疫情黑天鵝驅動數位轉型 企業化危機為轉機商機 **Turning Crisis into Opportunity, Businesses Are Embracing Digital Transformation to Combat COVID-19** 數位國家·創新經濟 No. 2020 09/01 **Problem Solving Technologies Neural Networks** DIGITAL Internet of Things Autonomous TRANSFORMATION **Cybernetics** Δ **Big Data** Machine Learning **Deep Learning** 大詠城機械 扎根基礎建設、關鍵技術 打造數位升級鑄造廠 Winson Machinery Digitally Upgraded Foundries Made Possible through Solid Infrastructure and Key Technologies

億馨針織數據精準管理 變身機能布料智慧染整專家 Through Precise Data Management, Proknit Knitting Becomes Intelligent Dyeing-Finishing F

優化數據管理 實現智慧餐飲 Tofu Restaurant Group Smart Catering Realized Through Data Management Optimization 黑橋牌創新求變 不畏疫情 求新求變拚永續 Black Bridge Pursues Sustainability Through Innovation and Transformation Despite the Pandemic

善用區塊鏈溯源系統 新芳園醬油 用數位轉型贏得消費者信賴 Utilizing Blockchain Traceability System Xin Fang Yuan Builds Trust with Consumers Through Digital Transformation____

自錄 Contents

編者的話	行政院科技會報辦公室 執行秘書 蔡志宏	P.02	Zse-Hong Tsai,Executive Secretary of the Office of Science and Technology, Executive Yuan	EDITOR'S WORDS
封面故事	疫情黑天鵝驅動數位轉型 企業化危機為轉機商機	P.04	Turning Crisis into Opportunity, Businesses Are Embracing Digital Transformation to Combat COVID-19	COVER STORY
台灣優勢	新芳園醬油第三代負責人 王榮生 善用區塊鏈溯源系統 新芳園醬油 用數位轉型贏得消費者信賴	P.11	Mr. Jung-sheng Wang, the third-generation owner of Xin Fang Yuan. Utilizing Blockchain Traceability System Xin Fang Yuan Builds Trust with Consumers Through Digital Transformation	TAIWAN'S COMPETITIVE EDGE
台灣優勢	億馨針織總經理 洪家傑 億馨針織數據精準管理 變身機能布料智慧染整專家	P.16	Jay Hung, General Manager of Proknit Knitting Through Precise Data Management, Proknit Knitting Becomes Intelligent Dyeing-Finishing Expert	TAIWAN'S COMPETITIVE EDGE
台灣優勢	大詠城機械總經理 謝宜軒 大詠城機械 扎根基礎建設、關鍵技術 打造數位升 級鑄造廠	P.21	Eric Hsieh, General Manager of Winson Machinery Winson Machinery Digitally Upgraded Foundries Made Possible through Solid Infrastructure and Key Technologies	TAIWAN'S COMPETITIVE EDGE
台灣優勢	黑橋牌食品董事長 陳春利 黑橋牌創新求變 不畏疫情 求新求變拚永續	P.26	Mr. Robert Chen, Chairman of Black Bridge Foods Black Bridge Pursues Sustainability Through Innovation and Transformation Despite the Pandemic	TAIWAN'S COMPETITIVE EDGE
台灣優勢	豆府餐飲集團資訊管理部 經理 呂禮同 豆府餐飲集團 優化數據管理 實現智慧餐飲	P.31	Li-tung Lu, Manager of Information Management at Tofu Restaurant Group Tofu Restaurant Group Smart Catering Realized Through Data Management Optimization	TAIWAN'S COMPETITIVE EDGE

科技會報辦公室 執行秘書 蔡志宏

Zse-Hong Tsai, Executive Secretary of the Office of Science and Technology Executive Yuan

▶ 序入秋,嚴重特殊傳染性肺炎(COVID-19,以下簡稱新冠肺炎)疫情仍威脅著我們,目前世界的運作將迎來「新常態」(New Normal)。在「新常態」中,我們發現傳統商業模式會加速萎縮,而新經濟模式將順勢接管。

As autumn approaches and there Ais still no sign of the severe pneumonia with novel pathogens (COVID-19) letting go of its grasp on the world, we must come to grips with the fact that the new normal is going to be in effect. In this new normal we live in, we will discover that traditional business models will shrink at accelerated speeds, while new ones will spring up to replace them. The coronavirus is the driving force behind changes in consumer behavior and the industrial ecosystem, and these changes have put digital transformation under the global spotlight. Furthermore, as Taiwan officially crosses into the age of 5G, enterprises and governments are more determined and motivated than ever to hasten the progress of digital transformation.

The recent trade war and coronavirus pandemic greatly shook up the global industrial supply chain. Not only are consumer behaviors changing, but even business models are silently undergoing 正因為新冠肺炎的驅動,帶動消費 行為與產業生態的改變,這些改變 讓數位轉型成為全球熱議話題,與 此同時台灣也正式進入5G時代, 更加強烈影響企業與政府加速數位 化轉型的決心與動力。

貿易戰和新冠肺炎疫情衝擊造成全

transformation. This discrepancy has led to new applications of data, algorithms, platforms, and other new tools, forcing many small and medium-sized enterprises to undergo a trial by fire and recognize the need for digital transformation in order to survive in the new normal.

Digital transformation at its core, is fundamentally redefining customer experience, business models, and operation processes; eventually creating value, profits, and increasing efficiency through new methods. At the same time, digital transformation is an exploration of how disruptive innovation can reshape business models, streamline processes, and rebuild a digital economy through a brand-new accepted style of work. The founding president of New Generation College, Lai-iu Chen, also mentioned that digital transformation is a holistic approach to company change; starting from a point, extending to a line, and finally encompassing a plane. Digitalization is not equivalent to

球產業供應鏈劇變,不僅消費的型 態在改變,就連商業模式也正無聲 無息的轉變中,這之間的變化帶動 了數據、演算法、平台等新工具應 用,帶給許多產業震撼教育,為了 在「新常態」(New Normal)求 生,數位轉型已經是台灣中小企業 迫在眉睫的需求。

所謂數位轉型,真實的意義是代表 著重新定義顧客體驗、商業模式及 營運流程,進而找到新的方式提供 價值、創造營收並提升效率,同時 深入瞭解顛覆性創新如何轉化商業 模式及流程,建構數位經濟的新 工作型態。二代大學創校校長陳 來助也提到,數位轉型是一個從點 到線再到面的企業整體調整,數 位化並不等於數位轉型,「並不 是導入企業資源規劃(Enterprise

digital transformation. "Introducing Enterprise Resource Planning (ERP) systems and purchasing robotic arms are not enough to be called digital transformation," he added.

In response to the needs of digital transformation of micro-, small-, and medium-sized enterprises in Taiwan, the Board of Science and Technology, Executive Yuan has put in digital transformation efforts with micro-, small-, and medium-sized enterprises in key sectors including retailing and service, manufacturing, and agricultural and fisheries production and marketing. SMEs and micro-enterprises are the most dynamic and resilient key drivers of Taiwan's economy. And the efforts aim to help these enterprises expand international markets. Through a government-based platform, the policy will build lighthouses for digital transformation among micro-, small-, and medium-sized enterprises. Relevant governmental agencies also have whole-heartedly put their efforts into digital transformation for



Resource Planning, ERP)系統、 購入機械手臂,就叫數位轉型。」

因此,為因應我國產業特性與中小 微企業數位轉型需求,行政院科技 會報辦公室也積極規劃以我國經濟 命脈、最具活力與韌性的中小微企 業為對象,優先推動零售服務業、 製造業、農漁產銷等重點領域數位 轉型,以拓展國際市場為目標,透 過輔導支援平台建構中小微企業數 位轉型新典範(lighthouse)。而 政府各相關單位,也全面投入各產 業的數位轉型,並特別針對製造業 推動相關計畫,希望透過智慧製造 促成供應鏈上下游串接,提升產業 競爭力。

在這期的報導案例中,新芳園醬油 第三代接班人王榮生在去年接觸區

all industries, and have specifically pinpointed the manufacturing industry for related projects. Hopefully, smart manufacturing will be able to connect upstream and downstream supply chains, increasing industry competitiveness.

In this quarter's DIGI+ case reports, the third-generation owner of Xin Fang Yuan, Jung-sheng Wang, first learned about blockchain traceability systems last year and started taking the first steps towards digital transformation. Although only preliminary actions were taken, Jung-sheng Wang has already tasted the fruits of digital technology. He is guite expectant of what the future transformation will bring. Litung Lu, Manager of Information Management for the Tofu Restaurant Group, a company determined to provide authentic Korean cuisines, also agrees that future optimization of management will rely heavily on digital systems. Through the introduction of digital technology, the Tofu Restaurant Group wishes to

塊鏈溯源系統,開始了公司數位轉 型的初步,雖然只是輕扣數位轉型 的大門,王榮生已經感受到數位科 技帶來的甜美果實,對於未來的轉 型,他也頗為期待。至於以正宗韓 式料理為主打的豆府餐飲集團,資 訊管理部經理呂禮同也認為,未來 集團更需要仰賴數位系統的數據優 化管理,透過數位科技導入,打造 更優質的用餐體驗!而 2015 年導 入機械手臂,接著在2018年建置 冶金智慧化生產線系統,直至今年 啟動「A+企業創新研發淬鍊計畫」 的大詠城機械,就是從數位化、數 位優化到數位轉型很成功的案例。 總經理謝宜軒表示,大詠城正往著 將黑手產業帶向智慧、數位新境界 的路上穩健前行。

而在數位轉型的過程中,讓員工能

provide a more robust experience for users! Winson Machinery purchased robotic arms in 2015, established an Intelligent Metallurgical Assembly-Line System in 2018, and this year started the A+ Industrial Innovation R&D Program. Winson Machinery can be seen as a successful example of transformation starting from digitization, digitalization to digital transformation. Eric Hsieh, General Manager of Winson Machinery, explains that his company is in the process of leaving behind labor intensive practices and crossing over into smart and digitized new frontiers.

In the process of digital transformation, ensuring that employees can keep up with the pace of change is another obstacle that companies must face. The General Manager of Proknit Knitting, Jay Hung, shared his experience with digital transformation. In the early stages of introducing digital transformation, he faced many challenges. Through policy 跟上公司腳步,向來也是在轉型時 的困境之一。億馨針織總經理洪家 傑分享該公司數位轉型經驗談。在 導入數位轉型的初期,也是困難重 ,後來洪家傑透過策略改變及不 斷向員工説明,才大幅降低與員工 的抱怨。而已有一甲子歷史的黑橋 牌,面配之了一甲子歷史的黑橋 調,過程並不容易,但「這些改變 的確為公司帶來業績與經營方向改 變,」董事長陳春利認可了數位轉 型是挑戰也是契機。

數位轉型是一趟旅程,而非終點。 從數位化到數位轉型,過程或許辛 苦且長遠,但以數位 DNA 融入企 業,推動企業透過數位轉型以提升 企業競爭力,卻是企業能長長久久 的唯一法門。

changes and ongoing explanations, complaints from employees finally died down. It wasn't easy for Black Bridge, with 60 years of history, to implement so many applications of innovative technology. The company had to conduct cross-industry and cross-discipline communication. The process wasn't easy, but "these changes did indeed bring change to sales and management," chairman, Robert Chen, affirms that digital transformation is challenging but can also be considered an opportunity.

Digital transformation is an ongoing journey rather than a destination. The road from digitalization to digital transformation may be arduous and winding with many setbacks, but coding digitalization into the DNA of an enterprise and increasing competitiveness through digital transformation is the only method of ensuring the future longevity of a company.

疫情黑天鵝驅動數位轉型 企業化危機為轉機商機

Turning Crisis into Opportunity, Businesses Are Embracing Digital Transformation to Combat COVID-19

2020年,嚴重特殊傳染性肺炎(COVID-19,以下簡稱新冠肺炎)疫情為全球帶來關鍵 影響,亦帶動消費行為與產業生態的改變,強烈影響企業與政府推動數位轉型的決心與動 力。DIGI本期特別專訪二代大學創校校長陳來助,透過深入輔導眾多中小微企業的經驗, 解析台灣目前中小微企業面臨的轉型問題,也分享成功案例、預見未來數位轉型趨勢!

