

出國報告（出國類別：其他）

## 赴日本金澤市參加 **PICMET 2014** 國際研討會議及招商出國報告書

服務機關：科技部中部科學工業園區管理局

姓名職稱：黃懿美 組長

陳怡彥 科員

派赴國家：日本

出國期間：103 年 7 月 27 日至 8 月 2 日

報告日期：103 年 10 月 2 日

## 公務出國報告提要

出國報告名稱：赴日本金澤市參加 PICMET 2014 國際研討會議及招商出國報告書

頁數 16 含附件：2

出國計畫主辦機關/聯絡人/電話：科技部中部科學工業園區管理局/陳怡彥/04-25658588#7317

出國人員姓名/服務機關/單位/職稱/電話：

黃懿美/科技部中部科學工業園區管理局/投資組/組長/04-25658588#7301

陳怡彥/科技部中部科學工業園區管理局/投資組/科員/04-25658588#7317

出國類別：☐1 考察☐2 進修☐3 研究☐4 實習☒5 其他

出國地區：日本（東京、金澤）

出國期間：103 年 7 月 27 日至 8 月 2 日

報告日期：103 年 10 月 14 日


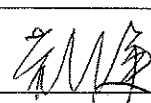
分類號/目：

關鍵詞：PICMET、日本招商、科技政策

內容摘要：(二百至三百字)

今年 PICMET 以基礎架構與服務整合(Infrastructure and Service Integration)為主題，黃懿美組長代表本局於「科技政策」場次以「中科園區中長期產業發展策略」為題論述中科產業發展政策，在全球科技管理經營領域提供本局實際經驗，增加本局在國際能見度，同時與國際科技領域產學界專家交流，增廣見聞吸取經驗，有助於推動園區創新管理。另本次招商計拜會愛的文藝復興(Love Renaissance)株式會社與 3 家日本上市公司－株式會社三化研究所、木德神糧株式會社與 NanoCarrier Co., Ltd 共 4 家潛在廠商及新日本有限責任監查法人(EY)，均肯定台灣完整的產業供應鏈與有利外商投資環境，並表達未來配合其營運擬來台設立海外第 1 個生產據點，以就近服務國內高科技廠商、藉此拓展大陸市場，受訪各公司對於未來投資中科均表示高度興趣。

## 出國報告審核表

出國報告名稱：赴日本金澤市參加 PICMET 2014 國際研討會議及招商出國報告書			
出國人姓名 (2人以上，以1人為代表)		職稱	服務單位
黃懿美		組長	科技部中部科學工業園區管理局
出國類別	<input type="checkbox"/> 考察 <input type="checkbox"/> 進修 <input type="checkbox"/> 研究 <input type="checkbox"/> 實習 <input checked="" type="checkbox"/> 其他 國際會議及招商 (例如國際會議、國際比賽、業務接洽等)		
出國期間：103年7月27日至103年8月2日		報告繳交日期：103年10月14日	
出國人員 自我檢核	計畫主辦 機關審核	審 核 項 目	
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出國人簽章(2人以上，得以1人為代表)		計畫主辦機關 審核人	機關首長或其授權人員簽章
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">局長王永壯(甲)</div>

說明：

- 一、各機關可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。
- 二、審核作業應儘速完成，以不影響出國人員上傳出國報告至「公務出國報告資訊網」為原則。

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# 壹、目的

在台灣與中國大陸簽訂兩岸經濟合作架構協議（ECFA）後，台灣成為國際企業開拓大陸市場的跳板，再加上過去大陸民眾因與日本領土爭議致仇日情結陰影下，日本廠商改以與國內企業合作以台灣為生產基地，拓展大陸市場。根據經濟部投資審議委員會統計資料顯示，2012、2013 年核准日本企業來台投資金額分別達 4.14 億、4.08 億美元，核准件數分為 619 件與 618 件創歷年高點。依經濟部統計近 2 年日本來台投資廠商以中小企業為主，亦包含多項高階技術來台投資案件，顯示日本對台投資日益密切。

為促成日本中小企業至中科投資，補強國內高科技產業供應鏈及提升產業技術層次，本次招商行程期望藉由宣傳中科投資環境，並回應廠商所提投資相關問題，以尋求具有技術及市場領導性之日本潛在廠商進駐。首先在台灣安永會計師事務所胡子仁會計師安排陪同下，拜訪從事保養品及美容儀器之研發生產與銷售之「愛的文藝復興(Love Renaissance)株式會社」，該公司計畫於今年以日本原股形式來台在興櫃掛牌；後順訪新日本有限責任監查法人(EY)，討論目前日本廠商海外經營與投資動態。除此之外，本次亦參訪 3 家日本上市公司，包括生技公司 NanoCarrier 從 2008 年起與國內生技大廠友華生技合作開發抗胰臟癌新藥，目前在台已進入第 3 期臨床試驗，預計今年在台共同投資興建其全球第 1 個癌症針劑藥廠以供應全球市場；另此行也參訪 1 家從事半導體與光電業製程用原料製造的株式會社三化研究所、農業生技的木德神糧株式會社。

另本次行程亦安排參加「波特蘭國際工程與科技管理研討會」(PICMET)，由黃懿美組長代表本局於「科技政策」場次以「中科園區中長期產業發展策略」為題論述中科產業發展政策，在全球科技管理經營領域提供本局實際經驗，增加本局在國際能見度，同時與國際科技領域產學界專家交流，增廣見聞吸取經驗，有助於推動園區創新管理。

## 貳、出國行程

本次詳細出國行程表如下：

日期	地點	行程安排	會面人員
7/27(日)	去程(桃園－東京)	搭 機	
7/28(一)	東京都銀座區	拜訪 <u>愛的文藝復興株式會社</u>	1.人事總務部部長－千秋賴彥 2.人事總務部內部統制擔當－張之立
	東京都千代田區	拜訪 <u>新日本有限責任監査法人</u> (日本安永事務所)	1.公認會計士－渡邊力夫 2.公認會計士－前田隆夫
	山梨縣上野原市	拜訪 <u>株式會社三化研究所</u>	1.會長－齊藤隆 2.社長－太附聖 3.營業本部副本部長－椿谷暁人 4.營業本部海外擔當－山田諭
7/29(二)	東京都江戸川区	拜訪 <u>木德神糧株式會社</u>	1.企畫開發室室長－宿谷勉 2.企畫開發室顧問－松尾隆次 3.社長室長－管益成
	東京飛抵小松 小松機場-金澤市	搭 機	
7/30(三)	金澤市	於 PICMET 2014 會議發表論文	
7/31(四)	金澤市	參加 PICMET 2014 會議	
	小松飛抵東京	搭 機	
8/1(五)	千葉縣柏市	拜訪 <u>NanoCarrier Co.</u>	1.社長－中富一郎 2.事業開發部長－花田博幸 3.研究部部長－內藤健一郎 4.海外臨床開發擔當部長－高橋和展
8/2(六)	返程(東京－桃園)	搭 機	

# 參、招商成果說明

## 一、愛的文藝復興(Love Renaissance)株式會社

### A. 公司背景

愛的文藝復興(Love Renaissance)株式會社為日本專業保養品製造及銷售商，總公司位於東京都銀座區，公司成立於 1998 年，約有 22 名員工，於日本及美國夏威夷均有子公司與布建行銷通路，該公司主要從事保養品及美容儀器之研發生產與銷售，其化粧品產品特色採用高純度、高比例精華液的方式，製作改善女性膚質的保養品，另 2012 年美療器(Photoshow)開始銷售，美療器主要供沙龍店作為產品推廣之媒介，客戶亦可自行購買後於居家使用，透過美療器之使用，與其美容產品具有相輔之銷售效果。

公司網站：<http://love-renaissance.com>

公司地址：5-6-16-6f Ginza Chuo-ku, Tokyo 104-0061, JAPAN 90220

### B. 訪談情況

由安永會計師事務所胡子仁會計師陪同，該公司計畫以日本原股形式來台登錄興櫃。該公司考量日本化妝品在台灣市場接受度頗高，且台灣與中國大陸在文化、語言及地緣相通的特性，希望未來藉由開發台灣市場成功經驗，拓展到進入大陸市場。我們建議該公司未來進軍中國大陸市場，可在中科園區投資設研發中心或公司，有助其降低營運成本。



安永會計師事務所胡子仁會計師(後排右 1)陪同本訪團拜會「愛的文藝復興株式會社」人事總務部千秋賴彥部長(左 1)。



拜訪新日本有限責任監査法人(即日本安永會計師事務所,EY)渡邊力夫(右一)與前田隆夫(右二)會計師。

## 二、株式會社三化研究所

### A.公司背景

株式會社三化研究所成立於 1978 年，於 2007 年大阪証券交易所 (Osaka Security Exchange)上市，資本額約新台幣 2.2 億元，約有 106 名員工，於 2004 年設立台灣分公司，並於去年 12 月成立韓國事務所。公司主要生產 ultra fine(極細)液態與氣體化學特用品，應用於半導體、太陽能、LED 與光纖等四大領域製程材料(如化合物及觸媒等)，可少量多樣生產客製化產品，以公司營收除日本外，海外市場主要來自台灣，台灣已有半導體與太陽能廠使用該公司產品。

去年會計年度營業額約新台幣 12 億元。就應用領域而言，主要營收來自半導體業，部分來自太陽能業。在半導體材料方面，日本國內的銷售狀況不會出現大幅度的成長，而台灣市場銷售狀況良好，提升公司的整體業績；在太陽能電池材料方面，因中國市場的太陽能電池企業間不

斷在淘汰及企業重組，狀況較為複雜。另一方面，日本國內的太陽能電池生產量增加，在材料方面整體的營業額持平，不過日本國內廠商正準備提高產量。而高品質光纖材料的生產也正在進行，但由於原料費用較高，要如何增加收益是待解決的課題。

公司網站：<http://www.trichemical.com/>

公司地址：山梨県上野原市上野原 8154-217

## B. 訪談情況

在半導體材料方面，公司展望預計在智慧型手機和觸控裝置等資訊機器用的半導體材料可以帶來可觀收益，台灣市場銷售額應會繼續增加。另該公司肯定台灣半導體產業聚落與有利外商投資環境，未來將會視公司在台營運狀況，評估於科學園區設立其海外第一個生產據點，就近供貨予台灣客戶。



拜會株式會社三化研究所齊藤隆會長(左二)、  
太附聖社長(右二)、營業本部椿谷曉人副部長  
(左一)

### 三、木德神糧株式會社

#### A. 公司背景

木德神糧集團成立於 1950 年，資本額約新台幣 1.6 億元，約有 410 名員工，主要生產大米、米粉、雞肉、雞蛋、加工食品的加工及銷售，去年營業額約新台幣 345 億元。集團以「誠意與感恩之心」、「追求高品質」、「創造新價值」視為企業價值和企業理念。該集團以中國木德（大連）貿易有限公司、越南 ANGIMEX KITOKU 有限公司、美國木德美國公司、及泰國木德泰國公司 4 個網點為中心，將米製品行銷全球。

公司網站：<http://www.kitoku-shinryo.co.jp/cn/>

公司地址：東京都江戶川區西瑞江 2-14-6

#### B. 訪談情況

該公司除生產一般米外(日本 7-11 為其主要客戶)，近年來致力研發調整米製品蛋白質含量技術，鎖定慢性腎臟病（CKD）和苯丙酮尿症（PKU）等消費族群，開發具低蛋白的米類食品，於 2013 年 7 月起上市行銷全球，可將一般米蛋白質含量降低到 5%，可加惠一般罹患慢性腎臟病患所需攝取低蛋白飲食，可使患者攝取肉類和魚類等食品中同等含量的蛋白質，控制攝取蛋白質量不超標，有助病患其他營養攝取，售價約為一般米的 6 倍。

因考量中國與東南亞經濟快速增長，該公司計劃在台灣投資設廠生產和銷售的低蛋白的米類食品，由於雲林西螺米為日治時代時日本天皇指定米，我們建議可考慮於虎尾園區設廠，就近於產地取得稻米，可有效降低成本。



本局與木德神糧企畫開發室宿谷勉室長(右 2)、企畫開發室松尾隆次顧問(右 1)合影

#### 四、NanoCarrier Co., Ltd

##### A. 公司背景

成立於 1996 年，目前資本額約新台幣 37.2 億元，約有 53 名員工，半數以上為研發人員。該公司積極推動全球化合作以進行研究及臨床開發，2013 年 10 月以歐美、日本及亞洲市場為對象，進行大規模的全球招股活動，這是日本國內生技創投公司中的首例，共募得了超過 90 億日圓的資金，推動 NC-6004(順鉑膠束)在美國(肺癌)及日本(實體癌)的臨床試驗與次世代新藥開發:ADCM (藥劑和抗體膠束奈米粒子技術的融合)與 si RNA 等 (以核酸和蛋白質等高分子藥品為主)。

在次世代新藥開發方面：微粒抗體藥物複合體 (Antibody/Drug-conjugated Micelle(ADCM))是該公司成功開發出新型標靶治療藥物，將能夠鎖定癌細胞的抗體結合至膠束奈米粒子表面，此新藥將會比之前的 ADC (抗體藥物複合體)等之細胞導彈療法更加有效，傳送更多藥劑到鎖定之癌細胞。另該公司亦針對 siRNA、microRNA 等藥開發膠束化核酸藥物(NanoFect)，雖然 siRNA 等類的核酸藥物效果優良，但是一旦送至血液中，效果將會被代謝影響，迅速消失。為了要能

有效發揮藥效，必須要有一個傳導系統。該公司利用膠束奈米粒子技術，讓藥物能在血液中能保持穩定狀態，目前共開發出三種系統：

系統 A：易被細胞吸收，能有效移至細胞質內(自有技術)

系統 B：利用細胞內部的 ATP(三磷酸腺苷)釋放 siRNA(東京大學技術)

系統 C：能有效停留於血液中(東京大學技術)

公司網站：<http://www.nanocarrier.co.jp/>

公司地址：千葉縣柏市若柴 226 番地 39 中央 144 街区 15

## B. 訪談情況

該公司從 2008 年起與友華生技合作開發抗胰臟癌新藥 NC-6004(順鉑膠束)，目前以台灣、亞洲各國的胰臟癌細胞為實驗對象，進行第 3 期臨床試驗，也預期不久能進行日本和美國地區的臨床試驗。順鉑是廣泛使用於世界各地的抗癌藥劑，但具嘔吐、噁心等副作用，此外為了要抑制腎毒性，患者必須住院觀察，實驗顯示該公司產品 NC-6004 有望解決上述問題，其將藥物包覆於特殊設計過的「高分子奈米微胞」技術，經實驗證明能有效大幅降低藥物的副作用及增加療效，該技術使用更微小的分子為載體將藥物送進癌細胞而不易進入正常細胞，能夠降低副作用及增加療效與安全性，可望改善癌症病患生活品質。目前 NC-6004 在台灣已進入第 3 期臨床試驗，計有全國 11 家醫院合作參與，期望 2017 年完成試驗且 2018 年新藥上市，該公司預計今年在台灣投資興建其全球第一個癌症針劑藥廠，未來生產抗癌新藥供應全球市場。





