlands, procurement had to comply with the requirements for export credit guarantees. Equipment and material procurement orders were distributed across these five financing countries, calculated based on a specific formula. This accounted for 40% of the contract value, complicating the process.

In the face of such an enormous project, CTCI took

a cautious yet innovative approach, experimenting with new operational models, creating a new learning curve, to prepare for even larger-scale projects in the future.

Although the project was a joint venture, CTCI took on a pivotal role early on by deploying a dedicated team to CB&I's project management center in The Hague, Netherlands. "I spent one year and ten months in the Netherlands during the project's early stages," said M.L. Lee. His responsibilities included working with the client's project management team to review progress, establish management systems and workflows, and make critical decisions.

For CTCI, the challenges of the Oman project were unlike any it had encountered before.

For instance, the design and procurement centers were established in Taiwan, the Netherlands, the Czech Republic, and India, while the construction team was based in Oman. This multi-operation center approach enabled synchronized operations across five countries, ensuring streamlined project execution without conflicting leadership while maximizing the efficiency of human resources.

The project actually included four EPC contracts, with the CCJV managing the largest and most critical portion, "EPC1." This included the ethylene production plant and

utility systems like water purification, steam, exhaust, wastewater treatment, and flaring systems. These had to be completed first to support the rest of the industrial complex.

The remaining three projects, managed by different engineering firms, were carried out simultaneously, with upstream and downstream material flows linking them. CCJV was responsible for overseeing and coordinating the extensive and complex range of engineering interfaces across the projects.

In engineering, "interfaces" refer to the integration points between systems and equipment, such as the alignment of design, procurement, and construction, or the convergence of civil, mechanical, and electrical works at the site. As a result, effective interface management became critical to project efficiency.

To ensure seamless coordination, the project team conducted weekly meetings with the client to address design details, procurement, and construction issues. Major concerns, challenges, and critical decisions were reviewed in monthly face-to-face meetings. Through constant communication and collaboration, the team resolved issues, enhanced interface management, and ensured the project's success.

Learning from the Best: DuPont, Master of Workplace Safety

The Oman project spanned five years, during which CTCI achieved a remarkable 77 million safe man-hours, a feat that left the engineering industry in awe. "At its peak, there were approximately 10,000 workers on-site without a single lost time injury," said John Yu, his confident tone reflecting his appreciation for the team's dedication and hard work.

But the pressing question from outsiders remained: how did CTCI achieve this?

"We were fortunate," said M.L. Lee, who spent two years stationed at the Oman site. He inspected the grounds daily, frequently reminding workers to prioritize safety. "I often had to speak to 6,000 to 7,000 workers at a time, in both Chinese and English to ensure the rules and requirements were clearly communicated."

CTCI's meticulous focus on occupational safety has been deeply ingrained in its corporate culture for years. "When I joined CTCI as a project engineer in 1989, senior colleagues repeatedly emphasized, 'A petrochemical plant can easily cost tens of billions and is highly prone to corrosion. The work isn't something to take lightly — if anything goes wrong, it could explode and bankrupt the company,'" he said. "That's why we're extremely strict about engineering safety." Lee explained, recounting how he approached every project with caution and diligence.

Lee recalled one weekend afternoon 25 years ago when he received an unexpected call from a DuPont project supervisor, asking him to come immediately to a production plant in Taoyuan's Guanyin Industrial Park.

Upon arrival, the supervisor pointed to a board displaying "Safe Man-Hours" and asked sharply, "You know what this means, don't you?" Leading Lee into the office, he continued, "One of your team members almost ruined my record."

Puzzled, Lee cautiously asked, "What happened?" The supervisor explained that a CTCI colleague had accidentally injured himself while sharpening a pencil at the site office. While the injury was minor, it was deemed unacceptable under DuPont's stringent safety standards and could not be taken lightly. The supervisor issued a stern warning: "This must never happen again!"

At that time, DuPont's Guanyin plant held the top global safety record across all DuPont facilities. Their safety protocols extended to the smallest details: when using stairs, employees were required to hold railings and were

prohibited from keeping their hands in their pockets.

Even decades later, Lee still vividly remembers the incident and credits it for shaping his unwavering commitment to workplace safety, both as a project manager and supervisor.

In fact, this focus on safety wasn't limited to Lee alone; the rigorous standards and practical training from clients like DuPont were gradually internalized in CTCI's corporate culture. Over time, it fostered an uncompromising attitude toward safety and meticulous project execution. It is this commitment that has enabled CTCI to consistently deliver outstanding performance and set new benchmarks in the international engineering industry.

Mastering Lummus Processes, Optimizing Design Expertise

The Oman project carried immense significance for CTCI across multiple dimensions, particularly through its use of Lummus' latest patented "selective hydrogenation" technology for the ethylene cracking process. This was the first time the technology was implemented in one of CTCI's projects. The design team operated across four execution centers, with a peak workforce of 800 and 2.3 million man-hours dedicated to the design phase.

CTCI had built a strong foundation with Lummus through previous collaborations, amassing extensive experience in ethylene plant construction.

"In 2013, we completed CPC's Sixth Naphtha Cracker (Third Naphtha Cracker Revamp) EPC project. Before that, we worked on CPC's Fourth Naphtha Cracker and Formosa Petrochemical's Second and Third Naphtha Crackers, all utilizing Lummus' patented technologies," recalled John Yu. "The Oman project further enhanced CTCI's design capabilities," he stressed.

Lummus, a U.S. company with over 115 years of history, specializes in industrial process technologies, particularly in refining and petrochemicals. It pioneered ethylene cracking furnace technology in the 1960s and now holds cutting-edge patents licensed to over 200 ethylene plants worldwide, accounting for 45% of global production capacity. "They now hold more than 150 technologies and 4,100 patents," Yu noted. Despite Lummus' technical prowess, its history has been marked by ownership changes and mergers. Acquired by McDermott in 2015, it was sold again in 2016.

Understanding that "technological know-how is king;" Yu emphasized, "with the know-how, an engineering company becomes far more valuable." He saw this as a

prime opportunity for diversification, noting that acquiring a company with patented processes, coupled with CTCI's EPC expertise, could significantly boost CTCI's competitive advantage in bidding.

"We bid US$2.4 billion at the time, but unfortunately, an Indian company outbid us," John Yu said with a hint of regret. In 2020, McDermott sold Lummus for over US$2.7 billion, with the acquisition ultimately made by a joint venture between Haldia, under India's TCG[1], and Rhône Capital.

Partnering with Technology Patent Innovators

While missing the opportunity to acquire Lummus was a setback, CTCI's four-decade long collaboration with the company helped it evolve from an initial NT$100 million capital base with an annual revenue of just a few hundred million into one of the global top 100 engineering firms.

Its collaboration with Lummus, which began in Taiwan, had expanded to Malaysia, Saudi Arabia, and Oman. CTCI's ability to bid for ownership of this century-old enterprise reflects the group's tremendous growth and competitiveness.

In addition to Lummus, the U.S. firm Stone & Webster[2] was another key contributor to CTCI's growing success. This company played a pivotal role in pioneering CTCI's journey into ethylene engineering and facilitating its eventual return to the Middle Eastern market.

CTCI's collaboration with Stone & Webster dates back to its days as CTCI Foundation. In 1971, the two companies co-managed the detailed design for CPC's Second Naphtha Cracker, the largest engineering project CTCI undertook in the 1970s. This experience significantly bolstered CTCI's engineering and design capabilities.

Around the year 2000, CTCI and Stone & Webster collaborated on multiple projects in Taiwan, China, the Philippines, and Thailand. In 2004, CTCI partnered with JGC Corporation to secure the QAPCO ethylene plant expansion project in Qatar, with Stone & Webster providing ethylene process technology.

After years of collaboration and skill-building, CTCI's solid reputation with Stone & Webster helped it win the QAPCO EP2 project, marking its successful return to the Middle East market.

Raising Competitive Barriers Through Strategic Alliances

Collaborating with internationally renowned engineering firms has allowed CTCI to continuously sharpen its expertise and enhance its competitive edge. These strategic alliances have enabled CTCI to take on increasingly large and complex projects, solidifying its position as a global contender.

After its establishment in 1979, CTCI initially worked as a subcontractor for foreign firms. However, the formation of strategic alliances enabled CTCI to gain experience and credibility in executing large-scale international projects. Among its most significant partners was Chiyoda, which played a pivotal role in guiding CTCI into global markets and fostering its growth.

Another key partner was JGC Corporation. In 1981, JGC invited CTCI to participate as a subcontractor in the SRC project in Singapore, where it managed the construction of catalytic reformer and visbreaker units — marking CTCI's first project in Singapore.

During the catalytic reformer shutdown due to maintenance, the CTCI team worked tirelessly, often late into the night, and finally completing the project a month ahead of schedule. This achievement set a new record for JGC at SRC.

Similarly, the visbreaker project was completed seven days early, establishing CTCI's reputation for excellence in pipeline engineering. In 1984, impressed by its performance, SRC specifically selected CTCI to construct its hydro-cracker plant.

The early 1980s marked a golden era for CTCI in Singapore. The company undertook a series of significant projects, including a substation for the Esso Refinery and an oil storage tank expansion EPC project for Singapore's Senoko Energy.

In 1994, CTCI returned to Singapore to assist JGC with the Residue Cracking Complex (RCC) project, completing it within one year as scheduled and earning widespread recognition for its quality and safety standards.

These Singaporean projects provided invaluable opportunities for CTCI's young engineers to observe the operations of world-class engineering firms, helping to lay the groundwork for the company's global market expansion and its ability to train international talent.

CTCI's consistent performance over the years did not go unnoticed by Chiyoda, its longest-standing international partner. Recognizing CTCI's potential, Chiyoda made

a decisive move in 2011, acquiring a 10% stake in the company and was once a shareholder.

Furthermore, on August 17, 2011, Chiyoda and CTCI signed a cooperation agreement to jointly bid on projects and expand into overseas markets, including the Middle East and Southeast Asia. The partnership focused on infrastructure projects, water treatment facilities, and railway construction.

Moreover, both companies sought to leverage their technical expertise and human resources to explore diversified collaborations in global infrastructure, transportation, renewable energy, and environmental engineering.

Evolving from Subcontractor to Lead Contractor

As CTCI continued to grow, it transitioned from a subcontractor to a main contractor, gaining the capability to collaborate with international companies on larger contracts.

In 2014, as part of Petronas's refinery and petrochemical project at the Pengerang Integrated Complex in Malaysia, CTCI led a consortium to bid for the Residue Fluid Catalytic Cracking (RFCC) project. The consortium included Chiyoda and two Malaysian construction firms, MIE and Synerlitz, with CTCI serving as the lead contractor. The team ultimately outperformed competitors from around the globe to secure the RFCC project.

This US$1.3 billion contract was a landmark achievement for CTCI, representing its largest project to date and its first to surpass US$1 billion.

That same year, CTCI and Chiyoda teamed up again, venturing into the non-ferrous metals industry in the Middle East, securing an EPC contract for a Yanbu Ti-Sponge plant in Saudi Arabia. This marked a new milestone for CTCI, as it entered a completely new industry. The client, ATTM[3], was a joint venture between Saudi Arabia's AMIC[4] and Japan's TOHO, a leader in Ti-Sponge technology.

Japan strictly regulates Ti-sponge technology as a state-controlled export, enforcing stringent confidentiality as well as national interest. CTCI gained the trust of the client through its rigorous approach to intellectual property protection. This, coupled with its proven track record of successful collaborations with Chiyoda, secured the opportunity to jointly undertake the project.

Building Trust: Partnering with Clients for Worldwide Success

Beyond forming strategic alliances with patent licensors and international engineering firms, CTCI has excelled at building trust-based partnerships with its clients. These relationships have paved the way for continued collaborations and shared successes in global markets.

Leveraging its extensive experience in international refinery and petrochemical EPC projects, CTCI secured the largest investment contract in the construction of the Sixth Naphtha Cracker Complex in 1995, handling the complete design of the Formosa Petrochemical Refinery. CTCI has also been a key player in other major projects, including the Formosa Ha Tinh Steel Mill in Vietnam, various projects for Formosa Plastics, Nan Ya Plastics, and Formosa Chemicals & Fibre Corporation, as well as investments by Formosa Plastics and Nan Ya in the United States and China. CTCI's footprint is present in nearly all of these landmark developments.

Similarly, CTCI's early involvement in Grand Pacific Petrochemical's styrene monomer plant in Taiwan opened doors to new opportunities abroad. In the 2000s, after Grand Pacific established its subsidiary Guo Heng in Zhenjiang, China, CTCI was entrusted with the EPC projects for its SAN (AS resin) and ABS plants, extending their collaboration beyond Taiwan to international markets.

In addition, in 2001, CTCI designed Chang Chun Group's phenol plant, a collaboration that eventually led to joint ventures in China by 2010 and further expansion into the U.S. market in 2021.

Other successful partnerships include collaborations with Chi Mei Group for polystyrene plants in Taiwan and Zhenjiang, as well as ABS/AS plants in Zhangzhou. CTCI has also worked closely with Taiwan's USI Corporation, Asia Polymer Corporation, and Taita Chemical Company on projects across Taiwan and China. In 2022, CTCI completed Quanzhou Guo Heng's 660,000-ton PDH and 450,000-ton PP project.

By collaborating with leading international engineering firms, CTCI combines core strengths to create high-

CTCI joins forces with international engineering companies, and combining core competencies to build solid and efficient teams. This synergy enables CTCI to stand out in the highly competitive global engineering market.

performing teams, distinguishing itself in the competitive global market.

Earning Trust Through Professional Execution

"CTCI earns the trust of its clients through professional execution," emphasized David Chung, Deputy CEO of Group Engineering Business. "When projects are executed well, clients are more willing to build deeper collaborative relationships with us. Mutual trust is essential for the smooth completion of any project."

This sentiment underscores the vital role of trust in project execution, particularly in Saudi Arabia, where CTCI has built a strong partnership with SABIC, one of the Middle East's largest chemical conglomerates.

After CTCI's return to Saudi Arabia, its first major collaboration was with SABIC in 2006. Building on the success of the Saudi Kayan Ethylene Oxide/Ethylene Glycol project, CTCI secured the front-end design contract for the plant's capacity expansion in 2016, defeating major global competitors like Japan's JGC and the US-based Fluor. The project was completed on schedule, earning SABIC's trust.

Thanks to its strong performance in FEED, CTCI later won the bid for the Saudi Kayan ethylene plant project. This end-to-end process — from front-end design to detailed design, procurement, construction, and commissioning — allowed CTCI to achieve vertical integration of its EPC engineering services.

In 2018, CTCI partnered with McDermott to secure the world's largest monoethylene glycol (MEG) plant project in Texas. The client, GCGV, was a joint venture between SABIC and ExxonMobil. With SABIC's strong support, CTCI entered ExxonMobil's business ecosystem for the first time, paving the way for future collaborations.

Building on its solid foundation with SABIC, CTCI successfully secured the EPC contract for the Dual-Loop HDPE plant at the Gulei Petrochemical Base in Zhangzhou, Fujian, China, in 2024. The client, SABIC Fujian Petrochemicals Co., is a joint venture between SABIC and Fujian Energy Petrochemical Group.

"Over the years, we have continuously learned and grown, providing comprehensive engineering services to clients worldwide. By establishing long-term relationships and delivering reliable service quality, CTCI has become the partner of choice for international clients," said Group Vice Chairman Michael Yang confidently.

A Strong Alliance to Reach New Heights

In recent years, CTCI has formed strategic alliances with internationally renowned engineering firms, combining their strengths to create high-performing teams. This approach has proven highly effective, enabling CTCI to rise above intense global competition. In early 2023, CTCI and SAMSUNG E&A secured the US$2.5 billion Ras Laffan Ethylene Project in Qatar, the world's largest ethylene plant, marking another major achievement.

The key to CTCI's success in securing the bid alongside a former rival, as Michael Yang noted, was "our extensive experience in ethylene engineering and the integration of modular and automated innovations, which earned the client's trust and recognition."

Yang, who has served at CTCI for over 30 years, reflected on the company's transformation from a Taiwan-based firm to a global leader. "Starting in Taiwan and expanding overseas, CTCI has diversified into fields such as refining, petrochemicals, power, waste-to-energy, rail systems, and high-tech industries. This broader perspective has positioned us as a leader in the engineering world," he remarked.

In 2017, CTCI partnered with General Electric (GE) for the first time, leveraging GE's exclusive combined-cycle power generation technology to secure the Track 4A Combined-Cycle Power Plant project for Malaysia's Southern Power Generation.

CTCI not only achieved success in the global market but also continued to set records domestically. In 2020, it teamed up with GE again to secure EPC contracts for Taiwan Power Company's Hsinta and Taichung combined-cycle gas turbine power plants. With a combined value exceeding NT$100 billion, it set a new record for CTCI's largest single contract in Taiwan.

Together, these achievements underscore the success of CTCI's strategy to collaborate with leading industry players, enabling consistent success in both domestic and international projects. With unmatched expertise in design, procurement, and construction, CTCI stands as a leader in Taiwan, exemplifying how to collaborate with industry giants, adapt to evolving demands, and continually strengthen its team.

As Isaac Newton once put it, "If I have seen further, it is by standing on the shoulders of giants."

With Group Chairman John Yu at the helm, CTCI has spent more than two decades building its engineering expertise through strategic alliances and transformative

reforms. By 2005, CTCI had surpassed RSEA Engineering Corporation to become Taiwan's leading engineering brand. Internationally, it ranked 55th among global engineering firms, outperforming many prominent European, American, and Japanese companies.

"In Asia, only three to five companies in Japan and Korea can match CTCI's capabilities," Yu remarked with confidence.

CTCI's growth trajectory has been nothing short of extraordinary. In 2000, its consolidated revenue was just over NT$10 billion. By 2023, annual revenue had surpassed NT$100 billion, with backlog exceeding NT$300 billion. Now CTCI competes alongside the world's leading industry giants. Standing on the shoulders of giants, or building on the expertise of global partners, CTCI has refined its skills, advanced its technologies, and continuously evolved. With a vision for the future and the determination to go the distance, CTCI has transformed into a giant itself.

Notes:

1. The Chatterjee Group.
2. Established in the late 19th century, this company has over 130 years of history. Its ownership changed multiple times, with parts of its business acquired by CB&I and later Westinghouse Electric.
3. AMIC-Toho Titanium Metal Company.
4. Advanced Metal Industries Cluster Company Limited.

Chapter 4

Thriving Globally, Flourishing Everywhere

CTCI has made bold strides in its global expansion, creating a network of subsidiaries under the unified "CTCI" brand. Like a hen guiding her chicks, the parent group has established operations worldwide. Each CTCI "family" member operates independently while adhering to the parent group overarching strategy. By adapting to local conditions and collaborating strategically, CTCI seizes opportunities for shared success. The 1980's marked the beginning of CTCI's ambitious overseas expansion, with Asia serving as its first frontier.

CTCI Thailand: The First Overseas Permanent Base

Approximately 220 kilometers from Bangkok, in the Rayong Industrial Zone, lies the PTTLNG Nong Fab Liquefied Natural Gas (LNG) Terminal. With its 6-kilometer jetty stretching into the Gulf of Thailand, it holds the distinction of being the world's longest LNG receiving jetty, while its two LNG storage tanks set global capacity records. This landmark EPC project[1] was awarded in 2018 to CTCI Thailand and its Italian strategic partner, Saipem[2].

As CTCI's first permanent overseas base, CTCI Thailand played a pivotal role in the company's international expansion, making this project especially significant to CTCI. The US$1 billion contract marked a significant milestone, demonstrating its ability to manage mid- to large-scale engineering projects effectively. In 2023, the project won both the Distinguished Project Award and the Outstanding Project Leader Award at Taiwan's Project Management Institute Grand Awards, known as the Oscars in the field of project management.

"It's been thirty-seven years!" Group Chairman John Yu reflected on the establishment of CTCI Thailand. The journey began in 1986 when Chiyoda secured an expansion project for Thai Oil[3] and subcontracted the construction work to CTCI. To oversee the project, Yu — then a deputy general manager in the Business Division — was sent to Thailand to set up CTCI Thailand.

"After completing my two-year assignment in Saudi Arabia, I returned to Taipei for a debriefing," Yu explained. "My boss, Chiu-Ching Lin, told me, 'You've worked hard in

Saudi Arabia; now I'll send you somewhere better.' But," Yu added with a laugh, "when I found out I was being stationed in Thailand, the company didn't even exist there yet."

"And just like that, on January 6, 1987, I arrived in Bangkok, rented an apartment, handled administrative tasks, and registered the company. I spent the Lunar New Year all alone in a foreign land," he recalled.

Two days later, on January 8, CTCI Thailand was officially established and promptly approved by Thailand's Ministry of Commerce, with J.T. Lin appointed as its first Managing Director.

"The office was in Bangkok with just 33 employees, 18 of whom were dispatched from Taiwan and mostly stationed at the construction site," Yu recalled. The Thai Oil project site was located in Sriracha, southeast of Bangkok and north of Pattaya.

After six months in Thailand, Yu handwrote a detailed report summarizing the company's establishment process, operations, and business prospects. The report also included an analysis of Thailand's refining, petrochemical, and fertilizer industries, as well as CTCI's potential in the region.

Yu mentioned in his report that Thailand's petrochemical development was about 15 years behind Taiwan's, resembling Taiwan in the 1970s when large-scale chemical plants were

still rare. He foresaw a flourishing market in the years ahead. Among the subcontractors hired by Chiyoda for the Thai Oil project, CTCI Thailand's performance stood out, thanks to the dedication of the team of engineers sent from Taiwan.

Building Local Foundations for Long-Term Success

"To establish local roots, CTCI must leverage its expertise and focus on projects that local companies cannot handle," John Yu explained as he analyzed CTCI's strengths and weaknesses in Thailand, outlining a clear strategy for future development.

In terms of construction, Yu acknowledged that CTCI Thailand could not compete with local firms. Instead, he proposed focusing on construction supervision services. While CTCI Thailand lacked the capacity to handle full EPC projects, it could target smaller projects under US$20 million, where it could effectively compete with Japanese firms. For larger EPC projects, Yu suggested that the parent company take the lead, collaborating with CTCI Thailand to strengthen their competitive edge.

Yu also emphasized that engineering design — the "root" of any project — could serve as a key differentiator. Thailand lagged far behind Taiwan in this area, except in civil engineering. He proposed establishing an engineering design division in Thailand, with headquarters staff guiding local engineers through on-the-job training. This, he argued, would ensure long-term sustainability. Yu's strategic report laid the foundation for CTCI Thailand's long-term strategy. Six months later, Yu was appointed Managing Director of CTCI Thailand, allowing him the opportunity to implement his own recommendations.

Breaking into a new market was challenging, and it took CTCI five years to gain traction. In 1992, CTCI, in partnership with CTCI Thailand, secured the Bangchak hydrodesulfurization (HDS)[4] project.

This was CTCI's first large-scale EPC project in Thailand and was successfully completed in 1993. Building on this experience, CTCI began gaining momentum, securing contracts such as Vinythai's vinyl chloride monomer (VCM)[5] plant, Taiwan's Tuntex Group PTA[6] plant, and U.S.-based Monsanto's ABS[7] plant for design and procurement services. These projects not only strengthened CTCI Thailand but also provided invaluable hands-on training, guided by the parent company, to develop local capabilities.

CTCI Thailand eventually transformed into a significant regional player. After 2000, CTCI and CTCI Thailand began securing EPC contracts exceeding US$300 million each. Major projects included PTT's[8] PPCL[9] phenol/cumene plant, a propane dehydrogenation (PDH) project for HMC[10] in partnership with U.S.-based Stone & Webster, and Bangchak's quality improvement EPC project. They also won a US$600 million contract for PTTAC's[11] acrylonitrile (AN) and methyl methacrylate (MMA) plants.

At its peak, CTCI Thailand employed over 1,000 people. Today, the company maintains a workforce of approximately 700-800 and contributes stable annual revenue and profits. In 2018, with support from the parent company, it secured a nearly US$1 billion EPC contract for the PTTLNG Nong Fab natural gas receiving terminal.

CTCI Vietnam: A Key Talent Hub for CTCI

"In overseas markets, we typically begin with a project-specific office and withdraw once the project is finished," explained John Yu. This "hit-and-run" approach allows CTCI to assess the viability of establishing a long-term presence.

But what are the determining factors? "The first factor is the presence of opportunities, and the second is market potential," Yu stated. "If sufficient business volume supported long-term growth, establishing a permanent office would be worthwhile." Yu explained briefly.

Yu highlighted the benefits of establishing local roots, including gaining a deeper understanding of local customs, laws, and regulations to avoid potential pitfalls, as well as building stronger employee loyalty. However, he emphasized that even with a permanent office, consistent investment in development is essential. In Vietnam, for example, the shortage of experienced design professionals led CTCI to recruit fresh graduates and provide extensive training.

Years of effort have paid off. "CTCI Vietnam now has nearly 200 design personnel," said CEO of Group Engineering Business and CTCI Corporation President Ming-Shyan Lee, who spent five years serving as General Director at CTCI Vietnam. Lee observed that "the Vietnamese value education highly, with parents heavily investing

CTCI evaluates long-term viability of a permanent office overseas based on business volume and market potential.

in their children's studies. This aligns with our talent development goals, making Vietnam an ideal foundation for growth."

Taiwan's thriving hi-tech industry has made it increasingly difficult to recruit electrical engineers for other sectors. To tackle this challenge, CTCI turned to Vietnam, focusing on training talent in electrical and civil engineering. Since its founding in 2001, CTCI Vietnam has grown into a vital talent hub for the Group. In recent years, it has been recognized as the Group's second design center, playing a crucial role in addressing manpower shortages in the parent company's engineering and technical teams.

Selective Establishment of Permanent Offices

Not all markets are suited for long-term operations, however, and when conditions are unfavorable, tough decisions must be made.

"Take the Middle East, for example. Almost everything has to be imported — labor, materials, even bottled water. Many intangible assets simply cannot be retained locally," explained John Yu. He pointed out that imported labor

often lacks cohesion and loyalty, creating challenges for sustainable operations. "CTCI made several attempts to establish a permanent office in the Middle East but ultimately decided against it."

This strategic mindset shapes CTCI's approach to overseas expansion. Its early international ventures, such as the establishment of CTCI Arabia and CTCI Singapore in 1981 were all task-oriented in nature, followed by temporary setups in Malaysia, Oman, and Qatar. Today, permanent offices are established only in markets with suitable conditions, such as Beijing, Shanghai, Thailand, Vietnam, Indonesia, India, and the United States, which support long-term operations.

Singapore and Malaysia: Pioneering Overseas EPC Projects

After completing the SRC refinery project with JGC in 1986, CTCI expanded into the power sector. In 1987, the company secured a contract with Singapore's Public Utilities Board to expand the oil tank zone at the Senoko Power Plant, managing storage tanks and pipeline systems.

"This was CTCI's first large-scale EPC project in Singapore," recalled former Executive Vice President of CTCI Corp. Wen-Chung Liao, who served as the project manager for the SRC refinery project. In his autobiography, *My Life Trilogy*, Liao described the project as a significant milestone, marking CTCI's initial venture into EPC services.

However, after completing SRC's heavy oil cracking pipeline project in 1994, Singapore's refining and petrochemical industries stagnated, leaving CTCI without further opportunities in the region. It would take nearly a decade before the company re-entered the Singapore market.

In 2011, CTCI and its Singapore subsidiary jointly secured several MRT contracts, including the Downtown Line Stage 3, the Thomson-East Coast Line, and the Gali Batu Depot expansion. Leveraging its experience with Taiwan's MRT systems, CTCI successfully applied its expertise to Singapore, achieving a new milestone in international rail infrastructure development.

Furthermore, Malaysia has also played a significant role in CTCI's overseas journey. Since establishing CTCI Malaysia in 1983, the company has focused on the refining and petrochemical markets while gradually moving into power plant construction.

In 2011, CTCI secured a US$300 million EPC contract for the Kimanis combined-cycle power plant in Sabah,

worth nearly NT$10 billion. William Pung, then Construction Manager and now head of CTCI's Advanced Technology Facilities Business Operations, remarked, "This was CTCI's first overseas non-petrochemical EPC project, solidifying its reputation in the international combined-cycle power plant market." In 2014, CTCI secured a US$1.3 billion contract for Petronas' residue fluid catalytic cracker (RFCC) project, marking a new milestone for EPC projects in Malaysia and throughout Asia.

A notable feature of the RFCC project, referred to as the P1 project[12], was the modularized construction of waste heat boilers. Two modules, each weighing 2,000 metric tons, were pre-assembled in Taiwan and delivered to Malaysia by late 2016. The approach significantly shortened the timeline and demonstrated CTCI's expertise in modular prefabrication, reinforcing its leadership in engineering excellence.

CTCI Beijing: A Stronghold for Expansion into Central and South Asia

China has been a cornerstone of CTCI's strategy in Asia. With over 30 years of market experience in the region,

CTCI established CTCI Beijing in 1993 as a wholly owned subsidiary. It has since become one of the Group's strongest overseas operations, employing more than 650 people. Tie-Shi Zhang, who joined at its inception, later rose to serve as its chairman.

"At the time, to demonstrate our commitment to a long-term presence and reassure employees, CTCI decided to invest in property," John Yu explained. He noted that engineering firms without physical assets like plants or equipment could easily withdraw from a market. To address this, CTCI Beijing purchased office buildings in both Beijing and Shanghai. In Beijing, the company chose a prime location between the second and third ring roads, acquiring a 10,000-square-meter building to symbolize stability and permanence for its employees.

"CTCI Beijing's key clients include Taiwanese businesses, foreign companies with stringent intellectual property standards, and private enterprises in China. To them, CTCI Beijing is a top-tier engineering company, capable of delivering end-to-end services from engineering and

CTCI explored new trends and opportunities at home while exploring globally.

procurement to construction," Yu shared with pride.

Over the years, CTCI Beijing has built a solid reputation in international markets. It has undertaken foundational engineering projects for purified terephthalic acid (PTA) and polyethylene terephthalate (PET) facilities in Russia, as well as projects for SASA's PIA (purified isophthalic acid) facility in Turkey and RIL's[13] PTA project in India. These projects have helped the company develop extensive expertise in plant design and construction.

"CTCI Beijing will follow the parent company's international expansion strategy, focusing on Central and South Asia, including markets like Kazakhstan, Turkey, and India, while enhancing its cross-border management capabilities," said CTCI Corporation President Ming-Shyan Lee. "This approach will enhance CTCI Beijing's global competitiveness and deliver greater operational benefits."

US and India: Expansion into High-Tech

In recent years, CTCI has shifted its focus to the high-tech sector, leveraging global supply chain realignments to expand internationally. The United States, with its advanced technology and strong STEM foundation, and India, a rapidly growing economy, have become central to CTCI's growth strategy.

In 2010, CTCI established its operations in the United States, but it wasn't until 2017 that it secured its first EPC project — a design and construction contract for Formosa Plastics' US plant. Building on this success, CTCI won a landmark US$1 billion contract in 2018 to construct GCGV's modular MEG plant on the Texas Gulf Coast, the largest of its kind worldwide.

These achievements provided CTCI with a strong foundation for further growth, including the creation of its Advanced Technology Facilities Business Operations unit in 2020. Since committing to the high-tech sector, CTCI has adjusted its overseas expansion strategy, leading to a significant breakthrough: winning a major semiconductor project in Arizona. This milestone has profoundly transformed CTCI's operations in the United States.

In addition, India has also become a vital market for CTCI. Since its establishment in 2008, CTCI India has provided EPC engineering services across planning, design, procurement, construction, and commissioning. In 2009, it partnered with its parent company on ISRL's[14] styrene-butadiene rubber (SBR) project in Panipat, completing the basic design and cost estimates within six months for a

contract worth around US$1.4 million.