As the world has been severely affected by the outbreak of severe pneumonia with novel pathogens (COVID-19), consumer behaviors and ecosystems in industries have undergone significant changes. In light of this trend, businesses and governments have been determined to promote digital transformation. This quarter's DIGI interviewed the founding president of New Generation College, Lai-ju Chen. Based on his past experiences as a corporate consultant, Chen offered readers an insight into challenges many micro-, small-, and medium-sized enterprises encountered during the course of business transformation. In addition, he also demonstrated successful transformation cases and provided predictions regarding the trend of digital transformation.

riven by COVID-19, digital transformation has come under the spotlight all over the world. Lai-ju Chen, the founding president of New Generation College and the president of TEN Life Corporation, pointed out that many businesses consider the introduction of an Enterprise Resource Planning (ERP) system or the procurement of robotic arms an example of digital transformation. However, this is a misunderstanding of its concept. The core of digital transformation is, in fact, transformation rather than digital. However, as digital

tools are becoming more advanced, powerful, and affordable, it is very likely to fall into the myth that digital transformation is simply about introducing digital technologies instead of embracing transformation.

Digital transformation is a large-scale, gradual process encompassing three stages: digitization, digitalization, and digital transformation. Examples of it start from introduction of electronic records with digital signature, the usage of E-mail, and the construction of ERP and Customer Relationship Management (CRM) systems. The two systems can be further connected to manufacturing engines and business engines to address diverse needs such as manufacturing optimization, finance, customer service, business, and customer experience.

Companies Are in Urgent Need of Transformation

Consumer behaviors are changing due to the outbreak of COVID-19, which in turn lead to changes

為新冠肺炎的驅動,數位轉 型成為全球熱議話題。二代 大學創校校長、天來創新集團負 責人陳來助強調,許多企業誤以 為導入企業資源規劃(Enterprise Resource Planning, ERP)系統、 購入機械手臂,就叫數位轉型,其 實,數位轉型的重點在於「轉型」, 但是由於近年來數位工具越來越進 步、便宜、強大,談論數位轉型落 入迷思,只講求數位,卻沒有做到 轉型。

數位轉型分為三段,分別是數位 化、數位優化、數位轉型,是一 個從點到線再到面的大架構數 位化,例如從電子簽核、使用 Email, 到導入 ERP 系統、客戶關



▲ 二代大學創校校長陳來助 Lai-ju Chen, the founding president of New Generation College.

in business models. As a result, new application possibilities regarding data, algorithms, and platforms have emerged. The trend is an unexpected shock to many industries, and small and medium-sized enterprises in Taiwan are in urgent need of digital transformation to survive in the post-COVID-19 era.

Lai-ju Chen gave the hospitality and food & beverage industries as an example. Companies in the two industries are facing severe challenges this year not from their old competitors, but from non-typical competitors such as Uber Eats. With digital tools and platforms, it is now possible to order meals over a smartphone. In addition, what comes with the paradigm shift are changes in

factors of production. In the past, restaurants focused on good locations, chefs, and decor; but as food delivery platforms emerge, these new "cloud kitchens" do not have to seek perfect locations anymore. This has brought changes to operating expenses, as owners can now run their restaurants with cloud kitchens opened in an alley or on the second floor of a building. The rent saved can be then used for investments on the product itself.

After innovations integrating logistics, cash transaction (online payment), and information

flow emerged, food and us are now merely 1 centimeter apart, namely the distance between a finger and a phone screen. Mr. Chen emphasized that even thousand-year old bed-andboard in the hospitality industry are now "in urgent need of digital transformation to survive the crisis since consumers are getting used to ordering their meals on their phones during the pandemic. As the penetration rates of food delivery platforms are increasing, it is unlikely consumers will go back to the old ways even after the pandemic ends."



▲ 從數位化、數位優化、數位轉型,是一 個從點到線再到面的大架構數位化,提 高客戶滿意度,也為公司創造更多利潤 空間。Digital transformation is a largescale, gradual process encompassing digitization, digitalization, and digital transformation. It helps enhance customer satisfaction and generate greater profits for companies.

係 管 理(Customer Relationship Management, CRM)系統,再 到串接上述兩種系統,連結製造引 擎與生意引擎,對接優化製造、財 務、客服、業務、顧客體驗等多元 面向。

商業模式改變 企業亟需數位轉型

因為新冠肺炎的疫情影響,客戶消 費的型態正在改變,商業模式正在 轉變,帶動更多數據、演算法、平 台等新工具應用,對於許多產業有 如震撼教育,為了在疫情後求生, 台灣中小企業需要數位轉型。

陳來助舉例,今年飯店業、餐廳遭 逢經營寒冬,不是被傳統同業威 脅,而是被 Uber Eats 這樣的非 典型對手打敗,透過科技工具與平 台,只要手機就能點餐,典範移轉 後專業也隨之改變。過往餐廳著重 的是地點、廚師、裝潢氛圍,隨著 美食外送平台的興起,雲端廚房顛 覆餐廳必須設在黃金地段的思維, 也帶動成本的創新,餐廳開始在巷 子內、在2樓的雲端廚房中經營, 將省下的房租投資在最佳的特色食 材上。

當結合物流、金流(線上支付)、 資訊流的創新出現,我們與「餓」 的距離只剩下手指與螢幕間的1公 分。就連有千年歷史的傳統產業飯 店,也因為新冠肺炎疫情「為了求 生存勢必要數位轉型,因為疫情期 間消費者只要手機就能點餐,隨著

Businesses Launch Innovative Transformation Through Self-Assessment

Traditional industries in Taiwan must prepare against changes in business models and delve into digital transformation. In addition to the prediction that coronavirus will eventually become a regular pneumonia or a seasonal disease like the flu, climate change is another great challenge for businesses. Facing the unprecedented crisis, Mr. Chen quoted the five constant factors governing the art of war from The Art of War by Sun Tzu: the moral law, heaven, earth, the commander, and method and discipline. He suggested that businesses should

conduct self-assessment to review factors such as corporate visions. For example, a travel agency that originally targeted overseas markets should modify its visions and shift its target to domestic or local markets. It is necessary that all businesses adjust their corporate visions, organizational structures, and processes to adapt to changes in macroeconomy and microeconomy.

Succession, transformation, upgrade, and innovation will be the most important issues for enterprises in Taiwan for the next decade. Enterprises need successors to initiate transformation, launch business upgrades, and encourage innovation. Lai-ju Chen recommended that enterprises use the 3 x 3 Grid for Digital Transformation to assess themselves and seek guidance on transformation. Enterprises should first find where they are in the three stages of digital transformation and then determine whether process innovation has been implemented. They can start from Business Process Reengineering (BPR), Business Process Innovation (BPI), to Business Process Transformation (BPT).

The key person in digital transformation is the business owner, and the success of digital transformation lies in people. Orientations and consensus camps should be held first to help reach a consensus within an organization. Settlement of the organization should always be prioritized before introducing new systems; otherwise, the digital 外送平台的滲透率越來越高,消費 者的習慣改變後就回不去了!」陳 來助強調。

自我盤點健檢 接班轉型升級創新

台灣傳統產業必須趕緊思考未來商 業模式的改變,進行數位轉型布 局。除了因應新冠肺炎可能流感 化、肝炎化的趨勢,氣候變遷也是 企業的重大挑戰,面臨前所未有的 危機,陳來助引用《孫子兵法》中 講求的「道天地將法」五大作戰元 素,建議企業一一自我盤點健檢, 例如重新思考願景,假設旅行社原 本鎖定海外市場,因應國際環境變 動進行願景修正,改成經營國內或 區域型生意,每家企業都必須隨著 總體經濟、個體經濟改變,調整願 景、組織、流程。

接班、轉型、升級、創新是未來 十年台灣企業的重要課題,企業 必須要有新的接班人,由接班啟 動轉型、帶動升級、連結創新。 陳來助建議使用「數位轉型九宮 格」來健檢及指引公司的轉型方 向,了解自家企業處於數位化、數 位優化、數位轉型中的哪一個階 段,審視有沒有做流程創新,從企 業流程再造(Business Process Reengineering, BPR) 到企業 流程創新(Business Process Innovation, BPI), 再到企業 流程轉換(Business Process Transformation, BPT)。

數位轉型的關鍵人物就在於企業 主,而數位轉型的成敗關鍵在於 人,必須先定時辦理説明會、共識 營,藉由辦活動在組織中達成共 識,要把組織先搞定,而非急著導 入系統,否則組織中會分裂為支持 數位轉型與反對數位轉型兩派,造 成不必要的內耗,拖慢數位轉型進 度或導致數位轉型失敗。

觀察到目前數位轉型發展的現象, 陳來助歸納出兩大趨勢:一是速度 越來越快、二是重新定義產業邊界 (Industrial Boundary)。未來 企業將更難定義誰是競爭者、合作

transformation issue can split the organization into supporters and opponents, causing unnecessary internal conflicts, undermining the efforts put in digital transformation, and even leading to failure eventually.

Based on current digital transformation patterns, Laiju Chen proposed two probable trends: One is that digital transformation will take place faster and faster, and the other is that it will redefine the socalled industrial boundary. In the future, it will be even harder for businesses to define who their competitors or partners are. As digital transformation brings about countless challenges such as rapidly changing trends, businesses are more likely to experience unexpected failures.

Therefore, it is advisable that businesses should be well prepared for aspects such as global regulations, organization, talent, and process. Furthermore, they should endeavor to increase the value added of their products and services.

New Generation College to Drive Transformation

New Generation College was established in August, 2018. After realizing the trend and importance of digital transformation in 2019, the organization has helped several micro-, small-, and mediumsized enterprises with digital transformation. For example, to address the increasing revenue, Hai Lu Jya He (HLJH), a manufacturer and supplier of metalworking fluids, originally planned to introduce the ERP system. After the secondgeneration owner discussed the company's visions, data sources, and core competitiveness with New Generation College, HLJH decided to introduce the CRM system and connect it to Line app. The company analyzed the purchase cycle of each customer with the CRM system and sent notifications to remind customers who were about to run out of the fluid to make orders through Line chats. This strategy not only enhanced overall service quality, but also solved the problem of high inventory levels.

Another transformation success by New Generation College is found in Anko Food Machine Company, a food machinery company founded more than 40 years ago. 者,而因為數位轉型帶來眾多挑 戰,例如變化過快,企業發展常會 意外絆倒,因此建議必須針對全球 法規、組織、人才、流程等面向建 好穩固基礎,並且致力於提升產品 與服務的附加價值。

二代大學輔導 驅動企業轉型

2018 年 8 月二代大學創立,並在 去年開始看到數位轉型的趨勢與 重要,陸續輔導許多中小微企業數 位轉型成功。例如販賣工業用油的 海陸家赫因應營業額擴增,原本希 望導入 ERP 系統,二代大學與二 代經營者針對願景、數據來源、 核心競爭力等主題進行討論後, 建議應該導入 CRM 系統,之後並 將 CRM 與 Line 進行結合,運用 CRM 運算每個客戶的採購週期, 透過系統主動提醒即將用完油的客 戶,使用 Line 進行訂貨,不但進 一步優化服務,更解決過往工廠內 堆滿庫存的問題。

二代大學的成功輔導經驗,還包括 創立超過40年的安口食品機械, 以製造食品生產機械為本業,包 括水餃、包子、印度餃等麵點製造 機,以及肉品、水產品等食物處理 器,多年前就導入電商模式,透過 網路將水餃機等產品行銷至全球 一百多國,打破語言與地理疆域。 承恩食品主要銷售珍珠奶茶原料, 並客製化開發原物料與創新配方、 開店創業、飲品調製教學,二代經 營者因應世界各地市場風味與口味 的需求,創造產品附加價值,從製 造業升級為服務業,在網路上將產 品銷售到全球 60 多國,成為驅動 珍奶 3.0 的國際大廠!

政府建平台 造生態圈打團體戰

針對台灣產業的數位轉型階段,陳 來助直指,台灣的數位落差極大, 有的企業正在進行數位轉型,有的 企業卻還在用打卡機、生產線上貼 滿紙本作業指令,6成以上的台 灣中小企業甚至都還沒有進入數位 化階段!

Anko started its business with food production machinery for dumplings, buns, and samosa as well as processing machinery for meat and seafood products. Several years ago, the company adopted the e-commerce model and started selling its products, such as dumpling machines, to more than 100 countries around the world, breaking down language barriers and geographical boundaries. Another example is the success of Chen En Food Product Enterprise, a company producing ingredients for bubble milk tea. Its services include the development of customized ingredients and new flavors, guidance for those who aspire to start their beverage stores, and tutorials for drinks. To cater to the needs of different

flavors and tastes in global markets and create added value to the products, the second-generation owner of Chen En transformed the company from a manufacturer to a service provider and is now selling products online to over 60 countries around the world. Chen En can be regarded as a key promoter of the Bubble Milk Tea 3.0 trend.