本局與社長中富一郎博士(右三)、事業開發部長花田博幸(左一)、研究部部長內藤健一郎(右二)、海外臨床開發擔當部長高橋和展(右一)合影

## 肆、PICMET 2014 國際研討會議

「波特蘭國際工程與科技管理研討會」(PICMET)，名列國際三大科技管理會議之一，係由波特蘭州立大學(Portland State University) Maseeh College of Engineering and Computer Science所創辦，從1991年第1屆開始於美國波特蘭市舉辦以來，從2004年後成為例行年會，今年已是第16屆，PICMET會議議題兼具學術研究與產業技術管理實務，近年來，於該年會發表論文皆被收錄於EI。

PICMET今年考量服務業在已開發國家與開發中國家的經濟成長引擎與技術驅動力中扮演主導角色，且世界各地有關社會基礎架構包括能源、衛生部門、製造業、金融機構、政府和教育機構等高度依賴服務業，科技管理在服務方面運用技術以支持基礎設施建設上發揮關鍵作用，這也是目前及未來領導者在科技管理領域的一大挑戰。故本屆年會係以基礎架構與服務整合(Infrastructure and Service Integration)為主題，期盼藉科技管理議題討論有效引導相關技術進行基礎設施和服務整合，以滿足世界上的需求。

本屆年會發表386篇科技管理論文是從全世界投稿超過800篇論文中擇優接受發表，作者來自28個國家超過200個產官學研機構，會議包含下列主要討論議題：科技管理架構(Technology Management Framework)、科技策略管理(Strategic Management of Technology)、科技政策(Science and Technology Policy)等，其中黃組長代表本局於「科技政策」場次在7月30日以「中科園區中長期產業發展策略」為題發表英文演說。

在本篇論文「中科園區中長期產業發展策略」(Strategies of the Long-term Industry Development in Central Taiwan Science Park)，探討中科園區提供高科技產業良好投資環境、產業聚落形成與廠商競爭力提升等，會中有日本立命館大學三藤利雄教授詢問園區日商進駐情形及本局對日商的輔導策略，另主持人Michael J. Freiling 博士關心管理局對於園區廠商的軟性服務，進行相關意見交流。



會場留影



黃懿美組長於 PICMET 國際研討會以「中科園區中長期產業發展策略」為題發表英文演說。



黃懿美組長(左 2)與會議主持人 Michael J. Freiling 博士(左 3)、日本學者三藤利雄博士(左 1)等人合影



參加 7 月 31 日會議與主講人 Osunyomi Babasile Daniel(左 2)等人合影

另 7 月 31 日參加由德國 Fraunhofer-Gesellschaft 機構 Hans-Jörg Bullinger 博士主講 Keynote Speech 「保持成長與繁榮：成功創新者應具備特質」 (Safeguarding Growth and Prosperity: What successful innovators have in common) 與「衛生部門的科技管理」 (Technology Management in the Health Sector) 場次，其中 Fraunhofer 為歐洲最大以應用為導向之研究機構。

Bullinger 博士認為創新管理是企業核心競爭力，有助公司維持成長，公司創新因子越高，越能從中獲取更多利益，優異的創新管理能有助公司增加營業額。當所有人都專注在降低成本、裁員時，成功企業卻積極投資新技術，並精進製造高品質產品，以提供具競爭力的價格與良好服務。雖然藉由目標性、長期的創新和科技管理企圖降低風險，但是創新仍然會存在一個未知結果的風險。無論如何我們必須準備嘗試新的事物，創造以前不曾存在的價值。成功的創新者應具備以下四個特質：

- 1.明確的策略與目標
- 2.組成最佳團隊與工作環境
- 3.有成功的決心
- 4.結果可常態控制迴路(a constant control loop of results)

## 伍、心得及建議

「波特蘭國際工程與科技管理研討會」(PICMET)，名列全球三大科技管理會議之一，明年(2015 年) PICMET 年會將於 8 月 2 至 6 日假美國波特蘭市召開，建議本局同仁就園區管理經驗及科技產業政策推動成果發表論文，增加本局在國際能見度，同時藉此機會與國際科技領域產學界專家分享交流科學園區經營策略、管理與發展，增廣見聞吸取經驗，有助於推動園區創新管理。

本次招商計拜會愛的文藝復興(Love Renaissance)株式會社與 3 家日本上市公司－株式會社三化研究所、木德神糧株式會社與 NanoCarrier Co., Ltd 共 4 家潛在廠商。他們均肯定台灣完整的產業供應鏈與有利外商投資環境，同時表達未來配合其營運擬來台設立海外第 1 個生產據點，以就近服務國內高科技廠商、藉此拓展大陸市場。

行政院全球招商聯合服務中心目前提供僑外商全方位之單一服務窗口，此次所拜會木德神糧株式會社係為該中心轉介之日商，建議未來海外招商能與該中心保持聯繫，發現並拜訪有來台投資潛力之僑外商，介紹中科投資軟硬體環境、獎勵投資與產業發展現況外，並針對其個別投資問題提出說明，以加強吸引僑外商進駐中科園區。

## 陸、附件(PICMET 論文發表資料)

# Strategies of the Long-term Industry Development in Central Taiwan Science Park

Wayne Wang<sup>1</sup>, I-Mei Huang<sup>1,2</sup>, Kwoting Fang<sup>2</sup>

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<sup>2</sup>Department of Information Management, National Yunlin University of Science & Technology, Yunlin, Taiwan, R.O.C.

**Abstract**--This paper aims to explore the long-term industry development strategies of Central Taiwan Science Park (CTSP). To upgrade the technology industry in Taiwan, CTSP provides strong foundation for high tech company to enter and formulate the clusters, formulating the nature advantages and bringing the regional competitiveness.

Cluster effect strengthens the overall development of Science Park, especially connects the related industry and support the combination of internet. As for Central Taiwan Science Park, it has optoelectronics, precision machinery and integrated circuits.

By evaluating the movement of industry trends, the research benefits the study to the cooperation and competitiveness relations of Hsinchu Science Park, Southern Taiwan Science Park and Central Taiwan Science Park.

## I. INTRODUCTION

The Science park to facilitate balanced regional developments throughout Taiwan and to respond to the industrial advancement and economic boom in central Taiwan, the Executive Yuan approved the preparation proposal for the Taichung and Yunlin sites of Central Taiwan Science Park on September 23, 2002. As of the end of December, 2013, overall planning and development is nearly in nits tenth year. A total of 157 manufacturers have been approved to establish a presence at CTSP, generating a planned investment value in excess of NT\$ 2 trillion. Thereafter, 117 manufacturers completed their company and facility registration and became operational.

Thanks to fast-paced and prosperous development, the CTSP industrial cluster will team up with Hsinchu Science Park and Southern Taiwan Science Park and, through synergistic effort, successfully transform Taiwan into an island of high technology and help Taiwan become well known and respected throughout the world.

Science Park is greatly regarded as an important policy instrument to stimulate economic development. How to plan a good regional industry strategy for a science park to implement is still the issue needed to be discussed. So, the paper by making a case study of Central Science Park seeks to investigate the role of science park in the boarder economic development context such as attracting inward investment or providing support for the formation and growth of local firms. Also, this science park is at its infancy phase and begins to attract tenants or inward investment aggressively from this year. The paper will explore the process how Central Science Park identify its industrial strategy to foster regional economy growth in the future, and what it intends to do for achieving its commitment to regional development.

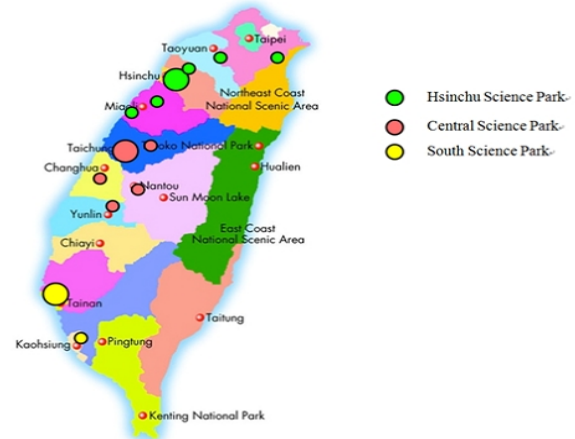


Figure 1: Three Science parks in Taiwan

## II. LITERATURE REVIEW

The literatures related to this paper can be divided into three parts: (1) the economies of scale (2) an industry cluster, and (3). innovation and entrepreneurship. These are discussed below.

### A. An Overview of the Economies of scale

Krugman [4] believe that vendors in order to achieve economies of scale, minimize transportation costs, manufacturing firms tend to have a greater market demand settled in the area , or to be close to the Commodity Production and Marketing Activity.

Krugman [4] claims that the study of economic outcomes across space and helists “familiar examples of localization” in the United States, including Silicon Valley, Route 128, and North Carolina’s Research Triangle as high tech centers, Hartford as an insurance city, Chicago as the center of futures trading, and Los Angeles as the entertainment capital.

Marshall's exposition of external economies applied to industry localization (other reasons for concentration). He summed up the industry gathered for three reasons:

The first, pooled market for workers with specific skills, the second, none-tradable specialized inputs, the third, Informational spillovers across.

Even casual observers, however, know that a large number of industrial clusters both inside and outside the United States look quite different from these “familiar examples.” In developing countries, there are rapidly growing clusters, declining clusters, and traditional and still active clusters, but the majority are what Altenburg and Mayer Stamer [6, p.1695] call “survival clusters of micro and small-scale enterprises which produce low-quality consumer



goods for local markets”.

While almost all clusters were formed spontaneously due to localization economies, their performances vary considerably in growth, productivity, product quality, profitability, employment sizes, and wage levels.

The term business cluster, also known as an industry cluster, was introduced and popularized by Michael Porter in The Competitive Advantage of nations [3]. The importance of economic geography, or more correctly geographical economics, was also brought to attention by Paul Krugman in Geography and Trade [4]. Cluster development has since become a focus for many government programs. The underlying concept, which economists have referred to as agglomeration economies, dates back to 1890, and the work of Alfred Marshall.

Michael Porter claims that clusters have the potential to affect competition in three ways: by increasing the productivity of the companies in the cluster, by driving innovation in the field, and by stimulating new businesses in the field. According to Porter, in the modern global economy, comparative advantage—how certain locations have special endowments (i.e., harbor, cheap labor) to overcome heavy input costs—is less relevant. Now, competitive advantage—how companies make productive use of inputs, requiring continual innovation—is more important[2] .

President and Chief Executive Officer, Dr. Curtis R. Carlson is known for a term known as "Carlson's Law", coined by New York Times columnist Thomas Friedman to describe Carlson's balance between autocracy and democracy in an organization: "In a world where so many people now have access to education and cheap tools of innovation, innovation that happens from the bottom up tends to be chaotic but smart. Innovation that happens from the top down tends to be orderly but dumb. Carlson (2013) made a keynote speech titled "Challenges and Opportunities for Taiwan in the Innovation Economy" in Taiwan (show in the Table 1,2 & Figure 1 ).

TABLE-1: INNOVATION ECONOMY

Innovation Economy	
Type of Innovation Economy	Example
● Driving Force for Innovation Economy	<ul style="list-style-type: none"> <li>✓ Rapid Development of Technology ( ex: Moore's Law )</li> <li>✓ Surge of Emerging Market</li> <li>✓ Intensive Global Competiveness</li> </ul>
● Opportunity for Innovation Economy	<ul style="list-style-type: none"> <li>✓ Rapid Industry Change : Shorten Life-cycle, Withdraw from Market (RCA, Bell Lab), Operation Crisis (Kodak) , New Ventures (Google, Facebook...) , Driving Transformation(IBM, HP)...</li> <li>✓ Endless Business Opportunity: Web 2.0, Web 3.0 software, cloud ware, consumer internet, wireless communication, clean energy etc.</li> </ul>

Source: Challenges and Opportunities for Taiwan in the Innovation Economy, Curtis R. Carlson, August 6, 2013

TABLE-2: ECOSYSTEM OF INNOVATION

Requirements for Innovation	
Type of Innovation Economy	Example
● A Complete Ecosystem for Innovation Contains <u>Four Elements</u>	<ul style="list-style-type: none"> <li>✓ Government,</li> <li>✓ Education,</li> <li>✓ Talent and</li> <li>✓ Ventures</li> </ul>
● Plus a Comprehensive Plan	✓ <i>Success= a comprehensive plan that is implemented</i>

Source: Challenges and Opportunities for Taiwan in the Innovation Economy, Curtis R. Carlson, August 6, 2013

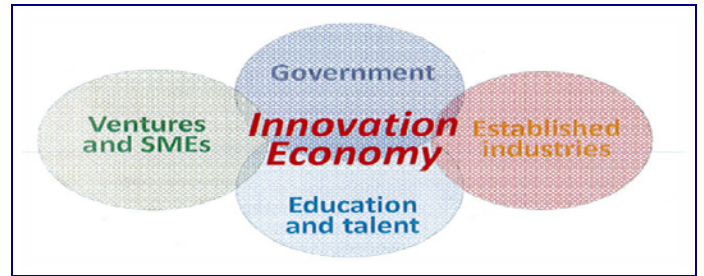


Figure 1: Ecosystem of Innovation

Source: Challenges and Opportunities for Taiwan in the Innovation Economy, Curtis R. Carlson, August 6, 2013

Put in another way, a business cluster is a geographical location where enough resources and competences amass reach a critical threshold, giving it a key position in a given economic branch of activity, and with a decisive sustainable competitive advantage over other places, or even a world supremacy in that field (e.g. Silicon Valley and Hollywood).

As of the end of 2012 in CTSP, a total of 39 manufacturers in the optoelectronics industry had been introduced, with the planned investment value to be NT\$908.4 billion, including benchmark enterprises such as AUO, TSMC Solar, Taiwan Corning, Taiwan Nitto Optical, JSR Micro Taiwan, Huga Optotech, High Power OPTO, NexPower Technology, Big Sun Energy, Genius Electronic Optical, and Taiwan Ohara Optical. As these domestic and international heavyweight optoelectronics manufacturers and upstream material suppliers establish their presence at CTSP, the complete upstream, midstream, and downstream optoelectronics industrial chain has steadily taken shape.

In addition, precision machinery has always been a key industry for CTSP and also the industry with the most manufacturers introduced to the Park at present, 48 manufacturers in total. The investment value is expected to be NT\$45.13 billion. The manufacturers are heavyweights in the production of optoelectronics and integrated circuit machinery and equipment, parts, and machine tools. They can help improve product processing precision and accordingly the additional value of the final product. In addition, the advantageous location favors supply of production equipment to the optoelectronics and IC industries to greatly reduce production cost and significantly increase competitive advantages, contributing to the formation of the world's topnotch precision machinery cluster.

