出國報告（出國類別：其他）

2012 年第 29 屆世界科學園區年會(IASP)暨招商訪問行程

服務機關：行政院國家科學委員會南部科學工業園區管理局
姓名職稱：陳俊偉/南部科學工業園區管理局 局長
許增如/南部科學工業園區管理局投資組 組長
派赴國家：愛沙尼亞及瑞典
出國期間：中華民國 101 年 6 月 16 日至 6 月 23 日
報告日期：中華民國 101 年 9 月 20 日

摘要

南部科學工業園區管理局（以下稱南科管理局）結合財團法人金屬工業研究發展中心（以下稱金屬中心）現正全力推動「南部生技醫療器材產業聚落發展計畫」,在四年間以新台幣12億元經費引進生技醫療器材產業,計劃結合600億元生技創投基金,在南科高雄園區打造最具國際競爭力的醫療器材專區；過去南科積極引進生技製藥產業，引進的廠商已有33家進駐南科。2012年南科醫材產業的營業額為4 億元，就業人數500人以上。

目前南科管理局正全力推動之聚落發展計畫，主要重點在於研發與招商，協助南部廠商產業升級、轉型投入生技醫療器材產業，目前醫療器材產業聚落主要以牙科、骨科與醫學美容為主。本次透過參與第 29 屆世界科學園區年會(IASP)並結合訪廠行程,以期增加產業發展經驗及強化聚落招商成果，南科管理局由局長陳俊偉親自率隊，和與會先進一同討論高雄園區之醫療器材產業的成果與策略，並拜訪愛沙尼亞的醫療器材廠商兩家，會後前往北歐瑞典拜訪通訊科學園區 Kista 科學城，及瑞典廠商 Swedish Quality Care 公司了解當地市場概況及行銷模式，學習相關經驗。

目次

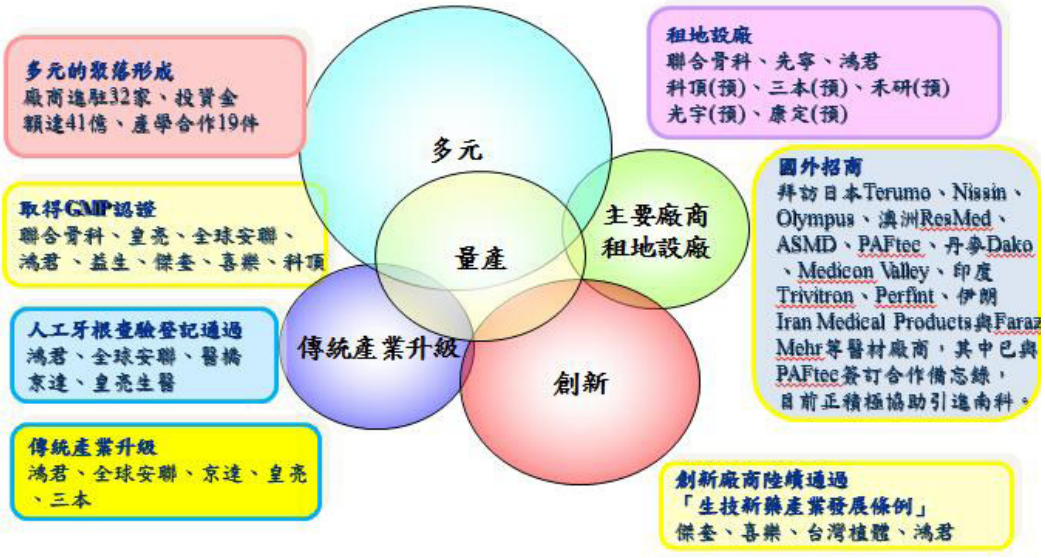
壹、出國目的

各國政府為因應高齡化社會逐漸來臨，紛紛針對醫療制度進行改革，加上新興國家對於醫療器材之需求持續成長，已逐漸帶動醫療器材設備需求之龐大商機。不過，我國生技產業過去不論在生技醫藥或醫材產業產值占世界比重皆低，因此，為了促進我國生技產業發展，行政院積極打造三座指標性生技園區產業聚落，以奠定台灣生技產業穩固發展之基礎；同時更於2009年10月通過「台灣生技起飛鑽石行動方案」，並將生技產業納入六大新興產業中積極推動，經建會亦將生技產業列為世界招商主軸產業之一，前往新加坡及美、日等國家進行招商。

自98年度起，南科管理局推動「南部生技醫療器材產業聚落發展計畫」，以推動我國生技醫療器材產業聚落發展，激勵產業投入前瞻技術自主性研發，並整合學術研發量能，建立研發平台，培育高階生技醫療器材產業專業人才，進而提升我國生技醫療器材產業競爭力並建構優良學術研究環境，整合全國科技研發能量培育尖端高科技人才，發展產業創新聚落；金屬中心自98年度起成立「計畫推動專案辦公室」(以下簡稱計畫辦公室)，以醫療器材產業為核心，整合研究機構、大專院校與廠商的現有資源，擬定整體發展策略、創造生技醫療器材產業專區之投資誘因、加強宣傳活動與實際訪廠招商、促進產學合作，以吸引廠商進駐及協助建立以南科高雄園區為主的醫療器材產業聚落。

經過三年多之耕耘，目前產業聚落已具有雛型，至101年5月止，已促進廠商投資金額41億餘元，並吸引33家參與計畫之醫療器材相關產業廠商進駐南科（台南園區與高雄園區）；其中，園區廠商－鴻君科技股份有限公司已成功開發台灣第一支人工牙根並於99年7月27日成為國內第一家取得人工牙根查驗登記通過之企業，目前也已開始販售相關產品;另醫橋科技股份有限公司、全球安聯科技股份有限公司、京達科技股份有限公司與皇亮生醫股份有限公司也陸續取得人工牙根

查驗登記；喜樂醫療器材股份有限公司更於99年10月獲通過「生技新藥產業發展條例」資格審定之公司；另鴻君科技股份有限公司、台灣植體科技股份有限公司與傑奎科技股份有限公司也陸續通過。在旗艦廠商招商方面，聯合骨科器材股份有限公司已進駐園區，並斥資1.24億元於南科高雄園區闢建第一期新廠，現已正式量產，擴廠後最大年產量可望提高 4 倍，第二期廠房亦已於高雄園區興建當中。聯合骨科目前全球人工關節市占率約 0.1%，市場也看好，在新產能加持及中美市場挹注下，全球市占率可望逐年成長。在與國外廠商接軌的部份，經由計畫之補助鼓勵機制，鼓勵推動聚落廠商與國際知名醫材廠商進行各種形式鏈結，包含技術、行銷及人才等相關鏈結與媒合，進而促進高雄園區成為世界級的醫療器材產業中心；101 年皇亮、京達也陸續取得產品查驗登記，成為全國密度最高的人工牙根聚落。而目前進駐專區廠商計有 15 家廠商屬於齒科相關產業，顯示我國齒科用醫療器材深具發展空間，更意味著高雄園區醫材專區儼然成為牙科產業聚落。除了牙科以外，在骨科領域、醫學影像領域及腎透析領域也逐漸具有聚落雛型，使得醫療器材產業聚落更加多元。



圖一、成為兼具創新、量產及多元產業升級的生醫示範園區

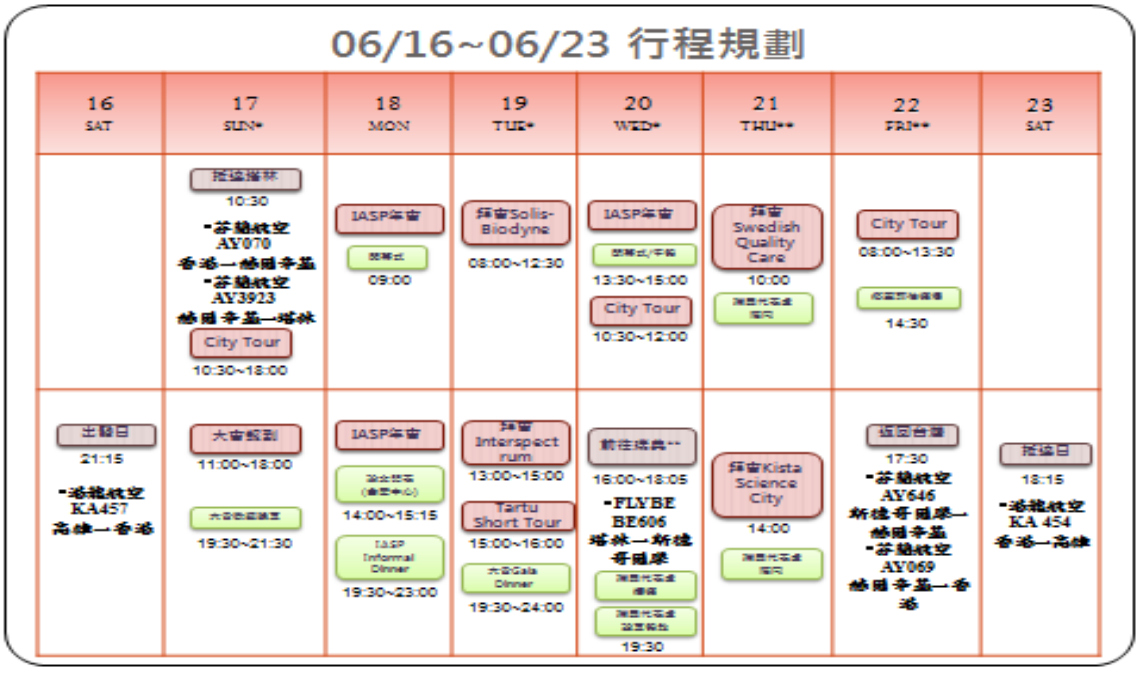
觀察近年來全球醫療器材市場的併購活動，可發現許多醫材大廠皆積極擴張其產品組合，除加強既有產品線的競爭力，並延伸跨足週邊產品，企圖以併購方式加快系統性的佈局，針對人口老化議題、個人化預防醫學、慢性疾病管理等醫療發展趨勢，建構一套「完整解決方案」，如疾病診斷完整方案、心血管疾病治療完整方案等等，台灣是否能在這一波醫療改革及新興國家需求持續成長中取得市場商機，極為重要。因此，本年度將強化國外廠商鏈結的相關業務活動及國際宣傳、加強相關醫療器材廠商之互動與交流會、媒合代理商或通路商，以共同合作方式，拓展醫療器材產業聚落的共通效益及目標市場，期能以產業聚落吸引國際醫療器材大廠與園區廠商交流，推動高雄園區成為世界級的醫療器材產業中心。

