Divergence or Convergence?
Sketching the Cross-path between
Science Technology Parks and Cultural and Creative Industrial Parks in Taiwan

Hsiao-Ling,CHUNG[1], Shiann-Far KUNG[2], Chun-Wei CHEN[3]

Paper Summary

The purpose of this paper is to explore and project the network relationships between the two major forms of industrial cluster of modern economy- Science Technology Parks (STPs) and the Cultural and Creative Industrial Parks (CCIPs), which might pave the ground for fostering the competitive advantages for STPs. Four major steps are taken to establish this initial and literature-based research.

Firstly, the paper starts with the research background including the literature review and an introduction to the current issues associated with the instrumental approach of developing STPs and CCIPs in Taiwan, which resulted in taking the 'parks' as the panacea to drive the regional as to national competiveness, and more importantly, a widening divide and misunderstanding between the two types of industrial cluster.

Secondly, a brief overview on the STPs in Taiwan will be provided, yet the focus is given to the emergence growth of CCIPs in Taiwan. Significantly, by looking at the CCIPs' developing yet various forms and dimensions, implications derived from its network characteristics are structured as the foundation, from which to start weaving the probable network relationship between STPs and CCIPs. Such a review is to introduce an alternative kind and its network dynamics of CCIPs, yet the existing models of STPs and CCIPs in Taiwan both highlight the importance for their wider network openness and connections, both inwardly and outwardly, and commercially and creatively.

Thirdly, the four recognized theoretical themes of the co-evolution framework (Adaptation and Selection, Cooperation and Competition, Connectivity and Interdependence, and Heterogeneity and Catalysts) are taken metaphorically, in drawing out the distinctive network condition and characteristics of STPs and CCIPs, and the co-evolutionary network implications between the two industrial clusters.

Finally, the management and development implications for STPS are provided in the concluding discussion. Together, it is an initial and conceptual inquiry into one of the most promising yet neglected area -the network synergy that might be generated between the two major forms of industrial cluster, which involves more than a combination of their network resources, but a co-existing and co-evolving ecosystem. The main contributions of this paper are therefore firstly to have taken a cross-boundary and cross-industry perspective by

integrating the network landscape of the growing CCIPS into the future roadmap of STPS, an expanding network model which enriches the STPS's people and competence is thus outlined; and secondly, to have put forward the wider social, cultural and creative values and intangible human capital that STPS might generate and contribute to more significantly and timely at the centre of the network study.

- ## Part 1 : Research Background

Science and Technology Parks (STPs) has been well-recognized worldwide as the instrument of creating supportive industrial clustering environment for innovative business development, and its 'the perfect *habitat* for businesses and institutions of the global knowledge economy" (IASP). Such an environment has also been found to be embedded in a complex network, in that the firms in the STPS are acting as internal network agents connecting with financial and economical ties with operational and strategic aims (Ferrary and Granovetter, 2009), and externally, the limitation in duplicating the STPs model as well as the challenges for its future growth have also been identified (Isaak, 2009).

Yet in the mid-1980s in the UK, the concept of 'cultural and creative industries quarter' or 'park'- CCIPs has also been gaining attention in the fields of economic and regional development. CCIPs came to be considered as a quarter or district, where economic development of the arts and creative sector and the everyday urban life can be concentrated, and therefore diverse and dynamic trading and agglomeration economies can be encouraged. CCIPs is therefore taken as tools for urban and regional regeneration, because it could create a new image of a city by bringing fresh life and ideas into communities through cultural production and consumption, and thus enhancing the quality of life, and the sense and a way of living in a place (Florida 2008, 2002). Such a hybrid strategy for regional development is regarded as a new path to transform the national economy with the culture and creativity being harnessed in the entrepreneurial and competitive drive (Porter, 2005).