Another notable success came in June 2012, when CTCI India, in collaboration with China Steel Corporation India, secured a US$100 million EPC contract for an annealing and coating line (ACL) project in Dahej, delivering it successfully within 29 months.

"Taiwanese companies operating in these regions have created many opportunities for CTCI," John Yu remarked with optimism. He expressed confidence that by aligning with the growth of Taiwanese high-tech firms, CTCI could deepen its presence in the US and Indian markets, with the benefits of this strategy gradually becoming evident.

However, CTCI's focus is not limited to overseas markets. "Simultaneously developing domestic and international markets to strengthen the Group's organizational structure has been my transformation goal," Yu explained. Since becoming President in 1998, he had actively pursued new business opportunities to drive the company's growth.

Mastering the Energy-from-Waste Trend

In the 1980s, Taiwan's rapid urbanization led to a surge in waste generation, straining the environment and igniting

the "Waste War." After nearly a decade of efforts, in 1991, the Environmental Protection Administration (EPA)[15] introduced a policy framework of "incineration as the primary method, with landfilling as a secondary option." The central government took the lead by seeking advanced technologies abroad and encouraging local governments to build energy-from-waste (EfW) plants. This policy laid the foundation for Taiwan's environmental protection industry and sustainable urban development.

CTCI was one of the first engineering companies in Taiwan to respond and actively participate in the construction of waste incineration plants. In the 1990s, CTCI expanded into the energy-from-waste and waste treatment sectors. As the trend took hold, CTCI gradually laid its foundation, securing projects such as providing consulting services for the EPA on the planning and design of large urban waste incineration plants, winning Taiwan's first public-private partnership (PPP) project for the New Taipei City Incineration Plant, and undertaking the EPC construction of Kaohsiung's South District Waste Incineration Plant, the first and foremost turnkey construction project in Taiwan led by a local company. In 1999, CTCI founded ECOVE, which quickly achieved success.

"In our first year, we secured the contract for Taiwan's

first BOT (Build-Operate-Transfer) large-scale waste incineration plant — the Taichung Wujih EfW Plant," said J.J. Liao, CEO of Group Resource Cycling Business and Chairman of ECOVE Environment Corporation. "It signifies that CTCI has evolved beyond EPC services to encompass upstream investments, downstream operations management, waste transportation and dispatch services, and energy operations involving power generation and sales — a transformation incomparable to the past," he explained.

This confidence is well-founded, for what's even more remarkable is that while branching into new fields reflects the successful implementation of diversification, such a move would have been impossible without meticulous preparation — something CTCI has achieved with excellence.

"These projects required an entirely different business mindset from traditional engineering services. We had to relearn everything, from financial accounting, management systems, and technical talent development to fundraising and risk assessment," recalled J.J. Liao. At the time, ECOVE had to consider countless factors, such as political and economic conditions, industry trends, environmental regulations, and public awareness of environmental issues. "Fortunately, CTCI's leadership had the foresight to recognize that turning waste into energy (electricity)

would become a major trend. No matter how difficult, they believed it was critical to find a way forward and not back down."

To succeed in this market, a strong foundation in engineering expertise was essential, but it also required strategic planning. By integrating investment strategies with EPC project execution and operational management, CTCI achieved synergy. With a smile, J.J. Liao remarked, "There's no one better suited for this than us!"

ECOVE: An Environmental Pioneer in Green Energy

"CTCI is not only committed to active participation but also strives to be a guardian of the environment and society, enhancing Taiwan's environmental image and safeguarding public health," said J.J. Liao, expressing pride in the company's efforts and the leadership dedicated to corporate social responsibility.

From its inception, ECOVE has concentrated on the environmental and green energy sectors, driving innovation and embracing smart applications as its key competitive edge. With clear goals in mind, the company implemented

organizational changes to align with its vision.

First of all, ECOVE adopted an investment holding structure, consolidating subsidiaries within the Group that are focused on environmental resource management, such as ECOVE Environment Corp. and ECOVE Waste Management Corp. By offering professional investment, development, operational, and management services, ECOVE expanded its business and created significant value.

In May 2010, ECOVE became Taiwan's first OTC-listed green energy and environmental holding company on the Taiwan Stock Exchange. Then, in 2017, ECOVE introduced a new brand identity, embracing the philosophy of "cherishing every resource" while expanding its services. This strengthened its position as a trailblazer in Taiwan's environmental sector and resource management service provider. In 2023, ECOVE's Chinese company name was renamed to emphasize its dedication to sustainable green investments, the green energy industry, and resource recycling.

"We have developed smart management systems that leverage big data and integrate advanced technologies like artificial intelligence (AI) and the Internet of Things (IoT), alongside our patented innovations, to enhance operational efficiency," said J.J. Liao. In 2023, ECOVE processed over 2.45 million tons of waste and generated more than 1.3 billion kWh of electricity, enough to power over 350,000 households.

ECOVE continues to lead in renewable energy. Supporting the government's diversified energy policies, ECOVE now owns and operates over 100 photovoltaic power plants worldwide and is one of the few companies in Taiwan capable of providing comprehensive, end-to-end services — from investment and development to construction, operation, and green electricity trading. Notably, ECOVE became the first Taiwanese company to earn U.S. Green-e® Energy certification for its Lumberton Photovoltaic Power Plant (Lumberton PVPP) project. In resource recycling, ECOVE has achieved remarkable milestones.

In 2018, the company established EVOVE Solvent Recycling Corp. to recycle waste isopropyl alcohol (W-IPA) generated from the semiconductor manufacturing process into industrial-grade isopropyl alcohol (IPA), returning it to the market for use. By 2023, ECOVE had processed over 16,000 tons of waste solvents. Additionally, it has expanded its water treatment services, managing and maintaining wastewater treatment plants and processing 75 million tons of wastewater in 2023.

Today, ECOVE thrives with its core sectors of waste

management and electricity sales each contributing over 30% of revenue. The company's services now extend beyond Taiwan to areas such as Macao in Greater China, Southeast Asia, and the U.S., offering a wide range of resource recycling solutions. According to ECOVE's 2023 annual report, the company achieved revenue exceeding NT$7.6 billion, with earnings of NT$16.36 per share.

Embracing Intelligent Technology with Strategic Insight

With a clear vision of future trends, CTCI has fully embraced the era of smart technology. Through its subsidiaries — CTCI Advanced Systems Inc., CTCI Smart Engineering Corporation, and CTCI REI — the company has made significant strides in the market.

The origin of CTCI Advanced Systems Inc. dates back to 1987, when CTCI invested NT$20 million to establish a company specializing in the design and system integration of computer, communication, and control systems, as well as software engineering. Renamed in 1999 as CTCI ASI and listed on the stock exchange in 2002, the company expanded its business to include engineering integration and smart

services, becoming the second publicly listed affiliated company of CTCI Group.

CTCI Smart Engineering Corporation was founded in 1980 as a joint venture between CTCI and U.S.-based Ebasco Services. Initially focused on securing business in nuclear power plants, the company pivoted when nuclear projects faced setbacks and foreign investors withdrew. CTCI took majority ownership and redirected its efforts toward power plants and high-tech electronics manufacturing.

CTCI REI, originally established as CTCI Resources Engineering in 1984, was created to handle petroleum exploration and extraction services for CPC Corporation. In 1988, the company was renamed CTCI REI to reflect its expansion into civil and construction-related projects, primarily supporting CTCI's engineering and construction operations. CTCI REI has had a legacy spanning 40 years. In 2021, CTCI ASI acquired full ownership of CTCI REI, making it a wholly owned subsidiary.

"CTCI REI was the first company in Taiwan to hold both a technical consulting license and a construction license," said Kuo-Ann Wu, Executive Director of Group Intelligent Solutions Business who became Chairman of CTCI REI after retiring from public service in 2015. At the time, the company was undergoing a significant transformation.

Recognizing the growing importance of modularization and prefabrication, it repositioned itself accordingly.

"Transitioning to structural steel and prefab operations will enhance the competitiveness of CTCI's engineering projects," John Yu explained. "At first, CTCI REI focused exclusively on handling contracts from CTCI, enough to sustain its prefab business. Once the company gains a solid foothold, it can then seek opportunities externally." With the growing trend of modular prefabrication solutions that lower on-site labor demands and costs, he expressed strong confidence in CTCI REI's future development.

More importantly, John Yu highlighted the synergy among these three affiliated companies: "These three companies complement one another's strengths." By combining project management expertise with advanced information and communications technology, together they have honed their focus on the Taiwanese market, excelling in areas such as process instrumentation control, system integration, smart applications, high-end cleanroom electromechanical engineering, and construction development. The affiliate companies aim to leverage their expertise in structural engineering, electromechanical HVAC, industrial automation, and control system integration. Looking ahead, CTCI plans to

expand into smart manufacturing, smart transportation, smart buildings, and smart parks, offering comprehensive intelligent application solutions.

"CTCI ASI, CTCI SEC, and CTCI REI can form specialized project teams and operate independently," Wu noted. From 2021 to 2024, these three companies collectively secured contracts exceeding NT$10 billion annually, with revenue growing from under NT$4 billion to nearly NT$10 billion, establishing smart technology as another steadily growing business sector for CTCI.

The Transformation of CTCI Chemicals Corporation

In 1999, CTCI Chemicals Corporation (CTCI CHC) was founded. "At that time, I was the CTCI President. I witnessed the completion of the integrated design of Formosa Plastics' Mailiao Sixth Naphtha Cracking Complex, with major production facilities like heavy oil cracking, hydrogen plants, heavy oil hydrodesulfurization, and light oil cracking nearing completion. These were significant milestone projects, and we had to continue to strengthen our client relationships and provide follow-up services after

the project completion," John Yu recalls the founding of CTCI CHC.

Initially, CTCI CHC focused on representing Baker Petrolite's chemical additives, primarily catering to Taiwan CPC and Formosa Plastics. The company provided both chemical products and technical services. Over time, Rongji Engineering Consultants, originally Baker Petrolite's agent, joined as a shareholder in CTCI CHC.

In 2014, CTCI CHC proposed building an integrated office and factory to replace its aging rented facility, a move strongly supported by John Yu. The corporation's performance thereafter did not disappoint Yu's expectations.

In 2017, the new office in Huwei was completed, and in 2020, the office and factory at Taoyuan Industrial Technology Park were completed and put into operation. In recent years, the technology center has significantly enhanced R&D efficiency, established its own brand, optimized the supply chain, and obtained certifications such as ISO 9001, ISO 14001, ISO 45001, and ISO/IEC 17025 from the National Accreditation Foundation, paving the way to becoming a comprehensive solutions provider.

With market evolution and business expansion, CTCI CHC shifted its focus, developing proprietary specialty chemical formulations and expanding its trade agency

network. The company introduced a range of high-quality, internationally competitive catalyst products, including those for China Petrochemical Development Corporation's (CDPC) C3 hydrocarbon, linear low-density polyethylene, ethylbenzene dehydrogenation, and alkylation for CDPC, as well as Junfei's sulfur recovery and carbon monoxide (CO) oxidation. Additionally, CTCI CHC collaborates with global industry leader TNK to offer chemical dosing systems and chemical services.

These achievements have supported the CTCI Group internally by supplying essential products to achieve synergy while providing chemical additive services to external clients such as Formosa Petrochemical, Formosa Chemicals & Fibre, Nan Ya Plastics, Chi Mei Corporation, Grand Pacific Petrochemical, and LCY Chemical.

Fulfilling Corporate Social Responsibility

CTCI CHC has steadily expanded its scope beyond the petrochemical and refining sectors, delving into environmental resource improvement; for example, activated carbon, fly ash heavy metal chelation agents, solidification additives for waste treatment, water treatment

chemicals, and sodium bicarbonate supply services.

As large-scale resource recovery incineration plants flourished, CTCI CHC initially supported CTCI's Group Resource Cycling Business (GRCB) with essential environmental products such as activated carbon for dioxin adsorption, chelation agents for capturing heavy metals from reaction ash, and boiler water treatment chemicals. These efforts successfully expanded into the domestic incineration plant market, achieving an 80% market share.

In response to evolving environmental demands, CTCI CHC quickly introduced sodium bicarbonate blending and unloading equipment in 2022 to help clients effectively remove acid gases from flue gas. "We remain committed to supporting Taiwan's environmental protection efforts and fulfilling our corporate social responsibility," John Yu emphasized.

Pursuing excellence and aligned with CTCI's entry into the high-tech sector, CTCI CHC has also established high-tech and new chemical divisions, capitalizing on emerging opportunities. It has secured contracts for specialized activated carbon in wastewater and exhaust treatment systems for major Taiwanese semiconductor manufacturers, chemical testing orders for copper and fluoride removal agents, and chemical supply agreements for the Southern Taiwan Science Park Water Reclamation Plant.

"CTCI CHC 2023 revenue exceeded NT$730 million, with earnings of NT$15.17 per share," John Yu noted. "We aim to continue expanding through diversification, exploring new business areas, and tapping into overseas markets to ultimately upgrade to a public company." This small yet dynamic company is poised to evolve into an international leader in specialty chemicals and technical services. Yu looks forward to this with great anticipation.

CTCI Machinery Corporation: A Complete Makeover of a Machinery Plant

After the year 2000, CTCI continued its expansion and reform in Taiwan, with a significant transformation at CTCI Machinery Corporation (CTCI MAC). Originally operating as a machinery fabrication plant, it spun off to become a subsidiary in 2007 and later emerged as one of Taiwan's leading suppliers of pin pile and foundation products for offshore wind farms.

CTCI Machinery Corporation (CTCI MAC) traces its origins to 1975, when CTCI established a mechanical equipment fabrication plant in the Kaohsiung Dashe

Industrial Zone. This area, along with the nearby Linyuan Industrial Zone, became southern Taiwan's petrochemical hub, supporting CTCI's business needs. With its own machinery plant, CTCI was able to manufacture and supply equipment for construction projects commissioned by CPC and other petrochemical plants, whether for new installations or equipment replacements. However, John Yu recognized an opportunity for improvement. To revitalize operations and enhance performance, he restructured the business in 2007, transforming the mechanical plant into CTCI MAC, shifting it from a cost center to an independent, profit-driven subsidiary.

Since its reorganization, CTCI MAC has produced a wide range of equipment, including towers, storage tanks, heat exchangers, and reactors. It has taken on both new construction and capacity expansion projects in the petrochemical, refining, specialty chemicals, and general industrial sectors, positioning itself as a small-to-medium-sized EPC contractor. In 2012, the company expanded

Leveraging the Group's global and local resources, CTCI delivers differentiated, diverse, and flexible services to clients worldwide.

further by launching a maintenance division, offering comprehensive plant inspections, total assessments, specialized checks, and debottleneck services.

"This was a strategic approach," John Yu said frankly. He noted that many aging factories required minor modifications or optimizations. However, these projects are relatively small in scale and not ideal for CTCI to handle directly. "If we don't act, competitors will," he said. Put simply, this approach enabled CTCI to seize market opportunities and set entry barriers to block rivals. Smaller and more agile, CTCI MAC could handle these projects with greater flexibility and competitiveness.

In recent years, CTCI MAC has undergone transformation, venturing into the offshore wind power industry. Since 2019, it has successfully undertaken projects of transition piece, a substructure of offshore wind turbine for OWF Yunlin, the Changfang & Xidao Offshore Wind Farms and Zhongneng Offshore Wind Farms. The company also built a new facility in Daling to produce underwater foundations, marking a milestone with Taiwan's first domestically-produced offshore wind turbine equipment.

From 2017 to 2023, CTCI MAC achieved an impressive 147% revenue growth, driven by advancements in offshore wind power projects. "Organizational changes have

improved efficiency, strengthened employee cohesion, and elevated CTCI MAC into a high-performance company," John Yu stated with pride.

Winning by Differentiation

Rooted locally and expanding globally, CTCI has boldly taken on challenges in Taiwan and around the world, executing diverse projects. Its international footprint spans the Middle East, including Saudi Arabia, Jordan, Oman, and Qatar; Southeast Asia, including Singapore, Thailand, Malaysia, Indonesia, and Vietnam; South Asia, including India; as well as China and the United States. Operating in over 10 countries with approximately 50 affiliated companies, CTCI has firmly established itself as a global player.

"Currently, nearly half of our revenue comes from overseas," Michael Yang, Group Vice Chairman, remarked optimistically. "Moving forward, we will strengthen our overseas project execution, accelerate international business expansion, and maintain a balance between global growth and local market needs."

As reflected in its financial statements, CTCI Corp.'s

market value reached nearly NT$70 billion in 2023, with consolidated Group revenue amounting to NT$103.5 billion, half of which was generated by global affiliated companies. "Small CTCIs" exemplify the power of aggregation and differentiation by leveraging the resources of domestic and international affiliates to maximize localization and specialization. This approach creates a unique competitive edge, empowering CTCI to deliver diverse, flexible, and internationally competitive services to clients worldwide.

Notes:

1. The second liquefied natural gas (LNG) receiving terminal project invested and constructed by PTTLNG, a subsidiary of PTT (Thailand National Petroleum Corporation).
2. A subsidiary of ENI (Italian National Oil Company).
3. Thai Oil Public Company Limited, a subsidiary of PTT.
4. The process of removing sulfur compounds from natural gas, gasoline, fuel, or petrochemical feedstocks (such as isopropyl benzene) before processing or combustion.
5. Vinyl chloride, a monomer widely used in the industrial production of polyvinyl chloride (PVC).
6. A primary raw material for producing polyester products.
7. Acrylonitrile (AN), butadiene (BD), and styrene (PS) copolymer, a common plastic material.
8. PTT Public Company Limited, Thailand's national petroleum corporation.
9. PTT Phenol Company Limited.
10. HMC Polymers Company Limited.
11. PTT Asahi Chemical Company Limited.
12. Refinery and Petrochemical Integrated Development Package 1, Residue Fluid Catalytic Cracking, LPG Treatment Unit & Propylene Recovery Unit Project, abbreviated as P1 Project.
13. Reliance Industries Limited.
14. Indian Synthetic Rubber Private Limited.
15. Upgraded to become Ministry of Environment on August 22, 2023.

Chapter 5

From Observing Others to Knowing Yourself

"Yesterday, while I had some free time at home, I sent a discussion topic to the Executive Committee (EXCO)[1]," John Yu said in a casual tone.

On a rainy Sunday before the interview, John Yu shared a YouTube video with CTCI Group's eleven-member executive decision-making team, as no golf outing was scheduled that day. The video, titled *How Formidable Is the World's Richest Man, Elon Musk?* explored how Musk, the founder of Tesla, had single-handedly built nine groundbreaking businesses.

Move Forward or Perish

"I asked everyone to watch the video and reflect on their own practices, to think about how we can leverage technology to create new business opportunities," John Yu explained. "I often pose questions to put pressure on my people, so they are compelled to think."

The "people" John Yu referred to includes the Group's top decision-makers: himself as Group Chairman, Michael Yang as Group Vice Chairman, Todd Chen as Chairman of CTCI Americas, Ming-Shyan Lee as CEO of Group Engineering Business, Kuo-Ann Wu as CEO of Group Intelligent Solutions Business, J.J. Liao as CEO of Group Resource Cycling Business, T.C. Li as Head of Group Shared Services, M.L. Lee as Head of Group Engineering Business, K.L. Tsai as Deputy CEO of Group Engineering Business, David Chung as Deputy CEO of Group Engineering Business, and William Pung as head of Advanced Technology Facilities Business Operations.

"As senior management, our responsibility is clear: we must innovate and improve every day to stay ahead," Yu emphasized, highlighting that CTCI's market dominance in Taiwan's engineering sector is built on continuous innovation and progress.

"If we don't move forward, it's not just stagnation; it's extinction," he warned, stressing the need for senior leaders to guide the company toward the right goals amidst fierce

John Yu believes: Success can't be replicated, but one can learn from others' mistakes and avoid failure, which brings him a step closer to success.

global competition.

During the New Year's holiday in 2024, T.C. Li woke up to a LINE message from John Yu at six in the morning. Yu had assigned tasks before teeing off that day. By mid-morning, another message arrived: "Please have HR get online and check what others are saying about our salary and turnover rates, then prepare a presentation on it."

"Chairman Yu frequently shares insights from newspapers, magazines, or social events, encouraging us to learn from others' strengths and avoid their mistakes," T.C. Li explained.

Yu, a Catholic, takes a one-hour leave and goes to work late every Friday to attend early morning Mass at 6:30 a.m., ensuring he doesn't miss his Saturday golf gatherings. For him, golf isn't just a way to stay active; it is also a place to build relationships, gather resources, and spark creative decision-making.

For decades, John Yu has made it a habit to stay informed about the company and reflect daily on the Group's strategic direction. "Observe others, reflect on yourself" is a motto he often shares — it's his core method for training the team's analytical skills. This mindset was shaped more than thirty years ago during his three-month learning journey at Harvard Business School.

A Learning Journey at Harvard

In early 1991, John Yu traveled to Boston to attend a three-month advanced management program at Harvard Business School — his first trip to the United States that wasn't work-related but solely for furthering his studies.

"Three case studies a day, with homework due the night before. I often had to look up unfamiliar words in the dictionary, sometimes working until midnight. The professor also assigned additional readings, but I eventually gave up trying to find all the books because there simply wasn't enough time…" John Yu recalled, his thoughts drifting back to Harvard more than three decades ago.

"In the dormitory, we were grouped into units of eight, which we referred to as a 'can.' We woke up at six in the morning, had breakfast, and by seven we began our 'can discussions' — dormitory group sessions to analyze and share insights on the previous day's case studies. Everyone had to contribute their opinions," he said. These early discussions were essential preparation for class.

"The lecture halls at Harvard Business School could seat hundreds of people," John Yu recalled. "Professors would tell stories about different companies, and then randomly call on students to lead discussions and share their views. The

selected student had to analyze why a company succeeded or failed, identifying the factors behind its rise or fall."

Each day required intense focus on three case studies. "I was the only one from Taiwan in the class. If I couldn't make a reasonable point, it would have been embarrassing," he admitted.

Additionally, the program's tuition and accommodation costs — US$30,000 for three months, nearly NT$1 million at the time — were fully covered by the company. While no one pressured him, his strong sense of responsibility motivated him to excel.

Afternoons often featured guest lectures. "Renowned management experts like Michael E. Porter and Apple CEO John Sculley were invited to speak, and the lecture halls were packed. My English wasn't great, so sometimes I couldn't fully understand what they said," he recalled.

John Yu's daily routine began at six in the morning and ended near midnight, driven by a relentless pursuit of knowledge. Despite the challenges, the experience proved deeply rewarding. It reinforced his belief in the power of education and became a pivotal influence in his decision to later establish CTCI University.

Gaining Insights Through Case Studies

"Three case studies a day, over three months — we discussed more than a hundred cases, from Benihana, Walmart, Southwest Airlines, Intel, and DuPont to other global industry leaders. I brought all the materials back with me," John Yu said, gesturing toward a bookshelf in his office neatly lined with roughly a dozen red binders. Each binder was filled with case study notes from his time at Harvard.

Opening the yellowed A4 pages, he revealed English-language case handouts with key points highlighted in colored pens and annotated with Chinese translations. Some reports were handwritten in English, interspersed with Chinese notes. Each page was a treasure trove of learning.

On the spine of each binder, the professor's name and course title were neatly labeled — subjects like Competition and Strategy, Production and Operations Management, and Corporate Financial Management. These foundational courses he diligently studied back then now shape CTCI's principles of corporate governance.

As the first employee to receive company funding to study at Harvard, Yu returned to Taiwan eager to share his learnings.

At weekly senior management meetings every Monday,

he began introducing concepts he had absorbed, starting with an example from Benihana, the Japanese teppanyaki chain founded in 1964 in Manhattan. "Benihana attracted customers with the innovative idea of preparing food right in front of them," Yu explained. He dissected the model, comparing it to traditional restaurants by analyzing differences in service, food, ingredients, staff, utensils, and drinks. He highlighted the cost advantages and unique characteristics that set Benihana apart.

"In the room were senior decision-makers like Kuo-Chi Wang, Ya-Moh Tung, J.T. Lin, Si Bei, and Chiu-Ching Lin," John Yu recalled. "I wanted to engage the Group just like the professors at Harvard, moving around the room and commanding their attention," he said with a smile. "During my 20-minute presentation, I was so passionate that I couldn't wait to share everything I'd learned."

Through case studies, Yu examined the rise and fall of various companies, pinpointing where they had failed, identifying areas for improvement, and offering strategic insights for management.

"After my presentation, Ya-Moh Tung looked at me and said, 'It feels like you're talking directly to me,'" John Yu laughed, realizing his feedback had been a little too direct.

Taking Different Perspectives to Identify Key Success Factors

The three-month learning experience at Harvard broadened John Yu's horizons, inspiring innovative management thinking and sharpening his decision-making abilities.

Through case studies, he developed the habit of looking at situations from multiple perspectives: "What decisions did the leaders in these cases make that led to success or failure? If I were in their position, what choices would I have made? Would I have done the same? What can CTCI learn from their successes or failures?"

Shortly after returning from Harvard, John Yu was promoted to Vice President. The practice of "thinking as if I were the decision-maker..." became a valuable habit, guiding him through his subsequent roles as Executive Vice President, President, and Chairman. It equipped him with the ability to navigate varying levels of authority and responsibility with a broader vision and more effective

CTCI enhanced its international strength by adopting the successful strategies of respected competitors.

decision-making skills.

Learning from Partners and Charting Cross-Industry Growth

"When I was at Harvard, the professor said on the first day, 'Many of the cases here showcase both successes and failures. You can apply the insights to your company's management, but don't try to copy them. Copying will definitely lead to failure!'" This struck a chord with John Yu. "No business model can be replicated," he realized. "A company's success is always rooted in its unique background and circumstances."

However, he also learned an important lesson: "While success can't be copied, failure can be avoided." By learning from others' mistakes, CTCI could navigate away from pitfalls and move closer to success.

In late 1996, after being promoted to Executive Vice President, John Yu began visiting domestic and international clients, partners, and competitors to learn from their strengths and adapt them to CTCI.

During a visit to Chiyoda, which was grappling with losses and leadership changes, he analyzed their challenges.

"Chiyoda was struggling due to a lack of competitiveness, relying on underpricing to win bids, which ultimately led to losses," he observed.

"To run a successful business, you must first ensure survival, establish a solid market position, and sustain growth. When growth stagnates, you lose your competitive edge," John Yu reflected. These observations reinforced the urgency for CTCI to enhance its global competitiveness.

Facing shifting market dynamics, John Yu believed that survival depended on improving competitiveness faster than rivals.

Upon becoming President in 1998 and Chairman in 2001, he spearheaded significant reforms and organizational restructuring, culminating in the creation of three key business groups — Group Engineering Business, Group Resource Cycling Business, and Group Intelligent Solutions Business — and a central management office called Group Shared Services.

To this day, John Yu urges his leadership team to draw lessons from both the successes and failures of others, using these as benchmarks to steadily elevate CTCI's position on the global stage.

Building an A-Team and Establishing the CAP Procurement Supply Chain

"The stone from another mountain can be used to polish jade." This saying, from *The Book of Songs*, conveys the idea of improving oneself by learning from others.

John Yu often draws on this principle to motivate his team, urging them to analyze challenges, seek solutions, and enhance organizational competitiveness by leveraging others' experiences and creativity. A prime example of this mindset is the creation of the CAP^2 procurement mechanism.

In the early 2000s, Taiwan's leading bicycle manufacturers, Giant and Merida, faced mounting global competition. They responded by forming the A-Team alliance with their parts suppliers.

Giant, in particular, leveraged this alliance to streamline its supply chain, enabling rapid development, production, and launch of new bicycle models — a strategy that received widespread acclaim. This success caught John Yu's attention.

"If Giant can have an A-Team, why can't we?" he asked during a meeting, directing the newly promoted procurement Vice President, Todd Chen, to investigate the concept and present a plan.

"Each factory is different," Chen explained during his presentation. "We have a supply chain and manage it, but we can't operate like the bicycle industry, where parts are standardized."

John Yu responded with probing questions: "In the bicycle industry, don't they compare prices from three suppliers for chains? How do they ensure they're getting the best value? How do they estimate costs? And how has Giant managed to stay competitive and become the world's number one?" He pressed further: "Why are we still relying on price comparisons? Surely there's a more innovative method we can use. Research it and bring me a solution."

Motivated by the challenge, Chen and his team began brainstorming. They reviewed CTCI's procurement needs, analyzed potential products and components for a supplier alliance, and identified the most competitive suppliers in each category.

Control valves were among the first products targeted. Over time, the strategy expanded to other components. In 2015, CTCI officially launched the CAP mechanism, signing framework agreements with suppliers to establish long-term, strategic partnerships.

Guaranteed Procurement: Creating a Triple Win Scenario

"Establishing the CAP mechanism is a testament to innovation in the procurement department," John Yu remarked, praising how the system reduces labor costs, stabilizes material prices, cuts expenses, all of which help improve efficiency and competitiveness.

But what exactly is the CAP model at CTCI, and how does long-term collaboration work?

At its core, the CAP model ensures that while CTCI cannot guarantee procurement volumes, it commits to sourcing from its alliance partners for future purchases. Prices are locked in for a year before opening to competition. CTCI starts by selecting a major order and inviting suppliers with pre-established quality certifications to bid. The bidding process doesn't just cover a single order but encompasses future orders over the next one to two years, effectively expanding the supplier's business.

"This approach has many benefits," explained Todd Chen. "First, it enables better economies of scale." For CTCI, larger order volumes translate to more competitive pricing, making them a key customer for suppliers. This, in turn, provides leverage over delivery schedules, quality standards, and after-sales service.

Furthermore, for suppliers, not only are orders secured, but they also collaborate with CTCI during the bidding process. Once selected, they can proactively plan production schedules, manage deliveries, and allocate resources and workload efficiently for the next one to two years.

"The CAP system delivers three key benefits: it's fast, efficient, and cost-effective," Chen noted. Once a bid is secured, CTCI's procurement team knows exactly which items need to be sourced from which suppliers, eliminating repetitive price comparisons. This streamlined process results in optimal pricing and special discounts for bulk orders.

For CTCI, the CAP system also introduces transparency into supplier information while standardizing procurement processes. It accelerates access to design data and manufacturing progress, strengthens supply chain management, reduces lead time before placement of an order, and streamlines procurement activities. The system not only enhances project execution but also fosters stable, long-term relationships with suppliers, increasing the overall value of the partnership.

In this way, it creates a triple-win scenario: CTCI, suppliers, and clients all benefit. Clients enjoy the reliability of long-term after-sales service from a single supplier, simplifying

spare parts management and ensuring quality.

However, building such partnerships isn't without challenges. "One side wants to save money, the other wants to make a profit. The relationship is both collaborative and competitive," John Yu acknowledged.

Reducing Procurement Risks with Financial Strategies

Building long-term partnerships takes time, requiring consensus and trust. As John Yu emphasized, "Once we become a CAP partner, it's like we're all in the same boat." This means facing challenges together and sharing the risks of price fluctuations. To ensure this collaboration, CAP partners sign agreements and adhere to mutually established rules.

Using cables as an example, a key raw material with significant usage, John Yu explained the process: "Our projects usually take about six months from bidding to contract award, and even if we win, we can't place the order immediately." Cable specifications and quantities must first be determined during the design phase before placing an order with the manufacturer. This lag exposes CTCI to the risk of price increases.

Cable cores are made from highly conductive metals like copper, nickel, and aluminum. Copper, for example, significantly impacts cable pricing due to its daily price fluctuations. Therefore, locking in copper prices to mitigate the risks of price volatility is essential. "We manage this by locking in copper prices through the London Metal Exchange (LME)[3]," John Yu explained. "By securing the price, we reduce exposure to fluctuations."

When bidding, CTCI estimates the copper requirements for a project. For example, if copper's market price is US$8,000 per ton, CTCI bids at US$9,000 per ton. If CTCI wins the bid and the market price of copper remains at US$ 8,000, CTCI purchases copper futures at that price to lock in costs, securing a US$1,000 margin between the bid price and the actual cost.

