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FROM MASS PRODUCTION TO SCALE CUSTOMISATION

量產客制化

RESEARCH
E-GUIDEBOOK

Challenges & Opportunities for
Hong Kong Industrial Design Professionals
香港工業設計專業的挑戰與機遇

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**From Mass Production to
Scale Customisation:
Challenges and Opportunities for
Hong Kong Industrial
Design Professionals**

**量產客制化：
香港工業設計專業的挑戰與機遇**

e-Guidebook
電子版指南

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31/F, Billion Plaza,
8 Cheung Yue Street,
Cheung Sha Wan, Kowloon, Hong Kong
香港九龍長沙灣長裕街8號億京廣場31樓

T (852) 2732 3188
F (852) 2721 3494
W www.designcouncilhk.org
E dchk@fhki.org.hk

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Executive Editor 總編輯

Prof Eric C. Yim 嚴志明教授

Project Manager and Editor 統籌及編輯

Vivian Au 歐慧敏



Foreword 前言

Challenges or Opportunities: The Heart Determines

The Advanced Manufacturing Partnership and National Network for Manufacturing Innovation from the US, Industry 4.0 in Germany, Japan Industry 4.1J, Manufacturing Innovation 3.0 in South Korea, and the Industrial Internet of Things (IIOT)... A pile of industrial keywords or buzzwords that are uncannily familiar; how many do practitioners in manufacturing and industrial design know indeed?

Since the 1980s, the major migration of Hong Kong's manufacturing industry to the north has almost been fully completed, Hong Kong is about to be dominated by the service industry. As observed by the Industry 4.0 experts, most Hong Kong enterprises are stuck between Industry 2.0 and 3.0; though, most of their businesses have entered the development of alternative services and no longer rely on manufacturing. Interesting as it

seems, the concept of "Industry 4.0" has been discussed around the world in recent years, indicating that manufacturing and services are equally important for the development of a knowledge-based economy. No government may claim that economic development depends solely on the service industry. Mrs Carrie Lam, Chief Executive of the Hong Kong Special Administrative Region, also showed her vision in her policy address 2018, reiterating she would respond positively to "Made in China 2025" with "re-industrialisation".

With the fast-changing science and technologies, some consumers demand "high price-performance ratio", some pursue individuality, some wish to go green, consumption patterns can vary largely. The manufacturing industry should keep pace with the development of the market economy, as quantity and efficiency

alone can no longer meet the high-level needs of today's consumers. As the general trend goes, whether the manufacturing or service industry, should join forces with the design profession. To put it in another way, everyone may participate in design and manufacturing, while manufacturing and service enterprises do not necessarily employ designers exclusively, all practitioners in each industry are designers.

The visionary predecessors of the Federation of Hong Kong Industries (FHKI) foresaw the importance of design 50 years ago, and set up the Design Council of Hong Kong (DCHK) to encourage industrialists and entrepreneurs to make effective use of design. Today DCHK actively promotes the use of design thinking in manufacturing, as we are convinced that design is one of the methods where people can think out of the box to solve problems;

it helps promote the progression of re-industrialisation for manufacturers and enterprises.

There is a famous saying from Winston Churchill: Difficulties mastered are opportunities won. The purpose of this research study is not only to provide knowledge of mass customisation under Industry 4.0 for industrial design, which is closely related to the manufacturing industry, so that Hong Kong industrial design can be equipped with the ability to face the dilemma of double-edged sword positively; but it also shows that modern technologies can solve the predicament of enterprises regarding high costs, and hence making considerable support for the "local production" model. The research results indicate that "re-industrialisation" is not just a liability in the balance sheet, but an asset of thinking, the investment strategies to build a solid brand. In fact, it is only when the manufacturing, design and service sectors work together can economic development achieve long-term and holistic support.

On behalf of the Federation of Hong Kong Industries and Design Council of Hong Kong, I would like to thank the Hong Kong Special Administrative Region Government and the Professional Services Advancement Support Scheme (PASS) for the support. My gratitude also goes to the respondents for their valuable time and insights. This research e-guidebook is but a small step in changing the game, it is hoped that more Hong Kong entrepreneurs, industrialists and industrial design professionals can be triggered to work together and collaborate, moving freely among spaces of manufacturing, design and service, making mass and customised production a healthy lever as business strategy.

危或良機 心態使然

美國的先進製造夥伴計劃、製造創新國家網絡計劃、德國的工業4.0、日本的日本工業4.1J、南韓的製造創新3.0、工業物聯網(IIOT).....一堆堆工業界的關鍵字或者流行語,既陌生又熟悉;製造業和工業設計的從業員其實又知多少?

自八十年代至今,香港製造業北移的大遷徙已差不多完全完成,香港已幾乎以服務業為主。據「工業4.0」專家的觀察,大部份香港企業停留於工業2.0和3.0之間的狀況,然而大部份的業務已進入另類服務的發展,而不再依賴製造。相映成趣的是近年世界各地群起討論接近「工業4.0」的概念,說明製造和服務對知識型經濟的發展同樣重要,沒有一個政府會誇言經濟發展只靠服務業。香港特別行政區行政長官林鄭月娥在2018年的施政報告中也展示了其遠見,重申以「再工業化」積極回應「中國製造2025」。

現今科技日新月異,有些消費者要求「高勝價比」、有些追求個性化、有些則講求綠色環保,消費模式亦是五花八門。製造業要與市場經濟發展同步,純粹講求數量和效率已不能滿足現今消費者的高層次需求。大勢所趨,不論製造或服務業都理應與設計專業結下不解之緣。換一個說法,可謂人人都可以參與設計和製造,製造和服務企業聘用設計師並非必然,但每個行業的從業員都是設計師。

香港工業總會的前輩們五十年前已獨具慧眼,設立香港設計委員會鼓勵工業家和企業家有效利用設計。今日香港設計委員會推動製造業運用設計思維依然不遺餘力,因為我們深信設計是其中一個讓人跳出框架去解決問題的方法,有助推動製造和企業「再工業化」的進程。

邱吉爾有句名言:能克服困難的人,可使困難化為良機。是次研究的目的不僅為與製造業息息相關的工業設計提供「工業4.0」下量產客制化的知識,讓香港工業設計具備積極面對雙刃劍兩難局面的能力;也說明現今科技也可化解企業面對高成本的困境,對「在地生產」模式作出相當的支援。研究結果指出「再工業化」不僅只是資產表中的負債,而是思維上的資產,是建立堅實品牌的投資策略。而事實上,也只有當製造、設計和服務聯手,經濟發展才能得到長遠和全面的支持。

藉此,我謹代表香港工業總會和香港設計委員會感謝香港特別行政區政府專業服務協進支援計劃(PASS)的贊助和支持;同時,也感謝各受訪者的寶貴時間和見解。祈盼這本電子版研究指南是改變遊戲的一小步,觸發香港的企業家、工業家和工業設計專業無間協作,讓大家平衡自在地游走於製造、設計和服務之間,量產和客制化健康地成為業務策略的槓桿。

Prof Eric C. Yim
嚴志明教授

Chairman of Design Council of Hong Kong
Deputy Chairman of Federation of Hong Kong Industries
香港設計委員會主席
香港工業總會副主席

31 January 2019
二零一九年一月三十一日

No Talking Design 不談設計的設計

“

In the international market, industrial design professionals have moved from providing product design services during the 80s and 90s to offering one-stop business solutions for enterprises today. As an industrial designer who has been involved with manufacturing enterprises since the mid-90s and providing them development strategies for more than 15 years, I am full of hopes for the prospect of industrial design development.

On the other hand, when we examine the current development of Hong Kong industrial design professionals, the research team found that in a market flooded by products, crowdfunding and start-ups, the space for the development of Hong Kong industrial design disproportionately turned out to be less and less. The phenomenon prompts us to upgrade and transform, wishing for industrialists and entrepreneurs to use industrial design more effectively for the strategy to make the most of their business.

The market today is full of products, services and systems. Yet the most professional industrial design always provides the business solution of product-service system

for enterprises: integrating and transforming both manufacturing and market knowledge into the corporate strategies, which are the best for Hong Kong industrial design professionals.

It may sound like a cliché, but the pursuit of balance is definitely the utopia of industrial design. If there are only 24 hours for industrial design practitioners per day, and that we can't call ourselves Renaissance people, the introverts probably will go research on craftsmanship, processes and co-production; whereas the outgoing ones may have a broad understanding of consumer behaviours and market, together with our insistence to pick the good, an equilibrium where all can flourish won't be far away.

Taking this opportunity, I would like to thank the Hong Kong Special Administrative Region Government for the sponsorship, the Design Council of Hong Kong, Federation of Hong Kong Industries for the commissioned research, also Association for Creative Education, Hong Kong Polytechnic University School of Design, Industrial Designers Society of Hong Kong, and in particular, TALK Research and

Innovation Management Company and all the respondents, for the tremendous support and valuable.

Let's make it a mutual encouragement in our endeavours!

國際市場上，工業設計專業已由八、九十年代提供產品設計服務發展到今天為企業提供一站式的業務方案。身為一個九十年代中投身製造企業並且曾為企業提供發展策略超過十五年的工業設計師，對於工業設計專業的發展前景實在是充滿期望的。

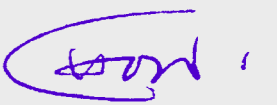
另一邊廂，當我們檢視當下香港工業設計專業的發展時，研究團隊發現在充斥產品、眾籌和初創的市場中，香港工業設計的發展空間竟然是越來越少的反比。這樣的現象，讓我們更想為進行升級轉型，期望工業家和企業家更有效地利用工業設計專業，策略更能為業務發揮淋漓盡致的效果。

現今市場充斥了產品、服務和系統，最專業的工業設計總是為企業提供產品服務系統 (Product-service System) 的業務方案；可以融會貫通製造和市場知識輻射到企業策略上，便是香港工業設計專業之上策。

老套地說，追求平衡狀態肯定是工業設計的烏托邦。如果每天只有二十四小時的工業設計從業員，不能稱自己是文藝復興人的我們，內向型的可能鑽研工藝、工序和配合製造，外向型的可能廣泛了解消費者行為和市場，再加上對設計產品的擇善固執，平衡兼百花齊放的狀態也就不遠矣。

藉著這個機會，我僅代表研究團隊感謝香港特別行政區政府的贊助、香港工業總會和其轄下的香港設計委員會的委托、創意教育協會 (ACE)、香港理工大學的設計學院 (PolyU SD)、香港工業設計師協會 (IDSHK) 和特別鳴謝拓途研究及創新管理公司 (TALK) 的努力，以及一眾被訪者的支持和寶貴時間。

共勉之！



Elaine Chow
周思彤

Wonderlaine Studio
大可工作室

28 January 2019
二零一九年一月二十八日

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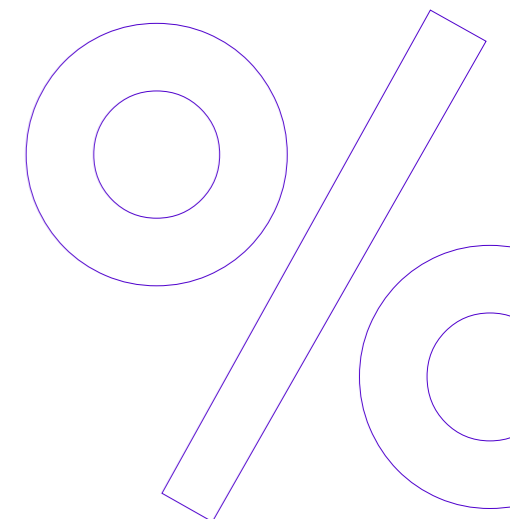
CATCH ME IF YOU CAN

捉到你套路

In the era of fast changing consumer market, the rise of the niche marked the start of a seismic shift where products are pulled based on actual market demands rather than pushed based on reports and forecasting. Consumers no longer play passive roles in the production value chain, and their behaviours will continue to influence and disrupt the ways in which design and manufacturing should approach the market. Mass production driven by OEM business model will put manufacturers and designers in the bottom of the production value chain. It is now critical to understand and meet the pace of our consumer needs, such that we can reposition the new value of scale production and design with Industry 4.0 technologies.

在消費市場迅速變化的年代，小眾市場的冒起是地震式轉變的初兆。產品的吸引力是根據實際的市場需求，並非由報告和預測去推動。消費者在生產價值鏈中不再扮演被動的角色，他們的行為將會繼續影響和瓦解設計與製造業靠攏市場的方式。由OEM商業模式主導的大量生產會將製造商和設計師置於生產價值鏈的底部。如今了解和滿足消費者需求的節奏變得尤其重要，因為這樣我們就可以利用工業4.0技術為量產客制化和設計的新價值重新定位。

10%



Hidden Figures
關鍵少數

The seismic shift from mass market to niche market, or generalisation to customisation, is happening. The niche increases the viability and specifics of what you can cater to your audience. Consumer markets will continue to be diluted with varieties and choices, and the niche will become the new mass market.

從大眾市場轉向小眾市場、從概括轉向客制的一場巨大轉變其實正在發生。小眾為製造商增加了可以迎合觀眾的可行性和具體細節。消費者市場將繼續被種類和選擇所稀釋，小眾市場將成為新的大眾市場。

NICHE

MARKET

NEW MASS
MARKET

AT A GLANCE 瞄一瞄

The Global Market Shift
全球市場變化



Consumer market is becoming more and more fragmented from mass consumption – resulting in niche segments. Consumers are empowered through technologies and medias with higher accessibilities to products and services and transparencies of information.

現今大眾消費市場變得越來越分散——導致零碎的小眾市場出現。技術與媒體賦予消費者更大權力，信息透明度更高，讓他們更輕易接觸產品及服務。

The Problem
問題



Many Hong Kong industrial professionals still hone onto mass production, and misinterpret customisation needs as personalisation of products. This sets back design and manufacturing strategy to meet the changing consumer needs in today's economy.

許多香港工業專業人士仍在琢磨大量生產，將客制化需求誤解為產品個性化。這成為設計與製造策略上的挫敗，使其未能滿足當今經濟中不斷變化的消費者需求。

The Opportunities
機遇



Understanding scale customisation as industrial strategic approach with the adoption of technologies, particularly advancements from Industry 4.0, will accelerate internal and external production capacities to better serve the growing niche markets.

通過採用技術，特別是工業4.0的推進，把量產客制化理解為工業策略方針，將加速內部與外部的生產能力，為不斷增長的小眾市場提供更好的服務。

#1

CUSTOMISED PRODUCTS ≠ PERSONALISED PRODUCTS

客制化產品 ≠ 個人化產品



Research has reflected **less than 10% of Hong Kong consumers demand highly customised products. The rest of the 90% still consume and make purchases based on what is offered in the existing market.** This does not mean that customisation only took place within the 10% spectrum. Deeper analysis has allowed the research team to discover that “highly customised products” refer to personalised goods, and these are different from products manufactured with scale customisation strategy. In order to achieve clarity in consumer customisation needs, it is important to first decipher and break down the information.

研究反映，**少於10%的香港消費者需要高度客制化的產品。其餘90%的人仍然根據現有市場提供的選擇購物。**這並不意味客制化只出現在10%的範圍內。研究團隊透過更深入的分析發現「高度客制化產品」意指個性化產品，而這些產品與採用量產客制化策略所製造的產品不同。為了明確詮釋消費者的客制化需求，先解讀和分拆信息尤其重要。

Play Your Cards Right 按牌章出對牌

In 1997, Harvard Business Review published an article, elaborating on four kinds of customisation needs in consumer lens. First and foremost, the types of consumers identified are not mutually exclusive from one another. There are consumer types that may overlap, therefore designers and manufacturers will require to have more holistic understanding on the niche markets in which they serve.

1997年，《哈佛商業評論》發表了一篇文章，從消費者角度出發，詳細闡述四種客制化需求。首先，涉及的四種消費者類型彼此不相互排斥。有些消費者類型可能會重疊，因此設計師與製造商需要對他們所服務的小眾市場有更全面的了解。

Therefore, it is important to understand customisation needs from consumer lens (what the niche is) to align with design and manufacturing capacities.

因此，了解消費者角度（小眾市場）的客制化需求，從而使設計及製造能力相一致非常重要。

#2

CUSTOMISED PRODUCTS = GOODS MANUFACTURED WITH SCALE CUSTOMISATION STRATEGY TO SATISFY NICHE MARKETS

客制化產品 = 為滿足小眾市場採用量產客制化策略而製的產品

About Four Approaches of Customisation 關於四種客制化方法

Understanding the four types of consumer customisation needs will allow designers and manufacturers to know better the niche markets in which they serve.

了解消費者客制化需求的四種方法讓設計師和製造商能夠更好地掌握他們所服務的小眾市場。

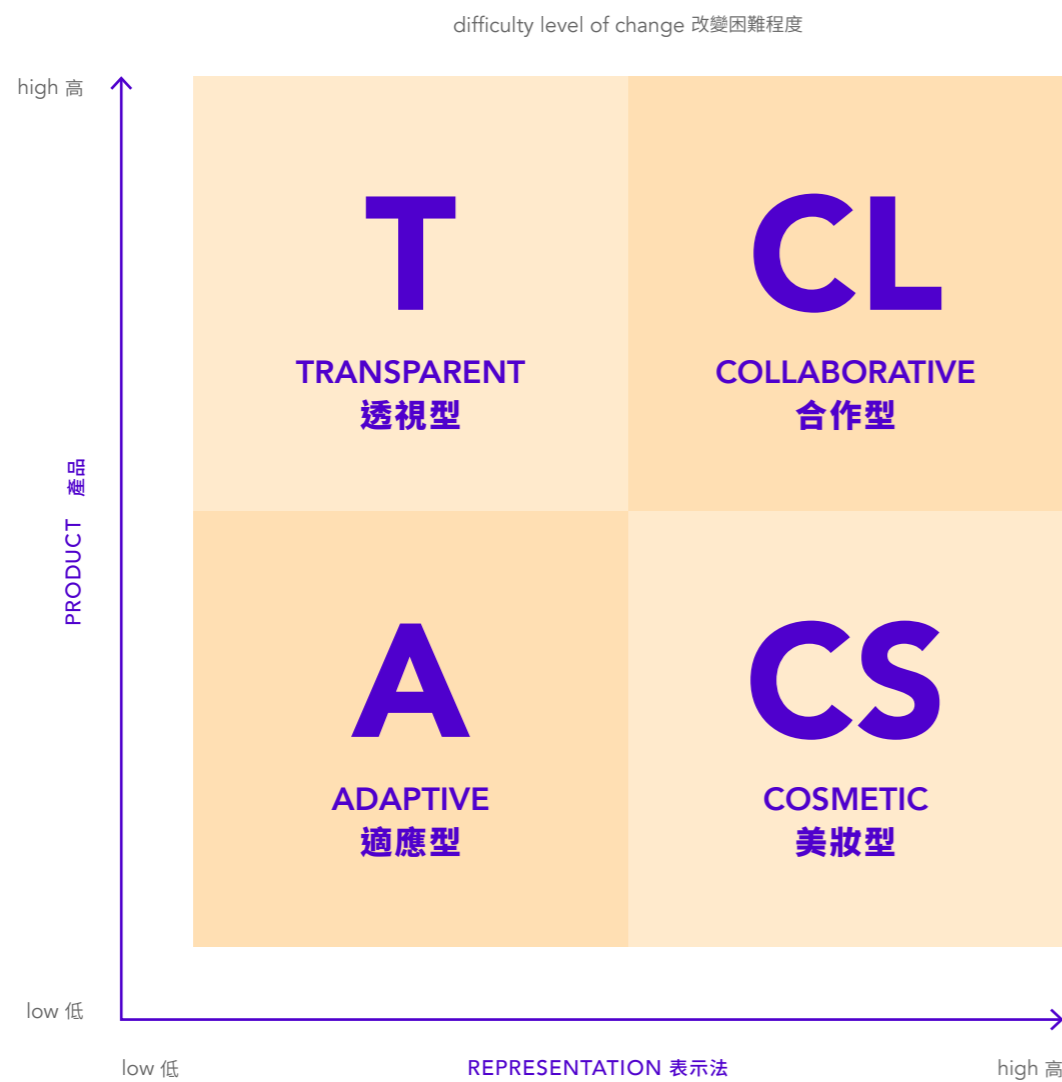
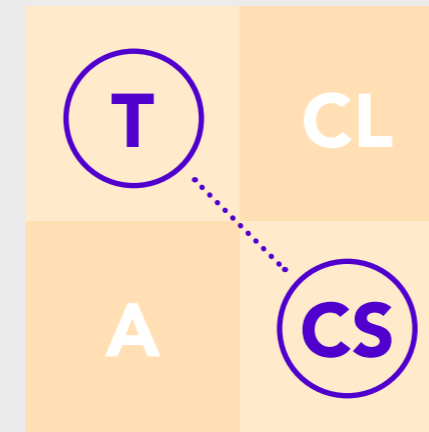


Figure 1 A Sample on Four Approaches of Customisation¹
圖1 四種客制化方法的範例

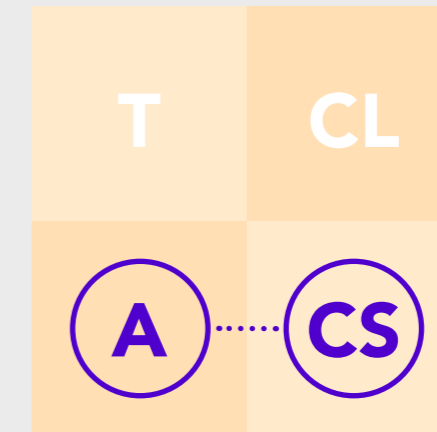
¹ Gilmore, James H., (1997). "The Four Faces of Mass Customisation." *Harvard Business Review*, Jan-Feb. Harvard Business Publishing. Retrieved 12 December 2018 from <https://hbr.org/1997/01/the-four-faces-of-mass-customization>.

CASES

1 Absolute Vintage/ Eyepopper



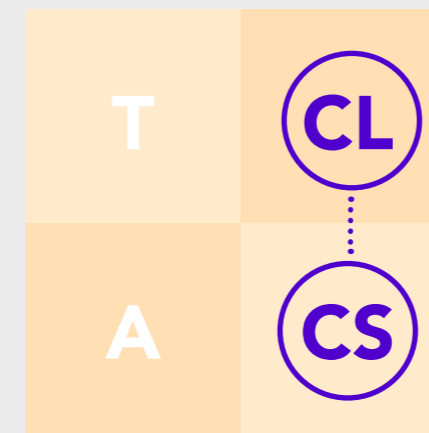
2 Airland



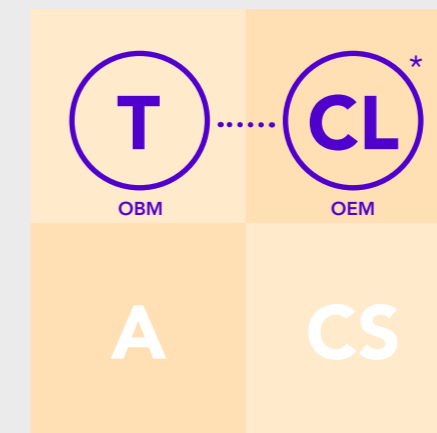
3 Artop



4 Asia Animation Ltd



5 Best Victory



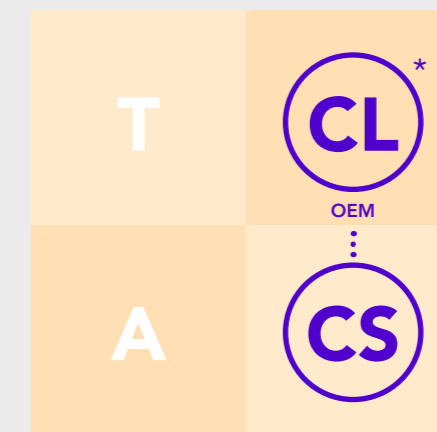
6 Big Horn



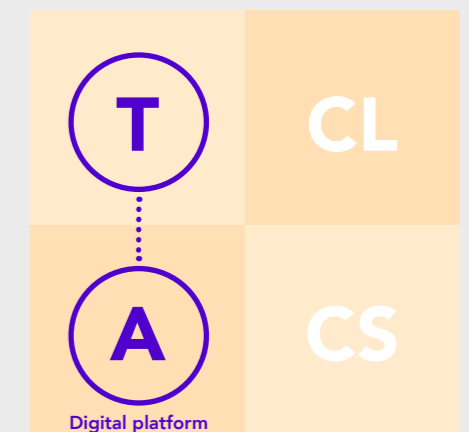
7 Cosso



8 ECO Concepts



9 ECOPrint



* Collaborative – OEM: manufacturer receives order from business client to fulfil design requirements for mass produce orders

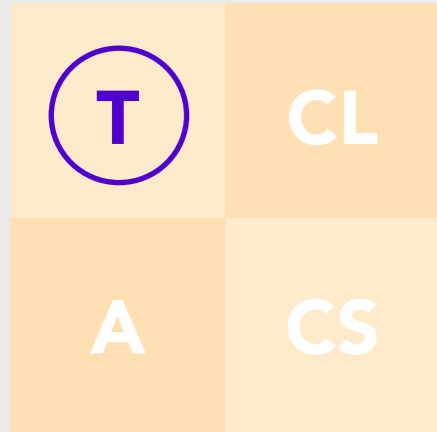
* 合作 – OEM: 製造商從業務客戶處接收訂單以滿足大量生產訂單的設計要求

** Collaborative – Consulting: Service consultation where designers work with clients to define scopes and requirements on bespoke designs

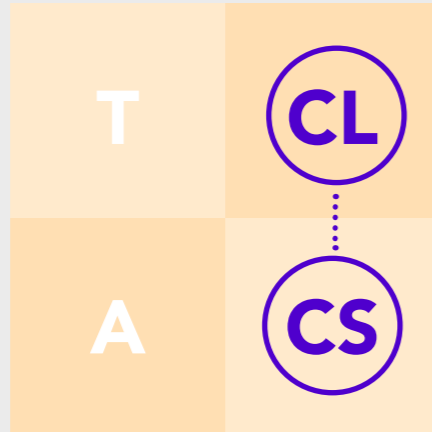
** 合作 – 諮詢: 設計師與客戶合作, 定義客制化設計的範圍和要求, 進行服務諮詢

CASES

10 Eone



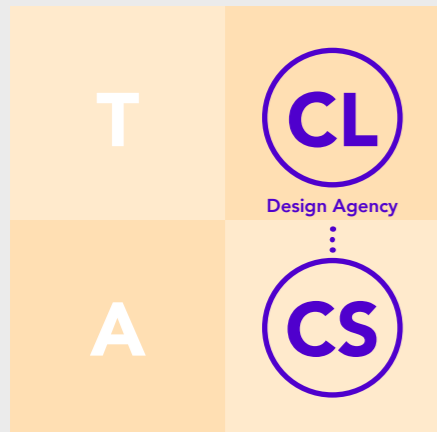
11 Forever Couple



12 Fullhouse



13 Gear Atelier



14 Genic Eyewear



15 Gift Concept



16 Giormani



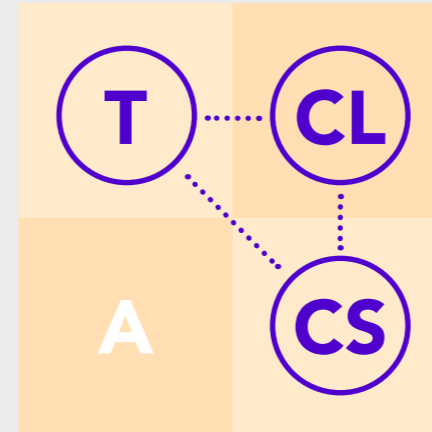
17 Goodway



18 GOXD



19 Grand Classic Ltd



20 Grandion Group /

21 TML Apparel



22 Green & Associates



23 Greenology / UPD



24 Ikonee



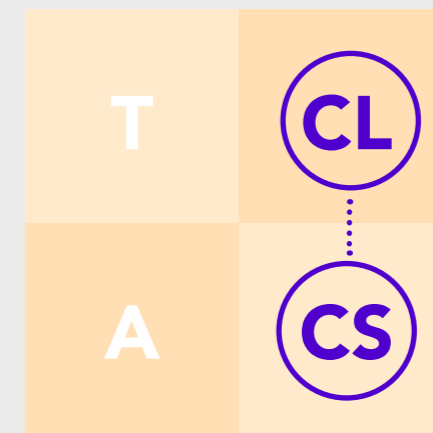
25 Inno Box



26 InnoSphere



27 Jervis



28 Kentex



* Collaborative – OEM: manufacturer receives order from business client to fulfil design requirements for mass produce orders

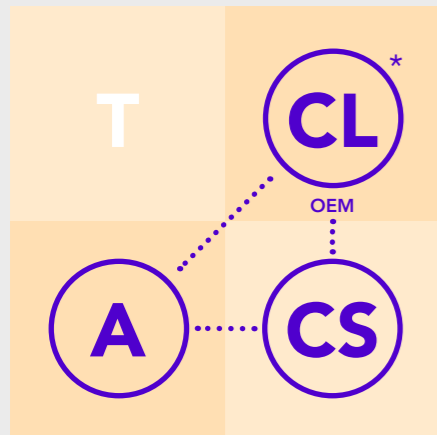
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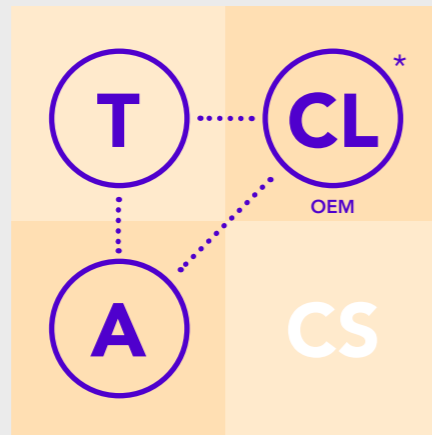
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CASES

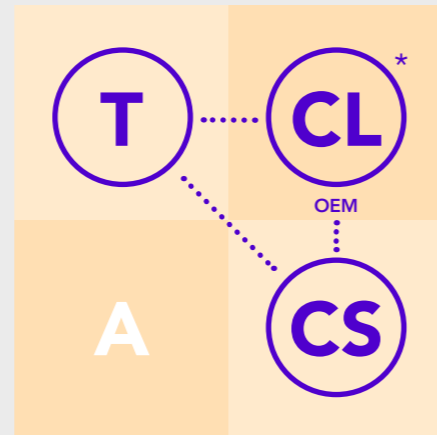
29 King's Flair International Ltd



30 KINOX



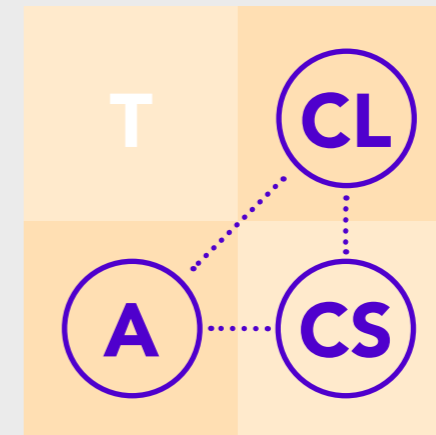
31 LAWS Group



38 odm



39 OFESS



40 People On Board



32 L.I.M. Design Work



33 MAISTO



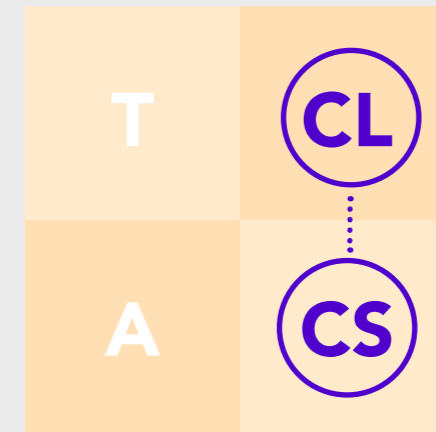
34 Master Concept



41 PO



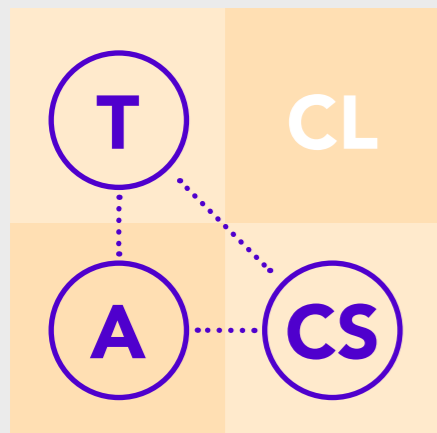
42 POMCH



43 POSTalk / Takon



35 Memomem



36 Memorigin



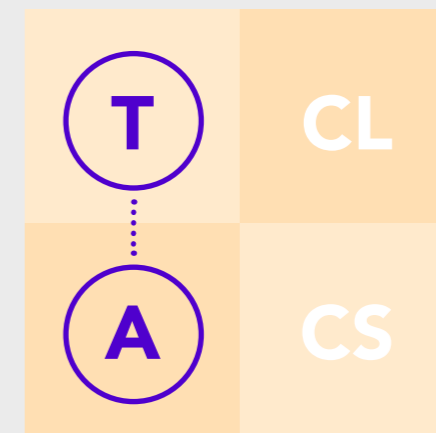
37 NowHere Design



44 Rcube



45 S&C Furniture



46 Shing Hing Plastic Manufacturing Ltd



* Collaborative – OEM: manufacturer receives order from business client to fulfil design requirements for mass produce orders

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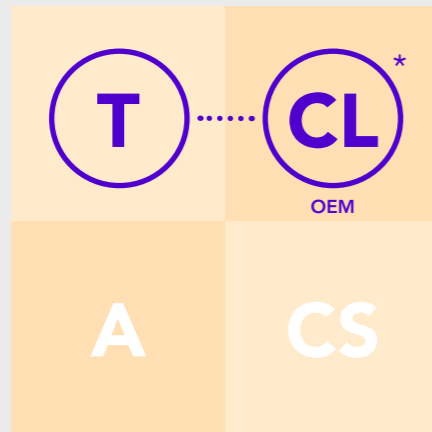
** 合作 – 諮詢: 設計師與客戶合作, 定義客制化設計的範圍和要求, 進行服務諮詢

CASES

47 Silverlit



48 Stars Industrial



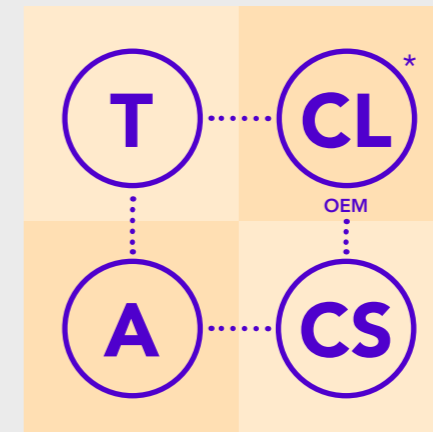
49 Sweda



56 Xoopar



58 Yick Shun Group



59 Zing



50 Team Green /

51 Starlite



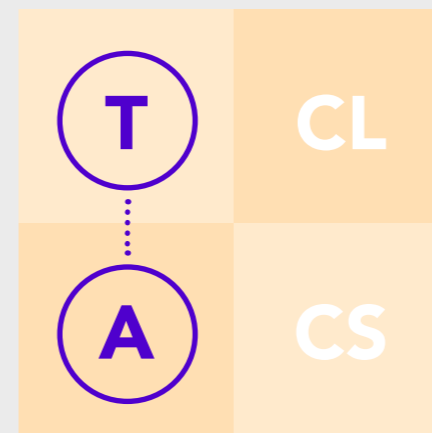
52 TTI



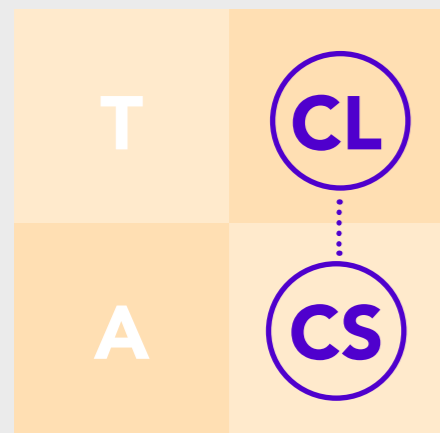
53 Ten Stationery



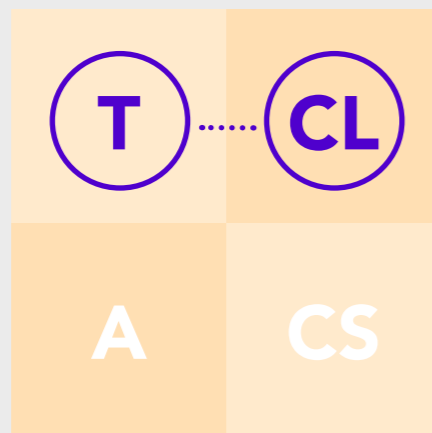
60 ZOTAC



54 The Darts Factory



55 unspun, inc.



55 Velove



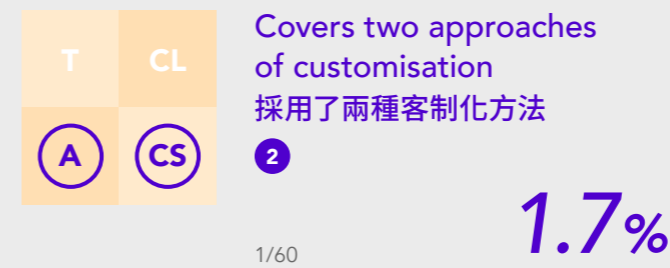
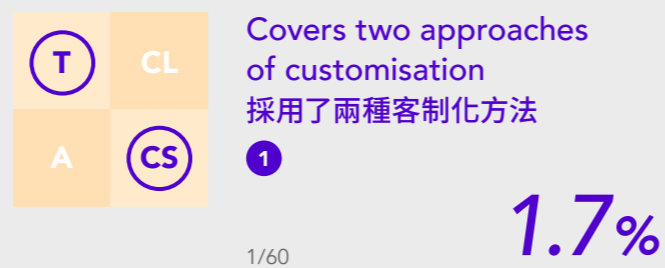
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STATISTICS



Due to the different levels and scales of operation and business nature, the four approaches of customisation model here do not reflect 100% of the state of all interviewed companies. The comparison has been generated with the exceptions of 9H, ACE, ChinaDesign Research Work-Group, ENICMA, Fraunhofer IPT, Hong Kong Productivity Council, Mings 3D / Hong Kong 3D Printing Association, OMG, the Vocational Training Council and Wonderlaine Studio to maintain a fair and compatible representation.

由於受訪公司的營運和業務性質各有不同層次和規模，這裡的四種客制化方法模型並不能反映全部100%受訪公司的情況。為了確保這裡所呈現的是持平兼容的比較，以上並不包括9H、創意教育協會、中國設計研究工作室、ENICMA、德國弗勞恩霍夫生產技術研究所、香港生產力促進局、Mings 3D / 香港三維打印協會、對象管理組織、職業訓練局和大可工作室等公司。

COLLABORATIVE CUSTOMISATION

合作型

In a fully **Collaborative Model** (very high change in product and representation), designers and manufacturers are required to fully articulate consumers' needs and provide bespoke products. Consumers are engaged early in the design cycle, working hand-in-hand with designers and manufacturers to specific solutions. Traditionally, designers have to go through lengthy, and often iterative, cycles of conversations to gather the requirements and scope prior to conceptual ideation of product design, leading to longer production time frames and complex manufacturing steps. However, with the advancement in technologies, more tools and systems are available to assist designers in understanding consumers' desires in real time.

For example, Forever Couple Limited, a couple ring manufacturer in Hong Kong, utilise a 3D scanning machine to dissect exact finger sizes of each individual. Along with custom styling, the results are more precise quantifications and higher degree of fitting than standard measuring tools.

在 **完全合作型**（產品和代表性的極大變化）的模式下，設計師及製造商需要充分拿捏消費者的需求並提供定制產品。消費者在設計週期的初期就參與其中，與設計師和製造商攜手合作，尋求特定的解決方案。傳統上，設計師必須經歷冗長又經常重複往返的對話，以在產品設計構思概念之前集結要求及範圍，這導致更長的生產時間框架和複雜的製造步驟。然而，隨著科技的進步，設計師得以透過更多工具和系統的協助，實時了解消費者的需求。

例如，香港的情侶戒指製造商Forever Couple Limited利用3D掃描器去精確剖析每個人的手指大小。加上客制化造型，結果製成品比標準測量工具更精準的量化及更高的合身度。



Forever Couple Limited

The Forever Couple collections are created to customise every wedding ring by scanning the exact finger size with 3D technology, the "Sizing Master". With detailed data analysis, a 3D prototype ring is produced for every customer to wear on the go, with the perfect ring to be carved through standardised production process.

Forever Couple系列旨在利用三維打印和光學掃描技術「Sizing Master」精確地計算手指大小（手寸）去客制化每一隻結婚戒指。透過詳細的數據分析，FOREVER COUPLE為每位客戶生產三維打印的原戒指模型，讓他們能隨時隨地佩戴；而真正完美的婚戒則通過最後的標準化工藝雕刻而成。

ADAPTIVE CUSTOMISATION

適應型

Whereas in **Adaptive Customisation** (low change in product and representation), products are standardised with customisability. In most circumstances, consumers prefer to satisfy multi-purpose occasions with lesser products. Similar to a handyman who would like to have an all-in-one tool than carrying stacks of tools, not only is it troublesome to carry but also inconvenient. According to Fraunhofer IPT, a smart table with customisable digital interface to home lighting and temperature controls is produced to meet this market demand.

在 **適應型的模式**（產品和表達變化少）中，產品都是標準化兼可客制化的。在大多數情況下，消費者更喜歡用較少的產品去滿足多用途場合。就如雜工想擁有萬用的工具，而不是自攜成堆的工具，攜帶麻煩又不便。據Fraunhofer IPT稱，有一款智能工作台可根據市場需求加入了客制化數碼介面，控制家居照明及溫度。

Fraunhofer IPT

The Fraunhofer Institute for Production Technology IPT, aka Fraunhofer IPT, is an institution of the Fraunhofer-Gesellschaft for the Promotion of Applied Research eV. Its activities focus on applied research and development in the Subjects to Engineering and Mechanical Engineering. It partnered with Hong Kong Productivity Council (HKPC) and Vocational Training Council (VTC) for the launch of the first Professional Diploma Programme in Industry 4.0 in Hong Kong in 2018.