貳、過程

一、第29屆世界科學園區年會(IASP)

(一) 行程規劃

本次參加第 29 屆世界科學園區年會(IASP)之行程規劃如下：



(二) 參與狀況

本次出國參加第29屆世界科學園區年會(IASP)，將透過國際論文發表，分享高雄科學園區之招商投資經驗模式及招商成果，提升醫療器材產業聚落知名度，此外，在國際會議出席之場合，增加與其他各國園區互動的機會，並互相學習園區發展經驗與了解國際最新運作思維。除了可增加高雄生技醫療器材產業專區之知名度及國際地位，並透過相互學習做為我國醫療專區創新模式的思考方向，以提升未來招商綜效與能見度。

本次以「南部科學園區與區域創新網絡關係之探討」為題，於年會中口頭發表，發表之重點在於自公司背景(規模、資本與創立年分)、專利來源及合作對象、創新模式與作用、產業群聚之觀點，分析創新網絡如何影響醫療器材廠商進行區位選擇而進駐高雄科學園區。並敘

明區位選擇之資料及創新作用、描述高雄科學園區之發展及其促進創新研發之政策。最後則是分析結果並加以總結與歸納。

根據分析，吸引並支持企業進駐科學園區，特別是在現今全球化趨勢及金融風暴危機的情形下，對管理當局來說是非常重要的一項任務。由過去的研究指出，目前園區發展之模式，在回應廠商之進駐問題上，仍不是最有效的方式。因此，過去科學園區管理局單純只運用提供土地、公共與學識設施之方式，無法有效吸引，亦須更多政策工具上的協助，例如藉由整合並分配有限資源，驅動新興市場開發及升級原有技術，是可以思考的方向。

區域創新網絡被理解為位於一定地域範圍內的一套創新網絡系統。在此範圍內，廠商及其他組織在以社會經濟聯繫為特性所制定的環境下有系統地從事相關活動。有越來越多的研究討論，科學園區可以成為激勵區域創新網絡內的知識轉移和技術創新的有效途徑之一。從理論上來說，我們知道，鄰近大學實驗室和其他研究中心的公司，更容易獲得其科學專業知識及研究成果，並且能夠促進將研究成果移轉進入商業應用。然而，在現實生活中，無論是作用還是如何作用仍是需在科學園區規劃之領域進行分析的議題。

因此，本次發表的論文旨在提供實證證據，以南科園區內廠商之專利資料庫，包含積體電路、光電、綠能、節能、生技以及醫療器材等產業，進行社會網絡分析，研究南部科學工業園區(STSP)在區域創新網絡中之角色。此社會網絡分析共涵蓋11家企業，包含南科、中科、竹科園區廠商、北、中、南部之廠商及研究機構與國外企業。藉由中心性指數、關聯性指標、路徑長度指數及群聚係數之社會網絡分析，我們可以瞭解科學園區創新網絡之結構，並測試南部科學工業園區是否在區域創新網絡中擔任重要角色。

理論上來說，土地、勞工與資本係屬必要因素，然而如何建構創新的環境並貼近指標廠商與上下游產業等因素對廠商而言亦漸趨重要，並可能取代地區的選擇。從實證研究中可得知，科學園區之設立是有效激勵學術單位和「知識密集機構」進行技術移轉及科技創新的

方式；從而創造出以科技為本或高科技產業創立及成長之結果。然而，部份研究結果卻正好相反，科學園區在執行下列廣泛預期之利益時，往往以失敗收場，因此釐清廠商選擇的需求，乃當務之急：承租廠商之研究生產力、高科技產業之就業成長率、位於園區且以研發為取向之產業的額外成長或成果，以及產業、學術單位與公立或其他研究機構間之發展優勢與營運關係，而這些因素是否成為廠商進駐園區時之考量重點，則是本次論文發表的重要論點，也是分析的主要研究方向。

論文發表（金屬中心黃博偉博士）

藉由參加本年會，同時與來自世界各地之科學園區代表交流，交換不同意見，分享各國經驗，並透過文化間的差異，激盪出新的想法與創新的思維模式，做為日後發展園區聚落的參考。而各國代表之論文發表，除可參考國外研究分析之結果外，亦可適度與國內園區發展方式做比較，分辨其優缺點，尋找出適合台灣發展的途徑、了解台灣醫療器材產業之缺口及長處，進而設法改善以補不足，同時增加效益，突顯產業優勢，促使聚落發展、成長、茁壯，最後成為在世界醫療器材產業專區中佔有一席之地之知名產業聚落。

年會參訪團成員合影

（三）參加人員名單

機關	職稱	姓名
行政院國家科學委員會	科長	謝勝隆
南部科學工業園區管理局	局長	陳俊偉
南部科學工業園區管理局	投資組組長	許增如
科學工業園區管理局	投資組副組長	陳淑珠
科學工業園區管理局	科長	鍾幸如
金屬工業研究發展中心	副執行長	陳進明
金屬工業研究發展中心	副組長	黃博偉

二、參訪廠商

在愛沙尼亞年會期間，同時安排拜訪位於塔圖當地的重點醫療器材企業兩家，期能增進對愛沙尼亞市場及醫療器材產業現況之認識，提供園區廠商日後更進一步之合作及國際交流機會，並進一步前往瑞典拜訪。本次參訪的另一個目的，就是將南科醫療器材專區進一步推廣至世界舞台，介紹南科園區之優勢與特長，鼓勵當地企業來台投資設廠，進行南科招商宣傳。除此之外，參訪後亦與其保持聯繫，為日

後可能的合作與交流奠定基礎。

(一) 公司參訪

1. Solis BioDyne 公司簡介

Solis BioDyne公司自1995年起開始開發並製造生技檢驗試劑，以高水準的產品及服務為訴求，目前已成長為歐洲地區檢驗試劑領導廠商之一，並建立信賴品牌之形象。 該公司產品在全球市場中成長迅速，包含頂尖的研究機構及生技公司皆使用其產品，客戶範圍涵蓋國營事業及私人企業，合作方式包含OEM及科學研究等。另Solis BioDyne公司擁有自己的專業研發團隊、實驗室以及行銷業務部門，提供客戶個人化服務，並以即時、快速的服務著稱。

本次參訪最大的心得，是該公司主要與南科醫療器材產業聚落有密切的關係，包含普生、益生及亞洲基因有密切的關係，可以與聚落廠商充份的互補。未來具有媒合的機會，並在自動化設備上，能夠與園區內相關廠商與法人研究機構合作開發，成為未來的合作伙伴。

Solis BioDyne公司拜訪情形

2. Interspectrum OU參訪情形

本次參訪之與會人員有南科管理局、竹科管理局及金屬中心等共六位人員參與，拜會Interspectrum OU (ISM)公司。ISM公司自1991年起設計並生產光學儀器及相關配件，如光譜儀等，產品應用範圍相