As for the IC industry, there are currently 7 companies already based in the Park, including TSMC, Winbond,

Rexchip, SPIL, Dainippon Screen, and Applied Materials, accounting for as much as NT\$1.095 trillion in planned investment. Among these manufacturers, a total of 6 Fab 12 plants from TSMC, Winbond, and Rexchip have already been commissioned for mass production while another 2 Fab 12 plants are currently under construction. TSMC will continue to further expand its Fab 12 and Fab 18 plants in the future and enhance its production technology and capabilities. CTSP is well-positioned to become the world's next leading IC hub.

In terms of the biotech industry, there are a total of 21 companies, including Adimmune Corporation, Microware Precision, GeneReach, Singen Animal Health, Orient Pharma, and Yushen Biotechnology, that plan to invest up to NT\$5.42 billion in products including vaccines, pharmaceuticals, medical devices, and diagnostics reagents. They will help consolidate biotech manufacturers in central Taiwan and drive the formation of a biotech industrial cluster.

In addition, to substantially support the operation, management and technological requirements of the scientific industry, there are currently 10 utilities companies based at CTSP. For gas supplies, there are the Air Liquide Far Eastern, UIGC, Air Products San Fu, and Lien Hwa Commonwealth, 4 companies in total. As far as warehousing and logistics are concerned, there is the Central Taiwan Science Park Logistics Co., Ltd. Canon Semiconductor also established its presence in CTSP to provide IC and flat panel display manufacturers with manufacturing equipment maintenance and service. Sungen Power Corp. also has a presence in CTSP, and engages in solar power generation.

In terms of the computers and peripherals industry, there are currently 13 manufacturers, including Fomex Technology, Fulltech Fiber Glass, Bolymin, Jinco, Daiwoo, and Bigbest Solutions. For the telecommunications and digital content industries, there are the INPAQ and Info-Link Services.

### *C. An Overview of innovation and entrepreneurship*

Innovation and Entrepreneurship by the 1980s, one of America's trademark fields, heavy industry, had been losing ground for at least two decades. Further, deregulation had gained momentum in the late 1970s, and by 1980, President Carter began deregulating industries from trucking to airlines to railroads. All combined, the external environment demanded that American management shift its thinking toward a more innovative, entrepreneurial approach to business.

Halfway through the 1980s, three fourths of America's 113 million workers earned their living providing services and establishing what would soon become known as the service industry. By the end of the 80s, entrepreneurship had taken off, and American managers were finally getting comfortable having shifted their focus from products to processes and from quantity to quality. It wasn't just happening in America. All across the world industries were undergoing transformation, which forced companies to begin laying the foundation for a new breed of innovation.

Peter Drucker's 1985 book to present innovation and

entrepreneurship as a purposeful and systematic discipline that explains and analyzes the challenges and opportunities of America's new entrepreneurial economy. Superbly practical, Innovation and Entrepreneurship explains what established businesses, public service institutions, and new ventures need to know and do to succeed in today's economy.

Right in the thick of the decade's advances, Drucker's 1985 book on innovation and entrepreneurship championed "specifically entrepreneurial" strategies that Drucker described as important, distinct and different. They were aimed at breaking down the barriers to change that often discouraged CEOs. Resistance to change was a company's worst enemy in the 1980s, yet change was becoming increasingly unavoidable.

Peter Drucker claims innovation and entrepreneurship as purposeful and systematic discipline which explains and analyzes the challenges and opportunities of America's new entrepreneurial economy. A superbly practical book that explains what established businesses, public survey institutions, and new ventures have to know, have to learn, and have to do in today's economy and marketplace.

Looking into the tenth year, we are expecting a "new" CTSP. "New" here is a synonym of "innovative". The current focus in the business circle is to constantly innovate in order to create high return for companies. As such, the operational strategies of CTSP will also shift from being efficiency-oriented to being innovation-oriented. We will take advantage of the superior industrial foundation laid in the past to transform industries to focus on technological innovation, help them break through by creating new niche for the technology industry, and enable steady developments of both science and technology to accordingly keep Taiwan competitive in terms of technological prowess, gradually realize the vision of "Highly Productive Taiwan, work together with the National Science Council to gradually realize the vision of "A Highly Productive Taiwan, Highest Leverage in the World", and create new opportunities for industries and the economy.

In the past, the Science Park is focus on efficiency. Facing with the competitiveness from China and Korea, we will continue to keep progress in innovation and entrepreneurship.

### III. METHODOLOGY

This study is based on the results from three phases of research studies for the of industry development strategies carried out by using the secondary data analysis method.

According to the research goals stated above, we want to find all relevant materials across the whole project scope as long as they are collected from unbiased sources. This study includes the following three research phases.

#### *Phase I: A Critical Review of Investment Environment*

This section offers a critical review of extant research on Investment Environment Creation. The purposes of this article are to use the secondary data analysis to summarize



information about the relationship between investment environment and subjective well-being and to assess the strengths and weaknesses of the secondary data analysis as a mode of research synthesis.

CTSP try to build a better quality investment environment in five science park bases in order to successfully attract international companies' investment (show in figure 2).

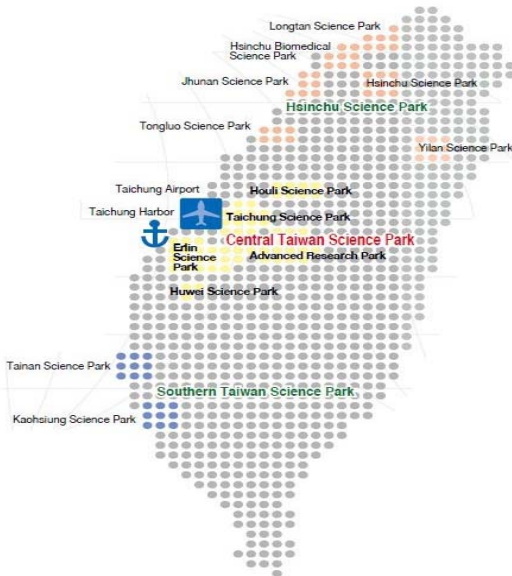


Figure 2: The Central Science park in Taiwan

After the successful introduction of international magnates such as TSMC, upstream, mid-stream, and downstream manufacturers and foreign companies have actively followed suit to establish their presence, resulting in the current shortage of land at CTSP. Besides the existing Taichung Park of 466 hectares, Huwei Park of 97 hectares, and Houli Park of 255 hectares, the Erlin Park of 631 hectares whose construction is ongoing and the Zhongxing New Village Advanced Research Park of 259 hectares whose construction began in 2011 will all be included as the hinterland of CTSP. The overall area of development will reach around 1,708 hectares.

The Public Facilities in CTSP emphasis on quality and quantity of power and water supplies are excellent at the CTSP's Taichung Park of the CTSP. Such as an administrative management and a business center, a residential area, electric power telecom line facilities, detention ponds, wastewater processing facilities, parking lots, a scenic park greenbelt, roads and traffic facilities, etc. It is expected to provide not only a pleasant working environment for all personnel, but also a good place for the public to spend their leisure time.

#### 1. Taichung Park: A New Center to Prosper in Central Taiwan

Taichung Park is located on the border between Daya District and Xitun District of Taichung City, with an area of 466 hectares and a highway system connecting Freeway 1, Freeway 3, and Taichung-Changhua Expressway. It is 9.2 km

from the Wurih Station of Taiwan High Speed Rail and adjacent to the Port of Taichung and Qingquangang Airport, with convenient air, sea, and land transportation access. The overall core planning for the park featured the dual track of "sustainable development" and "preservation of local look" for its adequate location, favorable climate, and adjacent urban functions, among other environmental advantages to create a green park that attracts the technology industry and talent for permanent settlement.

#### 1). Standardized Facilities:

There are employee cafeterias and Mega International Commercial Bank to offer dining and financial services.

#### 2). Business Services Building:

In order to provide manufacturers and employees at CTSP with various business services, the Administration has introduced related service providers as follows:

There are currently banks, CTSP employee clinic, employment service center, post office, transfer station, Convenience Store, among others, available on the first floor of the building. The CTSP employee clinic is organized by the China Medical University Hospital medical team and offers employees at CTSP and residents in adjacent villages and neighborhoods with quality healthcare services featuring both western medicine and traditional Chinese medicine. The employment service center is in charge of finding outstanding employees for CTSP and plays a crucial role in driving corporate growth and industrial developments. The transfer station offers transfer and shuttle services among the Taiwan High Speed Rail Station, Xitun residential district, the Houli Science Park, and National Experimental High School at Central Taiwan Science Park. The post office is like any other post office. It has mail boxes for rent and other functions such as savings, withdrawal, and passbook entry, ATM, mail pickup, sales of freeway toll tickets, and various commodities, etc. The 0.02 Convenience Store on the other hand, sell daily necessities and provide shopping and dining services.

#### 2. Huwei Park: Up-and-Coming Technological Center

The Huwei Park is located in the northwest of Huwei Township of Yunlin County and spans 97 hectares in area. The adjacent area on its eastern side is designated for a Taiwan High Speed Rail station that is expected to be completed in July 2015. With the Taiwan High Speed Rail community, it will be able to quickly develop into a green park and community that is both healthy and functional in the future. Its industrial strength is expected to be splendid and promising.

#### 3. Houli Park: Technology Town of Tomorrow

The Houli Park is located in Houli District of Taichung City. It is about 11 km from the Taichung Park and close to the Fengyuan commercial district. Among the total area of 255 hectares, 148 hectares are meant to be used for industries only. Generally speaking, Houli and Qixin are the two

primary sites. They are located on the south and north sides of the urban planning area in Houli District. They target primarily manufacturers in the photovoltaic industry in order to integrate local industrial resources in Houli District and create economic prosperity.

#### 4. Erlin Park: Transforming Hub for Precision Machinery Industry

The Erlin Park is located in Erlin Township of Changhua County, around 6.3 km to the west of the Yuanlin Interchange of Freeway 1. The site encompasses the Wanxing Farm and Dapaisha Farm of Taiwan Sugar and spans 631 hectares in area. The area assigned exclusively to park utilities consists 350 hectares. The park primarily targets the precision machinery industry.

#### 5. Advanced Research Park: Research and Development Engine for Taiwan

The Advanced Research Park is located in the northwest of Nantou County, four km from Caotun and six km from Nantou City. It is part of the urban planning area for Zhongxing New Village (including Nanneilu) in Nantou County. The total area of the park is 259 hectares. In addition to existing administration-oriented operations, the park primarily focuses on the cultural creative industry and high-tech research and development.

#### *Phase II: A Critical Review of Public Services*

This section offers a critical review of extant research on public services quality. The purposes of this article are to use the secondary data analysis to summarize information about the relationship between public services quality and subjective well-being and to assess the strengths and weaknesses of the secondary data analysis as a mode of research synthesis.

The CTSP Administration is the authority responsible for Park construction and administration. In order to consolidate one stop window services and enhance administrative efficiency for applications submitted by manufacturers, the Administration proactively engaged itself in obtaining authorization in handling multiple services that help expedite business registrations. Business services that are currently available include company and manufacturing facility registration, tax deduction, personal property endorsement, employment permit for foreign professionals, online completion and submission of annual statements, and regulatory counseling.

##### 1. One-Stop Service:

The One-Stop Service aims to simplify and integrate the service flow in administration for the CTSP enterprises. It includes investment recruitment, labor administration, business service, environmental protection, security protection, etc. CTSP also continues to invite various services to set up their offices in the Park to satisfy industrial and commercial service, such as customs, power,

telecommunication companies, post office, banks, park associations, employment service center, customs brokers, and Central Taiwan Science Park Logistics Co., Ltd. etc. The Central Taiwan Science Park Logistics Co. offers warehousing, import/export pallets, customs, and transport services along with integrative logistics planning, etc.

Most enterprises currently based at CTSP are high-tech manufacturers whose throughput is constantly changing and innovating. In order to increase environmental protection permit documentation efficiency, the Administration offers one-stop window services in the review of fixed pollutants, water pollution sources, and waste clearing protocols. This helps manufacturers complete submission of documents, review, and regulatory counseling at one stop too.

##### 2. E-Park Information Infrastructure and Service:

In order to boost the efficacy in promoting CTSP to the outside world to facilitate expanded operations and provide more convenient public services, the Administration took extra care to introduce various public facilities at CTSP such as a transportation map on the official CTSP website, interactive 3D office building guided tour, bike trails, and free park-wide shuttle bus. Meanwhile, email is available to facilitate real-time petitions and suggestions / communication from the general public.

For the purpose to satisfy innovation requirements of people and enterprises here, the Administration not only expanded various equipment -- such as related hardware servers and enhanced system backup mechanisms -- but also utilized modern information technology to realize real-time online interactive operations. Meanwhile, we continue to promote e-administration and operations for the ultimate goal of making CTSP a quality science park with rich information flows and sustainable management in the high-tech industry.

Important and substantial accomplishments in terms of information for the past few years include the complete deployment of the ADSL broadband network among the three park areas in Taichung, Huwei, and Houli, i-Taiwan in public areas for ordinary users, and WIMAX jointly configured by the Taichung Science Park and the Institute for Information Industry. Meanwhile, a fee-saving mechanism for landline telephones and mobile phones has been adopted to cut down on telecommunications costs. In addition to the original FTTB and the exclusive line for external networks, the Administration added the national high-speed network exclusive line. It is meant to enhance the bandwidth of the Administration's external network and the backup safety mechanism.

Moreover, to help manufacturers complete related applications, streamline administrative procedures, and enhance the administrative efficiency, the Citizen Digital Certificate and Industry and Commerce Certificate are introduced to further perfect the online declaration process and make it even safer.

In response to the National Science Council's effort to expedite restoration of information at its affiliate agencies, we

planned integration of information among individual park areas by promoting the online integrated official document management system, paperless online sign-off operation, and client-end common information system among the National Science Council and the three park areas. The shared information resources are meant to enhance service quality and also contribute to environmental protection.

### 3. Emphasizing Service Quality for Enhanced Satisfaction with CTSP-based Manufacturers:

In order to have fair, objective, and consistent rating indicators with regard to the service quality of individual park administrations (at Hsinchu Science Park, Central Taiwan Science Park, and Southern Taiwan Science Park) and urge the administrations to pay attention to satisfaction among people they serve for the ultimate goal of improving service quality, the National Science Council authorizes a professional survey company each year to perform the satisfaction survey. In 2012, the survey company completed a survey of 86 manufacturers at CTSP which included on-site visits and interviews. In addition, the Administration also inspected manufacturers when their facilities became operational, including proactive visits to manufacturers already based at CTSP. We visited a total of 93 manufacturers in 2012. In addition to understanding the individual needs of the manufacturers in depth and providing them with related assistance and services, we also held instructive sessions which detailed CTSP's operations. We provided immediate responses to questions posed by participating manufacturers and followed up on subsequent developments in order to enhance the overall satisfaction level of manufacturers based at CTSP.

### *Phase III: Shaping industry clusters*

The purposes of this article are to use the secondary data analysis to figure out that Industry clusters involving tight connections that bind supply chain firms and industries together in various aspects of demand inquiry, geographic location, sources of innovation, shared suppliers and factors of production, and so forth.