Government-Based Platform to Help Create a Mature Industry Ecosystem

Speaking of where Taiwanese businesses are in digital transformation, Mr. Chen pointed out the wide corporate digital divide in Taiwan. While some businesses are already in the third stage of digital transformation, many more are still using punch card machines and pasting hardcopy guidelines everywhere along the production line. Over 60% of the SMEs in Taiwan are still at stage 0 of digital transformation.

n response to the needs of digital transformation of micro-, small-, and medium-sized enterprises in Taiwan, the Board of Science and Technology, Executive Yuan has put in digital transformation efforts with micro-, small-, and mediumsized enterprises in key sectors including retailing and service, manufacturing, and agricultural and fisheries production and marketing. SMEs and micro-



▲ 企業數位轉型可分為三大階段,分別是數位化、數位優化、數位轉型是一個從「點的布局」到「線的連結」再到「面的翻轉」的大架構數位 化。透過每一次的轉型,企業從「企業流程再造」到「企業流程創新」,再到「企業流程轉換」,各分別得以有 20%、40% 及 60% 的價值提 升。其中每個轉型階段都有各自的執行構面,「數位化」階段須從 3 個維度來執行公司數位轉變;至於「數位優化」則須從 6 個構面來執行; 「數位轉型」階段則須透過 9 大創新來讓公司走向真正的數位轉型。陳來助校長的「數位轉型九宮格」就是透過 1、2、3 的數位轉型階段, 分別獲得 2、4、6 的價值提升,及從 3、6、9 的執行構面來完成「數位轉型」。Corporate digital transformation is a large-scale, gradual transformation process encompassing three stages: digitization, digitalization, and digital transformation. It starts from a point, extends to a line, and finally encompasses a plane. Businesses enhance their corporate values by 20%, 40%, and 60% respectively following the completion of Business Process Reengineering (BPR), Business Process Innovation (BPI), and Business Process Transformation (BPT). Each stage of transformation has its own dimensions of execution. For example, businesses are required to execute digitization from three dimensions and digitalization from six. Finally, the last stage involves nine innovations that will help businesses achieve the goal of digital transformation. The 3 x 3 Grid for Digital Transformation by Mr. Lai-ju Chen consists of numbers 1 to 9: 1, 2, and 3 refer to the three stages of digital transformation; 2, 4, and 6 are the first digits of the respective percentage of enhanced corporate value; and 3, 6, and 9 are the dimensions of execution that complete digital transformation. 為因應我國產業特性與中小微企業 數位轉型需求,科技會報辦公室 規劃以我國經濟命脈、最具活力與 **韌性的中小微企業為對象**,優先推 動零售服務業、製造業、農漁產銷 等重點領域數位轉型,以拓展國際 市場為目標,透過輔導支援平台 建構中小微企業數位轉型新典範 (lighthouse)。陳來助認為,中 小微企業的弱勢就是沒有資源,台 灣的數位轉型需要平台,由政府建 平台是很好的做法,能夠對接教練 與業師輔導、提供解決方案!現今 商場的挑戰越來越大,打群架、建 平台、打造跨界生態圈,是最佳的 對策!

過去企業經營者喜歡興建營運總 部、蓋工廠,以生產創造收入,展 室未來,陳來助預言,未來每一家 企業都應該建立數位總部,收集全 世界的數據。而企業數位轉型成功 的要件,包括「總裁的心、執行長 的眼、高階主管的腦、老師傅的 手、經營團隊的腳、創新商業模 式 DNA」,也就是場域、數據、 二代接班、打破慣性、數十年的經 驗、員工認同等各種細節。

陳來助進一步以「老師傅的手」為例 説明,例如台灣水五金產業,許多 製程仰賴經驗老到的老師傅累積3、 40年經驗,經由人工打磨實現完美 產品最後一哩路,「透過數位科技 記錄,將隱性知識顯性化、顯性知 識數位化,學習模仿老師傅的技法, 而非透過機器取代,將是未來台灣 企業數位轉型的機會與挑戰!」



▲ 從企業流程再造(BPR)到企業流程創新 (BPI),再到企業流程轉換(BPT), 是 企 業 數 位 轉 型 的 過 程。Digital transformation within an enterprise starts from Business Process Reengineering (BPR), Business Process Innovation (BPI), to Business Process Transformation (BPT).

enterprises are the most dynamic and resilient key drivers of Taiwan's economy. And the efforts aim to help these enterprises expand international markets. Through a government-based platform, the policy will build lighthouses for digital transformation among micro-, small-, and medium-sized enterprises. Chen indicated that traditionally these enterprises are in lack of resources, and a governmentbased platform matching lecturers and consultants to enterprises can be a great solution to foster digital transformation. Given the increasing challenges in the market, teamwork, a dedicated platform, and a cross-sector industry ecosystem can be the best measures to take.

Traditionally, business owners hastened to build operational headquarters and factories to generate revenues. However, Chen suggested that every business should build a digital headquarters to collect global data. He added that the key factors of a successful digital transformation include "the heart of the president, the eyes of the CEO, the brain of C-level executives, the hands of senior craftsmen, the feet of the management team, and the DNA of creative business models." In other words, businesses need to focus on details such as domain, data, business succession, new business models, decades of accumulated experiences, and employee recognition.

Lai-iu Chen further took "the hands of senior craftsmen" as an example. In the plumbing industry in Taiwan, many manufacturing processes rely on the skills which senior craftsmen have spent 30 to 40 years specializing in. These manual polishing processes put the finishing touches to the outstanding products. "We need to record these skills with digital technology. Our attempt is to make implicit knowledge explicit and digitize the explicit. Instead of replacing the craftsmanship with machinery, we should use technology to learn from these craftsmen. This is expected to be the opportunities and challenges Taiwan will face during its pursuit of digital transformation," he added.

善用區塊鏈溯源系統 新芳園醬油 用數位轉型贏得消費者信賴

Utilizing Blockchain Traceability System

Xin Fang Yuan Soy Sauce Builds Trust with Consumers Through Digital Transformation

新芳園醬油第三代負責人 王榮生 Mr. Jung-sheng Wang, the third-generation owner of Xin Fang Yuan.

創立超過 70 年的新芳園醬油,從日照曝曬、煮豆、製麴、入甕缸等過程,堅持傳統手 工釀造、天然無添加,在食安風暴後力圖數位轉型,上架至電商平台,導入資料不可篡 改的區塊鏈溯源系統,成為全球第一款應用區塊鏈的醬油品牌,為老字號增添新生命, 更贏得消費者的青睞與信賴。

From the process of sun drying, steaming soybeans, Koji-making, and fermentation, for over 70 years, Xin Fang Yuan has insisted on using traditional handmade methods to produce its naturally brewed soy sauce without any food additives. After an outbreak of food fraud scandals in Taiwan, Xin Fang Yuan strived for digital transformation by selling its products on e-commerce platforms and adopting a blockchain traceability system to prevent data alteration. In doing so, Xin Fang Yuan became the first soy sauce brand in the world to embrace blockchain technology, bringing new life to the iconic brand, winning favor, and building trust with consumers.

▶ 2013 年「順丁烯二酸」 毒澱粉、毒醬油的食安事件,曾被視為夕陽產業的手工釀造 醬油重新獲得眾人關注。新芳園醬 油從原料開始以契作確保品質,更 在 2013 年起上架電商平台,並於 去年導入資料不可篡改的區塊鏈溯 源系統,透過數位轉型導入資訊應 用,也守住傳統風味,讓健康醬油 進入更多家庭。

契作把關原料 電商鏈結消費者

新芳園醬油擁有代代相傳黑豆黃 豆的黃金比例,更堅持每缸至少 180天釀造、用料天然、無人工 添加劑。在第三代負責人王榮生



▲ 有了區塊鏈溯源系統,讓消費者明白 自家醬油的生產流程,促進產品在電 商上的銷售量。With the blockchain traceability system, consumers can learn about the production process of Xin Fang Yuan's soy sauce, which increases sales on e-commerce platforms. 的主導下,啟動品牌數位轉型! 他娓娓道來7年前的轉型契機, 「因為食安風暴,我們從原料開 始把關,選用非基因改造豆,找 小農契作,不使用化肥,採用友 善農法栽種,用水果酵素灌溉黑 豆田,種出高品質的台灣黑豆後, 更通過SGS共474項農藥、重金 屬等檢測,不添加化學香料和焦 糖色素,讓消費者更安心食用。」

原本僅在雲林、嘉義等中南部縣 市銷售,新芳園醬油在 2013 年起 透過奧丁丁集團上架至奧丁丁市 集後,有了電商平台的曝光,從 原本的區域品牌變身,開始擁有 來自全台、甚至海外的消費者。 除了銷售數字的助益外,消費者

ue to the food safety scandals in 2013 regarding toxic starch and tainted soy sauce that contained maleic acid, handmade soy sauce, once considered a sunset industry, regained the public's attention. Through contract farming Xin Fang Yuan can ensure the quality of its ingredients from its source. In addition, Xin Fang Yuan started to sell its products on e-commerce platforms in 2013 and adopted a blockchain traceability system last year to prevent data alteration. Through the information applications induced by digital transformation, the traditional flavor of naturally brewed soy sauce has been brought to the dinner tables of even more families.

Ensuring Ingredient Quality via Contract Farming and Connecting Consumers with E-Commerce

Adhering to its recipe for the ratio between black soybeans and soybeans passed down through generation after generation, Xin Fang Yuan insists that its soy sauce be brewed naturally for at least 180 days with no artificial food additives added. Under the leadership of the third-generation owner Wang Jung-sheng, Xin Fang Yuan initiated the digital transformation of its brand. Wang elaborated on the opportunity of transformation 7 years ago. "Because of the food safety scandals, we decided to implement quality control for our ingredients

- soybeans. We started to use non-GMO soybeans and launched contract farming projects with smallholders who practice natural farming by using fruit enzymes as fertilizers instead of chemicals. The high-quality black soybeans will then have to pass 474 SGS tests for pesticide residues and heavy metal contaminants. With no chemical flavorings or caramel colorings, consumers can enjoy our products without any food safety concerns."

Xin Fang Yuan products were previously exclusive to central and southern Taiwan, such as Yunlin and Chiayi. Ever since its collaboration with OwlTing's OwlTing Market, an online e-commerce platform, Xin Fang Yuan has transformed from a regional brand to a national one, attracting consumers all over 的建議更成為產品開發的金礦!

「我們原本專注在生產,現在受 惠於電商平台,透過消費者的留 言,傾聽顧客的聲音!」王榮生 回憶,當初由於消費者反應,醬 油的麴菌味太濃,新芳園醬油就 以時間方造不同產品線,將 酸 間打造不同產品線,將 酸 間 日原本標準的6個月,延伸 至一年、兩年、三年、四年等, 以 離全新產品線;也有消費者覺 得產品太鹹、不夠香,正好給新 芳園醬油機會説明產品特色與堅 持,包括無防腐劑、無人工甘味 劑、無人工焦糖色素、無單氯丙 二醇等調色調味的化學添加。

導入區塊鏈 詳實記錄生產流程

因為政府持續倡導生產溯源、生產 履歷等政策,讓王榮生深覺,要證 明原料與製程的來源與安全、取得 消費者的信賴,可靠的溯源記錄 了事的信賴,可靠的溯源記錄 了。2019年新芳園醬油。 拿了。2019年新芳園醬油。 拿了。2019年新芳園醬油。 拿了。2019年新芳園醬油。 算不可是改區塊鏈溯源系統, 就 一款應用區塊鏈的醬油品牌。 身為傳產一款應用區塊鏈的醬油品牌。 身影響員工的心態。「還好我是寬 一款應用區塊鏈的醬油品牌。 會影響員工的心態。「還好我是第 一款。」雖然改員和一款不會有大問 題。」雖然改時間,不過由於對溯源 的理念都很認同、全力支持,讓新 芳園醬油的數位轉型順暢快速。

王榮生指出,有了區塊鏈溯源系 統,新芳園醬油將包括選用豆子、 出麴洗麴、培麴、發酵、入缸再次 發酵、蒸煮調味、裝罐、出貨等天 數與過程完整記錄,上傳至雲端的 區塊鏈溯源系統,以負責任的態度 公開生產流程。也因為這個系統, 讓消費者明白自家醬油的生產流 程,無形中也促進了產品在電商上 的銷售量。

創造信任 改進公法 優化製程

消費者可用手機掃碼查閱所有記 錄,連結生產者與購買者的信任, 也幫助新芳園醬油改進工法、優化

Taiwan and even abroad. Sales of its products have increased and consumer opinions have been taken into consideration for future product development.

"In the past, we only paid attention to production; as for now, thanks to e-commerce platforms, we get to know consumer opinions directly through their comments online." Wang remembered that at first, some consumers complained that the Koji taste in the soy sauce was too strong. Therefore, Xin Fang Yuan expanded its product line by extending fermentation time from the standard 6 months to 1-4 years to produce soy sauce of different colors and aromas. Moreover, other consumers claimed that the soy sauce is too salty or not aromatic enough, which gave Xin Fang Yuan a perfect opportunity to reiterate

that its products contain nopreservatives, artificial sweeteners,artificial caramel colorings,3-MCPD, or other chemicals.