當廣泛，除可用於醫學研究外，亦可進行化學分析、材料分析、食品科技等。ISM公司之核心產品即為光譜儀系列產品，包含一般型及可攜式產品，並由該公司自行設計、研發、生產，除此之外，亦提供OEM服務或客製化產品。遠紅外線產品，在有機化學上扮演重要的角色，雖然，NMR及Mass逐漸取代其功能，但是以成本有效性作為考量，仍是一個有機化學或是醫療領域的利器。所有的有機化合物以及許多無機化合物都可以吸收紅外線。想了解為何化合物可吸收這一帶的放射能，那我們必需先了解：分子不是靜的物體，它們不僅相對地在運動著，即使在單一的分子內，其組成的原子核也隨時在改變著相對的位置。分子內之原子核相對運動的結果，便造成振動（vibration）或分子的旋轉(rotation)。透過這些不同吸引，有如指紋一樣可以判斷其有機構造，該公司專注的領域可以說在愛沙尼亞境內非常的少見，在廣大的農業與畜牧業中，可以有一間科技公司，非常特別。

參訪Interspectrum OU

3. Swedish Quality Care AB公司簡介

瑞典的照護模式與社會福利非常值得全球產業借鏡，也創造許多營運與商業模式，本次透過參訪SQC公司，促成我國除了以製造業發展醫療產業之外，是否可以透過服務模式創造台灣產業發展的附加價值，是這次前往瑞典的主要因素。Swedish Quality Care(SQC)公司成立於2007年，在日本東京設有分公司，在歐、亞兩洲皆可提供完整的服務，並與瑞典貿易委員會及瑞典外交部均有密切合作關係。

SQC公司主要針對老年人、殘疾人士和兒童的醫療照護上提供全方面的服務，包含教育培訓、服務、產品以及提供相關知識與經驗並以整體護理觀念為目標，提供培訓從業人員、使用護理輔助器械、使用藥物、護理設施的建設與設備配置以及康復訓練等服務項目，跳脫傳統產品製造，成為新型態的醫療服務廠商。

參訪Swedish Quality Care AB公司及意見交流

(二) 科學園區參訪

1. Tartu科學園區

塔爾圖科學園區是波羅的海地區歷史最悠久的科學園區。近20年來，透過與高等學校、公共和私營部門的聯網，一直支持著該地區的業務創新活動。該園區擴展業務的特點是利用愛沙尼亞境內的勞動力、優惠的稅收制度和自由市場經濟環境進行發展。

塔爾圖位於波羅的海三國之一的愛沙尼亞西部，是該國第二大城以及科學、文化和教育中心。前蘇聯時代為科技重鎮，發展各式各樣的機械及生醫領域，該園區取得歐盟經費，主要有奈米光學實驗室及雛型品開發實驗室，(Bio-Competence Centre of Healthy Daily Products、Estonian Nanotechnology Competence Centre、Nanolab及Protolab)。本次參訪主要的研發成果及相關計畫，係透過歐盟科技計畫的執行，發展出該國在生醫領域的能量與快速雛型品開發的能力。


參訪Tartu科學園區


參訪 Tartu 科學園區，南科陳局長並致贈紀念品予 Tartu 科學園區

2. Kista科學城

在年會結束後，前往瑞典進行技術參訪。本次參訪的地方是Kista科學城（Kista Science City），是歐洲最大的ICT園區，也是全球前5大的ICT園區，全球最高素質的相關公司、技術員工及研究員都密集地匯集此地。園區的都市機能齊備，位在北歐首都斯德哥爾摩的中心。

區域內目前有 120,000 個居民，5,000 個公司中有 500 個 ICT 公司，62,000 名員工中有 20,000 名員工屬於 ICT 產業。區內兩個大學，擁有 4,500 名學生，65 名教授及 300 個研究員。有 4 個研究中心，750 個研究人員，有 8 個國際企業在此從事研發工作。

Kista 科學城定位為創新及成長的生態系統，人力主要來自學術及研發團體、企業以及當地居民。未來策略發展領域包括：無線系統（Wireless systems）、寬頻系統（Broadband systems）、手機服務與應用（Mobile service and applications）、數位媒體（Digital medis）以及醫療及潔淨技術（MedTech＆CleanTech）。 Kista 手機及多媒體展示中心（Kista Mobile & Multimedia Showcase）主要是由70個協力廠商及組織所組成的獨立單位，包括價值鏈產業中的醫療照顧、內容提供者及顧客服務端。訪客在此可以體驗目前手機中的應用軟體，有許多創新都是源自於Kista 科學城，包括智慧型收費、節能及旅行規劃等應用。

參訪 Kista 科學城並致贈紀念品

參、心得與建議事項

目前在南科園區進駐之生技產業廠商已達33家，而高雄園區之生技醫療產業聚落專區，在三年來的積極運作下，亦已逐漸成形。然而，這僅僅是南部生技醫療器材產業聚落發展計畫的初期目標，除了引進廠商進駐園區，更重要的，是將台灣醫材產業及產品推廣至世界舞台這個重大任務。本年度世界科學園區年會(IASP)於6月17-20日在愛沙尼亞首府塔林(Tallinn)盛大舉行，今年由南科管理局陳俊偉局長親自率隊參與，與投資組許增如組長、竹科管理局陳淑珠副組長、鍾幸如科長、金屬中心陳進明副執行長、黃博偉副組長一行共6人代表台灣一

同參與盛會。

會中由金屬中心黃博偉副組長，根據過去南科醫療器材產業聚落計畫推動的成果與周邊學研的關係發表題目為「南部科學園區與區域創新網絡關係之探討 (The study of the relationship between Southern Taiwan Science Park and regional innovation network)」之論文，主要發現為鄰近大學實驗室和其他研究中心的公司，更容易獲得其科學專業知識及研究成果，並且能夠促進將研究成果移轉進入商業應用。而本次亦有多位演講者針對園區如何發展一套創新研發的Ecosystem提出相關論點。歸究來看，學研、資金、企業及環境是創新Ecosystem不可獲缺的主要因素。

在會期間特別參訪位於愛沙尼亞第二大城－塔爾圖(Tartu)的科學園區，以及該園區內包含 Solis-Biodyne 公司、Interspectrum 公司、Clifton 公司、Bio-Competence Centre of Healthy Dairy Products、Estonian Nanotechnology Competence Centre、Nanolab 及 Protolab 等地。年會結束後，隨即前往北歐工業與通訊大國－瑞典，拜訪主要針對以老年痴呆照護模式發展的 Swedish Quality Care 公司，並透過參訪了解疾病發生前後對病患生活機能的輔助，仍可以發揮正常生活功能，所產生的營運模式及醫材衍生產業的附加價值。同時參訪通訊科學城Kista Science City，根據訪談的了解，諸如微軟、通用電器、三菱、IBM…等都位於區內，證明瑞典優越地區發展中心之地位，軟硬兼施的發展，可讓台灣思考台灣科技產業的下一步。

愛沙尼亞及瑞典兩國之高科技產業及醫療器材產業技術發展相當成熟，市場潛力前景不容小覷，亦可考量作為台灣醫療器材廠商踏入國際市場的參考之一。醫療產業聚落逐漸成形之後，除了了解各國園區的運作及創新理念，做為日後發展的參考外，更同時了解當地市場的特性，為往後產品行銷模式的建立踏出了相當重要的一步。同時透過學術交流與實際參訪，正式將台灣醫療器材產業及專區介紹並帶入世界舞台。未來除了將聚落的方向與精神更聚焦之外，促成產業聚落間研發、行銷的共效機制，是本次最重要的收獲。而透過本次行程，

也更了解未來醫療器材產業聚落更進一步的發展方向，持續推廣並提升台灣醫材產業的能見度，使聚落成長、茁壯，進而成功推向國際市場。

附件

The Study of the Relationship between Southern Taiwan Science Park and Regional Innovation Network

Shiann-Far KUNG[1], Yung-Chi YEN[2], Bing-Che WU[3], Chun-Wei CHEN[4], Chin-Ming CHEN[5], Bol-Wei HUANG[6*]

[1,2,3] Department of Urban Planning, National Cheng Kung University, Tainan, Taiwan

[4] Southern Taiwan Science Park Administration, Tainan, Taiwan

[5,6] Mental Industries Research & Development Centre (MIRDC), Kaohsiung, Taiwan

* Corresponding author: bwh@mail.mirdc.org.tw

Abstract

The aim of this paper is to provide empirical evidence to study the role of Kaohsiung Science Park (KSP), the branch of Southern Taiwan Science Park (STSP) in the regional Innovation networks by studying the actors participating in the project "Taiwan Bio-Medical Instrument Industry Cluster Project". We find that Southern Taiwan Science Park Administration (STSPA) cooperating with local research institute, Metal Industries Research & Development Centre (MIRDC), as "gatekeepers" are the centre of regional innovation network of medical device industry (MD) in which the gatekeeper have the capacity with R&D capacity, transferring and diffusing different type of knowledge, and organizing social network. STSPA, MIRDC and local government are responsible for the dialogue with central government; while university and MIRDC are to provide ideas and knowledge to the central government and firms. Innovation platform provide the public space to integrate resources and knowledge, to stimulate collaboration, and to foster innovation with different actors within the regional innovation network. We think the model of innovation platform could be the practical tool to realize the triple helix idea.

Key words: Southern Taiwan Science Parks (STSP), Regional Innovation Network, Social Network Analysis

1. Introduction

Innovation is greatly regarded as an important tool to stimulate economic development. How to promote innovation is still the issue needed to be discussed.