In addition to the copper core, cables also include costs for insulation materials, labor, and processing, which are less volatile. CTCI and its CAP suppliers agree to base cable pricing on the LME copper price plus processing fees, creating a pricing model that minimizes risk for both parties.

Once the detailed design is finalized and the actual cable quantities are determined, CTCI's procurement department places the order. If the market price of copper has risen to US$10,000 per ton by that time and the supplier purchases

copper at this higher price, CTCI will pay the supplier US$10,000. Although this exceeds the bid price by US$1,000, CTCI offsets the increase by selling the copper futures previously secured at US$8,000 on the LME, achieving a US$1,000 price difference. The CAP mechanism effectively mitigates the risk of raw material price fluctuations, enhances procurement efficiency, and serves as a foundation for strengthening CTCI's competitiveness.

Flexible Learning: Developing Market Strategies for Bidding Preparation

In the field of EPC projects, CTCI had a strong competitor, SAMSUNG E&A. "In the past, whenever SAMSUNG E&A was involved, it posed a significant challenge to us," said David Chung, Deputy CEO of Group Engineering Business.

However, John Yu aimed to change this dynamic. Observing SAMSUNG E&A's success, the CTCI team identified two key factors: support from the South Korean government and a unique approach to project bidding. SAMSUNG E&A prioritized "strategic projects" during the marketing phase, dedicating resources early in the process.

"A 'strategic project' is one that, if not won, would

significantly disadvantage the company in the market. It's a must-win," explained Chung. "Typically, for standard projects, basic design is completed during the bidding phase, and detailed design begins after the contract is awarded. However, SAMSUNG E&A starts detailed design during the bidding phase, ensuring that critical design elements are in place and precise quantities are determined. Their strategy is to invest upfront to mitigate the risks of inaccurate quantity estimation."

Historically, CTCI's bid success rate ranged from 20-30%. Given the company's limited resources, it was critical to allocate them wisely; for critical projects, resources would be strategically allocated and heavily prioritized. As a result, each business unit would assess all upcoming projects to determine which were strategic projects and prioritize those to improve the overall win rate. However, John Yu emphasized focusing resources on strategic projects and securing high-quality wins. "Our goal is not to win as many projects as possible but to secure important, high-value projects," Yu stated.

A prime example of this strategic approach was the bidding for the Sulfur Recovery Unit No. 10 at the Dalin Refinery of CPC Corporation. The project was slated for bidding in 2012, and CTCI treated it as a "strategic project."

David Chung, who was responsible for the bid, recalled, "In 2011, when we began preparation, we approached the project as if it were already in the execution phase. We invested during the basic design phase to create 3D modeling, allowing us to complete the detailed design upfront. This meant we could estimate the procurement quantities more accurately, eliminate risks of miscalculated quantities, and make our bid more competitive."

David Chung added, "The project was worth about NT$3.2 billion, and we adopted a competitive pricing strategy. In the end, CTCI won the bid, with only a slight price difference compared to the second-place bidder." At the age of 36, his accurate cost estimation and project completion ahead of time earned him significant recognition.

By learning from respected competitors' approaches to project bidding, CTCI enhanced its strategy and applied it to future projects. This allowed CTCI to build competitive bidding power on the global stage, matching SAMSUNG E&A's bidding capabilities. The strategic advantage that CTCI adopted from SAMSUNG E&A ultimately turned yesterday's rival into today's alliance partner, based on CTCI's growing competence.

In early 2023, the two companies jointly secured the EPC contract for a 2.08-million-ton ethylene plant as part

of the Ras Laffan petrochemical project in Qatar. The joint team is responsible for the engineering, procurement, and construction of the project. This landmark US$2.5 billion contract elevated CTCI to new heights, cementing its position as an industry leader.

Critical Thinking: Turning Products into Services

With keen observational skills and a habit of deep reflection, John Yu consistently stays attuned to his surroundings. The founding of CTCI CHC was a direct result of his thoughtful decision-making process.

Upon promotion to President, John Yu met Ching-Rong Lee, Plant Manager of CPC Corporation's Kaohsiung Refinery, who introduced him to Shiuli Chou, Chairwoman of Rongji Industrial. Through their discussions, he learned that Rongji supplied CPC with Baker Petrolite chemical products, specializing in distribution for the refinery.

Constantly thinking and observing, John Yu asked himself, "What does CTCI have to do with chemicals?" and "If we are just importing and selling chemicals for a commission, is that all we can do?" He began to think

about whether CTCI could turn the product into a service. "If we offered it as a service," he thought, "we could blend chemicals into a variety of formulations, create our own brand, and serve a broader range of industries that CTCI is already involved in."

Just like that, in 1999, John Yu and Chou decided to establish CTCI CHC, a joint venture between CTCI and Rongji. This marked CTCI's entry into the specialty chemicals sector, providing comprehensive chemical additive solutions for the refining, petrochemical, and environmental industries. Instead of continuing to sell the Baker brand, CTCI CHC started promoting its own brand — "CTCI CHC." More importantly, CTCI transitioned from being a supplier to CPC to a company selling chemical additives to a variety of industries.

However, "the performance was not very good at first," John Yu admitted, so he decided to "reboot the business." He made significant personnel changes and appointed Wenbin Chang, a senior Vice President from CTCI's refining and petrochemical division, as the new Chairman of CTCI CHC. With his extensive network in the refining and petrochemical industries, Chang revived the business and turned loss to profit. Later, Shuping Ren took over as President, and the company became even more successful.

In recent years, CTCI CHC has actively expanded into the high-tech sector. Notably, its activated carbon products have been adopted by leading Taiwanese semiconductor manufacturers. "CTCI CHC spent over a year going through various rounds of testing and certification," John Yu explained. "Once we passed, we secured orders for five factories at once."

Today, CTCI CHC's product offerings include chemical process additives and catalysts, such as refining and petrochemical process additives, activated carbon for environmental resource improvement, and water treatment chemicals. The company also engages in catalyst agency and trading businesses. According to the latest annual report, the company's business is thriving, and its future looks promising.

Creating New Business Opportunities from Manufacturing to Service

"Every innovation brings new business opportunities and can even create entirely new business models. We should always consider whether there's an opening for us to enter," John Yu reflected. "An engineering company isn't just about engineering; it's about service. We need to think from every

angle about the services we can offer our customers. Take CTCI CHC, for example — it's a manufacturing company, but even manufacturing can evolve into a service-oriented business, unlocking new opportunities."

Drawing from his years of management experience, Yu offered this advice: "It's important to just spend half an hour each day to quietly reflect." He encouraged managers to develop the habit of pausing to think, rather than staying buried in documents and files all day. "If you think hard enough, you'll always come up with good ideas. Thoughtful reflection always yields good results."

John Yu often makes time to attend speeches and encourages employees to do the same. "If, after sitting through a two-hour lecture, you hear just one useful idea or gain a valuable insight, it's worth it," he said. He believes, "Even casual interactions with friends can inspire creativity, as long as you're sincere and attentive."

Notes:

1. The Executive Committee of CTCI Group — CTCI Group's decision-making center.
2. CTCI Alliance Partner.
3. London Metals Exchange (LME) — The world's largest non-ferrous metals exchange.

Chapter 6

Colonel-Commander System: Clearing the Path to Promotion

On the 17th floor of CTCI Group's First Headquarters, a spacious conference room hosts the Executive Committee's monthly roundtable, where senior leaders gather for in-depth discussions.

This is also the venue for the "Monthly Meeting" between CTCI Group Chairman, John Yu, and a group of young rising stars.

During these 90-minute sessions, he takes on the role of "Group mentor," sharing his personal experiences, insights, and lessons learned, as well as discussing key events from the past month, how challenges were addressed, and the decisions made by the Executive Committee.

CTCI has set a ten-year plan to develop these young talents into capable management leaders who will eventually take on independent leadership roles within the Group.

Personalized Mentorship: Cultivating Key Talent

This is one of CTCI's methods for nurturing talent: using the "Mentor-Mentee" system to pass on experience. The process begins by identifying key positions within the company. Department heads then select high-potential ("High-Po")[1] and young potential ("Young-Po")[2] employees to create a talent pool, which serves as a reserve for these critical roles.

"The Young-Po pool has about a hundred people; we carefully select around ten to become 'Young-Po Plus.' These select mentees can participate in the 'Meeting with the Chairman program,'" said John Yu. These individuals are then mentored directly by senior leadership, including the Chairman, CEO, and department heads.

Besides mentors, John Yu also personally selects promising Young-Po talents to work as Special Assistant to the CTCI Group Chairman for one year, providing hands-on guidance. The candidates chosen are typically those who are highly recommended for their exceptional performance and potential by their respective departments or affiliates.

After John Yu became Chairman, the personal secretary hired by his predecessor retired, and he opted not to hire

a replacement. Instead, he positioned the Special Assistant to the CTCI Group Chairman outside his office, with the role rotating annually. For instance, Louis Liu, who had previously worked at CTCI ASI, was reassigned in 2023 as the Special Assistant to the CTCI Group Chairman. This position allowed him to learn directly under John Yu's leadership before transitioning to a role in Advanced Technology Facilities Business Operations.

"Even the most outstanding talent, if confined to a specific department or focused solely on certain tasks, will have a limited scope for learning and risk becoming narrow-minded," John Yu explained. "That's why, whenever there's a meeting they can attend or materials they can review, I make sure they have the chance to listen and learn. Even when I give speeches outside the company, I encourage them to join."

"By observing carefully, taking note of what the supervisor is doing, understanding the situation, and learning the

CTCI cultivates generalist talent through overseas assignments and job rotation programs, providing employees with diverse experiences to prepare them as future leaders.

reasoning behind certain decisions, they can absorb valuable experiences, judgment, and knowledge. With enough thought and reflection, they too can become like me," John Yu explained. After a year of such training, employees gain a broader perspective, and when they return to their original roles, they are promoted to a higher level and entrusted with greater responsibilities, enabling the rapid development of talent.

However, John Yu feels that the pace of talent development still can't keep up with CTCI's rapid expansion and growing manpower demands. Additionally, some of the top talent he nurtures are often poached by competitors. In response, he has encouraged the Chairman and President levels to implement a similar training model, allowing more promising employees to enter the development program earlier and expand the talent pool. So far, 25 high-potential employees have completed this intensive training and been promoted to positions as high as General Managers.

Learning from Leaders: Strategic Thinking and Vision

John Yu personally trains his team with the goal

of passing down his experience and accelerating the generational transition, ensuring the group's sustainable development. But where did this mindset and approach to talent development originate? It all traces back to his experience in establishing CTCI's subsidiary in Thailand.

When John Yu was tasked with establishing operations in Thailand and later became Managing Director of the Thai office, he was already in his forties. Essentially, he had to learn everything from scratch.

"In the beginning, I couldn't even read the financial statements," he recalls. "I would sit down with the accounting staff and ask questions relentlessly. I asked about everything — from the meaning of each item on the financial statements to what assets and liabilities were, and why the left and right sides of the balance sheet had to balance."

John Yu continued to broaden his knowledge, "… and there's human resources, legal affairs, corporate governance, organizational structure, and management guidelines…etc. I learned to think about problems from a more comprehensive and elevated perspective," he says.

Previously, as a business manager, his focus had been solely on driving sales. But during the two years in Thailand, the biggest takeaway was how to quickly learn to manage a company.

Unfortunately, his tenure as Managing Director in Thailand lasted only two years. "I didn't fully familiarize myself with the local market or build enough connections. Before I could lay a solid foundation for the company, I was called back to Taiwan. The next person had to start from scratch, and we lost a lot of intangible assets," John Yu reflects.

As a result, after taking on the role of the group's top leader, he established a minimum five-year term for expatriates in managerial and business leadership positions. To support them, he introduced family allowances and education subsidies, ensuring expatriate employees could settle comfortably and focus on their work, thereby fostering loyalty and commitment.

Accelerating Generalist Talent Development through Job Rotation and Expatriate Assignments

At CTCI, both the capabilities and potential of employees are considered equally important. To nurture talent, the company employs expatriate assignments and job rotation mechanisms, providing employees with diverse experiences

to help them grow into well-rounded professionals capable of taking on key positions in the future.

Historically, CTCI's engineering training followed a mentorship model: "You learn from whoever you work with," explains John Yu. In the past, engineers would gain knowledge piece by piece, learning one part of a project during one assignment and another part during the next. That results in a very slow learning process. "Some projects, like the Linkou Power Plant, can last ten years, but young people today won't wait that long to learn. If they aren't gaining new skills, they'll leave," he says.

To create more opportunities for learning and skill development, CTCI has adopted a new approach. Employees are not allowed to remain in the same role or assignment for too long. Once they achieve a certain level of proficiency, they are promoted to take on more challenging tasks with greater responsibilities. This strategy enables employees to gain experience across various roles, learning through hands-on practice.

A prime example of this approach is Group Vice Chairman Michael Yang, who worked his way up to become Chairman of CTCI Corporation. In 1991, he began his career on the construction site in the Construction Division. Over the years, he held key roles in various projects, including

overseeing the CPC Kaohsiung Refinery EPC Project and the Taipower's Nanpu Power Plant Heat Recovery Generator Installation, as well as the HMC Polypropylene EPC project in Thailand.

In 1997, after six years with the company, Michael Yang was promoted to Site Manager for Formosa Plastics' No.6 Naphtha Cracker Plant EPC Project, where he managed all construction planning, execution, and commissioning. By 1999, he transitioned from the construction division to the overseas project business. In 2002, he was promoted to Deputy General Manager of the Market Development Division and later became General Manager of the Non-Petrochemical Business Division. In this role, he oversaw domestic and international projects, including power plants, incinerators, steel mills, and high-tech engineering ventures. The following year, he secured contracts totaling NT$22 billion.

Michael Yang's exceptional performance earned him further promotions, and while still under 40, he was appointed Project Manager for CTCI's largest EPC project at the time, the Taipower Datan Power Plant.

As part of CTCI's talent development strategy, the company focuses on cultivating high-potential employees by diversifying their experiences and expanding their skill

sets. This approach was exemplified through the focused development of Michael Yang for future leadership roles, highlighting its effectiveness.

CTCI proactively implements job rotations and expatriate assignments for promising individuals to strengthen its succession pipeline for critical positions. Through these rotational assignments and specialized training, employees gain broader perspectives and enhanced capabilities, ensuring they are well-prepared to take on future challenges. For instance, in addition to job rotations, Yang was selected to attend various professional development programs. In 2001, he was sent to the UK for project finance training and to Hong Kong for marketing training. The following year, he was chosen to attend the 2nd Youth Leadership Finance and Strategy Camp. He was also nominated by the company to pursue an EMBA degree at National Taiwan University of Science and Technology.

In 2006, Yang received the 24th "National Manager Excellence Award." He continued to climb the corporate ladder, serving in roles such as Head of the Power Projects Division, Head of the Energy and Environmental Resources Projects Division, Senior Vice President, Executive Vice President, President, and ultimately Chairman. Each promotion represented a significant milestone in his career development.

Retaining Talent Through Tangible Benefits

It's worth noting that as an international EPC company with numerous overseas projects, CTCI is well aware of the challenges its expatriates face. John Yu, having himself worked in the U.S., Saudi Arabia, and Thailand, understands the challenges of expatriate assignments. As a result, the company's benefits system is thoughtfully designed to provide special consideration and generous support for expatriates.

"For example, allowances for employees in the Middle East — such as Saudi Arabia, Qatar, or Oman—are significantly higher than in other regions," he says with a smile.

Indeed, CTCI's approach to expatriate benefits includes higher overseas allowances, increased year-end bonuses, and prioritization for promotions. The company also revised its vacation policy, shifting from an annual leave system to one that provides a break every three months, allowing employees to return to their home country to report to their jobs. These measures not only ensure expatriates feel valued

and supported but also strengthen CTCI's ability to attract and retain top talent.

Dual-Track Career Path: CTCI's Leadership Development Program

The traditional "master-apprentice" model, while effective for transferring tacit knowledge and skills, has its limitations. In hierarchical organizations, promotions are often restricted by the availability of higher-level positions, making it challenging for employees at lower levels to advance.

When William Pung, head of Advanced Technology Facilities Business Operations at CTCI Corporation, joined the company in 1990, he started as a civil engineer. At the time, he noticed that some of his supervisors had been with the company for 15 years yet remained in section heads, leading him to question the prospects for career advancement. Similarly, David Chung, Deputy CEO of Group Engineering Business, recalls observing veterans in their 50s or 60s still serving as site managers or section heads.

So, what helped them rise to senior leadership positions?

The answer lies in CTCI's unique talent development model — the "Colonel-Commander System."

The Colonel-Commander System is a dual-track career system, which allows employees to progress along either a specialist track or a management track, removing traditional barriers to career growth. Designed to provide greater flexibility, the system allows employees to progress based on their chosen focus, whether that be deepening their technical expertise or honing their management skills, ensuring opportunities for advancement in both paths.

"Some people are highly skilled in technical expertise but aren't suited for management, so they can remain as colonels without the responsibility of leading a team," John Yu explains. "They hold the same rank and earn the same salary as their peers. However, if someone is both technically skilled and capable of leadership, they can take on the role of commander, receiving additional compensation for the position."

"This system," Yu emphasizes, "ensures that everyone's career path remains open, allowing everyone to move upward together without facing the bottleneck of a traditional pyramid structure."

Everyone has the chance to move upward in their career, whether employees choose to become colonels or

commanders, they can tailor their career paths to match their skills, interests, and aspirations. Through the job rotation system, "a commander can return to a colonel role after three years, allowing another colonel to step into the commander position," John Yu explains. "This approach enables us to cultivate more well-rounded professionals and build a stronger pool of leadership talent."

In addition, CTCI implemented a Key Position Development Program. This program focuses on mid- to senior-level managers across various departments, including department heads and Presidents of subsidiaries. For each key position, three potential candidates are identified. Supervisors at all levels act as coaches and mentors, guiding these candidates through a structured training process. With the right timing and sufficient experience, when a vacancy arises, one of these prepared candidates is selected to step into the role.

At CTCI, every senior executive has a succession plan, and every employee has an Individual Development Plan (IDP). "We evaluate their experience, training, coursework, and job roles, then collaborate with their supervisors to identify three to five suitable candidates," explains T.C. Li, CEO of Group Shared Services. "These candidates are trained in areas beyond their original expertise, such as finance, accounting, human resources, and management, to develop into well-rounded professionals." This comprehensive approach ensures that selected candidates are prepared to seamlessly transition into and succeed in their new roles.

A Fair, Just, and Transparent HR System

CTCI has established various systems for talent development, providing diverse pathways to nurture employees and align their roles with their strengths. The goal is to develop employees into the talent CTCI requires within a few years.

Michael Yang points out from his personal experience that CTCI is a company with limitless growth potential. Its diverse job categories span mechanical engineering, electrical engineering, chemical engineering, civil engineering, and international trade. Yet, CTCI's recruitment strategy does not hinge on poaching talent from competitors. Instead, the company actively recruits graduates from various disciplines and equips them with a comprehensive education and training program.

CTCI even employs a unique policy regarding former employees who wish to return. Group Chairman John Yu explains, "If an employee leaves and comes back after some time with a promotion or pay raise, how do we explain that

to the employees who have been working hard within the company?"

"However," he reflected, "if someone is truly talented and willing to return, wouldn't it be a shame to let them go?" After much deliberation, he implemented a new policy: "Former employees who wish to return must undergo a three-year probationary period as contract staff. If their performance meets or exceeds expectations during this time, they can transition to permanent positions."

Initially, however, due to unclear regulations and insufficient communication, some subsidiaries did not adhere to the policy. As a result, John Yu instructed that all personnel requests for employees returning after leaving the company must be submitted for his approval. After some time, when the entire group achieved mutual understanding, he entrusted the implementation of the policy to the individual business units.

He likened the process to Singapore's method of addressing littering, especially with cigarette butts. Initially, the police struggled to catch everyone, and cigarette butts littered the streets. Then, undercover officers were deployed, which turned out to be highly effective. Over time, people began to realize they couldn't tell whether the person next to them was an undercover officer or just a regular citizen,

so they stopped littering. This eventually led to a shift in behavior, and the habit of discarding cigarette butts faded away.

"Any changes or new policies must be carefully considered," he emphasized. He personally attended meetings where the Personnel Committee drafted policies, ensuring diverse input and thoughtful decision-making. "If we create policies only to revise them repeatedly, it will lead to chaos. Policies must be clear and designed in a way that all 8,000 employees can understand and support."

Initiating the Senior Leadership Succession Plan

As a company led by professional managers, CTCI recognized the importance of succession planning early on. More than a decade ago, John Yu foresaw the need to accelerate the succession process and began laying the groundwork.

In 2001, at the age of 53, John Yu became Chairman of CTCI Corporation. The following year, he promoted John Lin to President. Both were born in the same year, joined CTCI at the same time, and advanced together from junior

engineers to top leadership positions. However, under the company's policies, all employees were required to retire at the age of 65.

The question, "If both of us retire at the same time, who will take over?" suddenly struck John Yu. This realization motivated him to intensify efforts to open leadership promotion channels and ensure the next generation could assume leadership roles earlier.

In 2009, the CTCI Board of Directors approved the promotion of John Lin to Vice Chairman, along with the appointments of Andy Sheu, the then-incumbent Executive Vice President, as President and Michael Yang as Deputy CEO. "They had to be younger than me," John Yu explained. The succession plan at that time focused on accelerating the rise of the younger generation, noting, "Andy Sheu is seven years younger than me, and Michael Yang is sixteen years younger."

Born in 1964, Michael Yang graduated from the NTU Graduate School of Mechanical Engineering. Despite his credentials, he chose to start from the ground up as a site supervisor in CTCI's Construction Division. He later transitioned to the business division, focusing on developing overseas markets and eventually leading the Non-Petrochemical Business Division.

With each job change, Michael Yang earned high praise from his direct supervisors, leading to steady promotions. He became President in 2014 and, in 2016, was appointed CTCI Group Vice Chairman and CEO of Group Engineering Business. In 2020, CTCI initiated the "Succession and Sustainable Growth" plan, implementing a generational leadership transition to prepare the next leadership team. That same year, with unanimous approval from the Board of Directors, Michael Yang was promoted to Chairman of CTCI Corporation at the age of 56.

John Yu had always hoped to further lower the age of succession at CTCI. However, ensuring a smooth generational transition remains one of the most challenging tasks for any corporate leader. To younger executives, Yu often offers his advice on the way to manage tasks and interpersonal relationships.

"Look at the rice ears; the golden ones are the most beautiful. When they are full and ripe, the golden rice ears bow down. You must become the golden rice ears..."

"You've climbed up the corporate ladder at a young age, you must learn humility..."

"Always look three steps ahead. Think three steps ahead before taking the first step..."

"Don't let anything shake your determination to move

forward. Don't be overconfident, but also don't be afraid to take the step forward..."

Encouraging Further Education with Sponsored EMBA Programs

Engineers often have strong technical expertise but tend to lack knowledge in areas like financial management and corporate governance. "The fastest way to help these senior executives develop skills beyond engineering is to send them back to school to study related fields," explains John Yu. "This is why all managerial positions and above at CTCI are required to pursue an EMBA."

Since 2004, CTCI has implemented a continuing education program for managers, fully sponsoring senior executives to enroll in EMBA programs. The initiative encourages executives to step out of their comfort zones, return to campus, and engage in further studies. Beyond acquiring new knowledge, it allows them to learn from peers in class, and bring fresh perspectives back to their roles at work. A key objective of the program is also to expand their professional networks, fostering connections that enhance their contributions to CTCI.

John Yu jokes, "Once you're part of the 'classmate' circle, it becomes incredibly effective." Through EMBA programs, senior executives with engineering backgrounds can not only deepen their expertise but also connect with high-level professionals from diverse industries, share experiences, and build meaningful relationships.

John Yu is CTCI's "super salesperson" himself. He has a knack of making friends and build long-term relationships, from which he has secured numerous business projects. However, "business can continue, but connections are hard to pass on," Yu remarks. When he rose to the top leadership role, he realized that the good relationships he spent years building couldn't easily be transferred to the next generation of leaders.

To address this challenge, CTCI introduced its sponsored EMBA program. The initiative allows managerial employees with three years of satisfactory performance to be recommended for further studies at domestic or international universities, depending on their job roles. Employees posted overseas also have the option to pursue studies at nearby universities. This program aims to develop a strong leadership pipeline while helping participants expand their professional networks.

"Our retired Vice President, M.H. Wang, completed his

EMBA at Thailand's prestigious Chulalongkorn University," says John Yu. The company covered all expenses, including tuition, books, and thesis subsidies. Even the domestic and international study visits required by the program were treated as paid leave, fully funded by the company. "For the past ten years, close to 100 CTCI's managers have attended EMBA programs; currently more than 60 have obtained degrees."

While the EMBA sponsorship program represents a significant investment, John Yu emphasizes that the creation of a knowledge-sharing system is its ultimate goal. "We only have one requirement for those who complete the program: upon graduation, they must sign an authorization agreement and upload their thesis to CTCI's knowledge base, making it accessible for all employees to reference."

In fact, CTCI's commitment to education extends beyond EMBA programs. The company has also partnered with National Taiwan University to create a specialized program for senior executives, sending them into academic settings for further study. Over the years, CTCI has invested tens of millions in employee training.

Why is CTCI willing to spend so much?

"Because we are Taiwan's most internationally competitive EPC contractor, and talent is our most valuable asset. That's why we're dedicated to investing both time and money into developing our people," says Michael Yang.

Despite these efforts, talent development remains a challenging task.

Concurrently Developing Global Talent

"Typically, it takes around ten years to develop a project manager. But to cultivate a project manager capable of leading a team to execute a US$1 billion international EPC project, at least 20 years of experience is required," John Yu explains the difficulty of talent development at CTCI.

In addition, "EPC projects are exponentially more complex than typical construction projects," he continues. "A project manager must have integrated project management skills, hands-on international experience, the ability to manage various risks, and the expertise to apply advanced technologies in project management. These skills are essential to meet customer expectations and create maximum value for the company."

With such challenges, what is the solution?

In their book *Hidden Value: How Great Companies Achieve Extraordinary Results with Ordinary People*[3],

Stanford professors Charles A. O'Reilly and Jeffrey Pfeffer argue that companies succeed not by attracting the smartest or most talented people, but by creating environments that help employees unlock their potential and contribute to the success of all stakeholders.

In other words, how a company develops talent is far more important than how it attracts talent.

"As headquarters of the Group's talent pool, CTCI Corporation is responsible for guiding and enhancing the capabilities of our overseas subsidiaries," says Michael Yang. "While we are actively recruiting international talent, we must also focus on localizing talent development. Our goal is to upgrade global talent simultaneously."

He cites Indonesia as an example, where CTCI recruits Indonesian engineers to train in Taiwan. After serving for several years, they are then reassigned to work in the Indonesian subsidiary. The talent developed in this way can connect business development between the two locations, creating synergy.

"Our aim is to nurture well-rounded generalists capable of competing in international markets," Yang emphasizes. "Over the years, CTCI has completed numerous challenging projects worldwide, and every team member plays a vital role in driving the group's innovative growth. We are committed to investing in comprehensive, professional education and training to develop international engineering talent that meets the needs of the modern era. By doing so, we ensure comprehensive talent development and retention while fulfilling our mission of passing on corporate knowledge and achieving sustainable growth."

Notes:

1. High Potential (abbreviated as High-Po within CTCI) refers to high-potential elite talent at the managerial level and above.
2. Young Potential (abbreviated as Young-Po within CTCI) refers to young elite talent below the managerial level, non-management, but with high potential.
3. *Hidden Value: How Great Companies Achieve Extraordinary Results with Ordinary People*, Harvard Business Review Press, 2000.

Chapter 7

Fostering Unity: 8,000 Employees Pulling Together

"One, two, three!"

"One, two, three!"

The tug-of-war is the highlight of the CTCI Group's biennial sports event. The commanding shouts of "one, two, three!" resonate through the stadium, uniting thousands of employees from both domestic and international offices. It's a powerful display of cohesion that symbolizes the collective spirit of the company.

Kazuo Inamori, the esteemed founder of Kyocera, once remarked:

"The foremost responsibility of an entrepreneur is to ensure that all employees think as one, moving in the same direction with shared goals…"

"When the collective strength of all employees is aligned, the impact multiplies, producing extraordinary results. In such moments, one plus one equals five, or even ten…"

Inamori passionately believes that when employees work in harmony toward the company's growth, it creates immense synergy, leading to exceptional achievements.

Indeed, the cohesion of the workforce is key to a company's competitive edge. The more a company can attract talented individuals who share its values and goals, the greater its chances of becoming a sustainable business. While the concept is simple, how can it be implemented?

Attracting Top Talent Through Competitive Compensation

Compensation and benefits have long been key factors in CTCI's ability to attract top talent.

Group Chairman John Yu recalls that when he joined CTCI Foundation (the predecessor of CTCI) in 1973, the company's salaries and benefits were already ahead of industry standards. Ming-Shyan Lee, who joined CTCI in 1989 and now serves as President, also highlighted this advantage, noting, "At that time, monthly pay, including transportation and overtime allowances were 20% higher than the industry average."

"Today, personnel costs alone amount to NT$10 billion annually," said John Yu. Taking CTCI's 2023 employee salaries and benefits expenses as an example, while the gap between CTCI and other companies may have narrowed,

the company has consistently ranked among Taiwan's "Top 100 High Salary Index" for over a decade, reflecting its competitiveness.

This index does not evaluate companies based on salary structure alone. In addition to stock liquidity, it must meet three key criteria: Over the past three years, the average employee benefits expenses must rank in the top third, and the average net profit after tax must be positive, and a minimum net stock value of NT$10 per share by the end of the previous year. Companies are then ranked by total remuneration scale.

These criteria show that CTCI's employee benefits rank in the top 30% among listed companies, maintaining consistent after-tax profitability for ten consecutive years, and its net asset value per share exceeds NT$10. These figures prove that CTCI retains top talent and fosters employee loyalty through competitive compensation and benefits, ultimately enhancing its operational performance.

Setting Shared Goals for Collective Progress

"This is a group photo from our Sports Day; thousands of

people, including executives from our overseas offices," John Yu said, showing a photo on a cell phone passed to him by Mei- Chen Hu, General Manager of the Brand Management Department. The images showed neatly arranged teams in the sports arena, all wearing matching sportswear as they awaited the start of the competitions.

At CTCI, the tug-of-war tradition stands as a powerful symbol of teamwork and collaboration, playing a key role in strengthening employee unity.

John Yu pointed to another photo, saying, "These are key executives from our domestic and overseas companies — more than five hundred people gathered for a meeting." The image depicted the impressive 2023 CTCI Group Strategy Consensus Meeting held at the Taipei Nangang Exhibition Center, where senior executives from global affiliates convened to strategize for CTCI's future.

Since 2008, CTCI has held Offsite Meetings every two years for the senior leadership of the entire group. In 2015, this initiative evolved into an annual Strategy Consensus Meeting, emphasizing the critical importance of strategic alignment across the organization.

This focus on strategy stems from the profound sense of responsibility felt by the company's leaders. "The group has more than 8,000 employees. If you consider a family of

four, that's over 32,000 people depending on CTCI for their future," John Yu remarked. "Leaders must thoughtfully plan the company's future. If we fail the company, how could we face these people? I lose sleep over it!"

Therefore, each annual strategy meeting plays a vital role in defining the company's development trajectory. "When all employees move in the same direction, like a well-coordinated tug-of-war team, applying force simultaneously and in harmony, we can harness our full collective strength and evolve into a world-class engineering group," John Yu explained.

For him, meticulously shaping CTCI's future and establishing a sustainable foundation is a responsibility he holds toward shareholders, employees, their families, and society at large. Many employees share this sense of commitment.