Introducing Blockchain Technology to Record the Process of Production

Recently, the government has been pushing forward policies regarding production traceability and sourceable agricultural products. Wang Jung-sheng realized that a reliable traceability system is crucial in order to prove the sources of ingredients and the safety of the production process as well as building trust with consumers. In 2019, Xin Fang Yuan introduced the blockchain traceability system to prevent data alteration. By uploading the details of each production process to the system, Xin Fang Yuan became the first soy sauce brand in the world to embrace blockchain technology. Since the soy sauce brewing industry is a conventional one, any small alteration can be a game changer for the business and affect its employees. "Luckily, I am the third-generation owner of the business and my employees are loyal to me and the company. As long as I can persuade my parents and my uncle, everything will be fine." Even though it required some time for the employees to adapt to the changes at the very beginning, they were all on board with the idea of traceability and were supportive of the plan, allowing Xin Fang Yuan to have a smooth and fast digital transformation.

製程,提高培麴的成功率。「以往 師傅都沒有記錄細節,所有經驗都 放在腦袋中。自從區塊鏈溯源系 統,我們就可以分析最適合的配 方、時間,例如下雨天應該如何調 整、氣溫太高時可以怎麼做,提升 產品的穩定度與品質。」王榮生進 一步説明。

在醬油製程中,培麴至關重大,以 前新芳園醬油培麴全都仰賴經驗, 依據溫、溼度等變因調整加入的水 量,成功率僅有約六成,失敗的豆 子就必須丟棄、增加成本!有了區 塊鏈溯源系統,累積大量的記錄與 數據,可以根據過往成功與失敗的 數據,調整水量,精準拿捏豆子與 水的比例,控制豆子的溫度不會升 溫太高、造成細菌死亡,大大提升 培麴成功率達到九成!

不上妝的醬油 MIT 品質與魅力

因為多年來在電商平台的曝光與經 營,加上區塊鏈溯源系統的助攻, 新芳園醬油成功推廣「不上妝的醬 油」品牌形象,培養一群愛用粉 絲,享有熟客持續回購的優勢。王 榮生強調,「很多消費者都希望尋 找無添加的傳統手工醬油,卻又不 知道從何選擇,透過溯源的機制, 從雲林產地到消費者的手中,每一 個步驟與過程都完整記錄、透明呈 現,消費者對我們的產品更放心, 持續指定購買。」



▲ 利用數位的區塊鏈溯源系統,可精準控 制豆子的溫度,培麴成功率大幅提高。 The blockchain traceability system helps control the temperature for soybeans precisely, increasing the success rate of Koji cultivation.

Wang Jung-sheng pointed out that with the blockchain traceability system, Xin Fang Yuan uploads the full records, including soybean selection, Koji cleaning, Koji cultivation, fermentation, refermentation in tanks, heating and refining, bottling, and shipment, to the system in the Cloud in order to keep the production process as transparent as possible. Thanks to the system, consumers can learn about the production process of Xin Fang Yuan's soy sauce, which in turn increases the sales on e-commerce platforms.

Building Trust, Improving Production Methods, and Optimizing Production Process

Consumers can use their

smartphones to view all the records by scanning QR codes. This helps producers build trust with consumers and allows Xin Fang Yuan to improve its production methods and optimize its production process, hence increasing the success rate of Koji cultivation. "In the past, brew masters kept all the knowledge and experiences in their mind without writing down the details; now with the blockchain traceability system, we can analyze what the best formula and times are and make adjustments to the formula, for instance making different adjustments for rainy days or hot days, thus improving the stability and quality of our products," Wang Jung-sheng further explained.

Koji cultivation relied entirely on experiences to adjust the amount

of water based on temperature and humidity. Therefore, the success rate was only about 60 percent and the rest of the beans had to be discarded, increasing the cost of production. As for now, thanks to the blockchain traceability system that collects previous records and data, the amount of water is adjusted accordingly and the ratio of soybeans to water is precisely controlled to make sure that the temperature for soybeans does not go so high that it kills the bacteria and causes Koji cultivation to fail. The average success rate of Koji cultivation is now more than 90 percent.

The Charisma of Au Naturel High Quality Soy Sauce Made-in-Taiwan

After years of efforts on

14

以往新芳園醬油的顧客多為餐廳、 小吃店等業者,電商通路帶動更 多一般消費者選購,就連主廚界 也主動接觸。有來自台灣與國外 的米其林星級餐廳主廚透過網路 得知產品,不但組團到雲林現場 參觀、購買,並且在餐會中採用 新芳園醬油!

2017 年新芳園的不上妝醬油勇奪 全國評鑑冠軍,拉抬品牌知名度。 王榮生期待,未來能在政府單位 的協助下,成為指定伴手禮,而 新芳園醬油更計畫在今年於美國 Amazon和日本電商平台上架, 讓更多人看見 MIT 醬油的品質與 魅力!

e-commerce platforms and the assistance of the blockchain traceability system, Xin Fang Yuan has successfully made "Au Naturel Soy Sauce" its brand image and established a solid customer base with repeat customers. Wang Jungsheng indicated, "Many consumers want to purchase traditional handmade soy sauce but do not know where to find it."

In the past, the clients of Xin Fang Yuan were mostly owners of restaurants and diners; now with the help of e-commerce, Xin Fang Yuan is more accessible to the general consumers and even some chefs. These chefs of Michelin starred restaurants learned about Xin Fang Yuan's products online, graced Yunlin for a factory tour, and even used Xin Fang Yuan's soy



新芳園醬油
公司簡介:
成立:1945年
創辦人:王坤城
負責人:王榮生
員工數:8人
主要業務:手工釀造醬油
轉型心法:從產地契作開始把關,
每批收成的黑豆都會經過 SGS 共
474 項檢驗,釀造生產過程記錄到
區塊鏈溯源系統,讓消費者信賴產
品、安心食用。

sauce for a banquet.

In 2017, the au naturel soy sauce by Xin Fang Yuan was crowned the champion of a national competition, increasing its brand awareness. Wang hopes that with the assistance of government agencies, the soy sauce produced by Xin Fang Yuan can be acknowledged as one of the designated souvenirs of Taiwan. Later this year, Xin Fang Yuan plans to sell its products on Amazon and other e-commerce platforms in Japan, allowing more people to witness the high quality and charisma of soy sauce made-in-Taiwan.

Company Profile of Xin Fang Yuan

Founded: 1945 Founder: Kun-cheng Wang General Manager: Jung-sheng Wang **Employees:** 8 Core business: sales and production of casting products Transformation philosophy: Handmade soy sauce Transformation Philosophy: Quality control through contract farming, 474 SGS tests for every crop of black soybeans, and a blockchain traceability system to record the process of production and reassure consumers.



Through Precise Data Management, Proknit Knitting Becomes Intelligent Dyeing-Finishing Expert

億馨針織總經理 洪家傑 Jay Hung, General Manager of Proknit Knitting



匯聚近 40 年的染整技術,紡織業者億馨針織專注於機能布料染整業務,近年來導入數 位創新應用,從紙本到數據到系統,透過智慧染整供應鏈數位系統,進行機能布效能分 析與製造管理,優化染整製程,成功將交期由 30 天大幅縮短至 14 天,實現智慧染整, 開拓紡織新藍海!

With almost 40 years of sophisticated dyeing-finishing techniques, Proknit Knitting devotes itself to the dyeing and finishing business of functional fabric production. A few years ago, Proknit Knitting introduced digital innovation to its business by creating a smart digital system for the dyeing and finishing supply chain that converts paper-based information to a digital format. The system helps carry out performance analysis and production management of functional fabrics to optimize the dyeing and finishing manufacturing process, making it possible to shorten the production cycle from 30 to 14 days, realizing a smart dyeing-finishing industry, and creating new business opportunities for the textile industry.

17

Nike、Adidas、Lululemon等國際知名品牌,都使用億馨針織生 產的機能布料,以高端技術門檻 聞名業界。造訪億馨針織官網, 「雲端智慧製造智能染整 AI 生產 線」幾個大字映入眼簾,其實, 在幾年前,這家機能布料染整的 紡織業者曾經非常人工、非常傳 統。近年來深刻體會數位科技可 提升的巨大效益,因而開啟了數 位轉型的新頁。

揮別人工紙本 數據系統運作

以前億馨針織全部仰賴人工紙本 作業,例如每一批布的製作,都 是由老師傅將顏色色號、染料的

K nown for its high-end techniques among the industry, the functional fabrics from Proknit Knitting are used by several internationally renowned brands, including Nike, Adidas, and Lululemon. On the official website of Proknit Knitting, a slogan caught everyone's attention: "Smart Production in the Cloud, Intelligent Dyeing-Finishing Process, and Production Lines with Artificial Intelligence Technology." In fact, the company used to provide dyeing and finishing services for functional fabrics in a very traditional and labor-intensive way a few years ago, before it fully realized the huge potential benefits that digital technology could bring about and started to launch digital transformation.

Bidding Farewell to Paper Documents with Data Systems

In the past, all the work in Proknit

配方等手寫在「紙本工卡」上。 總經理洪家傑指出,往往因為人 工抄寫,難免寫錯或看錯,有時 候一個小數點的錯誤,就會造成 後續到客的近災難!此外,每次 遇到客戶手邊,此外,每次 調會,往往要花上一天了 之業,必須導入電腦系統化管理, 先將紙本抄寫轉為數位紀錄檔, 有了數據才能進一步善用累積的 數據在分析之後改善製造流程。

在硬體設備上,億馨針織斥資上 億元從義大利添購 15 台可蒐集參

Knitting relied on manual, paperbased processes; for example, each batch of fabrics was produced by master craftsmen writing down color codes and combinations of dyes on "hardcopy work cards." Jay Hung, General Manager of Proknit Knitting, indicated that handwriting often led to mistakes in writing or reading, and sometimes a misplaced decimal point might result in a great disaster. Furthermore, each time clients asked about the delivery time, the production team had to stop their work, go through piles of papers, and figure out the exact date accordingly. It usually took a total of one day to get back to the clients. As a former electronic engineer, Hung believed that this family business could operate in a more efficient way. By introducing systematic management to digitize handwritten records, engineers can further analyze these collected

數的智慧染缸機台,透過染缸提 供的各項數據,讓生產過程更減 少用水與耗電,符合國際化節能 減碳趨勢。在軟體選擇上,考量 到億馨針織的流程、技術複雜, 公版套裝軟體並不適用,於是透 過經濟部工業局「智慧機械 - 產 業聚落供應鏈數位串流暨 AI 應用 計畫」,億馨針織攜手亞頌科技 與賀紀股份有限公司,自行開發 軟體。

監控產線 備貨預測 傳承經驗

在 億 馨 針 織 陸 續 導 入 ERP、 MES、AI 等科技後,於染整製程 應用 AloT 機台智慧聯網、AI 機器 學習、雲端資料庫、數據分析等

data and improve the production process.

In terms of hardware, Proknit Knitting invested hundreds of millions in 15 machines equipped with intelligent dyeing basins, which provide a variety of data to reduce the consumption of water and electricity, in order to follow the global trend of energy conservation and carbon reduction. On the other hand, in terms of software, due to the complicated production procedures and techniques, public-domain software suites are not applicable to Proknit Knitting. Therefore, through the Intelligent Machinery Program of Digital Streaming and AI Applications for Industrial Supply Chain Clusters, hosted by the Industrial Development Bureau, the Ministry of Economic Affairs (MOEA), Proknit Knitting collaborated with Avectec Co. and

智慧管理技術,建置億馨上下游 供應鏈系統、自主研發「色庫研



▲ 億馨針 纖陸 續導入 ERP、MES、AI 等 科技後,可透過客觀的數據進行管理, 確保產品品質穩定。Proknit Knitting introduced ERP, MES, AI, and other technologies to manage the production and ensure the quality of its products with accurate, reliable data. 究試驗室」分析方法。以億馨上 下游供應鏈系統為例,就包括機 台中控、染整品質與履歷追蹤、 維修紀錄、製程報表等系統,串 聯染整機、定型機等機器與製程, 監控產線、數據管理,更連結供 應商系統,輔助備貨預測。

過去染料、助劑、織布的上下游 供應鏈廠商,都以傳真或人工抄 寫傳遞資料,如今所有流程透過 掃描條碼獲得詳細資訊,將數據 串流到資訊平台分析研究,大大 提升效率與產能。洪家傑分享, 透過 AI 機器學習,更進一步將老 師傅在包括機台操作、條件設定 等經驗與技術傳承下來,跨部門 溝通也更有所本,就算產品出錯, 也能夠追溯原因加以檢討改進。

客觀數據邏輯 省時準確高質

過往很直覺、因人而異,現在則 是客觀、數據、邏輯第一!洪家 傑指出,過去億馨針織的生產很 仰賴師傅們的「直覺」,操作染 料搭配都因人而異,必須靠師傅 手摸,以觸感、直覺、經驗值調 整,在數位轉型後,透過客觀的 數據進行管理,包括顏色、色牢 度、加工時間等細節,都能即時 調整,確保品質穩定。

以打色為例,過去客戶下單、提 供標準色後,師傅必須要不斷地 透過「Trial And Error」(嘗試錯 誤法),往往歷經超過10次以上、 每次花費6小時的失敗,才能達

iPromise International Technology Corporation to develop its own software.