Fraunhofer研究所，又名Fraunhofer IPT，是Fraunhofer-Gesellschaft促進應用研究的一個機構。其活動側重於工程和機械工程學科的應用研究和開發。2008年，Fraunhofer與香港生產力促進局及職業培訓局合作，啟動香港首個工業4.0認證培訓課程。

TRANSPARENT CUSTOMISATION

透視型

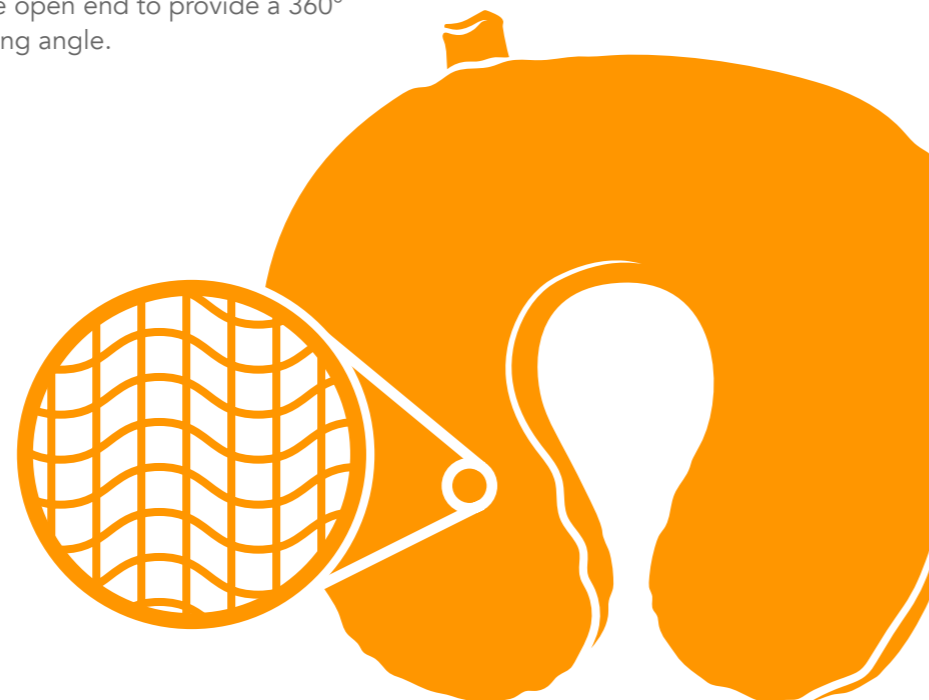
Transparent customisation

is often hard to be grasped. Generally, consumers are not fully aware of their own needs and wants. Designers need to deduce consumers' needs, often implicitly. This requires thorough observation on consumers' natural behaviours.

Gear Atelier Limited, a leisure product design agency, spotted an opportunity to redesign neck pillows. Travellers often sleep during flights. While many standard neck pillows are too soft in materials or too shallow in sizes, travellers have to bear with the discomforts due to the designs. Furthermore, the sleeping postures vary with individuals. In order to meet with the unspoken challenge, Gear Atelier design team experimented with multiple prototypes, finalising their design with sturdier materials like memory-foam pillows, added heights for better neck support, and a mechanism that can close off the open end to provide a 360° sleeping angle.

透視客制模式通常很難掌握。消費者一般並不完全了解自己的需要和渴求。設計師需要經常隱晦地推斷出消費者的需求。而這需要徹底觀察消費者的自然行為。

休閒產品設計公司Gear Atelier Limited發掘到重新設計頸枕的機會。旅客經常在航班期間睡覺，縱然許多標準頸枕在物料上太軟或尺寸太淺，但由於設計原因，旅行者必須承受這種不適。此外，睡眠姿勢因人而異，為了應付這無人道出的挑戰，Gear Atelier設計團隊嘗試過多個樣板，用更堅固的物料（如記憶海棉枕頭）完成設計，增加高度提供更好的頸部承托，以及兩邊尾端開口設計可以合攏以提供360°的睡眠角度。



Gear Atelier Limited

Gear Atelier is a renowned local design firm specializing in Original Brand Manufacturing (OBM) for the development of creative gift and household items, which are sold locally in Hong Kong and in more than 50 countries worldwide. Since its establishment, Gear has developed the brands of Living Gear and TAPAS for different market segments. Apart from its self-developed product series, Gear also provides design consultancy service to other companies in the area of branding and product design.

Gear Atelier是一間著名的本地設計公司，專門從事原創品牌製造（OBM），開發創意禮品與家居用品，這些產品在香港及全球50多個國家銷售。自成立以來，Gear已經為不同的細分市場開發了Living Gear和TAPAS品牌。除了自家開發的產品系列外，Gear還會為品牌與產品設計領域的其他公司提供設計諮詢服務。

COSMETIC CUSTOMISATION

美妝型

Cosmetic Customisation is by far the easiest approach of all and has the lowest degree of difficulty in production. This requires almost zero functional changes to the product design, only focusing on customising the presentation. As simple as engraving names on the product, applying customised designs on standard products, and even new packaging can be categorised as cosmetic changes.

One example can be referenced to Snaptee Limited, through its social integrated platform, consumers can share and upload any personal photos and images on-demand, personalise the t-shirt design for easy printing and shipping.

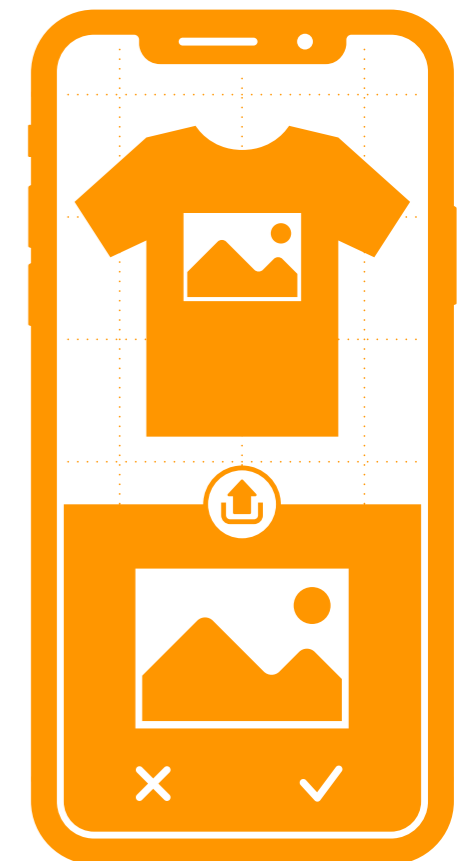
綜觀而言，**美妝客制化模式**於眾多方法之中最為簡單，而且生產難度最低，要求產品設計幾乎沒有功能變化，只著重客制化展示。就像在產品上雕刻名字一樣簡單，在標準產品上應用客制化設計，甚至新包裝也可以歸類為外觀變化。

其中一個例子可以參考Snaptee有限公司，通過其社交綜合平台，消費者可以按需要分享和上傳任何個人照片和圖像，輕鬆簡便打印和運送個性化T恤設計。

Snaptee Limited

Snaptee Limited is a mobile app created to make designing and ordering custom T-shirts as easy as applying a filter to a smartphone photo. Snaptee's interface features Instagram integration, a wide choice of fonts and colours, custom filters and design templates. Finished designs can be printed onto 100% organic cotton T-shirts for and shipped anywhere in the world.

Snaptee Limited是一款專為設計和訂購客制化T恤而設計的手機應用程式，操作就如同在智能手機照片上應用過濾器一樣簡單。Snaptee的界面結合Instagram、多種字體和顏色選擇、自定過濾器及設計模板。成品設計可印刷在100%有機棉T恤上，並可運送到世界任何地方。



Niche is the New Black? 小眾市場新貴乎？

Traditionally, the success of mass manufacturing as a business model is to maximise shareholders' return through the pursuit of productivity. The model neglects input from consumers and end users, thus limiting innovation opportunities. When product turnaround times in the market increase, manufacturers are forced to raise inventory costs. However, businesses that generate higher values for consumers have significantly scale and outperform those focused on the double bottom line. One reason is due to the growing demands and desires of personalised items, and more consumers are seeking more active ways to influence and participate in the design cycles of production. The varieties and choices of products, particularly under globalisation, have significantly increased for consumers, and growing ubiquity of platform services and mobile applications continue to create niche demands. Customisation of products is not restricted to only cosmetic designs. To clarify, customisation as discussed has always been part of consumer needs, but it differs from highly personalised products and handcrafting.

傳統大規模製造作為商業模式的成功之處，就是通過追求生產力令股東得到最大的回報。該模式忽視了消費者和最終用戶的投入，從而限制了創新的機會。當市場上的產品周轉時間增加時，製造商被迫提高庫存成本。然而，為消費者創造更高價值的企業具有顯著的規模，而且比那些專注於雙重底線的企業優勝。其中一個原因是個性化產品的需求和渴望不斷增長，越來越多消費者正尋求更積極的方式去影響及參與生產的設計週期。產品的種類和選擇，特別是在全球化的背景下，對消費者而言明顯增加，而不斷增長的平台服務和移動應用程式則繼續創造小眾需求。產品客制化不僅限於化妝品設計。為了釋疑，貫徹討論的客制化一直是消費者需求的一部分，但它不同於高度個性化的產品和手工藝製作。

WE ALL TALK ABOUT KNOWING OUR CONSUMERS BETTER, BUT WHAT DATA ARE WE REALLY GETTING?

我們常常把進一步了解消費者掛在口邊，但我們真正得到的數據又是甚麼？

Scale customisation is to achieve a state in which mass production value is maintained with customisable product offerings to consumers. With integration of digitalisation of product and service together, this presents new opportunities for designs and manufacturing to cover broader ranges for niche markets.

量產客制化是為了達致一種狀態：通過向消費者提供客制化的產品去維持大量生產的價值。自從產品及服務得以整合及數碼化，這為設計及製造業提供了新機遇，以更廣泛地覆蓋小眾市場的範圍。

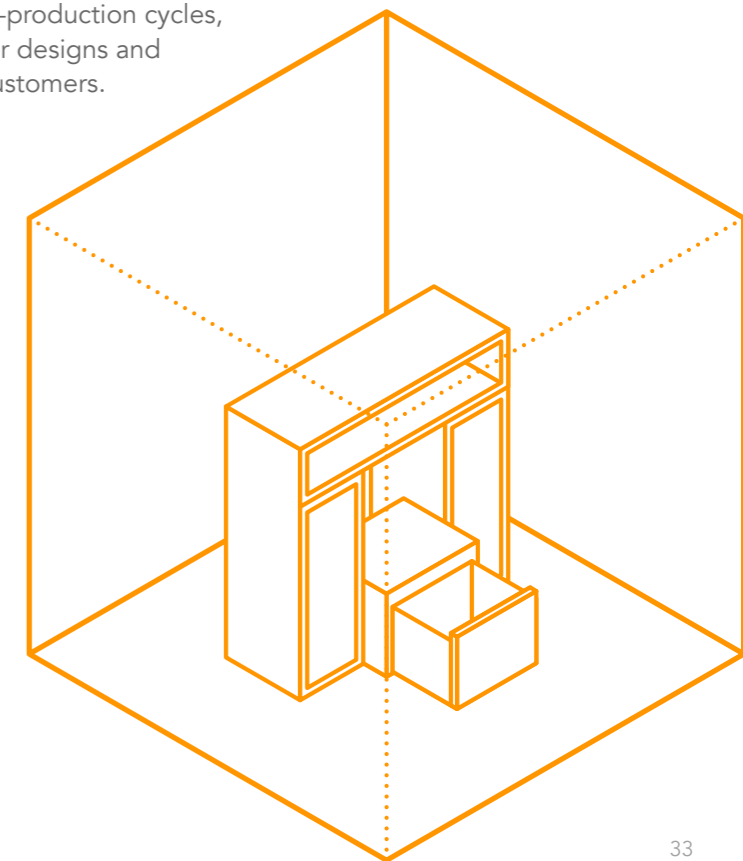
For example, Hong Kong has very high density of population in small confined spaces, therefore multi-functional and compact products satisfy the specific environmental constraints. Mass furniture manufacturers like S&C Furniture Limited in Hong Kong, and even global giants such as IKEA, particularly created line of modular products to cater to this niche market. By leveraging augmented scan of housing environment, these furniture manufacturers can understand home usages and conditions in pre-production cycles, resulting in better designs and fitting for their customers.

例如，香港在狹小密閉的空間內人口密度非常高，因此多功能和袖珍的產品能滿足特定的環境限制。像香港的方圓傢俱有限公司這樣的大型傢俱製造商，甚至是宜家家居等全球巨頭，都特別設計了模組化的產品系列，以求滿足這個小眾市場的需求。運用房屋環境的增強掃描，這些傢俱製造商可以於生產週期的前期了解到家居用途和狀況，從而為客戶提供更好的設計和配置。

S&C Furniture Limited 方圓傢俱有限公司

Being one of the pioneers and leaders of the Hong Kong furniture industry, S&C Furniture Limited is devoted to develop products that evolve with technology and most importantly Hong Kong's local living habitat. S&C is dedicated to develop a smart customisable furniture system that allows better understanding of clients, in order to customise unique furniture modules for each unique home using acquired data and algorithms.

身為香港傢俱行業的先驅和領導者之一，方圓傢俱有限公司致力於開發緊貼科技發展的產品，尤以香港當地生活環境作為最重要考量。我們的目標是透過香港人口統計數據的所得，深入研究和解決生活問題，並提供有效的解決方案，希望在有限的空間內提高生活水平。



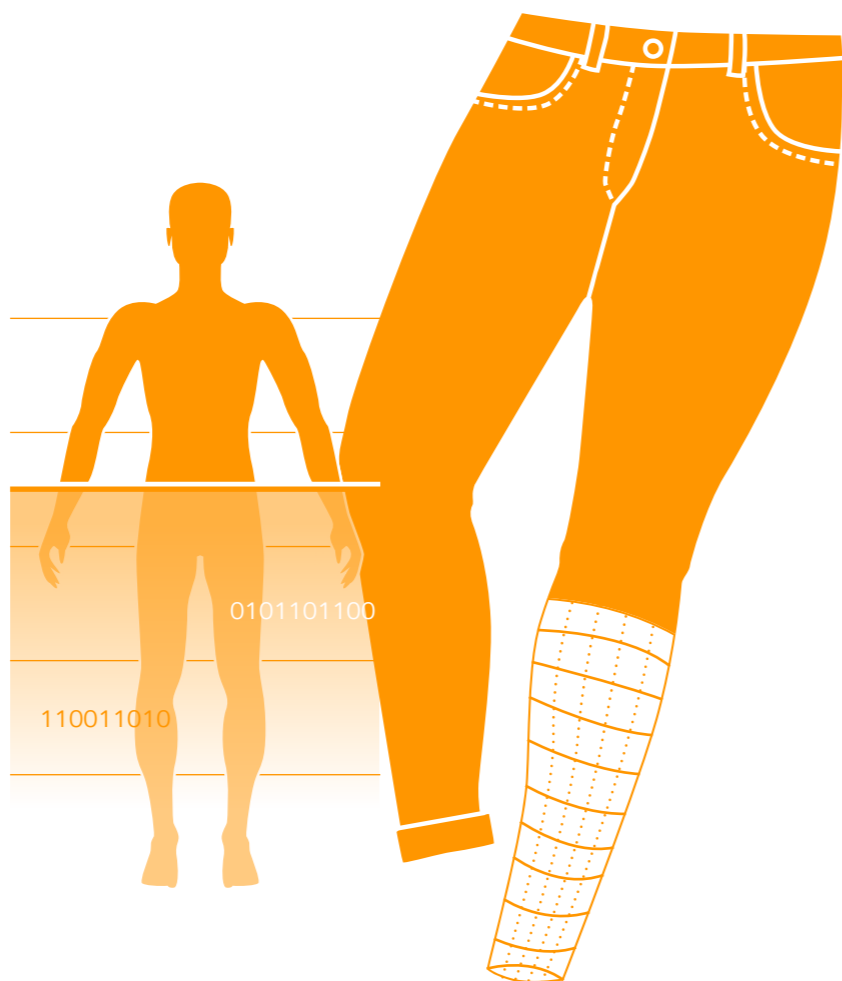
On another spectrum, startup communities have been approaching the market radically. unspun, inc., a startup team comprised of garment experts and technologists, is using full body scanned system to custom tailor make 3D printed jeans. Meanwhile, they are also inventing their own 3D textile machines to further reduce the cost and time for production.

另一方面，初創企業社群已經以極急進的姿態逼近市場。unspun, inc. 是一個由服裝專家和技術人員組成的創業團隊，利用全身掃描系統客制化3D打印牛仔褲。同時，他們還在發明自己的3D紡織機器，以進一步降低生產成本和時間。

unspun, inc.

unspun is a venture-backed robotics and apparel company, building custom jeans for each consumer, on demand. Its mission is to reduce global carbon emissions by at least 1% through automated, localised, and intentional manufacturing. unspun is a fast-moving company powered by technology, the National Science Foundation, SOSV, the Mills Fabrica and the H&M Foundation.

unspun是一家風險投資支持的機械人及服裝公司，可根據需要為每位消費者打造客制化牛仔褲。其使命是通過自動化、本地化及有意製造去減少全球碳排放至少1%。unspun是一家由技術、國家科學基金會，SOSV，南豐作坊和H&M基金會提供支持的快速發展公司。



**About TML Tower
關於 TML 廣場**

TML (To Make Locally) Apparel Limited is a one-stop smart manufacturing base that combines collaboration, production, technology and sales. It has been established as a "Hong Kong Made" brand with end-to-end service value chain. While maintaining financial balance, the initiative also strives for social values. This balance is critical in ensuring business diversities and sustainability in growth.

TML (To Make Locally) Apparel Limited 是一個一站式的智能製造基地，結合了協作、生產、技術和銷售。其創立為打造「香港創造」品牌，延伸我們之供應鏈服務能力。此外，項目在追求經濟效益之餘，同時能創造社會效益，使企業朝多元及持續發展。

New generation consumers have been constantly nurtured as designers. With the emergence of makerspaces, communities in DIY crafts and production have been revitalised. TML, or To Make Locally, a Hong Kong based co-creation hub established with small-scale production facilities, is a prime example providing resources and incubation in this space. An interesting phenomenon is the gaming industry and open social platforms in enabling consumers to become creators, and this culture has permeated across other sectors. Popular games such as Minecraft allow users to develop structures and architectures from scratch, platforms like Etsy enabled general consumers to access artisan products from home, social platforms like YouTube allow each user to profile their own subscription channels for video viewing, and there are countless more across diverse marketplace enabling personalisation needs. With consumers more and more involved in the design process, consumers will no longer play a receiving role in the market. The sense of involvement for consumers creates higher sense of attachment and pride rather than just consumption. Engaged communities become collaborators of the whole culture in shaping the products in which they like to use and purchase. The intertwining of personalised technologies in digital space and customisable artefacts in physical space will create ripple effects, progressively cultivate and empower consumers' behaviours in personalisation and customisation.

新一代的消費者不斷被培育成設計師，而隨著創客空間的出現，DIY手藝和製作社群亦重新變得活躍。TML (To Make Locally) 除了是一個以香港為基地、為小規模生產設備而建的共創中心外，亦是提供資源和孵化這個領域的一大主要例子。其中一個有趣的現象是遊戲產業及開放的社交平台，讓消費者成為創作人，而這種文化亦已經滲透到其他領域。像Minecraft一類的流行遊戲允許用戶從零開始開發建構和架構；而Etsy這樣的平台使一般消費者能夠在家中訪尋工匠產品；又如YouTube這樣的社交平台讓每個用戶分析自己訂閱的頻道去看視頻，還有其他無數跨界又多樣化的市場等去實現個性化需求。隨著消費者於設計過程的參與度越來越高，他們再不會在市場中只扮演接收的角色。代入感令消費者產生更強烈的依戀感和自豪感，而不僅僅是消費。在塑造他們喜歡使用和購買的產品時，參與的社群便成了整個文化的合作伙伴。數碼空間中的個性化技術與現實空間可客制化的人工製品，兩者的相互交錯將產生連鎖反應，逐步培養並賦予消費者個性化和客制化的行為。



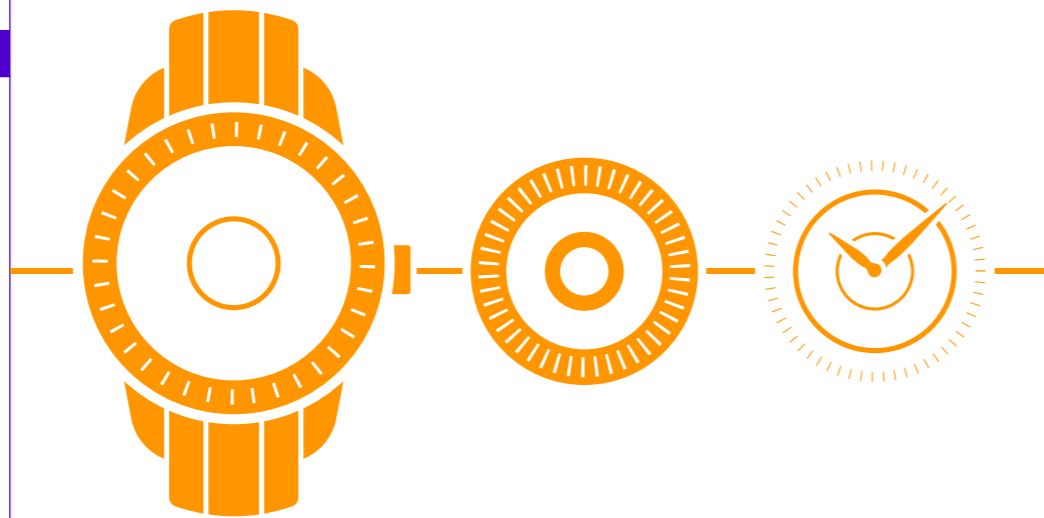
One of the researched design team in Hong Kong, Memomem Limited, partnered with Swiss watch manufacturing experts, has successfully portrayed the essence of consumer as designer by leveraging scale customisation capacities. From 100% handcrafted and custom-made Swiss watch, the team blended high quality technologies to turn premium luxury into common affordable products for mass market. With over 17 quadrillion possible combinations, every part of the watch can be customised transparently, from colour options, texts, bezels, cases, dials to hands, resulting in 17 quadrillion possible combinations in styles. The digital design portal enabled consumers to order online directly from the manufacturer. With higher data transparencies to consumers' preferences of styling, the team was able to better predict design styles and to manage inventory level at minimum.

作為香港研究設計團隊之一，Memomem Limited與瑞士鐘錶製造專家合作，通過利用規模定制能力，成功地將消費者的本質描繪為設計師。從100%手工製作和定制的瑞士手錶，該團隊融合了高品質的技術，將高端奢侈品轉變為大眾市場常見的實惠產品。超過17萬億可能的組合，手錶的每個部分都可以透明地定制，從顏色選項，文本，邊框，錶殼，錶盤到指針，從而產生17萬億種可能的風格組合。數字設計門戶使消費者能夠直接從製造商在線訂購。憑藉更高的數據透明度，消費者對樣式的偏好，團隊能夠更好地預測設計風格並至少管理庫存水平。

Memomem Limited

Memomem was founded by the post-90s Hong Konger Jims Liu. With the experience and knowledge of the 3 generations of family watchmaking, he has turned the 100% handcrafted, custom-made, "Swiss Made" product with high-quality technologies into a common item. To Memomem, a watch is not only a time instrument but also a life essential to represent ourselves, to mark every moment, and to create memory.

Memomem由90後香港人Jims Liu創立，憑著家族三代製錶的經驗及知識，將100%全人手製、自家客制、「瑞士製」等高質技術「平民化」。對於Memomem來說，手錶不僅是時間工具，也是表現自我，紀念每一刻，創造記憶的生活必需品。



Take Me Somewhere Nice 在途上的人

With the changes in consumer demands, the design of products also needs to change. Smart technologies have enabled physical artefacts to have digital interfaces. For example, smart chairs and tables allow remote control functions on housing electronics. Shoes can be 3D printed and customised with insoles and designs. Clothing becomes wearables just like smart watches. Cars become connected with added values extending beyond its physicality. One may think that these are just added technologies to physical objects, but much greater values are generated with these enabling technologies to capture real data and usages from end consumers.

Manufacturers and designers have long relied on sales and trend reports to gather indirect insights on consumer markets. The possibilities when manufacturers can directly obtain information from their respective consumers create more accurate quantities and designs in alignment to real user needs. To an extreme, disintermediation through removal of intermediaries, such as distributors, wholesalers and brokers, may even be resulted as new manufacturing business model.

With high transparencies to market, manufacturers can further strengthen their strategic offerings from business-to-business to business-to-consumer. With e-commerce, consumers can now directly purchase from factories (the concept of factory direct) while becoming less dependent, or even bypassing, wholesalers and retailers.

Through research, many Hong Kong manufacturers and designers have expanded their OEM (product and production driven) foundation to ODM (design driven with integrated manufacturing capabilities), OBM (service driven) and even OSM (design as strategy). Over 50% has developed their own branded product lines (OBM) from OEM business model, or has positioned their business operation with design-driven capabilities (ODM); whereas prioritising design (OSM) as business strategic pillars only tally to under 9%. While this aligns to the economic growth in Hong Kong as tertiary sector driven, these designers and manufacturers have identified the importance of customer values as market forces in prioritising their organisation strategic growth, from product to service-driven.

隨著消費者需求變化，產品設計亦需要相應改變。智能技術使人工製品實物能具備數碼介面。例如智能桌椅容許遙遠控制家居電子設備的功能；鞋履就可以3D打印及定製鞋墊和設計；甚至連服裝也像智能手錶一樣可穿戴上身。汽車的附加價值更是遠遠超越了其物理存在。可能有人會認為這些只是附加在實體物件上的技術，但這些支持技術可以衍生更大的價值去捕捉終端消費者實際的數據和用途。

製造商和設計師長期依賴銷售和趨勢報告去收集對消費者市場的間接見解。當製造商有可以直接從各自的消費者處獲取信息的可能性，就能根據實際用戶的需求創造更準確的數量和設計。極端情況下，不再為分銷商、批發商和經紀人等中介機構作媒甚至可能成為新的製造業務模式。

製造商憑高透明度進入市場，可以進一步加強由B2B至B2C的策略產品。通過電子商務，消費者現在可以直接從工廠購買（工廠直銷的概念），同時減少對批發商和零售商的依賴，甚至直接繞過他們。

通過研究，一些成功的香港製造商和設計師已將其OEM（原廠代工）基礎擴展到ODM（設計加工）或OBM（原創品牌）。超過50%的企業已經從OEM業務模式中開發了自己的品牌產品線（OBM），或者已將其業務營運定位為設計能力主導（ODM）；而優先考慮設計（OSM）作為業務策略支柱的企業只有不到9%。雖然這與香港的經濟增長由第三產業主導依然一致，但其實這些製造商已經確定了優先考慮客戶價值作為市場動力於組織由產品轉向服務主導策略增長方面的重要性。

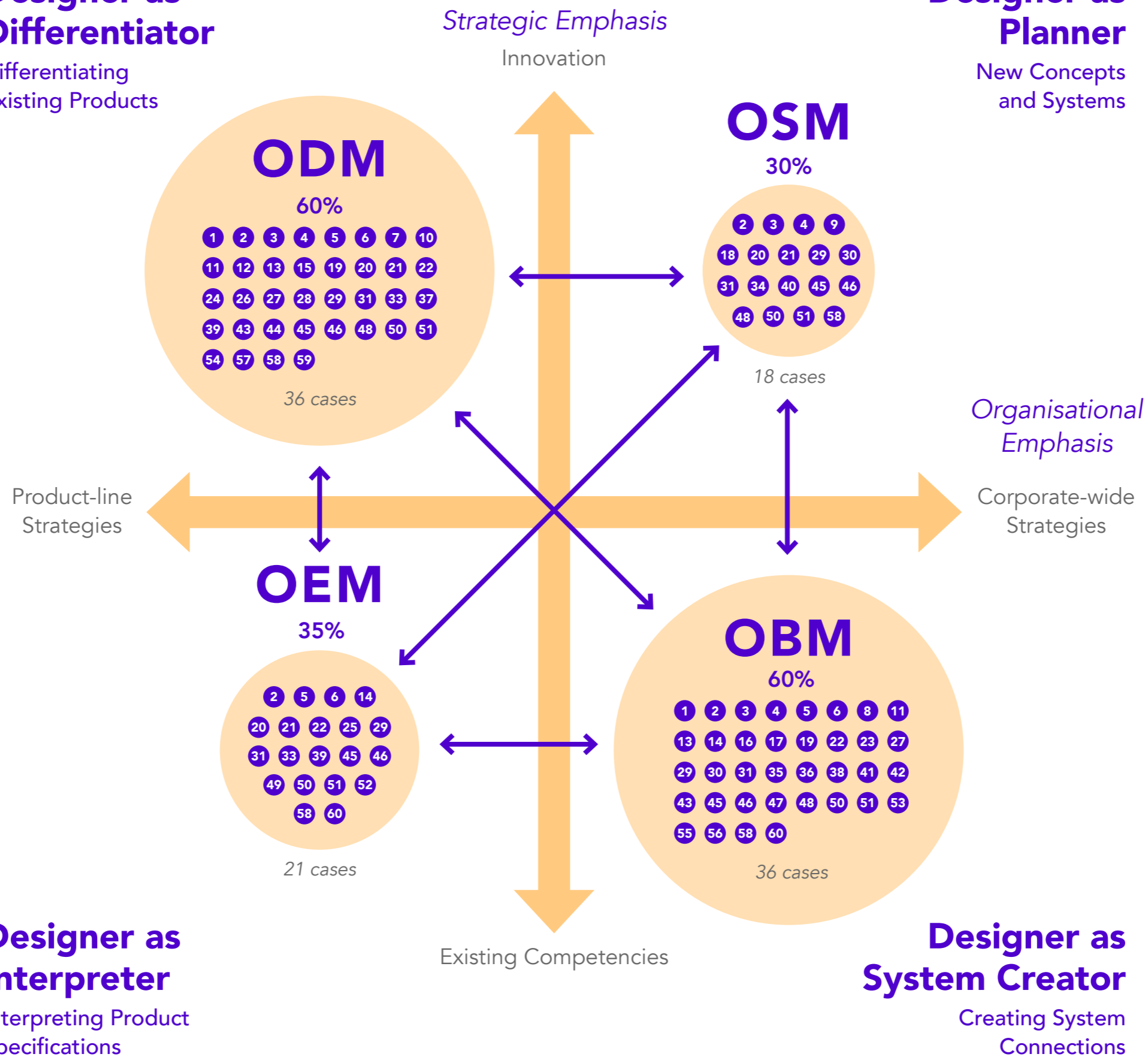
**THE CHANGES IN RELATIONSHIP
ALTERS THE POSITION IN WHICH
ONE APPROACHES THE SUBJECT.
關係的變化改變了觸及主題的定位。**

Designer as Differentiator

Differentiating Existing Products

Designer as Planner

New Concepts and Systems



About OEM-OBM-ODM-OSM²

關於
原廠代工 - 原創品牌 -
設計加工 - 策略管理

Due to the different levels and scales of operation and business nature, the OEM-ODM-OBM-OSM model here does not reflect 100% of the state of all interviewed companies. The four levels of design practices have been generated with the exceptions of 9H, ACE, ChinaDesign Research Work-Group, ENICMA, Fraunhofer IPT, Hong Kong Productivity Council, Mings 3D / Hong Kong 3D Printing Association, OMG, the Vocational Training Council and Wonderlaine Studio to maintain a fair and compatible representation.

由於受訪公司的營運和業務性質各有不同層次和規模，這裡的OEM-ODM-OBM-OSM模型並不能反映全部100%受訪公司的情況。為了確保這裡所呈現的是持平兼容的四個設計實踐階段，以上並不包括9H、創意教育協會、中國設計研究工作室、ENICMA、德國弗勞恩霍夫生產技術研究所、香港生產力促進局、Mings 3D / 香港三維打印協會、對象管理組織、職業訓練局和大可工作室等公司。

Designer as Interpreter

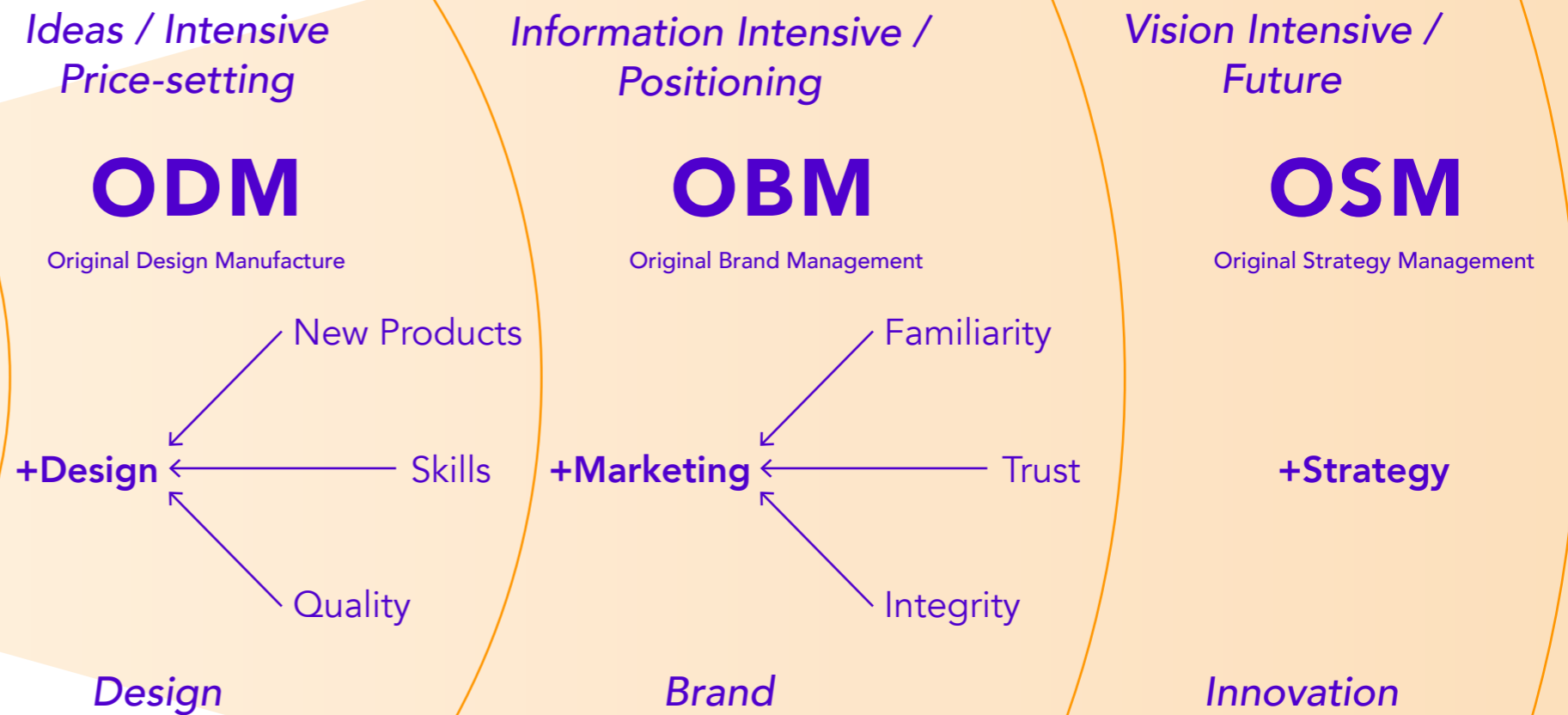
Interpreting Product Specifications

Designer as System Creator

Creating System Connections

² Heskett, J. (2009). What is design?. Retrieved from https://www.edb.gov.hk/attachment/tc/curriculum-development/kla/arts-edu/references/va/seminar%20notes_by%20John%20Heskett_%20version%20before%20editing_rev.pdf

Products create brand reputation



Low Value
Low Risk

High Value
High Risk

Brand reputation positions products

Source: John Heskett. Ten steps to heaven: Managing Design for innovation. 1st International Symposium, Shanghai, 2006; John Heskett. "Different levels of design practice." Shaping the Future: Design for Hong Kong : a Strategic Review of Design Education and Practice. School of Design, the Hong Kong Polytechnic University, 2003.

THE DEPARTED

貌合神離

With a maximum of a hundred local manufacturers and designers interviewed, there are several insights drawn which created the paradox and conflicts between their roles.

在訪問最多一百位本地製造商及設計師的過程中，有部份見解所得會造成兩者角色之間的矛盾和衝突。

AT A GLANCE 瞄一瞄

The Situation 情況



Industrial designers and manufacturers have conflict of interests. Traditional manufacturing landscape is structured as hierarchical (zero sum game) instead of integrative (win-win) between the parties. As a result, some become winners while others struggle in the competitive space.

工業設計師與製造商之間存在利益衝突。傳統製造業格局的結構被分為等級（零和遊戲），而不是各方之間的整合（雙贏），導致當中有些人會成為贏家，而另一些人則在競爭空間中掙扎。

Why It Happens 事因



There are several factors that constitute the paradox among designers and manufacturers.

1. The "Born" Identity
2. Gone North
3. The Not-So Great Gatsby
4. The Day After Tomorrow
5. Already Tomorrow in Hong Kong
6. Bad Education
7. Robocalypse

設計師和製造商之間的矛盾由幾個因素構成：

1. 與生俱來
2. 北上
3. 大亨小炒傳
4. 明日之後
5. 緣來說再見
6. 不良教育
7. 機械人啟示錄

The Ideal 理想



In a harmonised relationship, designers and manufacturers need to have transparent communication, such that decisions are achieved through mutual cohesion. It requires co-design and co-manufacturing processes instead of linear transition of tasks. A win-win relationship needs to be cultivated such that the identities can be strengthened together.

在和諧的關係中，設計師和製造商需要透明的溝通，互相凝聚去實行決策。這樣需要共同設計和共同製造的流程，而不是線性的工作轉換。一段雙贏的關係需要培養，從而讓雙方的身份都得以加強。

The "Born" Identity 與生俱來

Through research analysis with multiple Hong Kong Industrial Design Professionals, their design approach heavily inclined towards aesthetics and usability of products, with limited exposures in manufacturing capabilities, technologies and business dimensions. On the other spectrum, Hong Kong OEM manufacturers have high degrees of control and ownership in manufacturing technologies and processes (technical-driven and business-driven), which shapes the overall strategies and organisational development. Although many manufacturers may not be design-educated, they must consider all spectrum of design strategies as key business drivers. Suppliers also provide design requirements and OEM manufacturers follow specifications to production. This also extends the roles of manufacturers to design and branding activities as their businesses scale up. The nature of this model limits the necessity to have in-house design capabilities, causing bigger disconnect of knowledge to Hong Kong industrial designers. The priority of concerns in manufacturers' lens continue to widen against local designers.

Research has shown that **over 70% of Hong Kong manufacturers have little knowledge to understand the capabilities and true values of industrial practices,** resulting in generalisation of industrial designers to be associated with just decorative, cosmetics and styling activities. This is particularly true when the leadership and management team has limited exposure to formal training in design principles and management. The identity crisis with industrial designers, in irony, are familiar like Information technologists to be generalised as computer technicians. Although Hong Kong industrial designers reflected their high level of passions and knowledge towards aesthetics and design methodologies, very few of them demonstrated understanding of manufacturing processes and systems in modern technologies.

Commonly, local industrial professionals claimed themselves to be product design professionals, as if the prefix of industrial added an extra level of complexity towards their profession. As industrial designers cannot fulfil the roles to apply innovative thinking to breakthrough designs in solving many business challenges in the competitive space, manufacturers as business owners began to source external knowledge, e.g. through exhibitions, trade shows, vendors, workshops, etc, to increase their own understanding of new trends and technologies. This result in manufacturers' objectives prioritised to heighten and increase value in their products and services. Meanwhile, many industrial designers are fixated on enhancing product features and design through aesthetic changes. As more and more product designs and production steer in one direction, this widens the gaps in Hong Kong industrial landscape, causing many 'dead-end' solutions.

經過與多位香港工業設計專業人士進行的研究分析，他們的設計方針嚴重傾向於產品的美學和可用性，但對製造能力、技術及業務層面的接觸非常有限。另一方面，香港的OEM製造商對製造技術和流程（技術主導和業務主導）擁有高度控制及擁有權，促成他們整體策略和組織的發展。縱然許多製造商可能沒有接受過設計教育，但他們必須將所有設計策略範圍視為主導業務的關鍵因素。供應商亦會提供設計要求，而OEM製造商則遵循規格生產。隨著業務規模擴大，製造商的角色也擴展到設計和品牌推廣活動。這種模式在性質上限制了內部設計人才存在的必要性，導致香港工業設計師的知識更加脫節，而製造商所關注的問題比本地設計師更優先的情況則繼續擴大。

本地的工業專業人士普遍自稱為產品設計專業人士，好像「工業」這個字首會為他們的職業增添額外的一重深度。由於設計師無法履行自身角色，將創新思維應用於突破性產品設計去解決競爭空間中的眾多業務挑戰，因此作為企業老闆的製造商開始向外尋求知識，例如通過展覽、貿易展覽、供應商及研討會等，增加他們對新趨勢和技術的理解。這導致製造商將目標優先考慮成提高產品及服務的價值。同時，許多工業設計師都致力於透過美學改變去增強產品功能和設計。隨著越來越多產品設計和生產向著單一方向發展，香港工業面貌的空白越發擴大，形成了許多「死胡同」解決方案。

研究顯示 **超過70%的香港製造商對工業實踐的能力和真正價值了解甚少**，因此他們普遍認為工業設計師只與裝飾、美觀及造型等活動有關。當主管和管理團隊在設計原則及管理方面的正規培訓有限時，情況尤其如此。但是很諷刺，工業設計師的身份危機與資訊技術員一樣熟悉又相似，皆被概括為電腦技術員。雖然香港工業設計師充份反映出他們對美學與設計方式的激情和知識，但當中很少人表現出對現代製造工序與系統技術的理解。

The Research 研究

Based on the Stanford d.School design innovation framework, the Centre for Design Innovation expressed it as 6 spectrums of industrial innovation :

基於史丹佛大學d.School的設計創新框架，設計创新中心（Centre for Design Innovation）將工業創新以6個範圍表達：

M Manufacturing
製造

O Organisation behaviors
組織行為

T Technology
技術

H Human values
人文價值

B Business
業務

D Design & interactivity
設計及互動性

Translating our research statistics into this framework, one can examine the areas of interests of Hong Kong manufacturers and industrial designers, as well as their active roles and responsibilities.