The CTSP has been shaped by the six major industry clusters, including IC, Optoelectronics, Computers & peripherals, Precision machinery, Biotechnology and Other industries. (Table 4 exhibits the 2013 Top Six Industrial Export Trade Statistic).

### 1. The IC industry:

As for the IC industry, there are currently seven companies already based in the Park, including TSMC, Winbond, Rexchip, SPIL, Dainippon Screen, and Applied Materials, accounting for as much as NT\$1.095 trillion in planned investment. Among these manufacturers, a total of six Fab 12 plants from TSMC, Winbond, and Rexchip have already been commissioned for mass production while another two Fab 12 plants are currently under construction. TSMC will continue to further expand its Fab 12 and Fab 18 plants in the future and enhance its production technology and capabilities. CTSP is well-positioned to become the world's next leading IC hub.

### 2. The Optoelectronics industry:

As of the end of 2013, a total of 39 manufacturers in the photovoltaic industry had been introduced, with the planned investment value to be NT\$908.4 billion, including benchmark enterprises such as AUO, TSMC Solar, Corning Taiwan, Taiwan Nitto Optical, JMW, HugaOptotech, HPO, NexPower, Big Sun Energy, Genius Electronic Optical, and Ohara Taiwan. As these domestic and international heavyweight photovoltaic manufacturers and upstream material suppliers establish their presence at CTSP, the complete upstream, midstream, and downstream photovoltaic industrial chain has steadily taken shape.

### 3. Computers & peripherals

In terms of the computers and peripherals industry, there are currently 13 manufacturers, including Fomex Technology, Fulltech Fiber Glass, Bolymin, Jinco, Daiwoo, and Biggest Solutions. For the telecommunications and digital content industries, there are the INPAQ and Info-Link Services.

### 4. The precision machinery industry:

In addition, precision machinery has always been a key industry for CTSP and also the industry with the most manufacturers introduced to the Park at present, 48 manufacturers in total. The investment value is expected to be NT\$45.13 billion. The manufacturers are heavyweights in the production of photovoltaic and integrated circuit machinery and equipment, parts, and machine tools. They can help improve product processing precision and accordingly the

TABLE-4:2013 TOP SIX INDUSTRIAL EXPORT TRADE STATISTICS

Industry	Export volume		Import volume		Gross trade volume	
	2013	Growth rate (%)	2012	Growth rate (%)	2013	Growth rate (%)
IC	332.2	10.53	1,453.16	131.39	1,785.36	92.27
Optoelectronics	1,672.04	10.12	491.47	-11.68	2,163.51	4.27
Computers & peripherals	11.62	2.38	6.32	-50.48	17.94	-25.59
Precision machinery	60.46	0.92	17.35	-25.57	77.81	-6.50
Biotechnology	1.03	6.54	1.63	272.63	2.66	89.61
Other	2.39	283.40	4.90	-50.89	7.29	-31.33
Total	2,079.74	9.93	1,974.83	60.43	4,054.57	29.84

additional value of the final product. In addition, the advantageous location favors supply of production equipment to the photovoltaic and IC industries to greatly reduce production cost and significantly increase competitive advantages, contributing to the formation of the world's topnotch precision machinery cluster.

#### 5. The biotech industry:

In terms of the biotech industry, there are a total of 21 companies, including ADImmune Corporation, Microware Precision, GeneReach, Shin-Yuan Chemical & Pharmaceutical, Orient Pharma, and Yusheng Pharmaceutical, that plan to invest up to NT\$5.42 billion in products including vaccines, pharmaceuticals, medical devices, and diagnostics reagents. They will help consolidate biotech manufacturers in central Taiwan and drive the formation of a biotech industrial cluster.

#### 6. Other

In addition, to substantially support the operation, management and technological requirements of the scientific industry, there are currently ten utilities companies based at CTSP. For gas supplies, there are the Air Liquide Far Eastern, UIGC, Air Products San Fu, and Lienguo Medical Gas, four companies in total. As far as warehousing and logistics are concerned, there is the Central Taiwan Science Park Logistics Co., Ltd. Canon Semiconductor also established its presence in CTSP to provide IC and flat panel display manufacturers with manufacturing equipment maintenance and service. Sunken Power Corp. also has a presence in CTSP, and engages in solar power generation.

### IV. FUTURE TRENDS

*A vision for the Future of Transforming and Innovative Spearheading and Pace-setting.*

In the past, the Science Park is focus on efficiency. Facing with the competitiveness from China and Korea, we will continue to keep progress in innovation and entrepreneurship, transforming and innovative spearheading and pace-setting in the near future.

In addition, Internationalization and enhanced international influence have been two of the goals that the Administration has proactively devoted itself to over the course of developing the CTSP. To accomplish these goals, the Administration has been proactively promoting collaboration between domestic and international manufacturers, conducting visits and exchanges, recruiting international businesses, and seeking accession to world-class science park organizations and associations. The hope is to expedite the upgrade of industries in CTSP and help it become one of the international science parks through technical collaboration and transfer, both domestically and internationally.

Now the Administration of CTSP assisting young and start-up high technology companies with their business plans

access to finance and helping them to overcome general business and growth problems as they arisen.

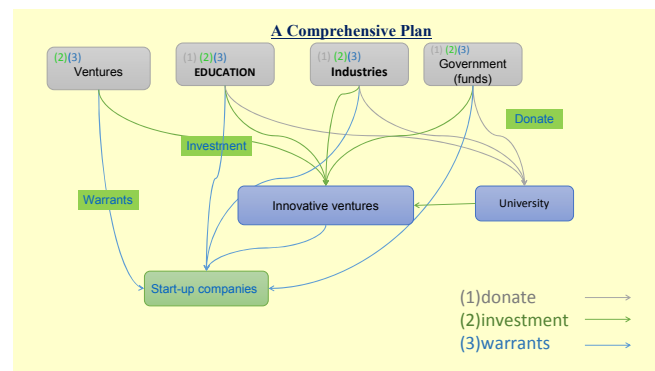


Figure 3: A Comprehensive Plan

#### *B. A Vision for the Future of Park Transformation for New Heights*

In early 2012, the photovoltaic industry experienced changes, and the Kuokuang Petrochemical Project was canceled. Both of these events impacted the Dadu Weir development plan. Long-term water supplies for the Erlin park also suffered significant changes. As such, the Executive Yuan instructed on the organization of and preparations for modifications to the development plan for the Erlin park on April 18. The revised protocol was approved on July 13. Having taken into consideration the overall environmental changes, local prosperity, industrial needs, and friendliness to the environment, the transformational plan re-tailored the Erlin park into a green science park that features minimum water consumption and reduced emissions, and serves as an important hub for the precision machinery industry. This will help realize the vision of having an industrial innovation corridor that connects Taichung, Changhua, and Nantou.

#### *C. A Vision for the Future of CTSP Halo Endless Prosperity*

2013 marks the tenth anniversary of CTSP. Over the past nine years, five sites, Taichung, Huwei, Houli, Erlin, and the Advanced Research Park were developed one after another, with the total area coming to 1,708 hectares. There are currently 140 high-tech manufacturers based in CTSP. The planned investment value is NT\$2056.4 billion. They offer nearly 29,000 job openings. Besides the said quantitative results, CTSP has also become a quality leader in high-tech developments in central Taiwan. It is playing an important role in industrial transformation and upgrade.

2013 is positioned to be the business recruitment year for the Erlin Science Park of CTSP. The science park's transformation plan was approved by the Executive Yuan last year and will be developed to feature low water consumption and low emission industries. Its environmental impact assessment results were deliberated and approved by the Environmental Protection Administration on February 04. The water issue has also been resolved. It will be an optimal

site for domestic and international high-tech manufacturers. 2013 will be a fruitful year in terms of business recruitment. On the other hand, besides introducing high-tech research and development, the Advanced Research Park will also feature the cultural creative industry. The CTSP Administration will promote the science park as a new cluster for cultural and creative industries in central Taiwan.

Ten years mark an important milestone. Looking into the tenth year, we are expecting a "new" CTSP. "New" here is a synonym of "innovative". The current focus in the business circle is to constantly innovate in order to create high return for companies. As such, the operational strategies of CTSP will also shift from being efficiency-oriented to being innovation-oriented. We will take advantage of the superior industrial foundation laid in the past to transform industries to focus on technological innovation, help them break through by creating new niche for the technology industry, and enable steady developments of both science and technology to accordingly keep Taiwan competitive in terms of technological prowess, gradually realize the vision of "Highly Productive Taiwan, work together with the National Science Council to gradually realize the vision of "A Highly Productive Taiwan, Highest Leverage in the World", and create new opportunities for industries and the economy.

## V. CONCLUSION

The goal of this research was to carry out the prior strategy of government agencies devoted to domestic and international business recruitment efforts. It is active in searching for potential high-tech manufacturers and helps them understand the overall investment environment at CTSP so that they feel confident in making investments and establishing a presence.

In addition, the One-Stop Service aims to simplify and integrate the service flow in administration for the CTSP enterprises. the One-Stop Service development through the wider use of information technology and to offer guidelines for handling government affairs online in order to improve administrative efficiency and raise the quality of public service. Moreover, the findings of this research can help government agencies reform civil servants' operating procedures and re-engineer the handling of public business so as to take advantage of modern computer and network communications technology in the Science Park, in the view point on bring in the regional competitiveness, thereby making other local government agencies dramatically more flexible and responsive, accelerating service speed, extending service time, broadening geographical service scope, enriching service options, and lowering costs.

This paper figured out that although capital for property is the most visible cost, there is another important component of cost - the management of the Science Park. The management function involves:

- Securing resources for the development of the Science Park;

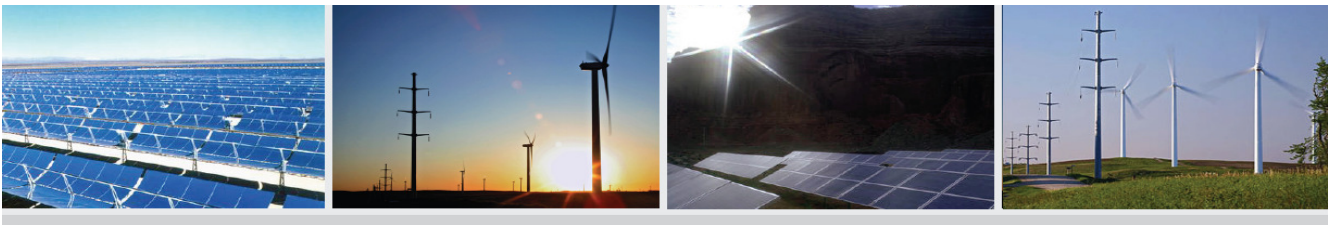
- Promoting the Science Park and identifying and securing the tenant companies;
- Providing the all important links between Tenant companies and University;
- Assisting young and start-up high technology companies with their business plans access to finance and helping them to overcome general business and growth problems as they arise;
- Management of the land and buildings on the Science Park;
- Planning the Science Park and its strategy and making investment decisions;

When the government first contemplates a Science Park, initial thoughts may centre on objectives and potential benefits, but it will not be long before thoughts are concentrated on how to resource the Science Park in terms of land, capital for infrastructure and buildings and ongoing revenue considerations. These financial considerations often determine the nature of the formal relationships in the creation of the Park.

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# Strategies of the Long-term Industry Development in Central Taiwan Science Park

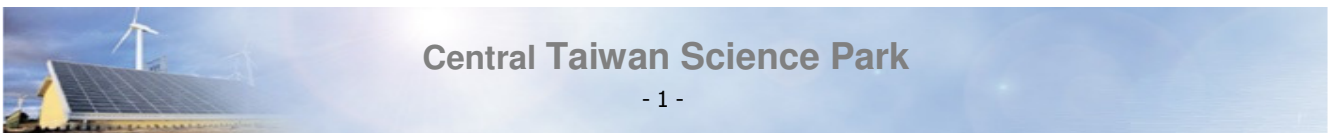
Presenter

**I-Mei Huang**, Director, Investment Division, Central Taiwan  
Science Park Bureau , Ministry of Science and Technology.

Wayne Wang, Director General, Central Taiwan Science  
Park Bureau , Ministry of Science and Technology.

Kwoting Fang , Professor, Department of Information  
Management, National Yunlin University of Science &  
Technology

PICMET July-30-2014  
Kanazawa, Japan



## Outline

### 1. Introduction

### 2. Literature Review

**An Overview of the Economies of scale**

**An Overview of the Industry Cluster**

**An Overview of the Innovation and Entrepreneurship**

### 3. Methodology

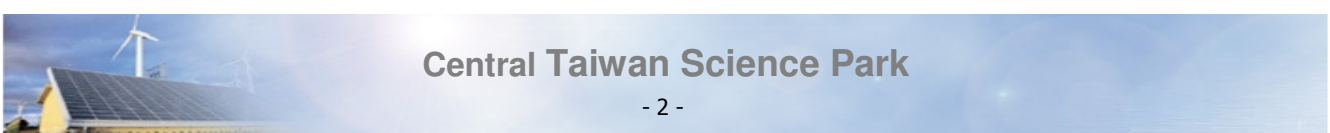
**Phase I: A Critical Review of Investment Environment**

**Phase II: A Critical Review of Public Services**

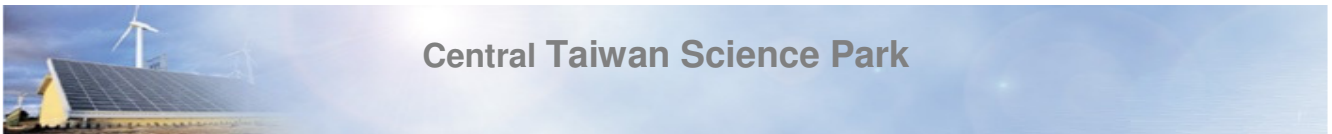
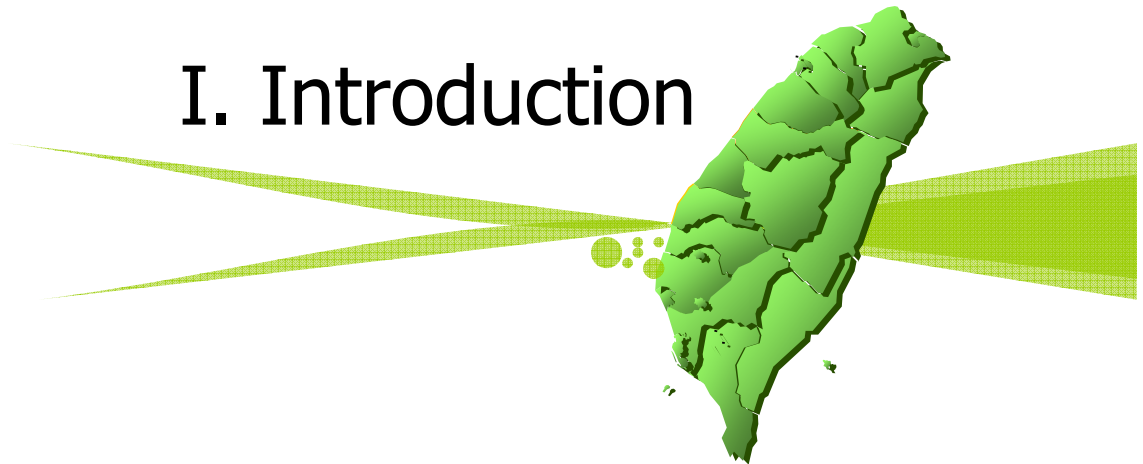
**Phase III: Shaping industry clusters**