Monitoring Production Lines for Inventory Forecasting and Passing on Experience

After introducing ERP, MES, AI, and other technologies, Proknit Knitting applied smart management techniques such as AloT, machine learning of AI, cloud databases, and data analysis to the dyeing and finishing process, establishing the Proknit Upstream-Downstream Supply Chain System and developing the Research and Trial Institute of Shade Library to do analysis. For example, the Proknit Upstream-Downstream Supply Chain System is integrated with many functions, including central control of machine operations,

dyeing-finishing quality control and records, maintenance record keeping, and manufacturing process reporting. In addition, the system is connected to dyeing-finishing machines, fixing machines, and other machines and processes, in order to monitor the production lines, manage the collected data, and even forecast the inventory in connection with suppliers' systems.

Upstream and downstream suppliers of dyes, additives, and fabrics used to exchange information via faxing or handwriting. Nowadays, all processes can be done by scanning barcodes to get detailed information and stream data on information platforms to perform analysis and research, greatly enhancing the efficiency and productivity. Hung shared his experience that AI machine learning could pass on the old craftsmen's experience and skills of operating machines and setting conditions; this way, cross-departmental communication would become more reliable and any possible error could be easily traced for correction and improvement.

Saving Time and Ensuring High Accuracy, Great Quality with Objective Data

In the past, the production process used to be managed by intuition, and the results often varied from person to person; however, the company now prioritizes objectivity, data, and logic. Hung indicated that the production in Proknit Knitting mainly relied on the "instincts" of old craftsmen, and the combinations of dyes they used were different. Adjustments were made by craftsmen according to how they 數位化排程幫助每一個製程步驟 更加提高使用效率,機台串連運 作順暢,產能提升、交期縮短, 成品的交期由30天大幅縮短至 14天!此外,受惠於數位系統的 導入,億馨針織更向上管理,從 下單開始,客戶就可以登錄系統, 自行鍵入顏色、數量、交期等需 求,進一步提供客戶更完善的整 體下單流程!

數位轉型升級 持續創新優勢

洪家傑也分享企業數位轉型的寶

felt about the texture, their instincts, and their experience. After the digital transformation, through the management based on accurate data, parameters such as colors, fastness, and process time can be adjusted immediately to ensure product quality.

For instance, in color matching, once the clients made an order and provided standard colors, craftsmen usually had to use the trial-and-error method to try at least ten times and spend 6 hours to meet the clients' demands. As for now, the latest AI system rapidly calculates color ratios and figures out the formulation; the number of trials is halved, the color matching rate is improved, and the process time is reduced as well.Digital scheduling improves the efficiency of every procedure among the manufacturing process, facilitates the connection of

machines, enhances productivity and considerably reduces the delivery time from 30 to only 14 days! Moreover, thanks to the introduction of digital systems, Proknit Knitting even provides more comprehensive management and develops a more efficient ordering process by giving clients access to the system to key in their desired colors, quantity, and delivery time.

Maintaining the Advantage of Innovation with Digital Transformation and Upgrading

Hung shared his precious experience in enterprise digital transformation. In the initial phase of digital transformation, software programs were introduced right after development for employees to put into use immediately; however, unstable systems often caused many problems and led to a lot of complaints from employees, making them unwilling to use these new approaches. After knowing this, Hung changed the strategy and ordered that the software and systems be tested thoroughly before field application begins. "The user interface must be intuitive, streamlined, and easy enough for employees to understand immediately and find it a convenient tool that saves a lot of time and energy. It can support digital innovation and

On the other hand, during the intellectualization of the production process, Proknit Knitting tried to find suitable algorithms for the dyeing-finishing process to enhance the estimation accuracy of smart formulation, but the company was stuck in a bottleneck

transformation very much!"

▲ 導入數位轉型的初期,不僅要與公司員工溝通,就連協力廠商,也要磨合許久,共同讓 營運更上一層樓。In the initial phase of digital transformation, the company should have good communication with employees and figure out the best way to cooperate with subcontractors, working together to bring business operation to the next level.



認軟體與系統成熟後才導入現場 應用,而且「介面一定要直覺、 精簡、好用,不必太多説明就能 輕易上手,讓現場人員立即感受 到方便、省時、省力等益處,進 而支持數位創新與轉型!」





▲ 透過數位轉型,億馨針織因而產出智 慧配方,也進而提升產能、縮短交 期。Through digital transformation, Proknit Knitting developed smart formulation, enhanced productivity, and reduced the delivery time.

此外在流程智慧化過程中,億馨 針織為尋找適合染色製程的演算 法以提升估算正確率,產出智慧

for a long time and could not find the best solution. Fortunately, with its participation in the Intelligent Machinery Program of Digital Streaming and AI Applications for Industrial Supply Chain Clusters, hosted by the Industrial Development Bureau, the Ministry of Economic Affairs (MOEA), Proknit Knitting received timely advice from AI experts of the review board, applied the algorithms they suggested, and finally succeeded to develop smart formulation.

Under the enormous impact of the coronavirus (COVID-19) pandemic this year, Proknit Knitting experienced a decrease in sales, which led to idle resources within the company. However, the senior management team turned the crisis into an opportunity by putting more resources in research and 配方,曾遭遇好一陣子的瓶頸, 遲遲無法覓得最適合的方案。所 幸透過經濟部工業局「智慧機械 一產業聚落供應鏈數位串流暨 AI 應用計畫」,AI專家審查委員適 時給予方向,建議選擇的演算法 類型,終於闖關成功,順利產出 智慧配方。

今年受到嚴重特殊傳染性肺炎 (COVID-19,以下簡稱新冠肺 炎)疫情影響,億馨針織業績有 受到衝擊,導致出現部分資源閒 置的情況。不過經營高層卻趁此 時機加強研發,並且延續數位轉 型成果,進一步應用數據,強化 智慧染整能力。洪總經理提到「品 質提升是我們的下一個目標,未 來將透過數據提升品質,以模組

development, maintaining the benefits of digital transformation, and using data to strengthen its intelligent dyeing-finishing technologies. "Quality improvement is the next goal." General Manager Hung said, "In the future, Proknit Knitting will make good use of data to enhance quality and export the mature dyeing-finishing technologies to Southeast Asian countries in a modular way. The company will continue to develop much more advanced dyeingfinishing technologies in Taiwan to keep the leading position in processing functional fabrics and increase its dominance in both lowend and high-end markets."

化的方式將成熟的染整技術輸出 到東南亞等國,在台灣繼續研發 更高端的染整創新技術,維持在 機能布料的領先優勢,更通吃低 階與高階市場!」

億馨針織股份有限公司
公司簡介:
成立:1983年
創辦人:洪冬榮
總經理:洪家傑
員工數:70人
主要業務:針織布、機能布料染整
加工製造。
轉型心法:善用數據,增進組織溝
通,提升流程效率,進一步提升品
質。

Company Profile of Proknit Knitting

Founded: 1983 Founder: Dong Rong Hung General Manager: Jay Hung Employees: 70 Core business: dyeing, finishing, and processing of knitted fabrics and functional fabrics Transformation philosophy: making good use of data,

facilitating communication within the organization, improving the efficiency of the production process, and further enhancing the quality.

大詠城機械 扎根基礎建設、 關鍵技術 打造數位升級鑄造廠

Winson Machinery – Digitally Upgraded Foundries Made Possible through Solid Infrastructure and Key Technologies

> 大詠城機械總經理 謝宜軒 Eric Hsieh, General Manager of Winson Machinery

鑄造業有工業之母之稱,隨著數位製造時代來臨,帶動產業數位變革。大詠城機械為我國少 數專注於大型工具機鑄造的鑄造廠,近年來導入機械手臂、冶金智慧化數據分析、物聯網監 控系統、智慧客服系統,扎根數位基礎建設、掌握關鍵技術,邁向工業 4.0。

The foundry industry, often referred to as the mother of all industries, became the spearhead of industry digital reform with the advent of the digital manufacturing era. Winson Machinery Co., Ltd. is one of the few foundries in Taiwan that specializes in massive machine tool castings. In recent years, the company introduced the technology of robotic arms, intelligent data analysis in metallurgy, IoT monitoring systems, intelligent customer service systems, and developed other key technologies in order to build a firm foundation for their digital infrastructure, and take strides toward Industry 4.0.

▲ 2008 年二代經營者、現 ● 2008 年二代經營者、現 ● 2008 年二代經營者、現 任總經理謝宜軒參與公司運作, 開啟兩代共治。謝宜軒分享,「當 時覺得公司內部人才素質、軟硬 體設備條件都有待加強!開始針 對廠房設備、現場人員教育訓練 等方面著手優化。」

數位創新 跨進電控 與軟體系統

當廠房硬體設備到位後,大詠城 在五年前開始引進數位創新,首 先於 2015 年導入機械手臂,插旗 電控領域,接著在 2018 年建置冶 金智慧化生產線系統,跨進軟體 系統。談起數位轉型的契機,謝 宜軒指出,許多年輕世代不願從 事 3K 行業,預見鑄造業未來的人 才斷層,希望在危機發生前搶先 布局,以機械手臂取代部分人力。



Hsieh, the general manager of Winson Machinery, depicted the changes made by

installing digital monitoring systems with data shown on a screen.

台灣 3K 產業的説法來自日本 3K 仕事。 「3K」即「骯髒」(汚い,Kitanai)、 「危險」(危 ,Kiken)、「辛苦」(き つい,Kitsui)。

The term originated from the Japanese expression "3K," namely Kitanai (dirty), Kiken (dangerous), and Kitsui (difficult).

obs in the foundry industry \mathbf{J} are typically labelled as $3K^1$ (dangerous, dirty and difficult); however, Winson Machinery, since its inception, has been devoting a great deal of effort to exclusively casting structural components for large machine tools and other equipment, serving as an upstream supplier of machine tools. In 2008, Eric Hsieh, the second-generation leader and the current general manager of Winson Machinery, joined in the operation of the company, opening up a new era in cooperation with the firstgeneration leader. Sharing his experience, Hsieh said: "At the time, I thought it was essential to improve the quality of personnel and upgrade the hardware and software equipment in the company. Therefore, I started to make optimizations to equipment in factories and improved staff training quality."

Branching out Towards Electrical Control and Software Systems through Digital Innovation

After the hardware equipment in factories were optimized, Winson Machinery began to introduce digital innovation five years ago. In 2015, robotic arms were installed in factories, and the company branched out into the field of electrical control engineering; in 2018, an intelligent metallurgy assembly-line system was established, allowing the company to expand its business into the software system market. In terms of motivation for digital transformation, Hsieh indicated that young people were largely unwilling to do 3K jobs, and a serious talent shortage was predicted to hit the foundry industry. Therefore, he

made early preparations ahead of the crisis by using robotic arms to partially replace human labor.

At first, the company planned to work with ERP companies and App developers. However, after taking into consideration the cost of communication, timeliness, and other factors, Winson Machinery decided to develop core techniques by itself as resources for open-source hardware and software such as Python and Arduino were becoming much more abundant and mature. From sensors to system applications, the company challenged itself to develop all the technology on its own. "Development might take a very long time, and could even lead to serious losses if it fails," Hsieh stressed, "but if we make it, we would completely own the knowhow (knowledge/techniques)."