"In fact, many of our colleagues and predecessors joined CTCI right after graduation and have never thought of leaving since their first day. I feel the same way," John Yu

CTCI encourages employee ownership through a stock trust, boosting performance and aligning interests for a win-win dynamic.

said. "I view CTCI as a lifelong career, not just a job. Only by dedicating yourself wholeheartedly to your work can you surpass yourself and achieve extraordinary success."

This unwavering dedication is reflected in CTCI's operational achievements. "When CTCI was founded in 1979, our capital was NT$100 million, revenue was under NT$400 million, and we had fewer than 800 employees. Today, our capital has grown to NT$8 billion, annual revenue exceeds NT$100 billion, and we have about 8,000 employees," John Yu shared.

45 Years of Profitability: Sustained Growth and Shareholder Returns

In May 1993, CTCI Corporation (TWSE: 9933) made history by being the first company in Taiwan's engineering services industry to be listed on the stock exchange.

Since its IPO, CTCI Corporation's annual financial reports have consistently shown positive operating profits and net income after tax. Remarkably, over its 45 years of operation, the company has never reported a loss. This resilience amid market fluctuations and global challenges underscores CTCI's steady profitability and competitiveness,

establishing it as a standout performer in the industry.

Furthermore, the company's strong track record of returning value to shareholders highlights its financial strength.

According to data from the Market Observation Post System, in March 1991, CTCI significantly increased its paid-in capital from NT$100 million to NT$800 million. This included a capital increase through the transfer of retained earnings amounting to NT$593 million, effectively distributing NT$59.3 per share to existing shareholders. Since 1993, CTCI has consistently provided annual dividends to shareholders, either in cash or stock, of at least NT$1 per share.

Employee Stock Ownership Plan: Empowering Employees as Shareholders

To prepare for its initial public offering (IPO) and diversify its shareholding structure, CTCI implemented a cash capital increase of NT$107 million in 1991. At the time, Chairman K.C. Wang made an unconventional decision: he secured approval from the parent company, CTCI Foundation, which held 65% of CTCI's shares, to

have existing shareholders waive their rights to purchase the newly issued shares. Instead, the entire allocation was offered exclusively to CTCI employees, resulting in an employee ownership stake exceeding 5% after the capital increase.

K.C. Wang, a professional manager, believed that for employees to truly share in the company's success, their ownership stake should reach 20%. This approach not only rewarded employees but also helped retain top talent. Achieving this required CTCI to first demonstrate strong operational performance, allowing it to share its business success with employees. Employee ownership thus became a cornerstone of CTCI's talent retention strategy, ensuring not just business growth but also the financial security of its workforce.

"Currently, employees globally hold more than 17% of CTCI's shares, with over 50% of our employees participating in the Employee Stock Ownership Plan (ESOP)," John Yu shared during a presentation. This participation makes CTCI one of the few companies where a significant portion of its workforce also serves as shareholders.

In 2003, CTCI's board of directors approved the ESOP and held the inaugural meeting of the ESOP committee to gradually work toward maximizing employee stock

ownership.

Under the plan, employees contribute a portion of their salary each month, and the company matches 50% of their contributions as a bonus. These funds are then used to purchase CTCI shares monthly. "The goal is to help employees save for the long term, accumulate wealth, and secure their future," John Yu explained. This approach demonstrates CTCI's commitment to not only the stability of its employees on the job but also their financial well-being after retirement.

"For example, if your annual income is NT$1 million, you contribute 10% (NT$100,000), and the company matches 50% of your contribution (NT$50,000). The total NT$150,000 is then used to purchase CTCI stock in your name through the trust," John Yu elaborated.

By 2017, ESOP had become CTCI's largest shareholder, demonstrating the high level of employee engagement and the program's success.

Encouraging employees to become shareholders serves a dual purpose for CTCI: it enhances company performance while aligning employee interests with the company's goals.

When employees work hard, they not only strengthen the company's competitiveness but also create value for themselves, ensuring a secure retirement. This mutually beneficial relationship fosters a true win-win dynamic.

Equal Stock Distribution: A Commitment to Global Fairness

CTCI has implemented various programs in the past, including employee profit-sharing stock options, general stock options, and the issuance of restricted stock awards, all aimed at fostering employee unity and loyalty. "I have consulted with many companies, and most limit stock options to senior executives, but at CTCI, every employee is given this opportunity," said John Yu. To enhance employee engagement and retain talent, CTCI expanded stock options and restricted stock awards to include all employees, with the exception of the bottom 5% based on performance evaluations.

"We want our employees to feel that they are part of the company and that the company treats everyone equally," he emphasized. Ensuring that all employees share in the company's benefits, much like being part of a supportive family, is essential to fostering long-term motivation, creating value for both the company and its shareholders, while also benefiting the employees themselves.

In 2007, CTCI introduced stock options, enabling employees to purchase company shares. This initiative was further enhanced in 2021 with the issuance of restricted stock awards, granted to exceptional employees both domestically and internationally when the company achieves its operational targets. This program was designed to attract and retain top talent.

Additionally, at CTCI's headquarters in Taiwan, employees of diverse ethnicities, skin colors, and cultural attire represent countries from across over the world. The company ensures that its international employees enjoy the same benefits and rewards as their Taiwanese colleagues.

"CTCI has over 2,000 foreign employees, with more than 200 working at the headquarters. These international employees contribute significantly to our success and deserve equal treatment," John Yu insisted, emphasizing that the entire group upholds the principles of fair and just employee benefits.

For the multinational team, "Overseas employees also have stock options, but these are virtual options," he explained. Since overseas employees cannot open a securities account in Taiwan, they are granted virtual accounts, allowing CTCI employees worldwide to enjoy the right to stock distribution and stock options, benefiting from the long-term appreciation of CTCI's stock price.

These efforts bore fruit in 2021 when CTCI was honored in *HR Asia's* "Best Companies to Work for in Asia 2021 - Taiwan Edition," solidifying its place among the region's top employers.

This prestigious award, one of Asia's most representative human resources honors, evaluates organizations based on three core factors: organizational culture, employee well-being, and team collaboration. The feedback from employees is quantified and benchmarked against the market to select the best employers. CTCI's inclusion in this list highlights its commitment to creating an outstanding workplace.

Becoming the Most Reliable Global Engineering Team

"The most foolish thing in the world is to try to change others and mold them into what you want them to be," said John Yu. That's why he believes it's essential to first inspire the 8,000-strong team at CTCI to voluntarily align with the company's vision and culture. Only then will employees be willing to contribute their efforts and move forward with

the organization.

For decades, CTCI has steadily worked toward its goal: To become "the most reliable global engineering services team."

The corporate culture that CTCI has cultivated over the years can be summed up in four key values: professionalism, integrity, teamwork, and innovation. John Yu believes that to create the most reliable global engineering services team, the first step is to build mutual understanding — to ensure that every employee not only understands but internalizes the company's culture, making it part of their daily behavior. This aligns with the core belief he has consistently emphasized to his employees: "Where there is CTCI, there is reliability."

Like a tug-of-war, leaders must contend with global competitors and navigate shifting industry trends. On one side of the rope are these challenges, while on the other, the leader must rally the team to pull together in the same direction. Only then can the full power of the team be harnessed to win the battle.

John Yu firmly believes that instilling CTCI's core values and philosophy while uniting the company's 8,000 employees will strengthen and solidify the team's cohesion. With shared goals and unified efforts, CTCI can steadily advance toward its vision, enhancing its competitive edge.

This approach will ultimately build an elite team, driven by collective success and mutual benefit, maximizing the company's value.

2

Seven Key Drivers of CTCI's Transformation

With over 40 years of history, CTCI Group has built a unique culture and developed a global workforce of over 8,000, ensuring lasting success at the pinnacle.

Chapter 1

Core Strength — Laying the Foundations from the Ground Up

"Imagine a pond filled with lotus flowers, where the number of flowers doubles each day. If the pond is fully covered with lotus flowers on the 30th day, on which day is it half-covered with blossoms in full bloom?"

"On the 29th day," answered CTCI Group Chairman John Yu during the "Industry Master" series of lectures at National Cheng Kung University.

He likened CTCI's growth to the "Law of the Lotus Flower" to describe how CTCI started as a small local company and grew into a global engineering powerhouse, generating over NT$100 billion in annual revenue. This transformation was achieved through years of experience, honing core competencies, and mastering the fundamentals, one project at a time.

Starting from the Basics

When Ming-Shyan Lee joined CTCI Corp. in 1989 as a newcomer, he could not have imagined that he would one day serve as CEO of Group Engineering Business, and President of CTCI. He vividly remembers the first thing he did upon joining the Piping Engineering Department was to pick up the necessary tools for the job.

"At that time, it was still the era of manual drafting," Lee explained. Designers sketched with pencils, erased mistakes by hand with rubber erasers, and cleaned up the crumbs with a brush.

"The operating system back then was still DOS, and there was no AutoCAD," he said. To ensure that the handwritten text on the design drafts was consistent in font and size, "every new engineer had to practice writing in the 'Fang Song' style for three months." The training required engineers to carefully write numerous annotations, including regulations, with exceptional neatness and clarity, honing a level of precision comparable to fine calligraphy.

"We started by copying drawings, slowly progressing to designing pipeline layouts. Completing a single A1-sized drawing often took an entire week," Lee recalled. The training was very demanding. If mistakes occurred, the entire

sheet had to be redone. Mastering drawing skills was a key part of foundational training for junior engineers.

"Constructing a plant could require over 9,000 design drawings, while even smaller projects demanded 3,000 to 4,000," he said. "We also handled material takeoffs, conducted site inspections, and made necessary revisions directly on blueprints. These experiences provided invaluable hands-on knowledge."

Turning Challenges into Expertise: Lessons from the Field

At CTCI, many share stories similar to Ming-Shyan Lee's. Todd Chen, now Chairman of CTCI Americas, is one of them. He joined CTCI in 1989 as an equipment engineer in the Engineering Division. Six months into the role, while still drafting designs by hand, CTCI adopted computer-aided design in preparation for the PC era. Seeing this as an opportunity, Chen requested a transfer to the IT department, where he worked as an engineer conducting stress analysis simulations for equipment design.

After two to three years of programming, Chen felt like he was back in graduate school — repeating tasks and

feeling mentally drained. Around the same time, Mitsubishi Heavy Industries in Japan, which had won the contract for the Shulin incinerator project, requested two onsite operations engineers from CTCI. Todd thought, "Onsite operation is a field I know nothing about, but it should be challenging." Driven by curiosity and a thirst for challenges, Chen volunteered to move to the construction site. "Are you out of your mind?" his supervisor exclaimed upon hearing about his plan to move to the construction site.

On-site work was seen as grueling and better suited for technical college graduates. With his master's degree qualifications, working at a construction site was often seen as a case of overqualification. However, Todd Chen believed that it was a great opportunity and appreciated that the company was willing to offer employees diverse experiences. So he thought, "Why not?" With the support of the General Manager, he went to the construction site.

"After a year onsite, I finally understood what engineering really meant," Chen admitted. At the time, CTCI was preparing to enter the incineration plant sector, and he was among the first to be involved. After a year of hands-on experience at the Shulin construction site, he said, "I finally gained a solid understanding of the equipment. I also learned about pipelines, civil works, instrumentation and

control, electrical systems, and methodologies — concepts that were once merely abstract to me. It was then that I truly grasped the intricacies of building, installation, and commissioning."

"At the time, I had to climb the 37-meter-high boiler — about 11 to 12 stories — several times a day. It was physically demanding work. It was tough!" Chen recalled.

He also remembers that the commissioning supervisor, a Japanese engineer, communicated in a mix of Japanese and English. The engineer would direct him to run from one area to another, telling him to open a valve in one place and close another in another location. Sometimes Todd didn't fully understand the instructions, and the engineer would sternly say, "I say, you do. You are an operator, not an engineer." The engineer would then walk away, leaving Todd unsure of what to do next.

"Just do as you're told! You're an operator, not an engineer!" But was that really what he meant?

After ten minutes of silent frustration, Todd Chen reconsidered: "He's my mentor. He's trying to teach me something, but what exactly is he trying to tell me?" He reinterpreted those words: "If you only do as you're told and report back without thinking about it, you'll always be just an operator, never an engineer!" Determined, he thought, "I

represent CTCI and Taiwan. I can't let them down!" In that moment, his mindset shifted — and so did his actions.

Turning Every Challenge into a Learning Opportunity

The next day, Todd Chen brought a notebook with him. "Whenever he told me to go somewhere or do something, I wrote it down. I often asked him why. Sometimes he explained, and sometimes he didn't. I wasn't sure if he didn't know the answer or just couldn't express himself," he recalled. Chen diligently wrote down everything, whether he understood it or not.

A year later, as he was preparing to return to CTCI, the Japanese engineer asked him, "What would it take for you to stay? I'll help try to make it happen." Apparently, his dedication had clearly earned respect — not just for himself, but for CTCI as well.

Having gained a thorough understanding of on-site operations, Todd Chen returned to CTCI and stepped into a completely new field — the Cost Department. At the time, the department was divided into two sections: Estimation and Cost Management. He joined the Estimation team,

responsible for equipment estimation.

"What is cost estimation?" At first, he didn't have a clue. But "after working for a while, I was pushed into the front lines as the lead estimator," he said. Interestingly, "at that time, CTCI was handling four or five EPC[1] power plant projects. I started attending client meetings with the business development team, clarifying and responding to inquiries, and that's when I realized I had a knack for communication. So, I was transferred to the business unit," Chen laughed, adding, "Actually, I had no idea how to do business development back then."

Many people think sales is all about talking, but Chen admitted: "I was introverted as a kid. When it came to speaking, I'd be totally nervous and shy." Since he wasn't an eloquent speaker, many doubted his ability to succeed in the role, but he thought to himself, "business development is a professional skill, and I'm a professional — why shouldn't I be able to do it?"

"Accomplish Every Mission" embodies CTCI's core spirit, where employees are dedicated to delivering on the tasks entrusted to them by their leaders.

Eager for new challenges, Chen ventured into business development for the domestic non-petrochemical sector. He was later assigned to Thailand for three and a half years, where he focused on expanding the non-petrochemical business. Upon returning to Taiwan, he was promoted to head of business development.

Throughout his career, Todd Chen took on a variety of roles, including head of the Energy and Environment Division II for CTCI's Non-Petrochemical Sector, and leader of the Procurement Division. Two years later, he was promoted to Vice President and later President of the Engineering and Technology Department. From 2016 onward, he steadily advanced from Senior Vice President to Executive Vice President. In 2020, he was appointed President of CTCI Corp., and in 2023, Chairman of CTCI Americas in the US.

This journey has led Todd Chen to a firm belief: "Never limit yourself. If others believe in you and are willing to give you a chance, why not seize the opportunity and challenge yourself?" Above all, he said with a smile, "Job rotations and overseas assignments are part of CTCI's culture. CTCI employees embrace an 'Accomplish Every Mission' spirit, taking on tasks assigned by their leaders and striving to complete every mission. This is the very spirit that has

empowered CTCI to build its solid capabilities."

Entrusted with Responsibility from Day One

Another person who exemplifies the "Accomplish Every Mission" spirit to its fullest is Michael Yang, CTCI Group Vice Chairman and Chairman of CTCI Corp, who started his career from the ground up at construction sites.

"I was an ambitious young man back then, eager to make a real difference, so I applied to CTCI's established Construction Division," Yang recalled.

With a master's degree in mechanical engineering from National Taiwan University, the supervisor who interviewed him said, "You know the position in the Construction Division is on-site, right?" It was unusual for a master's graduate to apply for site work, so he asked Yang again to confirm.

"I'd like to give it a try and learn along the way," Yang replied.

"You're hired! If you're sure about working on-site and won't regret it, then come on board!" He was hired on the spot, no tests needed.

"On the morning of July 16, 1991, I reported to the company at 8 a.m. By 8:30, they told me to go home, buy a bus ticket, and prepare to report to the Kaohsiung Refinery (Fifth Naphtha Cracker) site the next day," Yang recalled of his first day at CTCI.

"The following day, I quickly packed my bag, boarded the Kuokuang bus to Zuoying, and reported to the Kaohsiung Refinery site," Yang recalled. At the plant, he met with the site manager, John Lin, who later became the Chief Vice Chairman of CTCI.

"You're not just here to pad your resume and bail, are you?" Lin asked bluntly.

Yang responded firmly, "No, I won't."

Still skeptical, Lin insisted, "Promise me you'll see this job through to the end."

Without hesitation, Michael replied, "I promise."

"If you're determined to see things through, I'll assign you something more challenging," Lin continued.

"At the Kaohsiung Refinery, there were three massive main compressors — the heart of the entire cracking plant. Assembling those compressors required real expertise." Yang recalled.

Armed with a master's degree and fluent English, Yang was entrusted with liaising with foreign technicians and was

handed significant responsibilities from the outset.

Learning the Ropes Through Hands-On Experience

At the Kaohsiung Refinery site, braving wind, sand, and the scorching sun, Michael Yang recalled: "By the end of the day, my undershirt was soaked, dried, and soaked again." Even his mentor couldn't help but tease him, saying, "I've never seen someone like you — a master's graduate out here doing grunt work. Why put yourself through this?"

However, beyond the physical challenges, the bigger issue was adapting to the differing work styles of local and foreign teams.

In CTCI's early days, experienced foremen mentored apprentices on the job. When Michael Yang first arrived at the site, his mentor taught him how to install compressors and perform mechanical alignment work, which he carefully noted down. However, when the foreign technicians came in with their own methods, he found himself feeling confused.

Faced with two methods, he wondered which one to follow?

Determined to bridge the gap, Michael Yang purchased

books on mechanical operations and immersed himself in self-study. Through hard work and persistence, he eventually mastered the principles behind the operations, understanding not just "what to do" but also "how it works." He learned not just the theory, but the practical application of engineering, which enabled him to understand the instructions from the foremen and technicians, communicate effectively, and ensure smoother equipment installations. The experience continued to benefit him even during his overseas assignments.

Upon completion of the Kaohsiung Refinery project, Yang was relocated to Thailand as an Equipment Manager at the construction site. "At that time, we didn't outsource our work. CTCI Thailand had its own cranes, trucks, and tools. We directed the Thai supervisors, who in turn led the foremen and 200 local workers." Yang was in his early thirties back then. "It was the experience and knowledge gained from the Kaohsiung Refinery project that enabled me to lead the Thai team."

After returning to Taiwan, Yang joined the Mailiao Refinery (Formosa Plastics Sixth Naphtha Cracking) Plant project. One day, while he was in Mailiao, he received a call from John Lin: "Come to Taipei to work in business development; I'll give you half a day to consider." After

thinking for five minutes, he called back and said, "Alright! I'll go." Once again, the adventurous eager-to-challenge spirit of CTCI employees was on display.

In 1999, when Lin took charge of the overseas projects, he actively recruited and scouted some of the best talents from the Engineering Division. He immediately thought of Michael Yang, who had worked with him for three years at the Kaohsiung Refinery and had demonstrated excellent performance.

"Actually," Yang explained, "my original plan was to work my way from the back end to the front. I wanted to start in the Construction Division to learn what construction was all about, then move on to engineering or other departments." With clear career goals and a forward-thinking mindset, he seized a new opportunity as soon as it appeared.

That same year, Michael Yang was reassigned to Taipei at the request of John Lin to lead the expansion of overseas business.

However, after 2000, CTCI underwent an organizational restructuring, consolidating overseas projects into the Hydrocarbon Business Operations. Six months later, he was transferred to a Non-Refining and Petrochemical Project team, where he took charge of projects involving power plants, incineration plants, and steel mills. Soon after, an even greater challenge emerged.

Embracing Challenges with Courage and Accountability

As the saying goes, "Giving others an opportunity is giving yourself an opportunity." This holds true in business as well. In 2003, CTCI secured the Taipower Datan Power Plant EPC project, with Mitsubishi supplying the power generation units. CTCI oversaw civil works, equipment installation, and the full scope of piping and instrumentation design. This marked CTCI's first combined-cycle power plant project delivered as an EPC contractor, valued at record-breaking NT$16.5 billion.

CTCI had no prior experience with EPC power plant projects. When the company undertook its first large-scale power project, Li-Rei Pan, then Executive Vice President of Non-Petrochemical Business, struggled to find a suitable project manager.

"I'm not sure if I was asked or if I raised my hand and volunteered, but I said, 'If the company can't find anyone to do it, I'll do it.'" Yang recalled. In 2003, Yang was transferred from Business Manager to Project Manager.

"That was the first project of my life, and also the most excruciating one," said Yang with a wry smile. "When I was in business development, I watched others manage projects

and thought it looked easy, like practicing moves from the sidelines. But once I stepped onto the field myself, I realized just how much there was to handle."

"The pressure was immense. Taiwan was grappling with both labor and materials shortages. Every decision involved financial costs. If we made the wrong decision, it could end up costing the company a fortune," Yang explained. In 2005, global raw material prices surged, with stainless steel prices doubling, making cost management critical.

"In hindsight, the boss's decision was quite bold. I didn't have much project experience. By today's strict CTCI standards, my limited project management experience wouldn't have passed risk management requirements." Yang admitted, still uneasy at the memory. Fortunately, he shouldered the responsibility, learning as he went, and with everyone's collective effort, they successfully accomplished the mission.

After the completion of the Datan Power Plant, Taiwan's largest natural gas power plant, in 2009, CTCI secured its first independent EPC power plant project overseas the following year — the Kimanis Combined Cycle Power Plant in Sabah, Malaysia.

In 2015, the Kimanis plant withstood the Sabah earthquake, continued to provide stable electricity, which further

solidified CTCI's market position in both domestic and international gas-fired power plants.

This opportunity was both a challenge and a steppingstone. Yang embraced it, sharpening his skills and becoming the youngest General Manager of the business department. After transitioning to project management, he was promoted to lead the Non-Petrochemical Department, paving the way for even greater achievements. He continued to rise through the ranks — Executive Vice President, President, Chairman, and ultimately Group Vice Chairman. His career stands as a testament to CTCI's model of promotion within the Group, starting from the ground up.

From Experience to Excellence

Kenichi Ohmae, a leading Japanese thinker in management, once said: "Those who can thrive in the role of 'Project Manager' are incredibly valuable and will be highly sought-after talent in the future."

In CTCI's organizational structure, the Project Manager plays a pivotal role in the successful execution of projects. As key figures who directly influence a project's performance and outcomes, Project Managers must regularly meet with

clients and team members to exchange feedback, coordinate with contractors and technical licensors, and ensure smooth communication throughout the project. They are also responsible for addressing any client issues promptly to minimize delays and ensure project success.

M.L. Lee, Deputy CEO of Group Engineering Business and President of EPC Operations at CTCI Corp., began his journey at the company as a project engineer. With over 30 years of experience in project management, he now leads a Groupwide engineering team of more than 2,000 members. He joined CTCI in 1989 after earning his degree from the Graduate School of Chemical Engineering at National Central University. "Originally, I applied for a chemical engineer position in the Process Engineering Department. The day before the interview, I received a call from the company informing me that the position had been filled, but there was an opening in the Project Engineering Division and they asked me to come in for an interview the next day," he recalled that, by a twist of fate, he became a project engineer at CTCI.

"A project engineer acts as the project manager's assistant, handling coordination tasks essential to the project execution," Lee explained.

"My first assignment was the CPC Kaohsiung Refinery

project. The first three years were the most excruciating for me," he recalled. "I had to work with clients who were 15 to 20 years my senior, push myself to learn quickly, and seek advice from my senior colleagues to communicate effectively with them." He emphasized that communication and coordination skills are critical for a project engineer.

In addition, the ability to integrate various functions is crucial. The design department interfaces with a wide range of disciplines, including piping, civil works, methods, mechanical, electrical, instrumentation, and equipment — all of which are highly complex. To manage these areas, a project engineer must possess strong integration and follow-up management skills. After gaining experience on several projects, Lee was eventually appointed project design manager, responsible for overseeing and integrating all design tasks.

Developing the Ability to Lead Projects Independently

Furthermore, a critical factor in success is the ability to work independently and take ownership of projects.

At CTCI, project managers training begins with building

a solid foundation of core skills, followed by hands-on experience through real-world projects. M.L. Lee followed this model, gradually taking on major domestic and international petrochemical projects assigned by the company, including the DuPont Far East project, Formosa Petrochemical, Chang Chun Petrochemical, the CNOOC-Shell Guangdong project, and the Saudi Kayan project. After more than a decade, CTCI appointed him to lead Project Division III under Hydrocarbon Business Operations, overseeing project execution in key markets such as the Middle East and the United States. This role enabled him to develop a broader and more holistic perspective.

After 30 years in the refining and petrochemical sector, CTCI entered the Oman market in 2016, winning the US$2.8 billion Liwa Plastics Industries Complex (LPIC) contract through the team's collective efforts.

With a solid foundation and extensive experience, the Liwa team achieved outstanding milestones. In 2020, they earned the prestigious "Top Project Award" in the petrochemical category from world-renowned *Hydrocarbon Processing* magazine. In November of the same year, they achieved 77 million safe man-hours, a significant milestone in CTCI's EPC project execution. In 2021, the team received the Distinguished Project Award for large-scale projects

from the International Project Management Institute in Taiwan, often referred to as the "Oscars" of project management.

Perhaps the greatest testament to their success came from the Oman project site. "We had over 10,000 workers on-site, and the Omani project was the only one in the country that remained operational during the pandemic," M.L. Lee noted, crediting CTCI's exceptional project management.

Twenty Years in the Making, Sharpening Talent Over Time

Indeed, developing talent is about placing the right person in the right role, and sometimes it requires time to refine and cultivate that potential. K.L. Tsai, Deputy CEO of Group Engineering Business and President of Infrastructure, Environment & Power Business Operations, is a prime example of this approach.

Joining CTCI in 1987, Tsai now boasts 37 years of experience. After 20 years, he transitioned from Senior Engineer to a position in the Non-Petrochemical Department, where he began overseeing cost estimation.

It is often believed that after spending ten or twenty years

in one engineering role, it is difficult to change one's mindset and venture into a new area of work. However, Tsai not only did so successfully but also delivered impressive results. His first major success in cost estimation was securing the Kimanis Combined Cycle Power Plant project in Sabah, Malaysia, valued at US$300 million. This success marked CTCI's entry into the overseas market for non-petrochemical projects.

Subsequently, with successful estimations he continued to win major contracts, including the Vietnam power plant, Linkou Power Plant, and Dalin Power Plant. As a result, Tsai took on more responsibilities, eventually serving as Project Manager for Linkou, and later the Project Manager for the Dalin project. Over the years, he progressed steadily from Manager to Director, Senior Vice President, and is now serving as the Deputy CEO of Group Engineering Business.

Like Tsai, many CTCI employees spend a decade or even two honing their expertise in a specific field before transitioning to other departments to broaden their experience. A notable example is T.C. Li, current CEO of Group Shared Services, who has built a similarly distinguished career trajectory over nearly 40 years with the company.

T.C. Li graduated with a degree in architecture and began his career as a civil engineer in CTCI's Engineering

Department. Five years later, he transferred to the Estimating Department in the Cost Division, where he worked his way up from a specialist to Senior General Manager over nearly two decades.

"Cost estimation is a front-end task," T.C. Li explained the role of the Cost Division. "It sets the bid price for a project, aiming to secure the contract while ensuring profitability. Once the contract is awarded, the cost management team works within the project budget — the contract value minus the planned profit margin — to control costs and execute the project." The success of winning a bid and achieving profitability is closely tied to cost estimation. "Even if we secure the project, an error in the estimate — such as a missing zero — would reduce the margin by tenfold," said Li.

"Estimation requires meticulous thinking and clear logic, so that no details are overlooked due to the complexity of project cost items," Li shared. "Experience is also crucial in developing the sensitivity needed to analyze costs and

CTCI's senior executives typically accumulate extensive project experience, building a strong foundation that enables rapid growth and advancement.

determine reasonable prices for each item," he continues. "We account not only for material and labor costs but also for design fees, management costs, the project timeline, inflation, and exchange rates. After adding everything up, we arrive at the total estimate and the company's profit margin, which guides our bidding."

"Estimation requires cross-disciplinary talent. I studied architecture, and I began by estimating civil works," Li explained. "The closer our estimate is to the winning bid, the greater the sense of accomplishment." His willingness to embrace challenges and dedication to continuous learning created new opportunities for him and helped CTCI win major projects. In 2011, CTCI won the bid for Taipower's Linkou Power Plant, a project valued at nearly NT$88 billion — setting a record as the largest single EPC project in CTCI's history. Li served as the lead estimator for the project.

Building Leadership Through Real-World Projects

"EPC projects are far more complex than standard construction work," explained John Yu, citing a chemical

plant contract as an example.

First, in terms of project scale, typical construction companies handle only the construction phase, beginning work after engineering and procurement are complete. In contrast, EPC projects begin with the engineering phase, and within about three months of signing the contract, orders for long-lead-time equipment must be placed. By the time engineering reaches its midpoint, procurement for materials such as piping, cables, steel structures, and civil works should already be underway. To stay on construction schedule, approximately 80% of the materials must be procured early to meet the deadlines.

Secondly, the project team is formed based on the specific tasks of each project, bringing together professionals from various departments, including project management, design, procurement, construction, cost control, schedule control, contract management, and financial accounting. This results in a large and highly intricate organizational structure.

Moreover, EPC projects span anywhere from two to ten years, with risks such as price fluctuations and exchange rate changes. These factors must be carefully monitored throughout the project lifecycle.

"Project management involves handling countless

intricate details," said John Yu. "Typically, project managers need ten years of experience, but leading a US$1 billion EPC project demands twenty. However, with decades of accumulated knowledge, we've now streamlined and systematized our talent development, significantly reducing the time it takes to train a project manager."

He further explained that in CTCI, a project manager must manage hundreds, even thousands, of people, excluding subcontractor workers. This is comparable to running a large company. "A project manager is like the President of a company — leading, coordinating, and taking full responsibility. That's why CTCI's project managers are usually older in age in their careers, having built up the skills and reputation to 'carry the flag' and shoulder heavy responsibilities."

Indeed, as John Yu noted, such leaders must possess EPC[1] integration capabilities as well as international experience, and the ability to manage various risks. They must complete their contractual obligations on time, with the required quality and within budget to meet customer expectations, gain their trust, and deliver the maximum value for the company.

Passing Down Principles, Achieving Engineering Excellence

Many of CTCI's senior executives across various business departments have undergone rigorous project-based training, laying a strong foundation for their accelerated professional growth. From early leaders such as former President J.T. Lin, Construction Division Head Bo-Chun Chiang, former Vice President of Engineering Division Gen-Shin Lee, and Si Bei — who recruited John Yu — to today's senior executives on the Group's Executive Committee, all share a solid grounding in engineering and technical expertise. This long-standing dedication to talent development has enabled CTCI to secure prestigious projects and build its formidable core competencies.

The dedication and lifelong commitment demonstrated by earlier generations of engineers have profoundly shaped the development of CTCI professionals. Their unwavering pursuit of excellence built the foundation for CTCI's success. This legacy transcends mere philosophy — it's a reality. It is embodied by successive generations of CTCI professionals and reflected in prestigious honors, such as the "Engineering Medal" from the Chinese Institute of Engineers.

In 1979, the company's founding Chairman and President,

K.C. Wang, earned this prestigious honor. John Yu later received the award in 2000, along with other distinguished recipients such as Ya-Mou Tung, John Lin, and Michael Yang — each recognized for his leadership in propelling CTCI's remarkable contributions to the engineering industry.

While awards may not be inherited, what endures is CTCI's steadfast commitment to developing engineering talent, fostering technical innovation, and advancing the industry standards. These accolades symbolize the dedication of countless CTCI professionals who have devoted their careers to the field, demonstrating the precision and perseverance that define world-class engineering. Their efforts have solidified CTCI's core strength, allowing it to thrive both domestically and internationally.