Some evidences showing that the development of innovation is gradually toward to the type of network-centric innovation or open innovation model, such as regional innovation system. The regional innovation network is understood as a system of innovation networks located within a certain geographical area, in which firms and other organizations are systematically engaged in interactive and collective learning through an institutional milieu characterized by social-economic linkage. The member of linkage may come from the global or local actors. Both strong and weak linkages are important to innovation. Strong linkage (formal and informal relationship) includes a common language and high level of trust, whereas weak linkage (formal relationship) enables the flow of novel information to the system.

According to some real cases such as Silicon Valley, Stanford Research Park, and Cambridge Science Park, it is showed that science parks could be one of an effective way to encourage knowledge transfer and technological innovation within the regional Innovation network. From the definition, we know science parks could be defined as a geographical area in which firms and knowledge institutions (universities and research institution) have a common location. Some evidences also showed that proximity to university laboratories and other research centers as providing nearby firms with easier access to scientific expertise and research results, and then it will facilitate transfer of research into commercial application. In other words, this means we could use region as a specific area to construct a regional innovation environment in which the university, industry and science parks administration (government) are important actors in which science parks administration could be a "gatekeeper" within the structure hole for the formation process of collective learning system. However, it is still less studies to test whether it works or how it could be work in the fields of science parks planning.

In the Kung et al. (2011)[1], they found why the past experience to develop TFT-LCD of Tainan Science Park (TSP) can't be applied and how the KSP can attract local industries and stimulate upgrading by innovation platform. KSP is still at relatively young status; and then it is not easy for them to attract them. We think that the main task for a young science parks is how to construct an environment to attract it or even to shape it from existing firms in local area or related sectors. Innovation platform was developed by STSPA in 2009 as the tool and environment to integrate resources and knowledge, and to stimulate collaboration with

[1] Kung, S.-F, Y.-C. Yen, C.-W. Chen, C.-M. Chen, B.-W. Huang, 2011, Innovation Platform as the Tool to Shape the Environment for the Emergence of Flagship Firm – the Case of Medical Device Industry in Kaohsiung Science Park, XXV IASP World Conference on Science & Technology Parks.

different actors.

Based on the concept above, we think that science parks in Taiwan should not only provide lands, hard infrastructures and one step services, it still could play a strategic role in the formation of innovation environment by supporting, stimulating, and increasing local and global the innovation network. Therefore, we want to use the Kaohsiung Science Park (KSP), the branch of Southern Taiwan Science Park (STSP), and Metal Industries Research & Development Centre (MIRDC) as the case to study its innovation networks participating in the project "Taiwan Bio-Medical Instrument Industry Cluster Project".

In the following passages, Section 2 will describe the development of KSP and its policy to promote innovation. Section 4 will analyze the empirical result of interview. Finally, section 5 concludes and summarizes the paper.

2. The Innovation Policy in KSP for the development of MD industry

The KSP is established in 2003 as the second site managed by Southern Taiwan Science Park Administration (STSPA). The distance between KSP and TSP is about twenty kilometres, there had been ideas of utilizing KSP as a spill-over site for the fast expanding TFT-LCD industry in TSP several years ago, however, the stronger calls from both local communities and STSPA expected that KSP should construct some core industries of its own, preferably, some new industries that may have closer relationships with the existing industries and may act as catalyst to transform local economy.

Before the establishment of KSP, Southern region of Taiwan were famous for its complete steel and chemical clusters. Kaohsiung has been the major steel and petrochemical industrial centre in Taiwan. With the variety of materials and the convenience of the biggest harbour of Taiwan, metal works and precision machinery SMEs have clustered in Kaohsiung and the southern Taiwan region, and are still a significant industrial sector in the early 21st century (Yen and Kung, 2008). Yet, with the uprising industrial competition from China and ASEAN countries, many of these SMEs have to find new ways of production or higher value-added and more sophisticated products if they choose to stay instead of moving out to other lower cost countries. Therefore, STSPA tried to apply the successful experience of formatting the TTF-cluster into the upgrading projects.

MD industry is chosen under the trend for upgrading with the three main reasons. Firstly, MD industry has the opportunities to combine different field's high-tech technologies with metal, precise machine, chemical, and plastic industry in which it has high reputation in manufacturing sector. Secondly, the MD industry is comparatively a new industrial sector all over the world, even the major associations in the USA, for example, MDMA and MassMEDIC,

have been established only since the 1990s. Thirdly, it is widely recognized as very potential in the future, basically because of the global increase of ageing population as well as the rising awareness of the value of health. Different research estimated the global market of medical devices at about 200 billion US dollar per year between 2006 and 2008, with an annual growth rate between 6-9%. In Taiwan, the medical device industry was also assessed as one of the very promising industries that Taiwan may feature in the global market, and the central government of the Republic of China has included it in the list of new and strategic industries (MOEA, 2008). However, it is failed in the early stage, and there are only 3 firms tenanted in 2009. According to the interview, we found that there are three main reasons.

Firstly, in order to produce high-level MD products needs firms to upgrade their original technology or develop a new technology, and to get the market information and consumer needs, which often takes long time and large investment to integrate complex idea, technologies, and researches. The innovation of traditional industries is often based on the application or novel combination of obtainable knowledge with low levels of R&D. They are largely incremental and often arise from the firms' persistent efforts to satisfy requests from customers. In addition, medical industries have high professional and closed-market characteristics; and then it is very different in the distributing and sharing knowledge with the other industries. Therefore, although most of them are located in the southern region, it is also involved with different expertise and belonged to very high closed-market and different approach for innovation. Secondly, industrial upgrading in traditional industries is like the radical innovation or disruptive innovation in technology base and business model in which it needs to invest many resources and capital (Christenson, 1997 ; Davila et. al., 2005); however, most of them are small and medium sized enterprise (SME) with low capital; it is not easy for them to forecast the future market trend and connect the technology resources such as university, research institute, large firms and multinational corporations (MNCs) by themselves. Thirdly, it is very important for the MD industry to consider safety and efficiency carefully since it is going to be used in human body for the life-saving and working. Due to the high product certification and competition, it is not easy to estimate whether the product can pass the examination and when the product can enter the market. It will cause the high operation cost, low survival rate and high entrance barrier of the small and medium sized firms in the early stage.

According to Kung and Yen (2009), flagship firm is still the important driver for the formation of industrial clusters and the growth of firms in science parks. However, KSP is still at relatively young status; and then it is not easy for them to attract them. Therefore, STSPA think that the main task for a young science parks is how to construct an environment to attract or even to shape the flagship firms from existing firms with related sectors. From the Kung et al. (2011), we know that innovation is an important factor for the local firms to

upgrade as the flagship firms. The most important task of the science parks is to provide an innovation environment such as a “public space” to integrate diverse resources, to break different boundaries, and reduce the waste of the transaction cost, negative externalities and risk of failure in the structure hole in which who is the gatekeeper also plays an important pole in the success of innovation environment.

The policy, named “Taiwan Bio-Medical Instrument Industry Cluster Project”, were proposed to solve these problems including product R&D projects, human resource training projects, and innovation platform to integrate different resources. The structure of the project is shown as figure 1. The proposed areas of this project include dental instrument system, orthopedics instrument, cosmetic surgery equipment or instrument, medical alloy, and other sub-areas such as developing technology, training talents, and building platform for research and development among potential bio-medical instrument products. It aims at lending an impetus to the development of national bio-medical instrument industry cluster, inspiring industry to research and develop the required technology actively, and integrating relevant academic power and establishing the platform for training professionals and expertise among bio-medical instrument industry filed; furthermore, to promote the national competency, to construct an ideal and superior environment for academic research, and to integrate the national research and development force toward required technology for training hi-tech professionals and expertise and developing novel industry cluster.