Hsieh found that the data from

原本也曾經考慮外部 ERP、App 開發廠商,在思考溝通成本、時 效性等因素後,再加上 Python、 Arduino 等開源軟硬體資源越來 越豐富成熟,大詠城決定核心技 術自主開發不委外,從感應器到 系統應用完全自主挑戰開發, 「可能很慢、可能失敗會很痛, 但是一旦成功的話,Know-How (知識/技術)穩穩掌握在自己手 中。」謝宜軒強調。

謝宜軒發現,在自家工廠生產線 中,無法從製程收集數據加以分 析,「工廠內的設備各自運作、 互不溝通,無法取得材料、溫度 等數據!」大詠城缺乏數據存取 記錄的狀況,是許多傳產的縮影。 「想要了解這一批鑄造砂的溫度, 必須親自跑到現場量測,才能知 道溫度數字!而且也只有片段的 紙本數據,沒有數位化的連續記 錄!」

the assembly lines in factories during the manufacturing process were inaccessible for analysis. "All the machines in factories are functioning independently, so it is impossible to collect the data of material, temperature, and other factors." The lack of access to data is not an exclusive phenomenon to Winson Machinery but a common challenge in traditional industries. "You would not know the accurate temperature of foundry sand unless you measured the temperature at the scene, and there are no history of digital records but only fragmental figures on paper available."

Collecting Data for Analysis, Prediction, and Optimization

With an aim to preserve the data during the manufacturing process for future use in analyzing,

收集數據 帶動分析預測優化

為了將製程中的數據留下來,帶 動未來的分析、預測、優化,大 詠城申請了經濟部科技研究發展 專案產業升級創新平台輔導計畫, 更在眾多製程中選定最困難的智 慧冶金,自2018年10月啟動「五 軸加工機底座之冶金智慧化生產 線系統建置研發計畫」,展開兩 年的數位轉型歷程。

在冶金的製程中,從原料熔解到 製出成品需時一周,以前只能在 一周後見真章。透過冶金智慧化 生產線系統收集大量數據,大詠 城的生產管理進入 IoT(物聯網) 化,開始進行資料分析與品質預 測溫儀器上傳到資料庫,能夠 即時提升熔解效率、調控合金成 分,也能從每一爐材料的機能預

predicting, and optimizing the process, Winson Machinery applied for the Guidance Plan of Industrial Upgrading and Innovation Platforms, the Technology Development Program (TDP) hosted by the Ministry of Economic Affairs (MOEA). Out of all the manufacturing processes available in the program, the company even chose the category of intelligent metallurgy, the most difficult one, launching a two-year digital transformation with the Installation and Development Project of the Intelligent Metallurgical Assembly-Line System for 5-Axis Machining Center Bases starting from October 2018.

In metallurgical processes, it takes one week from melting the raw material to the end of production, and therefore, in the past, the quality of finished products could only be evaluated a week later. However, assisted by the



▲ 不用到電腦上看,透過公司自建的 WINSON 智慧客服系統,也能獲得即時 資訊。No need to check on computers. The WINSON smart customer service system developed by the company provides up-to-the-minute information on smartphones.

測成品的硬度、拉力等細節,透 過預測機械性能、調整提升良率。

其中數件製作工藝複雜的外銷 德國鑄件,良率也從86%提升 至95%, 而原本整廠平均良率 96%,更持續向上提升。謝宜軒 指出,「良率提升、客訴降低、

Intelligent Metallurgical Assembly-Line System which collects a vast amount of data, Winson Machinery can integrate IoT technologies into production management and carry out data analysis and quality prediction. The real-time temperature data of foundry sand is immediately uploaded to the database through temperature detection instruments. As a result, melting efficiency can be improved and alloy composition can be adjusted right away; moreover, based on the functions of materials in each furnace, the hardness, tensile strength, and other properties of the finished products can also be predicted. According to the prediction for mechanical properties of materials, the yield rate can also be further enhanced.

The yield rate of several difficult to craft castings for export to Germany has been raised from 86% to 95% as well. The overall 退貨降低,就連客戶查詢生產進 度的電話也都少了很多!不但在 生產過程能夠實現彈性生產、對 於客戶端也能提供即時訊息、產 品優化等附加價值。」

自行開發 打造數位升級鑄造廠

因為數位轉型的努力,大詠城 擁有自行開發系統的實力,例 如 WINSON 管理 監 控系統與



▲ 不同的金屬礦物原料的重量在一開始就做記錄,一直到原料熔解到製出成品,透過冶金 智慧化生產線系統收集大量數據,並減少人工介入的錯誤率,提升良率。Weights of different metal mineral raw materials are recorded from the start. With the Intelligent Metallurgical Assembly-Line System, a large amount of data is collected from melting the material until the end of production to reduce the probability of human error and increase the yield rate.

WINSON 智慧客服系統等,幫助 生管團隊監測設備、礦砂溫度, 更串聯上中下游。還能透過系統 超前部署,當發現材料異常時, 立即串聯上游供應商進行改善, 提前排除不良率;連結 WINSON 智慧客服系統,客戶可以自行查 看了解品質、製造進度、交貨時 間,不必再追著生管同仁盯進度、 確認交期。

average yield rate in factories even started steadily climbing from 96%. "The improved yield rate has reduced customer complaints and the number of refund requests we received. Even phone calls from clients to check the production progress have been significantly reduced!" Hsieh explained: "The production process not only became much more flexible, but also gives a lot of real-time information, optimized good quality, and provides other additional values for clients."

Digitally Upgraded Foundries Built on Self-developed Systems

Due to efforts in striving for digital transformation, Winson Machinery is now capable of developing systems independently, such as the WINSON management monitoring system and the WINSON smart customer service system. These systems help the product management team monitor equipment and the temperature of foundry sand, connecting upstream, midstream, and downstream operations. In addition, these systems allow the company to make early preparations before any abnormalities regarding materials occur, reducing the defect rate by immediately contacting the upstream supplier to improve the quality. Furthermore, clients can check the quality, the progress, and the delivery time themselves on the WINSON smart customer service system. No longer will they need to keep badgering the product management team for the latest update anymore.

Seriously affected by the coronavirus pandemic this year, many industries temporarily put a halt to investing in machinery,

equipment, and other capital goods, which led to a 30% decrease in sales for Winson Machinery. Yet, the company seized the chance to gather all product teams together for digital training. By staying in touch with existing clients via digital systems and distance meetings, the company made good use of the benefits from digital transformation and found even more clients from new industries. Extending its business from machinerv into semiconductors and other supply chains, Winson is expected to present a brand-new image as a digitally-upgraded foundry!

Starting from the Basics - Digitalized Infrastructure

The Installation and Development Project of the Intelligent Metallurgical Assembly-Line



▲ 大詠城機械自行開發的 WINSON 砂溫監控 裝 置。The WINSON sand temperature monitoring device solely developed by the company.

練基本功 建構數位基礎建設

「五軸加工機底座之冶金智慧化 生產線系統建置研發計畫」將於 今(109)年9月結案,大詠城已 經啟動另外兩個數位轉型專案, 包括智慧冶金效益發展與鎖定循 環經濟的「A+企業創新研發淬鍊 計畫」,前者延續之前研發的成 果,期盼進一步透過鑄造砂溫度 預測對於成品性能、應力等影響; 後者聚焦於研究製程中產出的爐 渣、粉塵及廢鑄砂再運用,擁抱 循環經濟。「大詠城正在努力建 構數位轉型,收集串接數據並分 析,除了把基本功練好;也不忘 擁抱低碳永續的綠色經濟」謝宜 軒強調。

透過參與經濟部的計畫,在嚴格 審查的評選過程,讓大詠城不斷 自我盤點、成長,更因為政府 案前瞻創新的概念,對於IT人員 的徵才留才很有幫助。謝宜軒指 出,鑄造屬於投入數位開發艱困 產業,缺人才、缺資源,期待 所能多關注號召這些艱困產業, 推大家一把,將黑手產業帶向智 慧、數位的新境界!

System for 5-Axis Machining Center Bases will be completed in September, 2020. Two more digital transformation projects have already been launched by Winson Machinery, one of which is "A+ Industrial Innovation R&D Program" focusing on two aspects - improvement in efficiency for intelligent metallurgy and closed integration in a circular economy: the former is to leverage research results to further influence product performance and improve stress management by predicting foundry sand temperature; the latter is to focus on reusing the slag, dust, and discarded foundry sand to embrace a circular economy. "Winson Machinery keeps striving to fulfill digital transformation by collecting and analyzing connected data." Hsieh stressed: "In addition to building a solid infrastructure, we also keep the vision of a lowcarbon, sustainable green economy in mind."

Through participation in programs hosted by the MOEA, Winson Machinery has reassessed itself and learnt a lot during the strict review process. Inspired by the forward-thinking and innovative concepts in these governmental programs, the company has also gained helpful ideas in recruiting and retaining IT talent. Hsieh indicated that digital development is hard to be done in the foundry industry because of the shortage of talent and resources. He wishes that the government could pay more attention to this situation and provide more assistance to industries in need, guiding the blue-collar industry to a new smart and digital age.

大詠城機械 公司簡介:

成立:1980年 創辦人(董事長):謝順民 總經理:謝宜軒 員工數:150人 主要業務:鑄鐵件產品生產與銷售 轉型心法:意識到數據的重要性, 從感測硬體到軟體應用完全自主挑 戰開發,走得慢卻將know-how(知 識/技術)穩穩掌握在自己手中。



▲ 大詠城已經啟動兩個數位轉型專案,努力 建構數位基礎建設,收集、串接數據, 希望將黑手產業帶向智慧、數位的新境 界! Winson Machinery has engaged in two digital transformation projects and managed to construct digital infrastructure, collecting and connecting data to bring this blue-collar industry into a new smart and digital age.

Company Profile of Winson Machinery

Founded: 1980

Founder: Shun Ming Hsieh General Manager: Eric Hsieh Employees: 150 Core business: sales and production of casting products Transformation philosophy: being aware of the importance of data, taking on the challenges to independently develop hardware of sensors and software of applications, taking slow but steady steps to obtain the know-how (knowledge / techniques)

黑橋牌創新突破 不畏疫情 求新求變 拚永續

Black Bridge Pursues Sustainability Through Innovation and Transformation Despite the Pandemic



黑橋牌食品董事長 陳春利 Mr. Robert Chen, the chairman of Black Bridge Foods.

一句「用好心腸做好香腸」的品質堅持,讓黑橋牌從一家台南老店,征服無數海內外華 人的味蕾。然而面對瞬息萬變的消費市場,董事長陳春利在傳承父親陳文輝打下的基礎 下,十年前就開始導入智慧化與數位化轉型,藉由數據資料分析,建立起生產、行銷到 冷鏈物流的系統,也讓黑橋牌挺過這十年來的食安風暴,成為國人最信賴的品牌之一。

Black Bridge evolved from a traditional store in Tainan to an internationally renowned brand loved by Chinesespeaking communities with its insistence on high-quality products, as its slogan goes - "using a good heart to make good sausages." In response to the dynamic consumer market, Chairman Robert Chen took up the baton from his father Wen-hui Chen and introduced the transformation of intellectualization and digitization to the brand 10 years ago. Through data analysis, Black Bridge managed to establish a system that encompassed production, marketing, and cold chain logistics, which allowed the company to make it through the food frauds in the last decade and become one of the most trustworthy brands in Taiwan.

60 年來產業環境、消費市場、流 通業變化萬端,在經營層面也必須 因應創新科技的潮流,透過智慧化 與數位化的導入和轉型,期待更 貼近消費顧客的心,回應市場的需 求。然而一場口蹄疫,改變了黑橋 牌的命運。

▲ 透過智慧化與數位化轉型,藉由數據資料分析,建立起生產、行銷到冷鏈物流的系統,讓 黑橋牌成為國人最信賴的品牌之一。Through the transformation of intellectualization and digitization, Black Bridge performed data analysis, established a system that encompassed production, marketing, and cold chain logistics, and became one of the most trustworthy brands in Taiwan.

口蹄疫情爆發 拓展行銷通路多元化

口蹄疫之前,門市的銷售佔品牌業

績的8到9成,其他超市的銷售佔 比還很低,但口蹄疫讓國內消費者 對豬肉加工食品的消費意願大大降 低,全台門市3個月都沒什麼生意,

" My father was adept at making sausages. Though founded from scratch in Tainan, Black Bridge became one of the earliest franchises at that time," said Robert Chen, the chairman of Black Bridge Foods. He remembered that back then, people from all over Taiwan flocked to the shop in Tainan to buy newyear gifts during Lunar New Year holidays. In 1976, the former chairman of Black Bridge decided to expand the business to Taipei and Taichung. At the time when hypermarkets, supermarkets, and convenience stores just came into being in Taiwan, Black Bridge had already introduced automated production and opened up 15 retail stores in Taiwan.

In the last 60 years, industrial

environments, consumer markets, and logistics have been everchanging, and management approaches have to change in response to the wave of innovative technology. Through the introduction and transformation of intellectualization and digitization, Black Bridge expected to get to know more about what consumers wanted and respond to market needs. However, the outbreak of foot-and-mouth disease changed the fate of Black Bridge.