### 4. Future Trends

### 5. Conclusion

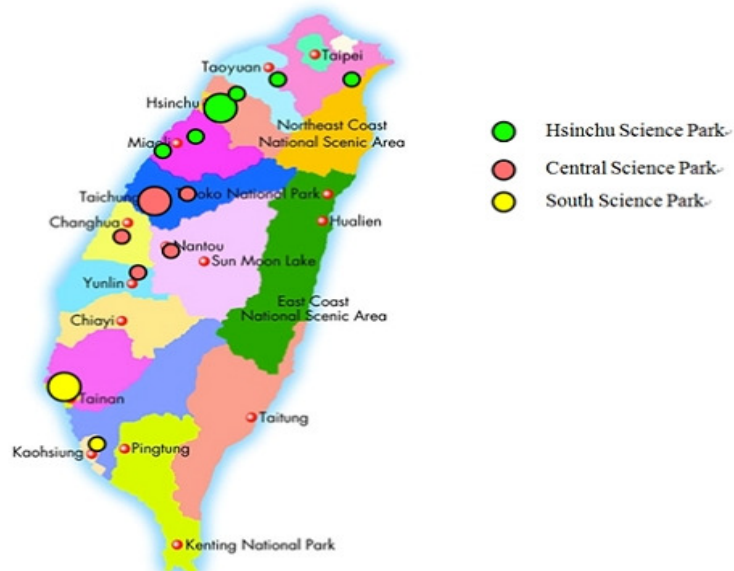


# I. Introduction



## I. Introduction

- CTSP industrial cluster will team up with Hsinchu Science Park and Southern Taiwan Science Park
- Taiwan transform into an island of high technology



# Science Parks Nowadays in Taiwan



**Hsinchu Science Park**



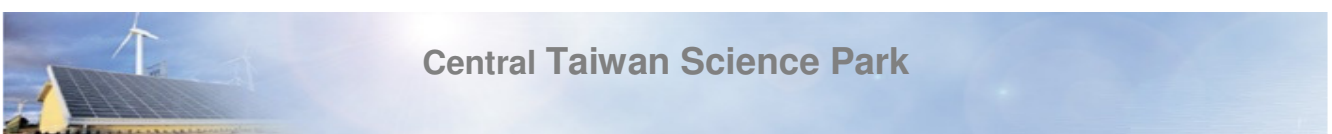
**Southern Taiwan Science Park**



**Central Taiwan Science Park**

## I. Introduction

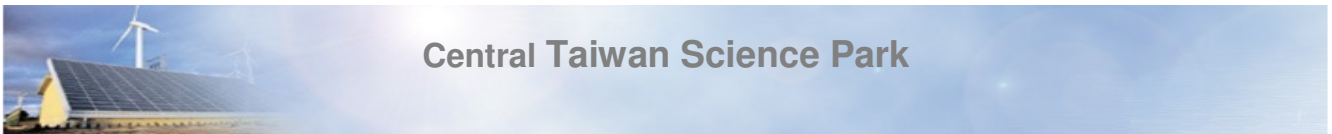
- Science Park is an important policy instrument to stimulate economic development.
- A case study of Central Science Park seeks to investigate the role of science park in the boarder economic development context.
- The paper will explore the process how Central Taiwan Science Park identify its industrial strategy to foster regional economy growth in the future .
- what it intends to do for achieving its commitment to regional development.



**Central Taiwan Science Park**



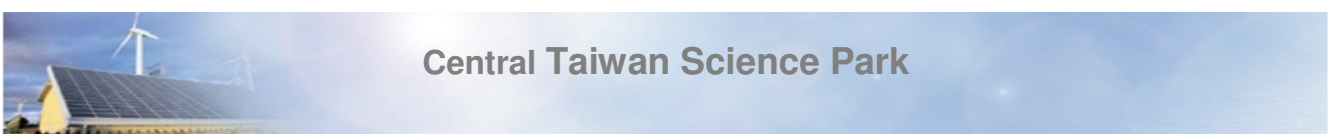
## II. Literature Review



## II. LITERATURE REVIEW

### (1). The Economies of Scale

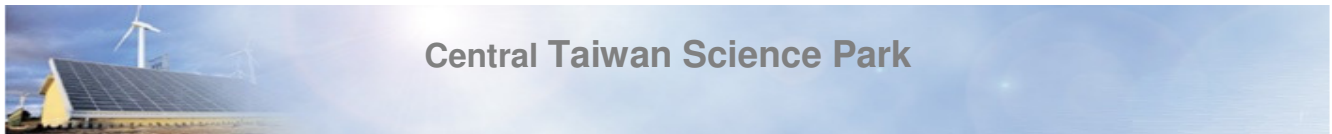
- Krugman(1991) claims that the study of economic outcomes across space and helists "familiar examples of localization" in the United States .-Silicon Valley, Route 128, and North Carolina's Research Triangle as high tech centers, Hartford as an insurance city, Chicago as the center of futures trading, and Los Angeles as the entertainment capital.
- Marshall's exposition of external economies applied to industry localization & concentration. He summed up the industry gathered for three reasons: pooled market for workers with specific skills, the second, none-tradable specialized inputs, the third, Informational spillovers across.
- All clusters were formed spontaneously due to localization economies, their performances vary considerably in growth, productivity, product quality, profitability, employment sizes, and wage levels.



## II. LITERATURE REVIEW

Innovation Economy	
Type of Innovation Economy	Example
● Driving Force for Innovation Economy	<ul style="list-style-type: none"> <li>✓ Rapid Development of Technology ( ex: Moore's Law )</li> <li>✓ Surge of Emerging Market</li> <li>✓ Intensive Global Competiveness</li> </ul>
● Opportunity for Innovation Economy	<ul style="list-style-type: none"> <li>✓ Rapid Industry Change : Shorten Life-cycle, Withdraw from Market (RCA, Bell Lab), Operation Crisis (Kodak) 、 New Ventures (Google, Facebook...) 、 Driving Transformation(IBM, HP)...</li> </ul>
	<ul style="list-style-type: none"> <li>✓ Endless Business Opportunity: Web 2.0, Web 3.0 software, cloud ware, consumer internet, wireless communication, clean energy etc.</li> </ul>

Data From: Challenges and Opportunities for Taiwan in the Innovation Economy,  
Curtis R. Carlson, August 6, 2013.

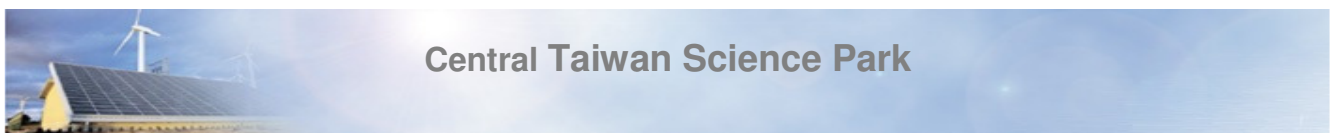


Central Taiwan Science Park

## II. LITERATURE REVIEW

Requirements for Innovation	
Type of Innovation Economy	Example
● A Complete Ecosystem for Innovation Contains <u>Four Elements</u>	<ul style="list-style-type: none"> <li>✓ Government,</li> <li>✓ Education,</li> <li>✓ Talent and</li> <li>✓ Ventures</li> </ul>
● Plus a Comprehensive Plan	<ul style="list-style-type: none"> <li>✓ <i><u>Success= a comprehensive plan that is implemented</u></i></li> </ul>

Data From: Challenges and Opportunities for Taiwan in the Innovation Economy,  
Curtis R. Carlson, August 6, 2013.



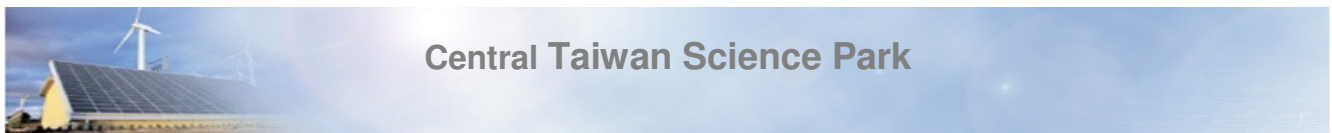
Central Taiwan Science Park

## II. LITERATURE REVIEW

### (2). Industry clusters

Clusters have the potential to affect competition in three ways (Michael Porter, 1998):

- . Increasing the productivity of the companies in the cluster,
- . Driving innovation in the field, and
- . Stimulating new businesses in the field.



## II. LITERATURE REVIEW

"In a world where so many people now have access to education and cheap tools of innovation, innovation that happens from the bottom up tends to be chaotic but smart. Innovation that happens from the top down tends to be orderly but dumb " (Carlson, 2013).

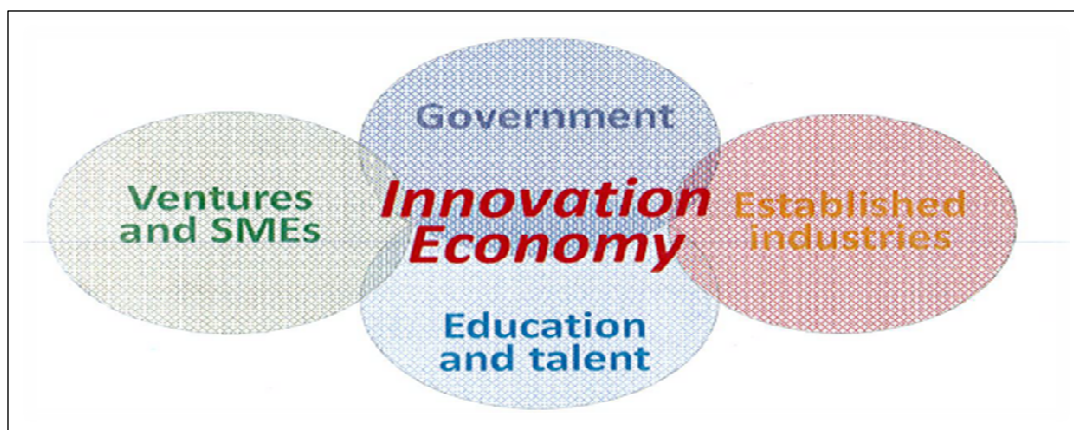


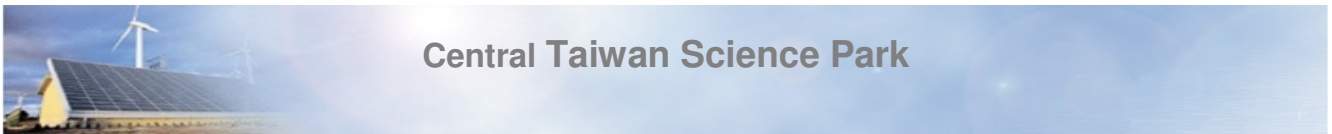
Figure 1: Ecosystem of Innovation

Data From: Challenges and Opportunities for Taiwan in the Innovation Economy,  
Curtis R. Carlson, August 6, 2013

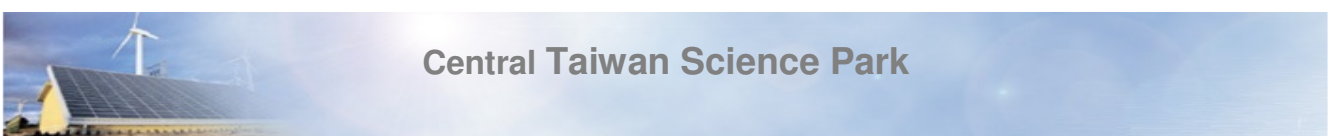
## II. LITERATURE REVIEW

### (3). Innovation and Entrepreneurship.

- Peter Drucker's 1985 book to present innovation and entrepreneurship as a purposeful and systematic discipline that explains and analyzes the challenges and opportunities of America's new entrepreneurial economy.
- Superbly practical, Innovation and Entrepreneurship explains what established businesses, public service institutions, and new ventures need to know and do to succeed in today's economy.



## **III. METHODOLOGY**



# Research subjects

This study is based on the results from three phases of research studies for the of industry development strategies carried out by using the [secondary data analysis method](#).

- **Phase I:** A Critical Review of Investment Environment
- **Phase II:** A Critical Review of Public Services
- **Phase III:** Shaping industry clusters



## **Phase I:** A Critical Review of Investment Environment

- This section offers a critical review of extant research on Investment Environment Creation.
- The purposes of this article are to use the secondary data analysis to summarize information about the relationship between investment environment and subjective well-being and to assess the strengths and weaknesses of the secondary data analysis as a mode of research synthesis.



# Five science park bases in CTSP

- CTSP built a better quality investment environment in five science park bases in order to attract international companies' investment.