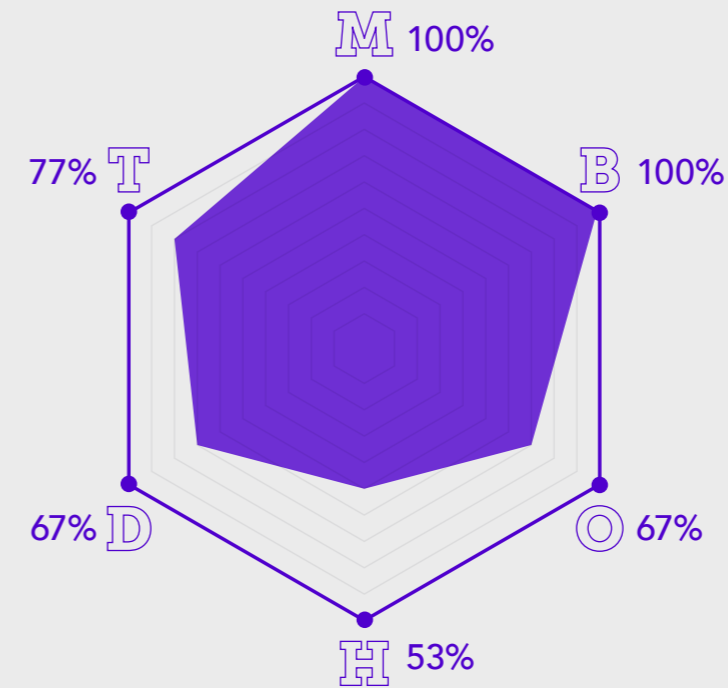
將我們的研究統計數據轉化成這個框架，可以檢視對香港製造商與工業設計師有利的領域，以及他們積極的角色和責任。

The Observation 觀察

In Hong Kong, manufacturers have a broader spectrum of innovation interests than industrial designers. Organisation behaviours and technological development, which are critical factors of success in strategic progression in Industry 4.0, are rated very low for designer roles. Ironically, an industrial designer by education and training should be able to cover all spectrums and provide valuable insights to manufacturers for strategic breakthrough.

香港的製造商比工業設計師所涉獵的創新利益和範疇都更廣泛。組織行為和技術發展是工業4.0策略發展成功的關鍵因素，設計師的角色於這兩個範疇的評價卻很低。諷刺的是，通過教育和培訓的工業設計師理應能夠涵蓋所有範疇，並為製造商提供有價值的見解，以達到策略突破。

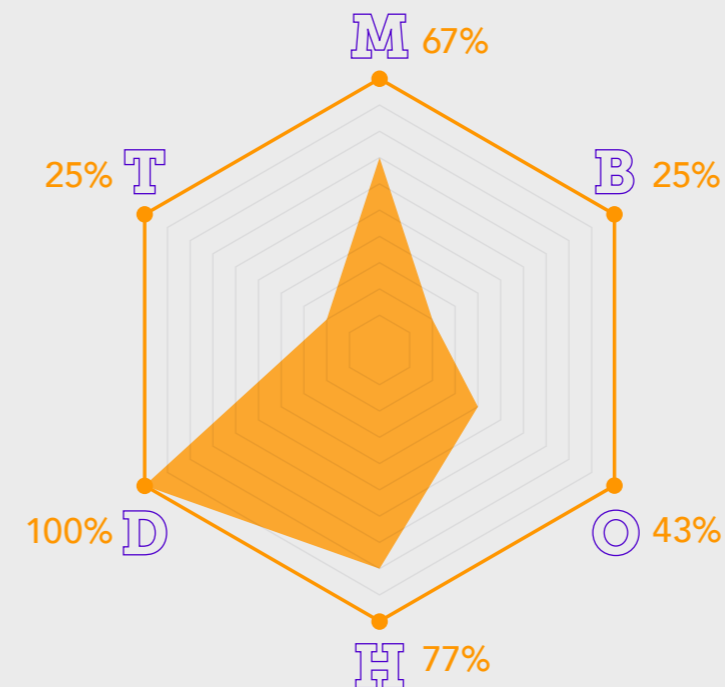
Manufacturers' orientation 製造商傾向



With the changes occurred in Hong Kong manufacturing landscape, the area of focus, as commonly shared by all manufacturing leaders in the research, is to evolve the business strategy in alignment to the changes taking place in the production technologies. Without a doubt, traditional manufacturers continued to strive to further production capacities and business operations, while the new generation of manufacturing leaders seek to expand the scope from product to service strategies.

隨著香港製造業景觀的變化，研究中所有製造業領導者共同關注的領域是根據生產技術發生的變化去調整出一致的業務策略。毫無疑問，傳統製造商會繼續努力進一步提升生產能力和業務營運，而新一代製造業領導者則會尋求將範圍從產品擴大到服務的策略。

Industrial designers' orientation 工業設計師傾向



Designers who lead and operate in manufacturing settings demonstrated their respective abilities and high interests in product design and interactivity. Although design with human experience has always been an essential of product and system designs, only 50% of the industrial designers interviewed prioritised human values as fundamentals. Majority of designers are keen on aesthetics and appearance of their design; technological and business considerations were particularly low, leading to bigger gaps between manufacturers' priorities against designers.

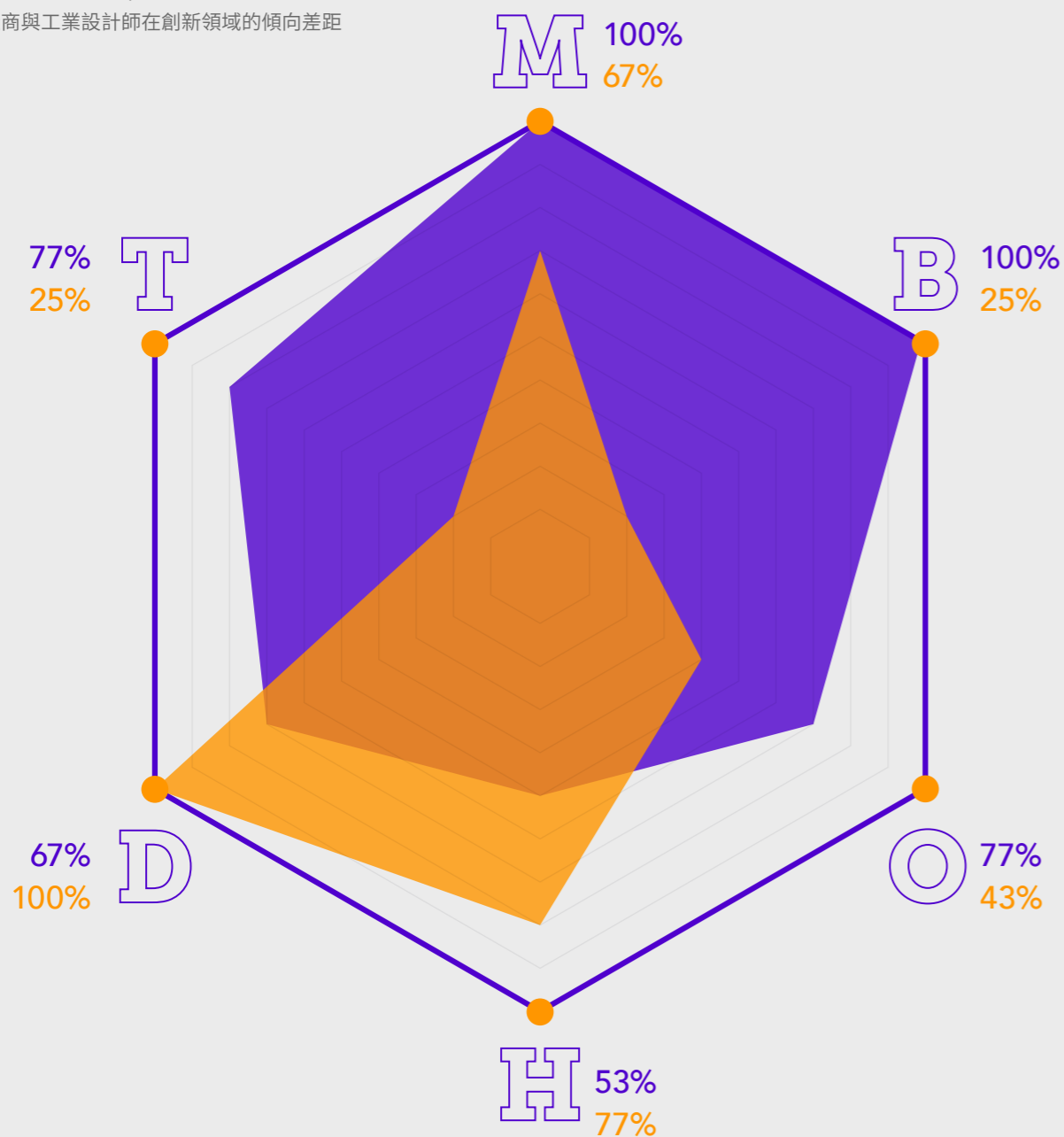
在製造環境中分別擔任領導和營運的設計師在產品設計和互動性方面各自展示了其能力和濃厚興趣。雖然切合人類體驗的設計一直是產品和系統設計的必要條件，但只有50%的受訪工業設計師會優先視人類價值觀視為根基。大多數設計師都熱衷於設計的美學和外觀；技術和商業方面的考慮特別低，導致製造商與設計師在優先排序之間存有較大差距。

Separate orientation

分離傾向

The gap between the interests of manufacturers and industrial designers in the innovation spectrum

製造商與工業設計師在創新領域的傾向差距



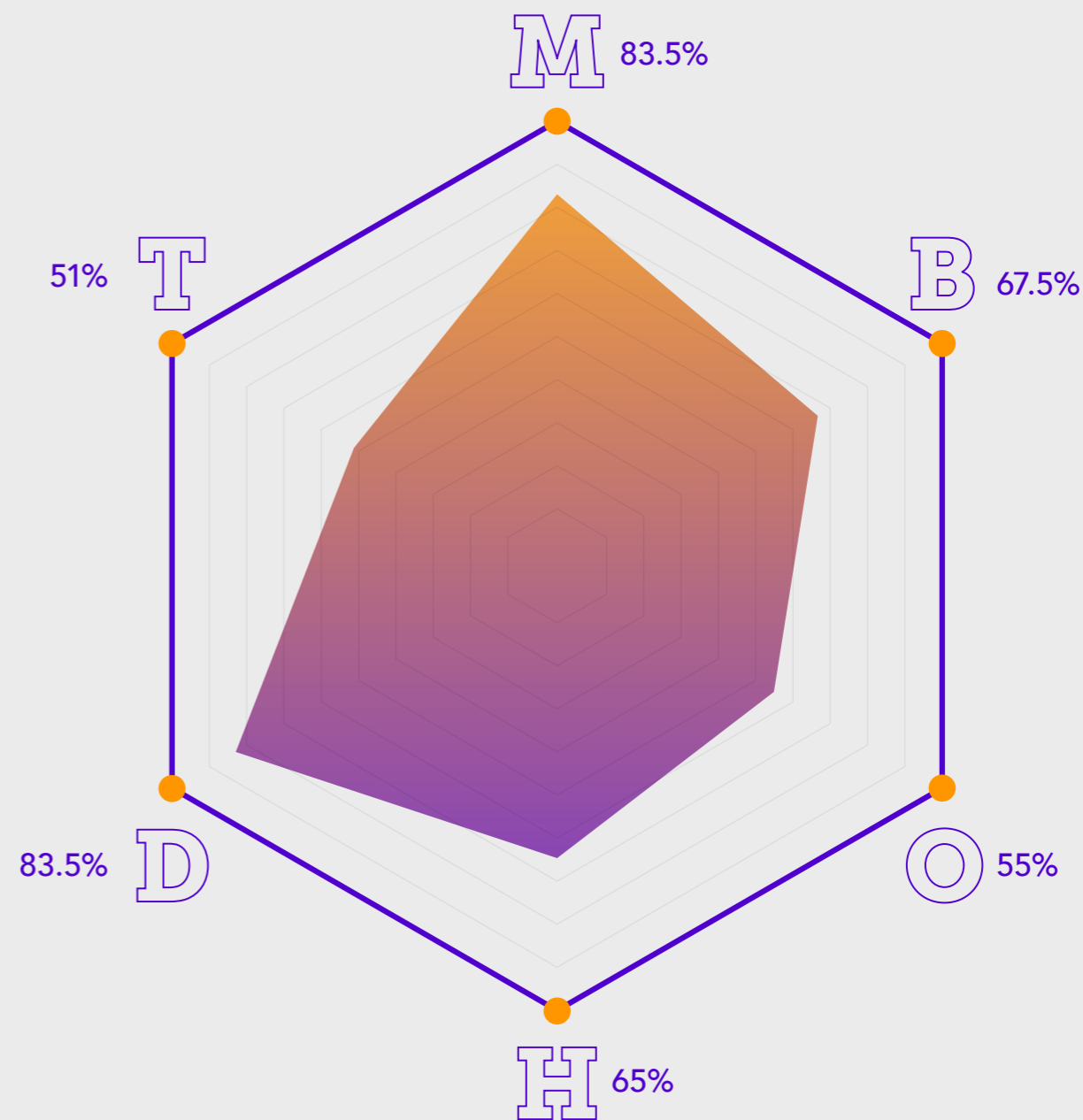
■ Manufacturer 製造商
■ Industrial Designer 工業設計師

Combined orientation

製造商與設計師在創新領域的興趣傾向

ideal is over 100%

理想是超過100%



Instead of pulling away, manufacturers and designers seek to lessen the gaps to compliment respective values and skills. As calculated in the combined orientation, technological and organisational capacity development score just averaged past the 50% margin. Without appropriate support systems and infrastructures, this hinders the knowledge and change capacity for an organisation to meet the small batch production demands in this disruptive and transformative digital era.

製造商和設計師並非要拉闊距離，而是在尋求縮小差距，以相互補足各自的價值觀和技能。根據合併傾向計算所得，技術和組織能力發展得分的平均僅超過50%。如果沒有適當的支援系統和基礎設施，這將阻礙組織就小批量生產需求的知識和變革能力，很難滿足現今顛覆又變動的數碼時代。

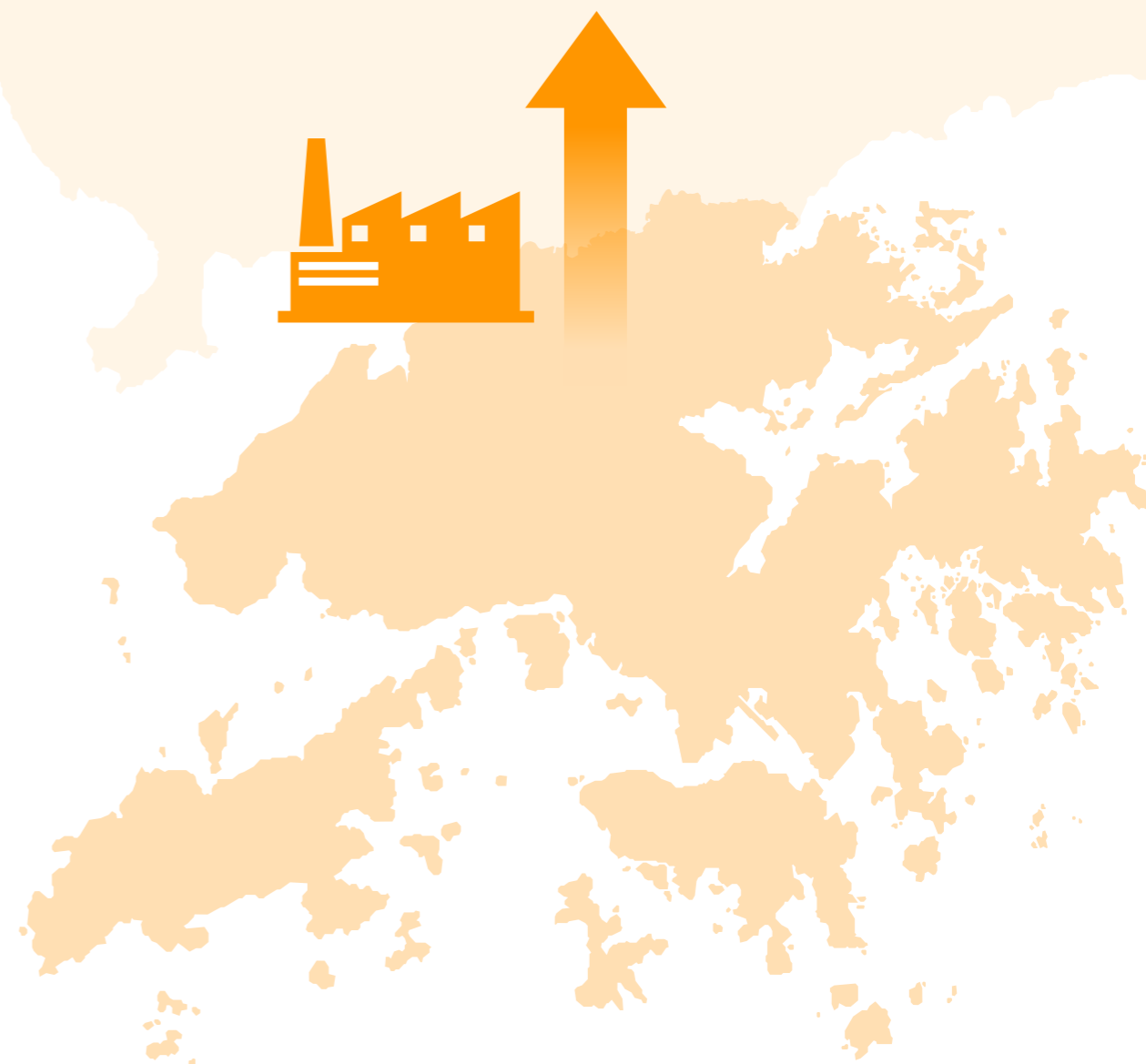
Gone North 北上

Although manufacturing underwent a booming period in the past, many factories have migrated away from Hong Kong locally to the north. The removal of the physical infrastructures resulted in a disconnect, or a knowledge blank period, in Hong Kong manufacturing landscape after the migration.

Furthermore, manufacturing and product design knowledge were once obtained through apprenticeship. While many manufacturers did not receive formal education in design methodologies, they honed their skills through hands-on practices. As manufacturing environment diminishes, next-generation industrial designers in Hong Kong have less opportunity to access and understand the development of manufacturing systems and infrastructure settings.

雖然過去製造業曾經歷過發展蓬勃的時期，但許多工廠已經從香港本土遷移到北方。北移後實體工廠基礎設施遷離，引致香港製造業景觀脫節或出現知識空窗期。

此外，製造與產品設計知識過往是通過學徒制傳授的。即使許多製造商都沒有接受過正規的設計方法教育，但他們透過實踐練習磨練出自己的技能。當製造環境日漸減少，香港下一代的工業設計師往往更難以獲取和理解製造系統及基礎設施設置的發展機會。



HK MANUFACTURING STRATEGY = REAL ESTATE INVESTMENT ?

香港製造業策略 = 房地產投資?

The Not-So Great Gatsby 大亨小炒傳

As Interviewee E stated, "Manufacturing investment strategy is dependent on real estate (buying lands in underdeveloped areas) and low cost of labour for production."

正如受訪者E所說，「製造業投資策略依賴房地產（購買不發達地區的土地）及低成本的生產勞動力。」

Hong Kong economy is mainly driven by real estate and financial sector. Upon interviews with Hong Kong industrial leaders, questions and concerns were raised to understand their strategic positioning in expansion of their manufacturing businesses. Similarly, the manufacturers have furthered their business scopes to real estate and financial investments, and their OEM operations become sub-entities to parent corporations. This reduces the anxiety and pressure for the manufacturing capabilities to evolve as the core business no longer relies on manufacturing production alone.

On the other hand, some Hong Kong manufacturers who depend solely on production business have to transform by meeting this new economic shift - in both customisation and using industry 4.0 technologies - and to not fall behind in this competitive space. These OEM manufacturers are not

only competing locally but against global giants and other established corporations that began to expand their service scope, e.g. Google can manufacture driverless cars. The transformation becomes inevitable to increase OEM service value. The latter, however, experience great challenges in organisation changes.

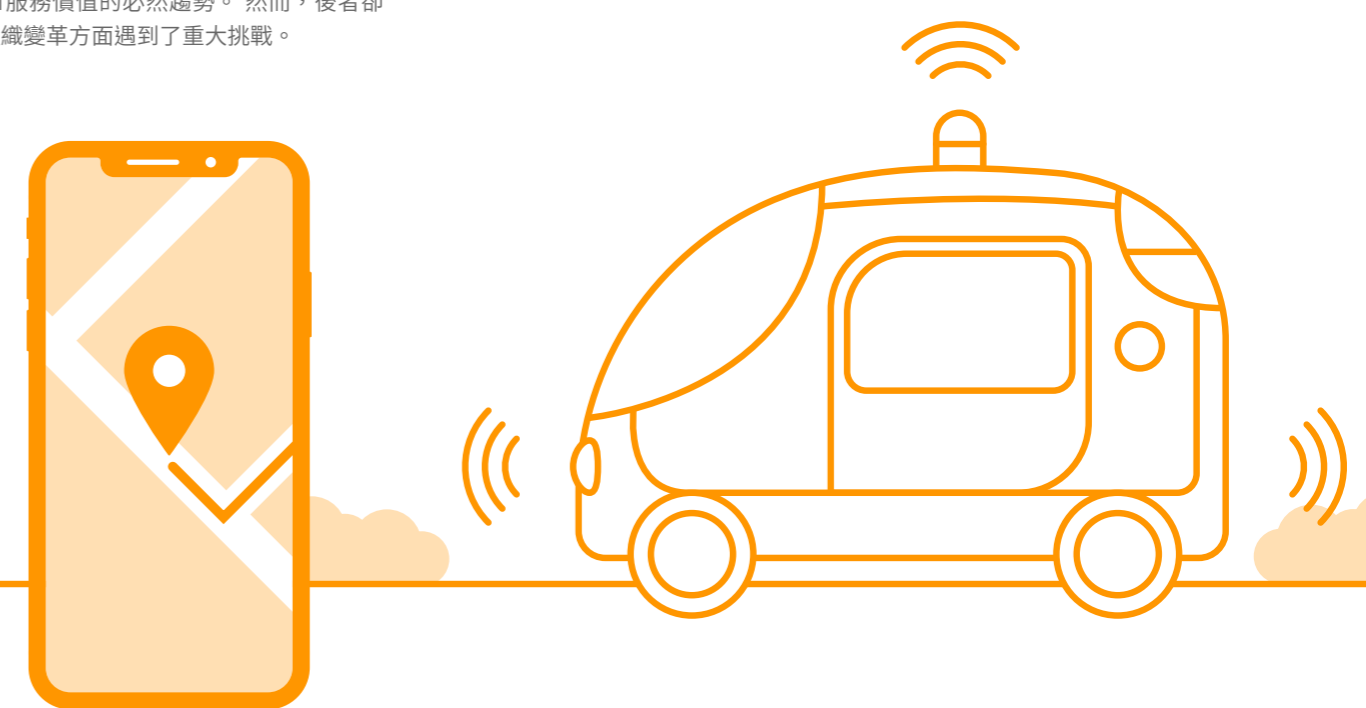
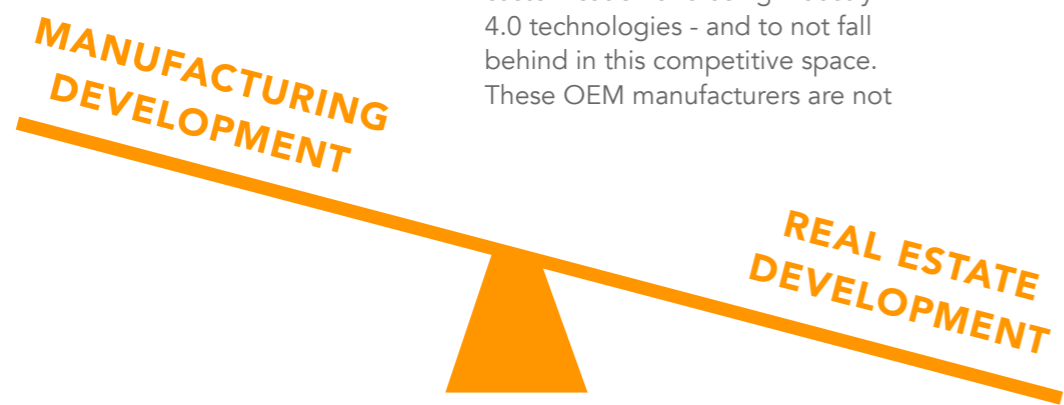
One of the main reasons are financial constraints as they do not have the necessary capital to pre-invest and wait for years of return. The dilemma of shifting limited capital to invest in scale customisation equipments can easily lead to their pitfalls and affect their foundational OEM business. Through research, some of these owners indicated the importance of government funding schemes in matching their limited investment pool.

香港經濟主要受房地產和金融業的帶動。我們與香港工業領袖進行面談時，提出了一些問題和疑慮，從而了解他們在擴大製造業務方面的策略定位。同樣地，製造商已將其業務範圍擴展到房地產及金融投資，而其OEM業務就成為母公司的子實業。因為核心業務不再依賴製造業生產，這減輕了製造能力發展的焦慮和壓力。

另一方面，一些完全依賴生產業務的香港製造商必須迎合這個新的經濟轉變——包括客制化與使用工業4.0技術——以免於競爭空間落後。這些OEM製造商不僅面臨本地競爭，而且更與全球巨頭和其他已開始擴大其服務範圍的成熟公司競爭，例如谷歌可以製造無人駕駛的汽車。轉型成為提高OEM服務價值的必然趨勢。然而，後者卻在組織變革方面遇到了重大挑戰。

其中一個主要原因是財務限制，因為他們沒有預先投資和等待多年回報所需的資金。將有限的資金轉移到量產客制設備的投資上很容易導致他們墮入困境，並影響其基礎OEM業務。通過研究，其中一些廠主表明了以政府資助計劃作為他們有限投資總匯配套的重要性。

What about manufacturers who strive for other competitive edge?
"Government funding and external investment channels becomes a critical outlet."
那些爭取其他競爭優勢的製造商呢？
「政府資助和外部投資渠道成為關鍵的出口。」



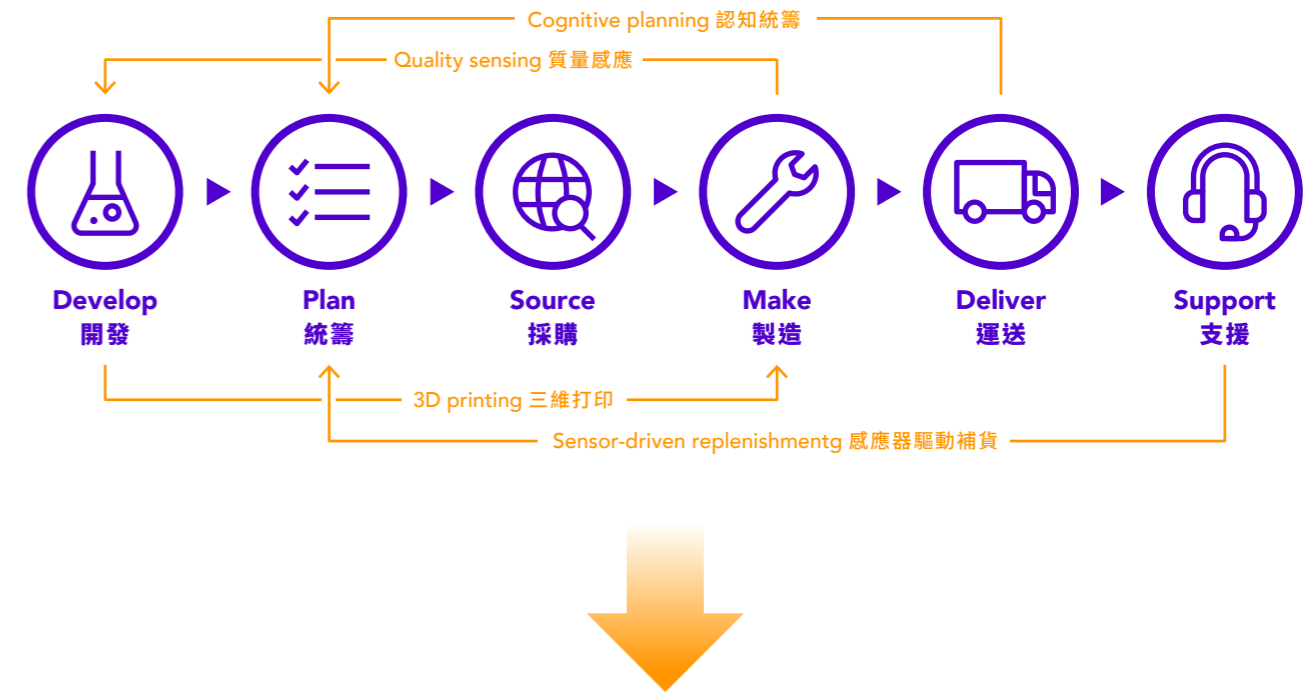
The Day After Tomorrow 明日之後

For decades, manufacturers have been focusing on developing capacities to captivate on costs for productions, with the belief of increasing product qualities and added functionalities while lowering prices to maintain competitive edges. While this model has been effective in the past, it was built upon the conditions with long production time and distance, and the opportunity space to capitalise on the profit gain was to optimise the gaps in between. With technological advancements, the gaps in the production life cycle have shrunk dramatically, and new windows of opportunities are resulted. The old strategy is now constantly being challenged as the world becomes more globalised and fragmented, distributions will become faster and easier, consumers expectations will continue to grow, and large quantities with small profit margins cannot sustain the growth and even survivability of manufacturing businesses.

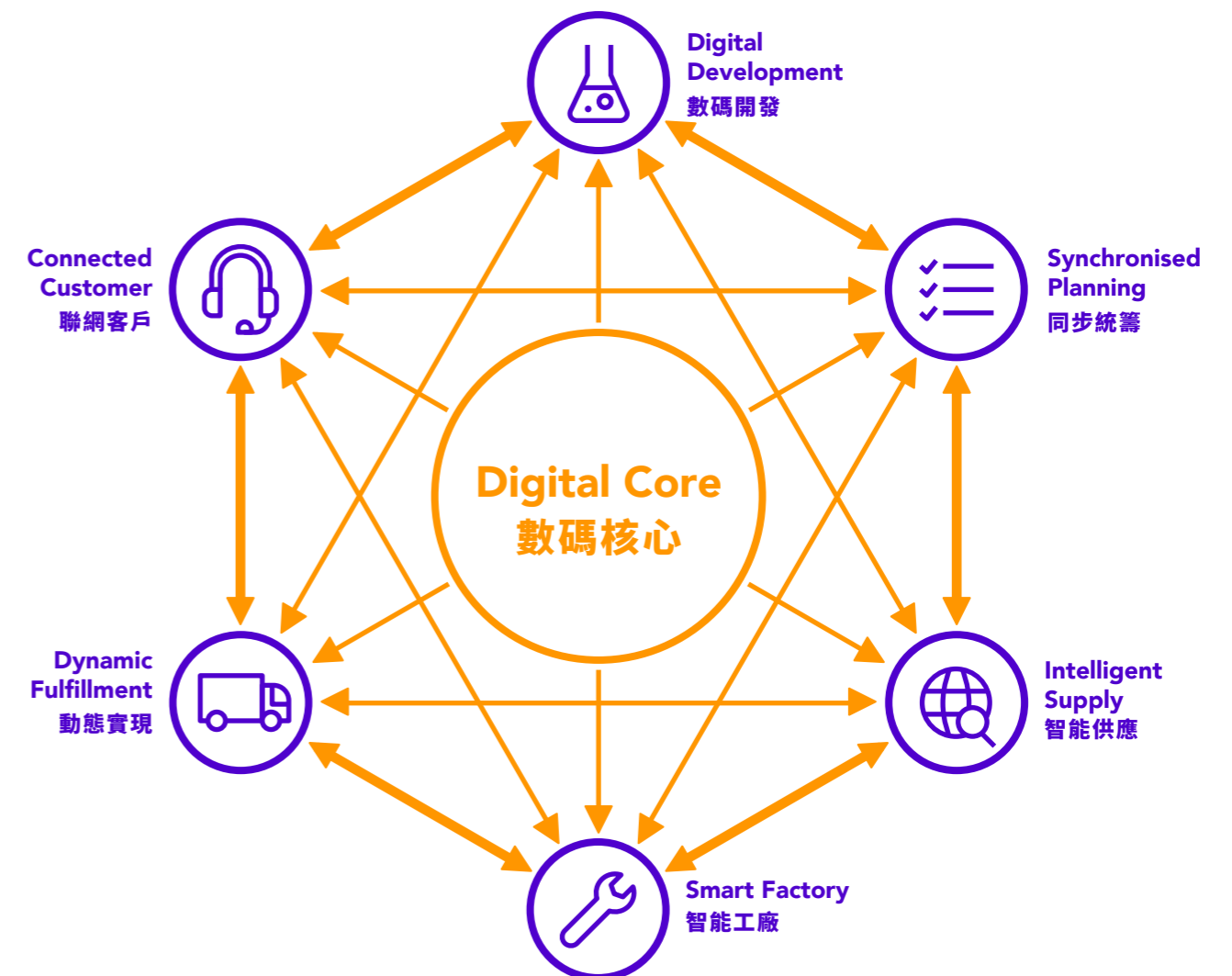
幾十年來，製造商一直致力開發能夠吸收生產成本的能力，提高產品質量及增加功能之餘，同時要降低價格以保持競爭優勢。雖然此模式在過去是有效的，但它建基於生產時間和距離較長的條件下，利用利潤增加的機會及空間去優化兩者之間的差距。隨著科技進步，生產生命週期的差距急劇縮減，新的機會也隨之而來。當世界變得更加全球化和碎片化，分銷將變得更快更容易，消費者的期望亦將繼續增長；然而利潤小的大量生產再無法維持製造業務的增長與生存能力，因為舊有的策略現已不斷受到挑戰。

FUTURE

Traditional value chain 傳統價值鏈



Digital value network 數碼價值網絡



Source: Adam Mussomeli, Stephen Laaper, and Doug Gish, *The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains*, Deloitte University Press, December 1, 2016, <https://www2.deloitte.com/insights/us/en/focus/industry-4-0/digital-transformation-in-supply-chain.html>.

Already Tomorrow in Hong Kong 緣來說再見

Information technologies heavily influence the survival and future of industrial space. With technologies integrated into people's daily lives, consumers will become more connected to information at high speed. Progressively, consumers develop quicker habits to sift through information and only engage in products and services that align to their best interests. This fundamentally transforms consumers expectations and behaviours, creating a need-driven culture. Speed of manufacturing, variety of design choices and ease of accessibility to products will become crucial success factors, and neither one can be exclusive from one another. This poses challenges for designers and manufacturers to respond adaptively and quickly with legacy systems.

Traditional methods using post-sales analysis reporting and market researches are insufficient to keep up, and so, Industry 4.0 technologies stresses on real-time data monitoring to progressively capture live user movements for predictive forecasting. Although the application of advanced technologies is inevitable in the upcoming industrial transformation, a subset of Hong Kong

manufacturers and designers do not see technology as a strategic pillar to progression. Many view technologies as purchases off the shelves, just like retail consumer products. They tend to wait for solutions to be fully mature when market has commonly adopted the technologies instead of strategically planning ahead of the curve. This results in passive actions instead of proactive approaches.

The economy has already advanced from the industrial era to the knowledge era, where technologies and information denote economic progression, and many Hong Kong manufacturers shown minimal signs of knowledge with technological skills. Cost of manufacturing systems are high and not easily upgradeable without transformative infrastructure changes and knowledge training. The lack of knowledge in technological utilisation also constrain available options to make progressive upgrades without disrupting existing operations and finances.

幾十年來，製造商一直致力開發能夠吸收生產成本的能力，提高產品質量及增加功能之餘，同時要降低價格以保持競爭優勢。雖然此模式在過去是有效的，但它建基於生產時間和距離較長的條件下，利用利潤增加的機會及空間去優化兩者之間的差距。隨著科技進步，生產生命週期的差距急劇縮減，新的機會也隨之而來。當世界變得更加全球化和碎片化，分銷將變得更快更容易，消費者的期望亦將繼續增長；然而利潤小的大量生產再無法維持製造業務的增長與生存能力，因為舊有的策略現已不斷受到挑戰。

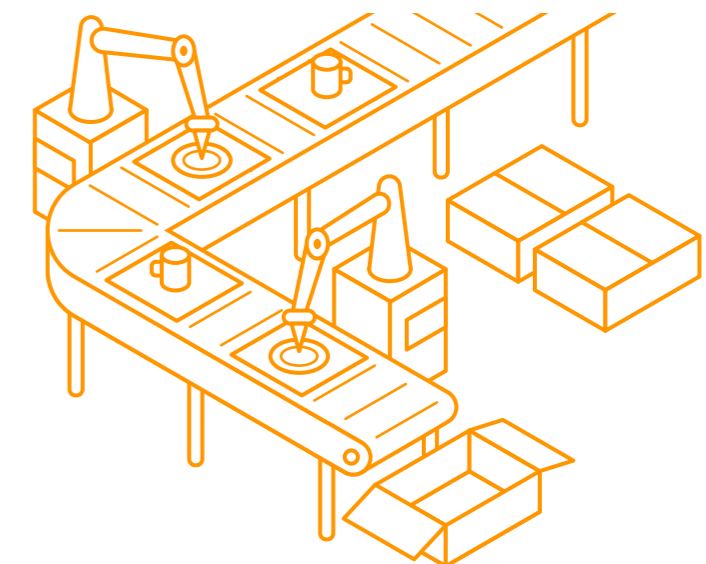
傳統方法如利用售後分析報告和市場研究已經不足以跟上改變，因此工業4.0技術強調實時數據監控，以逐步捕捉實時用戶行動去進行預測分析。儘管在即將來臨的產業轉型中應用先進科技是無可避免，但一部分香港製造商及設計師並不認為技術是進步的策略支柱。許多人認為科技就像購買現成的零售消費品一樣。當市場普遍採用科技，他們傾向等待解決方案完全成熟，而非事先的策略部署，導致被動行為而非主動方針。

現今經濟已經由工業時代走向知識時代，技術和信息代表經濟發展，而很多香港製造商在技術技能方面卻只表現出最低程度的知識。如果沒有革命性的基礎設施變更及知識培訓，以製造系統的成本之高，升級並不容易。要在不妨礙現有營運和財務的情況下進行漸進式升級，缺乏使用技術的知識無疑亦限制了可行的選擇。

Exception 例外

One exception identified amongst the researched manufacturers in Hong Kong is Best Victory. With leadership roles trained in computer programming, engineering and business background, they were able to transform from paper documentation and analogue controllers to full extensive usage with Industry 4.0 technologies. As they claimed, the technological transformation to uplift the deep-rooted legacy systems and processes was made possible due to their thoroughness of technological knowledge and analytical mindsets.

在對香港製造商進行研究時，我們發現到 Best Victory 是一個例外。透過擁有電腦程式、工程及商業培訓背景的領導人物，他們能夠從紙質文檔與模擬控制器轉為全面廣泛使用工業4.0的技術。正如他們所言，全因他們有透徹的技術知識與分析思維，令遺留下來根深蒂固的系統和流程得以技術轉型變得可能。



Bad Education 不良教育

With the ever-changing environment, traditional knowledge and training methods have become a hindrance. Currently, Hong Kong manufacturers and designers have to undergo at least 12 to 18 months to adapt to the changes and see fruitful results on organisation level when applying new system upgrades. Meanwhile, education systems in Hong Kong still lack in incorporating the new mindsets and latest technologies to train next generation industrial designers - in response to the growing demands in customisation and technological changes in manufacturing. This creates further gap in meeting manufacturing owners' needs to ride on industrial designers' knowledge in attempt to reshape their business changes and growth.

Meanwhile, many local universities in Hong Kong has restructured industrial design in bachelor programmes into product design in major. Although there are master degrees on design management, the marketplace has become limited and fragmented to appeal to mass public as career paths. Upon research with design students, many of them indicate their lack of manufacturing knowledge and so they have to hone their skills on aesthetic designs and ergonomics, and there is a lack of opportunities to move up in career. In turn, many designers aim to become entrepreneurs - with own brand - to pilot their own designs and projects in hopes for better future.

身在不斷變化的環境中，傳統的知識和培訓方法已然成為了障礙。目前，香港製造商及設計師在應用新系統升級時，若要適應轉變和看到組織層面上的有效成果，必須經歷至少12至18個月的時間。與此同時，面對製造業不斷增長的客制化需求和技術轉變，香港的教育系統仍然缺乏新思維和最新技術的融入去培養下一代工業設計師。製造業的老闆需要借助工業設計師的知識去嘗試重塑他們的業務改革和成長，但過時的教育系統未能滿足製造業這個需求，造成兩者之間更大的差距。

與此同時，很多香港本地的大學已將工業設計的學士學位重組為專業的產品設計。雖然有設計管理碩士學位，但為了吸引大眾以此作為職業生涯，市場空間變得有限且分散。通過對設計專業學生的研究，他們當中許多人表示自己缺乏製造知識，因此必須磨練好自己的美學設計和人體工學技能，縱然職業生涯亦缺乏晉升的機會。許多設計師的目標反而是成為企業家——擁有自家品牌——去試驗他們的設計和項目，希望有更好的未來。

Opportunities 機遇

Institutions like Vocational Training Council (VTC) in Hong Kong has recently partnered with Hong Kong Productivity Council (HKPC) and Fraunhofer IPT to launch new programmes, with hands-on training, specifically on nurturing next generation designers on Industry 4.0 capabilities.

香港職業訓練局 (VTC) 最近與香港生產力促進局 (HKPC) 及 Fraunhofer IPT 等機構合作推出新課程，讓下一代設計師進行親身實踐的培訓，著重培育他們工業4.0方面的能力。

FULL AUTOMATION

Robocalypse 機械人啟示錄

Another rationale reflected upon research is the deskilling of labour and knowledge workforces. Traditionally, workers have been dependent sources of intervention with machine operations in manufacturing, while designers play active roles in leading design criteria for production. As technologies advance in manufacturing space, the relationship of design to product and workers to machines are being redefined. Full automation undermines the necessity of human labour in manufacturing environment and replaces routine activities with robots, and digitalisation leads to remote control and operations of production. Consumers are taking more active roles to demand designs of products, adding levels of complexity and conflicts with designers' own perceptions of product aesthetics and design feasibilities. The deconstruction of roles and responsibilities changes the dynamics in which workforces are distributed and assigned in the organisation, and places the career of many industrial workforces at risks.