The Outbreak of Foot-And-Mouth Disease Diversifies Marketing Channels

Prior to the outbreak of foot-andmouth disease, sales in retail stores accounted for around 80 to 90 percent of the total revenue. whereas sales in supermarkets remained low. Nonetheless, consumers were concerned about the outbreak of foot-and-mouth disease and refused to buy as much processed pork products as they did before. The outbreak crippled its business in all retail stores in Taiwan and the sales decreased by 40 percent. Robert Chen, who was then ready to take up the baton from his father, said. "For nearly three months. we had no customers in our retail stores; however, the business in supermarkets started to show signs of recovery.

Despite the epidemic, pork was still one of the daily necessities for most households, and consumers 業績大降四成。當時已進入公司做 接班準備的陳春利回憶道,「整整 三個月,門市幾乎沒有生意而其他 生鮮超市的銷路卻已開始回溫。」

由於肉品消費仍是民生必需,消費 者口蹄疫情後開始轉向生鮮超市通 路採購,國內連鎖超市、超商數量 大幅成長的業態,讓黑橋牌的行銷 策略隨之靈活調整,從門市銷售轉 向更多元的銷售通路品牌門市。透 過幾千家的超市通路的合作近距離 接觸消費者、強化與百貨公司合作 設櫃,使得黑橋牌的商品流通更多 元,銷售業績更是呈現大逆轉。

如今黑橋牌不僅是超市量販低溫肉 品市佔率第一名,多元通路的銷售 業績也佔了品牌銷售的六成。門市 銷售則更聚焦在年節送禮的市場,

turned to supermarkets to purchase pork products after the outbreak. The sales in supermarkets and convenience stores thus increased substantially. In turn, Black Bridge made immediate changes to its marketing strategies and expanded its marketing channels. With thousands of supermarkets and retail counters in department stores accessible for consumers, Black Bridge managed to turn the tables and boost its sales by selling its products in even more diverse channels.

Currently, Black Bridge remains the best-selling brand for processed meat products in supermarkets. The sales in these diverse channels account for 60 percent of the brand's total sales. The retail stores, on the other hand, 透過新品開發和年節禮盒的彈性搭 配,吸引忠誠消費者上門。

食品安全把關 QR code 建奇功

「肉品加工畢竟是短效型商品,最 多就是兩個月,新鮮與食品安全是 我們最在乎的。」陳春利表示,台



▲ 手機掃描包裝上的 QR code, 消費者 可以查得到豬肉來源, 讓食安更有保 障。By scanning the QR code on a package, consumers can learn about the sources of pork, which ensures food safety.

focus on the gifting market during Lunar New Year holidays. With new products and gift boxes for holiday seasons, Black Bridge's retail stores managed to attract its repeat customers..

QR Codes Brings Surprising Success in Ensuring Food Safety

"Processed meat is perishable and the expiration date is within 2 months; therefore, food safety and freshness are what we care about the most," Chen explained. Ever since 2011, there have been 灣從 2011 年起發生「起雲劑和塑 化劑食品添加物」事件、2013 年 「毒澱粉」、2014 年食用油危機 等食品安全問題,對食品產業的衝 擊都不下於口蹄疫。因應這些食安 事件,政府做出了更多的規範,對 於食品安全的把關,從推動多年的 CAS 台灣優良農產品標章,進化 到食材的溯源和生產履歷,不管是 在初步肉品標章認證上還是後續追 蹤溯源,都有一定程序,也為業者 帶來轉機。

來到量販店,用手機掃描包裝上的 QR code,消費者都可以查得到豬 肉來源,也可追溯到生產批號,當 產品被懷疑有問題時,不管在哪個 通路都可追得到,做到即時下架, 整批回收,大大降低消費者買到的 風險。

a series of food safety incidents, including the use of plasticizers in food as a clouding agent in 2011, toxic starch in 2013, and cooking oil adulteration in 2014. For the food industry, the harm caused by these food fraud scandals was no less than the impact of foot-and-mouth disease. In response to the need of better food safety, the government has formulated corresponding policies and regulations, including CAS (Certified Agricultural Standards), which has been pushed forward since years ago, sourceable food, and traceability systems. From the initial certification of meat products to follow-up traceability reports,

protocols are designed for each procedure, bringing the industry more opportunities.

28



▲ 行動會員 APP 可以累積會員資料,進行整合分析,適時調整經營方向。The Black Bridge mobile application can collect data of its members and help Black Bridge adjust its management strategies through meta-analyses.

數位化管理 暢行通路 貼近消費者

黑橋牌的數位化經營早在15年前,就已導入企業資源規劃 (Enterprise Resource Planning, ERP)系統,並在10年前就已運 用政府的關貿平台取得大型賣場的 進銷存資訊,藉以調整廠內的庫存 與供貨,快速反應不同通路的需 求,也作為採購及生產的依據。

2018 年 黑 橋 牌 推 出 行 動 會 員 APP,整合優惠券、會員點數、商 城、行動會員卡等多樣功能,積極 搶攻會員戰場。「我們現在有 30 家門市,20 萬會員。累積的紅利 點數可以折抵現金,也能至『瘋搶 優惠』專區兑換各式優惠券,更貼 心的是,優惠券還能轉贈與其他使 用黑橋牌 APP 的親朋好友,僅需 輸入對方的手機號碼即可完成轉 贈。」結合官方購物平台,「黑橋 商城」可以一鍵導流會員至官網下 單購買,滿足會員購物需求。也藉 由透過會員資料庫數據的累積,進 行整合分析,適時調整經營方向, 不僅可以提升顧客的滿意程度,進 而提高營運效率。

數位轉型 讓業績面對疫情 逆勢成長

投入數位轉型,對已有一甲子歷史 的黑橋牌來説,是挑戰也是契機。

Digital Management Expands Marketing Channels and Satisfies Consumer Needs

Speaking of digital management, Black Bridge introduced the Enterprise Resource Planning (ERP) system to its business as early as 15 years ago. By accessing the inventory information of hypermarkets through Trade-Van, Black Bridge has been able to manage its inventory and distribution, respond to the needs in different marketing channels, and use the information for its procurement and production plans since 10 years ago.

In 2018, Black Bridge developed a membership mobile application

which integrates coupons, reward points, e-stores, and e-membership cards into one platform, aiming to attract more members with this app. "Currently, Black Bridge has 30 retail stores and 200,000 members in Taiwan. Members can redeem their reward points for cash or a variety of coupons; what's more, these coupons can be easily transferred to other users of Black Bridge App by typing in their phone numbers." Linked to the official shopping website, the "Black Bridge Online Shop" in the app allows members to place their orders with simply a tap on their phone screens. With the data stored in the member database, Black Bridge can conduct a meta-analysis and adjust its operation strategies accordingly.

In doing so, the company can not only improve customer satisfaction, but also enhance its operational efficiency.

Black Bridge Defeats the Pandemic and Boosts Its Sales Through Digital Transformation

As a brand that spans over 60 years, digital transformation represents new challenges as well as new opportunities for Black Bridge. Robert Chen indicated that as a front-runner in the food retail industry, it was never easy to collaborate with businesses in other industries, such as IT companies, hardware and software providers, and retailers. 陳春利指出,身為食品零售業龍 頭,與跨領域產業的資訊公司、軟 硬體廠商、銷售通路相互配合,這 過程並非易事,但如果透過數位科 技,讓我們更了解消費者的想法, 建立與消費者更長遠的情感與滿 意度,同時也提升公司營收、生產 力等,甚至幫助黑橋牌調整經營方 向,那這數位轉型過程中帶來的辛 苦,不僅非常值得,而且深具意義。

也正因為黑橋牌勇於改變,面 對去年到今年,對岸爆發非洲 豬瘟以及嚴重特殊傳染性肺炎 (COVID-19,以下簡稱新冠肺炎) 疫情,黑橋牌門市業績雖受影響, 但超市業績反而大爆發,成長幅度 更勝以往。 黑橋牌從品牌形象建立、生產履歷 溯源、多元行銷管道、產品開發 到冷鏈系統遍及量販、超商深入社 區,甚至拓展電商業務,都與近十 年來的數位轉型與創新緊密相連, 也象徵一個創業 60 年的品牌,求 新求變的決心。



▲ 透過數位轉型,讓已有一甲子歷史的黑橋牌,有了新的發展方向。As a brand that spans over 60 years, Black Bridge is able to set a new blueprint for the future through digital transformation.

Nevertheless, thanks to digital technology, Black Bridge is able to learn about consumer opinions, build customer relationships, and improve customer satisfaction. At the same time, the application of digital technology increases Black Bridge's revenues as well as productivity and even helps adjust its operation strategies. Hence, even though it took a lot of work to complete digital transformation, he thought it was all worthwhile and meaningful for the company.

Black Bridge never shies away from transformation; therefore, though the outbreak of African swine fever last year and severe pneumonia with novel pathogens (COVID-19) this year affected the sales in Black Bridge's retail stores, the sales in supermarkets, on the contrary, surged with unprecedented growth rates.

In the last 10 years, every step Black Bridge has taken is closely correlated with digital transformation and innovation, including building a brand image, introducing traceability systems, establishing diverse marketing channels, developing new products and cold chain logistics, setting up retail counters in supermarkets and convenience stores, and even creating e-commerce platforms. All

黑橋牌食品

公司簡介: 成立:1957年 創辦人(董事長):陳文輝 總經理:陳春利 員工數:400人 主要業務:臺灣香腸、肉酥、肉乾、 牛肉乾、臘肉等傳統中式肉品 轉型心法:生產履歷溯源、拓展電 商業務,求新求變迎戰新變局。

Company Profile of Black Bridge Foods

Founded: 1957 Founder: Wen-hui Chen General Manager: Robert Chen Employees: 400

Core business: Taiwanese sausages, pork floss, pork jerky, beef jerky, cured meat, and other traditional Chinese-style meat products.

Transformation philosophy:

introducing traceability systems, expanding its business to e-commerce platforms, and taking on new challenges with innovation and transformation

these actions have well shown the strong determination of a 60-yearold brand to embrace innovation and transformation.

豆府餐飲集團 優化數據管理 實現智慧餐飲

Tofu Restaurant Group Smart Catering Realized Through Data Management Optimization

隨著越來越多餐飲邁向連鎖化、集團經營, 品質提升與精準管理成為競爭力的關鍵!豆 府餐飲集團主打正宗韓式料理,以多品牌經 營策略不斷擴張,目前在全台已有 51 家門 市,導入智慧出餐管控、電子問卷、訂候位 及自動排位等系統,收集數據、優化品質, 提升營運效率與顧客滿意。

As restaurant chains and groups are on the growth, quality enhancement and precision management have become the keys to remaining competitive in the market. Tofu Restaurant Group, known for providing authentic Korean cuisines, is expanding its business scale following a multi-brand strategy. The group currently operates 51 brick-and-mortar stores in Taiwan and has introduced smart systems for menu ordering, online survey, table reservation, and automatic queue management. These digital systems help the group collect relevant data, optimize service quality, increase operational efficiency and eventually enhance customer satisfaction.

豆府餐飲集團資訊管理部 經理 呂禮同 Li-tung Lu, Manager of Information Management at Tofu Restaurant Group 府餐飲集團於2008年創 立,主打正宗韓式料理精髓 與道地烹調手法,發展出不同類型 韓式料理,推出涓豆腐、北村豆腐 家、韓姜熙的小廚房、銅盤、姜滿 堂、以及一名為飛機河粉的越式料 理等六大品牌。創辦人吳柏勳與總 經理吳孟哲為表兄弟,一位具備食 品經驗,一位有著科技背景,近年 來導入數位科技,將餐飲業從服務 型態升級為數據管理,瞄準管理財 邁進!

就像許多餐飲業者一般,為了傾聽 顧客心聲,豆府餐飲集團曾經使用 紙本顧客意見表,即使大部分的題 目可以透過機器讀取,然而姓名、 意見等卻必須由工讀生人工鍵入, 打字速度永遠追不上門市回傳的新 意見表!此外,出餐速度、訂候 位及排位、食材與耗材的叫貨管理 等,也都存在許多挑戰與盲點。

導入 ERP 系統管理 即時精準

2017 年 起, 豆 府 餐 飲 集 團 導 入 企 業 資 源 規 劃 (Enterprise Resource Planning, ERP)系統, 再加上自行開發的功能,一步一步 數位升級轉型。豆府餐飲集團資訊 管理部經理呂禮同説明,每一桌點 餐完成後就會出現一張點餐明細, 消費者只要掃瞄上方的 QR Code 就會連結電子問卷,消費者當場填 寫傳送後,櫃台立刻接收,只要其 中一題出現不滿意或非常不滿意的 回答,櫃台上的平板電腦就會出現



▲ 電子問卷能即時處理消費者的意見,提高 消費者對豆府餐飲集團的滿意度。The online survey system helps address consumer opinions in real time and in turn enhances customer satisfaction towards Tofu Restaurant Group.

ounded in 2008, Tofu Restaurant Group has been focusing on providing authentic Korean cuisines with traditional recipes. The group owns several brands focusing on diverse Korean cuisines, including Dubu House Korea, Hanok Tofu, Han Jeong Sig, BBQ Bronze, Jon Mat Taeng, and Pho Tau Bay, a Vietnamese restaurant. Po-shun Wu, the founder of Tofu, and Meng-zhe Wu, the group's general manager, are in fact cousins. With one specializing in food manufacturing and the other in IT, the two have implemented technology in the restaurant group and transformed its service-based business model into an entire new model centered around data management, generating profits through robust management.Similar to many

restaurants, Tofu used to collect customer feedback through paperbased questionnaires. While most of the questions could be recognized by computers, items such as names and comments were still keyed in by part-time workers, and their speed was not fast enough to handle all incoming questionnaires from the restaurants. In addition, there were also challenges and blind spots in the speed of service, table reservation, queue management, and inventory management.