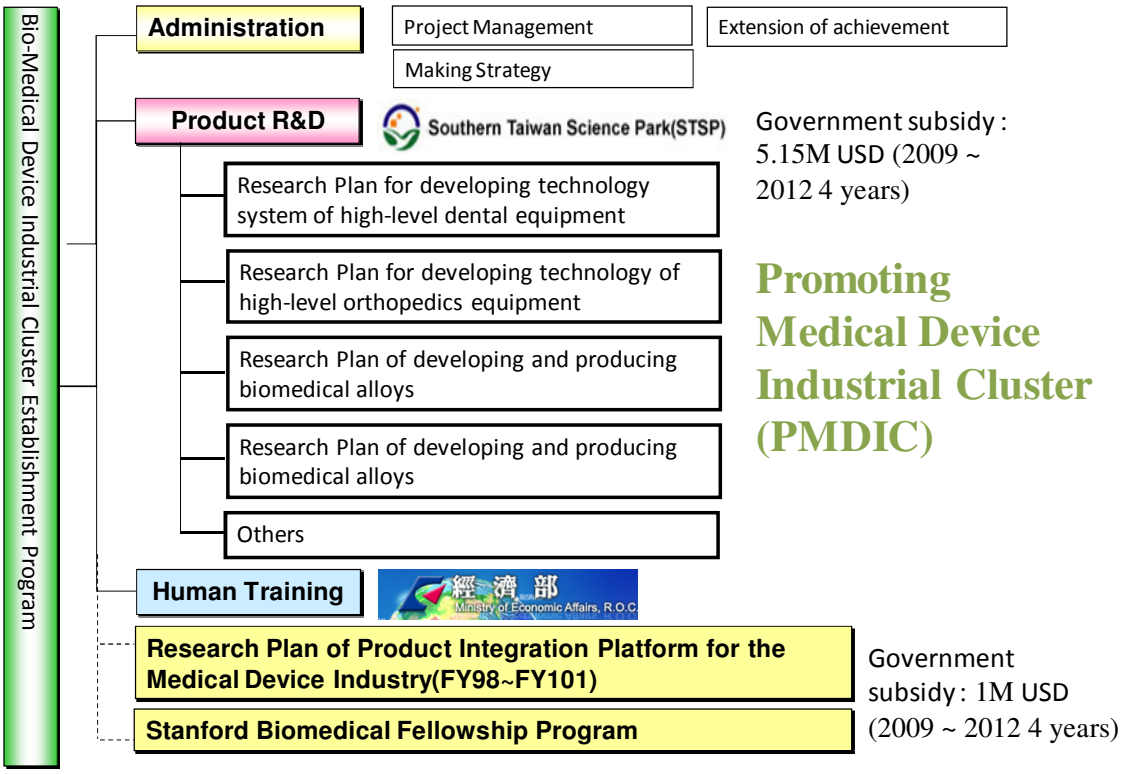


Figure 1: The gaps in the production process of MD products

The planning idea of the innovation platform is to make the real product as the final target to think about how to plan the function and organization of the innovation platform. By analysing the MD production chain, there are at least three big gaps (Figure 1) which are very difficult for a single small or medium-sized firm to deal with alone. In order to fix the breaks of production chain and integrate different resources to foster innovation, STSPA cooperated with local institution, Metal Industries Research & Development Centre (MIRDC), as the important gatekeeper to run the platform. The goal of the subsystem of this platform is to bridge the break for the formation of production chain by organizing and coordinating different innovation actors and finite resources (figure 2). The platform encompasses the set of components and rules employed in common in most user transactions (Table 1).

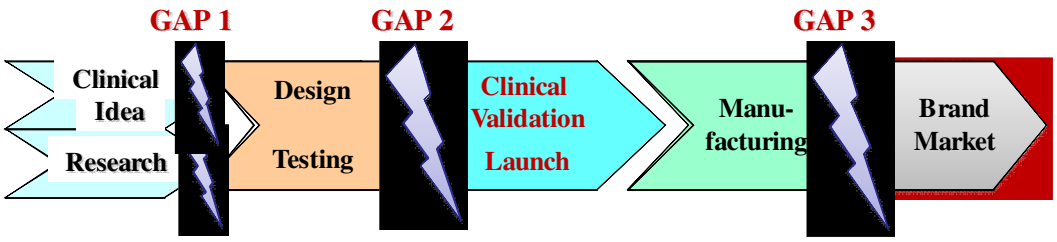


Figure 1: The gaps in the production process of MD products

Table 1: The responsibility and information of innovation platform

Core system	Subsystem	Mission	Supply-side users
Technology Service	Clinical Information Platform (CIP)	• Increase the information exchange during R&D • Setting up the professional team • Evaluation the clinical testing	• MC • HO
	Technology Merging Platform (TMP)	• Analyse the key technology in developing MD industry • Studying and selecting proper firms • Merging the proper firms • Explaining and diffusing R&D results	• UNI • RI • Firms
Product Service	Product Certification Platform (PCP)	• Setting up one window operation model • Integrating the existing certification resource • Setting up GLP laboratory • Setting up GLP certification	• RI • UNI

	Product Marketing Platform (PMP)	• Participating the international exhibition and information exchange • Raising the industrial image • Setting the common marketing mechanism • Planning the product exhibition site	• RI

MS: Medical School; MC: Medical Center; HO: Hospital; UNI: University; RI: Research Institute

The platform encompasses the set of components and rules employed in common. Components include:

A. Platform providers:
National Science Council (NSC) and Ministry of Economic Affairs (MOEA)

- Providing the fund to support the operation of platform.

B. Gatekeeper:
Planning office (PO) composed of STSPA and MIRDC.

- Responsible for determining who could participate in a platform network,
- Contracting that specify terms of trade and the rights and responsibilities of network participants,
- Developing its technology,
- Setting up operation rules such as how to govern information exchange, innovation resources, and knowledge transfer.

C. The core systems:
Technology Service and Product Service System. The subsystems are

- Clinical Information Platform;
- Technology Merging Platform;
- Product Promotion Platform;
- Certification Platform.

D. Supply-side users of the platform:
Universities, medical schools, medical research centres, hospitals, and regional and local research institutes.

- Offering complements employed by demand-side users in tandem with the core platform.

E. Demand-side users of the platform:

- Firms from TI, HI and MD industry, commonly called the end users.

F. Other support system:

- Capacity building, technical training and educational activities.

4. The Regional Innovation Network between STSP within Southern Region

In the Silicon Valley and Cambridge Science Park, university is like a gatekeeper to foster the innovation and spin-off in which most of them are private organization with flexibility. However, the developers in Taiwan are the central or local and government; therefore, STSPA can't work like a gatekeeper such as the university played in the Silicon Valley or Cambridge Science Park because they are the government officer with less flexibility. But it is easy for STSPA to get the trust between different actors in the region. We found STSPA and MIRDC as the gatekeeper developing an innovation platform in KSP with division of labour (figure 2), do played an important role in the formation of RSI in which knowledge creation and transmission for innovation are the central force to connect different actors.

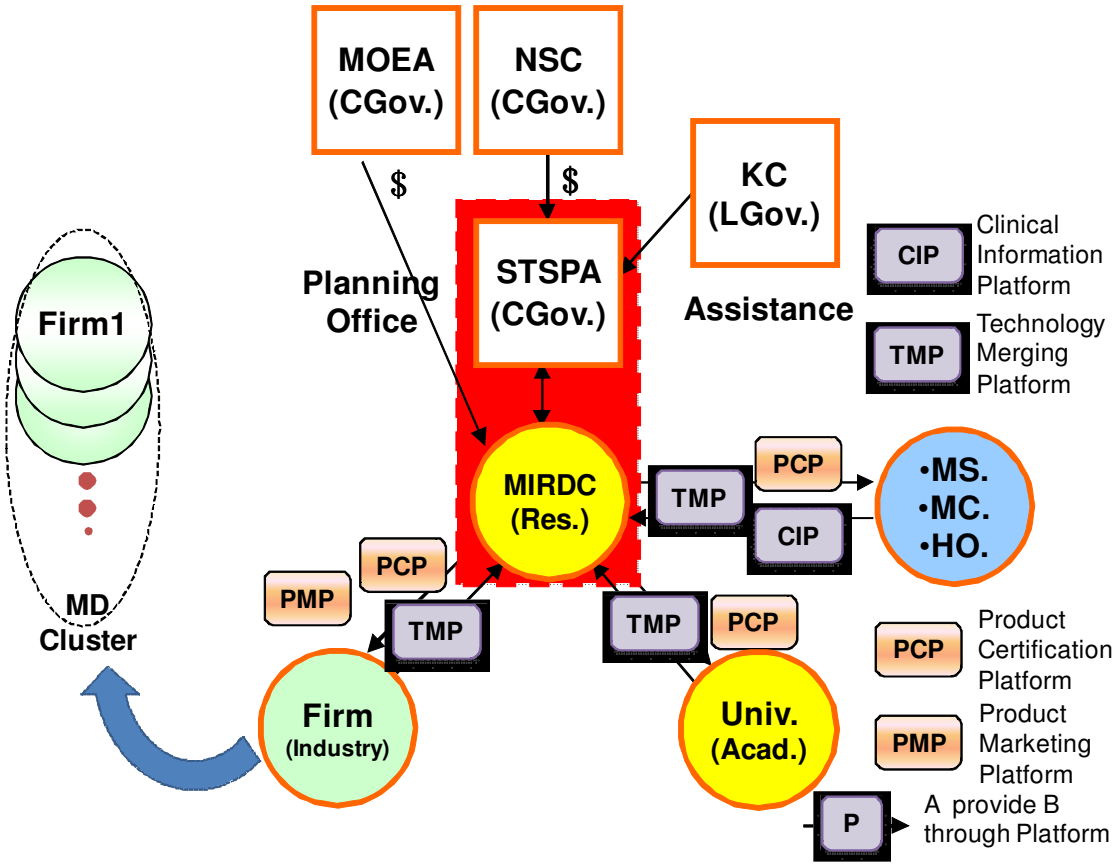


Figure 2: The Regional Innovation Network of Medical Device Industries in KSP

From the government side, STSPA and MIRDC are responsible for the dialogue with Legislative Yuan to get the project, while Kaohsiung county government is responsible for persuading the Executive Yuan to get the fund (figure 3). From the private side, University and MIRDC in this structure are to provide ideas and knowledge to the central government and firms. Under this structure, there are many actors in this network, and how to make good use of this advantage to fix the breaks of production chain and integrate different resources to foster innovation are the important issue needed to be resolved.