True success requires building a strong foundation and unleashing it strategically, with steady accumulation and refinement. In the engineering field, CTCI has established itself as a dominant force in Taiwan while making a significant impact on the global stage — achievements driven by the dedication and expertise of its people.

Notes:

1. EPC: E (Engineering); P (Procurement); C (Construction).

Chapter 2

Willpower — Transforming Pain into Strength and Adversity into Opportunity

Renowned Taiwanese management scholar Paul S.C. Hsu once likened CTCI's pioneering spirit to that of "modern-day Chang Chian and Pan Chao," referencing the legendary explorers of China's ancient Silk Road.

This comparison underscores the unwavering courage and resilience of CTCI professionals in blazing new trails around the world.

With a team of 8,000, CTCI's employees consistently push beyond their comfort zone, confronting and overcoming challenges posed by differences in environment, climate, culture, and customs.

Across diverse landscapes, they draw on their ambition, determination, and resilience to thrive in the face of adversity. Driven by a relentless work ethic and a determination to overcome obstacles, CTCI has firmly established its place on the global engineering stage.

Relentless Pursuit on the Global Stage

"One year, I traveled 26 times — essentially flying abroad every two weeks," recalled Group Chairman John Yu as he reminisces his tireless travels to secure business deals. "Once, I had an urgent meeting in Los Angeles. I landed, took a quick shower, went straight to the meeting, and flew back that same night."

"I've been to Japan at least a hundred times, and every visit was strictly business — just airports, restaurants, offices, and hotels. Not once was it for leisure," Yu noted. He firmly believes in the value of face-to-face interactions, where personal engagement strengthens business relationships.

However, frequent travel and constant time zone shifts take a heavy toll both physically and mentally. Using the Taipei-to-New York route as an example, with its 12-hour time difference, Yu recalled countless sleepless nights. "I'd often stare at the ceiling until dawn, and just when I started feeling drowsy, it was time to get up. To adjust, I had to rely on sleeping pills to get a good night's sleep and give it my best during the day. But just as my body was getting used to it, it was time to return to Taiwan and start the cycle all over again."

This relentless dedication to work isn't unique to Yu; it's a

hallmark of CTCI's workforce. An overseas project typically takes 3 to 5 years to complete. Many employees dedicate years to overseas assignments, becoming either long-term expatriates or frequent travelers. This was true for Yu in those days, just as it is for Group Vice Chairman Michael Yang today.

K.L. Tsai, Deputy CEO of Group Engineering Business, recounted an exhausting trip with then-President Michael Yang to Cleveland, Ohio, for a three-day meeting with suppliers. "We flew to the West Coast, hopped on a connecting flight to the East Coast, and arrived at the hotel at 3 a.m. After a quick shower and a 6:30 a.m. breakfast, we drove to the meeting venue to start at 9 a.m. sharp. After the meeting, we had dinner and boarded a return flight to Taiwan, landing at midnight. The next morning, it was business as usual at 7 a.m."

Another trip to India was equally grueling. "We had meetings with subcontractors every day from 10 a.m. to 9 or 10 p.m. By the time we returned to the hotel, it was around 11 p.m. After a quick instant noodle meal and a brief 30-minute rest, we'd gather in Yang's room at 1 a.m. for a conference call with Taipei, where Yang would assign tasks. Further discussions stretched until 3 a.m., followed by drafting and sending meeting minutes. After a brief nap and breakfast, we'd head to the next meeting. This went on for

an entire week," Tsai recounted. "It was sheer willpower that got us through and ensured we accomplished our mission."

This relentless drive and tenacity reflect the essence of CTCI's will-do spirit.

Michael Yang also shared his experience. For a project involving the Ca Mau Power Plant in Vietnam, he made seven or eight trips to the country. "Traveling frequently was manageable, but getting to the remote Mekong Delta site compounded the difficulty," Yang recalled. "We had to first fly to Ho Chi Minh City and stay overnight, wake up at midnight to catch a Russian-made propeller plane to Ca Mau Airport, and then drive three hours to the site and back."

Doing the Right Things, and Doing Things Right

The experiences of John Yu and Michael Yang are not unique but rather representative of the norm for many at CTCI, where employees support one another and hold themselves to the highest standards, committed not only to doing things correctly but also to doing them exceptionally well.

In 2002, when CTCI partnered with Spain's Técnicas Reunidas to undertake the CNOOC-Shell Petrochemicals

Guangdong Project, Deputy CEO of Group Engineering Business M.L. Lee — then the Project Manager — recalled the rigorous demands. "During the two-year project execution, I would fly between Madrid, Beijing, Guangdong, and Taipei every month, coordinating meetings and communications across the time zones for these four different locations. I slept very little. My computer stays on 24/7 to receive emails that could arrive at any time, and I'd respond to them right away."

David Chung, Deputy CEO of Group Engineering Business and President of CTCI's Hydrocarbon Business Operations, recalled a period when his work seamlessly spanned the Middle East, Taiwan, and the United States, as if time zones didn't exist.

From 2015 to 2017, Chung, who was stationed in Saudi Arabia, also remotely supervised two CPC projects. "In Saudi Arabia, the workweek runs from Sunday to Thursday, while Friday and Saturday are rest days. However, those are

Under intense work pressure, CTCI professionals rely on a deep sense of responsibility and commitment to ensure that they do the right things — and do them right.

workdays for projects in Taiwan, so I used those two days to hold project meetings, making decisions and discussions within the limited time available." Starting in 2018, Chung's work expanded to encompass yet another time zone.

"That year, I began overseeing a project in Texas while still managing work in Saudi Arabia and Taiwan. The schedule became even tighter," he added. Managing three projects across different time zones and with distinct characteristics poses a considerable challenge for any manager.

Such grueling work intensity, common among CTCI expatriates, places immense pressure on both body and mind, a challenge deeply understood by every CTCI professional who has experienced an overseas assignment. What sustains them is a strong sense of responsibility and a personal commitment to not only doing things right but also to doing them exceptionally well.

Building Resilience Through Challenges

CTCI's domestic projects span across Taiwan, often impacting local communities and presenting a variety of challenges that test employees' external communication

skills.

Around the year 2000, CTCI undertook a project to install long-distance pipelines transporting liquefied natural gas to the Hsintao Power Plant. The pipeline, which ran along Taiwan's Route 3, crossed private properties and even military zones. "I learned to communicate with highway authorities, government agencies, local residents, and police," recalled David Chung, who, at just 25 or 26 years old, was assigned to oversee the project in Guanxi, Hsinchu.

"The challenges we face in engineering are countless and truly test our capabilities," he said, citing an example: "Once, someone lay in front of an excavator, protesting that their family's water pipe had been cut, but we couldn't find any pipe in the soil."

David Chung recalled another incident: "There was a car accident near the construction site. To determine responsibility, I had to visit the local police station several times to provide statements and help clarify the facts."

"Despite the pressures, I gained valuable skills in external management, coordination, and communication," Chung reflected, expressing gratitude for the challenges that helped shape his growth.

Indeed, cultivating resilience through setbacks and challenges is a core belief among CTCI employees. This

holds true not only in Taiwan but also on the global stage, where fierce competition demands even greater endurance.

"I went two years without securing a single contract," shared Todd Chen, Chairman of CTCI Americas. While serving as the Southeast Asia Power Business Manager, he had to report monthly contract updates to the management team. However, with no new projects emerging in the region, his department posted zero contract value for over 20 consecutive months, drawing significant scrutiny from John Yu during review meetings.

Despite the pressure, Yu did not simply reprimand Chen but also encouraged him. "The Chairman said, 'Success in sales isn't just about how many contracts you win — it's about who can persevere the longest. The pain of not winning teaches you the painstaking reality of business development.' He urged me to continue planting seeds and remain resilient, promising that patience would eventually bear fruit," Chen recalled with a smile. True to Yu's words, Chen's persistence eventually paid off. He secured a US$300 million EPC cogeneration project from Thai Oil, proving that opportunities arise for those who refuse to give up.

Give It Your All and Never Give Up

CTCI professionals approach every challenge with unwavering commitment. Regardless of the difficulties they encounter, they give their all, never backing down until their mission is complete.

In 1995, CTCI won a contract to handle three out of four cogeneration EPC projects for CPC Corporation, at its Kaohsiung Refinery's Zuoying and Dalin Plants. These projects were jointly executed by CTCI and ECOVE, with K.L. Tsai, then project design supervisor, serving as the project design supervisor for the Zuoying project, before taking on the role of commissioning manager.

This was CTCI's first cogeneration EPC project, and it faced immense time pressure in its final stages.

"During construction, we were already doing overlapping commissioning tests, but once the project was done, we only had a few days left for performance testing," K.L. Tsai recalled. The toughest part was that the performance testing needed to run non-stop for 24 hours. On top of that, the contract required tests with three different fuels, with each one running for 24 hours straight. Switching fuels added another four to six hours every time, so "the whole process took about five days."

As the person in charge, Tsai had to oversee the entire commissioning process while managing a lean team of only two or three members. "We took turns resting, but one colleague was so tired that he didn't bother going elsewhere and fell asleep right there in a 120-decibel environment; it shows just how exhausted everyone was," Tsai recounted, reflecting on the team's dedication and the difficulties they endured.

"We pushed ourselves to the limit to complete the commissioning," said Tsai. "Typically, the process takes three months, but we finished it in just five days. During those five days, I only slept for six hours."

Achieving such a feat required ironclad willpower, but this wasn't the last time Tsai faced such an intense challenge. A few years later, he was reassigned to a project in Thailand, once again responsible for commissioning in a high-stakes, time-sensitive situation.

"If we didn't complete the project within six months, it would have been deemed a failure," Tsai explained. Upon arriving at the site, he was stunned by the delays and exclaimed, "How can this possibly be finished in six months?" Despite the daunting task, he had no choice but to rise to the challenge.

"For those entire six months, I didn't take a single day

off. I'd leave the dormitory at 6 a.m. each morning and work until 9 p.m., followed by internal meetings to plan the next day's tasks until around 11 p.m. By the time I got back to the dormitory, it was often already midnight," Tsai said, vividly recalling the relentless pace and immense pressure of those days.

Turning Challenges into Opportunities

William Pung, head of Advanced Technology Facilities Business Operations (ATFBO), shared a similar experience.

Pung recalled working on the CNOOC-Shell Guangdong project, where the goal was to achieve 100% completion of the steel structure before the Lunar New Year. "After I joined the project, I worked until 11:30 p.m. every single day. Two and a half months into the project, we reached over 97% completion," he shared. His dedication earned the client's trust and laid the foundation for a strong, long-term partnership.

Ming-Shyan Lee, CEO of Group Engineering Business Group, also completed his mission with exceptional efficiency, exceeding client expectations.

In 2021, a coal conveyor belt at Taipower's Taichung

Power Plant caught fire, leaving its coal reserves for the generating units with less than a month's supply. If the conveyor belt wasn't repaired in time, the resulting power shortage could cause power outage and impact all of Taiwan.

Sensing the urgency, Taipower's executives reached out to Michael Yang, requesting immediate assistance. Ming-Shyan Lee, then the head of Infrastructure, Environment & Power Business Operations, received a phone call from Chairman Yang early in the morning, instructing him to head to the site at once.

Upon inspection, officials asked Lee, "If we mobilize all available resources, how soon can it be repaired?" By coincidence, CTCI was conducting a similar conveyor belt project. "Six months," Lee replied, leaving everyone stunned, as another engineering firm had estimated at least 18 months for completion.

In the aftermath of the fire, heavy rains flooded the site, requiring constant pumping to keep it operational. Despite two months of effort, repairs on the conveyor belt had yet to begin. "Once the rains subsided, we worked tirelessly, around the clock — laying pipelines, setting up power distribution, repairing instruments, and assembling the conveyor belt. For many nights, the site was brightly

lit as we raced against the clock. After over a month of effort, we successfully completed the project on schedule," Ming-Shyan Lee recounts with pride. Through the team's unwavering collaboration, they resolved a critical nationwide power supply crisis and earned praise from Taipower's executives across the board.

A Deeply Ingrained Courage to Take Responsibility

CTCI professionals share an inherent courage to take responsibility.

On September 18, 2015, during the shield tunneling phase of Taipower's Dalin Power Plant reconstruction project, a section of Zhonglin Road in Kaohsiung's Xiaogang District collapsed, creating a 30-meter-deep sinkhole. The incident disrupted services for clients of CPC Corporation, China Steel, Chunghwa Telecom, and the local water utility.

CTCI REI, one of the project's contractors, along with its joint venture partners, bore the contractual responsibility for compensation. CEO of Group Intelligent Solutions Business Kuo-Ann Wu, who was the Chairman of CTCI REI at the time, recalled how he immediately stepped up: "Of course, I went straight to the site to handle the situation!"

Over the next three years, the team worked tirelessly to remediate the damage and complete the project. Wu reflected with both emotion and pride, saying, "This is the commitment CTCI stands by — we make sure our clients face no losses. Even if it means we lose money over it, we see the work through to the end; it's our responsibility."

Fully Committed, Anchored by Family

Balancing work and family are often challenging for CTCI employees, with extended time away from loved ones being one of their greatest trials.

During the year John Yu was seconded to Kaohsiung as a supervisor for China Steel Corporation, his newborn son stayed in Tainan with his parents, while his wife worked in Taipei, leaving the family divided across three cities.

Similarly, William Pung recalled his first overseas assignment to Thailand: "My child was just a newborn. By the time I returned to Taiwan, the baby was almost a year old." Throughout his career, Pung faced frequent overseas relocations — Thailand, Malaysia, and the United States — spending nearly 20 years away from home, only returning to Taiwan every three months.

However, even when stationed in Taiwan, balancing work and family remained a significant challenge.

K.L. Tsai recalled his first deployment to CPC Corporation's Kaohsiung Refinery for commissioning work, where he only returned to Taipei twice in an entire year. "Although weekends were technically off, the workload made it impossible to leave and go home," he explained. His two children were just two and five years old, leaving his wife to shoulder multiple roles and responsibilities on her own.

For couples who both work at CTCI, finding time to spend with family becomes an even greater challenge.

For Todd Chen and his wife, managing work and family life was a constant juggling act. When their children were young, if both had unfinished work on weekends, they would settle it by playing rock-paper-scissors — the winner could go to the office. Later, when Todd was posted to Thailand for three and a half years, the entire family relocated with him. At the time, their eldest child was in

With positivity and resilience, CTCI employees turn challenges into growth, earning the company's place as "Taiwan's Number One" and "Global Top 100."

third grade, and their youngest was in kindergarten. His wife had to leave her job to focus on raising the children. Balancing work and family life proved impossible, forcing them to make inevitable tradeoffs.

For Michael Yang's son, his father was "the most familiar stranger." From the moment Michael joined CTCI and reported to the construction site in Kaohsiung, he was rarely home. "I'd return only occasionally, sometimes weekly, and sometimes monthly. Weekends spent at home would fly by before I was back at the site or traveling overseas," he explained.

Years later, Michael asked his son what he remembered most about him while growing up. His son's response was poignant: "I always saw how hard you worked. On weekends, I'd sit across from you while you worked overtime, doing my homework at your desk. I remember feeling nervous because you seemed so strict with your colleagues. Even during lunch breaks, I'd keep my head down and avoid looking up." Reflecting on this, Michael acknowledged, "When I was immersed in projects, especially when working overtime for meetings or problem-solving sessions, I often spoke with a serious and stern tone."

For J.J. Liao, CEO of Group Resource Cycling Business, his children's most vivid Lunar New Year memory was

"spending the day in the car, traveling across Taiwan to 'look at garbage.'" On Lunar New Year's Day, he would take his family on a journey from Taipei to Tainan, inspecting incineration plants along the way. "At each plant, I'd join their rituals or hand out red envelopes, but I always checked the waste pits. My children grew up knowing their dad's job was all about managing garbage," he laughed.

Where there's a project, CTCI people are there, too. Yet, with every project comes the unpredictability of sudden crises. These unforeseen challenges could range from discovering dinosaur fossils to encountering a sea turtle.

Navigating Unforeseen Challenges

At the photovoltaic power plant project in Lumberton, New Jersey[1], CTCI encountered an unusual crisis — one involving dinosaur fossils, which temporarily halted construction. In 2011, construction came to a sudden halt when the project team received a court order claiming the southwestern corner of the site might contain buried dinosaur remains, requiring all activity to pause to protect potential historical artifacts. Public hearings and legal proceedings followed, only to reveal that the whistleblower, an out-of-state resident, had no concrete evidence to support the claim. Further allegations about Native American artifacts also proved unfounded, and after thorough inspections, the project was cleared to proceed.

Moreover, even a single sea turtle could bring construction to a halt.

In Malaysia, during the construction of the Kimanis Combined Cycle Power Plant in Sabah, CTCI tackled a challenging task: installing a seawater intake structure and a 400-meter pipeline to channel seawater into the plant. Already grappling with tough installation conditions, the team was forced to halt operations when a sea turtle swam through the intake grating and into a 30-square-meter filtration pool. Prioritizing the turtle's safety, over 30 workers were mobilized to gently extract it and release it back into the ocean, ensuring its safe return to its natural habitat.

In addition to artifacts and animals, sometimes the challenges are technical. During stability tests at a site in Thailand, a liquid level gauge repeatedly set off alarms in the middle of the night. After an exhaustive investigation, "we traced the issue to a faulty digital chip, but for a time, many Thai workers thought it was something supernatural," William Pung shared. Recalling countless days spent living

on-site, he shared stories of challenges and memorable moments from the construction field. What may seem like remarkable anecdotes to outsiders are, in fact, the everyday realities of countless CTCI employees dedicating themselves to projects in foreign lands.

Lessons from SARS: Uninterrupted Operations Amid a Pandemic

The challenges of safeguarding lives and confronting the fear of the unknown test even the strongest resolve. For CTCI, operating on a global stage during both the SARS outbreak and the COVID-19 pandemic demanded unwavering determination and resilience.

In 2020, as the COVID-19 pandemic swept across the globe, M.L. Lee, then leading the LPIC project in Oman, where he was stationed, recalled how the crisis first struck the site. "The first case was a foreign worker who contracted the virus after a hospital visit," he said. Acting decisively, Lee immediately coordinated with contractors to arrange 50 buses overnight, relocating and isolating workers to a designated village for centralized management.

At the time, about 100 Taiwanese employees were

stationed in Oman. Concerned family members urged them to return home. However, Lee analyzed, "Family members just want to know you're safe. After relocation and lockdown measures, the project site was safer. The uncertainty and risks of exposure during long flights back to Taiwan were far greater," he reasoned. His practical mindset inspired the team to stay in place, focused and committed, ensuring the project progressed smoothly without disruption.

While the pandemic inevitably impacted global economies and delayed some project timelines, CTCI successfully carried out its operations in the Middle East, demonstrating a remarkable ability to adapt and persevere. M.L. Lee among other CTCI professionals had learned hard-earned lessons from the SARS outbreak over two decades earlier.

In 2003, as SARS ravaged Taiwan, CTCI was executing a project in Huizhou, Guangdong, China. Seven employees returning to Taiwan via a flight from Guangdong through Hong Kong were later found to have contracted the virus. In about a week to ten days, they began showing symptoms and were diagnosed with SARS. One of them even required intensive care.

"That period was excruciatingly painful for me — I was deeply tormented because I was the one who sent him on the business trip," recalled M.L. Lee, who was the project

manager at the time of the SARS outbreak. Lee himself had been a close contact and was placed under home quarantine. Despite his guilt, his overriding emotions were sorrow and empathy for his colleague's suffering. Even two decades later, his voice still trembled with emotion as he recounted the experience.

Adversity often forges unbreakable bonds, and through countless battles on challenging projects, CTCI employees have cultivated a profound sense of camaraderie and shared purpose.

During the SARS outbreak, as soon as it was confirmed that employees had contracted the virus, CTCI's headquarters responded decisively. In coordination with the Taipei City Health Bureau, the company identified roughly 400 colleagues who had been in contact with the seven infected employees and placed them under home quarantine, with meal deliveries arranged by the health bureau. The image of pedestrians hastily avoiding the CTCI office building out of fear of contagion became an unforgettable snapshot of that time. Taking swift action, John Yu announced a four-day office shutdown to allow for total disinfection, effectively containing the outbreak and safeguarding employees.

The lessons learned during the SARS outbreak equipped CTCI to respond swiftly and decisively to the emergence

of COVID-19. The company quickly established a global epidemic prevention command center, coordinating efforts across departments and offices worldwide. Partnering with Taipei Medical University Hospital and other medical institutions, CTCI facilitated corporate rapid testing, encouraged self-testing at home and vaccination among employees, and ensured the availability of protective supplies for overseas assignments. For employees returning from international postings, CTCI arranged quarantine accommodations at designated hotels.

Overcoming Cultural and Lifestyle Differences

Distance often magnifies differences — a lesson Todd Chen came to appreciate deeply during his EMBA studies, especially while exploring the "CAGE Distance" theory.

Developed by Harvard scholar Pankaj Ghemawat in 2001, this model highlights four key dimensions of distance — Cultural, Administrative, Geographic, and Economic — that shape global trade and cross-border interactions. Of these, cultural differences often emerge as the most daunting, demanding adaptability and resilience to navigate

the complexities they bring. John Yu vividly recalled an incident from his early years in the United States, where a cultural misunderstanding nearly landed him in jail.

"I was once handcuffed and detained in the U.S. for three hours because I was caught driving with an expired driver's license," John Yu recalled. Forty-five years ago, while stationed in the U.S. as a procurement representative; about a year and a half into the assignment, he discovered his visa had expired so he drove to Newark, New Jersey, to renew it. After completing the process, he accidentally turned onto a one-way street. A police car immediately began following him with sirens blaring. "I thought they were chasing a robber, so I quickly pulled over to give way," Yu said. "To my surprise, the police car stopped as well and asked me to show my license."

After checking on his license, the officers instructed Yu to step out of the vehicle. "The moment I got out, one of them told me to place my hands on the car, searched me, and then handcuffed me," Yu recalled. The problem? His international driver's license had expired. In the U.S., such permits are only valid for one year. Unaware of this rule, Yu had inadvertently let his driver's license expire, putting him in violation of the law.

Carrying guns, the police left Yu too stunned to argue. In

a scene straight out of a movie, he was placed in the back of a patrol car with a barred partition separating him from the officers, his belongings confiscated and locked in a holding cell — a harrowing ordeal for someone navigating such challenges in a foreign country.

In Taiwan, an expired driver's license usually results in nothing more than a fine. In the U.S., however, driving with an expired license is considered unlicensed driving and is treated as a criminal offense. Standard procedure requires the offender to be handcuffed. Helpless, John Yu had no choice but to call the Lummus project manager, who arrived with a lawyer to assist him. Yu was taken to a temporary traffic court, where, despite his frustration, he pleaded guilty. The court imposed a fine of US$15, along with a US$25 towing fee, totaling US$40 for his release.

CTCI's overseas policy discourages employees from driving themselves. This precaution stems from an earlier incident where a staff member in Saudi Arabia was involved in a serious car accident, leading to months of legal and logistical complications. For safety reasons, the company generally prefers alternative transportation arrangements. However, exceptions are made based on local conditions — such as in the U.S., where the vast distances make hiring a driver impractical.

Beyond traffic laws, cultural differences also present challenges, encompassing language, food, customs, religion, and values. For example, in Middle Eastern countries, strict prohibitions on alcohol, pork consumption, revealing attire, and interactions with women are deeply ingrained. A simple misstep could inadvertently violate local laws and lead to serious consequences.

Adjusting to the Local Diet

Adjusting to different eating habits is another challenge that comes with working abroad.

"When I worked at Lummus, lunch at the office was always the same — burgers," John Yu recalled, shaking his head with a wry smile. "Every day, the American cook would ask, 'Lettuce and tomato?' It was always the same hamburger with lettuce and tomato." Reflecting on his time in the U.S. as a procurement representative, Yu couldn't help but laugh at the monotony of Western meals.

Eventually, the lack of variety took a toll on his stomach. "I had no choice but to cook dinner myself," he said. Together with around twenty other colleagues and clients from Taiwan, they took turns grocery shopping, cooking, and washing dishes. Thanks to his fluency in Cantonese, Yu was assigned a special task on weekends — visiting Chinatown to buy pork fatback and rendering it into lard for stir-frying.

For CTCI employees living abroad for extended periods, limited food options often demand resilience and strong willpower to navigate the inconveniences and challenges of daily life and mealtimes.

Bridging Barriers: Communication and Management Challenges

Geography and climate differences may cause physical discomfort and adaptation challenges, but these are usually manageable over time. However, navigating workplace dynamics demands patience, understanding, and deliberate effort to prevent conflicts or resolve misunderstandings effectively.

Todd Chen experienced these challenges firsthand in the United States. Fully aware of the cultural differences between Taiwan and the U.S., he made it a priority to foster a workplace culture rooted in mutual respect when he assumed the role.

Chen realized that effective communication with American employees required a softer tone and avoiding gestures like pointing a finger, as subtleties like word choice and body language could easily be overlooked by non-native English speakers. He recalled an incident shortly after arriving in the U.S. After sending an email to an employee, he learned from the American CEO the next day that the employee was threatening to resign.

Chen was initially puzzled, but as he looked into the matter, he quickly grasped the gravity of the situation. "I had used the word 'negligence' to describe a small oversight," said Chen. "I meant to remind him of his carelessness, but in the U.S., the word carries strong legal connotations and implies serious liability. The employee felt my wording was overly harsh and accusatory."

The art of expression through language and words goes hand in hand with the skill of effective communication, both of which demand ongoing improvement and refinement.

In Saudi Arabia, only about 10% of the workforce at CTCI projects consisted of Taiwanese staff, while the remaining 90% were local hires or workers from countries like India, Pakistan, Nepal, and the Philippines. "Most of these workers faced harsh labor conditions with their direct employers," David Chung explained, "but we ensured they

were treated equally and fairly under our management."

"I set up a complaint mailbox and made it a practice to meet with every new employee upon their arrival at the construction site. I explained the potential challenges they might face and encouraged them to reach out to me via email if they ever felt uncomfortable. This initiative put them at ease in their new environment."

"In the Middle East, so much depends on relationships," he explained candidly. "You need to build strong connections with local clients and government officials, both upward and downward, to form a tight-knit team. In Saudi Arabia, success comes only when your client wants to be in the same boat, sharing the glory with you." In other words, effective communication and management are essential for the smooth progress of the project.

Renowned management guru Kazuo Inamori once said, "Of all strengths, the most important characteristics are courage and willpower."

Echoing this philosophy, as CTCI expands its business and global footprint, the challenges of executing cross-border engineering projects have only intensified. While these difficulties often remain hidden from public view, the CTCI team consistently upholds a positive and proactive mindset. With a spirit of adventure, the courage to take

on daunting tasks, and the ability to transform challenges into growth, CTCI employees have developed exceptional resilience and adaptability. Their unwavering determination, mission-driven commitment, and ability to turn adversity into opportunity have propelled CTCI to its position as "Taiwan's Number One and ranked among the Global Top 100."

Notes:

1. Located between the financial hub of Manhattan, New York, and the capital, Washington, D.C., spanning nearly 200,000 square meters.

Chapter 3

Power to Break Through — Diversified Transformation and Reinvention

The year 2016 marked a major turning point for CTCI Group, catalyzing significant organizational transformation and propelling its growth to new heights.

On June 20, at its rebranding launch, CTCI unveiled a fresh, globally aligned brand identity. Simultaneously, all subsidiaries under the CTCI Group adopted the unified "CTCI" brand identity that day.

In the past, CTCI was well-known in Taiwan's engineering industry and recognized as a local leader. However, its global visibility, brand recognition, and international credibility were less pronounced. The rebranding to "CTCI" signaled an effort to redefine its brand value and position itself firmly on the global engineering stage.

"Our transformation goes beyond expectations," asserted John Yu, Group Chairman. He emphasized the importance of innovation and adaptability in navigating the tides of generational shifts. The brand overhaul was merely the first step; subsequent changes in organizational structure and business models would unfold as part of this transformative journey. 2016 marked the beginning of CTCI's emergence as a global brand.

Crafting the "Most Reliable" Engineering Services Brand

In the past, CTCI focused on delivering top-tier engineering services but paid little attention to brand image or marketing, resulting in relatively low brand awareness overseas. As John Yu's expectation for international business grew, even with efforts to promote CTCI as "Taiwan's number one," many international companies remained unaware of the brand, making it challenging for the business team to market it overseas.

This changed in 2015 when CTCI shed its traditionally low-profile image by establishing the Group Brand Management Department. It launched the Brand Transformation Project, aimed at defining the Group's brand positioning and framework. The department took charge of driving brand strategies, managing external communications and media relations. In addition, it created a bilingual website in

both Chinese and English, significantly enhancing CTCI's professional and globalized brand image.

To further enhance its brand value, CTCI participated in "Branding Taiwan," a development project led by the Industrial Development Bureau of the Ministry of Economic Affairs. Through a consulting firm's evaluation, a critical issue came to light: among CTCI's more than 40 subsidiaries, over 20 used distinct and inconsistent logos. The inconsistent branding weakened CTCI's recognition and presence internationally.

In 2016, CTCI took a bold step by adopting "CTCI" as its unified brand identity, creating a standardized international image. The previous hexagonal corporate logo was retained and placed at the upper-right corner of the new English brand mark, symbolizing the collective resources, intelligence, and experience of CTCI raised to the power of N. The brand color shifted from gold to vibrant orange, symbolizing the passion and energy of the CTCI team.

Dual-Brand Strategy for Global Marketing

With a consistent brand identity, CTCI ensured that clients and peers recognized all subsidiaries as part of one

Group, amplifying its global impact.

At the brand unveiling press conference, John Yu introduced the slogan "Discover Reliable," emphasizing the importance of embedding reliability into the DNA of the corporate culture. The vision was to discover and build trust collectively, driving sustainable growth for the Group and reinforcing its position as the "Most Reliable Global Engineering Services Team."

In 2017, CTCI rebranded its subsidiary ECOVE to reinforce its position in the resource recycling industry. With the tagline "Every Resource Counts," ECOVE aimed to convey its commitment to international expansion, appealing to investors, clients, and governments. This rebranding not only boosted ECOVE's global visibility but also enhanced the competitiveness of Taiwan's resource cycling industry, setting the stage for advancing a circular economy.

This initiative gained swift international recognition. In 2018, CTCI received the REBRAND 100® Global Award, ranking among the top 100 brand transformations globally. Additionally, Interbrand, a leading global brand valuation firm, ranked CTCI among the Best Taiwan Global Brands — the only engineering company to be included.

CTCI's transformative, international, dual-branding

strategy has yielded tangible results. In 2023, the Group achieved record-breaking annual revenue exceeding NT$100 billion, marking a historic milestone in its nearly 45-year history. New contract signings surpassed NT$100 billion for the fourth consecutive year, and backlog reached a record high of NT$346.9 billion.

Organizational Transformation: Leveraging Shared Resources for Greater Synergy

On December 24, 2016, in the 10th-floor conference room of its headquarters, CTCI held a Group Strategy Consensus Meeting. The event focused on three key areas: a new brand, new organizational structure, and new market opportunities. This workshop marked the beginning of a significant organizational transformation aimed at restructuring the Group's operations. CTCI redefined its 40+ subsidiaries, both domestic and international, into three main business groups based on their industry characteristics: Group Engineering Business, Group Resource Cycling Business, and Group Intelligent Solutions Business. To streamline operations and optimize resources,

CTCI also established the Group Shared Services unit to provide services and drive synergies across the business units. CTCI's three listed companies — CTCI Corporation, ECOVE, and CTCI ASI — lead the business groups.

Group Engineering Business is led by CTCI Corporation, with members including CTCI Machinery Corporation, CTCI Chemicals Corporation, and overseas branches in Thailand, Singapore, Vietnam, Malaysia, China, India, Saudi Arabia, Qatar, Abu Dhabi, Italy, and the United States.