Precision Management Made Possible Through Enterprise Resource Planning

In 2017, Tofu Restaurant Group

started digitalization and then turn into digital transformation by introducing the Enterprise Resource Planning (ERP) system and several self-developed addons. Li-tung Lu, the Manager of Information Management at Tofu Restaurant Group explained that after an employee takes an order, a receipt is automatically printed and sent to the table. Consumers can then scan the QR code on the receipt and fill in the online survey. Questionnaires submitted are received by the front desk in real time, and alerts will pop on the tablet at the front desk if any of the questions are rated with unsatisfactory or very unsatisfactory. Front desk employees will then take immediate measures to address customer dissatisfaction.

33

紅色警示,門店同仁立刻就能詢問 原因,消費者的意見立即被處理與 重視。

透過智慧出餐管控系統(Kitchen Display System,KDS),完整紀 錄從點餐到出餐的時間,大幅減少 顧客抱怨及成本損失,相關數據更 匯聚成為寶貴資料庫,分析每日、 每周、平日、假日等不同數據,優 化出餐速度,達成更高的翻桌率, 進而提升營業數字!預點餐功能也 在尖峰時段助陣,當消費者排隊等 候時,可以透過平板電腦預先點 餐,推進客人點餐速度、幫助廚 房提前備料,達成時效、品質、 顧客滿意、翻桌率多效合一。

ERP 系統更與所有門店連線,幫

助門店同仁每天預定食材,發揮 集中採購、掌控成本等效益,透 過長期的數據累積,除了透過同 仁的經驗判斷,也增添 AI 分析建 議,人機協作降低耗損與錯誤率。 此外,針對每半年更換菜單的大 事,也能透過 ERP 與銷售時點信 息系統(Point of Sale,POS) 的資料,根據點購率更有所本, 留下消費者喜歡的長賣型明星品 項,淘汰不受歡迎的品項,並且 了解新品的顧客接受度,做為未 來開發新菜色的參考。

有數據有資料超前 預判預防問題

導入數位工具前,為了應付每周 一的會議,主管們從周日下午就 開始做報表,導入數位工具不僅 節省人力與工時,更享有時效的 優勢。呂禮同指出,以前發生客 訴、食材耗損、現場大排長龍等 問題,都只能在問題發生後檢討,



▲ 透過數位工具,可以蒐集好數據資料, 讓管理更到位更即時,甚至可以超前預 判、預防問題發生。Digital tools help collect data and increase operational efficiency. It is even possible to predict and solve problems beforehand.

With the Kitchen Display System (KDS) recording the time from taking an order to serving, customer complaints and business expenses are significantly reduced. Furthermore, the data collected are compiled into a database. Through the comparative analysis of data collected daily, weekly, on weekdays, and on weekends, Tofu is able to accelerate its service speed, increase the table turnover rate, and generate even more profits. In addition, the preorder service is also helpful in peak hours. Consumers can make orders on the tablet while they are in the queue. This speeds up the time it takes to take an order, and kitchen staff are able to prepare ingredients in advance, improving operational efficiency, service quality, customer satisfaction, and

turnover rates at once.

All of Tofu's restaurants are connected to the group's ERP system. Each restaurant orders ingredients from the system every day to achieve centralized procurement and cost reduction. As employees order ingredients, the AI-powered system will provide purchase suggestions based on the data collected over the years. The human-computer collaboration helps reduce ingredients wasted and avoid ordering the wrong quantity. Currently, Tofu changes its menus once half a year, and data from the ERP and POS (point of sale) system serve as a reference of how often each menu item is ordered. As a result, popular dishes will be kept on the menu, and unpopular ones will be

removed. The popularity of each item will serve as a reference for the modification of future menus.

Predictive Analytics Help Solve Problems in Advance

Before these digital tools were introduced, executives in Tofu had to prepare materials for the weekly meeting on Mondays since the previous afternoon. Now, a significant amount of labor and workload has been reduced, and operational efficiency has increased. Li-tung Lu indicated that problems such as customer complaints, ingredient waste, and long queues could only be remedied after they happened. Oftentimes, it was difficult to analyze the roots of the problems



▲ 整合線上預約、電話訂位、現場候位等的 訂候位系統及自動排位系統,透過 AI 的 建議,能進行座位安排最佳化,更能縮短 現場領檯的訓練,傳承領檯現場排位的 經 驗。The reservation and automatic queue management systems integrate data from online reservation, phone reservation, and on-site queuing. Suggestions made by the AI system help optimize table arrangement. This mechanism shortens the time needed to train a restaurant supervisor and makes table arrangement a transferable skill. 還經常面臨資訊不足、只能猜測 等窘境,現在有數據有資料,管 理更到位更即時,甚至可以超前 預判、預防問題發生。

今年受到新冠肺炎疫情影響,豆 府餐飲集團從外送與外帶兩方面 同步因應,搭配進駐賣場與外送 平台的合作,並且在4月起推出 外帶88折有感優惠,更在3月起 就放置透明隔板,降低消費者在 店內用餐的疑慮。在種種努力下, 今年上半年累計營收7.73億元, 年增18.10%,比起其他同業動輒 腰斬的慘況,堪稱是前段班中佼 佼者!

在數位轉型的過程中,豆府餐飲集 團也接軌政府的輔導資源,去年 透過中國生產力中心的專案計畫, 導入智慧出餐管控系統(KDS)、 LINE@,升級智慧餐飲、深耕社 群經營。在專案計畫進行的期間, 審核委員給予關鍵意見,成為應 用上的最佳指引。呂禮同説明, 集團的每個品牌出餐速度不同, 例如涓豆腐30分、北村豆腐家 16分、主打美食街的飛機河粉則 為5分鐘,在進行智慧出餐管控 系統(KDS)的分析時,依據審 核委員的建議,給予不同的設定 參數,優化製作與出餐的效率。

數位升級轉型超前 部署管理

呂禮同指出,豆府導入數位工具, 正是希望扭轉產業的商業模式, 從過往的服務業轉型升級為「以

due to the lack of relevant data, and solutions were sometimes made by guess. With the new systems, the company now has adequate information and data to increase operational efficiency, and it is even possible to predict and solve problems beforehand.

In light of the outbreak of COVID-19, Tofu Restaurant Group has started offering to-go dishes and food delivery service by working together with shopping malls and food delivery platforms. A 12% discount has been applied to all to-go dishes since April. Furthermore, the company installed plastic barriers in its restaurants to reduce consumer concerns over the pandemic. With all of the efforts made, the revenue in the first half of this year reached NT\$773 million, an industry-leading 18.10% YOY growth, while many of Tofu's competitors have experienced more than 50% revenue decline.

During the process of digital transformation, Tofu Restaurant Group has benefited from governmental resources. The company participated in a project by China Productivity Center and adopted the KDS and Line@ systems to develop smart management mechanisms and invest in social media. Furthermore, suggestions provided by members of the evaluation committee served as application guidance for the company. Li-tung Lu indicated that each brand under the group has a different standard for service speed. For example, the standard service speed for Dubu House

Korea is 30 minutes and 16 for Hanok Tofu, whereas for Pho Tau Bay, a brand that opens stores in food courts, the standard is 5 minutes. To increase preparation and serving efficiency, Tofu adjusted the variables in the KDS system for each brand based on the advice from the committee members.

Digital Transformation Enables Early Strategies in Management

Li-tung Lu pointed out that Tofu introduced the digital tools to seek changes in its operational strategies. The company has transformed its service-based business model into an entire 數字管理、賺取管理財!」

今年豆府餐飲集團持續擴大數位 應用,包括導入線上簽核系統、 訂候位系統及自動排位系統等。 以訂候位系統及自動排位系統等。 例,整合線上預約、電話訂位、 現場候位等三大來源,透過 AI 的 建議,結合資深領檯的經驗,進 行座位安排最佳化,能夠訓練餐 廳最難養成的現場領檯,縮短訓 練養成時間,更傳承領檯現場排 位的經驗。

未來豆府餐飲集團每年計畫性的 展店,更需要仰賴數位系統的數 據優化管理。呂禮同強調,過往 依據人力、食材、客訴等許多落 後指標進行營運與管理,期待透 過數位科技導入,將落後追到「平 行」甚至能夠「超前」,打造更 優質的用餐體驗!



公司簡介: 成立:2008年 創辦人:吳柏勳 總經理:吳孟哲 員工數:1800人 主要業務:韓式餐飲 轉型心法:數位工具一定要直覺、 好用,減輕公司與門店同仁工作的 負擔,自然而然轉換、取代傳統紙 本運作!

豆府股份有限公司

new model centered around data management, generating profits through robust management.

This year, Tofu Restaurant Group continues to expand its digital applications, including electronic records with digital signatures, a reservation system, and an automatic queue management system. Take the reservation and automatic queue management systems for example. The systems integrate data from online reservation, phone reservation, and on-site queuing. The data are then used to optimize table arrangement with suggestions made by the Al system and the experience of senior supervisors. This mechanism shortens the huge amount of time needed to train a restaurant supervisor, one of the hardest

positions in the store, and makes table arrangement a transferable skill.

Tofu Restaurant Group is planning to open new stores on a yearly basis, and this ambition relies heavily on data management optimization. Li-tung Lu added that the company's operational strategies were based on outdated indicators such as labor, ingredients, and customer complaints. It is expected that with the introduction of digital technology, Tofu will be able to catch up with and even outperform its competitors and provide an even better dining experience.

Company Profile of Tofu Restaurant Group

Founded: 2008 Founder: Po-shun Wu General Manager: Meng-zhe Wu Employees: 1800 Core business: Korean Food & Beverages

Transformation philosophy: digital tools must be easy to understand and use to reduce the workload of a company and its employees, and paper-based work will then naturally be replaced by these tools.



DIGI⁺ 季刊第十期 DIGI⁺ Quarterly No.10

發行單位 PUBLISHER

行政院科技會報辦公室

OFFICE OF SCIENCE AND TECHNOLOGY, EXECUTIVE YUAN

電話 TEL

02-27377700

地址 ADD

臺北市大安區和平東路二段 106 號 5 樓

5F., No.106, Sec. 2, Heping E. Rd., Da'an Dist., Taipei City 106, Taiwan (R.O.C.)

網址 WEB

www.digi.ey.gov.tw

緫 編	輯	Editor	蔡志宏	Zse-Hong Tsai		
編輯小	ヽ組	Editorial Team	蕭景燈	Ching-Teng Hsiao		
			林劍秋	Chien-Chiu Lin		
			陳均輔	Chun-Fu Chen		
企劃	習作	Production	天下雜誌	整合傳播部 CommonWealth Magazine Group		
企劃主編 Executive Editor		白雲香	Yun-Hsiang Pai			
			文仲瑄	Chung-Hsuan Wen		
攝 影		Photographer	徐昭鈴	Zhao-Ling Xu		
			劉威震	Wesley Liu		
			蔡世豪	Shih-Hao Tsai		
			林育恩	Marco Lin		
設	計	Designer	劉丁菱	Ting-Ling Liu		

資料及照片來源 Printsource

行政院科技會報辦公室 OFFICE OF SCIENCE AND TECHNOLOGY, EXECUTIVE YUAN

出版日期 Date of Publication

109年09月 Sep 2020

版次 Edition

初版 First Edition



行政院科技會報辨公室 OFFICE OF SCIENCE AND TECHNOLOGY, EXECUTIVE YUAN

106臺北市大安區和平東路二段106號5樓 5F., No.106, Sec. 2, Heping E. Rd., Da'an Dist., Taipei City 106, Taiwan (R.O.C.) 電話 TEL:+886-2-2737-7470 傳真 FAX:+886-2-2737-7469 網址 WEB:www.bost.ey.gov.tw