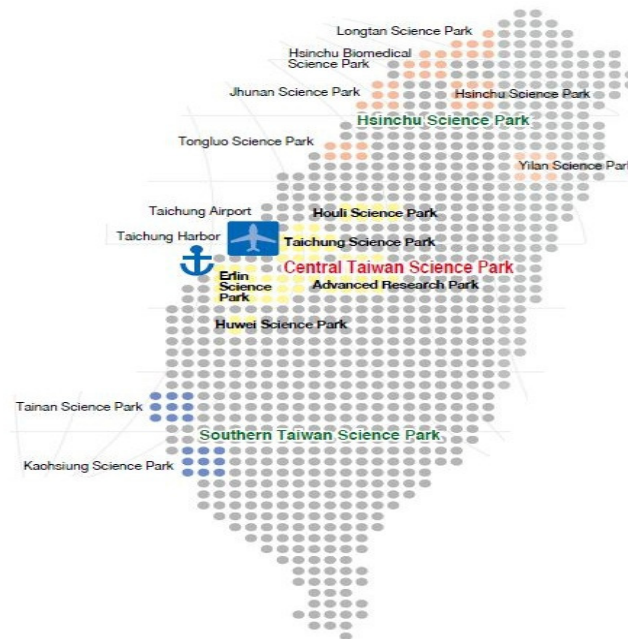
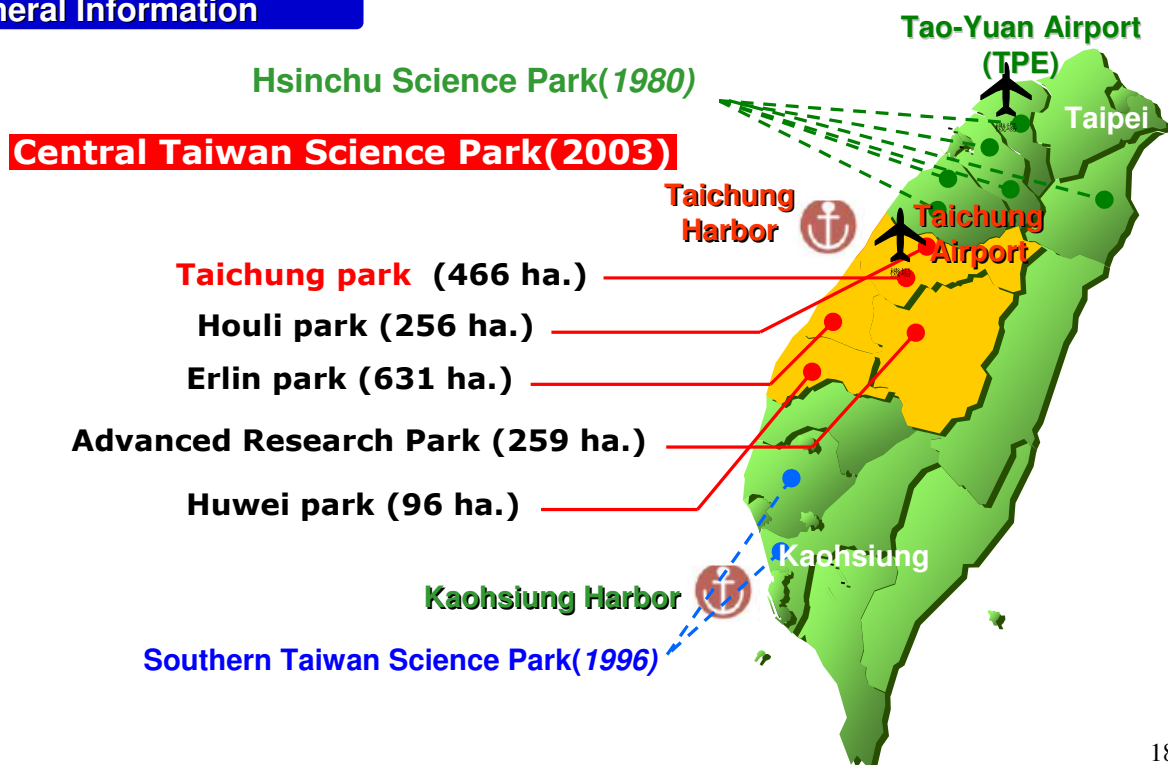


Figure 2: The Central Science park in Taiwan

## Overview of CTSP

### General Information

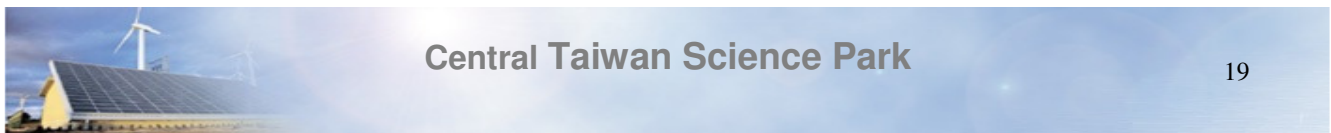




## Overview of CTSP

### A Glance at CTSP

- **Location:** The Taichung park is almost equidistant from *Taipei* and *Kaohsiung* (1 hr travel time by High Speed Railway(HSR)).
- **Area:** 1,708 hectares (5 parks).
- **Entry-Approved Companies** : 161.
- **Tenant Companies:** 120.
- **Employment Population:** 31,256.
- **Sales Revenue:** US\$15.08 billion (2013)



## Park Introduction

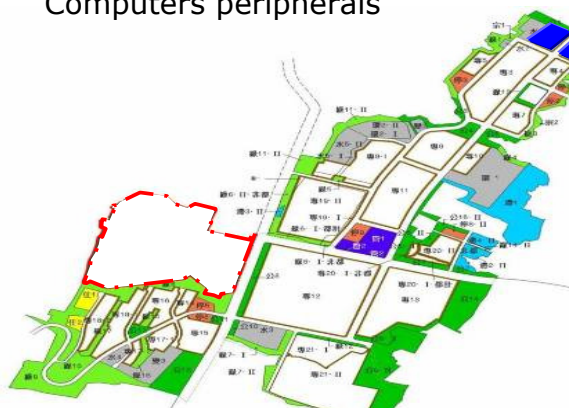
### Taichung Park

Allocated Units : 48

Allocated Rate : 100%

#### Focused industrial clusters

Optoelectronics 、 Integrated circuits 、  
Precision Machinery 、 Biotechnology 、  
Computers peripherals



**Standard Factory Building1&2**  
(100 units, unit size: 680 and 1000 m<sup>2</sup>)

Approved units : 91

#### 1. carrying capacity

(a)1st floor : 1,000Kg/m<sup>2</sup>

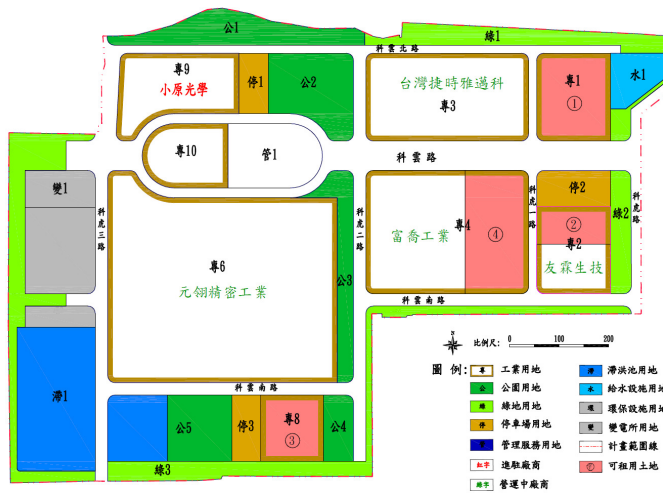
(b) 2nd-5th floor : 600Kg/m<sup>2</sup>

2.rent : (a)Unit of 680m<sup>2</sup> : US\$3.7K(per month)

(b)Unit of 1,000m<sup>2</sup> : US\$5K(per month)

## Park Introduction

### Huwei Park



Allocated Units : 5

Allocated Rate : 79.4%

### Focused industrial cluster

Optoelectronics、Precision Machinery、Biotechnology

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## Park Introduction

### Houli Park



### Houli Site

Allocated Units : 17

Allocated Rate : 100%

### Focused industrial cluster

Optoelectronics、Integrated Circuits、Precision Machinery



### Chising Site

Allocated Units : 2

Allocated Rate : 88.3%

### Focused industrial cluster

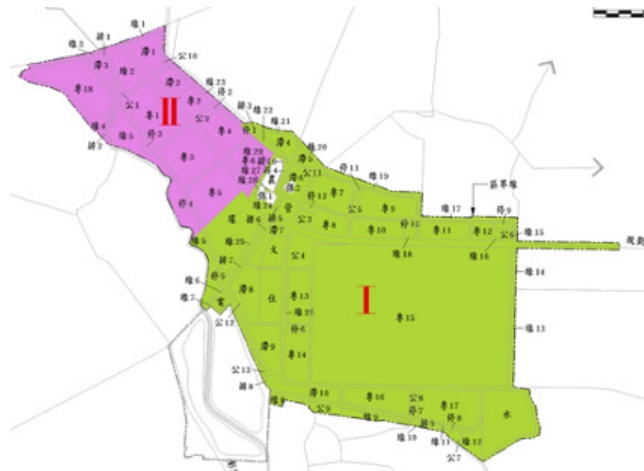
Optoelectronics

22



## Park Introduction

### Erlin Park



### Under Construction

**Phase I** (2009-2017) — Land: 380ha.

**Phase II** (2017-2021) — Land: 251ha.

Entry-Approved Companies : 14

### Focused industrial cluster

Precision Machinery 、 Optoelectronics (panel manufacturing excluded ) 、 Integrated Circuits (wafer manufacturing excluded) 、 Biotechnology 、 Green Energy

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## Park Introduction

### Advanced Research Park



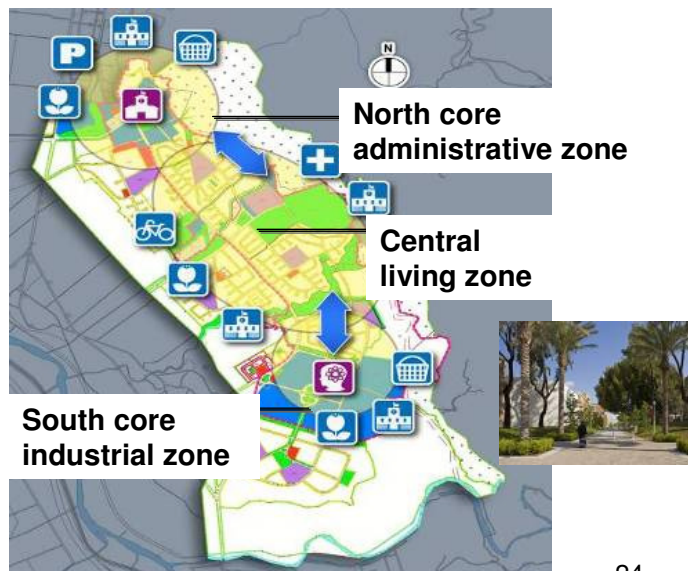
### Under Construction

Approved Research Institutes : 2

Entry-Approved Companies : 7

### Focused industrial cluster

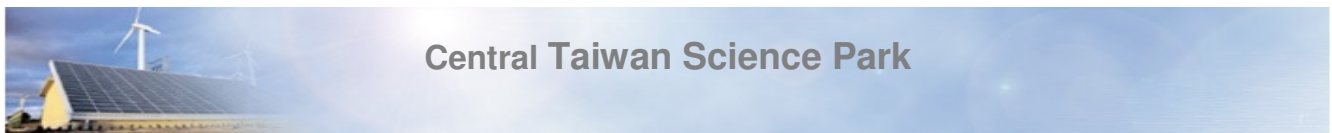
High-Tech Research 、 Administration 、 Cultural and Creative Industry



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## Phase II: A Critical Review of Public Services

- This section offers a critical review of extant research on public services quality .
- The purposes of this article are to use the secondary data analysis to summarize information about the relationship between public services quality and subjective well-being and to assess the strengths and weaknesses of the secondary data analysis as a mode of research synthesis.



Central Taiwan Science Park

### Phase II: **Public Services**

#### **One-Stop Services**

#### Highly Efficient Support

#### Friendly Investment Environment

The Bureau is authorized to offer all necessary services for Park tenants:

MOEA, MOF, MOL, MOI, MOE

Entrust

Authorization

Investment R&D grant Construction Foreign labor  
Business reg. Labor safety Security High school  
Trade license Tax incentive Environmental protection

Support

Custom, banks,  
post office, clinic,  
shipping

Water, power, safety,  
environmental protection,  
transportation

## Comparison of Industrial Zone and Science Park

Item	Industrial Zone	Science Park
Mission	• Manufacturing	• Hi-tech firms with R&D capability
Authority	• Industrial Development Bureau, Ministry of Economic Affairs	• Ministry of Science and Technology
Products	• New, Innovative Products	• Matured Products
Manpower	• Low Wage Labor	• Technical Manpower
Financial Resources	• Self-raised Fund	• Government Budget
Land Policy	• Mainly for Sale	• Only for Rent
Land Management Business Management Environment Protection Safety Protection Landscape Management Labor Administration	• Different Government Agencies	• Park Administration (One-stop Service)
Investment Incentives	• Industrial Innovation Act (4 incentives in R&D, talent training, business headquarter, logistic center) <b>can</b> deduct annual business income tax	• Tax incentive in bounded area (customs duties, commodity tax, business tax) Express customs clearance • Industrial Innovation Act(4 incentives in R&D, talent training, business headquarter, logistic center)
Subsidiary Incentive	• R&D subsidiary from Ministry of Economic Affairs	• R&D subsidiary from Science Park • R&D subsidiary from Ministry of Economic Affairs

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### Phase II: Public Services

#### Investment Incentives

##### **Tax Credits**

#### Preferential taxation

- **Bonded zone:** Machineries, raw materials, fuels, work-in-process goods imported for self use will be **exempted from import duty, commodity tax or business tax.**
- Machinery and equipment used for **more than five years** can be shipped outside of the CTSP tax-free.
- **Exported from CTSP:** All products or services exported by park enterprises will be granted **0% business tax rate.**

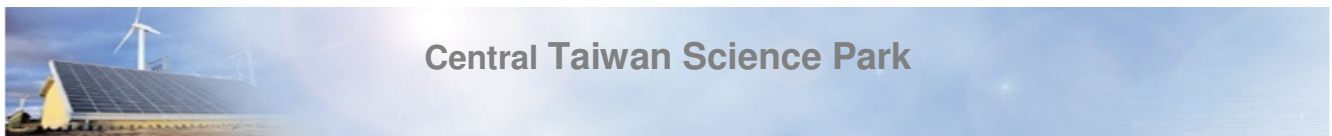


Central Taiwan Science Park

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## Phase III: Shaping industry clusters

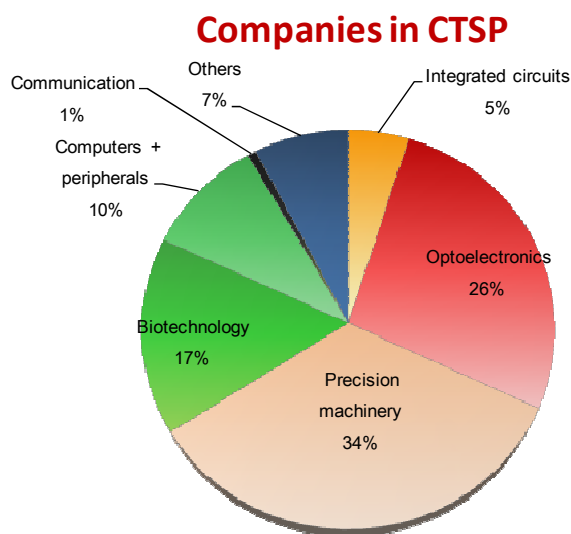
- The purposes of this article are to use the secondary data analysis to figure out that Industry clusters involving tight connections that bind supply chain firms and industries together in various aspects of demand inquiry, geographic location, sources of innovation, shared suppliers and factors of production, and so forth .