Indeed from a socioeconomic perspective, CCI researchers have demonstrated that specific geographical, historical and 'traded and un-traded' conditions (Pratt, 2004) are embedded in the formation of such networks. Especially, the creative start-ups and micro-firms rely on the social and spatial proximity for their growth. As a result, the emphasis on regional networks or various forms of CCIPS has proved appealing to policy-makers, as they offer proposals for regional and economic development. However, compared to manufacturing and high-tech industries, CCI fundamentally demonstrates different kind of economic and business models, as the creative enterprises are characterized by their micro and flexible scale, and the industrial scope of CI tends to be more decentralized, diverse and extensive (Bilton, 2010; Potts *et al.*, 2008), their dependency on natural resources is reduced and more emphasis is given to the generation of intellectual property, and centralized around the value of human capital (Florida 2008, 2002).

In fact study has revealed that CCIPs could involve the following forms of network: 1) Regional clustering: the strategy that has pervaded with most regional development agencies, 2) Information networks: various virtual information exchange platforms to complement the resources needed for the cultural and creative businesses. 3) Resource network: linking creative workers and entrepreneurs to the local cultural, educational and promotional bodies, government, funding sources to support emerging businesses, 4) Informal/ social networks:

creative producers and enterprises are characterized by their self-driven and embedded network-reliance, 5) Complementary network: creating synergies between the subsidized art groups and wider cultural and commercial creative businesses. 6) R&D network: collaborative R&D network to transfer the best practice and innovation know-how.

In Taiwan, after it gained the formal entrance into the WTO in 2002, and in confronting the competition from mainland China, the Taiwanese government introduced "Challenge 2008 – National Development Plan" (Executive Yuan, 2002), a six-year policy guideline to create a new national competitive advantages. Substantial investments were made in areas to improve manpower, R&D and innovation, logistics networks, and the living environment, aiming to turn Taiwan into a ''Green Silicon Island'', ie. a clean, high-tech and innovative island-state. Accordingly the Taiwan government earmarked the Cultural and Creative Industries (CCI) as one of the six key emerging sectors for national development, sitting together with the bio-tech and digital content sectors.

Yet building upon the STPs experience since the early 80s, therefore, the Taiwanese government has allocated a majority of its CI development budget to the building of the CCIPS. These parks are believed to function as venues for small creative and cultural enterprises to form cross-sector alliances and to speed up their industrialization process at the start-up stage. However, such a top-down imposing approach has triggered strong criticism, arguing that the STPs models are contradicting and suppressing the largely bottom-up generating, self-organizing, and non-linear nature of creative production and processes (Han and Liou, 2008). Yet the related debates provide the starting point for this study, as it suggests that a clarification of the possible model and practice transfer between the STPs and CCIPs is needed.

Despite the well-received network picture, however, Taiwanese government's reluctance to deal with the debates that have been surrounding the established STPS and the emerging CCIPS has resulted in the widening divide between and misunderstanding of the two major forms of industrial cluster. However instead of widening the divide, the paper takes a positive turn looking into the possible scenarios of bridging the gap.

Part 2: Overview of the 'Parks' in Taiwan

2.1 The Science Technology Parks in Taiwan

Taiwan has been recognized worldwide for its successful experience with introducing the high-tech industries and the developing of industrial clusters, which has given great strength to its national economy. Indeed, the Taiwanese government has vigorously implemented a policy to promote geographic concentration of economic activities with a goal of improving international competitiveness of her industries. According to the WEF's Global Competitiveness Reports, Taiwan placed second worldwide for the ''state of cluster development" index from 2004 to 2006 and has held the No. 1 spot since 2007.[1] Currently there are 70 industrial clusters in operation; among them some are developed by the central government, others by local city or county authorities, and some are by large private conglomerates. Chief among those industrial clusters are the STPS, which by offering attractive enticements such as favorable loan conditions, tax breaks, reduced charges on utilities, favorable rentals, pre-existing factory and waste management facilities, etc, they aim

1 The Taiwan Government Entry Point.- Introduction on Science Park
http://www.taiwan.gov.tw/ct.asp?xItem=27510&ctNode=1906&mp=1001 (11.02.2011)

to attract high-tech professionals, encouraging technological innovation, promoting industrial upgrading and balancing regional development (Yen and Kung, 2010; Dogson et al, 2006).