Group Resource Cycling Business is led by ECOVE Environment Corporation, which includes subsidiaries such as ECOVE Environment Service Corp., ECOVE Wujih Energy Corp., ECOVE Miaoli Energy Corp., Yuan Ding Corp., ECOVE Waste Management Corp., ECOVE Solvent Recycling Corp., and EVER ECOVE Corporation.

Group Intelligent Solutions Business is led by CTCI ASI, which oversees subsidiaries such as CTCI REI and CTCI SEC. This marks the largest organizational transformation in CTCI's history.

"This significant change has two main objectives: synergy and succession," John Yu explained. By streamlining and reorganizing the business functions of each company, the transformation seeks to unify decision-making, optimize human resources, cut costs, and improve both vertical

integration and horizontal communication across the Group.

Expanding Participation and Developing the Successor Team

A key objective of the transformation, according to John Yu, is leadership succession. The goal is put into practice by engaging more senior executives in the Group's operations and decision-making processes, allowing them to shoulder responsibilities, face challenges, and accelerate their growth. This approach aims to expand their horizon and develop a leadership pipeline of future leaders.

To support this initiative, CTCI established the Executive Committee of the CTCI Group as its highest governing body. The founding members included John Yu, then Chairman of CTCI Corp., who served as the Group Chairman and the highest leader of the committee; John Lin, Vice Chairman of CTCI Corp., as Group Chief Vice Chairman; Executive Director Andy Sheu as Group Second Vice Chairman; and President Michael Yang as Group Vice Chairman.

Current members of the Group's leadership include John Yu, Group Chairman, Michael Yang, Group Vice Chairman,

Todd Chen, Chairman of CTCI Americas, Ming-Shyan Lee, CEO of Group Engineering Business, J.J. Liao, CEO of Group Resource Cycling Business, Kuo-Ann Wu, CEO of Group Intelligent Solutions Business, and T.C. Li , CEO of Group Shared Services, along with three Deputy CEOs from Group Engineering Business: M.L. Lee, David Chung, K.L. Tsai, as well as the head of Advanced Technology Facilities Business Operations (ATFBO) William Pung.

This group forms the decision-making core of CTCI Group, entrusted with key responsibilities such as shaping the Group's vision and mission, establishing its corporate brand and culture, formulating operational strategies and goals, integrating and allocating resources across the Group, reviewing the medium- and long-term development strategies of each business group, and overseeing annual performance evaluations.

One-Stop Solution Service Innovation

One of CTCI's key business strategies is the extension and expansion of its scope of service.

Generally, engineering companies undertake three main types of projects: The first is consulting engineering, which

focuses primarily on planning and design, with an emphasis on drafting and design work. The second is construction engineering, which involves on-site construction based on design plans for project execution. The third type is EPC, which covers everything from engineering and procurement to construction. In EPC projects, a team of professional engineers transforms client's requirements into design and construction drawings. These are then handed over to subcontractors for execution, providing a one-stop professional engineering service.

The execution of EPC projects prioritizes comprehensive coordination and involves addressing complex challenges in areas such as legal and regulatory compliance, finance, technical issues, and cultural differences. The complexity and difficulty of EPC projects far exceed those of the other two types.

In its early days, CTCI began as a subcontractor, partnering with major international engineering companies to gain experience. Over time, it gradually became a full-fledged EPC contractor, offering comprehensive services that include planning, engineering, procurement, construction, and commissioning. By continuously improving its capabilities, CTCI carved out a competitive niche in the overseas market, eventually surpassing its competitors and

establishing itself as the leader in Taiwan's engineering industry.

The Three Pillars of Stability: Building a Strong Foundation for Growth

CTCI established its roots in the refinery and petrochemical sectors, playing a key role in Taiwan's economic miracle alongside the country's "Ten Major Construction Projects." In the 1980s, CTCI focused on engineering design and construction in the refinery, petrochemical, and chemical industries. In addition to the local market, the company expanded internationally, collaborating with global engineering firms on refinery and petrochemical projects in Saudi Arabia, Singapore, Malaysia, Thailand, and the Philippines. However, as CTCI continued to grow and strengthen, it became clear that the refinery and petrochemical market alone could no longer provide the opportunities for further expansion.

Fortunately, success favors those who are prepared.

"We are not afraid of a lack of opportunities or development; what we fear is stagnation, complacency, and a reluctance to push beyond our limits," said John Yu. Over

the years, CTCI's commitment to continuous improvement and proactive approach allowed the company to diversify its market reach. The successful execution of projects such as China Steel Corporation's first and third-phase power plant projects, provided CTCI with the opportunity for horizontal expansion. This enabled the company to build on its existing capabilities and venture into new engineering fields beyond the petrochemical industry.

Around the year 2000, CTCI built a strong presence in non-petrochemical sectors, including power plant engineering, transportation infrastructure, general industrial projects, and environmental engineering. At that time, its petrochemical and non-petrochemical businesses each contributed approximately 50% of the company's total revenue.

By 2020, recognizing the rising demand for advanced technology infrastructure, John Yu established the Advanced Technology Facilities Business Operations (ATFBO), which quickly became the company's third pillar.

CTCI's transformation is driven by innovation and adaptability, ensuring continuous progress in the development of diverse new business sectors.

This addition complemented the petrochemical and non-petrochemical sectors, creating a well-balanced three-pillar structure in spanning petrochemical, non-petrochemical, and high-tech industries.

Reflecting on its history, CTCI has undergone major transformations every 20 years, each aligning with industry trends and leveraging innovation as a strategic growth driver. As CTCI expanded into diversified new business areas, it advanced steadily, step by step.

Downward Integration, from Plant Construction to Operation and Maintenance

In addition to broadening its business scope, CTCI adopted a more proactive approach, evolving from an EPC contractor to a comprehensive service provider. This included not only engineering and construction but also expanding into operation and maintenance (O&M). This shift towards downstream services began with the establishment of the Environmental Engineering Department, which later evolved into CTCI's Environment & Resources Business Operations.

As environmental awareness grew in Taiwan during the 1980's, CTCI established its Environmental Engineering Department in 1984. In June 1988, J.J. Liao, who would later become the CEO of Group Resource Cycling Business, joined the department's Solid Waste Team. With a smile, he humorously remarked with a pun, "I joined the 'garbage' department — solid waste is really just garbage."

At that time, waste disposal was primarily managed by local governments through landfill construction. However, in 1990, Taiwan's Environmental Protection Administration (EPA) launched an initiative to promote the development of energy-from-waste (incineration) plants as part of a broader resource recycling policy. "This was CTCI's opportunity!" Liao pointed out. Under the government's "public-private partnership" policy for municipal waste incineration plants, CTCI's Environmental Engineering Department rapidly evolved into a key project division.

CTCI possessed expertise in technical consulting and construction but lacked experience in operation and maintenance. Nevertheless, the company's leadership recognized the growing importance of energy-from-waste plants as a critical component of environmental protection and an inevitable trend. As a result, in 1994, CTCI made a strategic investment by founding ECOVE Environment Services

Corp., focusing on the operation and management of waste incineration plants. The following year, CTCI secured the O&M service contract for the Xindian Incineration Plant in Taipei County (renamed as New Taipei City as of 2010). This plant became Taiwan's first public-private partnership incineration facility.

"That was the group's first foray beyond engineering services into operation and maintenance," Liao recalled with a smile. He initially served as a cost estimation manager before advancing to project manager and later deputy plant director. "Chairman K.C. Wang, along with several board members, including Ya-Moh Tung, personally visited the plant for an inspection." This hands-on experience enabled CTCI to later secure the O&M contract for the Shulin Incineration Plant in Taipei County.

The 1990s marked a period when CTCI began expanding its value chain downstream. Alongside J.J. Liao's involvement in the New Taipei City Incineration Plant's operations, Todd Chen was assigned to the Shulin Incineration Plant, serving as a site engineer for the main contractor, Mitsubishi Heavy Industries. At the same time, William Pung was stationed at the Kaohsiung South Incineration Plant as a civil engineer. Step by step, CTCI steadily accumulated experience, laying a solid foundation for its future growth.

Expanding Upstream: New Business Models through Investment

As global awareness of environmental protection continues to rise, the environmental engineering sector — particularly energy-from-waste plants — has become a massive market. The Taiwanese government was actively promoting public-private partnerships (PPP), using models like BOO (Build-Own-Operate) and BOT (Build-Operate-Transfer) to commission private companies for construction. Recognizing this trend early on, CTCI saw an opportunity to expand its business by extending its services from construction and operations to upstream investment and development.

In 2000, CTCI's investment in ECOVE led to a successful bid for the Tainan Science Park Resource Recycling Center Project under the BOO model. By July of the following year, ECOVE signed a contract with the Southern Taiwan Science Park Development and Planning Office for the construction and operation of a waste treatment center. When the office was upgraded to the Southern Taiwan Science Park Bureau in 2003, ECOVE successfully won the renewed contract and has been operating the facility ever since.

Also in 2000, CTCI secured the Taichung City Wujih Waste Resource Recycling Plant BOT Project, Taiwan's first large-scale municipal waste recycling facility operated under the BOT model. This milestone led to the establishment of ECOVE Wujih Energy Corp., a special-purpose company responsible for the investment, construction, and operation of the plant. Functional testing and trial operations began in February 2004. Official operations started on September 6 of that year, with J.J. Liao as President.

Later, CTCI established additional subsidiaries focused on environmental resources, such as ECOVE Waste Management Corporation (waste collection, transportation, and treatment) and ECOVE Miaoli Energy Corporation (Miaoli Waste Resource Recycling Plant BOT special-purpose company). As the business expanded, EPC projects involving incineration, air pollution control, and power generation were integrated into energy-related projects under the Infrastructure, Environment & Energy Business Operations, respectively. In 2004, subsidiaries involved in environmental resource investments and operations — including ECOVE Environment Service Corp., ECOVE Wujih Energy Corp., ECOVE Environment Corporation, ECOVE Waste Management Corp., ECOVE Miaoli Energy Corp., and the Kuokuang Power Plant investment — were consolidated into the Environment & Resources Business

Operations.

The Sole One-Stop Waste Management Service Provider in Taiwan

Today, CTCI has entered a new era of business diversification, with ECOVE emerging as Taiwan's largest operator of waste management, environmental resource recycling, and incineration facilities. Through effective energy-from-waste programs, ECOVE has reduced waste volume by over 90%.

To date, CTCI has planned, designed, constructed, or operated over two-thirds of Taiwan's energy-from-waste plants, including facilities in Keelung, Miaoli, Houli, Wujih, Xizhou, Tainan, the Southern Taiwan Science Park, and Gangshan. The Miaoli and Wujih plants stand out as the only two BOT-based incineration plants in Taiwan. Additionally, CTCI has even expanded its operations overseas, managing the operation and maintenance (O&M) of two incinerators in Macau.

CTCI has achieved vertical integration, extending its reach both downstream into operations and upstream into investment. It is now the only company in Taiwan capable of offering one-stop services for incinerators, from investment

and EPC projects to operations and waste collection management.

From Local to Global: Creating a New Growth Curve

Looking back, CTCI has not only witnessed but also actively participated in Taiwan's economic and social development. The company has led the way in the fields of refining and petrochemicals, while also making significant strides in non-petrochemical sectors such as infrastructure, environmental engineering, and energy. CTCI's footprint can be seen in various landmark domestic projects, including the mass rapid transit (MRT) systems, high-speed rail (HSR), and more. The company's experience and achievements in these fields have laid a solid foundation for its international expansion.

In the 1980s, as Taiwan's MRT system began to take shape, CTCI entered the sector as a subcontractor on the MRT Muzha Line for the French company MATRA. Building on this experience, it expanded its involvement to various electromechanical systems projects, including the Nangang–Banchiao Line, Tucheng Extension, Xinzhuang–

Luzhou Line, Xinyi–Songshan Line, and current projects such as the Wanda–Zhonghe Line and Taipei MRT Circular Line (North and South Sections). CTCI also contributed to the development of the Taichung MRT and Kaohsiung MRT systems.

Looking at the many MRT projects today, the impact may seem less dramatic, but before the 1980s, no company in Taiwan had the capability to build them. CTCI not only developed this expertise but also expanded internationally, playing a role in major MRT projects in Singapore and Malaysia.

In the power sector, CTCI had previously only played the role of a subcontractor. However, the Datan Power Plant project marked a turning point. "After we secured the EPC contract with Mitsubishi for the Datan Power Plant, we have never lost a power plant project in Taiwan," John Yu proudly remarked.

In 2003, CTCI, in collaboration with Mitsubishi Heavy Industries (MHI) of Japan, secured the EPC contract for the Datan Power Plant in Guanyin, Taoyuan — a watershed moment in the company's power business development. "The Datan Power Plant's output accounts for one-tenth of Taiwan's total power generation. It is the largest natural gas power plant in Taiwan as well as CTCI's first EPC power project," said Michael Yang, who served as the project manager for Datan.

Over the decades, CTCI has made significant strides in constructing various types of power plants, including nuclear, thermal, cogeneration, and combined-cycle facilities. Its portfolio includes major Taipower power plants such as Linkou, Dalin, Tongxiao, Taichung, and Hsinta, as well as private sector projects such as Changsheng, Kuokuang, Jia Hui, and Sun Ba Power Plants.

CTCI's exceptional track record in Taiwan has paved the way for its global expansion. The company has secured international power plant projects such as Kimanis and Track 4A plants in Malaysia, along with projects in Vietnam and Thailand. Additionally, leveraging its extensive experience in liquefied natural gas (LNG) receiving terminals in Taiwan, CTCI has successfully extended its business into China, India, and Thailand.

Diversified Growth: Reaching New Heights in Operations

Diversification is a key strategy for companies aiming for sustained growth and long-term success. CTCI continuously

monitors industry trends and market dynamics, adjusting its organizational structure to adapt to evolving business models, much like an amoeba adjusting its shape to thrive in different environments. With its flexible and agile transformation capabilities, CTCI has successfully transitioned from a local Taiwanese company into a globally recognized engineering player, securing a strong foothold in the international engineering market.

CTCI's engineering expertise has earned global recognition. In 2005, the prestigious engineering magazine *Engineering News-Record (ENR)* ranked CTCI among the world's top 100 engineering firms for the first time — an achievement it has consistently maintained ever since. On the business front, CTCI's strategic diversification has yielded remarkable results. Within just three years of establishing the ATFBO in 2020, high-tech facilities projects contributed 30% of the company's total revenue. These transformations and strategic pivots underscore CTCI's ability to innovate and adapt, propelling the company to new heights and ensuring its continued growth.

"A company's competitiveness must be examined from every angle," John Yu asserted, emphasizing the importance of maintaining a lean and efficient organization. "If your structure is layered with redundancies, it will inevitably

become inefficient. When others can achieve results with one dollar while you require two, you're destined to fall behind." As the outcomes of the organizational reforms began to materialize, Yu remained true to his principles, emphasizing, "If an organization does not review itself annually, it risks becoming bloated and inefficient." This philosophy materialized through the company's annual "consensus camps," where senior executives gather to assess and transform the organization.

To remain competitive in the highly challenging international engineering market — where CTCI competes against industry giants from Europe, the United States, and Japan — the company recognizes the necessity of continuous adaptation to rapidly evolving global trends. Through relentless innovation, strategic transformation, and organizational agility, and by aligning all teams toward a unified vision, CTCI is committed to maintaining its competitive edge and achieving continued success.

Chapter 4

Power of Insights — Capturing Trends with Vision

In 2020, *CommonWealth Magazine* published its "Top 2000 Survey," featuring a report on "Taiwan's Top 50 Corporate Groups." While reviewing the report, John Yu, CTCI Group Chairman, was struck by the significant shift in rankings since 2000. The industry landscape had undergone a major reshuffle: "New entrants were all high-tech companies, while traditional industries had slipped from the top 50," he observed.

Over the past two decades, Taiwan's industries have undergone profound transformations.

"Trends are moving in this direction, and you can't go against them. You need to find the opportunities within them," John Yu thought. This insight into the evolving market landscape led him to reevaluate CTCI's strategic positioning, particularly its expansion into hi-tech sectors.

In September 2020, CTCI established the Advanced Technology Facilities Business Operations (ATFBO). Just

six months later, in March 2021, CTCI inaugurated an office in Phoenix, Arizona, to support its key Taiwanese clients expanding into the U.S. market. This initiative leveraged the growing opportunities within the semiconductor industry supply chain. By July, CTCI successfully secured its first semiconductor fabrication plant EPC project in Arizona.

This series of actions marked CTCI's official entry into the high-tech industry, offering systematic EPC services for facilities in sectors such as semiconductors, precision testing, panel optics, computer and peripheral equipment, and data centers.

The project in Arizona wasn't CTCI's first venture into the U.S. market. The company had established a subsidiary in Houston, Texas in 2010, building a foundation across industries such as refining, petrochemicals, LNG storage and transportation, power generation, and solar photovoltaic energy, highlighting its versatility and commitment to sustainable solutions.

This milestone redefined CTCI's presence in the U.S. engineering market and solidified its reputation for delivering high-tech EPC services. More than just a project, it marked a transformative moment in the company's evolution. The launch of the ATFBO underscored John Yu's keen insights into market trends.

Keeping up with the Trends: Establishing ATFBO

By 2020, CTCI had been deeply rooted in the engineering services sector for over 40 years, and the time had come for the company to pivot toward continued growth.

At this juncture, the Group's subsidiary, CTCI Smart Engineering Corporation (CTCI SEC), was already shifting its focus toward high-tech and smart building projects, targeting semiconductor fabs, and optoelectronics production facilities, among other high-tech facilities. They actively pursued projects involving cleanrooms and water, gas, and chemicals for integration solutions for high-tech factories.

During a visit to a leading semiconductor company, a CTCI's business development team member was asked, "Is CTCI constructing a massive plant in the U.S.?"

Why the question?

CTCI's team had a keen business sense. At that time, CTCI was constructing the world's largest modular monoethylene glycol plant in Texas. After further investigation, CTCI discovered that the client was planning to enter the U.S. market. This led to a swift report back to the group headquarters.

Given CTCI's extensive experience in building oil

refineries, petrochemical, and chemical plants in the U.S., the project was initially assigned to the Petrochemical Division for research and coordination.

Deciding which division should oversee the project sparked considerable internal debate. "We initially considered creating a hi-tech department under the Petrochemical Division," recalled David Chung, the project manager for the Texas monoethylene glycol plant and now the Deputy CEO of Group Engineering Business.

However, a lecture John Yu attended shifted his perspective.

"What is five nanometers (nm)? Imagine cutting a strand of hair and then slicing that cross-section ten thousand times — that's five nanometers," John Yu cited a description by CEO of TSMC C.C. Wei during a speech. This analogy helped him grasp the intricacies of advanced semiconductor manufacturing, where the smaller the nanometer scale, the faster the computing speed.

"But as chips get smaller, the challenges increase. When components are so tiny that they're invisible to the naked eye, even a slight vibration or tremor could make them vanish. A single speck of dust in the air could cause contamination. That's why wafer manufacturing requires an ultra-stable and pristine environment, conducted entirely within a cleanroom," Yu explained.

Yu quoted Dr. Wei's analysis of Taiwan's global leadership in the semiconductor industry: "First, technological advancement; second, the relentless pursuit of yield rates..." John Yu then confidently added, "What influences yield rates, besides the production machinery, is the engineering companies that build the facilities."

He continued to reflect on how CTCI could help customers improve their yield. How can plant structures be designed to prevent vibrations? How can a plant be kept perfectly clean, with zero dust contamination?

These were the kinds of challenges that led John Yu to recognize opportunities for CTCI to provide innovative engineering solutions, unlocking significant potential in the high-tech sector.

Determined to capitalize on these opportunities, Yu decided to establish ATFBO. Within a short time, ATFBO expanded its operations across Taiwan, the United States, India, and other regions. It secured major projects,

CTCI embraces the challenges of the rising high-tech industry with the mindset: "Where there is change, there is opportunity; transformation is never too late!"

including EPC contracts for a Taiwanese semiconductor giant as well as its suppliers; the construction of Taiwan Cement's E-One Moli Energy Corporation (MOLICEL) lithium battery plant; and projects for leading international DRAM manufacturers. Notably, the MOLICEL plant became Taiwan's first large-scale battery facility, capable of producing enough batteries to power 24,000 electric vehicles annually.

In just over two years, by the end of 2023, ATFBO had secured over NT$100 billion in contracts, accounting for 34% of CTCI's total contract value for the year, equivalent to one-third of its orders. This made it a new highlight of the company's growth.

What's more, in 2023, CTCI made its debut on *ENR's* list of the top 10 contractors in manufacturing, ranking 9th — thanks to its outstanding performance in the high-tech sector.

Biotech and High-Tech: No Role Too Small

"Where there is change, there is opportunity; transformation is never too late!" This was the message Group Vice Chairman Michael Yang shared with shareholders in CTCI's 2020

annual report, reflecting the decision to establish ATFBO.

Interestingly, it was *CommonWealth Magazine's* "Taiwan's Top 50 Corporate Groups" ranking that sparked the creation of CTCI's ATFBO. By then, Taiwan's tech industry had already achieved global recognition for its accomplishments, and CTCI, as Taiwan's leading EPC engineering firm and one of the world's top 100 engineering companies, had firmly established its expertise in the field. So why did it take so long for CTCI to officially enter the high-tech sector?

"We have worked on projects for Baoshen Pharmaceutical, Yung Shin Pharmaceutical Industrial Co., Ltd., PharmaEssentia Corporation, the Sakai Display Products Guangzhou Zengcheng 10.5th Generation Display Plant Cleanroom Project, HannStar Display Corporation LCD Plant, Siliconware Precision Industries Co., Ltd. IC Packaging Plant, and WIN Semiconductors Corp. Semiconductor Fab MEP project…" said John Yu, listing a series of past projects in pharmaceuticals, biotech, and optoelectronics. Therefore, CTCI has never been absent from the high-tech engineering sector.

In fact, when he was promoted to President, John Yu made high-tech a key part of CTCI's diversification strategy. He began investing in new engineering sectors, securing

projects such as the EPC cleanroom project for Nanya Technology's semiconductor fab, the EPC project for Taiyen Biotech's collagen plant, and design work for Taiwan Sugar's biotech facility, officially bringing CTCI into the electronics and biopharmaceutical industries.

"We just never made high-tech our primary focus," Yu explained. CTCI originally built its reputation in the highly demanding fields of high-pressure, high-temperature, and highly corrosive petrochemical engineering. "Building hi-tech facilities is relatively simpler — it's not like chemical plants, where a mistake could lead to an explosion."

Embracing the Opportunities and Challenges of Supply Chain Regionalization

In addition to witnessing the evolution of various industries, John Yu also saw changes in the market as global supply chains shifted from globalization toward regionalization, making supply chains shorter.

In the past, many companies produced goods in Asia and then exported them to Europe and the U.S., forming a long supply chain. However, with the rise of global carbon reduction policies, businesses began to recognize the impact

of carbon footprints on costs.

Additionally, the ongoing escalation of the U.S.-China trade war prompted European and American companies to adjust their strategies. Production was increasingly relocated to regions closer to European and American markets, such as Central and Eastern Europe and Mexico, effectively turning long global supply chains into shorter, regional ones.

The COVID-19 pandemic in 2020 further disrupted supply chains, particularly in the semiconductor industry, driving Western nations to accelerate efforts to bring manufacturing back home, with a strong push for local semiconductor production to achieve self-sufficiency.

Having operated internationally for many years, CTCI was well-positioned to leverage this supply chain transformation. The timing was perfect for the company's expansion into the high-tech sector.

Moreover, as Taiwan's semiconductor companies

Amid this global supply chain shift, CTCI's focus on high-tech industries aligns with the domestic and global expansion strategies of Taiwanese semiconductor manufacturers.

expanded both domestically and internationally, Taiwan's high-tech chemical supply chain also seized opportunities to invest in new fabrication plants abroad. "Whether it's solid, liquid, or gas, CTCI has the expertise and experience," John Yu explained. "Whenever there's a risk of supply chain disruption, we can partner with both upstream and downstream supply chain players to collaborate and ensure continuity."

In addition, CTCI's extensive experience in the resource cycling sector and the semiconductor industry — such as waste solvent recycling and reuse; high-tech wastewater treatment, recycling and reuse; and waste disposal — has laid a solid foundation for expanding services in the high-tech sector, particularly in waste management and recycling. Simply put, CTCI offers comprehensive, one-stop solutions in high-tech industrial plant construction, including carbon footprint assessment, green building, smart factories, and supply chain waste treatment and recycling.

Rapid Talent Development to Meet High-Tech Business Growth

For CTCI, the Arizona project was undeniably a major

milestone in the realm of high-tech sector. However, for everyone at the company, it marked a completely new experience and learning journey — encompassing everything from project execution to gaining insights into the high-tech ecosystem.

One of the initial challenges they encountered was the shortage of talent with expertise in the high-tech industry and familiarity with the U.S. market.

In late 2020, having gained extensive experience in civil engineering and construction with over 20 years of overseas assignments, William Pung was selected by Michael Yang to lead the project management efforts for the Arizona project.

"We were awarded GC[1] and partnered with a local contractor for the project," William Pung said. CTCI took on project management, while the local partner handled construction, all while working with Taiwanese high-tech clients. He quickly noticed the cultural and high-tech industry ecosystem differences between the U.S. and Taiwan.

High-tech industries require rapid construction, short product cycles, and fast-paced project execution, which was a significant departure from the longer timelines and different requirements of the oil & gas, power, and transportation projects that CTCI was previously

accustomed to. This was the most striking realization for him.

After the Arizona project, Pung took on the role of Head of the ATFBO in 2023, facing new challenges.

"Business was growing rapidly, but the department's staffing levels couldn't keep up, so we had to mobilize elite teams from other units," he explained. However, talent development is a gradual process, and the rapid expansion of the high-tech business pushed CTCI to accelerate its internal talent training efforts.

To encourage employees to embrace new challenges and adapt to the faster-pace high-tech industry, CTCI introduced a job transfer allowance, offering financial incentives to attract employees to transition into the high-tech sector. At the same time, a decision-making committee was established to enhance industry knowledge and provide necessary training, ensuring that talent development keeps pace with business growth.

CTCI's adaptability in the high-tech industry, enhanced by digitalization and modular innovation, has significantly improved its flexibility and efficiency.

Although there is still room for improvement in terms of organizational structure and workforce development, Pung remained optimistic about the future of ATFBO.

John Yu added, "The agility of the high-tech industry is the most important aspect we need to master and integrate into CTCI. Through digitalization and modular innovation technologies, we can create greater agility in CTCI's services."

Agility: The Decision Behind the Purchase and Construction of the CTCI Headquarters Building

To gain insight into the future, it is essential to first understand the factors driving environmental changes. These include external factors such as industry trends and shifts in the global economic landscape, as well as internal pressures.

As CTCI continued to grow, the need for enhanced real-time interaction and collaboration became increasingly apparent. With offices spread across multiple locations, this inevitably led to inconvenience.

To enhance adaptability and streamline operations, John Yu made a major decision — to build the first and second

CTCI Headquarters Buildings.

"Group Chairman Yu not only has the ability to identify opportunities but also possesses the decisiveness to act on them," said Ming-Shyan Lee, CEO of Group Engineering Business. "His dedication and perseverance in achieving his goals are truly admirable."

At the time, CTCI's main office was in CTCI Tower on Dunhua South Road, Taipei. CTCI owned six floors, while the rest of the ten floors were leased. As the company expanded, several of its subsidiaries were scattered across various locations. In addition, the office building housed other companies, creating a crowded environment that was not ideal for operational efficiency.

"CTCI's clients are primarily large domestic and international corporations or government agencies, and many of the projects we handle involve sensitive documents requiring strict confidentiality and intellectual property protection," explained John Yu. "Having our own building would address these security concerns and strengthen client confidence in CTCI's commitment to confidentiality and reliability."

However, finding large parcels of land in the high-cost Greater Taipei area, where land is extremely scarce and valuable, seemed like an impossible dream. It wasn't until an informal golf outing that John Yu saw an opportunity to

make this vision a reality.

The current site of CTCI's First Headquarters, located on Section 6, Zhongshan North Road in Taipei, was once the site of Shihlin Electric's manufacturing plant. Originally, Shihlin Electric had planned to redevelop the land into a luxury residential complex. During a golf outing, Shihlin Electric's Chairman, Yu-Rui Hsu, suggested to John Yu that he consider purchasing a unit in the planned luxurious residential project.

However, upon visiting the site, Yu immediately recognized its strategic value as an ideal location for CTCI's headquarters. Given its size and proximity to the Tamsui MRT line, he swiftly persuaded Chairman Hsu to sell the land to CTCI.

In 2006, CTCI purchased the 1,800 ping (approximately 6,000 square meters) plot of land for NT$3 billion. Over the next three years, the company developed a commercial office building featuring three underground levels and 17 stories above-ground, which was completed in 2009.

Transforming the site from a planned luxury residential complex into CTCI's headquarters marked a key milestone in the company's history, reflecting John Yu's foresight and decisive leadership. The acquisition of land for CTCI's Second Headquarters further highlights his strategic vision and ability to seize long-term opportunities.

Strategizing Green Opportunities and Forging Smart Buildings

In 2016, CTCI unveiled its new brand identity, followed by the launch of the ECOVE brand in 2017. However, despite these advancements, many of the Group's subsidiaries, particularly those within Group Resource Cycling Business and Group Intelligent Solutions Business, were still spread across multiple locations in Neihu, Nangang, and Shenkeng. This fragmented office setup reinforced John Yu's vision to acquire land and establish a second headquarters.

At John Yu's direction, Kuo-Ann Wu, CEO of Group Intelligent Solutions Business, identified a prime piece of land in the Beitou Shilin Technology Park, located near the First Headquarters.

The 2,000-ping (approximately 6,600 square meters) site had just been cleared for development. "The initial asking price ranged between NT$150,000 and NT$170,000 per ping, but CTCI conducted a thorough market evaluation and determined a fair price of NT$126,000 per ping. With John Yu's determination and persistence, the deal was successfully secured."

This acquisition marked the first-ever land transaction in the Beitou Shilin Technology Park, as well as the first site

to receive urban planning approval, obtain construction permits and building use permits, and serve as a corporate headquarters. The new headquarters quickly became a landmark in the Tech Park.

The Second Headquarters building, a 12-story structure with two underground levels, was developed collaboratively by CTCI's Group Intelligent Solutions Business, including CTCI ASI, CTCI REI, and CTCI SEC. According to Kuo-Ann Wu, the building offers 7,000 ping of office space, with construction costs amounting to approximately NT$1.9 billion.

After three years and eight months of construction, the building was completed and now serves as the operation hub for both Group Intelligent Solutions Business and Group Resource Cycling Business.

The close proximity of the First and Second Headquarters enabled CTCI to consolidate previously scattered offices across northern Taiwan, enhancing internal collaboration and significantly boosting operational efficiency.

"The heat from sunlight affects the air conditioning load in the office. In the morning, the sun rises from the east, and in the afternoon, it shines from the west. Regardless of the time of the day, our building's automated curtains adjust accordingly," says Kuo-Ann Wu, his tone lighthearted and

enthusiastic. "Using AI technology, we've developed smart roller blinds that are integrated into the building and our everyday lives."

"Indoor lighting and air conditioning settings can all be adjusted using this panel," he adds, pointing to a smart panel on the wall, demonstrating the building's intelligent systems and functions. Visitors can directly experience the convenience and user-friendly features of this intelligent building.

From the very beginning of CTCI, the company's founder, Chairman K.C. Wang, had a dream of building a headquarters of its own.

Three decades later, John Yu brought this dream to life, constructing two smart, energy-efficient office buildings that integrate sustainability principles and lay the foundation for the CTCI's long-term growth.