Central Taiwan Science Park

### Phase III: Shaping industry clusters

#### CTSP Industry clusters



**27 New Ventures included**

#### Focused industrial clusters:

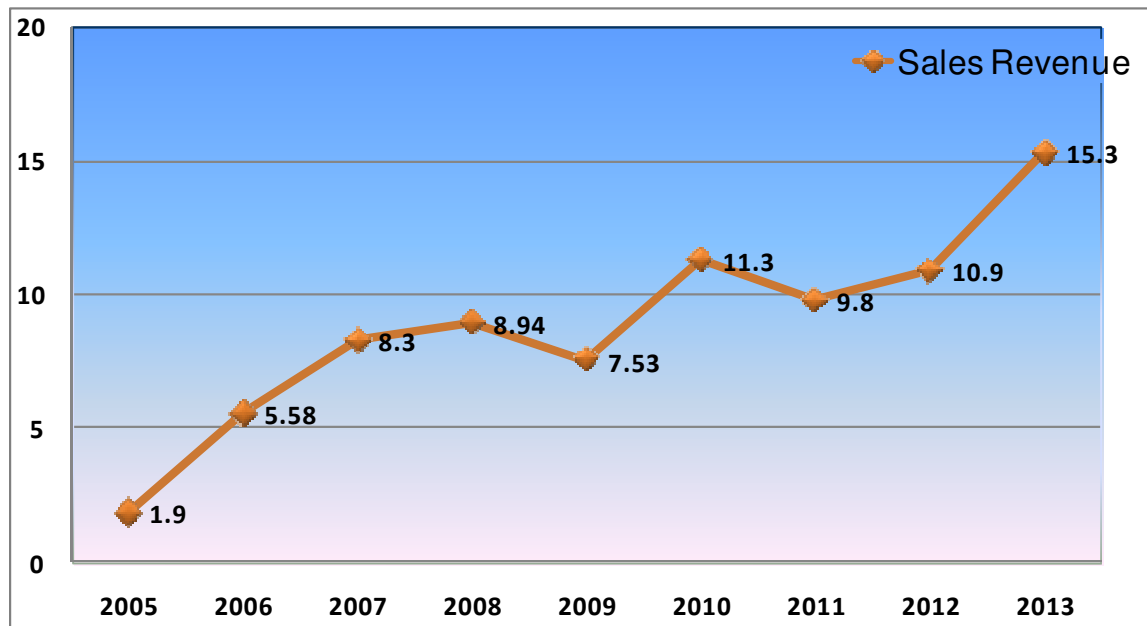
- Optoelectronics
- Integrated Circuits
- High-tech Precision Machinery

Unit: Billion USD

Industry	No. of Companies	Sales Revenue (2013)
Integrated circuits	8	6.77 (44.93%)
Optoelectronics	39	7.59 (50.36%)
Precision machinery	59	0.58 (3.82%)
Biotechnology	28	0.03 (0.18%)
Computers peripherals	14	0.06 (0.42%)
Communication	1	0.003(0.02%)
Others	11	0.04 (0.28%)
Total	160	<b>15.08</b>

## Sales Revenue

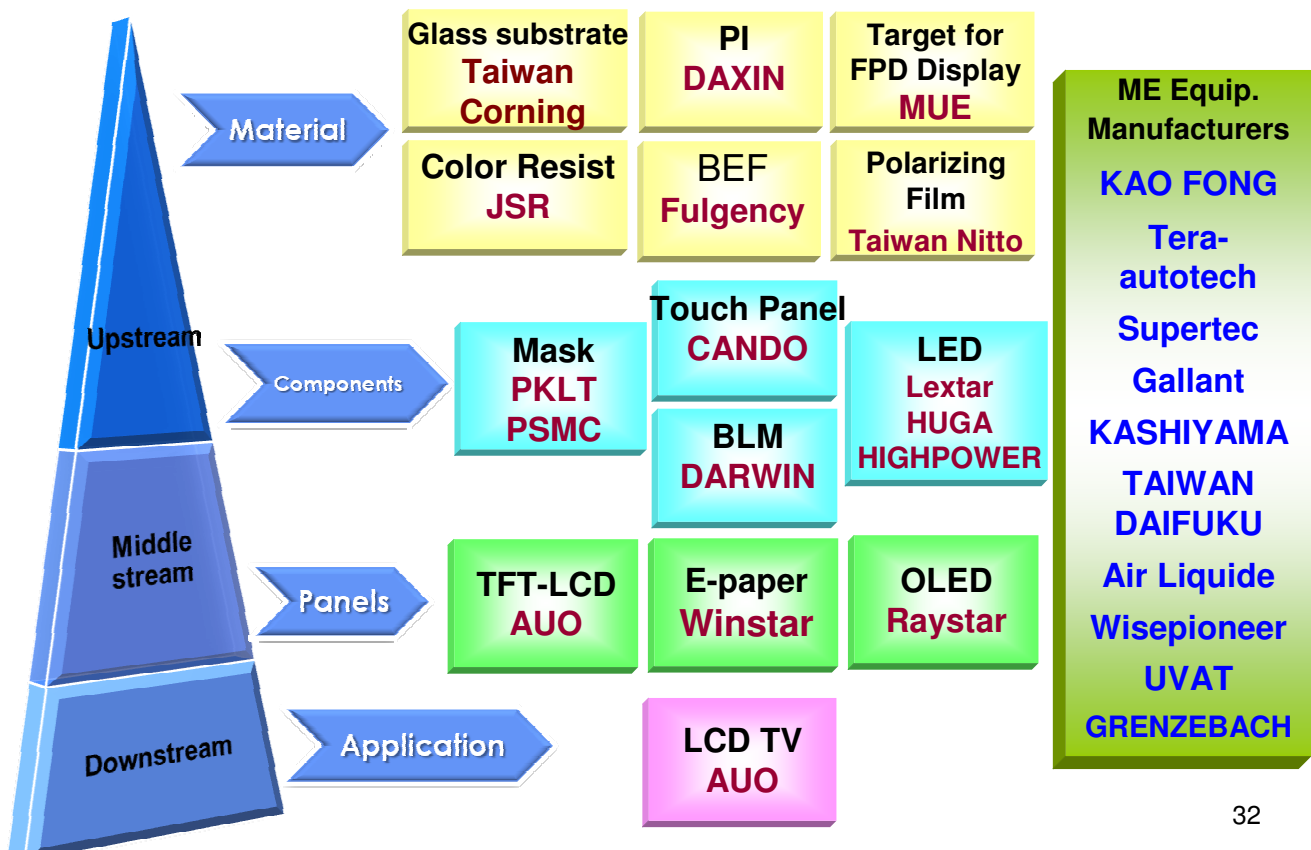
Unit : US\$ billion



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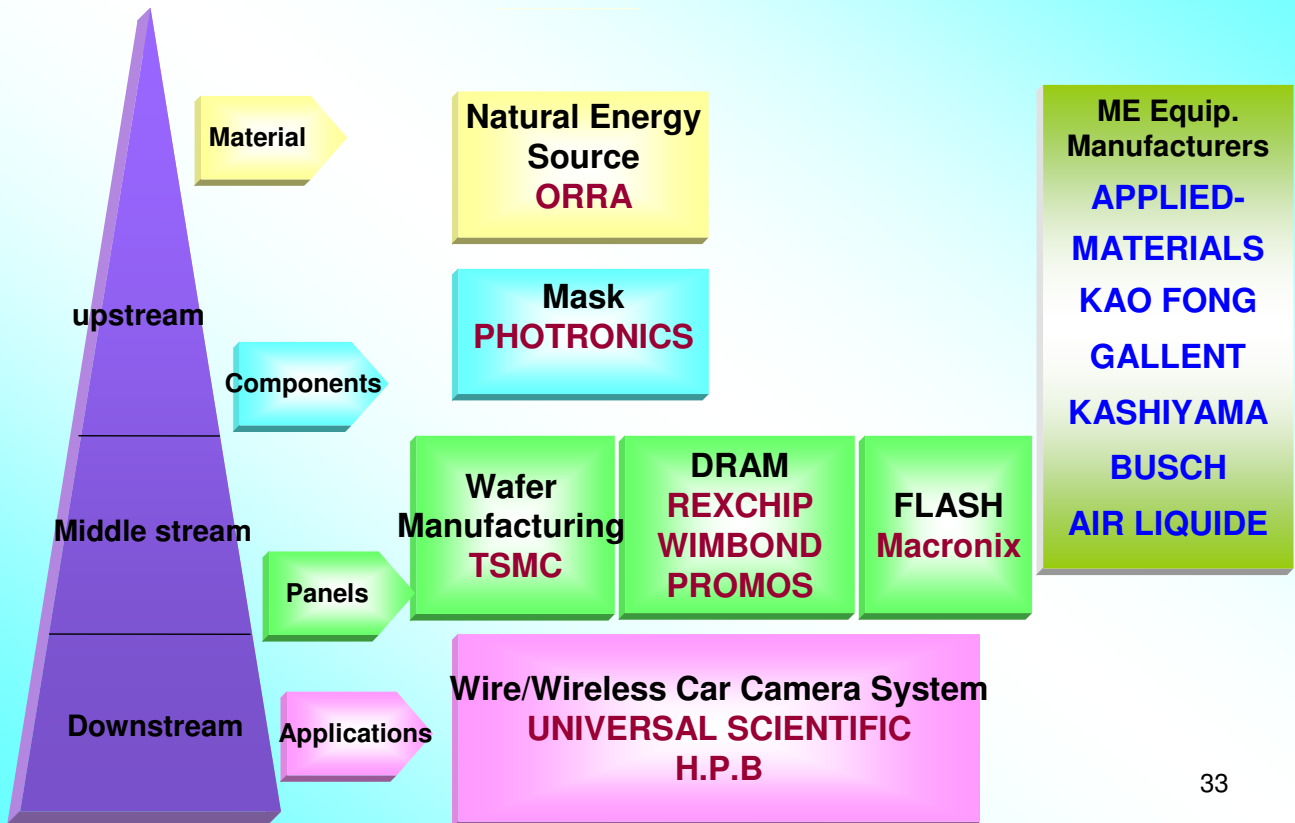
## Industry Clustering - Optoelectronics Industry



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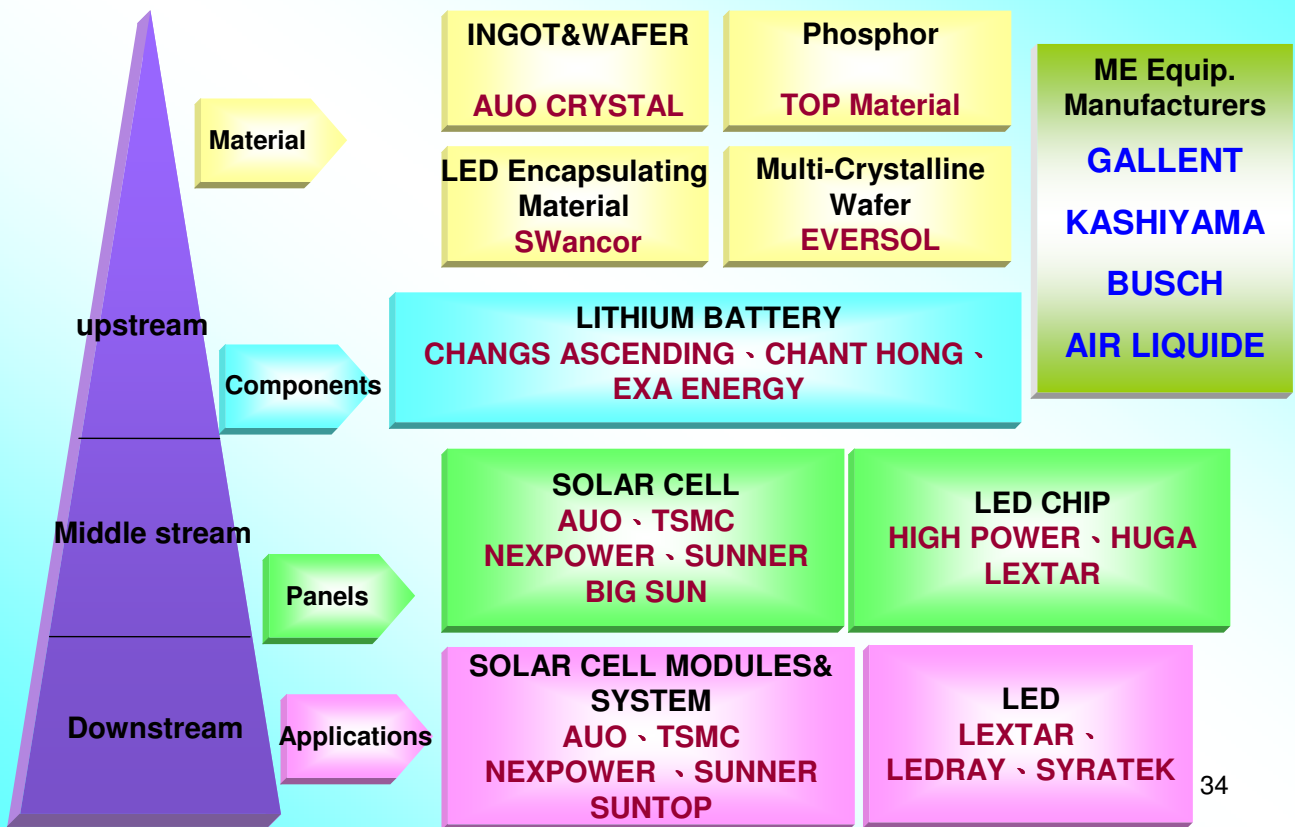


## Industry Clustering – Integrated Circuits



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## Industry Clustering – Green Energy

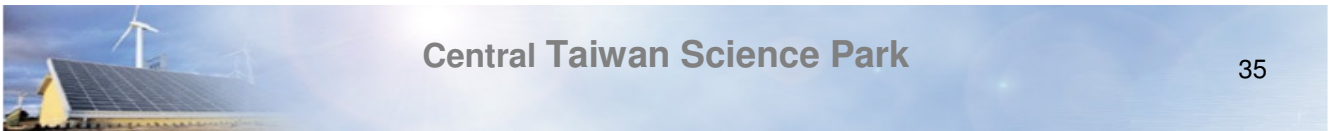


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## Renowned Companies

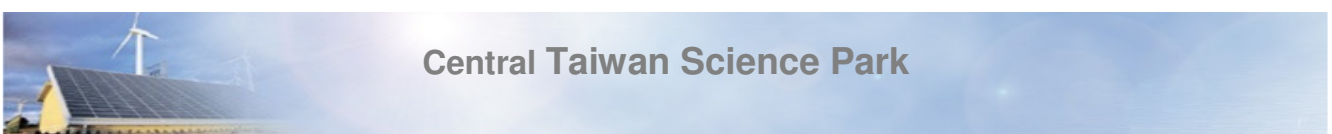
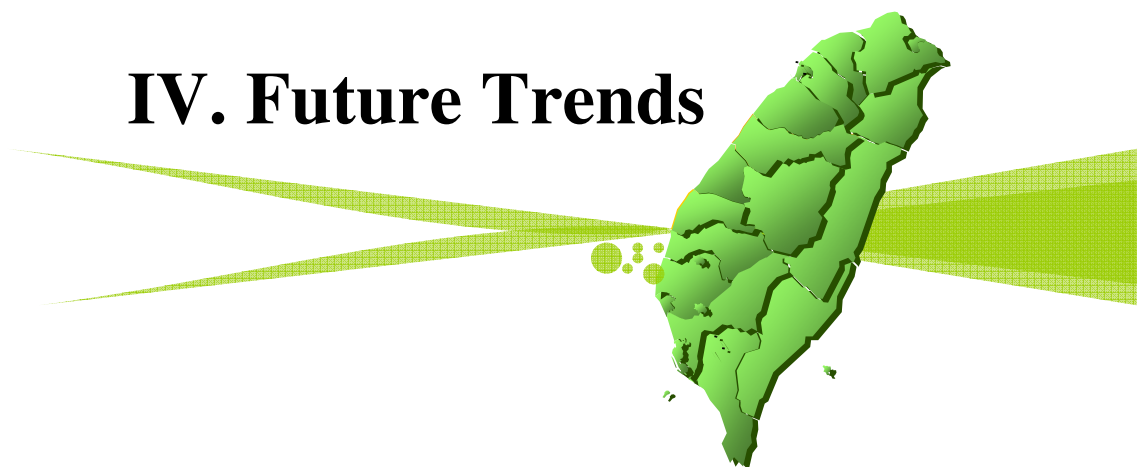
Optoelectronics			
Integrated Circuits			
Precision Machinery			
Biotechnology			



Central Taiwan Science Park

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## IV. Future Trends

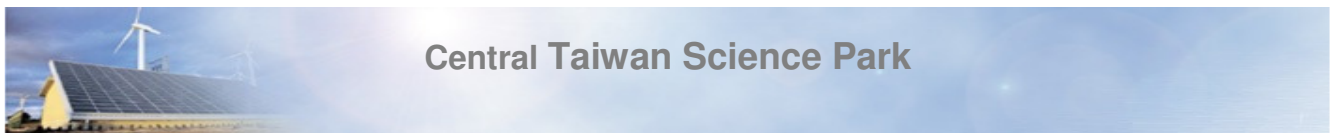


Central Taiwan Science Park

## IV. Future Trends

### 1. Vision for the Future of Transforming and Innovative Spearheading and Pace-setting.

- In the past, the Science Park is focus on efficiency.
- Facing with the competitiveness from China and Korea, keep progress in innovation and entrepreneurship, transforming and innovative spearheading and pace-setting in the near future.