Taiwan's STPS are part of industrial network set up over the years; some parks were planned as or have developed into specialized districts. One of the three government-developed/operated STPs existing, the most prominent cluster is the **Hsinchu Science Park (HSP)**, which was established in 1980 in Hsinchu County and part of Taoyuan County, covering six locations—the Hsinchu, Zhunan, Tongluo, Longtan and Yilan parks as well as the Hsinchu Biomedical Science Park—that span a total area of nearly 1,400 hectares. It is also the home of Taiwan's IC design, manufacturing and packaging industries, and also the home base of Taiwan's highly successful export products including large-screen LCD monitors, laptop and desktop computers, motherboards, servers, CRT monitors, and optical storage devices, which account for 90% of Taiwan's total production in information hardware industry.

Over the early 2000s, the cluster's DRAM production capacity ranked number one in the world and accounted for 23% of world's total capacity; the IC design industry was ranked number two, and the IC manufacturing and packaging industries were both ranked number one in the world with over 70% of the world market share. It is also the home of Taiwan's world-known semiconductor and computer firms including Taiwan Semiconductor (TSMC) and United Microelectronics (UMC). The HSP demonstrates its success lies with its human resources and well-defined statutes and regulations which evolve alongside its well-rounded clusters of related ventures to facilitate companies to adapt to external changes. [2]

Encouraged by the successful model of clustering effect achieved by HSP, the Taiwanese government has spearheaded a series of cluster-building initiatives. **Southern Taiwan Science Park (STSP)** was therefore built as the second STPS in Taiwan, established in 1996 as a complement to the HSP in the north, with the goals of forming an IC industry cluster and establishing an optoelectronics technology hub in southern Taiwan. After more than a decade's development, the 1,608-hectare STSP now encompasses the Tainan Science Park, Kaohsiung Science Park, and Kaohsiung Biotechnology Park and is targeted to promote precision machinery, optoelectronics, integrated circuit, telecommunication, biotechnology as well as computer and peripheral industries. It is home for some big-name high-tech companies located in the park, including Taiwan Semiconductor Manufacturing Co., Ltd. (TSMC), United Microelectronics Corp. and Chimei Innolux Corp.

Among those targeted industries, the IC, biotechnology and optoelectronics industry clusters have all taken root in the STSP. The total output value of Taiwan's optoelectronics industry was around US$23.87 billion in 2008, of which 46.91 percent, was created at the STSP, with its most complete vertical integration in the industry (Kung 2008). As for the IC industry, the park contains the world's largest 8-inch wafer fab and the most advanced 12-inch wafer facilities with nanometer copper-process technology, and the TSMC is scheduled to complete its 14th wafer fabrication plant, packaging and testing plant in the park. In biotechnology, the park is home to biotech R&D centers of several renowned institutions - Academia Sinica, National Cheng Kung University, National Chung-Cheng University, and National Laboratory Animal Center - forming an environment conducive to both R&D and production for the biotech industry and resulting proximity between industry and academia in STSP. For its future growth, the STPS continues to incorporate the regional characteristics of southern Taiwan to promote environmental protection, green building techniques, culture and art,

2 HSP website: http://www.sipa.gov.tw/english/index.jsp (07.01.11)

aiming to make the STSP a green STP offering "green production, comfortable life, and diversified ecology."[3]