研究反映的另一個原因是在勞工和知識勞動力的去技能化。傳統上，製造業的機器操作一直依賴和源自工人的介入，而設計師在領導生產設計標準方面則發揮積極的作用。製造領域的技術日益進步，設計和產品以及工人和機器的關係現正被重新定義。完全自動化削弱了製造環境中人類勞工的必要性，以機器人取代了日常的刻板活動，而數碼化生產更可遙遠控制和操作。消費者在產品設計的要求方面亦扮演更積極的角色，這不免加深了他們與設計師自身對產品美學和設計可行性的複雜性和衝突。角色和責任的解構改變了組織勞動力的分佈與及被分配的動態，令到許多工業勞動人口的職業生涯面臨風險。

ENDER'S GAME

精英的遊戲

**Scale Customisation as
Manufacturing
Design Strategy?**

量產客制化成
製造業設計策略？

Mass Effect 質量效應

Among conversations with many Hong Kong designers and manufacturers, there are confusions and misunderstanding that customisation is to design and manufacture separately for each and every individual consumer - this is another concept discussed in many Industry 4.0 studies as "batch size one" and mass personalisation.

Customisation is not a new term. To clarify the misconception of scale customisation and personalisation, one can study from the industrial approach with customisation as strategy. The concept was popularised in 1993 by Pine et al's Harvard Business Review article³, and some academic studies even traced back to 1980s. To clarify, scale customisation aims to deliver products and services that best cater to consumers' needs with close to mass production costs and efficiencies. The straightforward definition of scale customisation was "producing goods and services to meet individual customer's needs with near mass production efficiency" by Stan Davis (1987).

Lately, Kaplan & Haenlein (2006) and McCarthy (2004, p. 348) have highlighted the strategic balance between creating the customised products and maintaining the capability of mass production. The equipment allows low volume production and prototyping, while the feasibility of mass / scale customisation always entails the mindset of the leader, management and knowledge workers.

One principle which differentiates scale customisation from mass production is consumers' active involvement, by incorporating consumers' identities as inputs to design and service delivery in the value creation process of production. Another important theory is switching from economies of scale, which entails maximising gains through large volume production, to economies of scope, which focus on expanding benefits to produce wider ranges of products efficiently under the same infrastructures and business activities.

與許多香港設計師及製造商的對話中，得知他們之間存在混淆和誤解，以為客制化就是為每位消費者單獨設計和製造——這是多項工業4.0研究討論的另一個概念，即是「單件批量」和量產個性化。

客制化並不是一個新的詞彙，為了澄清量產客制和個性化當中的誤解，我們可以客制化作為策略的工業方針進行研究。客制化的概念於1993年由Pine等人於《哈佛商業評論》文章³推廣，有些學術研究甚至追溯到20世紀80年代。為了清晰說明，量產客制化旨在以接近大量生產的成本和效率，同時提供最能滿足消費者需求的產品及服務。Stan Davis (1987) 對量產客制化的直接定義是「以接近大量生產的效率生產商品和服務，從而滿足個別客戶的需求」。最近，Kaplan & Haenlein (2006) 與McCarthy (2004, 348頁) 強調製造客制化產品與維持大量生產能力之間的策略平衡。機器設備允許小批量生產和原型設計，然而大量/量產客制化的可行性終究還是取決於領導、管理層和知識工作者的心態。

區分量產客制化與大量生產的一大原則是消費者的積極參與，他們在生產的價值創造過程中，以消費者的身份投放於設計和服務的發送。另一個重要的理論是由本來通過大量生產實現收益最大化的規模經濟，轉向重點是擴大效益的範圍經濟，務求在相同的基礎設施及商業活動下有效地生產種類更多的產品。

One can further study and compare the strategic objectives between mass production and customisation through the modified research conducted by University Technical Malaysia Melaka⁴.

通過馬來西亞馬六甲技術大學進行的修訂研究，我們可以進一步研究和比較大量與客制化生產之間的策略目標⁴。

Mass Production vs Mass Customisation 大量生產和量產客制化的比較

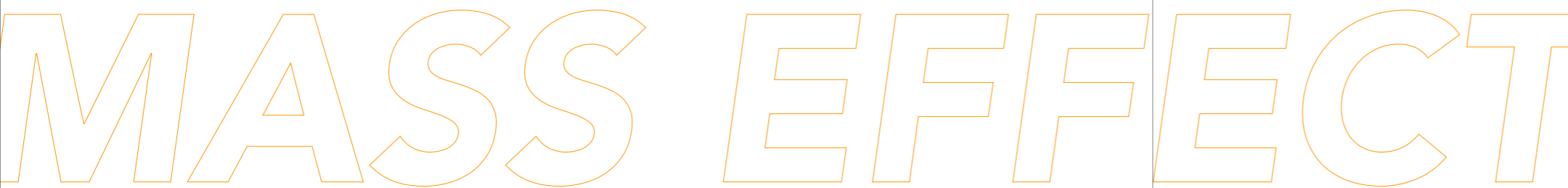
Parameters 規範	Mass Production 大量生產	Mass Customisation 量產客制化
Goal 目標	Deliver standardised goods/services with low price 以低價提供標準化的商品/服務	Deliver varied goods/services to fulfill specific customer groups with different wants/needs. Try to offer a lower unit cost 提供各種商品/服務，以滿足特定客戶群的不同渴求/需要，並盡量降低單件成本
Economics 經濟學	Economies of scale 規模經濟	Economies of scope with customer integration 範圍經濟連同客戶整合
Focus 焦點	Efficiency through large volume production, stability and control 透過大批量生產、穩定性及監控實現效率	Variety through personalisation, flexibility and responsiveness 透過個人化、靈活性及回響度實現多樣化
Key features 主要特色	Stable demand, low cost, consistent quality 需求穩定、低成本、一貫品質	Fragmented demand, mid-high cost, specific quality 需求分散、中至高成本、特定品質
Customer involvement 客戶參與	Passive 被動	Active 主動

Modified from Thakur et al. Mass Customisation
由Thakur等人修訂《量產客制化》



³ Pine, B.J. (1993). "Mass Customization: The New Frontier in Business Competition." Boston, Mass., Harvard Business School Press.

⁴ Nair, S.K., Thakur, L.S. and Wen, K. (1995). "Near optimal solutions for product line design and selection: beam search heuristics". Management Science, 41(5), IGI-I&S.



Margin Call 補倉指令

Customisation as a strategy is particularly suitable for small to medium manufacturers to target niche markets. SMEs have competitive edges as they are more adaptive to changes and closer to consumer engagements, while larger manufacturers require more resources to reposition themselves in the market.

客制化作為一種策略特別適合中小型製造商去瞄準小眾市場。中小企業具競爭優勢，因為它們更適應變化亦更貼近消費者參與；而較大的製造商則需要更多資源去為自己的市場重新定位。

Given that designers and manufacturers go hand-in-hand, to approach scale customisation strategically, the involved stakeholders should understand the dimensions of production systems synergistically. The five types of customisation approaches, according to Wortmann's typology, demonstrate the relationship between design to manufacturing process structure, product volume and consumer involvement.

According to S&C, furniture as design can be approached with all five types of customisation systems for manufacturing. Similar with toy design manufacturers like Maisto, OFESS and Yick Shun Group, watch companies as Memomem, and others, products which can be designed and developed by parts are in particular favourable with assemble-to-order approach.

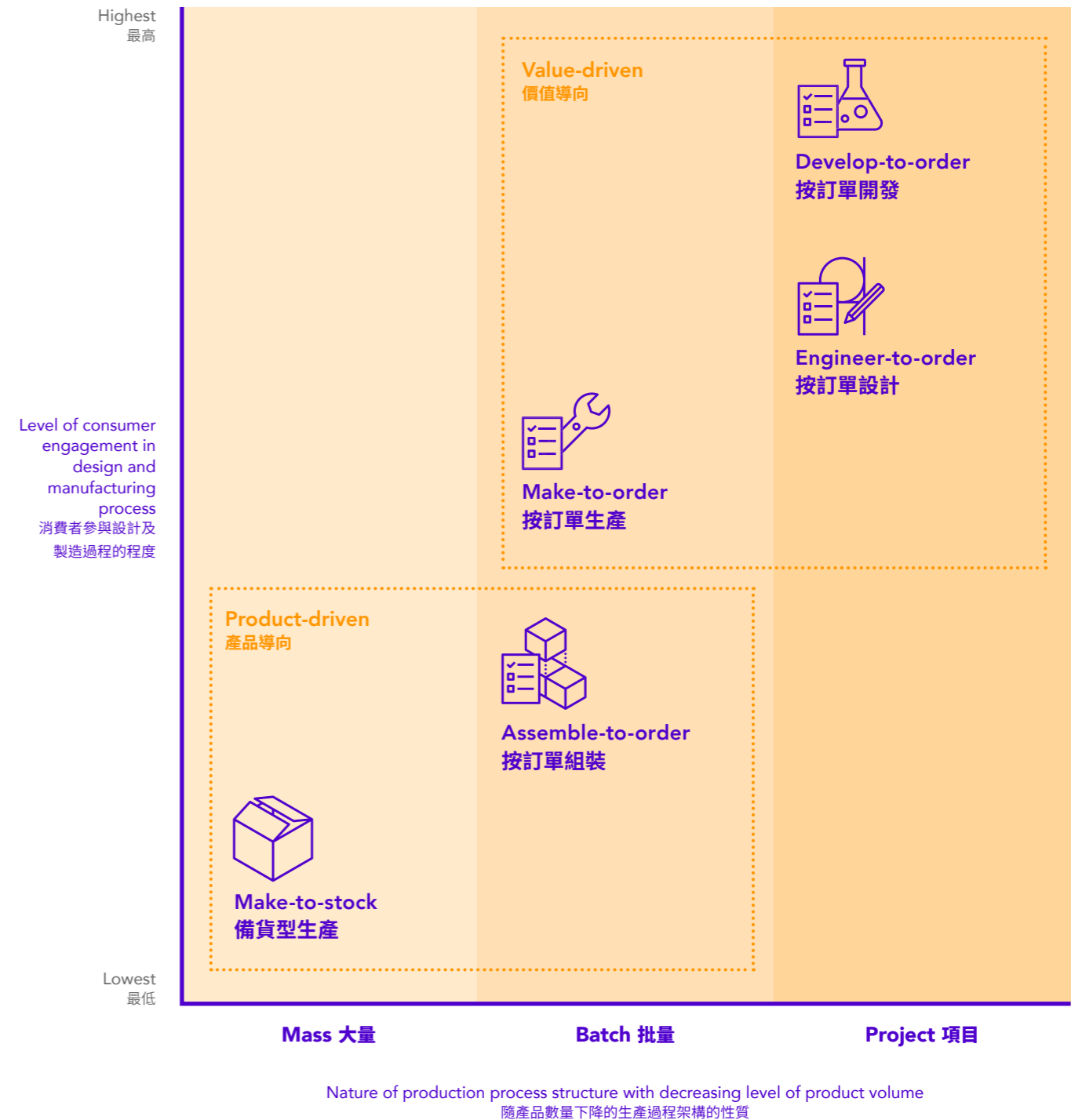
These businesses commonly shared the modularity in their product designs and assembly, achieving a higher degree of flexibility in approaching customisable products manufactured in scale - from batches to mass volumes. To further understand the benefits and differences of customisation occurring in each system, one

should further examine the approach that best fits their organisation development stages and capabilities.

由設計師和製造商並駕齊驅，若要進行策略性量產客制，相關的利益持份者應該協同理解生產系統的不同維度。根據Wortmann的類型學，設計與製造過程架構、產品數量和消費者參與之間的關係可以由五種類型的客制方法展示。

根據方圓傢具的說法，傢具作為設計可與全部五種類型的製造客制系統聯繫起來。同樣地，像Maisto、OFESS和億順集團一類玩具設計製造商，以及Memomem等手錶與其他公司，只要可以通過零部件設計和開發的產品，都尤其有利於按訂單組裝方針。

這些企業在產品設計和組裝中通常都有模組化的共通點，在邁向批量生產的可客制產品（從批量到大規模生產）方面有更高的靈活性。為了進一步了解每個系統當中客制化的好處和異同，我們應該進一步研究最適合各自組織發展階段和能力的方法。



The theory of customisation strategy can be also studied through Wortmann's typology⁵, which is categorised into five types of customisation production systems:

通過Wortmann的類型學進行研究⁵，客制化策略理論可以被分為五個類型的客制化生產系統：



Make-to-stock
(mass produced to stock)
備貨型生產
(按庫存大量生產)



Assemble-to-order
(mass produced by parts and assemble to order delivery)
按訂單組裝
(大量生產零件並按訂單組裝交貨)



Make-to-order
(manufacture to order)
按訂單生產
(按訂單製造)



Engineer-to-order
(design and manufacture to order)
按訂單設計
(按訂單設計和製造)



Develop-to-order
(research, design and manufacture to order)
按訂單開發
(按訂單研究、設計及製造)



In **make-to-stock** customisation approach, products are mass produced with customisable features or integrated technologies and stock in large volumes. The difference of this to traditional mass production system is that the concept of customisation is defined as early as the design stage, and this maximise the benefits of mass production capabilities while the flexibility of the product design provision consumers to specific individual needs. At the same time, manufacturers have to bear the overhead of high inventory management and controls.

在**備貨型客制化**的方針中，透過可客制化的功能或技術整合及大量庫存，產品得以大量生產。客制化的概念與傳統大量生產系統的不同之處，在於前者早於設計階段就已定案，令到大量生產能力的好處得到最大發揮，而產品設計的靈活性又能夠為消費者提供特定的個性化需求。與此同時，製造商亦必須承擔高昂的存貨管理和監控開銷。



Assemble-to-order prioritises on production by parts, and assemble the final products after consumers placed their orders. The significance lies in manufacturing resource planning and forecasting to ensure every modules and parts are readily available, and modularity of product design becomes essential. Modular products achieve economies of scale through mass production of product parts rather than the products themselves. Such can be seen in Memomem watches and S&C nano-home furniture series.

按訂單組裝的方針會優先生產零件，並在消費者下訂單後組裝最終產品。重點是在製造資源的規劃和預測，以確保每個模組和零件都有現貨，這使產品設計的模組化變成重中之重。模組化產品通過大量生產產品的零件而並非產品本身實現規模經濟。這從Memomem的手錶和方圓傢具的納米家居系列中都可以看到。



Make-to-order customisation initiates the manufacturing process after consumers orders are placed. This is approach particularly common in the computer industry, where products can only be produced and configured after consumers personalised their purchase. Zotac Hong Kong, a leading OEM computer chip manufacturer, utilise parts of this approach for their new line of gaming products.

按訂單生產的客制化製造過程在消費者下訂單後啟動。這個方針在電腦行業中尤為常見，因為購買的產品只能在消費者進行個性化之後生產和配置。OEM電腦晶片領先的製造商Zotac Hong Kong就是將此方針的一部份運用於他們的新系列遊戲產品中。

⁵ Wortmann, J. C. (1989). *Towards an integrated theory for design, production and production management of complex, one of a kind products in the factory of the future* ESPRIT '89: Proceedings of the 6th Annual ESPRIT Conference, Brussels, November 27 - December 1, 1989, pp. 1089-1099, 1989. Retrieved from 299888769_Towards_an_Integrated_Theory_for_Design_Production_and_Production_Management_of_Complex_one_of_a_Kind_Products_in_the_Factory_of_the_Future



Engineer-to-order customisation goes with meeting customers' specifications through production cycle starting from design activities, manufacturing then logistics. The focus of this approach is that consumers already have design specifications in mind, so rather than heavily relying on design efforts, product feasibility is materialised through engineering practices.

按訂單設計的客制化可以通過一整個從設計活動開始到製造再到物流的生產週期去滿足客戶的規格要求。這個方針的重點在於消費者已經有設計規範的考慮，因此產品的可行性在於工程實踐而不是過份依賴設計工作。



Develop-to-order has the highest degree of consumer engagement throughout the production value chain. Typically, consumers only have vague concepts to the solutions they desire, and so they sort for design and manufacturing capabilities by initiating research development. The production cycles tend to be lengthy due to heavy research and prototyping processes.

按訂單開發在整個生產價值鏈中具有最高的消費者參與度。通常，消費者對他們想要的解決方案都只有模糊的概念，因此他們通過發起研究開發去將設計和製造能力分類。由於有大量的研究和原型製作過程，生產週期往往很長。

The Incredibles 超人特工隊

Beyond the different adoption of design to manufacturing approaches reflected upon research, the business model driven by new industrial design development to meet customisation demands has also shifted drastically. A concept such as Product-service system⁶, a.k.a. PSS, has emerged in the past years to meet the paradigm shift. According to Piscicelli, L., Cooper, T., & Fisher, T. (2015)⁷, this system model involves an inclusive design and delivery of products and services. PSS models enable collaborative and flexible consumption⁸. A subset of the researched companies has reflected such forward-thinking design strategy to meet growing customisation demands.

As such, there are four design theories that industrial designers and manufacturers should be aware of: Product Family Architect, Product As Platform, Product as Service and Flexible Manufacturing.

研究除了反映出製造方針就設計的採納有所不同之外，由新工業設計發展推動以滿足客制需求的商業模式也發生了重大變化。過去幾年出現了諸如「產品服務系統」⁶，又稱PSS這樣的概念以滿足模式轉變。根據Piscicelli, L.、Cooper, T.和Fisher, T. (2015)所說⁷，該系統模型涉及產品和服務的共融設計和交付，能夠實現協作和靈活消費⁸。一部分被研究的公司反映出這種具前瞻性的設計策略去滿足不斷增長的客制需求。

因此，工業設計師和製造商應該了解四個設計理論：產品系列架構、產品作為設計平台、產品作為服務和彈性製造。

⁶ Costa, N. (2015). *Revisiting PSS and service design in the light of the SD-logic*. Retrieved from https://www.researchgate.net/publication/302906624_Designing_Integrated_Product_Service_System_Solutions_in_Manufacturing_Industries

⁷ Piscicelli, L., Cooper, T., & Fisher, T. (2015). "The role of values in collaborative consumption: insights from a product-service system for lending and borrowing in the UK" (PDF). *Journal of Cleaner Production*. 97: 21–29. doi:10.1016/j.jclepro.2014.07.032 – via doi:10.1016/j.jclepro.2014.07.032.

⁸ Deloitte. (n.d.). Flexible consumption business models. Retrieved from <https://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/articles/flexible-consumption-business-models.html>

Product Family Architect Approach 產品系列架構方法

Product-family-engineering, is a software engineering method to create subsets of architecture under an organisation's product platform, with the design considerations of both commonalities and variances. By focusing on developing new products through maximising existing product family components and structures, the design strategy is no longer isolated to just one product design anymore. Instead the consideration must be inclusive to cover a wide range of combinations and modularity for the manufacturer to produce and assemble. According to Carnegie Mellon⁹, this approach applied in product development can lead to higher productivity, higher quality, faster time-to-market, and lower labour needs.

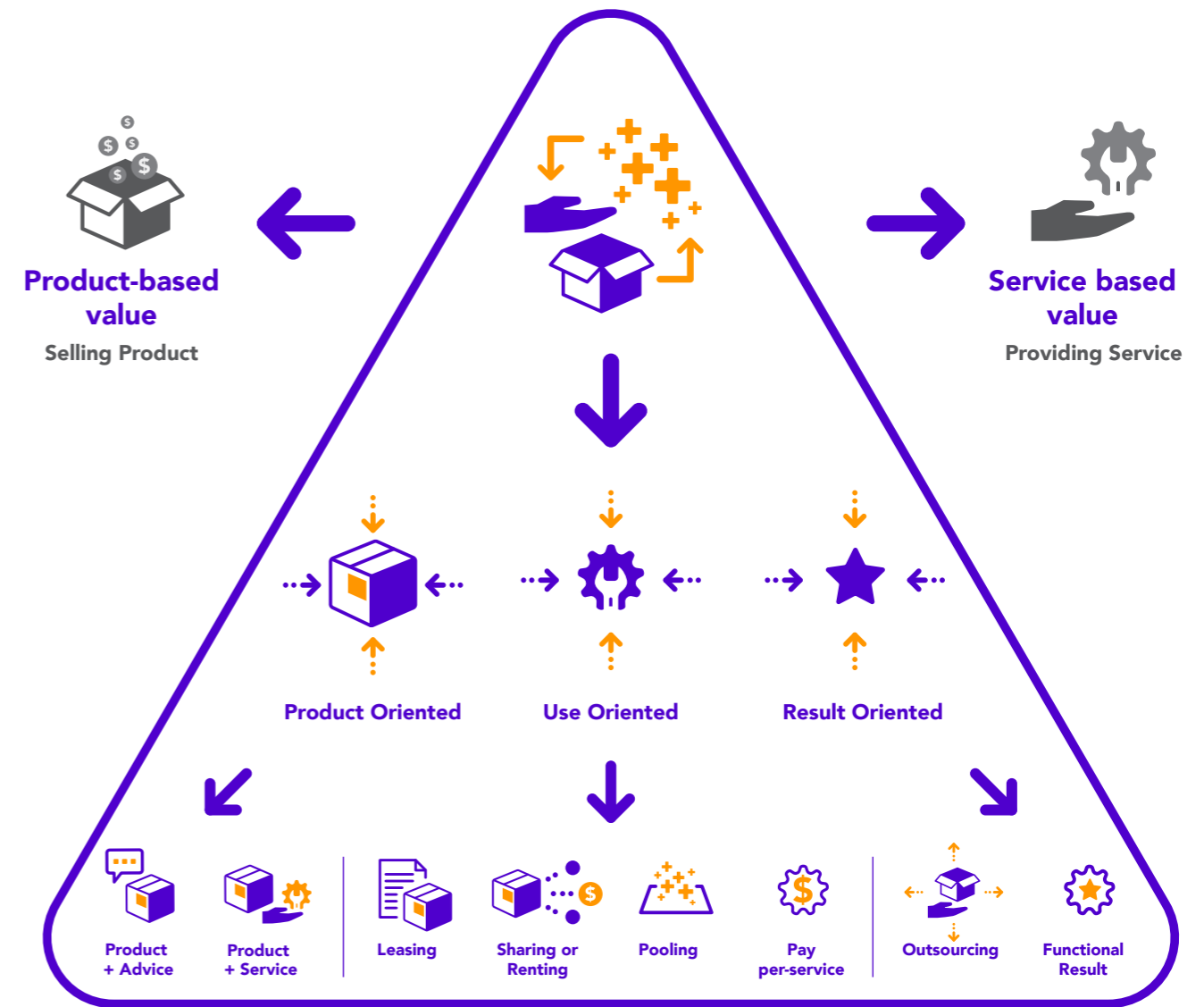
Yick Shun Group, a toy manufacturer, has demonstrated the concept of product-family approach across some of their product lines. For example, the wheels and chassis are mostly standardised for mass production, separated customisable parts such as the exterior and decors to be produced in batches for various toy cars series. By leveraging existing parts to new designs, Yick Shun Group was able to maximise their variety of products while mitigating on costs of productions and engineering.

「產品系列架構」是一種軟件工程方法，用於組織的產品平台下創建體系架構子集，其設計考慮了共同性和差異。透過集中開發新產品，將現有產品系列的零件和結構擴至最大最多，設計策略就不再僅僅局限於單一產品設計。相反，包容性必須在考慮之列，要足以涵蓋製造商生產和組裝的各種組合和模組性。據 Carnegie Mellon 所指⁹，這種應用於產品開發的方法可以帶來更高的生產力、更高的質量、更快的面市時間，以及更低的勞動力需求。

玩具製造商億順集團在部分產品線中示範了產品系列方法的概念。例如車輪和底盤大多是標準化的批量生產，個別的可客制零件如外殼和裝飾則分批生產成各個玩具車系列。通過將現有零件用於新設計，億順集團能夠最大限度地利用各種產品，同時降低生產和工程成本。

⁹ Carnegie Mellon Software Engineering Institute (SEI). Software Product Lines. Retrieved February 17, 2006, from: <http://www.sei.cmu.edu/productlines/>.

Product Service System (PSS) Value based on combination of product and service



Source: Daniel Christian Wahl, "C-Plan's Map of the different Product Service System types" in "Designing sustainable business models and product service systems." Activate the future. 12 Feb, 2017. Source: <https://medium.com/activate-the-future/designing-sustainable-business-models-and-product-service-systems-cd548328e852>

Product as Platform Design 產品作為設計平台

Product-as-Platform, is one concept that expands the value and product lifespan. With platform centered as design, the product itself can have endless modular features and add-ons because of enabling technologies. In technological terms, platform often refers to software-based system. In design, platform is an extension of intangible values to the tangible forms. This concept can be examined through the global success of iOS and Android platforms. With cellular phones being tangible interfaces, the mobile application platform enables greater reach and scale in customisation and personalisation. Simply put, the success of these platforms leverage growth model based on scaling the base modules. Platform can also take forms in governance models, where policies and standards are enforced to reduce cost of innovation in technologies. Other platform services take open form, where users can participate, collaborate and co-create to extend the platform's functionality. The collective pool of knowledge from mass user engagement further enriches the platform capacities to the products itself.

「產品作為設計平台」是一個擴展產品價值和壽命的概念。平台以設計為中心，因有強勁的支持技術，產品本身可以有無限的模組化功能和附加特色。在技術用語方面，平台通常指以軟件為基礎的系統。在設計中，平台就是無形價值去到有形之物的延伸。這一概念可以通過獲得環球成功的iOS和Android平台來驗證。由於手提電話是有形的介面，為手提應用程式的平台在客制化和個性化方面造就了更廣的範圍和更大的規模。簡單而言，這些平台的成功全基於利用擴展基礎模組的增長模型。平台還可以採用管治模型的形式，以實施政策和標準去降低技術的創新成本。一些其他的平台服務會採用開放形式，用戶可以參與、協作和共同創建，從而擴展平台的功能。這來自大量用戶參與的集體知識庫，會進一步豐富產品本身作為平台的能力。

About EcoPRINT 關於妙印云

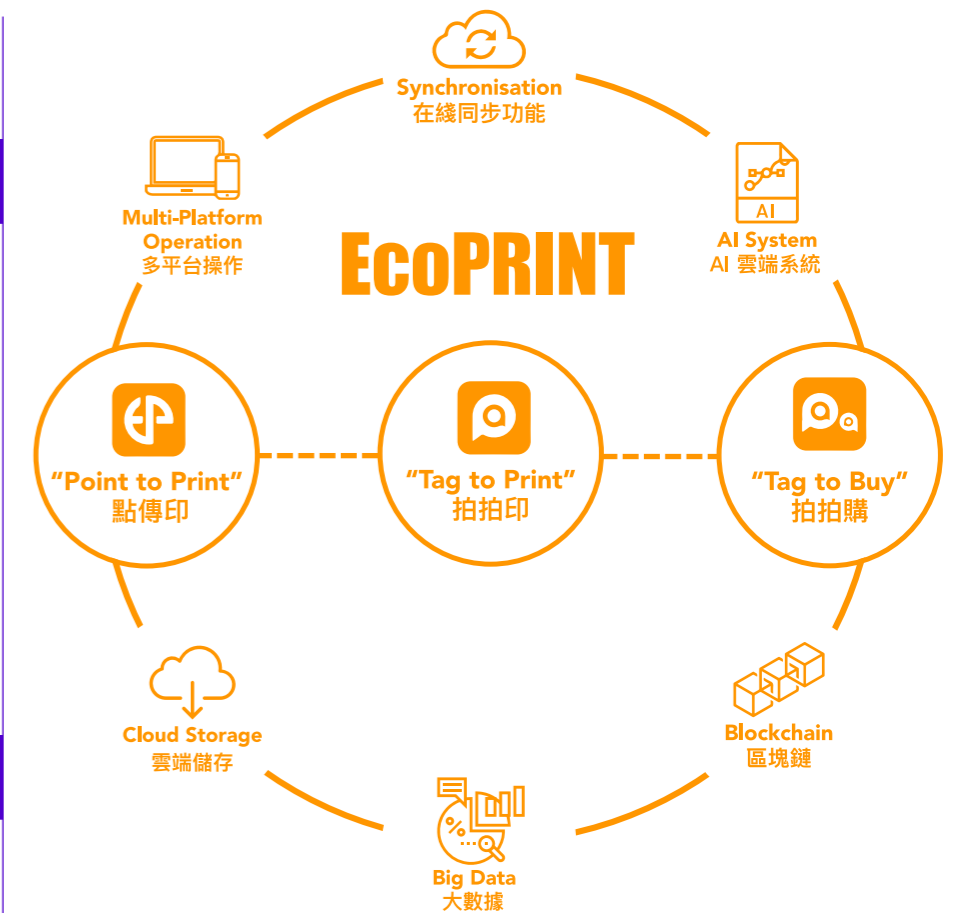
EcoPRINT is a technology company of printing and cloud intelligence, specialising in the core technologies of AI cloud storage, cloud computing, blockchain and big data. It offers a centralised platform to customise printing services and packages, adding value to the printing industry by leveraging Industry 4.0 technologies and providing cloud intelligence solutions.

妙印云 (EcoPRINT) 是一間「印刷+雲端智能科技公司」，以AI雲端儲存、雲端計算、區塊鏈和大數據為核心技術，提供一個客制化印刷套餐服務的中央平台之餘，又利用工業4.0的技術推出雲端智能解決方案。

About Grandion Group 關於興迅集團

The Grandion Group was established in 1996, which has developed from a casual wear manufacturer to an integrated casual wear supply chain enterprise with production facilities in the mainland. In 2015, the Group established the TML Tower in Tsuen Wan, creating the new industrial initiative "TML (To Make Locally)", a one-stop smart manufacturing base that combines collaboration, production, technology and sales. Through support on supply chain, fundraising, training and sales channels, it offers full business support to young and emerging Hong Kong design talents for design commoditisation and entrepreneurship. For example, by introducing new printing technology and rapid replenishment system, low-volume, high-quality fast fashion apparel can be produced with reduced market risks and inventory costs, providing the customers with customised production services.

興迅集團成立於1996年，已由一間休閒服裝製造商，發展成一個綜合休閒服飾供應鏈企業，亦於內地設立生產設施。集團於2015年在荃灣新落成TML廣場，創立新產業項目——TML (To Make Locally)。集團旗下的TML是個一站式的智能製造基地，透過供應鏈、資金募集與培訓、銷售渠道等等的支援為新晉的企業家和設計師提供幾方面的協助。例如藉引進新科技的打印技術及快速補貨系統，可生產少批量、高質素的快速時尚服飾，為客戶減低市場風險及存貨成本，並提供個性化生產服務。



In Hong Kong, EcoPrint as a technology company has launched a cloud-based platform, specialised in AI data storage, blockchain encryption and analytics. By overlaying a digital platform on top of physical printing infrastructures, the centralised platform allow vendors to customise printing services and packages, ultimately benefiting end consumers who are sourcing printing services. Another example is Grandion / TML, a mass garment manufacturer, which developed self-serve kiosk systems for consumers to upload their own images, via their online platform, to be customised and printed on selected clothing. The finished product will be mailed shipped to consumers within several days, making the purchase experience more seamless and desirable.

在香港，妙印云作為一間科技公司推出了一個以雲端為基礎的平台，專門處理AI數據儲存、區塊鏈加密和分析。透過疊加一個數碼平台於實體打印的基礎設施之上，這個中央平台允許供應商客制化打印服務和套餐，最終讓正在採購打印服務的終端消費者受惠。另一個例子是興迅集團 / TML，一間量產服裝製造商，開發了自助服務站系統，供消費者利用他們的網上平台上載自己的圖像，以便在所選的服裝上進行客制化和打印。製成的產品會在幾日內郵寄給消費者，令購買體驗更加無縫和理想。

Product as Service Approach 產品作為服務方法

Opportunities to redefine physical products to be service driven are also growing. Product-as-Service are made possible due to digitalisation. The concept of Product-Service system originated as a function-oriented business model, with the aim to sustain both consumption and production¹⁰. With digital services and physical products intersecting across multiple platforms, digital offerings create new magnitudes of values and unbound physical limitations.

Share economy, a concept that emerged in recent years, leveraging collaborative consumption on underutilised goods and services, and shifted the focus from ownership to access. Global companies like Uber (shared vehicles) and AirBnB (shared housing) have created great successes leveraging this concept. In reference, a notable example is an automobile tire manufacturer, who introduced the "Tire by miles" programme, redefined tyres as consumer products into utility service model. Instead of purchase, consumers pay for the mileage or distance travelled on the tire - shifting the fixed costs to variable costs in alignment to usage.

There are several benefits to this strategic approach. Firstly, consumers can access all sorts of products and services temporarily without the liability in ownership. This enables the market to try and experiment with various experiences and still retain the option to purchase when necessary. Secondly, consumers feel that they have more choices on product usage as service utilisation has higher degree of flexibilities. Thirdly, manufacturers and designers can obtain real feedback and data from consumers' usage, increasing satisfaction and accuracy of both product and service deliveries. Product-as-service approach is not simply designing better products, rather the notion requires fundamental change on how to fulfil consumers' needs than just transactional relationships. This change yields higher value creation, and the success of product-as-service model should be strategically examined to benefit manufacturing design and development.

以服務作主導為實體產品重新定義的機會也在增長。數碼化令產品作為服務變得可能。產品服務系統的概念源自功能導向的商業模式，旨在維持消費和生產⁷。隨著數碼服務和實體產品的交集橫跨多個平台，數碼產品創造了新的價值和無限的實體限制。

共享經濟是近年來出現的一個概念，利用未被充分使用的商品和服務進行協作消費，將重點從擁有權轉移到可及性。Uber (共享車輛) 和 AirBnB (共享住宅) 等環球公司利用這一概念取得巨大成功。作為參考，另一個值得關注的例子是一家汽車輪胎製造商，他們引入了「輪胎英里」計劃，將作為消費品的輪胎重新定義為公共事業服務模型。消費者不需要購買輪胎，而是支付輪胎的行駛里程或行駛距離——將固定成本轉換為與使用率一致的可變成本。

這種策略方法有幾個好處。首先，消費者可以暫時尋訪各種產品和服務，而不需承擔擁有的權責。這讓市場可以嘗試和試驗各種體驗，而在必要時仍保留購買的選擇。其次，消費者認為他們在產品使用上有更多選擇，因為服務使用率有更高的靈活性。第三，製造商和設計師可以從消費者的使用率中獲得真實的反饋和數據，提高產品和服務交付的滿意度和準確性。產品作為服務方法不單單是設計更好的產品，而是需要從基本上改變，思考如何去滿足消費者需求，而並非純粹只是交易關係。這種變化帶來更高的價值創造，而產品作為服務模式的成功應該被策略性地驗證，使製造業的設計和開發受益。



¹⁰ Nicola Morelli, Ph.D. Industrial Design and associate professor, Institute of Architecture & Design, Aalborg University, Denmark.

Flexible Production Environment 彈性生產環境

With different design to manufacturing and business models, industrial production systems will need to transform to align for manufacturing. Customisable yet can be mass produced products require flexible systems and machines conditions to be met. Machines and systems need to be more adaptable to retrofits and upgrades, yielding in higher versatility in production variations without jeopardising time and costs in the manufacturing line.

Industrial flexible manufacturing systems, also known as FMS, are higher degree manufacturing systems with flexibility to simultaneously produce variety of part types¹¹. FMS is comprised of autonomous robots, computer-controlled machines, computer numerical controlled machines (CNC), and more. With machine flexibility, a diverse range of parts can be manufactured with minimal requirements in switching tools on the machine. Without losing production time, technological progression has allowed sophisticated manufacturing procedures to be attained while parts can be machined separately instead in batches and in masses.

Additionally, routing flexibility enables systems to prepare for breakdowns and unpredicted situations without interruption to parts production. Each machine ability is no longer singular and can be synchronised simultaneously

with all other machines, resulting in all nodes of workstation to be able to perform the distributed activities, and parts can be produced via different routes under unpredicted situations. The overall flexibility in this manufacturing design is achieved with machines connectivity and versatilities, acting as network nodes instead as traditional bus network¹². Furthermore, the flexible system architectural layout is intended to achieve multipurpose handling and processing, resulting in control to adapt to fluctuations of volumes in production.

Upon our interviews with Hong Kong manufacturers, under 15% has indicated their manufacturing capabilities have advanced to higher automation and flexibilities, and over 43% stated the interests to modify and upgrade their systems and machines in the next 3 to 5 years. The significance of change may not reflect in the current statistics from our research sample pool of designers and manufacturers. However, with the high interests and potential in shifting production methods, the transformation will be crucial to prepare for the upcoming years.

根據製造和商業模式的不同設計，工業生產系統將要變動去適應製造業。可客制但亦可大量生產的產品需要彈性的系統和機器條件。機器和系統要變得更能適應改造和升級，在生產的變動中具有更高的多功能性，同時不會危害生產線的時間和成本。

工業彈性製造系統，也稱為FMS，是更程度的製造系統，具有同時生產各種零件類型的靈活性¹¹。FMS由自動機械人、電腦控制的機器、電腦數控機 (CNC) 等組成。有了機器的靈活性，各種零件就可以在機器切換工具的最低要求下製造。在不損耗生產時間的情況下，科技進步讓複雜的製造程序得以實現，而零件亦可以分批分別作批次及大量加工。

此外，路徑彈性使系統能夠在不中斷零件生產的情況下，為故障及不可預測的情況做好準備。每台機器的能力不再是單一的，而是可以與其他所有機器同時同步，從而使工作站的所有交點能夠執行分佈式活動，並且可以在不可預測的情況下通過不同的路徑生產零件。這個製造設計的整體靈活性是通過機器的連接性與多功能性去實現，它充當的是網絡交點而不是傳統的總線網絡¹²。此外，彈性的系統架構佈局亦旨在實現多用途處理和作業，從而實現透過監控適應生產中的數量波動。

在我們訪問香港製造商的過程中，低於15%表示他們的製造能力已經提升到更高的自動化和靈活性，超過43%表示有興趣在未來3到5年內變更和升級他們的系統和機器。改變的重要性未必會反映於研究樣本群中設計師和製造商的當前統計數據中。然而，由於對生產方法轉變的深厚興趣和潛力，轉型對為未來幾年做好準備至關重要。

Values in production 生產中的價值

Machine flexibility 機器彈性	- Product types 產品種類 - Process variance 過程差異 - Degrees of operations 操作程度
Routing flexibility 路徑彈性	- Volume and batch variance 數量及批次差異 - Expansion 擴展

In the past, small batch production was not feasible in cost-effectiveness compared to mass production. However, distributed manufacturing through multiple small-scale manufacturing bodies, integrated through platform systems for synchronised communications and data consistencies, allow lean yet agile manufacturing on par to large volume productions.

過去，與大量生產相比，小批量生產在成本效益方面並不可行。然而，通過多個小規模製造機構進行分佈式製造，再透過平台系統整合以實現同步通信及數據一致，精益而靈活的小批量製造亦能大批量生產相提並論。

¹¹ E. Stecke, K. (1983, March). Formulation and Solution of Nonlinear Integer Production Planning Problems for Flexible Manufacturing Systems. *Management Science*, 29(3), 273-288

¹² E. Stecke K., J. Solberg J. (1982, January). The Optimality of Unbalanced Workloads and Machine Group Sizes for Flexible Manufacturing Systems, *Working Paper No. 290, Division of Research, Graduate School of Business Administration, The University of Michigan*

LOTS OF DETAILS, HALF THE RETAIL

眾多的細節 零售佔一半

“Hong Kong is heavily populated in close proximity, whether it’s residential or commercial retails. This means that everyone can easily access products and services of any choices without much need to seek for personalisation. If the person cannot find one thing, he/she can just walk next door and shop.”

Wisdom of the Crowd? 群策群力？

According to industrial design professional F.T, he shared his view of Hong Kong market landscape: “Hong Kong is heavily populated in close proximity, whether it’s residential or commercial retails. This means that everyone can easily access products and services of any choices without much need to seek for personalisation. If the person cannot find one thing, he/she can just walk next door and shop.” This phenomenon may be true in metropolitan cities with highly-dense population, particularly for Asia Pacific cities like Hong Kong. However, it is also due to the diversities of products and multicultural communities in close proximities that enable such consumer behaviours. Further on this rationale, many retailers based off their strategies on geographical benefits, located in high foot traffic neighbourhood while operating in brick and mortar environment. Alongside with competitive pricing, quality of products and in-store experience, retailers can maximise their profit gains and retain consumers’ loyalties. This can only be possible in highly populated communities.

工業設計專業人士F.T分享了他對香港的市場景觀抱持的看法：「無論是住宅還是商業零售，香港的人口都相當密集。這意味著每個人都可以輕鬆遊走於任何產品和服務的選擇，而無需尋求個性化。如果一個人找不到一樣事物，他/她大可以走到隔壁再去選購。」這種現象於人口密集的大城市尤其適用，特別是像香港這樣的亞太城市。然而，這樣的消費者行為也是由於產品和多元文化社區的多樣性及鄰近性導致而成。此外，基於同一理由，許多零售商根據他們的地理優勢制定策略，在位於高人流的交通社區實體店環境中營運。除了富競爭力的價格、產品質量和店內體驗外，零售商還可以提高利潤至最大限度並保持消費者的忠誠度，這只能在人口密集的社區中實現。

「無論是住宅還是商業零售，香港的人口都相當密集。這意味著每個人都可以輕鬆遊走於任何產品和服務的選擇，而無需尋求個性化。如果一個人找不到一樣事物，他/她大可以走到隔壁再去選購。」

Confessions of a Shopaholic 潮拜購物狂

As per research statistics from this project, the once high percentage of sales for omnichannel retailers in the offline world is dramatically shifting towards online mediums. Some have increased online sales from under 10% to 30%. Design factories such as OFESS have even furthered social media channels as consumer engagement strategy to drive product interests and designs. New generation consumers will continue to browse online for competitive prices and for information, such as user reviews and descriptions on consumer goods, and global shipping has become far more accessible due to globalisation. Fewer and fewer consumers will access physical stores to make their final purchases.