CTSP assisting young and start-up high technology companies with their business plans access to finance and helping them to overcome general business and growth problems as they arisen.

Hence, I've proposed a comprehensive plan as the following flow in this diagram.

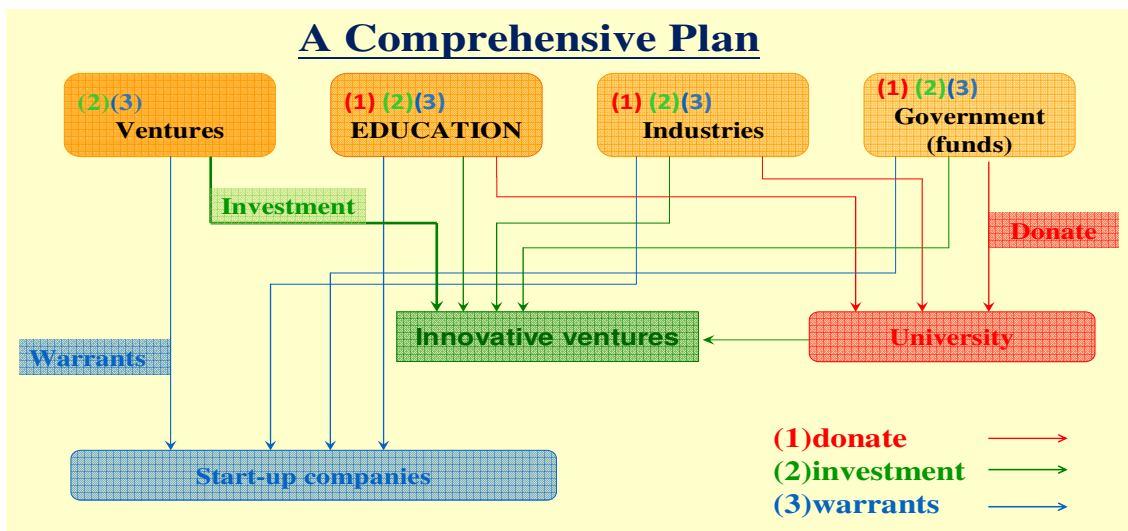


Figure 3: A Comprehensive Plan

# Innovative-Oriented Park Transformation

## Innovation & Startups Project (1/2)

- With “From IP to IPO” plan, Ministry of Science and Technology (MOST) helps innovative young entrepreneurs to develop their business ideas.
- MOST and Science Park Administration set up an ad hoc agency to provide capital, mentoring services and assistance with factory rentals.



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## Innovation & Startups Project (2/2)

- **2013** : 10 innovation teams have been introduced to CTSP.
- **2014** : Fully support the innovation teams to reach the standard of Start-up Company by holding 3 entrepreneurship series seminars and building proper environment for incubation.

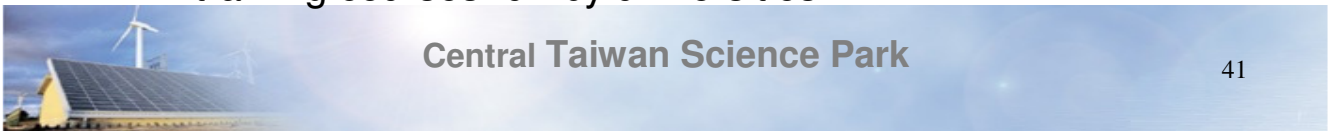


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## Strengthen Innovation Systems

### **R&D Activities**

- **High-tech Equipment Advanced Technology Plan**
  - A four-year, US\$13.2 million program is applicable to academic-private sector collaborative R&D projects for producing advanced equipment.
  - Approved companies receive a grant up to 50% of each project budget.
- **Industrial-Academic Cooperation Program**
  - Only for tenant company. Max. allowance is US\$330K for a year.
- **Science Park Talent Incubation Plan**
  - **On-job training:** CTSP finances full expenses of the talent training courses run by universities.



Central Taiwan Science Park

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## Foster Innovation Environment

### **Academia-Industry Consortium for CTSP**

- Identifying translational research results of Taiwan's R&D investment to be in the Pasteur's Quadrant
- Establish a platform of information sharing and technology collaboration between academia institutions and industry in Central Taiwan.
- It has been holding forums, academic workshops, and large academia-industry job fairs on a yearly basis.

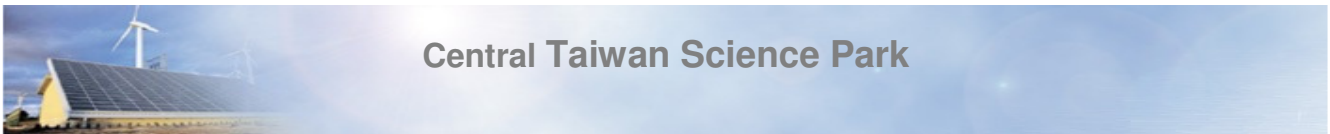


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## **IV. Future Trends**

### **2. Vision for the Future of Park Transforming for the New Heights**

- Having taken into consideration the overall environmental changes, local prosperity, industrial needs, and friendliness to the environment,
- The transformational plan re-tailored the Erlin park into a green science park
- That features minimum water consumption and reduced emissions, and serves as an important hub for the precision machinery industry.
- This will help realize the vision of having an industrial innovation corridor that connects Taichung, Changhua, and Nantou.



### **Balance Economic Growth with Environmental Sustainability**

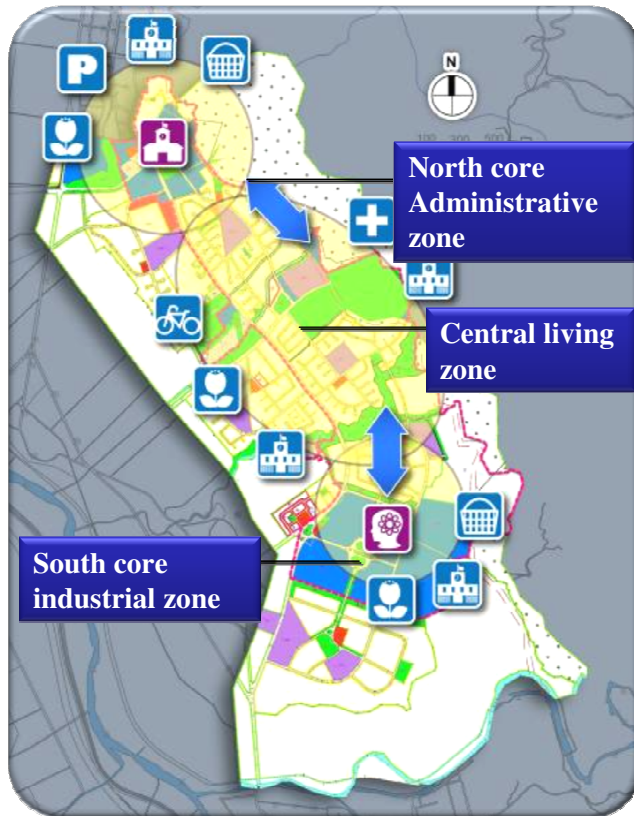
Transforming the Science Park by keeping its environmental impact to a minimum

- Adjust the construction plan of the park's roads and sewage system to preserve the farming community.
- Revise the development plan by reducing water & electricity demand and wastewater discharge
  - Adjust the industrial structure of the park
    - Precision machinery is to be the leading sector



## Fit in local culture environment

### Advanced Research Park



- This park used to be Taiwan provincial government. CTSP will develop the south area as core industrial zones, and a central living zone. The park will also be designed as a **Living Lab** and equipped with profound public facilities including schools, markets, green zones, and hospitals to attract talents and companies world wide.



Green traffic system

Protect local ecology system

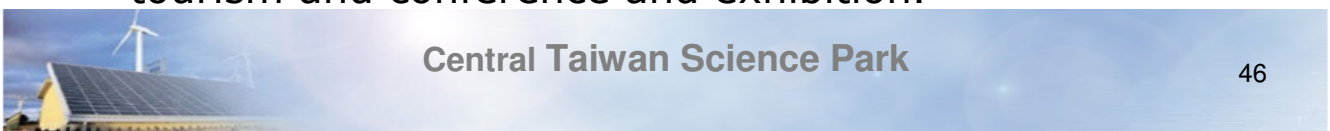
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### Development orientation :

- With the idea of Garden City, it reuse government-owned land, integrate the "eco-city", and create a high-technology research center compatible with the existing urban landscape and ecological quality.

### Enrolled Park Enterprises:

- Advanced research: including ICT value added service industries & test bed.
- Cultural and creative industries: including digital culture and local cultural industries.
- Long-term stay: including medical & healthcare, long stay and work accommodation.
- Short-term stay: including corporate training, eco-tourism and conference and exhibition.



Central Taiwan Science Park

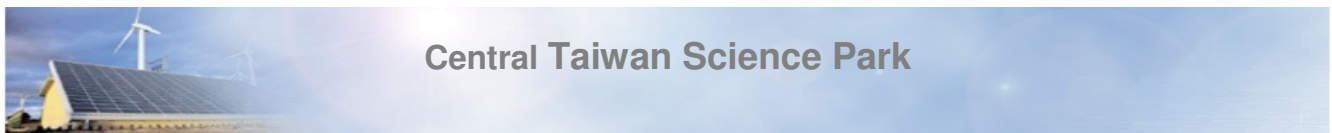
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## IV. Future Trends

### 3. Vision for the Future of CTSP Halo Endless Prosperity

- **Location:** The Taichung park is almost equidistant from *Taipei* and *Kaohsiung* (1 hr travel time by High Speed Railway (HSR)).
- **Area:** 1,708 hectares (5 parks).
- **Entry-Approved Companies :** 161.
- **Tenant Companies:** 120.
- **Employment Population:** 31,256.
- **Sales Revenue:** US\$15.08 billion (2013)



## Vision



# Future Perspectives

## Construct Innovative Environment

- Enhance investment incentives (venture capital)
- Support industrial development at CTSP
- Strengthen mechanisms for incubation
- Build-up innovation system (tolerance of failure)
- Encourage featured industrial/knowledge-based enterprises to CTSP (cluster effect)
- Encourage on culture of competition

## Promote Industry-Academy Cooperation & Foster Business Start-up

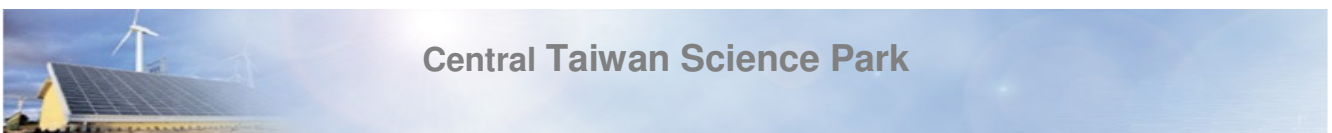
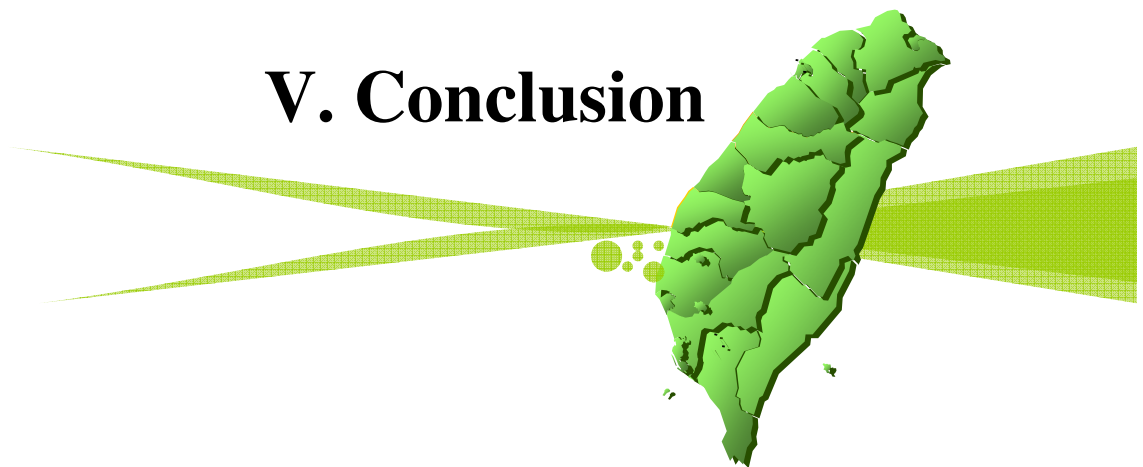
- Promote industry-academy linkage
- Enhance R&D results transfer mechanism
- Unleash regulations

## Recruit Science and Technology Talents

- Cultivate industrial and multi-disciplined talents
- Promote international cooperation

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## V. Conclusion



Central Taiwan Science Park

# Conclusion

Successful management of the Science Park:

- **Friendly Investment Environment**
  - Securing resources for the development of the Science Park
  - Promoting the Science Park and identifying and securing the tenant companies
- **Academia-Industry Cooperation**
  - Providing the all important links between Tenant companies and University
- **From IP to IPO**
  - Assisting young and start-up high technology companies with their business plans access to finance and helping them to overcome general business and growth problems as they arise
- **One Stop Service**
  - Management of the land and buildings on the Science Park
  - Planning the Science Park and its strategy and making investment decisions