The Central Taiwan Science Park (CTSP) was established in the early 2000s and hosts Central Taiwan Precision Machinery Industrial Cluster which focuses on precision machinery. It includes sites at Taichung, Huwei (Yunlin County), and Houli. The CTSP bears the heavy responsibility of promoting industrial and economic revival in central Taiwan. Building on central Taiwan's existing precision machinery industry, the park will create a high-tech industry cluster specializing in nano-precision machinery, nanomaterials, the aerospace industry, biotechnology, telecommunications, and optoelectronics. Over its seven year of growth, it has emerged to be the technology development center for central Taiwan and played an important role in industry upgrade. It is now moving ahead with a plan to invest US$ 122.4 million. To establish an Advanced Research Park, a platform between the fundamental research and industry application to provide service for companies to conduct field test before commercializing their products, to serve the purpose of enhancing technology development and providing the information exchange for the high-tech sector. By providing an integrated and comprehensive infrastructure, the CTSP aims to attract US$ 170 million in R&D investment and to generate a production value of US$1.02 billion a year (Photonics Industry and Technology Development Association, 2010).

Each of these STPS has established its own technological advantages and satellite industrial clusters, and when combined, the three STPs have attracted capital inflows in excess of US$ 10.2 billion[4]. Seeing their proven track records, the Taiwanese government continues taking an active approach encouraging the further development of STPs. In December 2008, the Taiwanese government announced its plans to invest US$20 million to develop 90 more science and technology industrial clusters between 2008 and 2011, covering sectors of biotechnology, environmental technology, health care and leisure, light-emitting diodes (LEDs) and intelligent lighting control.[5] Such a policy-driven approach toward the high-tech sectors has made Taiwan an instructive example demonstrating a top-down sectoral strategy that contributed to not only the development of STPs themselves and the supporting infrastructure (Chen et al, 2006). Also, the fact that the increasing STPs is still the subject of ongoing concerns and debates underlines some those network issues which are relevant to this study.

2.2 The Cultural and Creative Park in Taiwan

According to The Council for Cultural Affairs, the central governing ministry of CCI in Taiwan, the term 'Cultural and Creative industries' is defined with references to UK and UN's definitions, and means the following

> ''industries that originate from creativity or accumulation of culture which through the formation and application of intellectual properties, possess potential capacities to create wealth and job opportunities, enhance the citizens' capacity for arts, and elevate the citizens' living environment.''[6]

3 STSP website: http://www.stsipa.gov.tw/web/WEB/Jsp/Page/cindex.jsp?frontTarget=ENGLISH&thisRootID=4 (07.01.11)

4 HSP website: http://www.sipa.gov.tw/english/index.jsp (07.01.11)

5 Government Information Office, Executive Yuan (the Cabinet)

http://www.taiwan.gov.tw/ct.asp?xItem=27510&ctNode=1906&mp=1001 (09.01.2011)

6 Council for Cultural Affairs (2010) Law for the Development of the Cultural and Creative Industries.

english.cca.gov.tw/public/Data/0789585771.pdf (04.09.11)

Taiwan's CCI now comprises 15 different sub-sectors listed below with the top 6 sub-sectors considered as the key flagship industries.

1. Product Design
2. Digital Content
3. Craft
4. Music and Performing Arts
5. Movies/Film
6. Broadcasting and Television
7. Visual Arts
8. Cultural Asset Applications & Performance/Exhibition Facilities
9. Publishing
10. Advertising
11. Branding and Fashion Design
12. Creative Lifestyle
13. Architectural Design
14. Visual Communications Design
15. Pop Music & Culture Content

In 2007, Taiwan's CCI generated an overall sales of US$19.73 billion, powered by an estimated over 50,000 CCI businesses with the employment of 211,550 jobs in total. To boost its further development, a national development plan named 'Creative Taiwan' was formed in May 2009. The plan is set with more than US$ 623 million government investment for execution between 2009 and 2013. The project is estimated to create a total of 200,000 jobs and a production value of more than US$30.3 billion by the end of the program, making Taiwan a regional cultural and creative hub. Under the project, in the five major strategic areas listed below.