根據本項目的研究統計數據，離線世界中全通路零售商一度的高銷售額正大幅轉向網上媒體。有些零售商的網上銷售額從10%增加到30%。像OFESS這樣的設計工廠甚至進一步使社交媒體渠道成為消費者參與的策略，繼而推動產品利益和設計。新一代消費者將繼續在網上瀏覽有競爭力的價格和信息，例如用戶評論和消費品描述，環球的貨運亦因全球化而變得更容易，將有越來越少的消費者進入實體店作最終購買。

OFESS

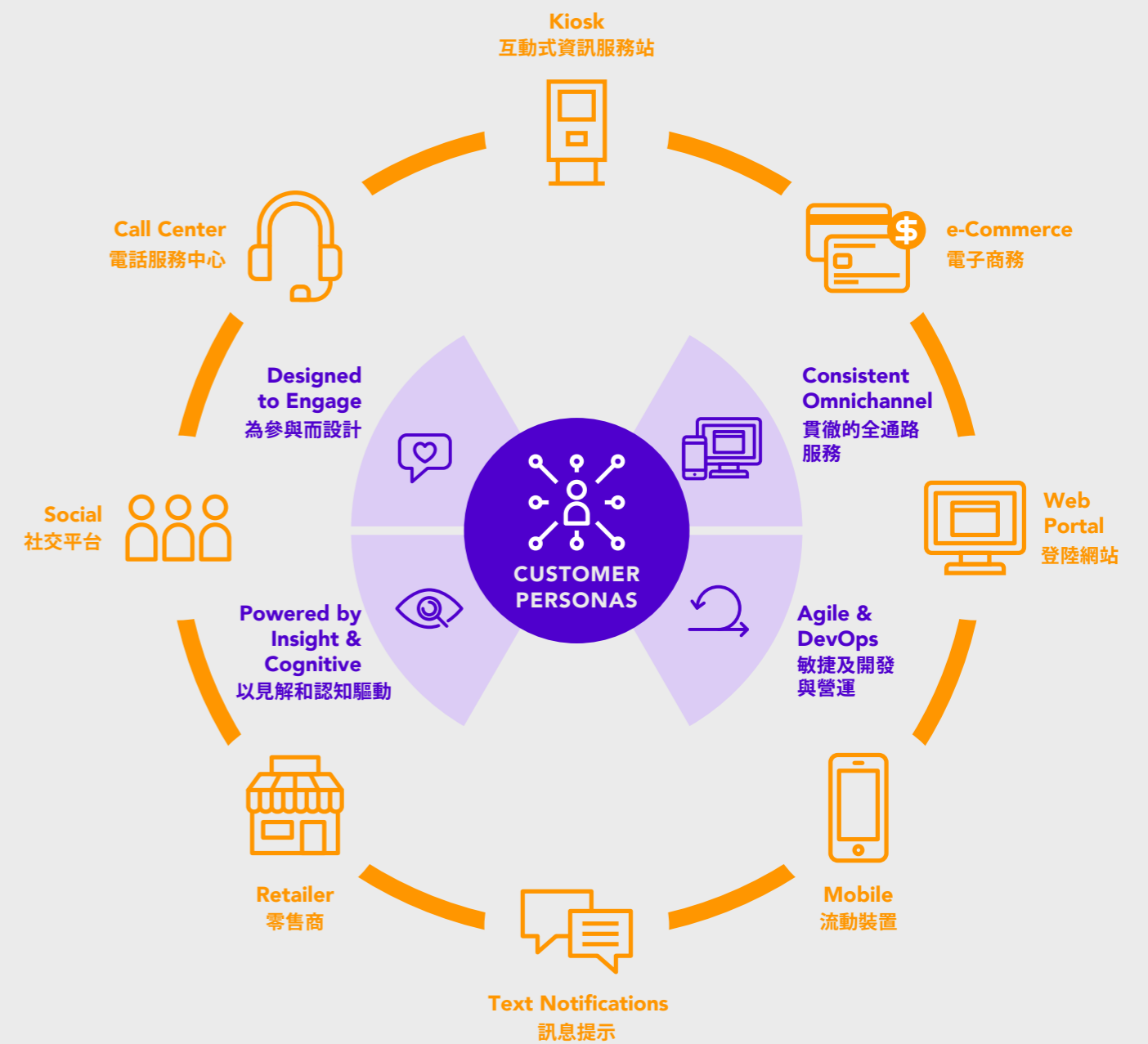
A "design factory", which provides both design and manufacturing services on premium gifts and toy collectables. With multiple award-winning designs and original product lines, OFESS has expanded their business scope from design and manufacturing to brand and consumer management.

OFESS是一間「設計工廠」，提供優質禮品與玩具收藏品的設計及製造服務。憑藉多個屢獲殊榮的設計和原創產品線，OFESS已將業務範圍從設計和製造擴展到品牌和消費者管理。

Omnichannel Retail 全通路零售商

A unified experience supported by omni-channel approach, which includes channels like marketing, advertising, digital platforms (web/mobile), service centres (call centre), brick and mortars (in-store) and more. Consumers should experience consistent brand messages and identities which translates across all distribution channels.

全通路支持的是一種統一體驗的方法，當中包括營銷、廣告、數碼平台（網絡/行動裝置）、服務中心（電話客戶服務中心）、實體商店（店內）等渠道。消費者體驗的應該是一致的品牌信息和身份，而這些信息和身份轉化到其他所有分銷渠道亦可通用。



Source: "Seamless Experience across Channels", Omni-Channel: Winning the Experience Battleground. Accenture. <https://www.accenture.com/lv-en/service-omni-channel>

"Offline sales are progressively shifting to online mediums, and it is becoming easier for consumers to make purchases globally."¹⁴

「離線銷售逐漸轉向網上媒體，消費者在全球購物變得越來越容易。」¹⁴

With the growing challenges in brick and mortar environment, retailers seek to revamp physical engagements, and thus the concept of "retail as destination" emerged. For example, Rebecca Minkoff, a global luxury clothing brand, partnered with eBay and Magento to innovate their in-store experience¹³. The engagement gap was bridged with augmented reality, creating digital fitting rooms in stores, which consumers can try out all selections of clothes. The sales increased by six- to seven-fold after the project piloted.

With digital tools and systems intermixed in physical and digital space, the experiential designs can continue to evolve endlessly. Shopping experience is no longer confined to physical space but instead boundaryless within the digital realm. Retailers seek to integrate their digital data with manufacturers, designers, and other stakeholders, thus forming a digital supply network to achieve horizontal integration in the production value network. Smarter and connected systems result in high transparencies of sales and usage data, providing a more inclusive and holistic consumer experience.

隨著實體環境的挑戰日漸嚴峻，零售商尋求實體業務的改造，因此出現了「體驗零售店」的概念。例如，環球奢侈品牌Rebecca Minkoff與eBay和Magento合作，創新他們的店內體驗¹³。在商店中設置數碼試身室，消費者可以嘗試所有衣服選擇，從前消費者參與度的差距因與增強現實結合而拉近。該計劃試行後，銷售額增加了6至7倍。

有了數碼工具及系統混和在實體與數碼空間之中，體驗設計得以不斷進化。購物體驗不再局限於實體空間，而是在無邊界的數碼領域內。零售商更可以將他們的數碼數據與製造商、設計師和其他利益持份者整合，從而形成數碼供應網絡，實現生產價值網絡的橫向整合。更智能化和緊密連接的系統可以提供透明度高的銷售和使用數據，繼而提供更共容和更全面的消費者體驗。

Rebecca Minkoff

Rebecca Minkoff is a global brand with a wide range of apparel, handbags, footwear, jewelry and accessories (including tech) as well as men's accessories under the label Uri Minkoff. In the spring of 2017, Rebecca Minkoff Watches was launched, reimagining the category through their decidedly downtown, Rock and Roll aesthetic.

Rebecca Minkoff是一個享譽全球的品牌，主營各類服裝、包袋、鞋履、珠寶和配飾（包括電子產品配飾），以及Uri Minkoff品牌的男士配飾。2017年春季，Rebecca Minkoff推出手錶產品，以城鎮和搖滾美學重新解讀這一系列。

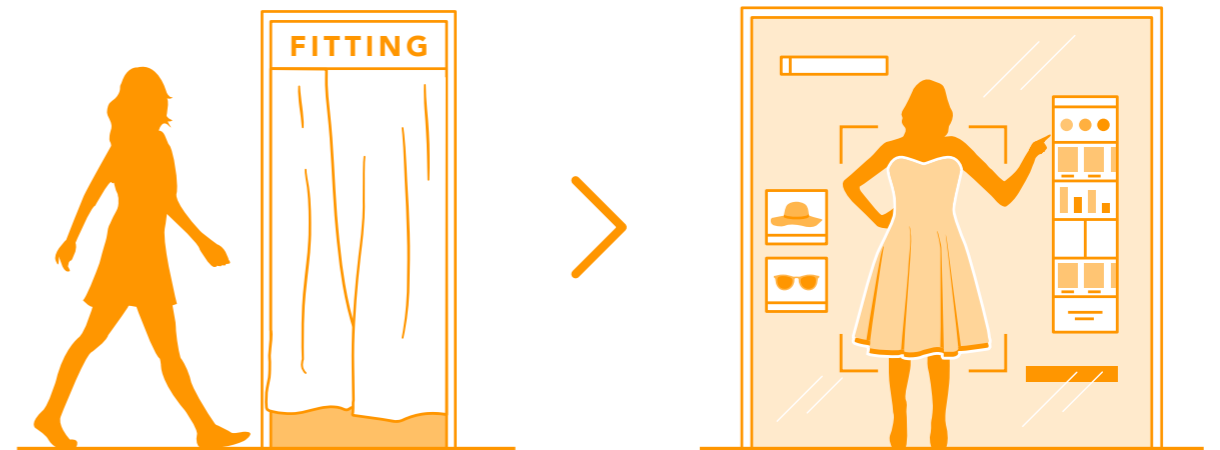
¹³ World Economic Forum. (2017, January 15). Shaping the Future of Retail for Consumer Industries. Retrieved from <https://www.weforum.org/reports/shaping-the-future-of-retail-for-consumer-industries>

¹⁴ Google. (2015, October). Rebecca Minkoff Empowers Millennial Shoppers. Retrieved from <https://www.thinkwithgoogle.com/intl/en-145/success-stories/global-case-studies/rebecca-minkoff-empowers-millennial-shoppers/>

Rebecca Minkoff, partnered with eBay and Magento to innovate their in-store experience



Digital fitting rooms with AR experience in stores, which consumers can try out all selections of clothes



Sense and Sensibility 理性與感性

The key of retail transformation to achieve higher operational efficiencies and customer loyalties are not just dependent on sensible aspects like technologies, but also the humanistic approach such as the mindsets of collaborative approach with partners, stakeholders and even consumers. While retailers are sole experts in in-store experience delivery, stores are only interfaces to consumer experience, and the success to the next future of retail can only be made possible with forward thinking in the business design strategies, while leveraging digital platforms such as mobile, cloud and social mediums. One can further examine the various retail business models¹² that emerged since Industry 3.0 shifted to 4.0.

The lines of manufacturing, design and retail are crossing, and the intermediaries along the supply value chain continue to collapse. The cycle times of information flow between the three stakeholders need to communicate with consumers more timely and accurately. This has heavy implications on value creation to consumers. Production is no longer simply manufacturing great products on shelf. Manufacturers and designers need to step out to the frontier, to capture real-time user feedbacks, thus improving the consumer experience in selection of purchase with new ways. With consumers driving the market, SME designers and manufacturers can further adopt scale customisation strategy, particularly with build-to-order approach, high collaboration

to design process, and rapid iteration of prototype to production to penetrate and gain market competitiveness.

要取得更高的營運效率和客戶忠誠度，零售轉型的關鍵不僅取決於理性的技術層面，還取決於與技術合作伙伴之間人性化的協作方法等思維模式。雖然零售商是店內體驗交貨的唯一專家，但商店只是消費者體驗的介面，只有通過業務設計策略中的前瞻性思維，同時利用行動裝置等數碼平台、雲端和社交媒體，才能獲得零售業未來的成功。人們亦可以進一步研究自工業3.0轉向4.0以來出現的各種零售業務模式¹²。

製造業、設計業和零售業的界線都在跨越彼此，導致遊走在供應價值鏈上的中介人角色繼續瓦解；三方利益持份者之間信息的流動周期時間與消費者溝通需要更及時、更準確。這對消費者的價值創造有重大影響：生產不再僅僅是在貨架上製造出色的產品；製造商和設計師需要走到最前線，捕捉實時用戶反饋，從而透過嶄新的方式改善消費者購買選擇的體驗。因應消費者推動市場，中小企業設計師及製造商可以進一步採用量產客制化策略，特別是按訂單生產方式、高度協作設計流程、以及快速循環原型到生產，去滲透和獲得市場競爭力。

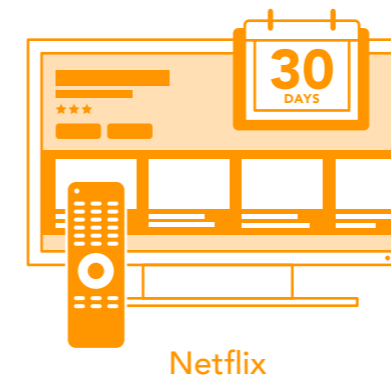
¹² Jo Caudron and Dado Van Peteghem (2015), Digital Transformation: A Model to Master Digital Disruption, Duval Union Consulting.

The evolution of new retail business models

新零售業務模式的演變

when scale customisation design strategy meets with Industry 4.0
當量產客制化設計策略遇上工業4.0

Some examples of the new business models nowadays 一些現今新零售業務模式的例子

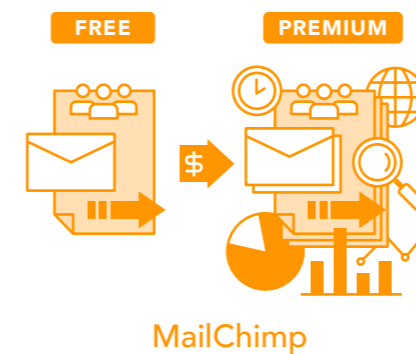


Netflix

Subscription model 訂閱模式

Retain and lock-in consumers by charging subscription fee, generally on monthly basis, for continued access to product/service

通過每月收取訂閱費用去保留和鎖定消費者，使其得到繼續享用產品/服務的權限



MailChimp

Freemium model 免費增值模式

Offer free first tier level product/service as "teasers" with the trade-off of money to obtain consumers data, subsequently hook onto consumers' interests to make further upgrades and purchases

提供免費的一級產品/服務作為「預告」，權衡金錢利益以獲取消費者數據，隨後吸引消費者的興趣以作進一步的升級和購買

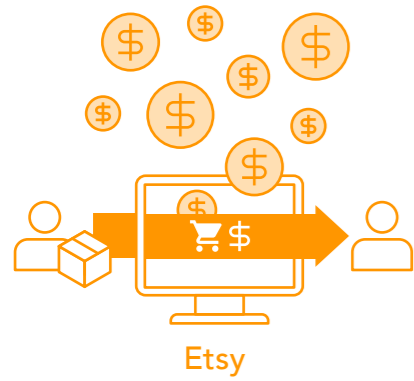


YouTube

Free model 免費模式

Harness and capture consumers' interests in free experience of goods and services, and harvest consumers usage data

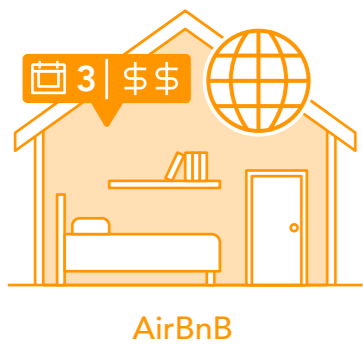
於商品和服務的免費體驗中利用及捕捉消費者的興趣，從而收集消費者的使用數據



Marketplace model
市場模式

Digital marketplace that connects buyers and sellers directly, charges transactional fees or commissions

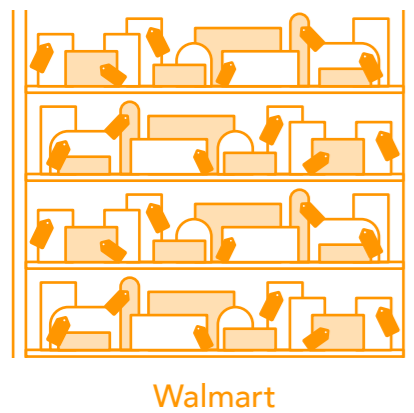
直接聯絡買家和賣家的數碼市場，收取交易費用或佣金



Access-over-ownership model
享用權限模式

Share economy concept; charges commission or usage fees from people monetising their assets through sharing/lending to temporary consumers

共享經濟理念；向通過分享/借貸給臨時消費者貨幣化其資產的人收取佣金或使用費



Hypermarket model
大賣場模式

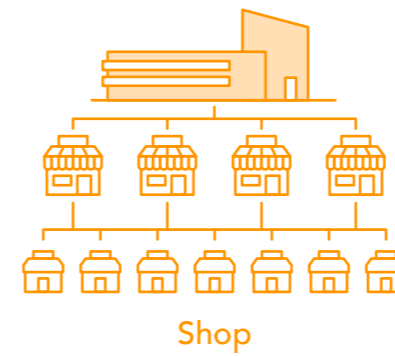
Brand bombing
品牌轟炸



Experience model
體驗模式

Superior experience in which consumers are willing to pay premium for

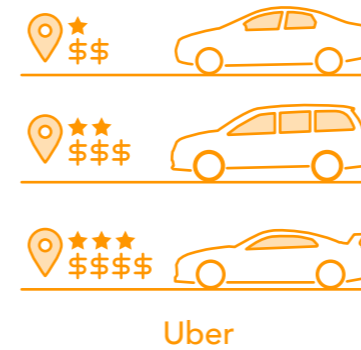
消費者願意支付附加費的卓越體驗



Pyramid model
層壓模式

Leverage small-scale resellers and affiliates to drive revenue

利用小規模經銷商和附屬公司去增加收入



On-demand model
自訂模式

Services and products that are offered with instant access but priced at premium, bridging the gaps between "people with money but no time" and "people with time but no money"

提供即時享用得到但額外收費高昂的服務和產品，縮小了「有錢但沒有時間的人」以及「有時間卻沒有錢的人」之間的差距



Ecosystem model
生態系統模式

Products and services that are connected to larger ecosystems, which increase in value in time and usage; create consumer dependency

與較大生態系統相關的產品和服務，其價值隨時間和使用率而增加；造成消費者依賴性

SCALE CUSTOMISATION THEMATIC WORKSHOPS

量產客制化專題工作坊

With the inherent multiple facets of product-service systems (PSS), Internet of Things (IoT) and Big Data, the traditional offering to design and evaluate product, service or system per se is no longer enough to meet the increasingly sophisticated market. The challenge is magnified when customisation is required within the new manufacturing revolution of Industry 4.0. A paradigm shift has been set in place to combine product, service and system all into one for added value. Hosted in summer 2018, Hong Kong manufacturers and designers from all areas of disciplines were put together in a series of innovation workshops, where new business models integrated new industrial technologies were created through design thinking process.

由於產品服務系統 (PSS)、物聯網 (IoT) 和大數據自身擁有眾多面向，傳統產品、服務或系統本身的设计與評估已經不足以滿足日益複雜的市場需求。在工業4.0的新一場製造業革命中，客制化的需求正正放大了這項挑戰。一次範式轉移已經發生，將產品、服務及系統整合為一體以圖增值。2018年夏天，來自各個領域的香港製造商和設計師參加了一系列創新工作坊，通過設計思維過程構想了融合嶄新工業技術的新商業模式。

During the Thematic Workshops, Participants were able to experience the design thinking method, starting with development of empathy using broad-based personas. The personas were carefully researched and designed to mimic new generation consumer behaviours and living environments, allowing each participating team to understand and relate to the market that the team must serve. Multiple design challenges to customisation needs are then added to the design process. Next, the nine pillars of Industry 4.0 technologies were incorporated into the manufacturing value chain, allowing participants in the design workshop to perceive and make sense of product design process in the new ecology.

Each team, according to their respective problems and products, utilised various design thinking tools to enrich their creative discussions and findings, resulting in innovative service and product models. Three future business ideas, incorporating scale customisation strategy with Industry 4.0 technologies, were selected and showcased in this book on the plausible future.

專題工作坊的參與者能夠體驗設計思維方法，並藉由使用基礎廣泛的人物角色去發展同理心開始。人物角色經過精心的研究和設計，模仿新一代消費者的行為及生活環境，讓每個參與團隊都能理解自己必須服務的市場並與之聯繫。然後，設計過程中又加入了針對客制化需求的多項設計挑戰。工業4.0技術的九大支柱接著更被納入製造價值鏈，令設計工作坊的參與者能夠認知並理解新生態中的產品設計過程。

每個團隊根據各自的問題與產品，利用各種設計思維工具去豐富他們的創意討論和發現，從而構想創新的服務和產品模式。本書選擇並展示了三個有板有眼的未來商業概念，將量產客制化策略與工業4.0技術相互結合，前景樂觀。

Sharing Sessions by Expert Speakers 專家講者分享環節

Mutualism Design: Industry 4.0 and Beyond 共生設計：工業 4.0 及後

Beast Jiang 姜臻煒 | CN 中國

Deputy General Manager & Creative Director, Artop Design Group Co., Ltd. 浪尖設計集團有限公司 常務副總兼創意總監

Managing the Coming Disruption from Industrial IoT 管理工業物聯網迫在眉睫的沖擊

Richard Mark Soley | US 美國

Chairman & CEO, Object Management Group Executive Director, Industrial Internet Consortium 對像管理組織 (OMG) 主席兼首席執行官 工業網際網路聯盟 (IIC) 行政總監

Customisation: Scaling Your Business the Smart Way 客制化：智能技術助你擴大業務

Ugo Negretto | DE 德國

Managing Director, ENICMA GmbH ENICMA GmbH 執行董事

Workshop
工作坊

#1

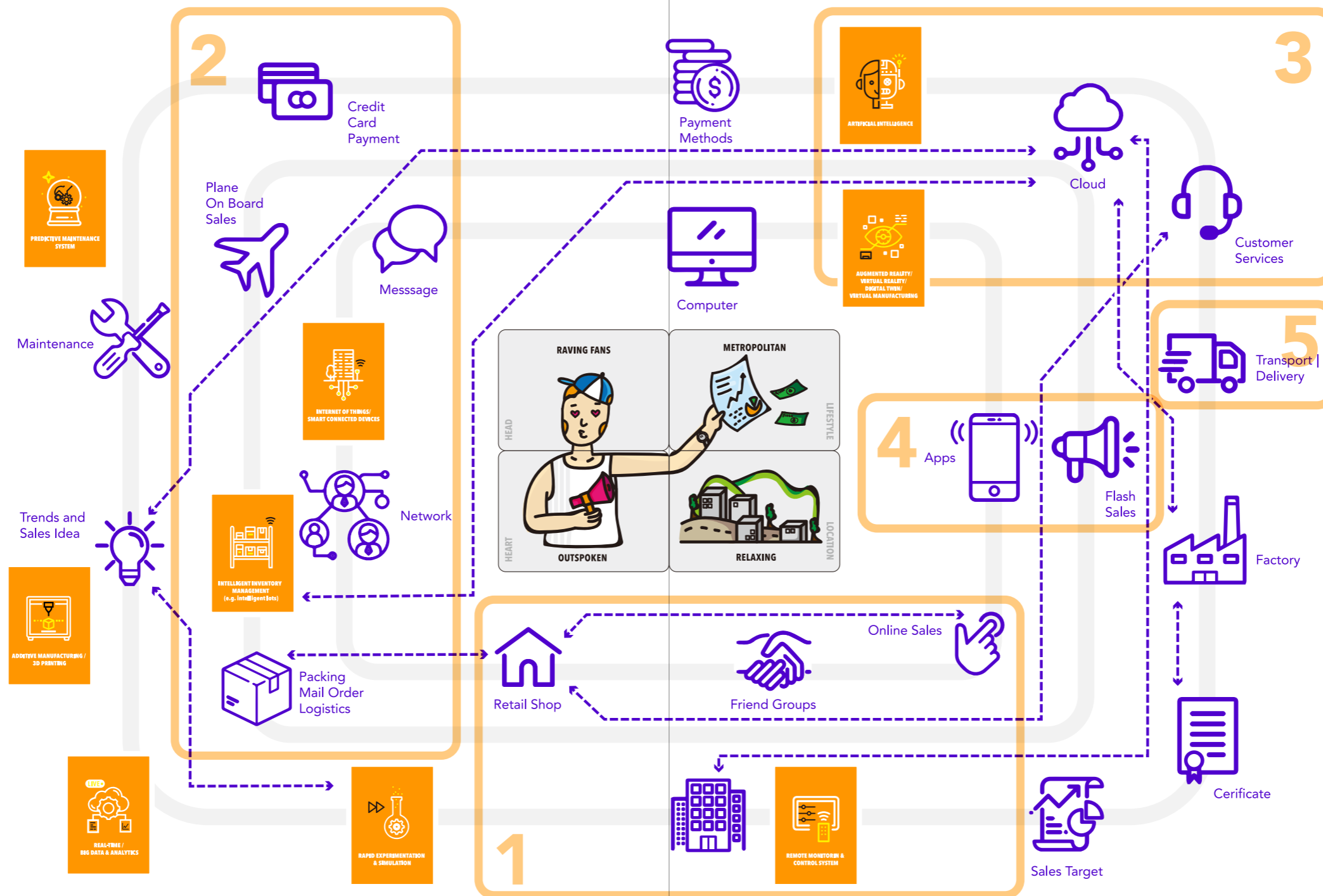
Airlines and travellers can now enjoy painless luggage check-in and travels. 航空公司和旅行家現在可享受無痛的行李托運和旅遊。

For a consumer, luggage is simply a container to hold traveller's items. However, almost everyone had encountered various issues with our luggage during travel. Whether it's lost in transit, or queued in long waiting lines for baggage drop-off, or overweight items making us scramble in the airport to repackage our luggage, there are a lot of user challenges. From the M2S thematic workshop, our participants analysed the challenges and come up with a conceptual, customisable and adaptive solution with I4.0 manufacturing. The product itself has evolved to become an integrative product and service offering, transforming the user experience with the luggage throughout the travelling engagement point.

對於消費者來說，行李箱只是一個容納旅行者物品的容器。然而，幾乎每個人在旅行時都遇到過各種各樣的行李問題。無論是在運輸過程中丟失，還是在等待時間很長的行李托運處排隊，或是超重的物品讓我們在機場爭相重新包裝的行李，都是很多用戶所面對的挑戰。在量產客制化的專題工作坊上，我們的參與者分析過各種挑戰，並提出了概念性、可量產客制及自我適應的I4.0製造解決方案。產品本身已發展成為一體化的產品和服務，改變了行李箱在整個旅行用戶體驗的切入點。



New Business Models of Product-Service-System
嶄新產品服務系統 (PSS) 商業模式



1

Pack your luggage and prepare to travel at ease. The intelligent luggage has modular compartments, weight sensor calculations, alert system and temperature sensor

收拾行李，準備好輕鬆旅行。智能行李箱具有模組化間隔，重量計算感應器、警報系統以及溫度感應器



2

Through cloud secure gateway connected to multiple airlines' database, you can now check-in your flight and luggage virtually. A unique digital ID (replacing paper scanning) will then be sent and displayed on the digital screen on your luggage

通過連接到多個航空公司數據庫的雲端保安網關，您現在可以為您的航班和行李進行虛擬登記。然後一個獨特的密碼（代替紙質掃描）將會被發送並顯示於行李箱的數碼屏幕上



3

No more lineups and wait time at the airport. The automated kiosk can scan your luggage digital ID through synchronised cloud data

無需再排隊，亦不用再花時間在機場呆等。自助服務站可以通過同步的雲端數據掃描您的行李數碼密碼



4

Worry free while travelling. With GPS location and the secure ID, you can track your luggage anywhere you go and feel safe

無憂無慮地去旅行。有了導航位置和安全密碼，您可以隨時隨地追蹤到行李，倍感安全



5

The intelligent interface will notify your mobile phone within proximity during airport baggage pickup. Making it hassle-free to wait and search for your luggage

智能介面將在機場領取行李期間和範圍之內發通知到你的行動電話，讓你輕鬆等待並尋找你的行李

Workshop
工作坊

#2

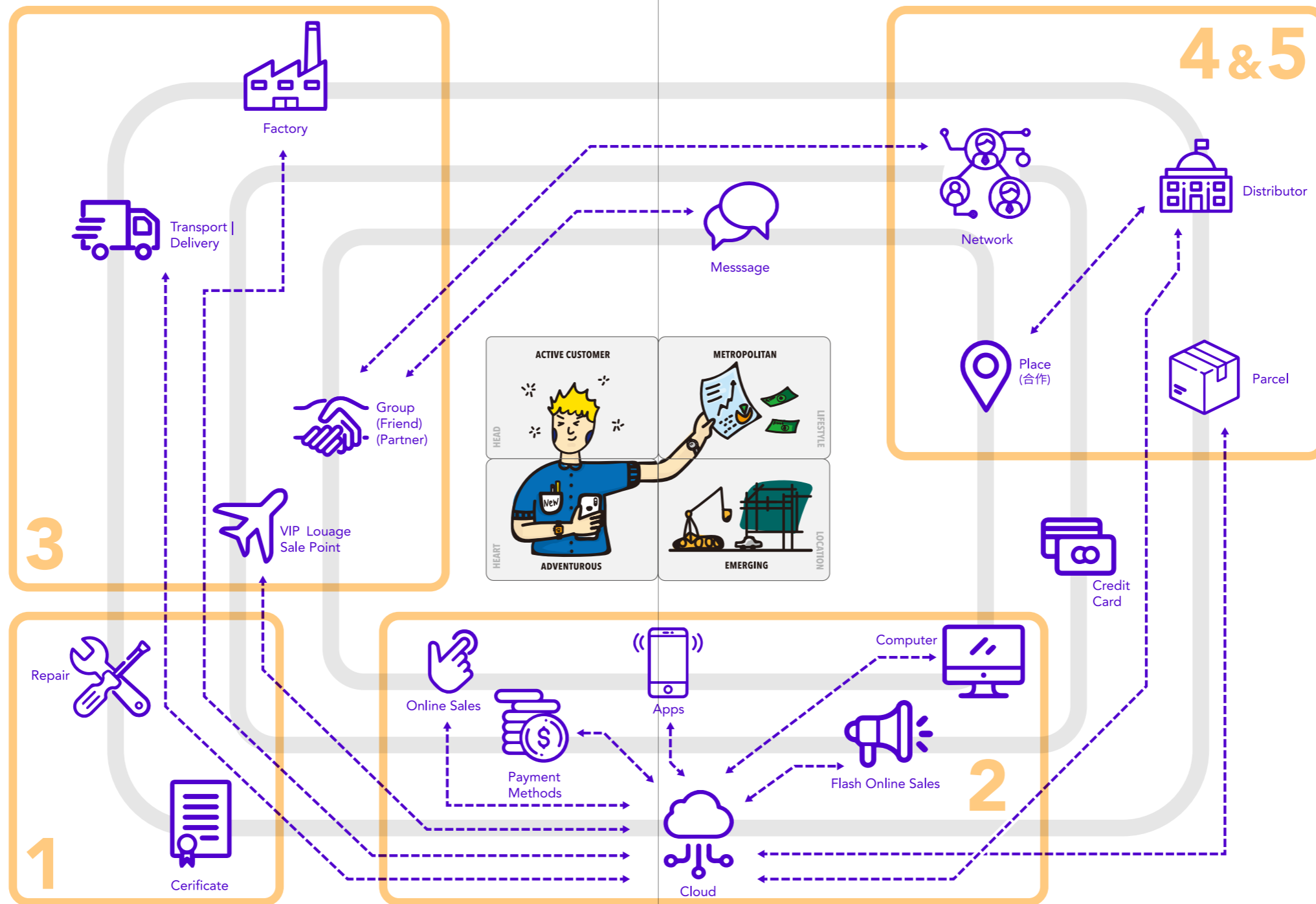
Premium custom man suits to meet working professional needs upon travel. 高級客制男士西裝滿足外遊工作專業需求。

Busy working professionals, who travel for short business trips, frequently need suits for formal meetings and events. The main problem is that carrying multiple suits for mixtures of occasions is impossible and inconvenient. From the M2S thematic workshop, our participants analysed the challenges and redesigned a service model to custom tailored suits.

專業人士的工作繁忙，頻頻踏上短期的商務出差之旅，經常需要適合出席正式會議和活動的西裝。然而，攜帶多套西裝以配合不同場合就成了主要的問題，因為這既不可能亦不方便。在量產客制化的專題工作坊中，我們的參與者分析了各種挑戰，將服務模式重新設計為度身定制的西裝。



Internet of Things (IoT) / People (IoP)
物聯網 (IoT) 與人聯網 (IoP)



1
VR / AR platform for customer to visualise suits' style and cutting, with customised measurements to enhance shopping experience
虛擬實境 / 增強實境平台讓客戶可以立體視覺化西裝的風格和剪裁，通過定制測量去提升購物體驗



2
Through a membership-based online portal, all customers will have their own virtual closet. Customer can craft as many choices of suits as needed for various occasions
透過會員的網上登陸戶口，所有客戶都將會擁有自己的虛擬衣櫃。客戶可以根據需要為各種場合製作多款西裝選擇



3
During travel, customer can easily select their style needs using their virtual closet. Parcel will be shipped out to airport VIP lounge – acting as point of sales and delivery
在外旅遊期間，客戶可以使用他們的虛擬衣櫃輕鬆選擇他們的風格需求。包裹將被運送到機場貴賓休息室 - 作為銷售點和交付點



4
Upon flight departure, customer simply leaves the suits at the VIP concierge. Airport service will return the suits to the company
航班抵達後，客戶只需將西裝留在VIP禮賓部。機場服務會將西裝交還給西裝公司



5
The suits are 3D printed by parts and can be disassembled and reprocessed for future use
西裝零件來自3D打印，可以拆卸和再加工以備將來使用

Workshop
工作坊

#3

**Home users can store and preserve fresh food in any ways they like in the future.
家庭用戶將可以任何方式儲存和保存新鮮食物。**

Every family use the fridge as storage for fresh food, and it has become a ubiquitous feature of the home. Interestingly, there are limited flexibility in which one family can personalise the compartments and controls for more specific usage and needs.

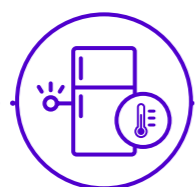
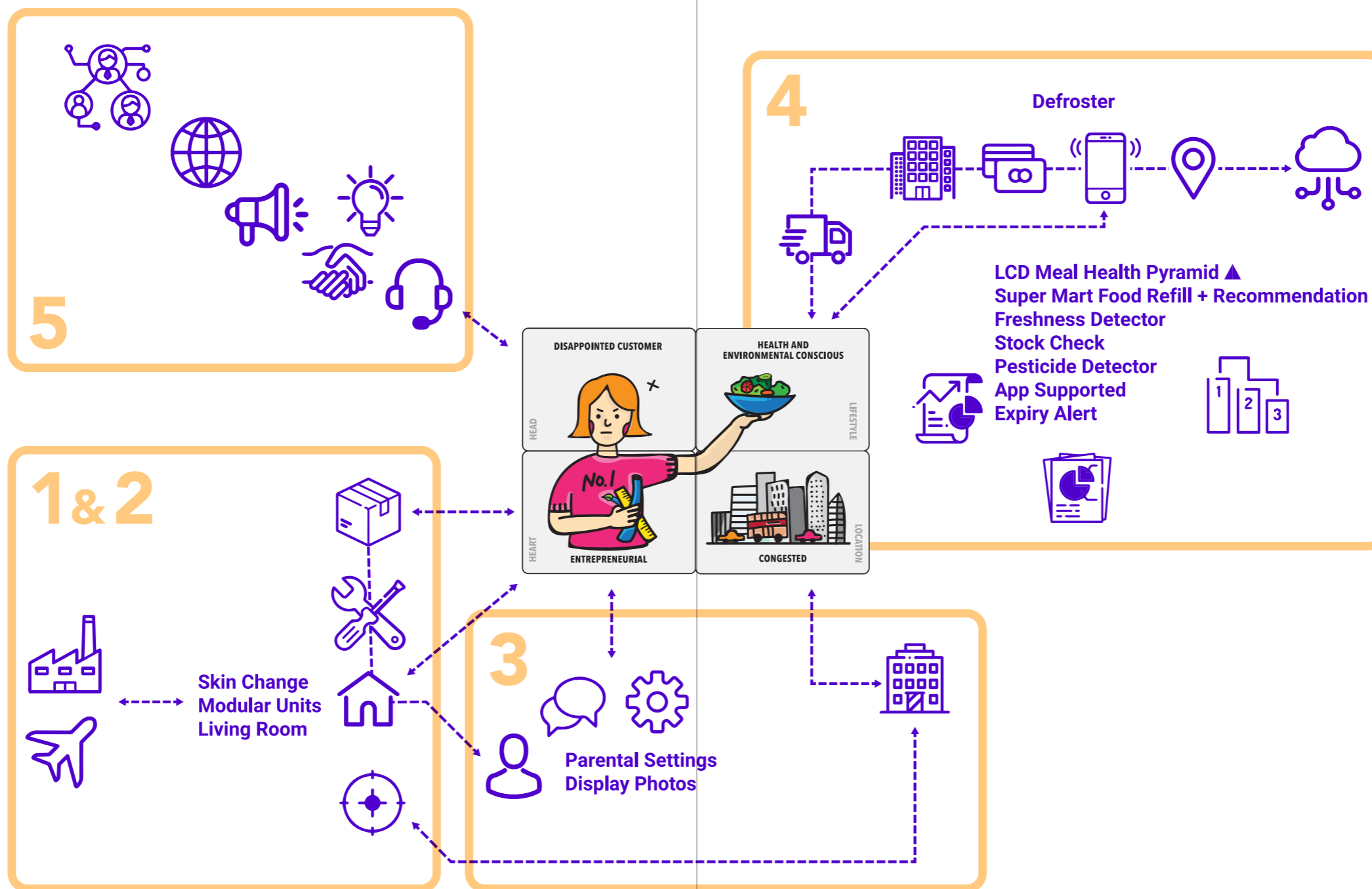
The M2S thematic workshop participants developed a deconstructed modular fridge – “LEGO” style, with each compartment physically interchangeable, and digitally connected via network as independent modules. The concept incorporated scale

每個家庭都會使用雪櫃的空間去儲存新鮮食物，它已成為一個無處不在的家庭特色。然而有趣的是，雪櫃的靈活性有限，一個家庭很難可以根據更具體的用途和需求對間隔和監控進行個性化設置。

M2S專題工作坊的參與者開發了一種可拆解的模組化雪櫃 - 「LEGO」風格，每個間隔可以互換，各個獨立的模組通過網絡數碼連接。此概念採用了多種工業4.0技術作量產客制化策略。

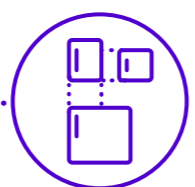


**Big Data Analysis
大數據分析**



1

Every fridge contains standalone compartments, with remote controllable sensors and temperature control
每個雪櫃都包含了可遙遠控制的感應器和溫度監控等的獨立間隔



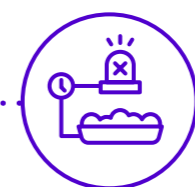
2

Inspired by Google Project Ara, the fridge can be freely assembled in irregular or regular upright structure in accordance to available home usage space
受到 Google Project Ara 的啟發，根據可用的家居使用空間，雪櫃可組裝成不規則或規則的直立結構



3

The fridge has an intelligent system that can scan and detect the types of fresh food in the compartments. Connected via digital platform between consumers and food retailers, users can easily replenish fresh food stockings through this smart monitor and order system
雪櫃有一個智能系統，可以掃描和檢測間隔中的新鮮食物類型。數碼平台連接消費者與食品零售商，用戶可以通過智能監控和訂購系統輕鬆補充新鮮食品



4

Further usage of the smart scanning system enables user to detect rotting food, ensuring all food in the fridge is kept fresh all the time
進一步使用智能掃描系統讓用戶能夠檢測腐壞的食物，確保雪櫃中的所有食物始終保持新鮮



5

The types of food are detected through sensors and integrated via cloud to internet. Food recipes will be recommended via the digital platform to the user on their corresponding food in the fridge
通過感應器檢測食物類型，再透過雲端整合到互聯網。雪櫃中相應的食品食譜亦將透過數碼平台推薦給用戶使用

Appendix
附錄

Appendix 附錄 A

RESEARCH: From Mass Production to Scale Customisation

研究：量產客制化 (M2S)

Nowadays Hong Kong industrial design professionals (HKIDP) are facing the predicament of a double-sided sword. Not only do the HKIDP's own branded products but the stakeholders, including the manufacturers, in-house industrial design practitioners, have been tolerating to lose either the market opportunities or overcome the supply challenges. The research study aims to investigate how the concept of scale customisation* of industry 4.0 may narrow the gap between the growth of evolving market demand for variable styles and the requirements of higher minimum order quantities from manufacturers.

According to a survey published in 2014 by the Hong Kong Federation of Design Associations, there are 88,571 designers in the industry. The total figure represents about 2.3% of total employment in Hong Kong. They get an equal opportunity to participate in any

commercial activities of industrial design, when Hong Kong is the sixth largest trading partner in merchandise trade and the fourth largest in services trade of Association of Southeast Asian Nations (ASEAN) for 2016. The recent signing of the ASEAN Free Trade Agreement (FTA) and related Investment Agreement sees the indispensable role for HKIDP to be engaged in the initial planning of manufacturing processes.

Hong Kong has been ranked high in the 2015 Global Creativity Index, or GCI. The GCI is a broad-based measure for advanced economic growth and sustainable prosperity based on the 3Ts of economic development—talent, technology, and tolerance.

That ranking could change, thanks to the Hong Kong government's emphasis on creativity and design thinking. In the Chief Executive's 2017 Policy Address,

the government acknowledges design professionals' success in enhancing the competitiveness of their clients, through branding and value addition. The government plans to take it one step further by collaborating with design professionals to transform creativity and design thinking into a "problem solving" tool in public administration and business operation.

香港工業設計專業人士 (HKIDP) 正面臨的困境就如一把雙刃劍。不僅僅是香港工業設計專業人士的自家品牌產品，就連製造商和機構內部工業設計從業者在內的利益持份者也一樣，不是要面對失去市場機會的困難，就是要克服供應上的挑戰。是次研究旨在研究工業4.0量產客制化*的概念如何縮小不斷進化又追求不同風格的市場需求增長，與及製造商提出的最小訂購量要求兩者之間的差距。

根據香港設計總會 (FHKDA) 於2014年發表的一項調查顯示，業界共有88,571名設計師，總數約佔香港總就業人數的2.3%。當香港2016年成為東南亞國家聯盟 (東盟) 第六大商品貿易伙伴和第四大服務貿易伙伴時，他們獲得相等的機會參與工業設計的任何商業活動。由最近東盟自由貿易協定 (FTA) 的簽訂與相關的投資協議可見，香港工業設計專業人士參與製造流程的初步規劃是不可或缺的。

香港在2015年全球創意指數 (GCI) 中名列前茅。全球創意指數是一個以3T – 人才 (Talent)、技術 (Technology) 和寬容 (Tolerance) 的經濟發展為基礎的廣泛標準去衡量經濟增長進步及可持續繁榮。

88,571

Designers in Hong Kong in 2014

2014年香港業界設計師總數

2.3%

of total employment in Hong Kong

設計師總數約佔香港總就業人數百分比

* Remarks: Scale customisation includes mass customisation - <http://www.doogma.com/ted-talk-scale-customization-the-future-of-manufacturing/>, smart customisation - <https://www.strategy-business.com/article/04104?gko=951a6>, large-scale product customisation - https://mashable.com/2011/04/13/mass-customization/#2vA_NqZVSq6. Also, similar initiatives of industry 4.0 are including but not limited to Industrial Internet, Manufacturing 2025, and Made in China 2025

* 備註：量產客制化包括大量客制化 - <http://www.doogma.com/ted-talk-scale-customization-the-future-of-manufacturing/>，智能客制化 - <https://www.strategy-business.com/article/04104?gko=951a6>，大規模產品客制化 - https://mashable.com/2011/04/13/mass-customization/#2vA_NqZVSq6。此外，類似工業4.0的舉措亦包括但不僅限於「工業網絡」，「製造2025」和「中國製造2025」。

Research Methodology

研究方法

The investigation on how the concept of scale customisation of industry 4.0 may narrow the gap between the growth of evolving market demand for variable styles and the requirements of higher minimum order quantities from manufacturers triggers a series of research questions:

- To what extent the HKIDP and the Hong Kong manufacturers understand and use scale customisation of industry 4.0?
- How do HKIDP and Hong Kong manufacturers perceive industrial design?
- How do the different perceptions facilitate or hinder the collaboration between HKIDP and Hong Kong manufacturers, if any?
- What is the best practice of collaboration between HKIDP and Hong Kong manufacturers?