Envisioning the Future: Building a Foundation for Sustainable Growth

CTCI has long been at the forefront of sustainability, actively integrating green energy trends into its core operations, as demonstrated by its self-developed, company-

owned headquarters. Both the First and Second Headquarters buildings have been nationally recognized, receiving the prestigious National Golden Award for Architecture and the Green Building Label (EEWH: Ecology, Energy Saving, Waste Reduction, and Health).

In 2010, the First Headquarters building won the 10th National Golden Award for Architecture in the "Construction Quality, National First Prize" category. In 2018, it received the Taiwan Green Building Existing Building Improvement Bronze Award and later that year was awarded the LEED² Gold certification by the U.S. Green Building Council.

The Second Headquarters, incorporating AI systems, has achieved three major green building certifications: the U.S. Green Building Council's LEED Gold certification, Taiwan's Diamond-level Intelligent Green Building (IGB) certification, and Taiwan's Diamond-level EEWH Green Building certification.

In 2023, it was honored with dual National Golden Awards for Architecture in the Planning and Design and Construction Quality categories. This achievement underscores CTCI's commitment to advancing sustainable and next-generation smart buildings.

The integration of green energy and smart technologies is closely aligned with CTCI's core business. For instance,

Group Intelligent Solutions Business applies low-carbon building technologies to support the petrochemical industry's carbon reduction efforts. Over the years, CTCI has built an extensive track record across high-tech fabs, large-scale data centers, specialty chemical plants, biotech pharmaceutical factories, and petrochemical storage and transportation facilities.

From identifying emerging industry trends and establishing ATFBO, to leveraging supply chain regionalization strategies, developing future talent learning from the high-tech sector, enhancing organizational collaboration through land acquisitions and new office developments, and integrating smart technologies with sustainability to capture green business opportunities — John Yu has consistently demonstrated keen foresight and strategic decisiveness.

With a forward-looking vision, he has successfully positioned CTCI to seize new opportunities, ensuring the company's long-term success.

Notes:

1. General contractor.
2. Leadership in Energy and Environmental Design.

Chapter 5

Power of Innovation — Smart Engineering: Building Competitive Edge Through Differentiation

Scene 1:

Customers equipped with AR (Augmented Reality) and VR (Virtual Reality) devices freely explore a fully immersive virtual environment. They witness real-time plant design simulations, visualizing the construction site before physical work begins.

Scene 2:

Massive petrochemical plant modules and boilers, resembling giant LEGO blocks, are carefully loaded onto heavy transport vessels. These colossal structures traverse oceans and continents — from Kaohsiung, Taiwan, to Malaysia, and from Qingdao, China, to Texas, USA. The world's largest modular boilers and onshore modular plants are delivered globally.

Scene 3:

At an LNG (Liquefied Natural Gas) receiving station

construction site in India, robots replace traditional cryogenic pipeline cleaning methods, removing residual contaminants and enhancing pipeline cleanliness.

Innovation is at the core of CTCI's values. These real-world applications of innovation reflect CTCI's pioneering engineering advancements and its continuous evolution of EPC solutions.

Over the decades, CTCI has consistently pursued groundbreaking innovations, establishing market differentiation, and enhancing its competitive edge. This commitment to innovation has fueled the company's steady and sustainable growth.

From Hand-Drawings to 3D Engineering Design Evolution

The path to intelligent solutions is a gradual evolution. In its early days, CTCI's application of computer technology in engineering design enabled it to stay ahead of industry trends and keep pace with technological advancements.

In 1975, CTCI's Engineering Department adopted the Wang Laboratories 2200T computer system — the world's first word processor with built-in editing and retrieval

functions — laying the groundwork for modern desktop computing.

CTCI quickly embraced this innovation. "But by today's standards, it was really just a typewriter," joked John Yu, Group Chairman.

In 1977, CTCI established its Computer Operations Center, continuously upgrading its systems by installing cutting-edge technology, including the CYBER 74 computer system, plotters from Control Data Corporation, and VAX[1] computers from Digital Equipment Corporation. These efforts enhanced automation and efficiency, steadily closing the gap between CTCI and top-tier international companies.

In the 1970s, these computer systems were at the forefront of technology. CTCI consistently led the industry by integrating and implementing them as soon as they became available, demonstrating the company's commitment to remaining an innovation leader.

CTCI aims for full lifecycle digitalization by extending seamless services beyond post-commissioning to operations and maintenance (O&M), creating fully integrated, one-stop engineering solutions.

This ambition continued into the 1980s.

In 1986, CTCI introduced AutoCAD 2D engineering design and drafting software. In 1989, the company further advanced by adopting large-scale 3D design software, such as Intergraph PDS and AVEVA DMS. However, in the early days, computer software functionality was still limited, and manual drafting skills remained crucial.

"We used to rely on slide rules and hand-draw engineering diagrams," John Yu reminisced with a smile, recalling that he spent three years manually drawing electrical engineering designs.

"We were all doing things by hand back then," said Ming-Shyan Lee, CEO of Group Engineering Business. He joined CTCI Corporation's Engineering Department in 1989 as a piping design engineer. "AutoCAD was just starting to gain traction, but its capabilities were still limited. We still had to manually draft design diagrams, so I practiced hand-drawing every day."

As the business grew and technology advanced, CTCI's push toward digitalization never waned. The company proactively transitioned from hand-drawn to computer-aided engineering diagrams, gradually embracing the era of 3D engineering design.

From Paper to Digital

As the 21st century unfolded, mobile communication technologies flourished. In 2008, the first iPhone launched, and 4G/4G LTE networks quickly became widespread. With the rise of automation and digitalization, the use of portable devices for streamlining construction site operations became the norm.

In 2012, during the EPC project for the 10th Sulfur Plant at the CPC Dalin Refinery, CTCI began integrating mobile apps and handheld devices (PDAs) for on-site operations.

Through PDAs, field supervisors could instantly access the latest design drawings and issue precise instructions, minimizing errors. This was critical on job sites because, as John Yu explained, "If issues aren't promptly addressed, it can lead to construction errors requiring costly rework."

Real-time mobile access eliminated the need for supervisors to carry heavy blueprints and documents during punch list reviews. Instead, they could use tablets to view and compare designs, take photos, record videos, and create voice memos — allowing for instantaneous on-site assessments.

Moreover, the massive volume of data updates and design modifications generated during EPC project execution could now be processed and synchronized in real time via cloud technology, significantly enhancing the convenience and efficiency of site management.

By fully integrating innovative project management processes and technologies during procurement and construction, alongside strict management controls, CTCI achieved exceptional execution efficiency. For example, the Dalin 10th Sulfur Plant EPC project was completed 48 days ahead of schedule. This outstanding project performance earned CTCI the Excellence Award at the 14th Public Construction Golden Quality Awards from the Public Construction Commission of the Executive Yuan.

Integrating Group Resources to Establish the Group Research & Innovation Center

In addition to leveraging external technological solutions, CTCI has consistently focused on strengthening its internal "soft power." The year 2008 was pivotal for the company's innovation and R&D efforts.

To drive innovation and enhance competitiveness, John Lin, who was President at the time, brought together a cross-functional team to form an innovation task force. This team, in collaboration with the newly established Strategy

Reinforcement Committee, implemented initiatives, focusing on process reengineering, optimization, and innovation across all areas.

In 2008, CTCI officially established the Research & Innovation Center as an innovative platform to integrate EPC engineering expertise with technical services. The center consolidated the company's R&D resources, focusing on core technology development, driving process innovation, and integrating all EPC engineering data onto a single platform. Shortly after, the Center established a new operations R&D team within the Engineering Department, responsible for developing and refining project workflows, tools, and methodologies.

After ten years of operation, the Center expanded in 2020 into seven specialized teams: R&D Project Management, AI Research, New Technology Applications, 3D+ Application Development, Tag Platform Development, App Development, and the Engineering Department's Operations R&D. The Center continues to optimize the development of design automation tools and digital transformation, aiming to develop processes and technologies that improve efficiency, reduce costs, and drive profitability and competitive advantage.

From iEPC to Digital Twins

Various developments stand as a testament to the significant achievements of CTCI's innovation-driven R&D efforts. After strengthening its software and hardware capabilities, CTCI shifted its focus toward business model innovation. A pivotal moment came in 2015, with the development of intelligent EPC (iEPC), an initiative that enhanced project management and execution efficiency, marking a key milestone in the company's digital transformation.

At the core of iEPC was CTCI's substantial investment in developing the Tag Platform. During EPC project execution, data related to equipment, piping, instrumentation, and civil foundations were stored in isolated coding systems that were not interconnected. The Tag Platform was introduced to unify these data sources, enabling seamless integration across various systems.

Simply put, the Tag Platform functions as an object-oriented data hub, linking documents, 3D models, material inventories, equipment procurement, construction data, and drawings across the engineering, procurement, construction, and commissioning phases, creating a cohesive and efficient project information system.

This technology enables CTCI to apply 3D visualization

techniques to enhance EPC productivity and quality, particularly in optimizing steel structure designs and construction workflows. Furthermore, CTCI leverages 4D (3D+time) applications to conduct feasibility analyses, lift planning simulations, and construction management. Through an intuitive, highly visual interface, clients gain real-time insights into project progress and execution details, enhancing transparency and improving customer satisfaction, thus increasing the chances of securing future contracts.

To achieve this, John Yu emphasized, "Everything must be cloud-based and fully digitized to ensure seamless integration across global project execution. We must stay ahead of the curve so the Group can achieve long-term sustainability."

CTCI has fully embraced this vision. In 2021, the company took a major step forward by incorporating iEPC into its broader digital transformation roadmap, further expanding its research and development efforts in digital twin technology. This advancement enabled CTCI to create a synchronized physical and virtual plant model, ensuring that virtual plants are completed in parallel with physical construction.

"Our goal is to fully digitalize the entire engineering

lifecycle, extending our services beyond commissioning into the operation and maintenance (O&M), thus delivering a comprehensive, one-stop engineering service," shared Michael Yang, Group Vice Chairman. CTCI has adopted advanced cloud computing, IoT, big data analytics, and other information and communication technologies (ICT), while integrating R&D capabilities to meet the evolving needs of the engineering industry. The goal is to drive the adoption of intelligent EPC solutions, enabling global industries and clients to transition seamlessly into the smart technology. The goal is also to execute projects faster, better, more accurately, and with greater competitiveness.

From Manual Labor to Robotic Applications

"Industrial automation and intelligent systems reduce reliance on manpower, enhance efficiency, and improve safety," explained Kuo-Ann Wu, CEO of Group Intelligent Solutions Business. He cites the Facility Management and Control System as an example, illustrating how the integration of smart equipment minimizes the need for on-site personnel. With a centralized "situation room," all control panels are via cameras, allowing incidents to be

monitored and managed remotely.

"In the past, factories required constant human supervision, and many processes had to be performed manually. Now, many operations are transitioning toward fully automated, unmanned facilities," Wu said with a smile.

As technology advances, the adoption of intelligent solutions continues to accelerate. The development and application of robotics have emerged as one of CTCI's key innovations areas. The company has implemented construction machinery management systems and mobile health, safety, and environmental management systems. Industrial robots are now utilized on construction sites for welding, assembly, painting, material handling, and inspection, significantly improving on-site operational efficiency.

At the end of 2021, CTCI deployed its first self-developed pipeline cleaning robot at the Adani LNG terminal construction site at Dhamra Port on India's east coast. This robot was specifically designed for use in LNG terminals, enhancing the efficiency and safety of pipeline maintenance and operations.

In this project, the pipeline cleaning robot was used to clean LNG cryogenic pipelines by removing residual materials and dust left from the welding process. It could navigate different pipeline structures, including vertical and horizontal sections, elbows, and tees. Equipped with real-time imaging, the robot provided visual feedback throughout the process, ensuring the pipelines were thoroughly cleaned.

In addition, CTCI developed a flange bolt fastening robot for engineering pipelines, capable of efficiently performing bolt fastening operations while digitally recording each task. For other repetitive or complex tasks, both physical and virtual robots were introduced to streamline operations.

For example, Robotic Process Automation was implemented to automate processes such as bulk material delivery, registration, and accounting from construction sites. Additionally, it was used to periodically verify government-issued "blacklists" of prohibited vendors, effectively minimizing operational risks.

"Automation and intelligence are not only applied in factories but also in buildings," emphasized Wu. "In

CTCI's integration of technologies such as pre-casting and modular construction methods not only minimizes the environmental impact but also reduces labor hours.

production plants, we manage machines through a Facility Management and Control System. In buildings, we use a Building Automation System to centralize the control of dispersed equipment — including air conditioning, lighting, and plumbing systems — to achieve high efficiency and energy savings."

He points to the Second Headquarters building as an example: "We use AI-driven technology to control our window blinds. After a year of machine-learning and adjustments, they now recognize sunlight angles and the indoor brightness levels, automatically shifting left or right as needed."

Seeing these results, John Yu expressed his confidence, stating, "I'm very optimistic about our Intelligent Solutions Business Group."

New Business Models to Expand Markets and Drive Win-Win Partnerships

In addition to expanding its business, CTCI has continually innovated its business models. A prime example is the "Mr. Energy" platform developed by CTCI ASI under Group Intelligent Solutions Business. It is an

energy information management tool that focuses on energy efficiency and carbon reduction, helping companies optimize their energy management efforts.

"We currently serve over 20 semiconductor fabs, as well as several major tech manufacturers," said Kuo-Ann Wu.

The "Mr. Energy" platform has already been deployed across various sectors, including semiconductors, chemicals, electronics, and building management, with the Second Headquarters building serving as a flagship demonstration.

"This service has now been upgraded to an 'Energy Management System and Greenhouse Gas (GHG) Inventory (EnMS & GHG Inventory),'" Wu explained. "It not only helps clients monitor and optimize energy consumption but also facilitates carbon footprint assessments, focusing on Scope 1[2] emissions associated with their operations." Wu expressed enthusiasm about the business potential this enhanced business model could create.

"Leveraging smart technology to drive ESG initiatives is a major industry trend," Wu emphasized. "Energy management is one of our core competencies, and we are expanding our capabilities by integrating AI-driven analytics to track indirect carbon emissions. This enables clients to monitor emissions throughout their production processes, assess workflows, and implement advanced carbon reduction

strategies, further reinforcing CTCI's leadership in the engineering sector."

CTCI is also exploring new business models, such as profit-sharing agreements and usage-based pricing structures. "We begin by conducting a comprehensive evaluation of the project, then invest resources to provide clients with a range of smart system services. Afterward, revenue is shared based on pre-agreed terms," Wu explained. This approach not only lowers upfront costs for clients but also creates revenue streams for CTCI, fostering long-term, mutually beneficial partnerships.

As Industry 4.0 continues advancing toward digitalization, the rapid evolution and optimization of systems and user interfaces is reshaping the engineering landscape. CTCI is not only developing smart operation and maintenance services but has also transitioned its business model from one-time sales to a "usage-based" pricing model.

Kuo-Ann Wu explained that under the "Product-as-a-Service" trend, the usage-based pricing model operates similarly to a "rent-to-own" or "subscription-based" services. In this approach, the company retains ownership of the product while providing clients with access rights through a dedicated service platform, along with ongoing technical updates and support.

"This creates a win-win scenario for both parties," Wu said. "Clients can avoid substantial upfront investments while benefiting from continuous operation and maintenance services. Meanwhile, we establish recurring revenue streams, strengthen client relationships, and enhance our competitive advantage."

Seamless Integration Capability for Optimal Client Solutions

CTCI's innovations, whether developed in-house or integrated from external advanced technologies, demonstrate the company's exceptional ability to merge cutting-edge solutions into efficient and adaptive systems. This integration not only enhances CTCI's competitiveness but also positions the company as a technological leader in the industry.

For example, Group Intelligent Solutions Business demonstrates outstanding expertise in shield tunneling and tunnel engineering. It is the only company in Taiwan capable of providing ground freezing technology applicable to any soil type or underground construction environment. This distinctive capability allows CTCI to deliver customized

solutions, even in the most challenging conditions.

CTCI REI, a CTCI Group subsidiary, successfully completed CPC's 26-inch onshore gas pipeline Horizontal Directional Drilling (HDD) EPC project, constructing Taiwan's first gas pipeline to cross the main shipping channel at Taichung Port. This project set a national record for the longest HDD subsea pipeline. With advanced construction techniques and an intelligent management system, CTCI integrated cross-disciplinary expertise to ensure the project's success.

CTCI Smart Engineering developed the "BIM[3] 7D" smart maintenance and repair system, providing comprehensive lifecycle management for engineering projects. According to Wu, the BIM 7D system is applied to plant and smart building maintenance.

He gave an example: if a door is left open or if equipment temperature rises unexpectedly, the central monitoring system immediately alerts the control room, prompting the dispatch of personnel to investigate. "Every machine or piece of equipment has a QR code. Just scan it, and you'll see all the details — including the name, model, maintenance company, and assigned repair personnel. The system will immediately notify the maintenance provider to send a technician over right away."

Optimize Resources and Minimize Environmental Impact

CTCI's innovation and integration of construction methods have played a key role in the company's growth and success. By adopting precast, prefabricated, and modular construction techniques, CTCI not only reduces the environmental impact at project sites but also minimizes the need for manpower.

"As part of our strategy, we relocate on-site installation work from high-cost and labor-scarce regions — like the United States — to areas with abundant, affordable labor — such as China, Indonesia, and Thailand. We fabricate the modules off-site and then ship them to the construction site for installation," said John Yu. He pointed out that CTCI had been accelerating the development of these innovative engineering and construction methods in recent years. "In the future, when executing large-scale projects in the U.S., we will also assess the feasibility of this approach."

In early 2017, CTCI successfully completed Malaysia's largest modular engineering project — the RAPID Package 1 RFCC[4] — by employing innovative modular construction technology. The boiler equipment was prefabricated in Taiwan and transported by sea to the construction site

in Malaysia. This method not only reduced on-site labor and machinery requirements, but also ensured precise scheduling and guaranteed the high-quality boiler construction, all of which were critical to the project's success.

Transporting the massive 2,000-ton boilers across borders was an extraordinary feat. Beyond sea transport, the boilers were first loaded onto a ship at the Kaohsiung Port, then transported by self-propelled modular transporters (SPMTs) from the port to the construction site in Malaysia, completing the complex logistics for this groundbreaking project.

Building on its proven modular construction expertise and experience in shipping large boilers, CTCI took on the world's largest modular onshore project in 2018 — the EPC contract for a 1.1 million-ton monoethylene glycol plant for the ExxonMobil and SABIC joint venture, known as the GCGV project, setting yet another milestone in the industry.

For the GCGV project, equipment modules totaling nearly 40,000 tons were divided into five massive sections, which embarked on a journey spanning almost the entire globe. It took two months to transport them to the construction site in Texas, USA.

The project employed innovative modular engineering, with all module fabrication completed within two years, from the first steel cut to the final equipment delivery. Once on-site, assembly and mechanical completion were achieved in just six months.

At first glance, those unfamiliar with the engineering industry may find it difficult to grasp the significance of these figures. However, the impact becomes evident when compared to traditional construction methods.

The innovative modular approach significantly shortened construction time, reducing project duration by about one-third compared to traditional on-site methods. In terms of workforce requirements, conventional construction methods would have required over 13 million man-hours, whereas the modular strategy reduced this to just 2.5 million man-hours — a reduction of 70-80%. From a cost perspective, the project would have been 20% more expensive without modular construction techniques.

These figures clearly demonstrate that the modular approach not only reduced costs and improved efficiency but also significantly shortened the construction schedule. From securing the contract in September 2018 to final delivery to the client, the entire project was completed in just three years.

Faster, Better, and More Precise

If there's one phrase that best describes CTCI's innovative capabilities, it would be "relentless pursuit of excellence."

In early 2021, CTCI executed the roof construction for LNG tanks at two LNG receiving terminals — one in Thailand and one in Taiwan. The project in Rayong, Thailand, was for PTT, the country's leading energy company, and involved the construction of Thailand's second LNG terminal. The project included two 250,000-cubic-meter LNG storage tanks, each the largest of its kind in Thailand, with a total annual supply capacity of 7.5 million tons of LNG.

However, the challenge in this project was how to lift the massive, curved roof sections — each weighing over a thousand tons — to install them several dozen meters above the ground.

To address this, the CTCI team adopted another innovative technique: air-raising.

The "air-raising" method involves sealing the space between the curved roof and the pre-stressed concrete wall of the storage tank.

By injecting air into the interior of the roof, additional air pressure is generated. Utilizing the pressure difference between the inside and outside of the roof, CTCI successfully lifted the 90-meter-diameter, over 1,000-ton roof at a rate of approximately 21 cm per minute.

The entire process took nearly four hours, successfully lifting the roof to a height of 48 meters — roughly equivalent to a 16-stories building.

This approach earned CTCI the "Distinguished Project Award" and the "Outstanding Project Leader Award" from PMI Taiwan Grand Award, presented by International Project Management Institute (PMI), widely regarded as the "Oscars" of project management.

Such examples are not only seen overseas but also in Taiwan.

The Guantang LNG Receiving Terminal, located in Taoyuan's Guanyin District and commonly referred to as the Third LNG Receiving Terminal, is a project jointly undertaken by CTCI and Japan's Kawasaki Heavy Industries. The project involves constructing two LNG storage tanks, each with a 160,000-cubic-meters capacity — the largest in Taiwan — capable of supplying 3 million tons of LNG annually.

However, during the construction phase, the team faced strong northeast monsoon winds and the constraints of a limited construction area. How were these challenges

overcome?

To overcome these difficulties, CTCI employed modular construction techniques, pre-fabricated the 78.2-meter-diameter, over 1,000-ton curved roofs of the storage tanks. Using the air-raising method, the team lifted the roofs at a rate of approximately 13 cm per minute, raising them to a height of 30 meters. This process allowed for the successful installation of the modular roof structures.

In March 2021, following the completion of LNG tank roof construction using innovative modular prefabrication and air-raising methods, workers conducted interior construction within the tanks for 388 days, unaffected by weather conditions.

This approach not only addressed the challenges of limited workspace but also minimized the risks associated with working at height and significantly enhanced work efficiency.

CTCI customize intelligent plant and fab designs for clients, seamlessly integrating the virtual and physical worlds through innovative, one-stop services to meet the demands of the Industry 4.0 era.

The Guantang project demonstrated outstanding quality and project management, earning the prestigious Public Construction Golden Quality Award from the Ministry of Economic Affairs in 2023.

A Corporate Role Model for Digital Transformation

For decades, CTCI has been at the forefront of innovation, harnessing digital capabilities to drive competitive advantage.

To compete globally with high efficiency, CTCI recognized that enhancing backend operations was just as crucial as adopting cutting-edge technology for project execution. In 2021, the company initiated the development of its iManagement smart management platform. By integrating technologies such as information systems, robotic process automation and artificial intelligence, the platform effectively digitized and automated functions like accounting and finance. This innovation allowed employees to focus on more creative roles while improving the precision, efficiency, and fluidity of project execution and logistical management.

After an extensive review of backend service workflows,

CTCI's development team consolidated dozens of proposals from various units across the Group into over 20 targeted initiatives and completed the development by mid-2023.

T.C. Li, CEO of Group Shared Services, commented: "Statistics show that these management systems have saved over 6,000 work hours annually for backend operations. But our innovation doesn't stop here. In addition to accelerating the adoption of intelligent technologies, I've encouraged all units to continuously generate new ideas from their daily work, which are then assessed and developed by the R&D team."

Indeed, by continuously innovating engineering technologies and adopting new approaches, CTCI stays ahead of the curve with cutting-edge solutions and diversified services. Leveraging artificial intelligence in design, CTCI customizes smart factories for clients, seamlessly integrating the virtual and real worlds through comprehensive and innovative services.

This accelerated digital transformation is driving the Group into the iEPC era, equipping it to thrive in the Industry 4.0 era.

CTCI's relentless pursuit of technological innovation and digital transformation has strengthened its organization and earned widespread recognition. In 2022, Group Chairman John Yu received the highest honor at the Harvard Business Review Complex Chinese Edition's "Ding Ge Awards" for digital transformation leadership.

In 2023, CTCI received the Digital Transformation Model Award for excellence in operational management and pioneering business models.

"Confronting the sweeping changes of our time requires steadfast perseverance," emphasized Michael Yang. "Only through the fearless embrace of transformation, combined with the power of innovation, can teams unlock their limitless potential.

By continuously applying digital technologies to advance engineering expertise and business models, we can offer differentiated, competitive, and high-quality services that honor our commitments to clients and drive operational excellence."

This steadfast belief is the driving force behind CTCI's perpetual cycle of innovation, propelling the company forward every single day.

Notes:

1. Virtual Address eXtension.
2. The international greenhouse gas inventory encompasses three scopes. Scope 1 refers to direct emissions from processes or facilities, such as plant chimneys and ventilation systems.
3. Building Information Modeling (BIM).
4. Refinery and Petrochemical Integrated Development Package 1, Residue Fluid Catalytic Cracking, LPG Treatment Unit & Propylene Recovery Unit Project, abbreviated as P1.

Chapter 6

Power of Learning — Building a Borderless Learning and Knowledge Management Organization

Without continuous learning, competitiveness cannot be sustained in the long run. For both organizations and individuals, continuous learning is essential to enhancing core competencies, creating value, adapting to ever-changing environments, and securing a strong foothold for survival.

In 1979, John Yu, now the Group Chairman, set foot in the United States for the first time. At the age of 31, he held the title of U.S. Business Representative, stationed in New Jersey. Just over a month later, he enrolled at the New Jersey Institute of Technology, self-financing evening classes to pursue a master's degree in management.

A graduate of National Taiwan University with a degree in Electrical Engineering, Yu began his career as an electrical design engineer and later worked as a steel mill construction supervisor before transitioning to sales and procurement roles. Reflecting on that period of his life, he

said, "When I left for the U.S., I knew I wouldn't return to the same career path. I didn't want to limit myself to just electrical engineering. Instead, I set my sights on evolving from a specialist to a generalist." Yu's overseas study experience and this mindset shift laid the groundwork for his rise to CTCI Group's top leadership.

Unfortunately, Yu's procurement mission in the U.S. ended after a year and a half, requiring him to return to Taiwan and abruptly interrupt his master's studies. However, about a decade later, in 1991, he was given the opportunity to study at Harvard Business School, fully sponsored by the company. This experience not only shaped his management mindset but also inspired him to create a learning organization within CTCI. He introduced several talent development mechanisms, accelerating the cultivation of skilled professionals and fueling the company's continued growth.

Yu's unwavering commitment to learning and self-improvement was pivotal in his rise to the top, enabling him to lead CTCI to become one of the world's top 100 engineering firms, earning recognition on the international stage.

This dedication to learning extends beyond Yu. It is a hallmark of CTCI's workforce, known for their drive to

acquire new knowledge and refine their skills.

Mentorship in Action: Passing Down Expertise

In 1991, freshly armed with a master's degree in mechanical engineering from National Taiwan University, Michael Yang, now CTCI's Group Vice Chairman, joined the company as a field construction engineer. His first assignment was at the Kaohsiung Refinery No. 5 Naphtha Cracking Project of CPC Corporation, where he was tasked with overseeing the challenging installation of the main compressor unit.

Back then, the company followed a traditional mentorship model, with experienced professionals training newcomers. Yang's mentor, Jin-Fang Chiang, the Deputy Section Head of the Site Construction Division, was a veteran in the field. "He taught me how to work as a machinist and install the main compressor, guiding me step by step," Yang recalled.

As a novice, Yang carefully documented every detail. However, when a professional technician arrived on-site, they proposed an entirely different approach. Confused, Yang asked his mentor, "Why is your method different from

the technician's?"

"The compressors I've worked on before were from a different manufacturer." Yang was taken aback by Chiang's straightforward response.

"It turns out that compressors come in various brands and designs, each requiring unique installation techniques. From reciprocating and centrifugal to rotary and screw compressors, every type has its own nuances," Michael Yang finally realized.

In the past, CTCI had seasoned foremen who had overseen projects for decades and possessed exceptional skills. Yang explained this through an example of compressor shaft alignment — ensuring the shaft is perfectly centered. "The difference in craftsmanship was significant. A skilled craftsman could get it right in three tries, while a less experienced one might struggle for three weeks without success. If the technician found it unsatisfactory, the adjustments had to continue," he explained.

Michael Yang vividly recalled his mentor guiding him through the intricate details of his first project. "Adjust here a bit, tweak that part," his mentor instructed, pointing out steps with precision. Confused, Yang asked, "Why here?" His mentor's reply was simple: "It's all about experience."

To a novice, the word "experience"— which implied an

intuitive understanding that could not be easily explained — were baffling to Yang.

"I thought to myself, this trial-and-error approach isn't sustainable," Yang reflected. "Is it really true, as some mentors say, that having a master's degree is useless on a construction site? That there's no room for academic knowledge here?"

As someone with strong academic credentials but limited experience, Yang faced skepticism from those around him. Many doubted his ability to survive in the demanding environment of a construction site. Yet, Yang refused to back down.

Structured Learning to Accelerate Professional Growth

"I did something against company rules back then," Michael Yang admitted with a surprising honesty, sharing a little-known secret.

To bridge the gap between theory and practical construction work, Yang turned to the renowned U.S. publishing house McGraw-Hill. At the time, they offered a comprehensive series of mechanical operation manuals,

which covered everything from foundational techniques to advanced skills.

"In those days, there was no internet, and our dorm didn't even have a fax machine," Yang explained. "After work, around 9 or 10 p.m., I used the construction site's fax machine to send purchasing requests for the books to the publisher. It took multiple exchanges to finalize the order, but eventually, I succeeded." Since the manuals were for personal use, using company equipment for the process technically violated the rules.

Once the books arrived, Yang diligently worked through them, studying page by page. With a solid foundation in mechanical engineering from his master's degree, he quickly grasped the concepts and applied them. The manuals became his go-to resource, demystifying technical challenges related to lifting, hoisting, rigging, and other on-site operations.

CTCI fosters a learning organization by integrating hands-on experience with structured training and development programs, enabling employees to acquire, apply, and transfer knowledge effectively.

"Once I understood the concepts and the logic behind them, even if the master and technician had differing methods, I could engage with them and explain the correct approach…" Yang recounted. Through diligent self-study and structured learning, he developed both theoretical knowledge and hands-on expertise, moving beyond trial-and-error methods."

Later, "I started sketching out the diagrams while they measured the data. Then, based on the calculations and engineering principles, I would illustrate the process and explain how to operate it," Michael Yang recalled with excitement. "It was truly a rewarding experience!"

Upon completion of the Kaohsiung Refinery project, Yang was assigned to a construction site in Thailand. Thanks to his newly acquired knowledge and skills, he led a team of 200 Thai workers in installing equipment for the project, successfully delivering the results.

Through self-driven, systematic learning, Yang broke free from his previous learning trajectory, quickly mastering the professional skills and capabilities needed to excel. His hard work and results earned him recognition. After seven to eight years in the Construction Division, he was promoted to Deputy Leader, and later, his dedication was further rewarded with a transfer to the business development team

to explore new market opportunities.

Learning by Doing: Building and Sharing Expertise

"Technical knowledge has a clear structure, and in today's world, there are systematic learning methods and channels," said Michael Yang. But more than 30 years ago, he candidly admitted that it was all about learning on the job under the guidance of a mentor. "You learned bit by bit — a fragmented process of gathering knowledge from different experiences — until you developed your skills. The learning process was completely different from today."

"Engineering training in the past followed a master-apprentice system — you learned only what your mentor chose to teach you," John Yu said. Engineers traditionally gained knowledge gradually from project to project. "The learning process was slow and inefficient."

In EPC, which encompasses planning, engineering, procurement, and construction, professionals must possess a broad range of skills to manage every phase of a project. The traditional method of gradually gaining experience through individual projects was too slow to keep pace with

these demands.

To develop talent more effectively, CTCI adopted a "learning by doing" approach. Employees take on increasing responsibilities as they grow, gaining hands-on experience in different roles. This method was crucial for Michael Yang. He began as a site supervisor in the Construction Division, transitioned to business development, became a project manager, and eventually led the Business Division.