- Strengthening Multiple Investment and Providing Awarding Subsidies
- Business Counselling and Promoting cross-sector integration and R&D
- Promoting Market Flow for Brands in Taiwan and Developing domestic and overseas markets
- HR Training and Matching Mechanism
- Cluster Effects

Over the past decade, the Taiwanese government's recent efforts in developing the creative economy can be summarized as, including: 1) 'Challenge 2008 National Development Plan', in which cultural and creative industries were included for the very first time in Taiwanese national development plans, sitting together on the ten major development plans for the bio-technology and digital content sectors etc. 2) Introducing various financial incentives for cross-sector corporate investments, and channels of institutional and bank financing, which were only available to high-technology and service sectors. 3) The first Cultural and Creative Industries Development Policy was legislated in January 2010, seven years after its inception. The focus of the related regulations will be focused on increasing the domestic consumptions of creative services & products. Significantly, the strengthening of the cross-sector networking and synergy effects has been consistently emphasized throughout those measures.

With those efforts, Taiwan's CCI products and services have been gaining local and international recognition and winning international awards. This indicates the Taiwanese CCI

businesses are striving for creating intangible and added values and moving away from the manufacture-bound mindset. Certainly, the amount of investment on CCI is only a tiny fraction of what it took for the high-tech sector, yet it highlights some major issues that Taiwanese CCI businesses are confronting: 1) the undercapitalized reality and 2) the limited size of local market which have triggered and required the networking practices of the creative producers, 3) the lack of business-driven practices and 4) overshadowed by the high-tech sectors.

Indeed while CCI enterprises are known for their flexibility, rapid mobilization and creativity, most of them they are too fragile to sustain with their own means. Therefore, the CCA expects the parks to create 'cluster effects' for CCI.[7] Therefore the government have been taking the CCIPS as means to develop and channel various programme and schemes as an infrastructures with inputs from local authorities, professionals, civic organizations and private businesses for nurturing creative talent, research development, information access, funding assistance, coordinating academic-industry collaborations, marketing and promotion, providing land lease and tax deduction incentives with the goal to increase the overall growing of the industries (Yang 2009).

2.3 The Emergence of the CCIPs in Taiwan

First stage: the 1990s

The roots of CCIPS development in Taiwan can be traced back to the late 1980s, when Taiwan ended the four decades of Martial Law in 1987, and the first wave of community-based cultural cluster began to start. Local cultural activities were formed through their own alliances, which resulted in the growing awareness of local cultural development and economy (Yang 2009). Cultural policy in the 1996, such as the Community Construction Movement, with its the theme was "industrialising culture, and culturalizing industry", the Taiwanese government took up the role of promoting Taiwanese culture, fostering and promoting a new set of cultural, and more importantly economic values.

2002~

In keeping with the goal of 'Green Silicon Island', an increasing emphasis is given to the intangible value of cultural and creativity. As a result, tourism becomes one of the major solutions for creating a synergy by combining natural resources, commercial activities, and local culture. Accordingly the "Local Culture House Programme" was also launched in 2002 with the aim to attract private investment and public participation in setting up local cultural houses for cultural activities, involving the artists, local historians, agricultural produce, town development planners and tourists.

After 2003~

The formal promotion of the existing five CCIPS was initiated in 2003. The First Stage (2003-2007) took properties of old wine factories and warehouses of the Tobacco and Wine Monopoly Bureaucracy located in Taipei, Hualian, Taichung and Jiayi, and measures like land transfer and urban planning were initiated. Currently in the second stage (2008-2011), the major five parks are positioned as follow[8]:

7 In Culture We Trust. Taiwan Review. http://taiwanreview.nat.gov.tw/ct.asp?xItem=59426&CtNode=1337&mp=1(17.01.11)

8 Data on the CCA website. http://english.cca.gov.tw/ct.asp?xItem=14194&ctNode=4139 (17.01.11)

- **Huashan:** the park in Taipei will be a center for the promotion of performing arts of "cultural creative industry, cross-field art and life aesthetics"
- **Hualian:** the park in the east will see the combination of the cultural and creative industries with the tourism industry "experimental zone combining art industry and tourism".
- **Taichung:** the one in the central will focus on architecture, design and art, "Taiwan architecture, design and art center".
- **Jiayi:** it is in the south and will be developed as the center of "innovative traditional arts"
- **Tainan:** it is in the south and is developing into an incubation center of "creative life media".