關於工業4.0量產客制化的概念如何縮小市場需求款式不斷變化的增長與製造商要求的最低訂購量之間的差距，此項調查引發了一系列研究問題：

- 香港工業設計專業和香港製造商對工業4.0中量產客制化的了解和使用有多大程度？
- 香港工業設計專業和香港製造商如何看待工業設計？
- 不同的觀念如何促進或阻礙香港工業設計專業與香港製造商之間的合作？
- 香港工業設計專業與香港製造商合作的最佳做法是甚麼？

The research comprises (a) literature review / secondary research of scale customisation, Industry 4.0 and equivalent initiatives or movements, and related knowledge of HKIDP; (b) four series of interviews, including 15 experts of Industry 4.0, 17 scale customisation specialists [and industrialists], 18 in-house industrial designers and 20 non-in-house industrial designers in Hong Kong; (c) three sessions of workshops to explore feasible ideas of collaboration between HKIDP and manufacturers.

The researchers collected secondary and primary data and then analysed about 70 stakeholders, who represent the Hong Kong cases against the existing knowledge and six theories. They range from four approaches of customisation (Gilmore, 1997), OEM-ODM-OBM-OSM models of manufacturing (Heskett, 2009), value chain, mass production and mass [scale] customisation (Pine, 1993; Boston Consulting Group), and product-service system (Morelli, 2006), to six spectrums of industrial innovation (Centre for Design Innovation, based on Stanford d.School). Moreover, the research team also reviewed literature that covers the existing publications, research papers, reports and studies by various industry professionals and the academia on scale customisation, Industry 4.0 and equivalent initiatives or movements, spanning from global to related knowledge of HKIDP.

是次研究包括 (a) 量產客制化、工業4.0及對等行動或運動的文獻評論 / 二手研究，以及香港工業設計專業的相關知識；(b) 四個系列的訪問，包括15名工業4.0專家、17名量產客制化專家[及工業家]、18名內部工業設計師及20名香港非內部工業設計師；(c) 三次研討會，探討香港工業設計專業與製造商合作的可行想法。

研究員收集了二手和一手資料，然後共分析了約70個利益相關單位，針對現有的知識和六個理論，這些單位成為代表香港的案例。當中理論包括四種客制化方法 (Gilmore, 1997)、原廠代工-原創品牌-設計加工-策略管理製造模式 (Heskett, 2009)、價值鏈、大量生產及大量[批量]生產客制化 (Pine, 1993；波士頓諮詢集團)、以及產品服務系統 (Morelli, 2006)，六個工業創新範圍 (Centre for Design Innovation，基於史丹佛大學d.School)。此外，研究團隊還就各個行業專業人士和學術界的文獻、量產客制化、工業4.0及同等行動或運動的現有出版物、研究論文、報告和研究等進行了審閱，將全球以至相關的香港工業設計專業知識都一一涵蓋。

All stakeholders who participated throughout the research phase are owners or senior management in their respective organisations. 24% of the researched candidates are 3rd generation leaders who inherited their HK family businesses established since the 1970s, 12% are design consulting businesses, and over 50% are manufacturers with over 20 years of industry experience.

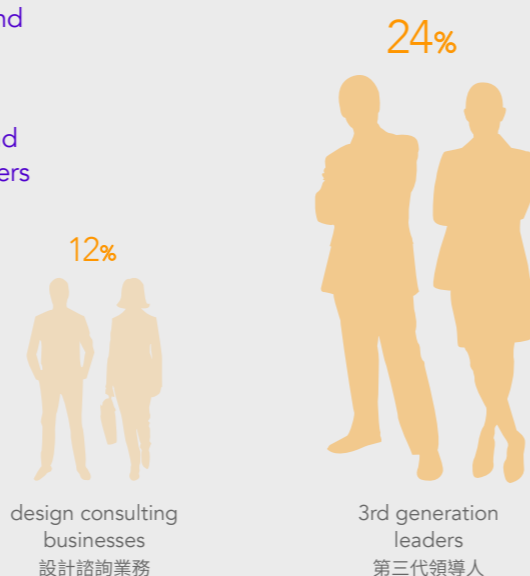
The objectives of the semi-structured interviews are:

- to understand the respondents' perception, cognition, understanding and knowledge (OR all) of scale customisation;
- to explore if they are experiencing / using / trying to implement scale customisation;
- to investigate how to utilise the role of industrial design professionals / manufacturers / intermediaries (experts) in the process of scale customisation;
- to study how the industrial design professionals in Hong Kong select partner(s) of scale customisation / how the manufacturers would change mindset to prepare and equip for scale customisation; and
- to inspire the respondents to feedback on the environmental scanning factors of the needs and demands of Hong Kong consumers towards scale customisation

所有參與整個研究階段的利益持份者為各自組織的擁有者或高級管理人員。當中24%的研究受訪者是繼承了自70年代創立香港家族企業的第三代領導人，12%來自設計諮詢業務，50%以上是擁有20多年行業經驗的製造商。

進行半結構式訪問的目的是：

- 了解受訪者對量產定制化的觀感、認知、理解及知識（或全部）；
- 探索他們是否正在體驗 / 使用 / 嘗試實施量產定制化；
- 研究如何利用工業設計專業 / 製造商 / 中介機構（專家）在量產定制化過程中的作用；
- 研究香港工業設計專業如何選擇量產定制化合作伙伴 / 製造商如何改變思維方式，為量產定制化做好準備和裝備；及
- 鼓勵受訪者就環境掃描因素反饋香港消費者對量產定制化的要求和需要



The research team synthesised the findings to recommend the best practice for HKIPD. The findings include (i) the methods for HKIDP to select manufacturers [suppliers] of scale customisation, (ii) the standards of the external market, and (iii) the ways to change mindset to prepare and equip for scale customisation. As conventional wisdom suggests, both challenges and opportunities are reserved only for those who are upgrading their mindsets and attitudes rather than technological infrastructure, for collaboration. A new paradigm in which all stakeholders across the industrial landscape work collectively and synergistically to increase multiple benefits is emerging.

The research is conducted in two core forms: primary research and secondary research, with up to 70 scale customisation specialists and industrialists, industrial design professionals, institutional leaders and global industrial experts.

The primary research methods include exploratory research with focus groups, semi-structured interviews, participatory observations in workshop settings, interactive research board in public exhibition.

Secondary research is the information gathering from existing publications, research papers, reports and studies by various industry professionals and academia on scale customisation, Industry 4.0 and equivalent initiatives or movements, spanning from global to related knowledge of Hong Kong Industrial Professionals.

研究小組綜合了研究結果，為香港工業設計專業建議了最佳實踐。調查結果包括 (i) 香港工業設計專業選擇量產定制化製造商 [供應商] 的方法、(ii) 外部市場的標準，以及 (iii) 改變思維模式以準備和裝備量產定制化的方法。正如古人的智慧一樣，挑戰和機遇都只留給那些正在提升思維模式和態度去進行協作的人，而非升級技術基礎設施的人。一個由所有工業領域的利益持份者共同協作以增加多重協同利益的新模式正在掘起。

本研究以兩大核心形式進行：一手研究和二手研究，對象為最多70位量產定制化專家及工業家、工業設計專業人員、機構領導層和環球工業專家。

一手研究方法包括焦點座談小組的探討研究、半結構式訪談、工作坊環境的參與觀察、公開展覽中的互動研究展板。

二手研究的資料來自各個行業與學術界的專業人士就量產定制化、工業4.0及其相關動議或運動的現有出版物、研究論文、報告和調查，涵蓋香港工業專業人士的環球及相關知識。

Research Strategy

研究策略



SECONDARY RESEARCH

二手資料收集

- Industry 4.0 and equivalent initiative or movements
工業 4.0 和同等的行動或運動
- related knowledge of HKIPD
香港工業設計專業的相關知識



PRIMARY DATA COLLECTION

一手資料收集

- Approximately 70 semi-structured interviews
大約 70 個半結構式訪問
- Three thematic workshops
三個專題工作坊
- Interactive installation at the pavilion
展示廊中展覽的互動裝置

70 Semi-structured interviews

70 半結構式訪問

- including experts of Industry 4.0, scale customisation specialists [and industrialists], in-house industrial designers and non-in-house industrial designers in Hong Kong
- Semi-structured questions
- Face to face interviews
 - > Industrial Designers
 - > Industrialists
 - > Domain Experts

- 包括工業 4.0 的專家、量產客制化專家 [和工業家]、香港的內部工業設計師和非內部工業設計師
- 半結構式問題
- 進行面對面訪問：
 - > 工業設計師
 - > 工業家
 - > 領域專家

Research topics

- How can we enable Hong Kong industrial design professionals to meet the needs of scale customisation for future design and manufacturing?
- Define the scope and direction of focus
- What is the global progression and local understanding of industrial 4.0, mass production and scale customisation models and strategies?
- Identify the trends and impacts of mass production to scale customisation in the industry

研究題目

- 我們如何讓香港工業設計專業人士滿足未來設計和製造的量產客制化需求？
- 定義研究焦點範圍和方向
- 工業 4.0、大量生產和量產客制化模式與策略的全球發展和當地理解
- 確定行業由大量生產擴大到量產客制化的趨勢和影響

List of interview questions

訪問問題

Objective The interview is structured to draw implicit insights and reflection from the interviewee on their knowledge capacities (from various perspectives) towards Industry 4.0, followed by revealing the relationship between the business strategic development, consumer expectation, and technological enhancement in manufacturing production processes.

目的 訪問的結構是從受訪者就工業4.0的知識能力（從不同角度）所得出的隱含見解和反思，繼而揭露在製造生產過程中企業的策略發展、消費者的期望以及技術提升之間的關係。

- 1 What is 'Scale [Mass] Customisation of Industry 4.0', and how do you think this has impacted your business in reshaping the organisation strategies and operations?
什麼是「工業4.0下的量產客制化」？你認為這對重塑你的企業組織策略和營運有何影響？
- 2 How do you interpret the differences between customisation (traditional approach) and scale [mass] customisation (new approach) of industry 4.0?
你如何解釋客制化（傳統方法）和工業4.0下的量產客制化（新方法）之間的差異？
- 3 Could you please share in your opinion, in a high-level view, progression with scale [mass] customisation of industry 4.0 in Asia / (HK if applicable) Hong Kong? In other words, what do you think about the interrelationship between the competitive advantage and its main drivers? If any, what are the main drivers?
從高層的角度來看，你能否分享一下工業4.0下的量產客制化在亞洲 /（香港，如適用）香港的進展情況？換句話說，你如何看待競爭優勢及其主要驅動因素之間的相互關係？如有的話，哪主要的驅動因素又是什麼？

- 4 How do you see the new roles of industrial design professionals, manufacturers, and retailer OR all in the scale [mass] customisation of industry 4.0?
你如何看待工業設計專業、製造商和零售商或他們全部在工業4.0下的量產客制化中所擔當的新角色？

- 5 What challenges do you see them (industrial design professionals, manufacturers and retailer, supply chains) need to overcome to take advantage of scale [mass] customisation of industry 4.0 and further improve?
你認為他們（工業設計專業、製造商和零售商、供應鏈）需要克服哪些挑戰才能利用工業4.0下的量產客制化作進一步改進？

- 6 From new business model to new technologies, what are some key points SMEs, Retailers and Industrial Designers should be aware to thrive in this new economy?
從新的商業模式到新技術，要在這個新經濟中茁壯成長，中小企業、零售商和工業設計師應該留意的關鍵是什麼？

- 7 With consumer expectations inclining heavily towards customisation of products and services, what suggestions and learning opportunities can you share for those stakeholders who is seeking change?
由於消費者的期望大大傾向於客制化產品和服務，你可以為尋求變革的利益持份者分享哪些建議和學習機會？

- 8 Optional 可選題
A. Who do you regard is the Asia leader in scale [mass] customisation of industry 4.0?
你認為誰是工業4.0下量產客制化的亞洲領導者？
—
B. [what if, the interviewees mention big data] What about data, privacy of access to devices and the rights of usage?
[如受訪者提到大數據] 你對數據、設備及隱私的獲得和使用權又有何看法？領導者又是誰？

Personal Background 個人背景

- 9** Your background (design discipline; education background)
你的背景（設計學科；教育背景）
- 10** What is your field of expertise now?
你現在的專業領域是什麼？
- 11** What is your position in the company?
你在公司的職位是什麼？
- 12** What are your responsibilities in the company?
你在公司的職責是什麼？
- 13** How long have you been working in this industry?
你在這個行業工作多久了？
- 14** Have you received any training on any related design practices (methods, processes, strategies) and manufacturing practices?
你有否接受過任何設計實踐（方法、流程、策略）和製造實踐相關的培訓？
- If so, how did you apply this in your work?
如有，你如何在工作上應用培訓所得？
 - If not, what other training have you received in which you find useful for work?
如無，你接受過的其他培訓對你的工作是否有用？
- 15** What types of changes and improvements, most noticeable/major/dramatic, have you observed since (joining or leading) this business compared to now? (people, process, technology, etc)
與現在相比，自從（加入或領導）此業務以來，你觀察到哪些類型的變化和改進最為明顯 / 主要 / 極端？（人事、過程、技術等）

Business Background 業務背景

- 16** How long is your organisation history?
你所屬組織的歷史有多長？
- 17** Which consumer market does your business target?
你的業務的目標消費市場是哪個？
- Can you name several successful product(s) / service(s) your organisation offers to consumers now? What made the offerings successful?
你能說出你的企業現在向消費者提供的幾個成功的產品 / 服務嗎？是什麼讓產品成功？
- 18** What drives the success of your business? Why?
什麼推動你的業務邁向成功？為什麼？
- 19** How does your business create value for stakeholders [particularly consumers], including initial stages from sourcing, production, supply chain to sale of final product (stakeholders value chain)?
你的企業如何為利益持份者 [特別是消費者] 創造價值，包括從採購、生產、供應鏈到最終產品銷售（利益持份者價值鏈）的初始階段？
- 20** What are the innovations in your business and work now? How do you see these innovations help (or not helping)?
你現在的業務和工作有哪些創新之處？你如何看待這些創新有助（或沒有幫助）於業務？
- 21** Can you share an unexpected situation, or most memorable experience, which influenced the [business strategy] or [manufacturing] process?
你可否分享一次影響 [業務策略] 或 [製造] 流程的意外情況或最難忘的經歷？
- How was the situation addressed?
是次情況如何解決？
 - What drove these decisions?
是什麼推動了這次決定？
- 22** If your client wants to have customisation product, how does your system respond?
如果你的客戶想要客制化產品，你的系統會如何響應？

Market Background 市場背景

- 13** Can you share your views on current consumer behaviours / expectations and its influence to your business competitiveness now and future? What percentage of your market segment seeks customisable solutions?
你能否分享你對當前消費者行為 / 期望及這些現在和未來如何影響你業務競爭力的看法？你的細分市場尋求可客制解決方案的百分比是多少？
- [if applicable] What type of customisation and how does your business satisfy this need?
[如適用] 什麼類型的客制以及你的業務如何滿足這種需求？
 - [if applicable] What challenges do you face with customisation?
[如適用] 你在客制方面面臨哪些挑戰？
- 14** From the 1st industrial revolution (mechanisation through water and steam power) to the mass production and assembly lines with electricity in the 2nd, then towards the 3rd with computers and automation. We are now at the 4th industrial revolution (Industry 4.0), furthering the industrial and manufacturing sector with smart and autonomous systems driven by data and machine learning (mass production → mass customisation).
從第一次工業革命（通過水和蒸汽動力機械化）到第二次工業革命有電力和大量生產與裝配線，然後到第三次工業革命有電腦和自動化。我們現在正處於第四次工業革命（工業4.0），通過數據和機器學習（大量生產→大量客制）驅動的智能和自主系統，進一步推動工業和製造業的發展。
- How do you view this shift relate to manufacturing, retail and design sector?
你認為這種轉變如何與製造業、零售業和設計業有關？
- 15** What is your next 5-year view (future) of your business (if applicable, discuss more about production manufacturing) evolution?
你對5年內（未來）的業務演變有何看法（如適用，討論更多關於生產製造）？
- What essential resources do you need to fulfil this? Can it start now; if not, what are the constraints?
你需要哪些必要的資源才能實現這一目標？這目標現在可以開始？如果不可，又有什麼限制？

Industry 4.0 and Scale [Mass] Customisation 工業4.0及量產客制化

- 26** Do you know or have you searched the information about the industry 4.0 or related activities?
你是否知道或搜索過有關工業4.0或相關活動的資訊？
- 27** Do you know or understand what is scale [mass] customisation which is under industry 4.0 period?
[Answer: yes / 50/50 / no (explain what Industry 4.0 and scale customisation are and share the case)]
你是否清楚或了解什麼是工業4.0期間的量產客制化？
[答案：是 / 50/50 / 否（解釋什麼是工業4.0和量產客制化並分享案例）]
- 28** Will your organisation plan to engage in scale [mass] customisation?
你的組織是否計劃參與量產客制化？
- 29** Do you think scale [mass] customisation can help bring more opportunities to your organisation?
你認為量產客制化可以幫助你的組織，為其帶來更多機會嗎？
- 30** Any plan or timeline to process the new technologies and the new commercial enterprise model for accommodation into your system?
有沒有任何計劃或時間表處理新技術和新商業企業模型以應用到你的系統？

Three thematic workshops 專題工作坊

- 3 thematic topics: IoT, Big Data and Product Service model as thematic discussion for innovation breakthrough
- design tools: personas, problem framing, technology trend shifts, concept link, challenge questions, stakeholder map
- ethnographic observation and action research on participant knowledge to content engagement
- 3個主題：物聯網、大數據和產品服務模式作創新突破的專題討論
- 設計工具：角色設定、問題框架、技術趨勢轉變、概念鏈接、挑戰問題、相關持份者圖表
- 關於參與者知識到內容參與的民族誌觀察和行動研究

Interactive installation at the exhibition

- Inspired by “WHAT MADE ME” installation, by Dorota Grabkowska, Birmingham, UK
- 66 elements related to design and manufacturing
- 400 visitors participated to contribute answers to the 4 questions: “what you value”, “what you do”, “what you want”, and “what you change”

DATA ANALYSIS

資料分析

Comparative analysis

- Affinity clustering: differences and similarities
- Insight finding: discover patterns and characteristics
- Evidence finding

Conclusion

- insights on challenges, recommendations and opportunities

在展覽會上互動安裝

- 受英國伯明翰Dorota Grabkowska「什麼構成我」裝置的啟發
- 66個與設計和製造相關的要素
- 400名參與者參與為「你重視什麼」、「你從事什麼」、「你想要什麼」以及「你改變了什麼」4個問題提供答案

對比分析

- 近似聚群：差異和類同
- 見解結果：發現模式和特徵
- 證據結果

結論

- 對挑戰、建議和機遇的見解

Workshop Tool Kit 工作坊工具組

Workshop menu 工作坊選單

Developed by TALK Research and Innovation Management Company
拓途研究及創新管理公司

Talk 拓途.
Research & Innovation Mgt.
研究及創新管理公司

COLLABORATIVE
How might we enable our product and service to be designed and delivered from customer when [shift cards] ?
Collaborative characteristics:
- Client likes to be involved with design of product and service
- Client do not articulate specific design needs
- Client do not like standardized offerings, prefer catered experience
- Longer production time ; higher costs for manufacturing/design
- High changes to accommodate to customer's personal tastes
- Minimal inventory, stock some raw materials, and only produce finished products in response to actual customer needs

CONFIGURABLE
How might we enable our product and service to be configurable by customer when [shift cards] ?
Configurable characteristics:
- Customer likes ONE product to meet various situations/needs
- Customer does not want a lot of choices
- Research-development driven
- Products/Services are usually standardized and programmable

PERSONALISABLE
How might we enable our product and service to be personalised for customer when [shift cards] ?
Personalisable characteristics:
- Convenient yet meet individual customer needs
- Customer do not like to repeat, expect customization happen for them
- Most changes happen to fit customer needs without the user even knowing (predictable preference through observation)
- Service-driven
- Fine tuning and adapt through learning customer's needs

GENERIC
How might we enable our product and service to be enhanced with customer preferences when [shift cards] ?
Cosmetics characteristic:
- Customised styling, experience, appearance
- Can be simple/stravagant/premium product/service yet cost effective
- Not prioritized on adding complexity and cost while delivering new "experience" (appears to look or appears to feel different)

Artificial Intelligence
- Combining high computational capabilities, extensive automation and extreme connectivity, machines can now interpret data to provide suggestive insights for further actions
- Machines can self learn and cross-teach to increase its capacity simultaneously

Real-time / Big Data & analytics
- From quantitative to qualitative evaluations, real-time (or live) data can be captured, processed, assessed and modelled to draw insights, discover useful information which leads to better decision-making process.

Remote monitoring & control system
- Distant monitoring and controlling factory facilities' operations allow higher accessibility and visibility to optimise processes and allocate labor

Human-robot collaboration
- Traditionally industrial robots are large and dangerous to work with humans
- Advanced performance sensors, intelligent control systems with high mobility designs allow machines to work closely with humans during various tasks

Rapid experimentation and simulation
- With technologies organisations can now design, test and iterate concepts/prototypes at much cheaper costs and time. This allows early market validation and feedback to generate better final products

Cloud
- Configurable systems and higher-level services networked via Internet, often reducing heavy costs and resource management on physical compute infrastructures and maintenance. Accessibility to application setup and virtual maintenance enable organisation to better align resources

Sustainability, Design, Manufacturing / Circular economy
- With scarcities of energy and raw materials and changes to compliance, organisations have to develop environmentally sustainable strategies while achieving economic scalability.

Intelligent inventory management (e.g. Intelligent lots)
- Localization technology can automatically track position of wafer carrier in production facility, positioning data is integrated with manufacturing system

Predictive maintenance system
- Fault prediction (beyond preventive errors): better identify relationship between fault diagnostics and operational data
- Aggregation and transparency of data allow systems and applications to become "self-aware" to predict production conditions, infer future abnormalities and errors, and further diagnose potential root cause of problems

Transparency
- Metrics of customer's input, supply chain, sales, factory and plant-floor performance are all invaluable information which affects design to production. Visibility of every pieces of data thus become critical in decision-making process

Augmented Reality / Virtual Reality / Digital Twin / Virtual Manufacturing
- With VR and big data analytics, Digital twin allow manufacturing of extremely high quality products. Virtual clones through real-time machine sensors allow production to be completely transparent and optimized before the actual physical manufacture
- AR allows real physical space to be merged with virtual dimensions which facilitates broader interaction and engagements

Internet of Things / Smart connected devices
- Devices, machines and systems are all connected via the Internet, the captured actions and behaviors through human interactions are translated into valuable information

On-demand production/ Batch Size One / Order of One
- Instant access to information, products and services has changed consumer's anticipation and expectation. Production volume control and speed also needs to meet this economic shift to create just-in-time services and products

Distributed manufacturing
- Raw materials and components remain decentralized (not in one factory/ storage). Final assembly occurs on a much more individualized basis, close to the customer, with products often shipped direct to the end consumer

Shared expectations / economy
- A.L.A collaborative consumption, is a trending economy in which consumers prefer to rent or borrow goods rather than buy and own them

Flexible manufacturing system
- Manufacturing system which can react to predicted and unpredicted changes
- Routing flexibility defines the system's changeable abilities to produce new product types, and ability to change the order of operations executed on a part
- Machine flexibility defines the ability to use multiple machines to perform the same operation on a part, as well as the system's ability to absorb large-scale changes, such as in volume, capacity or capability
- New systems can be programmed to do a high mix of part numbers for low volume production, and even one-off parts and product

Additive manufacturing / 3D printing
- Combination of processes in which material is joined or solidified under computer control to create a three-dimensional object, with material being added together in layers
- Use of lightweight alloys and less material in manufacturing
- Allow complex geometries so objects can be molded into infinite number of shapes
- Design and concepts can be rapidly prototyped and tested

Talk 拓途. PHQ

Shift cards 轉變牌

SHIFT CARD



快速實驗和模擬
Rapid experimentation & simulation

- With technologies organisations can now design, test and iterate concepts/prototypes at much cheaper costs and time. This allows early market validation and feedback to generate better final products

RAPID EXPERIMENTATION & SIMULATION

SHIFT CARD



遠程監控和控制系統
Remote monitoring & control system

- Distant monitoring and controlling factory facilities' operations allow higher accessibility and visibility to optimise processes and allocate labor

REMOTE MONITORIN & CONTROL SYSTEM

SHIFT CARD




人工智能
Artificial Intelligence

- With VR and big data analytics, Digital twin allow manufacturing of extremely high quality products. Virtual clones through real-time machine sensors allow production to be completely transparent and optimized before the actual physical manufacture
- AR allows real physical space to be merged with virtual dimensions which facilitates broader interaction and engagements

ARTIFICIAL INTELLIGENCE

SHIFT CARD




人類機器人協作
Human-robot collaboration

- Traditionally industrial robots are large and dangerous to work with humans. Advanced performance sensors, intelligent control systems with high mobility designs allow machines to work closely with humans during various tasks

HUMAN-ROBOT COLLABORATION

SHIFT CARD



物聯網 / 智能連接設備
Internet of Things / Smart connected devices

- Devices, machines and systems are all connected via the Internet, the captured actions and behaviors through human interactions are translated into valuable information

INTERNET OF THINGS/ SMART CONNECTED DEVICES

SHIFT CARD



實時 / 大數據和分析
Real-time / Big Data & analytics

- From quantitative to qualitative evaluations, real-time (or live) data can be captured, processed, assessed and modelled to draw insights, discover useful information which leads to better decision-making process

REAL-TIME / BIG DATA & ANALYTICS

SHIFT CARD




擴增實境 / 虛擬實境 / 數字孿生
Augmented Reality / Virtual Reality / Digital Twin / Virtual Manufacturing

- With VR and big data analytics, Digital twin allow manufacturing of extremely high quality products. Virtual clones through real-time machine sensors allow production to be completely transparent and optimized before the actual physical manufacture
- AR allows real physical space to be merged with virtual dimensions which facilitates broader interaction and engagements

AUGMENTED REALITY/ VIRTUAL REALITY/ DIGITAL TWIN/ VIRTUAL MANUFACTURING

SHIFT CARD



雲端
Cloud

- Configurable systems and higher-level services networked via Internet, often reducing heavy costs and resource management on physical computer infrastructures and maintenance. Accessibility to application setup and virtual maintenance enable organisation to better align resources

CLOUD

SHIFT CARD



分佈式生產
Distributed manufacturing

- Raw materials and components remain decentralized (not in one factory/storage). Final assembly occurs on a much more individualized basis, close to the customer, with products often shipped direct to the end consumer

DISTRIBUTED MANUFACTURING

SHIFT CARD

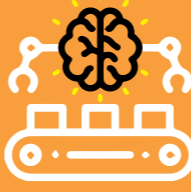


按需生產
On-demand production/ Batch Size One / Order of One

- Instant access to information, products and services has changed consumers' anticipation and expectation. Production volume control and speed also needs to meet this economic shift to create just-in-time services and products

ON-DEMAND PRODUCTION/ BATCH SIZE ONE/ ORDER OF ONE

SHIFT CARD



彈性製造系統
Flexible manufacturing system

- Manufacturing system which can react to predicted and unpredicted changes
- Routing flexibility defines the system's changeable abilities to produce new product types, and ability to change the order of operations executed on a part
- Machine flexibility defines the ability to use multiple machines to perform the same operation on a part, as well as the system's ability to absorb large-scale changes, such as in volume, capacity, or capability
- New systems can be programmed to do a high mix of part numbers for low volume production, and even one-off parts and product

FLEXIBLE MANUFACTURING SYSTEM

SHIFT CARD



預測性維修系統
Predictive maintenance system

- Fault prediction (beyond preventive errors): better identify relationship between fault diagnostics and operational data
- Aggregation and transparency of data allow systems and applications to become "self-aware" to predict production conditions, infer future abnormalities and errors, and further diagnose potential root cause of problems

PREDICTIVE MAINTENANCE SYSTEM



INTELLIGENT INVENTORY MANAGEMENT
(e.g. intelligent lots)

SHIFT CARD

智能庫存管理
Intelligent inventory management (e.g. intelligent lots)

- Localization technology can automatically track position of wafer carrier in production facility, positioning data is integrated with manufacturing system




TRANSPARENCY

SHIFT CARD

透明度
Transparency

- Metrics of customers' input, supply chain, sales, factory and plant-floor performance are all invaluable information which affects design to production. Visibility of every pieces of data thus become critical in decision-making process



ADDITIVE MANUFACTURING / 3D PRINTING

SHIFT CARD

積層製造
Additive manufacturing / 3D printing

- Combination of processes in which material is joined or solidified under computer control to create a three-dimensional object, with material being added together in layers
- Use of lightweight alloys and less material in manufacturing
- Allow complex geometries so objects can be molded into infinite number of shapes
- Design and concepts can be rapidly prototyped and tested



SUSTAINABLE, DESIGN, MANUFACTURING / CIRCULAR ECONOMY

SHIFT CARD

可持續性, 設計, 製造 / 循環經濟
Sustainability, Design, Manufacturing / Circular economy

- With scarcities of energy and raw materials and changes to compliance, organisations have to develop environmentally sustainable strategies while achieving economic scalability.



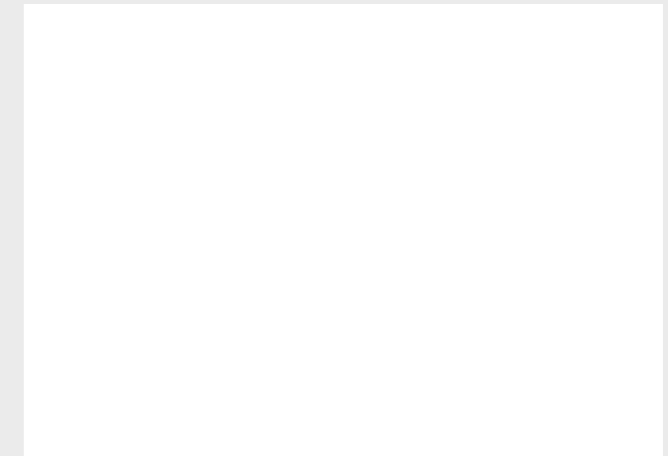
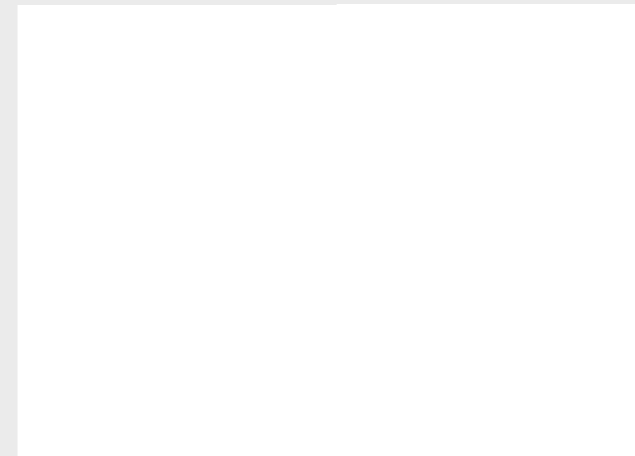
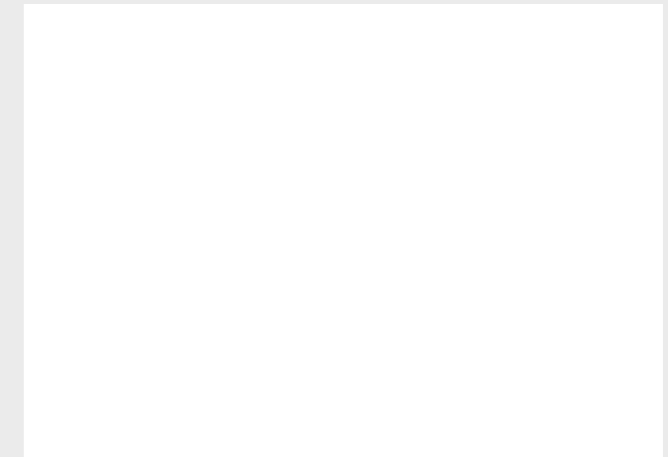
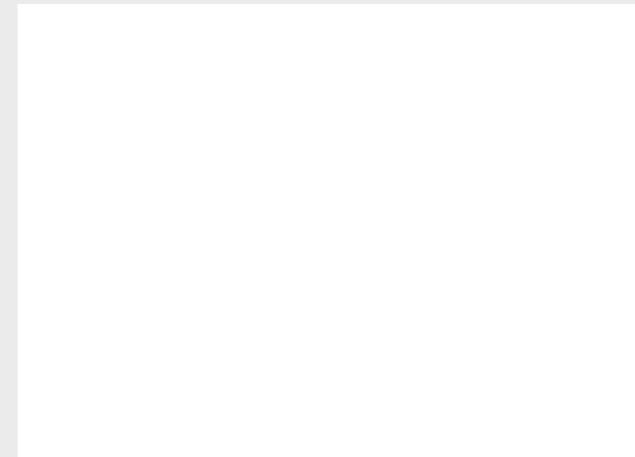
SHARED EXPECTATIONS / ECONOMY

SHIFT CARD

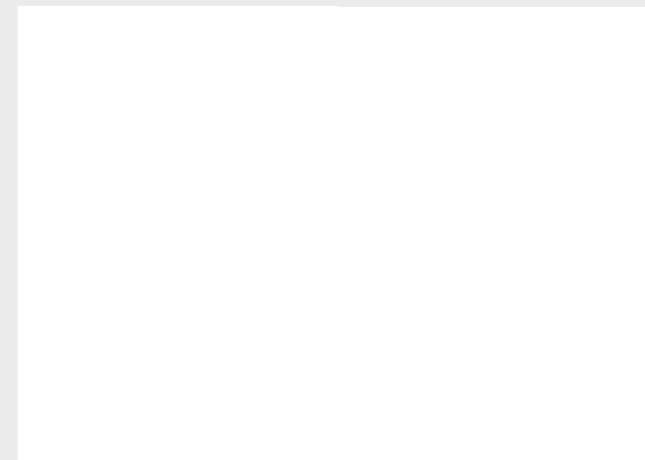
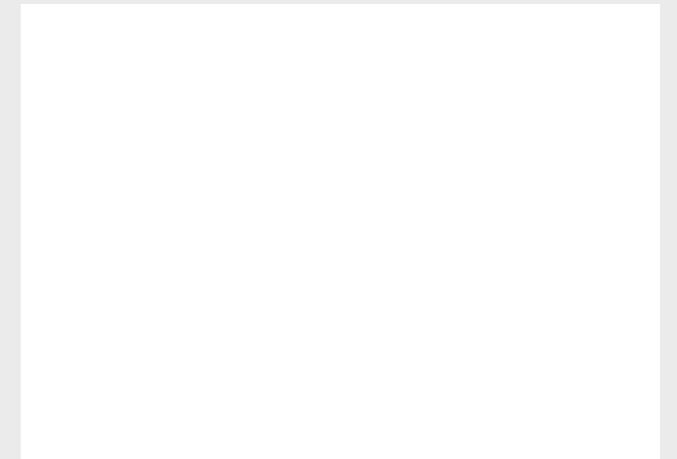
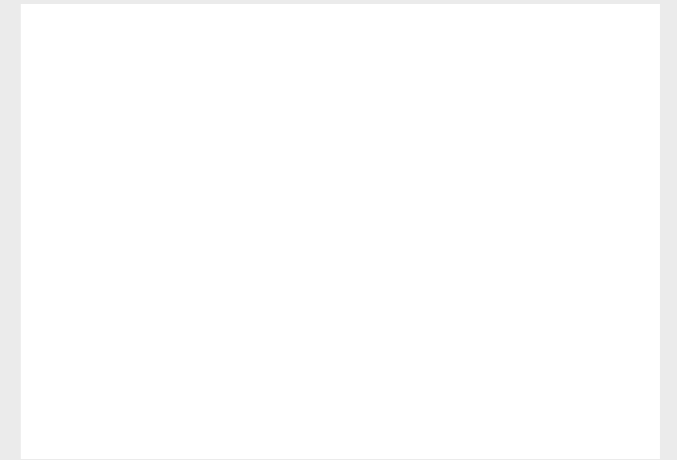
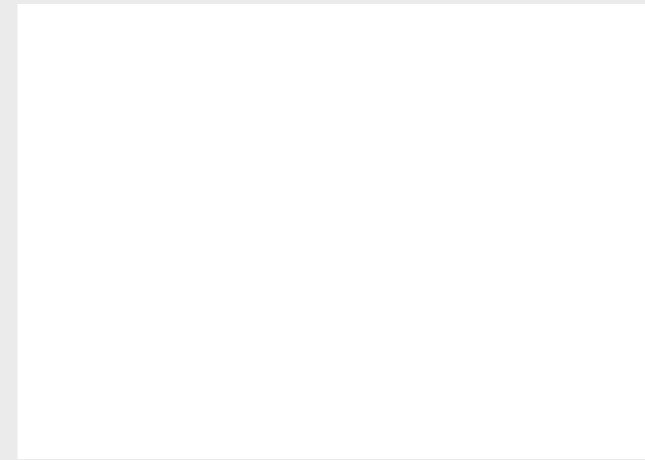
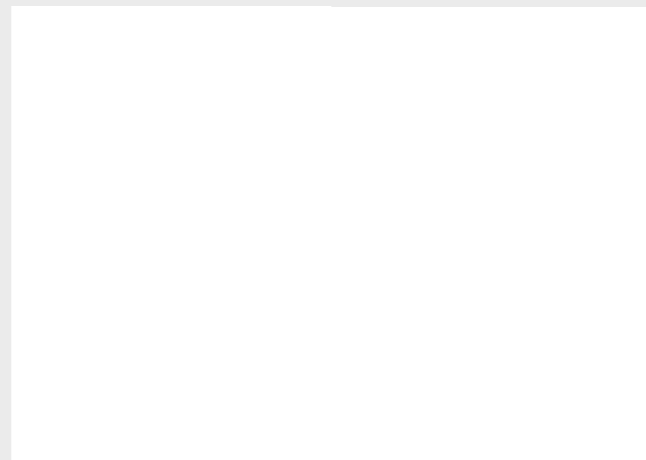
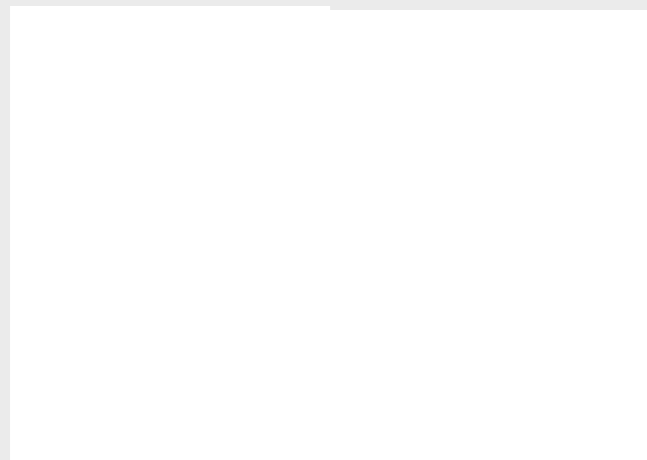
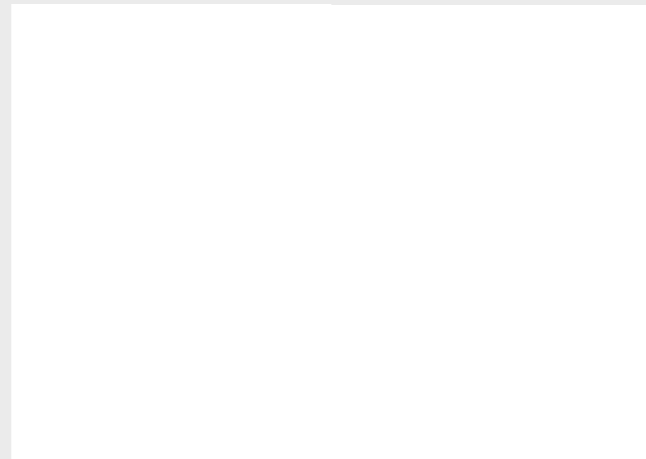
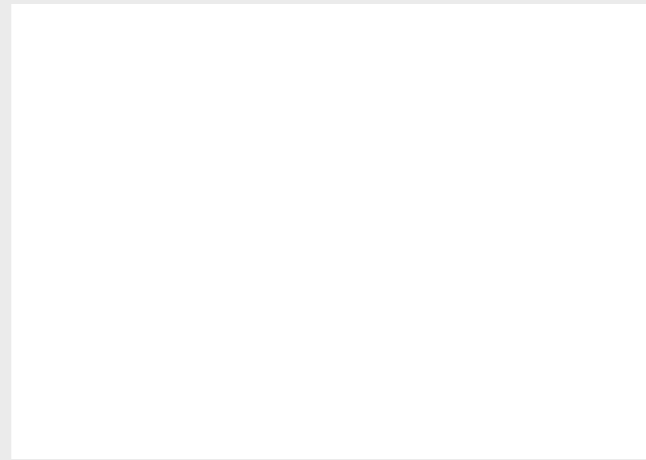
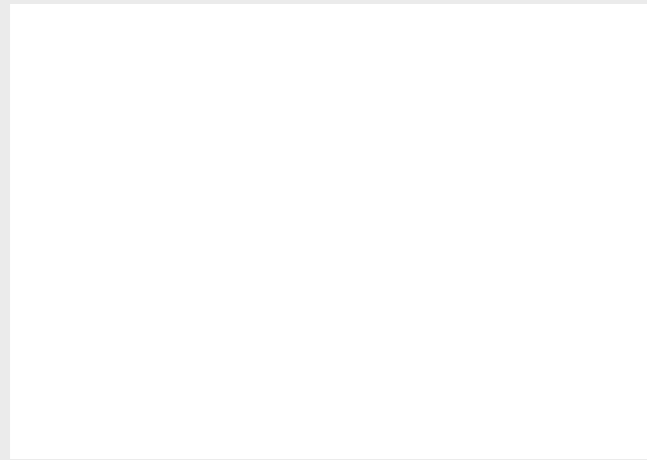
共享期待, 經濟
Shared expectations / economy

- A.k.a collaborative consumption, is a trending economy in which consumers prefer to rent or borrow goods rather than buy and own them

Concept link map
概念連結圖



Persona cards
角色牌



Customisation cards
客制牌

COLLABORATIVE

FROM CUSTOMER



Can your products & services be customised FROM the customers?