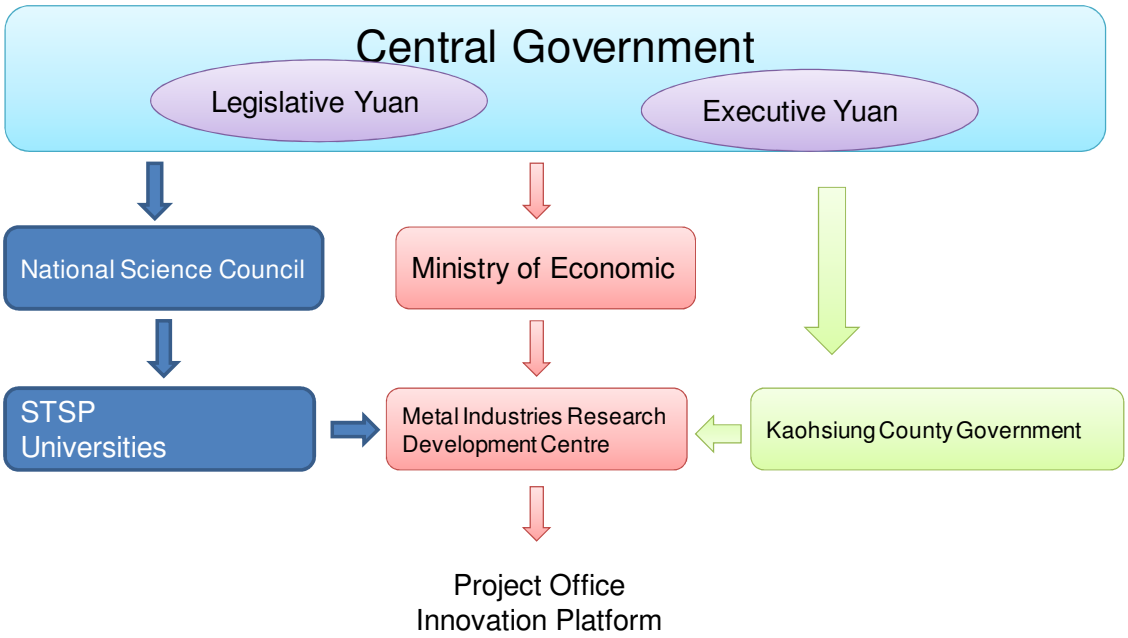


Figure 3: The division labour of different actors

We found that STSPA use innovation platform as the environment to integrate different resources (fund, idea, and services) from different actors to reduce the negative externalities (structure hole) from production to marketing (Baxter and Tyler, 2007[2]; Lester and Piore, 2004[3]). The goal of the platform is to bridge the break for the formation of production chain by organizing and coordinating different innovation actors and finite resources. The innovation platform could be seen as the practical model to realize the triple helix idea in which research institute as the centre of government, industry, and academia (Cooke and

[2]Baxter, C. and Tyler, P. (2007) Facilitating enterprising places: the role of intermediaries in the United States and United Kingdom,
[3]Lester, R. K. and Piore, M. J. (2004) *Innovation: The Missing Dimension*, Cambridge, Mass.: Harvard University Press.

Morgan, 1998[4]; Etzkowitz, 2008[5]; Nabisan and Sawhney, 2008[6]).

The gatekeeper of the innovation platform is composed of the MIRDC from the research institute side and STSPA from the government side. Therefore, the gatekeeper has the political power to get the trust between different actors and has the ability to identify, integrate, and to transmit the knowledge. The planning office authorizes the department which is experienced among administration or techniques in practice to establish the project office and to conduct the following investigating and administrating procedures:

- Conducting the investigating procedure among application and other relevant document for the project, the qualification for the applying institution, and its financial situation.
- Organizing the techniques investigating committee for the "Developing Southern Taiwan Bio-tech Medical Instrument Industry Cluster Project" (hereinafter referred to as "committee"), and conducting the techniques investigating procedure case by case.
- Conducting the investigating procedure of the modification among application for the project.
- Submitting application for the project to the administrating institution for investigating.
- Other administrating procedures relevant to this project.
- Committee will consist of several members in accordance with each sub-area, who are recommended by the project office from government institutions, industry, and academic and research institutions, and employed after submitting to the administrating institution for approval.

MIRDC is the only actor who can use the CIP to collect the clinical needs. They have highly contacts and trusts between local mental firms and local government, and have full information about their technology base and development. From the theoretical theories, we know knowledge is asymmetries, and the process of knowledge creation requires a larger variety of knowledge sources and inputs, and needs a dynamic interplay and transformation between tacit and codified forms of knowledge within and between diverse organisations (Kallio et al., 2009[7]; Keeble and Wilkinson, 1999[8]; Tödtling and Trippl, 2005[9]; Vedovello,

[4]Cook P. and Morgan, K. (1998) *The Associational Economy: Firms, Regions and Innovation*, Oxford: Oxford University Press.
[5]Etzkowitz, H., 2008, *The triple helix: university-industry-government innovation in action*, NY: Routledge.
[6]Nambisan S &Sawhney M, 2008, *The Global Brain, Roadmap for Innovating faster and smarter in a networked world*, New Jersey, Pearson Education.
[7]Kallio, A., Harmaakorpi, V., and Pihkala, T. (2010) Absorptive Capacity and Social Capital in Regional Innovation Systems: The Case of the Lahti Region in Finland, *Urban Studies*, 47 (2): 303-319.

1997[10]; Viljamaa, 2007[11]). Most of MIRDC's researchers are coming from the National Cheng Kung University (NCKU) or other National Universities; and they also can connect the knowledge infrastructures. Therefore, MIRDC plays the key role in dealing the knowledge transmission.

In the operation of innovation platform, they use the social network to construct the relationship with hospitals such as NCKU Hospital, Kaohsiung Medical University Chung-Ho Memorial Hospital (KMUH) and E-Da Hospital to get the right information from final product users, and to cooperate with them to develop the native MD products. Not only the social network they need to have, but also the capacity of R&D, transferring and diffusing different type of knowledge to evaluate what the feasible direction to develop MD products and technologies is, and whether the proposals is workable and deserving to invest. Therefore, choosing proper local research as the gatekeeper is a critical factor to fill in the breaks within structure hole and to guarantee the success of the innovation platform.

Planning Office has dense connection with final product user such as Hospital and Medical Centre to understand and make sure the firm's future market. Final consumer is the important driving sources to understand customer's needs and foster innovation (von Hippel, 1998[12]). Moreover, hospital is also the main purchasing group for MD products. However, both of them are very close and not easy to access especially for the TI firms. In addition, substitute products emerge faster (Fennelly and Cormican, 2006[13]). CIP provides the channel to gather and discuss the information from doctors in hospital and medical center. This strategy makes firms having confidence to enter KSP to develop and produce their products.

Based on the discussion above, we know Taiwan has fought very hard to gain market access to the world through its capacity in OEM/ODM production in the past; such as the steel and metal products in the traditional sector and electronics and IT products in the high-tech sector (Amsten and Chu, 2003). It has also learned through sweaty practice that marketing and branding are even harder than manufacturing. Yet, the MD industry of Taiwan is still in the emerging stage, not even a major OEM/ODM manufacturer in the global market. With the

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[8]Keeble, D. and Wilkinson, F. (1999) Collective learning and knowledge development in the evolution of regional clusters of high technology SMEs in Europe, *Regional Studies*, 133(4):295-303.

[9]Tödtling, G. F. &Trippl, M. (2005) One size fits all? Towards a differentiated regional innovation policy research, *Research Policy*, 34 (8): 1203-1219.

[10]Vedovello, C. (1997) Science parks and university–industry interaction: geographical proximityamong agents as a driving force, *Technovation*, 17(9):491–502.

[11]Viljamaa, K. (2007) Technological and Cultural Challenges in Local Innovation Support Activities—Emerging Knowledge Interactions in Charlotte's Motor Sport Cluster, *European Planning Studies*, 15 (9): 1215-1232.

[12]Von Hippel, E. (1988) *The Sources of Innovation*, New York: Oxford University Press.

[13]Fennelly, D. and Cormican, K. (2006) Value chain migration from production to product centred operations: An analysis of the Irish medical device industry, *Technnovation*, 26(1), pp 86-94.

much stricter regulations on MD products, without a brand name that is familiar to the hospital or major end users, the gap between manufacturing and selling could be very wide. Therefore, the most important task of the science parks is to provide an innovation environment such as a “public space” to integrate diverse resources, to break different boundaries, and reduce the waste of the transaction cost, negative externalities and risk of failure in the structure hole in which who is the gatekeeper also plays an important pole in the success of innovation environment.