Each park's industrial orientation is varied, for the present; each park has planned for construction refurbishment, environment upgrading, private enterprise involvement and art performances. All planned projects are expected to complete by 2011. And under the current plans of the CCA, the CCIPs in Taiwan will be developed under the three major types (CCA, 2010), see Table 1:[9]

Gradually, both the public and private sectors alike began to show greater interest in cultural park building, with an attempt to turn CCIPs into the mainstream industrial cluster. Despite continued disputes concerning how to develop a well-defined, realistic, and future-proof CCIPs, both economically and culturally, and to create a level-playing ground in the view of the current developing stage of creative industries in Taiwan, it is clear that with the Taiwanese' government aim of developing the overall creative sector, a broad definition of the CCIPS is favored, in order to appeal to the wider parties concerned.

Given the above, it is clear that CCIPs in Taiwan need to be understood as a relational term. It shares profound connotations with the STPs, the dominant form of industrial cluster in Taiwan, rather than a design that is totally free-standing. This leads to the another prominent point that the network characteristics of CCIPs are evident. They have developed historically as a result of interdependence with the central government and the local communities; it has from the outset leant towards a 'networked' model, and increasingly across sectors, resulting in a mode of cross-sector dependence and networking. It may therefore be said that the CCIPs in Taiwan has been incorporated into the economic logic of national competiveness.

Park Type	Main Function	Position	Service	Planning/ Management Strategy
CCIPS for Cultural Creation	-the incubator and exchange platform for local and international artists	- Providing supportive and infrastructures and inspiring environment for artists - Encourage international exchange - Encourage cultural knowledge and	-workshops -exhibition gallery/ performance venues - trading center - artists' social club -seminar rooms -tea house -theatre -cinema	-Encourage cross-sector /cross-cultural exchange -hold annual/ international theme events/festivals -Market local artists and art groups

9 Creative Taiwan- Cultural and Creative Industries Development Project- Action Plan http://www.cci.org.tw/cci/upload/law/20100604104150-8dd3d038610f19c0bd08739c496f4052.pdf (17.01.11)

		education		
CCIPS for Cultural Consumption	as the exchange platform between cultural producer and consumers	- Providing convenient assessable space for general public - Provide cultural and learning experience through a well-designed consumption space - stimulate mass cultural participation and consumption	-exhibition gallery/ performance venues -resources centre for creative production -experiential workshops - creative market -life atheistic lectures -local cultural tourism service station	-Develop a park 'character' by organizing regular theme events and artists residence programmes -provide creative education programmes
CCIPS Complex	as a complex accommodates cultural creation and consumption activities	- a combination of the above two park types based on its local cultural and geographic characteristics and stage tasks given in its regional development		

Table 1: The Three Major Types of CCIP in Taiwan. Translated and summarized by the authors

While both the STPs and CCIPs in Taiwan have attempted to interpret the cluster strategy by developing a fuller network picture of their own, the STPs put forward the grand picture of high-tech industry, the CCIPs provided a more growing and evolving one in the broader context of the creative economy. These two forms of industrial cluster have documented the top-down as to bottom-up of the cluster dynamics, and provided a foundation for drawing a possible co-evolutionary network picture.

The four elements of the co-evolutionary analytical framework are discussed below. These are Adaptation and Selection, Cooperation and Competition, Connectivity and Interdependence, and Heterogeneity as Catalysts. By so doing, the authors intend to draw out the issues and implications concerning how their development paths may cross in practice.