Collaborative characteristics:

- Client likes to be involved with design of product and service
- Client do not articulate specific design needs
- Client do not like standardized offerings, prefer catered experience
- Longer production time; higher costs for manufacturing/design
- High changes to accommodate to customers' personal tastes
- Minimal inventory, stock some raw materials, and only produce finished products in response to actual customer needs

Talk | 

CONFIGURABLE


BY CUSTOMER



Can your products & services be configured BY the customers?


Configurable characteristics:

- Customer likes ONE product to meet various situations/needs
- Customer does not want a lot of choices
- Research-development driven
- Products/Services are usually standardised and programmable

Talk | 

PERSONALISATION


FOR CUSTOMER



Can your products & services be adaptive FOR the customers?

Personalisable characteristics:

- Convenient yet meet individual customer needs
- Customer do not like to repeat, expect customization happen for them
- Most changes happen to fit customer needs without the user even knowing (predictable preference through observation)
- Service-driven
- Fine tuning and adapt through learning customers' needs

Talk | 

COSMETIC

WITH CUSTOMER



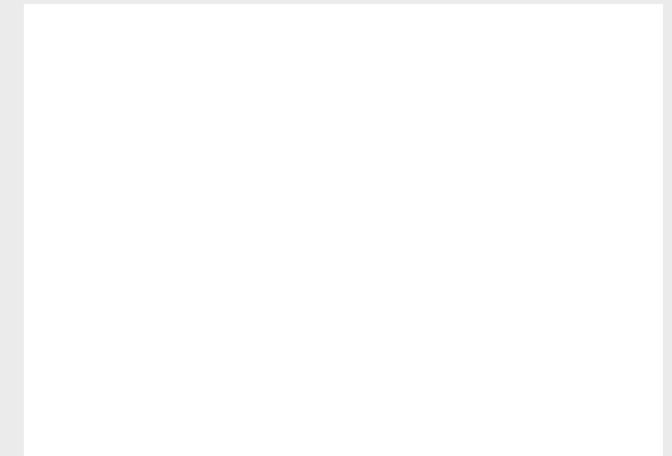
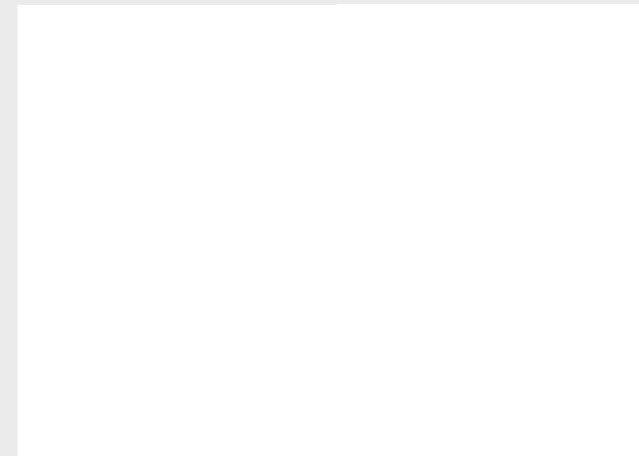
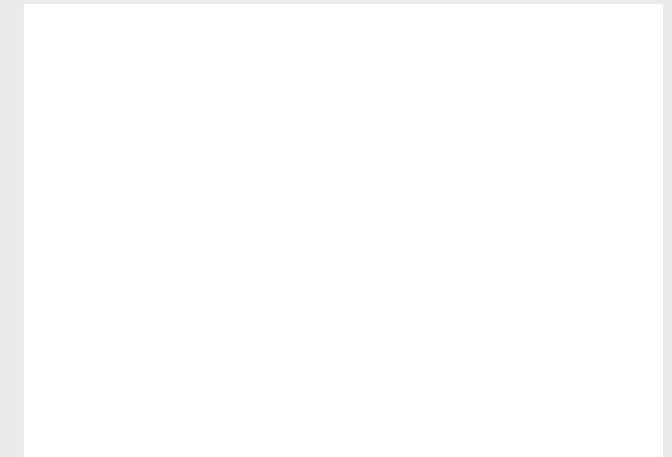
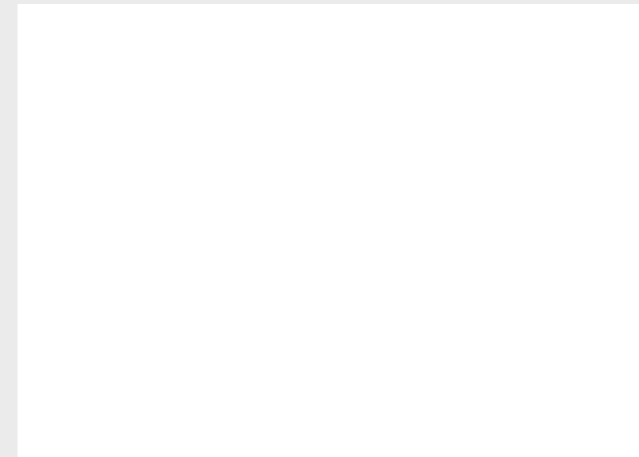
Can your products & services be customised WITH the customers' taste?

Cosmetics characteristics:

- Customised styling, experience, appearance
- Can be simple/extravagant/premium product/service yet cost effective
- Not prioritized on adding complexity and cost while delivering new "experience" (appears to look or appears to feel different)

Talk | 

Presentation icons
簡報圖標



Appendix 附錄 B

Industrial Design Is More Than Squiggles

工業設計何止一堆混沌線？

What Is Industrial Design (ID)? 何為工業設計？

Industrial Design (ID) is a discipline that has been taught and practiced for centuries. In business dictionary, industrial design is defined as the process of designing the shape, features, etc. of manufactured products. And in the famous book written by John Heskett in 1980, "Industrial Design" provided a holistic view of the industrial landscape in response to changes in production methods and economic reforms during the time. Quoted from Heskett (2003), "[Industrial] Design is when [industrial] designers [industrially] design a[n] [industrial] design to produce a[n] [industrial] design."

The definition of industrial design originates from the mechanical production processes, and design as connotation of art and industrial mass production needs to be redefined to include digital production paradigm. Industrial design is a practical result of prolonged study and shaping

of people's behaviours for the formulation of tangible (product) and intangible (service) aids to optimise and nourish the operation physically and psychologically. Referencing from Professor Eric C. Yim (Chairman, Design Council of Hong Kong, Federation of Hong Kong Industries), "industrial design covers all artefacts in daily life", and with economic considerations for mass production. From micro level activities to macro level thinking with design management and strategies, ID involves user-centric design, manufacturing capacities, technological applications, business strategies and organisational development. There are multiple streams in which industrial designers specialise and branch off, and most commonly known to public are product designers.

“[Industrial] Design is when [industrial] designers [industrially] design a[n] [industrial] design to produce a[n] [industrial] design.”

「[工業] 設計就是當 [工業] 設計師以 [工業角度] 設計一個 [工業] 設計去生產一個 [工業] 設計。」

—Heskett (2003)

工業設計 (ID) 是一個投入教學與實踐已經幾個世紀的學科。在商業辭典中，工業設計的定義為設計製造產品形狀、特徵等的過程。John Heskett 於 1980 年撰寫的著名書籍中，「工業設計」為工業面貌提供了一個整體的觀點，去應對當時生產方式及經濟改革上的轉變。引自 Heskett (2003)，「[工業] 設計就是當 [工業] 設計師以 [工業角度] 設計一個 [工業] 設計去生產一個 [工業] 設計。」

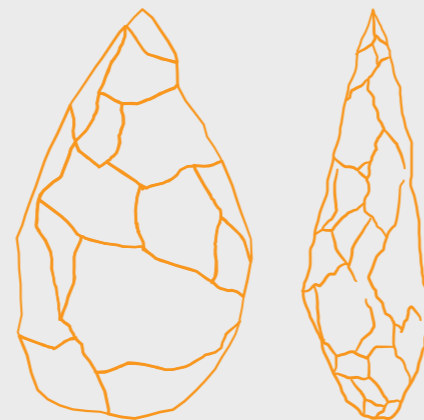
工業設計的定義源自機械生產過程，然而設計既有藝術亦有工業大量生產的意味，需要被重新定義以包含數碼生產模式。工業設計是長期研究和塑造人們行為的結果，用於輔助及補足有形（產品）和無形（服務）的業務，優化營運的身心層面。參考嚴志明教授（香港工業總會香港設計委員會主席）所言，「工業設計涵蓋日常生活中的所有工藝品」，其中也有大量生產的經濟考慮。從微觀的活動層面到具有設計管理及策略的宏觀思考層面，工業設計涉及以用戶為中心的設計、製造能力、技術應用、商業策略和組織發展。工業設計師間存在多個流派，各有專業和分支，而大眾最常見的就是產品設計師。

Industrial Design Then and Now 工業設計的前世今生

ID has moved from a simple stone cutting tool several millennia since, to handcraft products based on manual proficiency and then the pre-industrial era, which commenced the division of labour and the collection of repeatable patterns and processes during the Renaissance in order to speed up the production efficiency for trading purpose. With the introduction of assembly line and mechanisation, products and parts could be manufactured identically by machines. The production efficiency achieved through mass production led to the mass consumption phenomena.

Society is living in the digital information era now, and this is due to the advancement of technology. Physical functions of products are now augmented into digital space, leading to higher interactions and inclusive user experience. Digitalisation has liberated traditional industrial design from physical boundaries to virtually endless possibilities. This requires a change of philosophy in terms of what society defines products, artefacts and designs should be. The methodology behind the construction of design and innovation that leads to game-changing products is a complex process of design thinking, from understanding users and market, realisation to ideation, materialisation to sustainment. Most important of all, the method of design thinking requires high

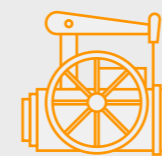
collaboration between cross-disciplinary individuals, as this fosters collective insights and equips non-design-oriented business with new creative opportunities and growth. Industrial design incorporates the essence of design thinking, and the application of this methodology has propelled many organisations to be the new innovative leaders globally. Therefore, industrial designers are the key drivers in manufacturing to provide holistic solutions, where business viability, design usability and technical feasibilities meet all at once.



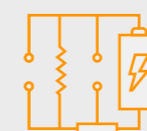
Oldowan Tools by about 700,000 years ago
約70萬年前的奧度瓦伊工具

工業設計已經由幾千年前的簡單石材切割工具，因應人工熟練的程度演變成手工藝製品；接著進入前工業時代，在文藝復興時期開始分工和採集可重複的模式和流程，以加快生產效率達到貿易目的。隨著裝配線和機械化被引入，相同的產品和零件可以通過機器製造，而經由大量生產實現的生產效率亦引起大眾消費的現象。

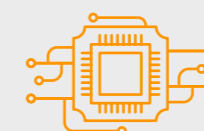
由於科技的進步，社會現正生活在數碼信息的時代。產品的實體功能如今已經擴展到數碼空間，實現互動性和共融性更高的用戶體驗，數碼化將傳統工業設計從實體的界限中解放出幾乎無限的可能。這視乎社會定義產品、手工藝製品和設計應該是甚麼，需要一個理念上的轉變。從理解用戶和市場、發現到構思、實踐到維持，構建設計和創新的方法進而改變遊戲規則的產品是一個複雜的設計思維過程。最重要的是，設計思維方法需要跨界別人士之間的高度協作，因為這樣可以助長集體的見解，為非設計主導的企業提供新的創意機會和增長。工業設計融合了設計思維的精髓，應用這種方法促使許多組織成為新的全球創新領導者。工業設計師集業務可行性、設計可用性和技術可行性的功能於一身，因此在製造業中是提供全面解決方案的關鍵驅動因素。



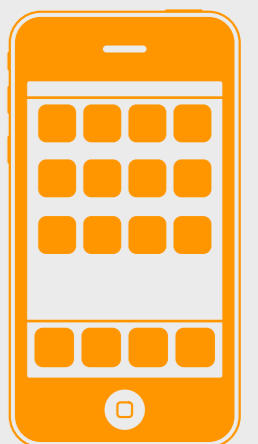
STEAM ENGINE
蒸氣



ELECTRICITY
電力



DIGITAL
數碼



Apple iPhone (since 2007)

How Industrial Designers Approach Design? 工業設計師如何著手設計？

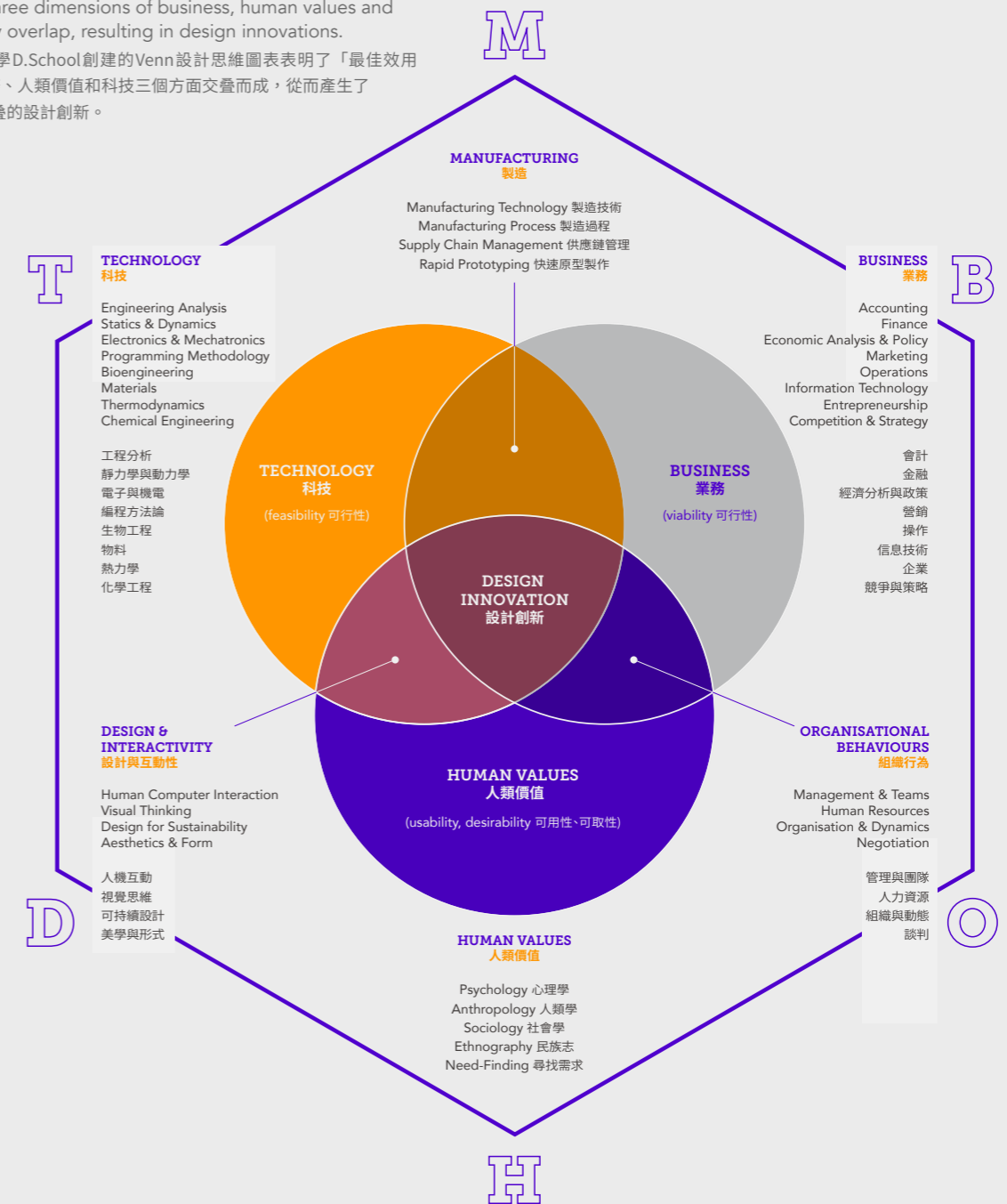
Mindsets for Industrial Design Professionals 工業設計專業的心態

The essence of value creation to consumers has changed, and most essentially, the understanding of information derived from new manufacturing systems and consumer expectations are the key to success. Industrial design professionals need to have combined knowledge on business viability, user desirability and technological feasibility. The design thinking Venn diagram model created by the Stanford University D.School indicated the “sweet spot” in which all three dimensions of business, human values and technology overlap, resulting in design innovations.

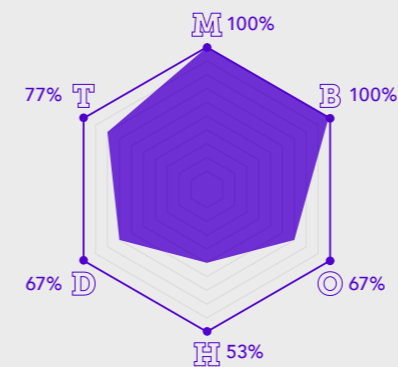
價值創造的本質對消費者而言已經產生了變化，理解由新興的製造系統和消費者期望所帶來的資訊是成功最重要的關鍵。工業設計專業人員需要掌握有關業務的可行性、用戶需求和技術可行性等綜合知識。由史丹福大學D.School創建的Venn設計思維圖表模型表明了「最佳效用點」，由業務、人類價值和科技三個方面交疊而成，從而產生了三環中間重疊的設計創新。

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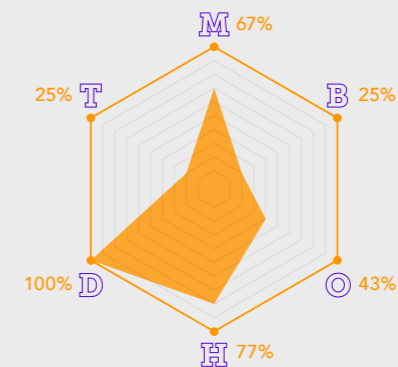
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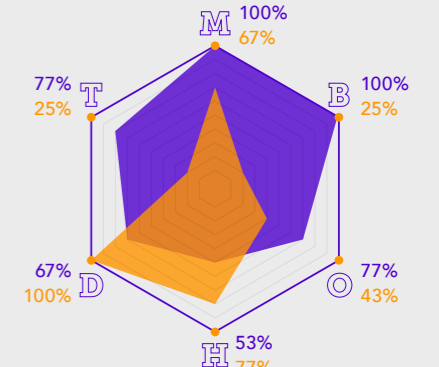
Manufacturers' orientation
製造商傾向



Industrial designers' orientation
工業設計師傾向



The gap between the interests of manufacturers and industrial designers in the innovation spectrum
製造商與工業設計師在創新領域的傾向差距



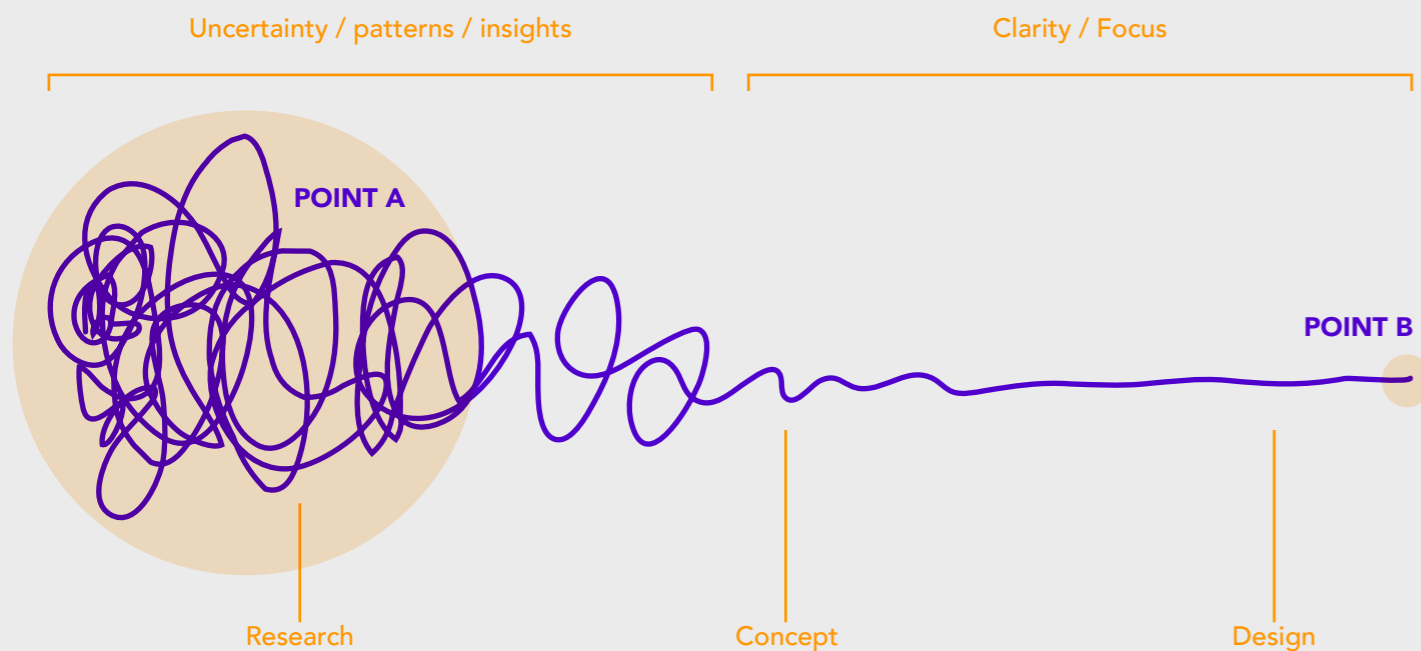
■ Manufacturer 製造商 ■ Industrial Designer 工業設計師

The taxonomy of design innovation

設計創新的分類

The value of striving harmony among the three dimensions yield great results: Consumers' lives will benefit from greater products, resources will be better allocated and used more effectively, executions and operations will be more optimised. However, according to "the Squiggle" by Damien Newman, the process of design is unorthodox, and not meant to be straight from point A to point B.

在三方之間互相調和取得了重大的價值和成果：消費者的生活將受益於更好的產品、資源將被分配得更好和運用得更有效、執行和操作亦將更加優化。然而，根據Damien Newman的「混沌線 (Squiggle)」，設計的過程是非正統的，意義並不在於直接從A點到B點。



"The Squiggle" by Damien Newman reflects the process of design is unorthodox, and not meant to be straight from point A to point B.

Damien Newman的「混沌線」反映設計的過程是非正統的，意義並不在於直接從A點到B點。

Observing from the research dialogues conducted with local established designers and industrialists, the individuals all share the notion of "T-shaped" thinking to assist them in navigating through the world of complexity. According to Tim Brown, CEO of IDEO design consultancy, the horizontal stroke of the "T" signifies collaboration across disciplines, increasing both depth and breadth in skills. Whereas the vertical stroke of the "T" represents the breadth of knowledge split between human left and right brains. Innovative designs sprout from ambiguity, and the process of navigation until clarity is identified required intensive and extensive exploration to unravel patterns and insights.

This experimentation process cannot be fruitful if conducted alone, it must be a collective journey in which individuals from multi-disciplinary background, be it industrial designer, manufacturer, engineer, architect, business specialist, to co-create the knowledge together. Good ideas are constructively built and nurtured upon one on top of another. Thus, in order to effectively make sense of the unfamiliar in the early chaotic

research to conceptual phase, "T-shaped" settings become valuable. Teams and individuals with this way of thinking synergise creative and practical thinking together, and develop systemic methods to approach innovative designs.

The widened array of thinking allows information to be integrated, seen and communicated in multiple perspectives in which singular mindsets cannot attained. The Hong Kong industrial realm has a vast untapped area of information, from people to machines, that can be fruitful to propel the next manufacturing evolution. Preceded with lack of information, designers and manufacturers will be navigating and making decisions with uncertainties given that there is absence of knowledge. The outcomes in turn result in potential organisational losses and ineffective solutions.

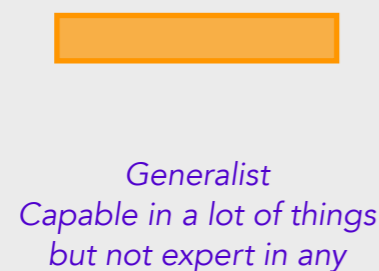
通過與本地知名設計師和工業家進行的研究對話，所有人都呈現共同的「T形」思維概念，幫助他們在複雜的世界中導航。根據IDEO設計顧問公司首席執行官Tim Brown的說法，「T」的一橫表示跨界別的協作，增加技能的深度和闊度。而「T」的一豎則分別代表人類左腦和右腦的知識分裂和廣度。創新設計都由模稜兩可衍生，直至被清晰確定之前，摸索的過程都需要進行密集和廣泛的探索去拆解形態和見解。

如果單獨進行，這個實驗的過程就不會有成效；無論是工業設計師、製造商、工程師、建築師、商業專家，它必須是由多個界別背景人士組成的一個集體旅程去共同創造知識。好的點子都是建基和培育在一個又一個有建設性的其他點子之上。因此，為了有效地理解混亂的早期研究至概念階段中的不熟悉，「T形」設置就變得有價值。擁有這種思維方式的團隊和人士會將創造力和實踐性思維結合，並發展出有系統的方法去實現創新設計。

更廣泛的思維方式容許資訊被多角度整合、看見和傳達，而單一的思維模式是無法做到的。香港工業界從人手到機器方面擁有龐大的資訊領域尚未開發，足以推動下一次的製造業進化。在缺乏資訊的大前提下，設計師和製造商將要在缺乏知識的情況下摸索並做出不肯定的決策，結果反過來導致潛在的組織損失和無效的解決方案。

THE HARD TRUTH ABOUT INNOVATION: 創新的硬道理：

**It's One Part Creativity,
它一部分是創意，**



Left Brain
左腦

Right Brain
右腦

COLLABORATION ACROSS DISCIPLINES INCREASING BOTH DEPTH AND BREADTH IN SKILLS 跨界別的協作增加技能的深度和闊度

BREADTH OF KNOWLEDGE SPLIT BETWEEN HUMAN LEFT AND RIGHT BRAINS
分別代表人類左腦和右腦的知識分裂和廣度

**One Part Discipline.
一部分是紀律。**

The world is now connected as a mesh network, whether it is human to human, human to machine, and systems to systems. Traditional education and work settings facilitate "I-shaped" (individual depth-skill without communication skills) behaviours, particularly in manufacturing where people are specialised in each assigned workstation and working in separation from other disciplines. This old model will hinder innovation and progression, especially when manufacturing environment is rapidly transforming through technologies. Therefore, industrial design professionals need to realise their skills and minds to be cultivated in alignment to the industrial revolution ahead in this changing economy.

無論是人類連接人類，人類連接機器，還是系統連接系統，世界如今作為一個網狀的互聯網絡存在。傳統的教育和工作環境促成「I形」（個人擁有深度技能，但沒有溝通技巧）行為，特別是在製造業中，人們專注於每一個指定的工作站並與其他界別分離。這種舊有模式將會阻礙創新和發展，特別是當製造的環境因應科技迅速轉變時。因此，工業設計專業人員需要實踐他們的技能和思想，好讓他們能預早與不斷變化的經濟和未來的工業革命達成一致。

Source: (T-Shape) "Design and the Market – T-Shaped Skills", <https://jamesricedesign.wordpress.com/2013/02/18/design-and-the-market-t-shaped-skills/>
(Quote on the top "THE HARD TRUTH ABOUT INNOVATION")
Harvard Business Review, January 2019

User Desirability

用戶滿意度

In order to fulfill true user needs, design should start with people. Most of the time, designers associate moments of a-ha (spurs of sudden creativity) from their surroundings and experience. When speaking to some Hong Kong product designers, the question “How do you get your inspirations?” was asked. Their common answers fall to trends and insights from their living environment. However, the understanding of human values lies beyond users’ interaction with the artefacts, it also includes the understanding of the root of desires - the reasons in which users’ needs exist and the relationship of the artefacts to the users themselves.

Too often, designers avoid engaging users directly and fall into their own design presumptions - a creative complex in which designers live in their own bubble of thoughts.

Borrowing a famous quote from Tim Brown from IDEO, a global design consulting firm, he noted, “Instead of thinking about building we have to build to think.” It is undeniable that designers are passionate with crafting and tinkering, and it is especially easy to jump straight into design without full awareness of all conditions. There can be many insights drawn through ethnographic and participatory studies on consumers’ behaviours, resulting in higher empathetic understanding of real users’ needs.

為了滿足真正的用戶需求，設計應該以人為本。大多數時候，設計師的「嗯哼」時刻（突發創意的刺激）都會與周圍環境和體驗有所聯繫。與一些香港產品設計師交談時，也有問到「你如何獲取靈感？」的問題。他們一般的答案可總結為他們生活環境的動向和見聞。然而，我們對人類價值的理解不僅僅是用戶與手工藝製品之間的互動，更包括對慾望根源的理解——用戶需求存在的原因以及手工藝製品與用戶自身的關係。

很多時候，設計師會避免用戶直接介入並跌落他們自己的設計假設——設計師會活在他們自己的一個複雜的創意思想泡沫之中。借用環球設計顧問公司IDEO的Tim Brown一句名言，他指出「我們不是要考慮建設，而是必須要建立思考。」無可否認的是，設計師對工藝和修復充滿熱情，而且特別容易在未完全了解所有條件的情況下直接跳進設計。通過消費者行為的民族誌和參與性研究可以獲得許多見解，從而對真實的用戶需求有更高的同理心理解。

Business Viability

商業可行性

Everyday businesses are confronted with decisions, whether they are challenges or opportunities. In the manufacturing sector, the speed to commercialisation, or speed to market, is particularly crucial for product survivability. How can industrial designers assist manufacturers in deciding the right products to manufacture? The highest economic return? Any consumer products, even non-perishable artefacts, are not timeless and have limited life span. The success of product design in manufacturer metrics is the return of investment. The longer the products sit in stores and on shelves, the

lesser the monetary value perceived by consumers. The most desirable solution is that industrial designers have clear vision and metrics, which align to the manufacturers’ business value propositions - a broadened vision with long-term winning design and cost-effective strategy.

無論是挑戰還是機遇，日常的企業都要面對各種決策。在製造業界的領域，產品商業化或推出市場的速度對其生存能力至關重要。工業設計師如何協助製造商決定製造哪些合適的產品？最高的經濟回報呢？任何消費品，就算是不易腐化的手工藝製品，都不是永恆的，而且壽命有限。在製造商的指標中，成功的產品設計就是投資回報。產品在商店和貨架上存放的時間越長，消費者認知的金錢價值就越小。最理想的解決方案就是工業設計師擁有清晰的願景和指標，並與製造商的商業價值主張維持一致——透過長期致勝設計和具成本效益策略的一種開闊視野。

Technology Feasibility

技術可行性

In the Fourth Industrial Revolution, technology plays a huge factor in the design and manufacturing processes. The technical capabilities in production must be on par with the rapid market changes. No matter how innovative and groundbreaking a new product or service offering may be, the feasibility of implementation can hinder the creative efforts. Successful industrial designers leverage small task forces, teams comprised of designers, engineers and marketing and sales, to collaboratively conduct sprints of conceptual designs and prototypes, and maximise data to perform

feasibility studies. With real-time data on manufacturing processes and on consumers’ usages, advanced technological systems enable designers to make faster and better decisions.

在第四次工業革命中，科技在設計和製造過程中起著重要作用。生產中的技術能力必須與快速的市場變化相媲美。無論一個新產品或服務如何創新與突破，實施的可行性都會阻礙所付出的創意努力。成功的工業設計師會利用由設計師、工程師，以及市場推廣和銷售人員組成的小型工作團隊，協同進行概念設計和原型的衝刺，盡最大可能使用數據進行可行性研究。借助製造流程和消費者使用的實時數據，先進的科技系統讓設計人員能夠做出更快更好的決策。

Appendix 附錄 C

Comparison of Global Progression in Industrialisation To Hong Kong

全球工業化發展與香港的比較

AT A GLANCE 瞄一瞄

The Advances 進展過程



Advanced 4.0 technologies (9 pillars) have liberate designers and manufacturers to become more flexible in production and responsive to real-time consumer needs. The progression enhances innovation capacities with consumer-centric approach, resulting in more accurate and inclusive designs.

先進的4.0技術（9個支柱）讓設計師和製造商能夠在生產中變得更加靈活，並滿足消費者的實時需求。通過以消費者為中心的方法，這種進展提高了創新的能力，從而實現更加準確和共融的設計。

The Areas of Transformation 轉型領域



Manufacturing landscape is radically changing in design, production and retail value chain. From technological infrastructure changes to business strategic modelling, the ways in which scale customisation in Industry 4.0 applies require new skills, mindset and learning attitude.

製造業在設計、生產和零售價值鏈方面都正經歷巨大的變化。從技術基礎設施演變成業務策略模式，適合應用於工業4.0的量產客制化方案需要新的技能、思維方式和學習態度。

The Global Economic Progression of The Fourth Industrial Revolution

第四次工業革命的全球經濟發展

Industry 4.0 is a terminology widely used to define the fourth industrial transformation in the manufacturing and industrial design sectors. There may be other notations referring to the same transformation across the world, but putting that aside, manufacturers and designers must recognise this revolution as a significant change. It will not only affect the methods and systems in manufacturing production, but also changes the way products are designed and its ways to interact with consumers. First, to understand the implications of fourth industrial revolution, one should reflect on the historic progression in manufacturing.

The first industrial revolution took place over three centuries ago, started in the 1760s. It is one crucial milestone in the humankind evolution, as many sources of energy were still in discovery. During this era, horses were still a great source of energy to extract water out of mines and woven clothes in textile production were costs ineffective. There was a necessity for innovation to break the paradigm to increase operating efficiencies, and throughout this period, scientists invented the steam engine. The innovation proved that the revolution of this new source of energy changed

the production process drastically. From the introduction of railways to steamboats, the steam powered mechanisms were also incorporated into textiles, printing press and more.

Certainly, the first revolution seems to only revolve around steam power on machine inventions, but one thing to note is the production of iron as a material. In the 1700s iron production relied on furnace heating, powered by coals, and heavy labouring was required to cure the metals. However, steam powered furnace transformed the method of iron production, yielding in better production control and higher quality finished products. Another thing to note is the transfer of knowledge and training for manufacturing workers. With the appearance of printing press, publications, records, and documentations were more convenient to share among higher societies, such as industrialists, scientists, philosophers, inventors and more, and travellers from abroad. The mediums allowed knowledge to be communicated and trained through apprenticeship to labourers.

工業4.0是一個術語，普遍用於定義製造業和工業設計領域的第四次產業轉型。世界各地或許還有其他詞彙指向同樣的轉型，但除此以外，製造商和設計師必須意識到這場革命是一次重大的改變。它不僅會影響製造業的生產方法和系統，還會改變產品設計及其與消費者互動的方式。要理解第四次工業革命的影響，我們首先應該反思製造業的歷史發展。

第一次工業革命在三個世紀前發生，始於1760年代。這是人類進化史中一個重要的里程碑，因為我們仍在發掘很多能源。在這個年代，馬匹仍然是從礦井中提取水的一大動力，而當時紡織品生產的梭織衣物成本效益亦很低。固有的範式必須藉由創新去打破以提高營運效率，在此期間，科學家們發明了蒸汽機。這項創新發明證實了這種新能源革命徹底改變了生產的過程。從引入鐵路到蒸汽船，蒸汽推動的機制也被納入紡織品、印刷機等。

當然，第一次革命似乎只圍繞機械發明的蒸汽動力，但有一點需要注意的就是鋼鐵作為一種材料的生產。在18世紀，鋼鐵生產依賴由煤炭驅動的加熱鑄爐，並且需要大量勞動力去固化金屬。然而，蒸汽驅動的鑄爐改變了鋼鐵的生產方法，令更好的生產控制和更高質量的成品產生。另一點需要注意的是製造業工人的知識轉移和培訓。隨著印刷機的出現，上流社會諸如工業家、科學家、哲學家、發明家等，以及來自國外的旅客之間分享出版物、記錄和文獻就更加便利。這些媒介容許勞動人口通過學徒制獲得知識的傳授和培訓。

INDUSTRY 1.0

1760s

In the late 1800s, just a century apart, the industrial world had another shift. The introduction of electricity, oil and gas enabled another innovation breakthrough in manufacturing, transportations and communications. Although there were remarkable inventions such as the light bulb and aircrafts, but the ultimate revolution that redefines manufacturing sector was the introduction of automotive assembly line by Ford. In an assembly line, manufacturing workforces are distributed and assigned with specific activities across the production chain - commonly known as division of labour. The separation of duties reduces one labourer to understand and conduct all activities from end to end, mitigating the risk of failure and can further optimise the outputs from labourers while each of them specialise on specific tasks, repetitively. Through a chain of assembly, each labourer will pass on the completed parts from one workstation to another, added in sequence, until the final product is assembled.

Through leveraging mechanised machineries and tools, such as conveyor belts, each part can be built and transferred

without labourers carrying, which significantly increases the speed of production and lower the costs - initiating the era of mass production. Made-to-stock production cycles enable products to be offered to mass consumers at low and affordable costs, while customised products, also referred to make-to-order production process, has been treated at higher price points due to longer production lead times and complexities of design and functions. As mass production reached its peak, economies of scale allowed manufacturers to produce affordable products for consumers without jeopardising profit margins. The success of mass production can therefore be summarised as interchangeability, the ability to assemble by parts, moving assembly line and division of labour.

19世紀後期，僅僅相隔一個世紀，工業世界又發生了變化。電力、石油和天然氣的引入造就了製造業、運輸業和通訊業的另一項創新突破。雖然亦有一些非凡的發明如電燈泡和飛機，但重新定義製造業的終極革命卻是福特引入的汽車裝配線。在一條裝配線中，製造業勞動力在整條生產鏈中會被分配和指派特定的活動——通常稱為勞動分工。職責的分隔減省了一個勞動工人從頭到尾理解和進行所有活動的功夫，既減輕了失敗的風險，又可以進一步優化勞動者的輸出，同時每個人都能專注於特定重複的任務。通過一系列裝配，每個工人會將完成的零件從一個工作站傳遞到另一個工作站，按順序類加，直到最終產品組裝完畢。

通過機械化的機器和工具，例如輸送帶，每件零件都可以在沒有工人傳送的情況下建構和調動，顯著提高了生產速度並降低成本——開啟了大量生產的時代。備貨型生產週期使產品能夠以低廉且可承擔的成本提供給大眾消費者，而客制化產品（又稱為按訂單生產的過程）因為需要更長的生產週期，加上其設計和功能的複雜性，會得到較高的價格待遇。隨著大量生產達到頂峰，規模經濟的效益使製造商能夠在不損害利潤率的情況下為消費者生產價格實惠的產品。因此，大量生產的成功可歸納為可互換性、按零件組裝的能力、流動裝配線以及勞動分工。

By the 1980s to 1990s, computerisation and internet democratised knowledge and information, resulting in a huge leap forward on humankind. The boundaries of innovation again expanded with advanced robotics, nanotechnologies, renewable energy and more. Manufacturing productions become further streamlined and automated with better machineries, and internet facilitated and catalysed the exchange of data transmissions.

到了20世紀80至90年代，電腦化和互聯網令知識和資訊民主普及化，從而又實現了人類的一大躍進。創新的界限再次延伸到先進的機械人技術、納米技術、可再生能源等更多技術。製造業的生產因有更好的機器被進一步簡化和自動化，而互聯網更加有助和促進數據的傳輸交換。

INDUSTRY 2.0 

1960s

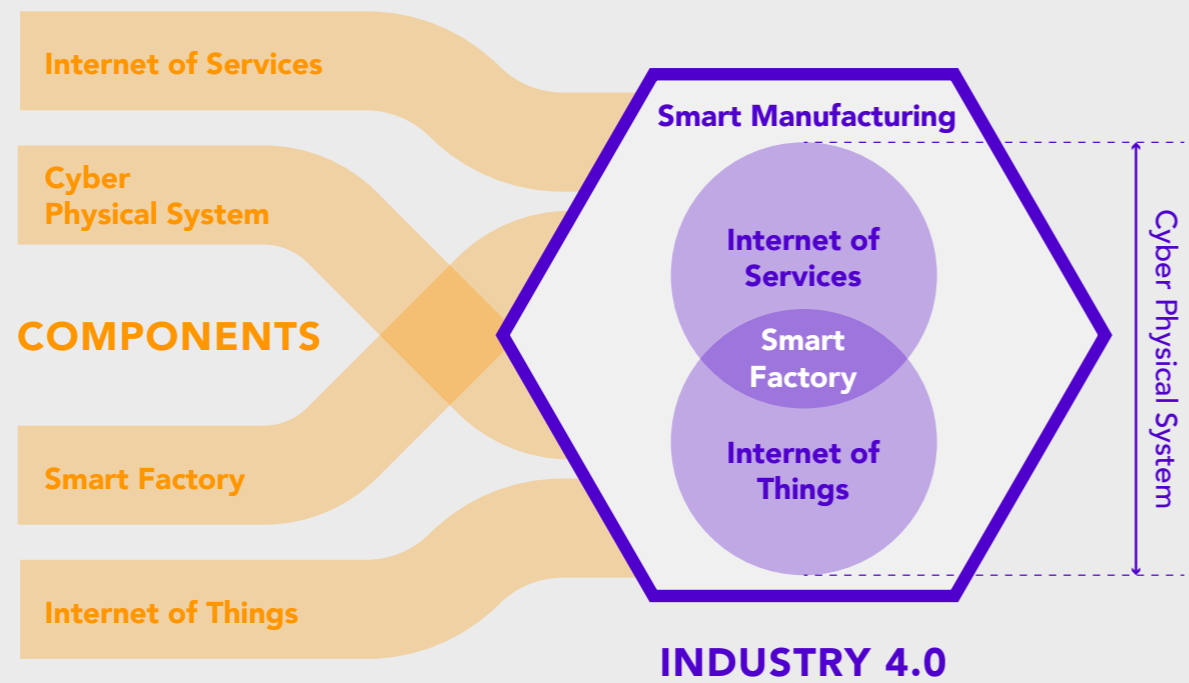
INDUSTRY 3.0 

1980s

Moving into the modern era, the fourth industrial revolution is taking shape. As Industry 4.0 unfolds, computerised machines and systems can further integrate and communicate via cloud computing, relaying information at real-time speed with minimal human assistance. The combination of cyber-physical systems and cloud platforms allow manufacturing

to become more intelligent, also widely known as smart factories. The heightened transparencies and accessibilities of data made production far more efficient and productive than ever in history. Digitalisation and connectivity facilitated hyper communications via machines remotely, decentralisation production chain and unbounded physical restraints.