Learning by doing accelerates development, but cultivating project managers takes time. When employees don't acquire skills fast enough, the company must step in.

So, "we must create a learning organization that offers systematic training and education," John Yu emphasized. "Providing structured training and learning for employees to acquire, apply, and pass down knowledge is essential for cultivating talent and strengthening the company's competitiveness."

KM Sharing Platform: Empowering Global Success

The engineering industry is a knowledge-intensive field where every project relies heavily on specialized expertise.

This makes the management and transfer of professional knowledge even more critical.

In 2006, CTCI launched the CTCI Corporate Knowledge Management (KM) Platform, consolidating engineering regulations, project documents, and training materials into a central hub for knowledge sharing and transfer.

This platform equips employees with the resources needed to compete globally. Former CTCI Executive Vice President Wen-Chung Liao was a key driving force behind the initiative.

A project completion report typically contains a wealth of data, including basic project information, cost breakdowns, technical details, and quality documentation. During his tenure as a cost engineer, Liao meticulously analyzed monthly cost reports to understand every detail of each project.

However, in the early days, most of these records were paper-based, cumbersome to transport, and often inaccessible to employees working overseas. Each project could generate hundreds of designs, technical reports, and vendor documents required for commissioning, not to mention the numerous reference materials needed during construction. This made it nearly impossible for expatriate employees to carry everything they might need to remote

worksites.

After accumulating a vast collection of project reports, Liao had an idea: "If we could 'smart copy' these materials, we'd save a lot of time. Ideally, we should be able to replicate and use them instantly."

In the 1990s, CTCI began digitizing paper documents, scanning them into PDF files and creating a searchable database. However, this approach alone was insufficient.

In early 2005, while on a business trip to the Philippines, Liao attended a site meeting where a construction engineer expressed his frustrations. "Vice President, you're always asking us to work harder and faster, but we don't have the tools we need. How can we win the battle without proper weapons?"

At the time, overseas employees could access the Taiwan headquarters' corporate database remotely, but as the volume of information grew, the system lacked an effective indexing structure and a robust search engine. Retrieving specific documents often required sifting through files one by one, making it difficult to locate critical information quickly.

The engineers' complaints resonated deeply with Wen-Chung Liao. "CTCI needs a global knowledge 'arsenal' (mobile knowledge base) accessible to everyone," he

thought. Determined to revamp CTCI's knowledge management system, Liao envisioned a platform that would enhance search functionality and integrate a Q&A mechanism, facilitating the sharing and discussion of expertise. His goal was to ensure that professional knowledge could be continuously preserved, expanded, and passed down.

In 2007, CTCI Corp. introduced a search engine and began translating all documents into English. Gradually, this globalized knowledge management system matured into more than just an internal library — it became an essential "arsenal" for employees competing in global markets. Accessible through the internet, the system provided a wealth of work-related resources, including documents, data, and technical references, available whenever and wherever.

For employees operating overseas, the system served as a 24/7 repository of knowledge, eliminating barriers of geography and time zones. This ever-ready digital arsenal became a critical tool in CTCI's ability to compete with top-tier international firms, giving its teams a decisive edge on the global stage.

Turning Project Experience into Case Studies

In its global endeavors, CTCI treats every project like a battle, where the experiences and lessons learned — whether from success or failure — become invaluable assets.

In 2004, after nearly two decades, CTCI returned to the Middle Eastern market by undertaking the QAPCO EP2 project. However, the project was fraught with challenges at every stage, from contracting and design to procurement and construction.

For example, with fourteen overseas projects underway simultaneously and due to resource constraints, CTCI subcontracted detailed design work to vendors across four countries under thirteen contracts. Yet, poor integration with these subcontractors delayed design schedules. Additionally, misalignment with the initial design contractor resulted in two further delays. By the time the project was completed in mid-2007, it was over ten months behind schedule, with labor hours exceeding estimates by 1.5 times.

"Success cannot be replicated, but failure can be avoided," said John Yu. Determined to ensure that employees would learn from this experience, he invited a team of professors from National Taiwan University's (NTU) College of Management to develop a case study based on the project.

In 2008, CTCI held its first workshop camp for mid-level and senior managers, inviting professors Ji-Ren Lee and Chung-Hsing Huang from NTU's College of Management to join. Using the QAPCO EP2 project as a case study, the camp facilitated in-depth analysis and discussions among CTCI's leadership, helping them draw lessons from the past and avoid repeating similar mistakes in the future.

Following the lessons learned from the QAPCO EP2 project, CTCI implemented a structured approach to case-based learning, which was integrated into its knowledge management platform for company-wide sharing. This process, often referred to as "lessons learned" or "experience transfer" in project management, focuses on extracting insights from past successes and failures. It typically includes an analysis of project execution, impacts, recommendations, challenges, risks, and proposed improvements — serving

CTCI supports the development of national engineering talent by offering over 100 free courses through its "CTCI Learning" platform, promoting shared growth and learning.

as a valuable reference for enhancing future project performance.

In 2011, CTCI upgraded its KM platform, enhancing functionality to include interactive associations and knowledge-sharing communities, further improving usability and engagement.

Beyond project-based case studies, CTCI introduced a new feature in 2014: a knowledge repository for project managers. This repository categorized expertise and professional knowledge by product type, ensuring that valuable insights and reusable knowledge generated during project execution were uploaded and shared upon project completion.

In 2015, CTCI launched myVideo-KM, an initiative to enrich its multimedia knowledge library by incorporating training materials and practical insights in video format. This multimedia learning platform became an integral part of the upgraded knowledge management system, which now includes features such as: a document management system, a core competency tracking, a knowledge-sharing community platform, a talent networking platform, a digital video learning hub, and an advanced search engine. Together, these tools connect and share knowledge across the organization, forming an important platform for

managing and transferring expertise.

CTCI University: A Real-Time, Borderless Online Learning Platform

As CTCI expanded its presence in international markets, the company remained committed to innovation.

While the CTCI Knowledge Platform provided essential frontline support by sharing valuable information, CTCI had long aimed to establish a structured learning system for its employees. In 2009, the company launched the Global Training System, a training management platform that coordinated internal and external programs across departments.

Whether in Taiwan or abroad, through the Global Training System, CTCI employees can engage in synchronous or asynchronous online training, free from the constraints of time and location. The platform empowered individuals to manage their own learning progress, while providing managers with tools to monitor the training status of their teams.

To further integrate training resources and ensure seamless transfer of expertise, CTCI Global Training System

upgraded its learning system.

In 2020 the CTCI University digital education platform was founded. Centered on four key pillars — enhancing global competitiveness, deepening professional expertise, fostering leadership and corporate management capabilities, and internalizing the brand and corporate culture — the platform consolidated all online learning resources into a single, comprehensive hub.

CTCI University is a tailor-made online learning platform for global employees, offering a seamless, borderless, and real-time learning experience.

It emphasizes a "full-competency, full-time, and globalized" approach. Combined with resources such as the knowledge management platform and case-based learning, it ensures effective knowledge transfer, fosters continuous improvement, and cultivates a global outlook, empowering employees to develop into well-rounded international professionals.

CTCI University is organized into six specialized schools: the School of Quality, Safety, Health & Environment, the School of Engineering Design, the School of Project Integration, the School of Business Administration, the School of Leadership, and the School of General Education. Each school offers tailored programs to meet diverse

professional and functional needs. Deans, department heads, and program chairs are selected from the company's senior management, while courses are led by experienced managers and senior employees. Through CTCI University's dedicated website or the "myCTCI" app, employees can access learning resources anytime, anywhere.

Now, new employees at CTCI no longer need to wait for supervisors to provide training — they can find time to learn at their own convenience. This approach expands the pool of instructors, allowing professionals to teach on their job sites.

"You just log in to 'myCTCI' and learn at your own pace — there's no avoiding it. The platform connects directly to the HR system, and once courses are completed, exams are taken online," said John Yu. "We have an employee who spent 22 years supervising projects overseas, highly skilled but unable to return to Taiwan for training due to his commitments. Now, people like him can attend classes online; everyone has the chance to keep learning."

As of 2024, CTCI University has uploaded over 1,400 courses online, organized by job role with nearly 600 tailored curriculums. All courses are available in both Chinese and English, allowing employees stationed worldwide to complete their required training online and

stay on track with learning goals.

It's worth noting that CTCI University offers more than just job-specific training. Employees can pursue cross-disciplinary courses aligned with their personal interests, with managerial approval, fostering well-rounded professional development. The "pre-course" system further accelerates development for high achievers, allowing them to complete advanced courses and earn certifications that prepare them for future roles.

Building on the success of CTCI University, the company launched the "CTCI Learning" platform, a free digital education hub open to industry, government, academia, and research sectors. This platform offers over 200 select engineering courses, enabling external participants to register, complete courses, and receive digital certificates from CTCI, enhancing the competitiveness of national engineering talent.

Building Leadership Pipelines and Cultivating Key Talent

Simply put, CTCI University is structured to align with the company's strategic goals, developing creative, forward-

thinking talent with a global perspective. By implementing systematic and efficient training programs, CTCI University ensures the seamless transfer of specialized knowledge and skills, strengthens core competencies, and promotes growth across diverse areas such as English proficiency, management, information technology, finance, and legal expertise. This comprehensive approach not only nurtures key talent but also builds a strong leadership pipeline for CTCI.

For example, as the global lingua franca, English is essential. CTCI uses TOEIC scores as an initial recruitment filter, with specific benchmarks set for each role. Employees at different levels are required to meet varying score thresholds. However, during overseas assignments, CTCI employees consistently demonstrate strong self-learning abilities, further accelerating their professional growth and adaptability.

CTCI's Core DNA: Relentless Pursuit of Learning

Michael Yang is a prime example.

During his two-year assignment in Thailand, he

dedicated himself to learning Thai, communicating directly with local workers, foremen, and supervisors, fostering deeper bonds. This commitment to bridging cultures unexpectedly resolved a "host crisis."

At the 2023 company sports event, the host drew a raffle winner but froze at the sight of a Thai name, unable to pronounce it. As the room fell silent, Yang calmly stepped forward, took a look at the list, and fluently called out the Thai employee's name, saving the moment.

Ming-Shyan Lee, CEO of Group Engineering Business, is another great example.

During his five-year assignment in Vietnam, Lee set a personal goal to learn the local language. He became proficient enough to engage in conversations and understand written communication. His effort not only broke down barriers but also exuded warmth and approachability, strengthening his bond with local employees and enhancing his leadership.

These instances illustrate how "a relentless pursuit of learning" has become an integral part of CTCI's DNA. Employees proactively seek out opportunities to grow through various learning methods, enhancing their personal value and competitiveness. Simultaneously, CTCI has built systematic learning mechanisms to encourage continuous, lifelong learning. This shared commitment to learning has become a critical pillar of the Group's overall competitiveness.

Chapter 7

Sustainability — Safeguarding the Planet with Green Engineering

"ESG[1] isn't about philanthropy; it's about integrating sustainability into the core of our business operations," John Yu, Group Chairman stated straight to the point.

In both 2023 and 2024, CTCI ranked in the top 1% globally in the S&P Global Sustainability Yearbook for two consecutive years, with a score of 86 percentile — the highest among all engineering and construction companies worldwide.

S&P Global is a world-renowned benchmark for ESG evaluations. In 2024, the assessment covered 62 industries and reviewed approximately 9,400 companies, with only 759 selected for inclusion in the yearbook. CTCI's top-tier ranking highlights its outstanding commitment to sustainability.

CTCI's commitment to ESG is not new. The company has long embraced ESG, embedding sustainability into its operations and making it a core competitive advantage and part of its DNA. By leveraging its engineering expertise, CTCI has systematically and strategically implemented ESG initiatives, creating "green engineering" projects that benefit the environment. Guided by a vision to become a "Guardian of Sustainable Earth," CTCI is committed to embedding sustainability into every aspect of its business.

Innovative Leadership in Driving Net-Zero Carbon Solutions

In 2018, CTCI launched the "Total Participation in ESG Implementation" initiative, spearheaded by Group Chairman John Yu. His mission was to embed the concept of sustainable operations into the very fabric of the company, infusing ESG principles into every corner of the organization.

Each month, CTCI's three major business groups participate in the Sustainability and Net-Zero Improvement Meetings, personally chaired by John Yu. These meetings aim to internalize ESG practices, encouraging employees to integrate sustainable principles into their daily work routines.

All three business groups are required to regularly

submit innovative proposals related to energy conservation and carbon reduction. These proposals are compiled and assessed for feasibility in the monthly improvement meetings.

"Any idea related to energy conservation and carbon reduction is welcome," said John Yu, his enthusiasm clear. "It often doesn't take much — just paying a little more attention and making small adjustments in the right places can lead to significant results." His pride was evident as he continued, "Since launching Total Participation in ESG Implementation in 2018, we have collected and implemented over a hundred practical proposals for energy efficiency and carbon reduction. Many of these ideas are already being successfully applied in our plant construction projects."

For CTCI, ESG is more than a slogan; it's a call to action. Through a series of initiatives and competitions, the company actively encourages all employees to continuously think about how their daily work can contribute to a sustainable planet.

To turn this goal into action and drive progress toward net-zero, CTCI spearheaded Taiwan's net-zero emissions initiative in 2022. The company pledged to achieve net-zero emissions in its offices by 2030 and across its service

and production sites by 2050. Aligning with the 1.5°C pathway, certified by the Science Based Targets initiative (SBTi), CTCI has integrated "Net-Zero" as one of the key performance indicators throughout the organization, incrementally transforming these ambitious goals into measurable achievements.

Embedding Sustainability into Daily Operations

CTCI has broken new ground in the engineering industry with its innovative "ESG Moment"[2] initiative for sustainability.

The "ESG Moment" initiative mandates that every internal meeting with more than five participants begins with a brief sharing of ESG-related topics or insights. The goal is to weave sustainability into employees' daily lives. By transforming these moments of learning into "every moment" through actionable practices, CTCI underscores its commitment to making sustainability part of both work and daily lives for all employees.

Since 2019, CTCI has developed a comprehensive ESG Moment Database, containing thousands of presentations,

articles, and stories on ESG topics. This resource allows employees to access relevant information at any time, empowering them to enhance their understanding of sustainability and apply it to their roles.

"We want every employee to become a sustainability ambassador, turning Total Participation in ESG Implementation into a powerful force driving the company's sustainable governance," John Yu declared, reflecting the bold ambitions he and CTCI share.

The Chinese saying "*Heroes are shaped by their times*" rings true in the context of rising environmental awareness, where sustainable development has become a global value and green sustainability is now a key focus for businesses. Yet, just over a decade ago, ESG was rarely discussed, let alone integrated into the core operations of companies. However, CTCI is ahead of its time.

"What we achieve today is the result of decisions made ten or twenty years ago," said J.J. Liao, CEO of Group Resource Cycling Business. Over thirty years ago, CTCI was already building its reputation through expertise in environmental engineering, becoming a leader in waste incineration and power generation. This early commitment laid the groundwork for what has now become the Group's driving mission — advancing the circular economy and

turning waste into valuable resources.

The First CSR Report in Taiwan's Engineering Industry

For CTCI, the guiding principle has always been: if you are set to do something, you must aim to achieve the "most reliable" outcome. Following this principle, in 2008, CTCI established a CSR Committee and drafted a sustainable development policy — years ahead of government mandates for Corporate Social Responsibility (CSR) reports. That same year, CTCI became the first in Taiwan's engineering industry to issue a CSR report [3].

Understanding the importance of credibility, CTCI voluntarily sought third-party verification for its CSR report, becoming the first company in Taiwan to pass such an audit. In 2017, ECOVE achieved a world-first by obtaining the BS 8001 Circular Economy Certificate for its "Innovative Business Model," and received the Circular Economy Sustainability Award from the British Standards Institution (BSI).

These efforts to self-impose rigorous standards have not only yielded significant benefits for CTCI but has also

helped it earn widespread recognition.

In 2023, CTCI was included as a constituent stock in the Dow Jones Sustainability Emerging Markets Index, marking its ninth consecutive year of inclusion since 2015. Initially, only 13 Taiwanese companies made the list, but this number grew to 35 in 2023. Notably, CTCI remains the only engineering company from Taiwan to be included.

Top 1% in Sustainability Yearbook

As part of the Dow Jones Sustainability Indices (DJSI) family, the Dow Jones Sustainability Emerging Markets Index relies on S&P Global's Corporate Sustainability Assessment (CSA) to evaluate companies across economic, social, and environmental dimensions. To qualify as an index constituent, a company must rank within the top 10% of its industry.

Each year, CSA invites thousands of companies worldwide to participate in its assessment, selecting only the top 10% in each sector as index constituents. The list is reviewed and updated annually to reflect the most current sustainability performance.

As of 2024, CTCI has achieved the remarkable milestone

of being included in the Dow Jones Sustainability Emerging Markets Index for ten consecutive years, underscoring its globally recognized excellence in sustainability. In 2024, CTCI received further distinction by being ranked in the top 1% globally in S&P Global's Sustainability Yearbook — an honor awarded only to the highest-performing companies. CTCI is the only company in the global engineering and construction sector to achieve this rating, earning an outstanding percentile score of 86 and securing the highest industry ranking for the second consecutive year.

CTCI's achievements in sustainability go even further.

The company has been recognized as one of the Top 10 at the Taiwan Corporate Sustainability Awards for seven consecutive years and has received the National Sustainable Development Award from Taiwan's Executive Yuan, the highest national honor in sustainability.

For eight consecutive years, CTCI has ranked among

CTCI implements ESG through core operations and global "green engineering" projects, promoting environmental protection while supporting economic growth.

the top 5% of companies in the Taiwan Stock Exchange's Corporate Governance Evaluation. The company has also earned an A rating from MSCI[4] ESG Ratings, Leadership Level recognition from the CDP Climate Change program, the ESG Enterprise Sustainability Award from *Global Views Monthly*, the Corporate Citizenship Award from *CommonWealth Magazine*, and the Diversity, Equity, and Inclusion (DEI) Vision Award. These accolades position CTCI as a sustainable role model in the engineering industry.

Partnering with Clients to Build Green Engineering

Recognizing the global trend toward sustainability, John Yu ensured that CTCI not only get an early start but also develop a long-term strategy to integrate sustainability into its core engineering business. This approach has led him to exceptional recognition, including the "Outstanding Individual Award" at the 2020 Global Corporate Sustainability Awards and the Asia Responsible Enterprise Award in 2024, highlighting his leadership in positioning CTCI at the forefront of sustainable development.

Yet, a question often arises — how does an engineering company, which belongs to a field not typically associated with being "green," achieve such ambitious sustainability goals?

"Sustainability is a global trend. We started early and have the confidence — and responsibility — to go deeper and do better than others. At CTCI, our core business is industrial plant construction. By leveraging cutting-edge technologies, we help clients build the most energy-efficient, low-carbon facilities. This is what we call 'green engineering.' After all, achieving sustainability requires addressing the root cause, starting at the source. That's how we create the most impactful results," explained Michael Yang, Vice Chairman of CTCI Group.

He further elaborated: "CTCI's green engineering is built on three pillars — green technology, green contracting, and green investment — forming the foundation of our sustainability efforts."

Green Engineering 1: Green Technology

First, "Sustainability is a global trend, and the first aspect of green engineering involves applying advanced green

technologies to make our projects more energy-efficient and carbon-reducing," explained Michael Yang.

Green technology refers to energy-saving and carbon-reducing solutions implemented during the engineering, procurement, and construction phases of EPC projects. In other words, CTCI collaborates closely with clients to adopt advanced, eco-friendly process technologies that minimize environmental impact on land, air, water, and natural ecosystems. This commitment encompasses the entire project lifecycle — from engineering, procurement, and construction to commissioning, operation, maintenance, and decommissioning — ensuring that environmental impact is minimized at every stage while providing clients with green technology solutions that meet environmental standards.

Between 2021 and 2023, projects executed by CTCI using green technology achieved significant reductions throughout their lifecycles. These included a total reduction of 18.9 million tons of CO_2 emissions, which is approximately equivalent to the annual carbon absorption of 48,810 Taipei Daan Park. Additionally, the projects saved 760 million kilowatt-hours of electricity, equal to the annual consumption of 205,000 households, and conserved 150 million tons of water, enough to supply Taipei City for 182 days.

These figures have been independently verified by SGS and are included in CTCI's annual ESG report.

Green Engineering 2: Green Contracting

"From a business perspective, CTCI focuses on seizing green opportunities through green contracting," explained Michael Yang. "Simply put, green contracting refers to projects we undertake that have direct environmental benefits."

He pointed out that in 2023, revenue from CTCI's green and low-carbon projects accounted for nearly 60% of the Group's total revenue. Backlog data shows that the share of low-carbon and green projects has increased from 23% in 2015 to 56% in 2023, reflecting a remarkable 346% growth in value.

Among CTCI's many green contracting projects, the water resources sector stands out as a prime example.

Yang highlights the Southern Taiwan Science Park Water Reclamation Plant, the world's first facility to recycle industrial wastewater for reuse in semiconductor fabrication. The plant, which commenced operations in 2022, represents a major milestone in global water resource recycling. CTCI

led the investment, design, and construction of the plant, which operates under a 20-year DBOO[5] agreement.

With the capacity to produce 20,000 tons of recycled water daily, the facility has become one of the primary sources of industrial water for the Southern Taiwan Science Park.

The Southern Taiwan Science Park Water Reclamation Plant employs innovative technology with a low-pollution, advanced biological treatment process that significantly reduces energy consumption and sludge production. This approach delivers multiple environmental benefits, including energy savings, carbon reduction, minimized secondary pollution, and zero wastewater discharge.

"This project has set a new benchmark for water recycling engineering," Yang remarked proudly. "In February 2024, it was even certified as an environmental education facility. The public can now visit to learn more about water resource recycling, further enhancing its societal value!"

The global market for water resource management, particularly in wastewater reclamation and reuse, is incredibly diverse. For example, it includes reclamation and reuse of industrial and municipal wastewater as well as wastewater from the high-tech electronics industries. Notable projects include the Kaohsiung Fengshan River Plant, Taiwan's first municipal wastewater reclamation facility, and the Kaohsiung Linhai Plant, the country's first integrated wastewater and reclaimed water treatment center constructed as a single project.

Another major development is the Taoyuan North District Water Resource Recycling Center, a collaborative project involving CTCI and its partners. Once completed, the facility will produce 40,000 tons of reclaimed water per day, supplying the Taoyuan Guanyin Industrial Park and CPC's Taoyuan Refinery. Future expansion plans aim to increase the facility's capacity to 112,000 tons per day, making it Taiwan's largest water reclamation facility by supply volume.

Green Engineering 3: Green Investments

"The third dimension of green investments, which refers to CTCI's projects that generate environmental benefits through BOO (Build-Own-Operate) and BOT (Build-Operate-Transfer) models," explained Michael Yang. Examples include water reclamation plants, energy-from-waste facilities, and photovoltaic power plants — projects that serve as benchmarks for environmental responsibility.

The results of these efforts are impressive.

In 2023 alone, CTCI's energy-from-waste facilities generated 1.3 billion kilowatt-hours of electricity, enough to power over 300,000 households in Taiwan for a year.

The company processed 2.47 million tons of waste, treated and reclaimed 73.97 million tons of wastewater, produced 120 million kilowatt-hours of solar energy, and processed 16,000 tons of waste solvents, among other achievements.

As of 2024, CTCI's cumulative green investments had exceeded NT$47 billion, spanning projects such as energy-from-waste plants, photovoltaic power plants, wastewater treatment and water reclamation facilities, solvent recycling plants, and offshore wind power projects.

Notably, CTCI's commitment to green investments has been recognized by investment institutions. The company has secured nearly NT$9.2 billion in green financing, including green loans, bank guarantees, and green bonds. "Looking ahead," Yang affirmed, "CTCI will continue to expand its efforts in green investments, reinforcing our commitment to sustainability and environmental investments."

Capitalizing on Green Opportunities to Drive Sustainable Development

Through its emphasis on green technology, green contracting, and green investments, CTCI has forged a path of green engineering that not only advances ESG-driven sustainability but also fuels its business growth. This commitment delivered outstanding results in 2023, as the Group's consolidated revenue surpassed NT$100 billion for the first time, underscoring the success of integrating sustainability with its core business operations.

Looking ahead, expanding sustainability-focused opportunities will enable CTCI to further leverage its green engineering expertise to safeguard the planet.

"We've incorporated green project contracting rates into departmental KPIs," emphasized Yang.

"Our goal is for the Group to achieve strong business performance while utilizing our engineering expertise to advance sustainability. The green projects we deliver, which incorporate energy-saving and carbon-reducing technologies, not only help our clients cut operational costs but also enhance CTCI's competitive edge through differentiation. Moreover, we aim to support our clients in accelerating their ESG initiatives, fostering a win-win

scenario where economic growth and environmental protection go hand in hand."

Expanding into a Diversified Energy Landscape

Furthermore, the evolving global landscape continues to validate CTCI's commitment to green engineering as the right path forward.

In recent years, the increasing urgency to combat climate change and achieve net-zero emissions by 2050 has gained global consensus. This has positioned energy transition as a key strategy for carbon reduction strategies worldwide. Governments across the globe are implementing diversified energy policies, aligning closely with CTCI's focus on green engineering and sustainable energy solutions.

CTCI possesses extensive experience and proven track record in areas such as energy-from-waste incineration, gas-fired combined-cycle power plants, LNG receiving terminals, solar power, and offshore wind farms. The company continues to support governments and clients worldwide in their low-carbon transition and net-zero objectives.

CTCI supports clients in energy-efficient carbon reduction and supply chain sustainability, leading the engineering industry toward a greener future.

Michael Yang emphasized the significance of this trend, stating, "Due to its lower-carbon emissions, natural gas has emerged as a crucial transitional energy source in recent years, leading to increased demand for gas-fired power plants and LNG receiving terminals. CTCI remains Taiwan's only EPC contractor with the capability to build both gas-fired power plants and LNG terminals."

Looking ahead, CTCI is set to expand its footprint in the decarbonized energy sector. This includes advancing into hydrogen energy, increasing renewable energy adoption, and developing carbon capture, utilization, and storage technologies.

By diversifying its energy portfolio, CTCI is well-positioned to leverage its green engineering expertise to drive global sustainability efforts.

Collaborating with Global Partners for a Greener Supply Chain

CTCI is not only committed to achieving its own net-zero goals but is also actively working with global suppliers to foster a green supply chain. By offering clients low-carbon EPC and supply chain services, CTCI and its partners are collaborating to protect the planet's sustainability.

As part of this effort, CTCI has launched a series of initiatives to engage suppliers. Starting in 2016, CTCI implemented a requirement for all suppliers to sign a corporate sustainability and net-zero commitment agreement, urging them to adopt sustainable and net-zero practices. Since 2022, suppliers have been required to disclose greenhouse gas emissions and establish reduction targets. In 2023, CTCI introduced the Supplier Net-Zero Alliance, encouraging members to collectively drive progress toward net-zero goals. Beginning in 2024, CTCI launched a carbon management initiative for suppliers, providing guidance and support to help them conduct greenhouse gas inventories, report emissions regularly, and demonstrate measurable carbon reduction results.

To incentivize suppliers to actively participate in carbon reduction initiatives, CTCI implemented a supplier recognition system featuring green certifications and Gold, Silver, and Bronze "CTCI Awards," which serve as key criteria for supplier recommendations. Top-performing suppliers are recognized at annual supplier conferences for their outstanding carbon reduction achievements. Additionally, CTCI fosters knowledge-sharing by maintaining open communication with alliance members, publishing a bi-monthly ESG newsletter, and inviting supplier partners to participate in sustainability courses through its open-access "CTCI Learning" platform.

"CTCI has seamlessly embedded sustainability into its core engineering operations. ESG is now ingrained in our daily work and is an essential part of every CTCI employee's DNA," emphasized Michael Yang. "Moving forward, we will continue driving the 'Total Participation in ESG Implementation' initiative, achieving net-zero EPC solutions, and leading our global supply chain partners toward a more sustainable future."

Establishing a Foundation to Advance Sustainability Education

In addition to its "Total Participation in ESG Implementation"

strategy, CTCI extends its commitment to sustainability by promoting education across all sectors of society, with the CTCI Education Foundation leading the way.

In recent years, CTCI Education Foundation has collaborated with corporate institutions, government agencies, and private organizations to host forums on sustainable engineering, workshops on governmental support and subsidy programs, and environmental education programs. These initiatives aim to advance green engineering, cultivate emerging talent, and promote sustainable practices.

In terms of sustainability awareness education, CTCI Education Foundation has launched programs such as the CTCI Scholarship Program, Taiwan in My Eyes 120h, the Youth Sustainability Leadership Camp, the Living Lab Project Award, the Circular Economy International Conference, and the Little Sustainable Engineers Summer Camp.

Since 2022, the foundation has also partnered with the Taiwan Institute for Sustainable Energy to organize the annual "Sustainable Development Goals (SDGs) Teacher Empowerment Camp." Now in its third year, the program introduces educators to the "SDGs Series," an educational collection authored by leading experts and scholars,

compiled by the foundation. These workshops foster knowledge-sharing and enhance teaching methodologies, underscoring the importance of sustainability education.

CTCI Education Foundation's unwavering commitment to sustainability has gained international recognition. It was admitted to the United Nations Framework Convention on Climate Change (UNFCCC) process as an observer organization, making it the 11th Taiwanese NGO to be admitted. The Foundation participated in COP28, the United Nations Climate Change Conference held in Dubai Expo City, where it showcased "CTCI's Road to Sustainability and Net Zero" at the "Taiwan's Experience in Developing the Green Economy" forum. Building on this achievement, the foundation was invited to attend COP29 in Azerbaijan in 2024.

A Guardian of Sustainable Earth

CTCI's comprehensive sustainability initiatives demonstrate its commitment to integrating sustainability into its corporate DNA while extending its positive impact outward. By systematically promoting ESG, nurturing sustainable engineering talent, and embedding ESG

principles into its core operations, CTCI has effectively fulfilled its corporate social responsibility in driving sustainable development education.

Looking ahead, John Yu emphasized, "Achieving harmony with the Earth is fundamental to a company's long-term success. CTCI will remain focused on its core business, guided by the three pillars of green engineering, to maximize its contribution to ESG value. We have made concrete sustainability commitments, including acceleration of net-zero emissions at office sites by 2030 and at production and service sites by 2050." Both John Yu and Michael Yang expressed strong confidence in CTCI's sustainable trajectory.

Driven by its mission to lead green sustainability, CTCI is committed to achieving its ESG objectives and solidifying its role as a "Guardian of Sustainable Earth." By leveraging its engineering expertise, CTCI aims to build a sustainable future, enhance corporate value, and extend its positive impact — growing in harmony with the planet.

Notes:

1. ESG: Environmental, Social, and Governance.
2. Renamed "ESG Moment" in 2022 (formerly "CSR Moment") to emphasize CTCI's ESG commitment.
3. Originally called "CSR Sustainability Report," it was renamed as "ESG Report" by Taiwan's Financial Supervisory Commission in 2021.
4. MSCI: Morgan Stanley Capital International.
5. DBOO: Design, Build, Own, and Operate.

CTCI Transformology

The Secret of How John Yu and His Team Built Trust

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CTCI'S achievements, both domestically and internationally, represent not only the growth of a single company but also the broader progression of Taiwan's engineering services sector.

—— **Vincent Siew, Former Vice President of the Republic of China (Taiwan)**

CTCI has built "the most reliable" brand that enjoys global recognition, not only for its engineering excellence but also as a proud ambassador of Taiwan.

—— **Wenent Pan, Chairman of CTCI Foundation**

Through its unwavering commitment to sustainable environmental stewardship, CTCI has demonstrated that embracing sustainability not only drives growth but also spurs industry-wide transformation.

—— **Eugene Chien, Chairman of the Taiwan Institute for Sustainable Energy**