7. Concluding Remarks

The science park builders and researchers have been continuously trying to make sure that the prosperity is not reserved within the park alone. Much of the effort in the construction and development of the TSP has been paid to the local concerns, although many industry-academic collaboration programs have been created and transplanted to many places in the world or even adapted to suit local situations. Yet, how to realise the potential of the innovations generated from these programs in the market place terms is still much waited. We think that science parks in Taiwan should not only provide lands, hard infrastructures and one step services, it still could play a strategic role in the formation of innovation environment and the innovative performance of firms by supporting, stimulating, and increasing the number of channels through which knowledge develops at a local or global level.

By studying the regional innovation network of STSPA, the case of the innovation platform for the medical device industry at the KSP has been described in this paper, and may be attributed as a collective wisdom simultaneously evolved among the STSPA, the MIRDC, the local industrial communities and the regional HEIs may shed a light on the development of the concerned principles and good practice. Therefore, science parks administration and research institute in Taiwan could be a “gatekeeper” within the regional innovation network for the formation process of collective learning system, and innovation platform could be a possible model to promote industry upgrading with innovation and to create the good environment for the formation of flagship firms.

The Study of the Relationship between Southern Taiwan Science Park and Regional Innovation Network

S.-F. KUNG,. B-W. HUANG, Y.-C. YEN,
C.-W. CHEN, C.-M. CHEN

2012 IASP Conference Tallinn
June 17-20 2012

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The History and Programs to Develop Medical Device Industry

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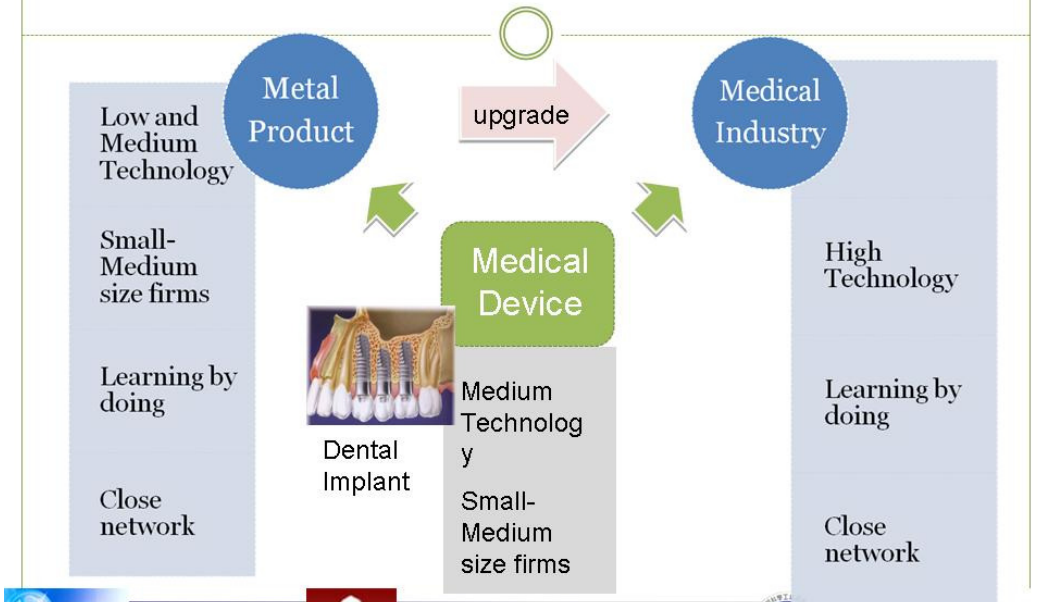
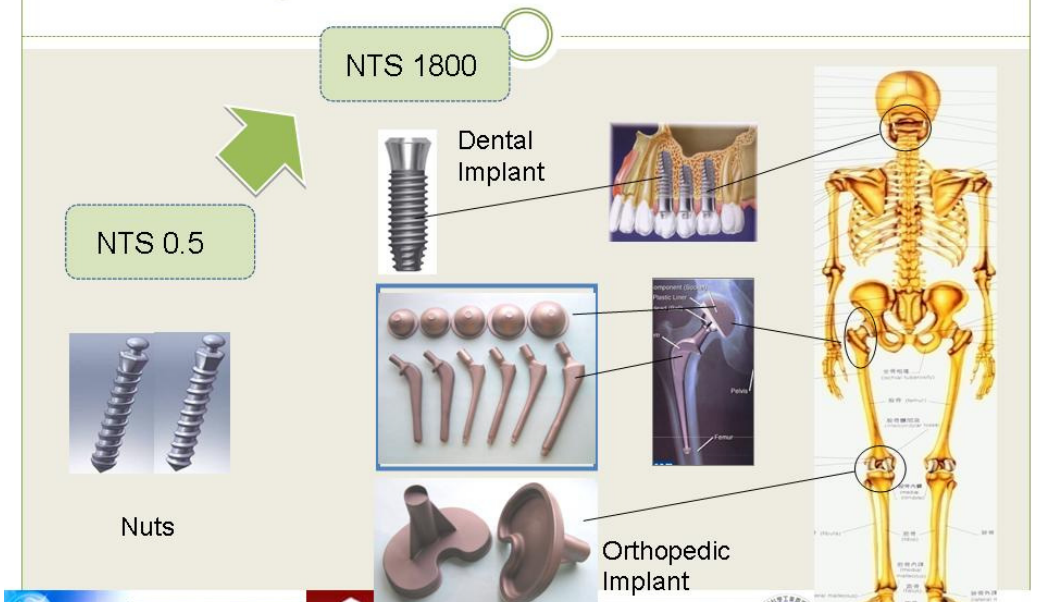
The Characteristics of Medical Device Industry



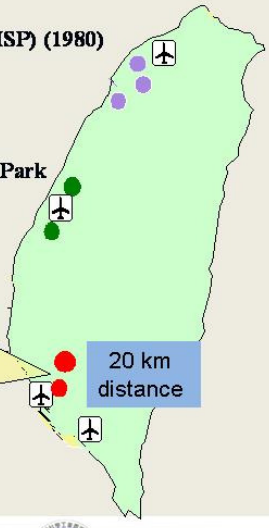
The Example of Medical Device Products



STSP and KSP in Taiwan

Hsinchu Science Park (HSP) (1980)

Central Taiwan Science Park (CTSP) (2003)



Southern Taiwan Science Parks Administration (STSPA)

Southern Taiwan Science Park (STSP)

- Tainan Science Park (TSP) (1995) (Area: 2,565 Acres)
- Kaohsiung Science Park (KSP) (2001) (Area: 1,408 Acres)

Total Area: 3,992.76 acres

20 km distance

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The Gaps in the Production Chain

Clinical Information Platform

Product Certification Platform

Product Marketing Platform

Technology Merging Platform

- innovation capability
- human resources
- most ideas from foreign countries

- product certification
- regulation system of different countries
- no complete regulation system in Taiwan

- international brand
- domestic products is not easy to be accepted
- marketing ability
- highly closed market