踏進現代，第四次工業革命正在成形。隨著工業4.0的展開，電腦化的機器和系統可以透過雲端計算進一步整合和傳訊，以最少的人手輔助以實時速度傳遞信息。網絡實體系統和雲端平台（CPS）的結合使製造業變得更加智能化，也被廣泛稱為智能工廠。數據透明度與可達性的提高使生產比以往任何時代都更加高效。數碼化和連接性藉由遙遠控制的機器促成了超級通訊和分散式的生產鏈，同時亦克服了物理上的種種限制。



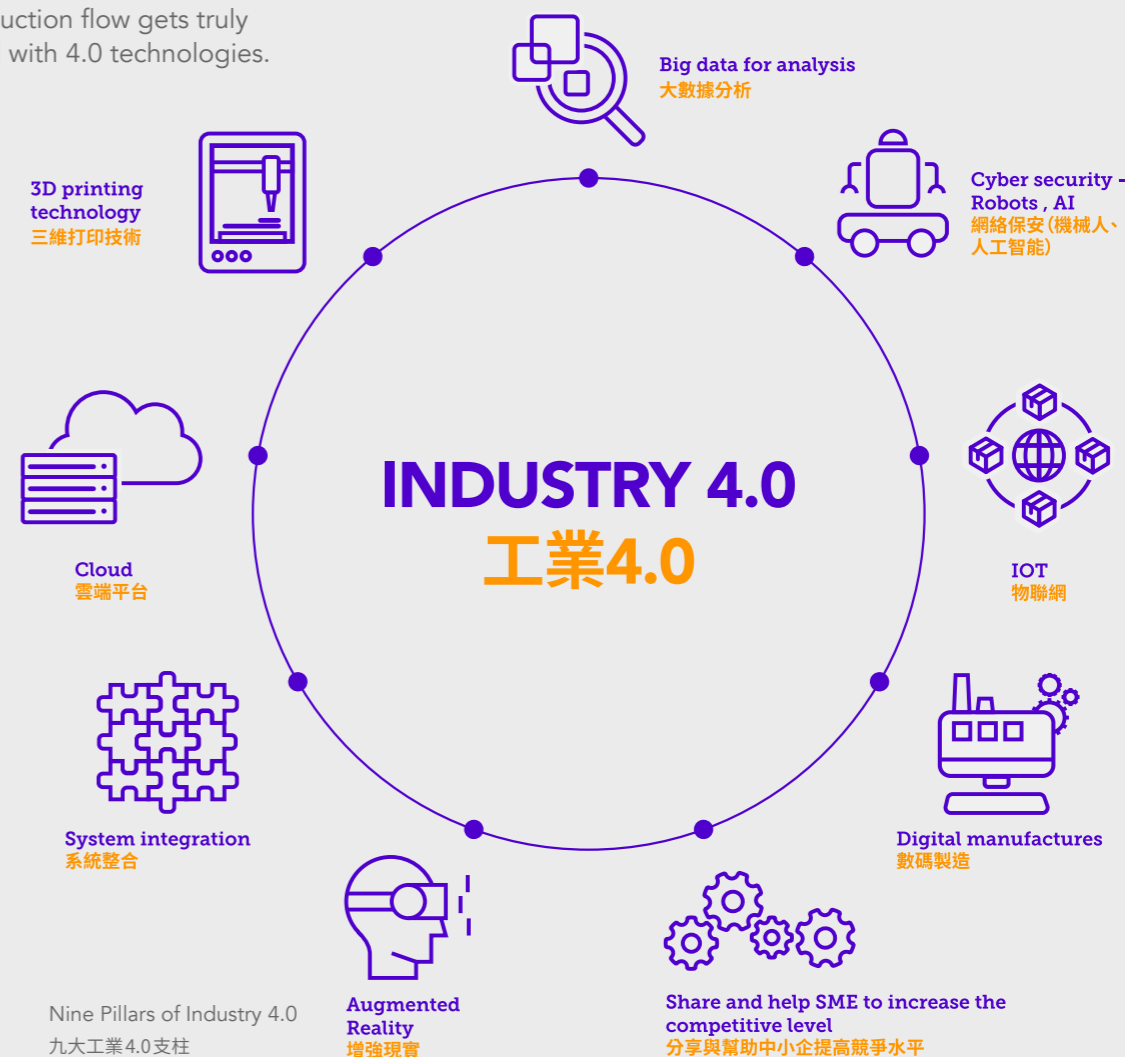
The cyber-physical systems 網絡實體系統
Source: Yao, X., Zhou, J., Lin, Y. et al. J Intell Manuf (2017). <https://doi.org/10.1007/s10845-017-1384-5>

INDUSTRY 4.0

What Is Industry 4.0? 什麼是工業4.0?

According to Boston Consulting Group, a globally recognised management consulting firm, Industry 4.0 is formed by nine technological pillars, which some are already being used in parts of production. However, it is when all are fully integrated and automated, then production flow gets truly optimised with 4.0 technologies.

根據全球認可的管理顧問公司波士頓諮詢集團所指，工業4.0由九大技術支柱組成，其中一些技術支柱已經在部份生產中應用。然而，當這九個支柱都完全融合並自動化時，生產流程才能透過4.0的技術得到真正優化。



Nine Pillars of Industry 4.0
九大工業4.0支柱

2000s

Autonomous Robots 自動機械人

Industrial robots have long existed in the manufacturing environment to assist in difficult tasks, ranging from heavy lifting to dangerous and complicated duties. These traditional robots are commonly huge in size, single task, and cannot be used in activities with high dexterity and precisions with small parts. However, advanced robotics in modern era have become more autonomous and flexible. Industrial robots are now capable to cooperate safely side by side with humans, while communicating between machines through integrated sensors and interfaces. With greater range

of capabilities, the modern robots can be applied in bigger ranges of duties in manufacturing environment now. According to research with some Hong Kong manufacturers, advanced robots have been implemented, increasing their overall production by at least 30% and reducing front line labours by over 60%. Some have even indicated that the overall organisation size in production has reduced to one tenth of the original with throughput increased threefold.

從繁重到危險和複雜的工作，工業機械人長期存在於製造環境中協助執行艱鉅的任務。這些傳統的機械人通常體積龐大、任務單一，不能用於靈活性高、精密度高的小零件。不過，現代的先進機械人已經變得更加自主和靈活。如今的工業機械人能夠與人類安全地協作，同時通過融合感應器和介面在機器之間進行溝通。現代機械人具有更廣泛的功能，可應用於製造環境中更大範圍的任務。根據一些香港製造商的研究，他們已經在運用先進的機械人，使其整體生產增加了至少30%，並將前線勞動力減少了60%以上。有些人甚至表示，生產中的整體組織規模已減少到原來的十分之一，吞吐量更增加了三倍。

Simulation 模擬

Simulations of objects in product and material designs have long been in practice since. The differentiation in Industry 4.0 is due to the extensivity of usage in manufacturing environment. With integrated sensors, real-time data can be captured and analyse simultaneously in conjunction with the physical space, resulting in a mirror of the physical environment in the virtual world. The virtual simulation will be able to map out all machines and objects across the

value chain, allowing manufacturers and designers to experiment and optimise designs and settings for respective line of products prior to real world production. This mitigates potential risks of failure and setup times in live production. Another term commonly known in this simulated environment is called digital twin.

自那時起，產品和物料設計中的物件就一直在實行模擬。工業4.0的不同之處是在製造環境中可以延伸使用。與感應器融合後，可以結合物理空間同時截取和分析實時數據，形成虛擬世界中實體環境的鏡像。虛擬模擬將能夠繪製整個價值鏈中的所有機器和物件，使製造商和設計人員能夠在實際生產之前對各個產品系列進行實驗並優化設計和設置。這減輕了現場生產中潛在的故障風險和設置時間。這個模擬環境中眾所周知的另一個術語為「數碼分身」。

System Integration 系統整合

Achieving full system integration across functional units within an organisation has been a pipedream for many. Horizontally and vertically, design, engineering, production, logistics and retail systems generally operate separately from one to another, leaving the information between units reliant on verbal conversations

and tons of file transferring and documentation. By leveraging Industry 4.0 technologies, cloud platforms and centralised data systems allow data communication to be further standardised across multi-stakeholders, thus unify the network of systems to deliver better transparencies and communications.

在組織內各個功能單位之間做到完整的系統整合對許多人來說是一場白日夢。無論是水平還是垂直的運作，設計、工程、生產、物流和零售的系統通常都彼此分開，單位之間的信息依賴口頭對話和大量的文件傳輸和文檔記錄。透過運用工業4.0技術，雲端平台和中央數據系統可以橫跨多個利益持份者進一步標準化數據通訊，從而統一系統網絡，提供更高更好的透明度和通訊。

Internet of Things 物聯網

Although commonly known as smart devices and gadgets in consumer markets, many manufacturing systems have yet to fully leverage the power of connectivity to production systems and machines. Traditionally, through embedded chips and computing systems, each machine controller can monitor and provide system data for analysis, but the data extraction was one-directional. With industrial IoT embedded as new computing technologies

to machines, the devices can now transfer information and communicate simultaneously with one another via the cloud as centralised control system, creating multi-directional communication between networked objects. Each step in the production cycle can be now captured and identified, shared among all machines, to become more adaptive and agile during the manufacturing process.

雖然在消費者市場中通常被稱為智能裝置和小配件，但許多製造系統尚未充分利用生產系統和機器連接帶來的威力。傳統上，通過植入式晶片和電腦運算系統，每部機器的控制器都可以監控和提供系統數據作分析，但是這些數據的提取卻是單向的。工業物聯網作為新的電腦運算技術被植入到機器中，這些裝置現在可以透過雲端的中央控制系統傳輸信息並同時通訊，從而在網絡各方之間創建多個方向的溝通。現在生產週期中的每個工序都可以被截取和識別，並在所有機器間共享，繼而在製造過程中變得更具適應性和靈活性。

Cybersecurity 網絡保安

With the increased usage of technologies and virtual communications, the risk of data loss and security to cyber threats become bigger needs in the manufacturing environment. Open systems will require a higher level of access management controls and secure sources of data transmission.

Information technology management practices therefore become crucial.

隨著科技和虛擬通訊的使用率增加，受到網絡威脅的數據遺失和保安風險在製造業環境中便成為更大的需求。開放的系統將需要更高程度的存取管理控制和安全的數據傳輸源，資訊管理公司因而變得至關重要。

Cloud Computing 雲端計算

The existence of cloud-based platforms and systems have demonstrated increasing values in manufacturing. Data sharing across on and off-site locations removed the boundaries of communication, achieving more real-time data

control and monitoring for production systems. Open systems will continue to generate huge data volumes in which cloud technologies will be leveraged.

以雲端為基礎的平台和系統的存在已經表明製造業的價值在不斷上升。橫跨網上和線下站點的數據共享消除了通訊的界限，讓生產系統得以控制和監控更多實時數據，而開放的系統亦將利用雲端技術繼續產生大量的數據。

Additive Manufacturing 積層製造

Additive manufacturing, particularly 3D printing, has been introduced to the market in the 1990s. While the cost of usage was high in the past, many manufacturers and designers have now integrated 3D printing for rapid prototyping and spare parts production. The technology is mostly suitable for small batch-size production for highly customised products in complex and lightweight designs. However, traditional

moulding used for manufacturing productions is also shifting to be 3D printed with advanced systems. Sophisticated parts in aerospace and aircraft designs are leveraging additive manufacturing systems to lower production expenses in raw materials usage and assembly.

積層製造，特別是三維打印，早於20世紀90年代已被推向市場。雖然過去的使用成本很高，但許多製造商和設計師現在已將三維打印整合，用於快速原型製作和後備零件生產。此技術主要適用於複雜又輕量的設計和高度客制化產品的小批量生產。然而，用於製造生產的傳統模具也正轉向先進系統去進行三維打印。航天航空和飛機設計中的複雜零件也正在利用積層製造系統去降低原材料的使用和裝配的生產成本。

Augmented Reality 增強現實

Augmented reality, also abbreviated as AR, is a virtual augmented environment in reality. While not commonly seen or used in manufacturing sector now, the technology has been commonly applied in gaming and even housing. AR systems enable workers to engage in real environment via

virtualism. This is particularly useful for maintenance and standard operating procedures.

增強現實（也簡稱為AR）是現實中虛擬的增強環境。雖然現在於製造業中並不常見或使用，但此技術已普遍應用於遊戲甚至住屋。AR系統使工作人員能夠通過虛擬主義參與真實環境，這對於維修和標準操作程序尤其有用。

Big Data 大數據

Across research in Hong Kong manufacturing landscape, data capturing and analytics are still at its infancy. The collection and evaluation of data can come from many different forms and sources, from production systems, enterprise level software to customer relationship management platforms. Without upgraded platforms like Enterprise Resource Planning (ERP), Supply Chain Management (SCM), Manufacturing Execution System (MES), Customer Relationship

Management (CRM) and integrated machine data, manufacturers and designers will not have full transparencies to make better and quicker decisions to support emergencies and to scale up production values.

在香港的製造業研究中，數據的截取和分析仍處於起步階段。數據的收集和評估可以來自生產系統、企業級軟件到客戶關係管理平台等許多不同的形式和來源。如果沒有像企業資源計劃（ERP）、供應鏈管理（SCM）、生產過程執行系統（MES）、客戶關係管理（CRM）等升級平台和機器整合數據，製造商和設計人員將無法獲得數據完整的透明度，因而無法做出更好、更快的決策去支持緊急情況和擴大生產價值。

Appendix 附錄 D

Interactive Installation: What Makes Design and Manufacturing?

互動裝置：設計和製造業由甚麼組成？

A word map comprised of elements of design and manufacturing terms, extracted from researches and findings.

It is a participatory design* to understand designers and manufacturers, who attended the DesignInspire exhibition, areas of interests, values, actions and thinking in their respective organisations.

On one side of the board, the words are visualised in a structured but randomised order. On the side, there are four different colors associated to four questions:

- What you value
你重視甚麼
- What you do
你從事甚麼
- What you want
你渴求甚麼
- What you change
你改變了甚麼

Participants can explore freely and connect words that best represent and resonate with them through the questions.

After three days through the exhibition, the end result was collected and analysed.

這是一個從研究和發現中抽取的文字圖陣，當中包含設計和製造詞彙元素。

這是一個參與式設計*，旨在了解參與了 DesignInspire 展覽的設計師和製造商，以及他們在自身組織的各方面如興趣、價值觀、行動和思考。

在展示板的一側，可以看到一個個詞彙有結構但隨機的排列。而在另一側，就有四種不同顏色對應四個問題：

參與者可以自由地探索並通過以上問題將最能代表和引起共鳴的詞彙用線連結起來。

展覽三天後，我們收集並分析了最終結果。

* The art installation is inspired by "WHAT MADE ME" - Dorota Grabkowska, Birmingham, UK
此藝術裝置的啟發自英國伯明翰的 Dorota Grabkowska 的「我由甚麼組成」



Interactive installation comprised of elements of design and manufacturing terms, inspired by "WHAT MADE ME" - Dorota Grabkowska, Birmingham, UK
包含設計和製造詞彙元素的互動裝置，啟發自英國伯明翰的 Dorota Grabkowska 的「我由甚麼組成」

Build 建立	Fabricate 製作/創作	Assemble 整合/組裝	Production 生產	Trade 貿易/交易	Construct 構建
Mould 模子	Tool 工具	Develop 開發/研發	Engineering 工程/研發	Architect 建築/構造	Milling 磨
Crafting 手工藝	Invent 發明	Merchandise 商品化	Mechanise 機械化	Buy / Sell 買/賣	Social 社會
Prototype 樣版	Digitalise 數碼化	Strategy 戰略	Risk 風險	User-centred 以用戶為中心	Validate 驗證
Workflow 工作流程	Process 處理	Technology 科技	Viability 可發展性	Feasibility 可行性	Sustainability 可持續發展
Packaging 包裝	Automate 自動化	Innovate 創新	Concept 概念	Brainstorm 集思	Ideate 形成概念
Research 研究	Aesthetics 美學	Form 形成	Function 功能	Styling 造型	Ergonomics 人體工程學
Market 市場	Rendering 渲染	Materials 物料	Patent 專利	Diagramming 圖化	Analytics 分析
Branding 品牌	Audit 審計	Wastage 廢物	Quality Assurance 質量保證	Journey 旅程	Usability 可用性
Model 模型	Iterative 迭代	Experiment 實驗	Visualise 想像	Needfinding 基本需求	Personas 人物畫像
Service 服務	Environment 環境	Simulate 模擬	Communicate 溝通	Management 管理	Data 數據

66 elements related to design and manufacturing

66個與設計和製造相關的要素

● VALUE 重視

Aesthetics, Branding, Concept, Environment, Form, Function, Journey, Packaging, Patent, Personas, Styling, User-centred, Social, Sustainability, Usability

● WANT 渴求

Analytics, Automate, Data, Digitalise, Feasibility, Market, Materials, Mechanise, Merchandise, Process, Quality Assurance, Service, Strategy, Technology, Validate, Viability

● DO 從事

Architect, Assemble, Audit, Buy / Sell, Construct, Diagramming, Engineering, Ergonomics, Iterative, Rendering, Management, Milling, Model, Production, Prototype, Tool, Trade, Workflow

● CHANGE 改變

Brainstorm, Build, Communicate, Crafting, Develop, Experiment, Fabricate, Ideate, Innovate, Invent, Mould, Needfinding, Research, Risk, Simulate, Visualise, Wastage



400 visitors participated to contribute answers to the 4 questions: "what you value", "what you do", "what you want", and "what you change" 400名參與者參與為「你重視什麼」、「你從事什麼」、「你想要什麼」以及「你改變了什麼」4個問題提供答案

The Outcome 所得結果

A total of 400 strings were prepared and approximately 95% were consumed (through tally) in 3 days. For each color, the most engaged words are identified for further analysis.

製置總共準備了400條線，並且在3日內消耗了約95%（通過計數）。我們會就每個顏色連線最多的詞彙作進一步分析。

● VALUE 重視

Interactive, Environment, Concept, Social, Sustainability, Viability
迭代、環境、概念、社交、可持續性、可發展性

● DO 從事

Production, Materials, Experiment
生產、物料、實驗

● WANT 渴求

Aesthetics, Technology, Crafting, Visualise
美學、科技、手工藝、想像

● CHANGE 改變

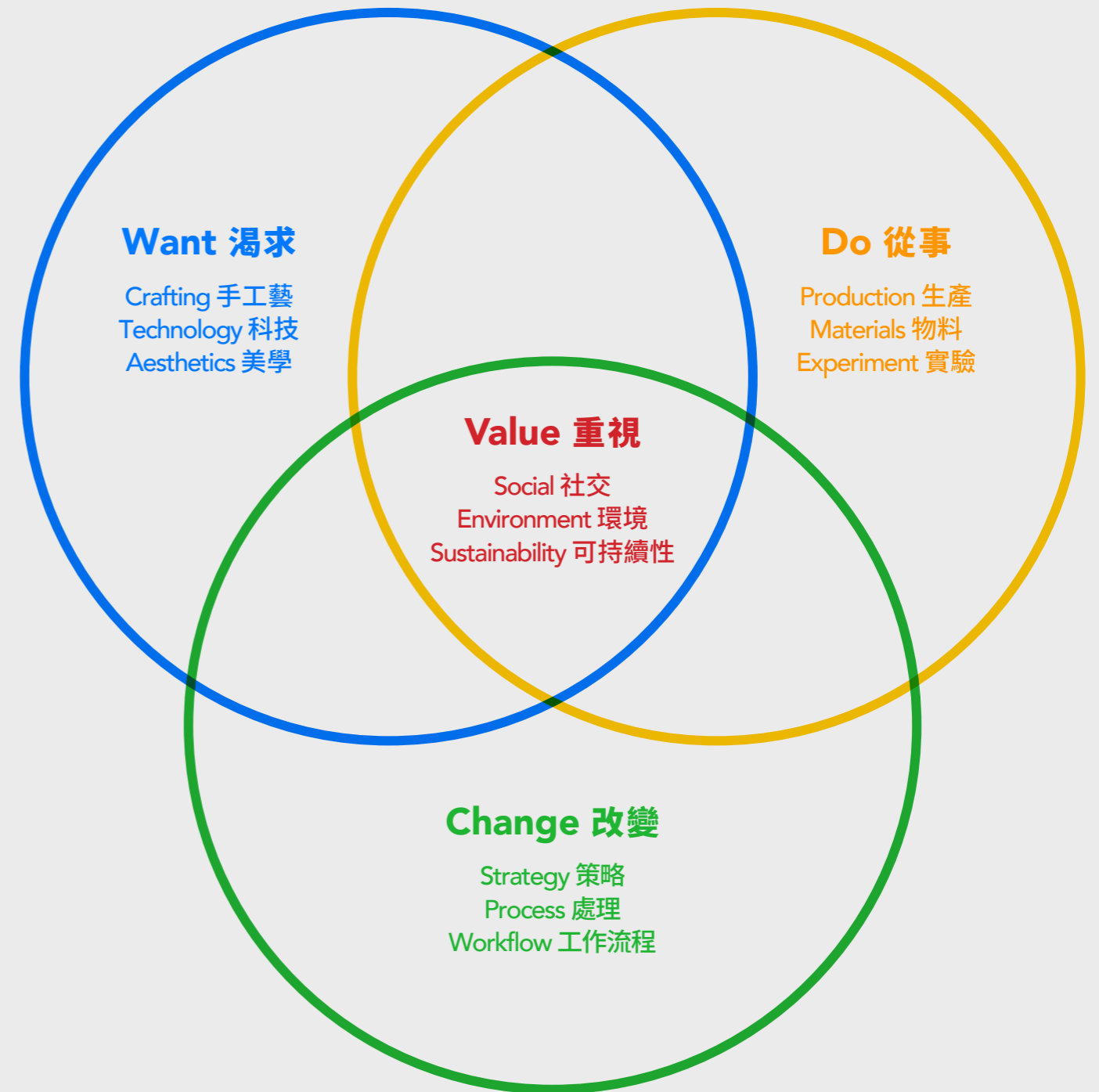
Strategy, Process, Workflow, Build
策略、處理、工作流程、建立

The findings allowed us to preliminarily understand that participants associated values are more humanistic, which aligned to words like social, environment and sustainability. Actions are tangible activities that designers and manufacturers conduct, and the words like production and materials reflected as such. “What you want” reflect consumers’ desirability to technologies and aesthetics. Strategies, processes, and workflows are areas in which participants changed the most.

The desirable outcomes in design and manufacturing are driven through changes in strategies and processes, leading to social and environmental benefits that sustain.

研究結果容許我們初步了解到參與者對人性化的價值觀更有共鳴，與社會、環境和可持續性等相關詞彙一致。行動是設計師和製造商進行的實際活動，正如生產和物料等詞彙反映出來一樣。「你渴求甚麼」反映出消費者對科技和美學的需求。策略、處理和工作流程則是參與者變化最多的領域。

理想的結果是設計和製造可以通過策略和流程的改變去推動，從而帶來可持續的社會和環境效益。



The interpretation of outcome being mapped into the design innovation Venn diagram
 被放置到設計創新Venn圖表中的研究結果解讀

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主辦單位



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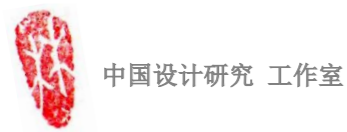


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THE HONG KONG PRINTERS ASSOCIATION

HKTDC
香港貿發局

IPP
INSTITUTE OF PRIVATE-AREA PROFESSIONALS
印模專業人員協會

List of Interviewed Companies



白
水
草
堂
創
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室

List of Interviewed Companies (Cont'd)



List of Interviewed Companies

* IDSHK member
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^ Companies with branches in the ASEAN

Company Name (English)	Company Name (Chinese)	Category / Discipline	Size of Company	Representative	Title (EN)	Business Contact	Website	Address
9H		Furniture - Office	Big	Eric Yim	Founder	+852 9858 0666		
Absolute Vintage Eyewear / Eyepopper		Eyewear	SME	Ben Chung	Co-founder	+852 2135 5590	absolute-vintage-eyewear.business.site/	H407, 4/F, Hollywood Block B, PMQ, 35 Aberdeen Street, Central, Hong Kong
Airland Holding Company Limited ^	雅蘭集團有限公司	Houseware - Bedding	Big	Maggie Sham	Director – Sales & Marketing	+852 2772 9090	www.airland.com	2/F, Yau Tong Industrial Building, 2 Shung Shun Street, Yau Tong, Hong Kong
Artop Design Group Company Limited	浪尖設計集團有限公司	Houseware / Plastic Products / Metal Products	Big	Beast Jiang	Deputy General Manager & Creative Director	+852 3628 2210	www.artopcn.com/en/	Artop Building (T), Industrial Design Park, No. 3838 Nanshan Road, Nanshan District, Shenzhen, China
Asia Animation Limited	亞洲動畫多媒體有限公司	Toys - Animation	Big	Gordon Chin	CEO	+852 2728 3189	www.asiaanimation.net/	Unit 816, 8/F, Peninsula Center, 67 Mody Road, Tsim Sha Tsui East, Kowloon, Hong Kong
Association for Creative Education Company limited*	創意教育協會有限公司	Design - Creative Industries	SME	Kent Wong			www.creative.org.hk	
Best Victory Enterprise Limited* / KidoKare	昱慶企業有限公司	Houseware / Plastic Products (works with IKEA)	SME	Kenn Lee	Director			
BigHorn / Winky International Limited		Eyewear	SME	Kelvin Ching	Founder	+852 2191 7716	bighornhk.com/zh-hant/	10/F, Sunbeam Centre, 27 Shing Yip Street, Kwun Tong, Kowloon, Hong Kong
China Design Research Work Group*		Industrial Design	SME	Prof. Yanta Lam	CEO			
Cosso International Limited	港濤國際有限公司	Houseware - Kitchenware / Plastic Products / Metal Products	SME	Joe Cheung	Design Director	+852 2690 9077	www.cosso.com.hk/	Room 802, 8/F, Wah Lai Industrial Centre, 10-14 Kwei Tei Street, Fo Tan, Shatin, New Territories, Hong Kong
Dongguan Maisto Industries Limited	東莞美馳圖實業有限公司	Toys - Cars	SME	David Cheung	Deputy Plant Manager		www.maycheonggroup.com/	Fengshen Avenue, Dongguan Shi, Guangdong Sheng, China, 511700
Eco Concepts		Fashion & Apparel / Houseware - Personal Accesories	SME	Phoebe Wong	Director	+852 3527 0722	www.ecoconcepts.com.hk	Room 308, Kwai Cheong Centre, 50 Kwai Cheong Road, Kwai Chung, New Territories, Hong Kong
ECOPrint Cloud Technology Limited	妙印雲科技有限公司	Paper Products - Printing Solutions	SME	Kenny Chan	Operation Director		www.ecoprint.tech/	
ENICMA GmbH		Production Efficiency	SME	Ugo Negretto	Managing Director	+49 1511 2288 159	www.enicma.de/en/	Agnes-Pockels-Bogen 1, D-80992 München, Germany

* IDSHK member
香港工業設計師協會會員

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Eone Bradley		Watch	SME	Nick Gu		+852 2154 1350	www.eone-time.hk	
Forever Couple		Metal Products - 3D-Printed Rings	SME	Alex FC Chan	Manager	+852 2395 3688	forevercouple.com/en/index	Shop L307 on L3, The ONE, 100 Nathan Road, Tsim Sha Tsui, Hong Kong
Fraunhofer Institute for Production Technology IPT	德國弗勞恩霍夫生產技術研究所	Production Technology	Big	Toni Drescher	Head of Department, Operative Technology Management	+49 2418 9042 50	www.ipt.fraunhofer.de/en.html	Steinbachstr. 17, 52074 Aachen, Germany
Fullhouse World International Limited	滿屋世界國際有限公司	Houseware	SME	Rita Kwok	Manager	+852 2337 0900	www.fullhouseworld.com	Shop 1027, 1/F, D ² Park, Tsuen Wan, New Territories, Hong Kong
Gear Atelier Limited		Industrial Design / Houseware	SME	May Wong	Founder	+852 2845 7321	www.tapas.com.hk/en/home	Unit 516, Inno Centre, 72 Tat Chee Avenue, Kowloon Tong, Hong Kong
Genic Eyewear		Eyewear	SME	Emily Tai	Founder		www.geniceyewear.com	Shop 303, 3/F, T.O.P Mall, 700 Nathan Road, Mong Kok, Kowloon, Hong Kong
Gift Concept Product Limited		Houseware - Silicone	SME	Jennifer Ko	Manager	+852 2402 8696	www.giftconcept.com.hk/products	Unit D, 6/F, Reason Group Tower, 403 Castle Peak Road, Kwai Chung, New Territories, Hong Kong
Giormani / Arredamenti Company Limited	茲曼尼 / 歐達家具有限公司	Furniture	Big	Jane Tong				
Goodway Electrical Enterprise Limited	威馬企業有限公司	Houseware - Electrical Appliances	Big			+852 3763 9100	www.goodwayelectrical.com	Unit C & E, 2/F, Gee Chang Industrial Building, 108 Lok Shan Road, To Kwa Wan, Kowloon, Hong Kong
GOXD / Marvel Digital Limited	萬維數碼有限公司	Houseware - Electrical Appliances	Big	Perry Wong		+852 2989 0200	www.marveldigital.com	7/F, Siu On Centre, 188 Lockhart Road, Wanchai, Hong Kong
Grand Classic Ltd.	惠佳有限公司	Furniture	SME	Kelvin Yiu		+852 2422 3962	www.grandclassic.com/e/default_home.asp	
Green & Associates*		Houseware - Environmental Products	SME	Gewah CL Lam		+852 2729 5915	greenassociates.com	Room 1001, 10/F Well Fung Industrial Centre, 58-76 Cheun Ping Street, Kwai Chung, Hong Kong
Greenology (a brand of UPD Limited)		Houseware - Decor (Concrete & Small Plants)	SME	Andy Tang	Brand Manager		greenology.com.hk	
Ikonee International Limited	圖意國際有限公司	Plastic Products - Lifestyle	SME	Sammual Yeung	Manager	+852 2411 1218	www.ikonee.net	Room 2701, Technology Plaza, 29-35 Sha Tsui Road, Tsuen Wan, New Territories, Hong Kong

* IDSHK member
香港工業設計師協會會員

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Inno Box Design Limited*	設計盒產品開發有限公司	Toys (Manufacturer)	SME	Eddie Kwok	Director	+852 9229 8104	www.innoboxdesign.com	Shop 26 ,1/F Yik Fat Building, Fung Yau Street North, Yue Long, New Territories, Hong Kong
InnoSphere Limited*	天品創意事務所有限公司	Houseware - Lifestyle & Baby Products	SME	Steve Yeung	Business Development Manager	+852 3586 0896	www.innosphere.hk	Unit A1, 12/F., Summit Building, 30 Man Yue Street, Hunghom, Kowloon, HK.
Jervis SportsTechnology Limited		Sports - Basketballs	SME	Dennis Wong	3-point Shooter	+852 3589 6700	www.jervissports.com	5/F, New Media Tower, 82 Hung To Road, Kwun Tong, Kowloon, Hong Kong
Kentex Craft Limited*		Watch / Plastic Products	SME	Tony Chan	Watch Designer	+852 2744 6881	www.kentexwatch.com	Room 4, 11/F, Sun Cheong Industrial Building, 2-4 Cheung Yee Street, Cheung Sha Wan, Kowloon, Hong Kong
King's Flair Development Limited	科勁發展有限公司	Kitchenware - Supply Chain	Big	Gigi Wong	Executive Director & COO	+852 2850 6626	www.kingsflair.com.hk	12/F, Yardley Commercial Building, 3 Connaught Road West, Sheung Wan, Hong Kong
Kinox Trading Limited	建樂士貿易有限公司	Houseware - Kitchenware / Metal Products	Big	Eric Sun	Managing Director	+852 3425 4949	www.kinox.com	20/F, Kinox Centre, 9 Hung To Road, Kwun Tong, Kowloon, Hong Kong
LawsGroup	羅氏集團	Fashion	Big	Miko Cheung	Human Resources Director	+852 2371 1836	www.lawsgroup.com	36/F, Laws Commercial Plaza, 788 Cheung Sha Wan Road, Kowloon, Hong Kong
L.I.M. Design Work Limited	白水草堂創作室有限公司	Industrial Design	SME	Ron Leung	Founder	+852 2987 9800	www.limdesignwork.com/ron	
Marvel Digital Limited / GOXD	萬維數碼有限公司	Houseware - Electrical Appliances		Perry Wong		+852 2989 0200	www.marveldigital.com	7/F, Siu On Centre, 188 Lockhart Road, Wanchai, Hong Kong
Master Concept ^	思想科技	IT - Cloud Computing	SME	Dennis Wong	Director & Co-founder	+852 3589 6700	www.hkmci.com	5/F, New Media Tower, 82 Hung To Road, Kwun Tong, Kowloon, Hong Kong
Memomem Limited*		Watch / Metal Products	SME	David Leung	Director		memomem.com	Unit 1813-1816, Tower A, Regent Centre, 63 Wo Yi Hop Road, Kwai Chung, New Territories, Hong Kong
Memorigin Watch Company Limited	萬希全	Watch / CNC Machining	SME	William Shum	Director, Founder & CEO	+852 2976 0108	www.memorigin.com	Room 804, Chai Wan Industrial City Phase 1, 60 Wing Tai Road, Chai Wan, Hong Kong

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Mings 3D Solutions Limited / Hong Kong 3D Printing Association		3D Printing	SME	Paco Wu	General Manager	+852 3480 2334	www.mings3d.com	Room 607A, The Galaxy, 313 Castle Peak Road, Kwai Chung, New Territories, Hong Kong
NowHere® Design Ltd.	現·在設計有限公司	Furniture - Interior	SME	Tony Lau	Founder & Creative Director	+852 2117 8030	nowhere.hk	Unit 520A, InnoCentre, 72 Tat Chee Avenue, Kowloon Tong, Hong Kong
Object Management Group (OMG)	對象管理組織	IoT / Technology Standards Consortium	Big	Richard Mark Soley	Chairman & CEO	+1 7814 4404 04	www.omg.org	109 Highland Ave, Needham, MA 02494 USA
odm DJ (SZ) Limited*	歐迪姆鼎駿 (深圳) 貿易有限公司	Watch / Metal Products	Big	Summy Chan	Design and Production Director			
OFESS		Metal Products - Umbrellas	SME	Momou Mo	Founder	+852 2742 1189	ofessonline.myshopify.com	Unit F2, 14/F, Block 4, Golden Dragon Industrial Centre, 182-190 Tai Lin Pai Road, Kwai Chung, New Territories, Hong Kong
People on Board Social Enterprise Limited	樂在棋中社會企業有限公司	Toys - Board Games	SME	Thomas Wong	Founder	+852 3158 0674	www.pob.hk/zh/	H304, Block B, PMQ, 35 Aberdeen Street, Central, Hong Kong
PO Selected Company Limited	普思力特有限公司	Houseware / Metal Products	SME	Wilson Wong	Business Manager	+852 2206 6022	www.po-selected.com	
POMCH		Fashion & Apparel	SME	Felix Tai	Founder	+852 2546 9419	www.pomch.com/	S204, 2/F, Block A, PMQ, 35 Aberdeen Street, Central, Hong Kong
POSTalk / Takon Product Development Limited	德翰產品開發有限公司	Paper Products	SME	Joe Wong	Creative Director	+852 3124 2707	www.postalk.com.hk	Unit 2, 14/F Wing Hang Industrial Building, 13-29 Kwai Hei Street, Kwai Chung, Hong Kong
Rcube Design Studio Limited		Lifestyle Products	SME	Raft Wong	Founder	+852 3613 1359	www.rcube-design.com/product.html	
S&C Furniture Limited	方圓傢俱有限公司	Furniture	SME	Gary Lui	Founder	+852 2462 9777	www.sncfurniture.com.hk	17/F, Unit 3, Tins Center, 3 Hung Cheung Road, Tuen Mun, New Territories, Hong Kong
Shing Hing Plastic Manufacturing Limited	成興塑膠製品有限公司	Plastic Products - Toys	SME	Calvin Wu	Founder	+852 2464 8378	shtoys.com.hk	Room 05, 6/F, Houston Centre, 63 Mody Road, Tsim Sha Tsui East, Kowloon
Silverlit Toys Manufactory Limited	銀輝玩具製品廠有限公司	Toys - Helicopters	Big	Billy Wai, FL (interview done)		+852 2834 4168	www.silverlit.com/a/	17/F, World Trade Centre, 280 Gloucester Road, Causeway Bay, Hong Kong
Hong Kong Productivity Council - Smart Industry One Consortium	香港生產力促進局 - 「智能產業聯盟」	Productivity Council	Hong Kong Productivity Council (HKPC)	Lawrence Cheung	Smart Manufacturing and Materials Division, HKPC	+852 2788 5774	bit.ly/2MlnbQt	HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong

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Company Name (English)	Company Name (Chinese)	Category / Discipline	Size of Company	Representative	Title (EN)	Business Contact	Website	Address
Snaptee Limited		Fashion	SME	Jeffrey			snaptee.co	Room 1, 7/F, Premier Centre, 20 Cheung Shun Street, Lai Chi Kok, Kowloon, Hong Kong
Star Industrial Company Limited (Red A)	星光實業有限公司 (紅A)	Plastic Products	Big	Jessica Leung, EY (interview done)	Business Development Director	+852 3798 8780	www.starreda.com	25 Tai Yau St., San Po Kong, Hong Kong
Starlite Visual Communication Limited*	星光視覺媒體有限公司	Paper Products	Big	Alex Lee	Assistant General Manager		www.hkstarlite.com	3/F, Perfect Industrial Building, 31 Tai Yau Street, San Po Kong, Hong Kong
Sweda Limited	時運達集團有限公司	Houseware - Kitchenware (Air Fresher; Manufacturer)	SME	Mimie Wong	General Manager	+852 2260 7128	www.sweda.com.hk/sweda2013/en/home.php	Flat B, 4/F Cheung Lung Industrial Building, 10 Cheung Yee Street, Lai Chi kok, Kowloon, Hong Kong
Takon Product Development Limited / POSTalk	德翰產品開發有限公司	Paper Products	SME	Joe Wong	Creative Director	+852 3124 2707	www.takon.hk www.postalk.com.hk	Unit 2, 14/F, Wing Hang Industrial Building, 13-29 Kwai Hei Street, Kwai Chung, Hong Kong
Team Green / Jigzle*			SME	Ball Cheung	Design Manager	+852 3403 1111	www.greentanet.com	3/F, Perfect Industrial Building, 31 Tai Yau Street, San Po Kong, Hong Kong
Techtronic Industries Company Limited (TTI)	創科實業有限公司 (TTI)	Metal Products - Power Tools & Electronic Equipment	Big	Leon Yoong	Vice President Techtronic Design"	+852 2402 6329	www.ttigroup.com/en/home	29/F, Tower 2, Kowloon Commerce Centre, 51 Kwai Cheong Road, Kwai Chung, New Territories, Hong Kong
Ten Stationery Limited		Lifestyle Products / Metal Products (writing instrument; manufacturer)	SME	Paul Lam	Director		www.ten-stationery.com	
The Darts Factory	飛鏢工房	Metal Products - Darts	SME	Jennifer Tsui	CEO	+852 2180 7047	www.thedartsfactory.com	Room BA16, 26/F, Two Harbour Square, 180 Wai Yip Street, Kwun Tong, Hong Kong
TML (To Make Locally) Apparel Limited (member of Grandion Group)	TML Apparel Ltd. (興迅集團成員)	Fashion & Apparel	Big	Alan Cheung	Founder & Marketing Director	+852 2743 1228	www.tml-hk.com/landing.htm	30/F, Grandion Plaza, 932 Sheung Sha Wan Road, Lai Chi Kok, Hong Kong
unspun, inc.		Fashion & Apparel - Jeans	SME	Walden Lam			www.denimunspun.com	
VElove Limited		Fashion & Apparel - Environmental Products / Accessories	SME	Catherine Leung	Founder		www.velovehk.com	Workshop 301, The Galaxy, 313 Castle Peak Road, Kwai Chung, Hong Kong

* IDSHK member
香港工業設計師協會會員

^ Companies with branches in the ASEAN

Company Name (English)	Company Name (Chinese)	Category / Discipline	Size of Company	Representative	Title (EN)	Business Contact	Website	Address
Vocational Training Council - Professional Diploma Programme in Industry 4.0	職業訓練局 - 「工業 4.0」專業文憑課程	Vocational Training	Vocational Training Centre (VTC)	Dr. Eric Liu	Executive Director, VTC	+852 2836 1003	www.vtc.edu.hk/html/en/about/press_1409.html	VTC Tower, 27 Wood Road, Wan Chai, Hong Kong
Wonderlaine Studio Limited	大可工作室	Design - Consultancy	SME	Elaine Chow	Designer		www.facebook.com/wbyelainechow/	
Xoopar Limited	森泊創意科技(深圳)有限公司	Plastic Products / Metal Products - Mobile Accessories	SME	Pierre Yu	Director	+86 755 8366 1082	www.xoopar.com	Room 1601-02, Jinwei Building, Jiabin Road, Luohu Area, Shenzhen, 518001
Yick Shun Electronic Toys Manufactory Limited	億順電子玩具製造廠有限公司	Toys - Electronic	SME	Terrence Hui	CEO	+852 2897 7393	www.yickshun.com.hk	Room G, 16/F, MG Tower, 133 Hoi Bun Road, Kwun Tong, Kowloon, Hong Kong
Zing HK*		Toys	Big	Will Ng	Senior Designer			
ZOTAC International Limited*		Houseware - Computer Hardware (Mini PCs & Gaming Graphics Cards)	Big	Royce Yu	Senior Product Designer	+852 2687 7709	www.zotac.com/hk/	

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+852 2732 3188

dchk@fhki.org.hk

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