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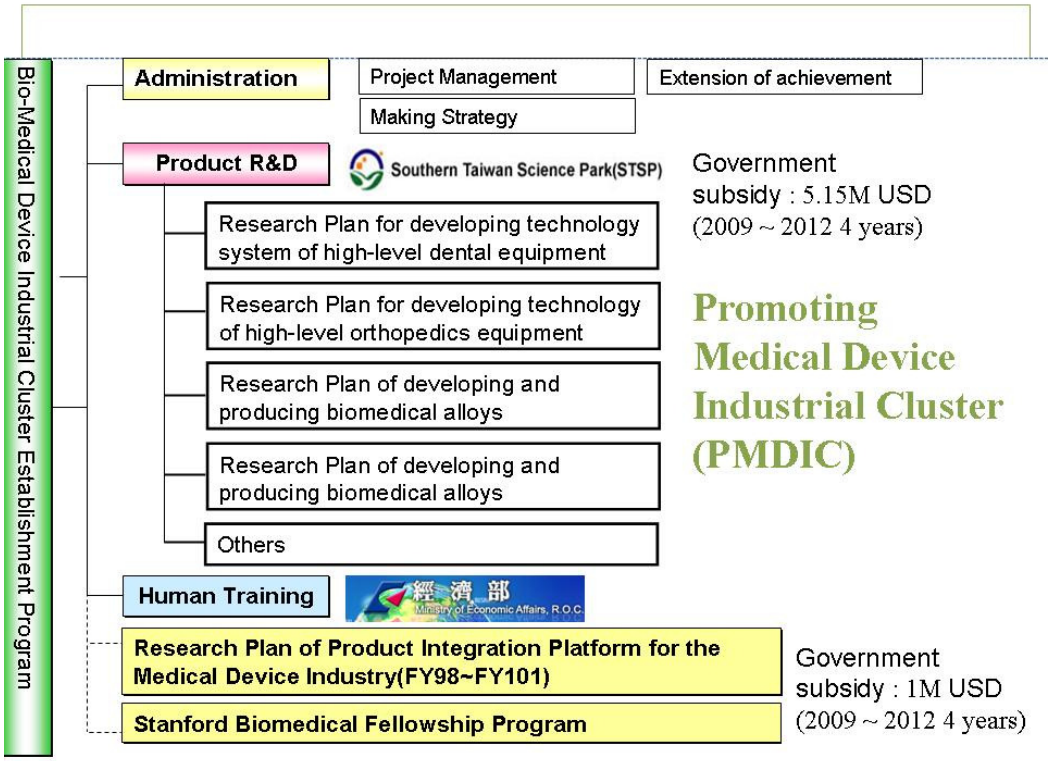
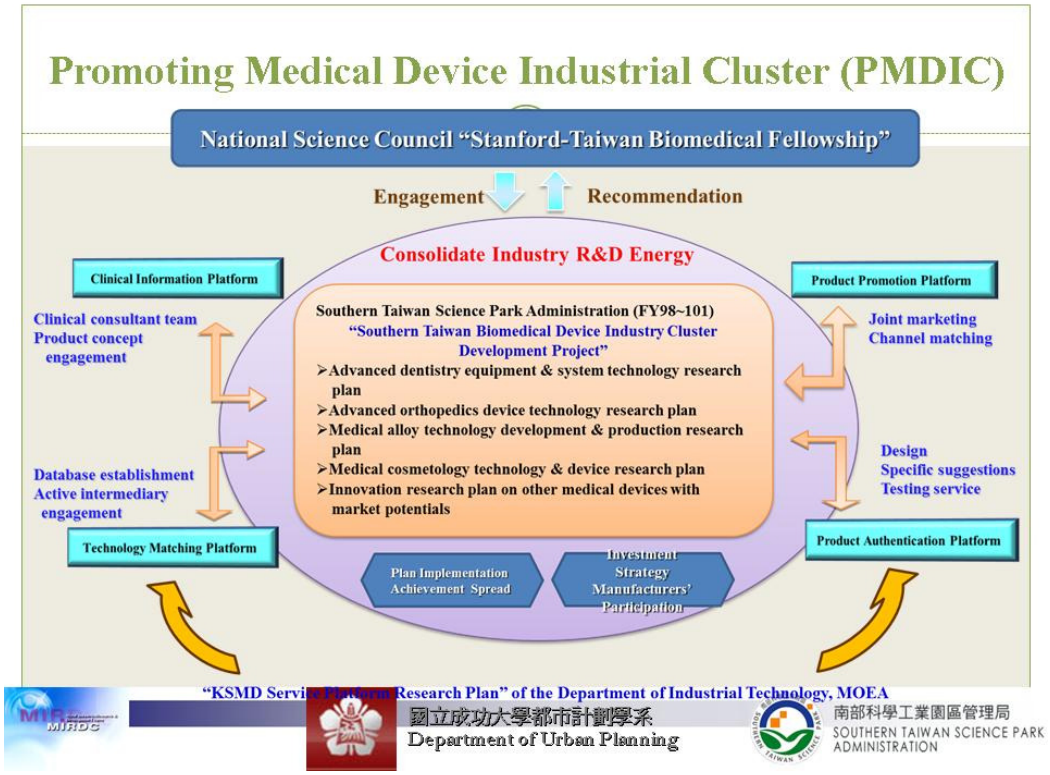

Bio-Medical Device Industrial Cluster Establishment Program
Administration
Project Management
Extension of achievement
Making Strategy
Product R&D
Southern Taiwan Science Park(STSP)
Government subsidy : 5.15M USD (2009 ~ 2012 4 years)
Research Plan for developing technology system of high-level dental equipment
Research Plan for developing technology of high-level orthopedics equipment
Research Plan of developing and producing biomedical alloys
Research Plan of developing and producing biomedical alloys
Others
Promoting Medical Device Industrial Cluster (PMDIC)
Human Training
經濟部 Ministry of Economic Affairs, R.O.C.
Research Plan of Product Integration Platform for the Medical Device Industry(FY98~FY101)
Stanford Biomedical Fellowship Program
Government subsidy : 1M USD (2009 ~ 2012 4 years)


Promoting Medical Device Industrial Cluster (PMDIC)
National Science Council "Stanford-Taiwan Biomedical Fellowship"
Engagement
Recommendation
Consolidate Industry R&D Energy
Clinical Information Platform
Clinical consultant team
Product concept engagement
Database establishment
Active intermediary engagement
Technology Matching Platform
Product Promotion Platform
Joint marketing
Channel matching
Design
Specific suggestions
Testing service
Product Authentication Platform
Southern Taiwan Science Park Administration (FY98~101)
"Southern Taiwan Biomedical Device Industry Cluster Development Project"
➢Advanced dentistry equipment & system technology research plan
➢Advanced orthopedics device technology research plan
➢Medical alloy technology development & production research plan
➢Medical cosmetology technology & device research plan
➢Innovation research plan on other medical devices with market potentials
Plan Implementation
Achievement Spread
Investment Strategy
Manufacturers' Participation
"KSMD Service Platform Research Plan" of the Department of Industrial Technology, MOEA
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Empirical Results

Methodology

- The survey was proceeded by the questionnaire of 21 patents from the perspective of four parts:
  - The spatiality of the patents and its owners in KSP
  - The characteristics of the patents and its owners in KSP
  - The roles and function of STSPA in the developing of patents.
  - The roles and function of MIRDC in the developing of patents.
- There are 9 patents and 28 owners responded, the rate of response was near 42%.

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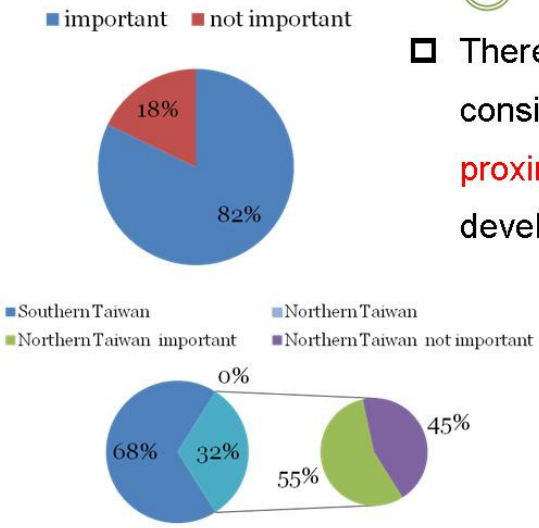
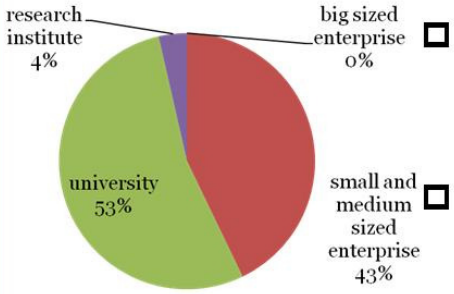
The Spatiality of the Patents and its Owners



- There are 82 % owners (23/28) considering that spatial proximity is very important for developing patents.
- There are 32% owners from Northern Taiwan in which 55% thinks that spatial proximity is still very important.

The Characteristics of the Patents and its Owners



- There are 53 % owners are from university and 43% are from small and medium sized enterprise.
- Only 2 patents are mixed with enterprises, university and research institute.
- The cooperation model:
  - → STSPA and enterprises provide fund.
  - → enterprises, university and research institute provide technology.

Check Indicator

Indicator
providing funds
providing technology matching
providing market information
providing spaces
providing administrative service
providing certification service
providing technology information
providing technology R&D
providing research device

The Roles and Function of STSPA

Now(Top 3)

1	providing funds	21
2	providing technology matching	11
3	providing market information	10

Future (Top 3)

1	providing research device	14
2	providing market information	13
3	providing certification service	13

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The Roles and Function of MIRDC

Now(Top 3)

1	providing funds	18
2	providing technology information	11
3	providing administrative service	8

Future (Top 3)

1	providing market information	24
2	providing certification service	16
3	providing funds	12

Conclusion

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Conclusion (1)

- Spatial proximity is still the important factor to develop patents.
- In the early stage to develop RIS, SPA could provide funds, spaces, hard infrastructures and technology matching as the first step.
- In the middle stage, it could play an active role to construct RIS by fixing the gap of production chain such as providing market information, technology information, and certification service.

Conclusion (2)

- In the early stage to develop RIS, research institute could cooperate with SPA to provide administrative service and integrate technology resources.
- In the middle stage, it could play an active role to construct RIS by providing advanced technology-related activities such as providing technology matching, certification service and research devices.

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Conclusion (3)

- We think science parks in Taiwan should not only provide lands, hard infrastructures and one step services, but it still could play a strategic role in the formation of innovation environment by supporting, stimulating, and increasing local and global technology exchange.

THANKS FOR YOUR ATTENTION

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