Part 3: Drawing Implications from the Co-evolution Framework:

What is Co-evolution?

'Evolution is mostly coevolution' (Mckelvey 1997), as ''the true and stunning success of biology reflects the fact that organisms do not merely evolve, they *coevolve* both with other organisms and with a changing abiotic environment'' (Kauffman 1993: 237). The overarching theme of co-evolution derived from the biology ecosystem is that while every agent takes adaptive walk and moves around its own landscape, it changes the fitness landscape of all the other agents. For organizational studies, the coevolution perspective is therefore proposed as new lens for gaining insights into the transformation process of the existing organizations on multiple levels (Lewin and Volberda 1999, Mckelvey 1997). Yet how does co-evolution happen? Over the past decades, organization scientists have identified that co-evolution occurs under certain conditions, and four set of them are taken as metaphors to build this initial study.

3.1 Adaptation and Selection:

According to Kauffman (1993), the primary message of classical Darwinian evolution theory is that selection effects are the fundamental cause of order in the biological world, through the process of selective retention. As a rule for evolution, every agent attempts to maximize its own survival chance by continually modifies its adaptive strategy to become more ‘’fit’’, and the environments, as an invisible hand make selections of the fittest. It’s the constant improvement and the self-organizing drive for the ‘uphill’ that keep the co-evolution moving.

The issue of selection and fitness remain central in the study of STPs in Taiwan. Research has indicated that the STPS in Taiwan has been trying to find the core engine for their further growth in order to adapt its model to the increasing competition. As a result, the selection of high-tech industries to locate in such a park has become a strategic issue for STPs in Taiwan. It is found that among those high-tech industries that are currently fit into the performance-productivity selection criteria of STPs in Taiwan, they are industries with higher fitness in “market potential”, “technology level” and “government policy”, such as computer, semiconductor, and communications industries, while as the emerging ones with higher potential, such as photo-electronics and biotech (Chen and Huang 2004).

Clearly those industries are of different development status, and hence require different development resources. Yet all the STPs’ industry-specific strategies are, in fact, interwoven in a dynamic web of industrial interrelatedness, it strengthens the roles played not only by the government but increasingly by the STPS management who are not only the gate-keepers in terms of selecting the incoming firms, but also the game-setter who can see beyond the statistical performance and productivity to reach another level of development (Chen et al 2006). To achieve this, many industry experts have urged that Taiwan needs to move toward the industrial model of ‘innovation as the capital’ (Sun 2004), which requires various cross-sector networking to open up input and output possibilities for high-tech industries, and yet it also requires the STPs, who are the home of some major players in the field, to adapt their current models accordingly.

As indicated earlier, the CCIPs in Taiwan has demonstrated a series of network adaptation in its emergence. On the one hand, it has been triggered by a series of sheltering cultural policies and regulatory measures to safeguard the local and community culture; on the other, the recent attempts to strengthen the economic competitiveness of those CCIPs by relaxing the control of central government also play a further role in the its development, and result in their cross-sector network practices.

In order to strengthen their own fitness and growth, research has also found that the CCIPs in Taiwan has also taken the selection criteria such as: the ‘market potential’, ‘regional development’ and ‘culture improvement’, as the most important criteria when considering introducing the creative industries into the park (Huang 2009). It can therefore be said that the expansion of both STPs and CCIPs in Taiwan are largely an outcome triggered by regulatory and institutional supports, and subsequently, accelerated by their own operational priorities of the concerned authorities, with the aim to survive the marketing competition and to become consolidated.

However, as it was indicated that while the network agents or industries share similarities in scope and attributes, and their production function can be better understood by each other, their co-evolution adaptation pressure to each other tend to cancel each other out (Lewin and

Volberda 1999). In other words, more attention should be given to focus the micro level and to cover a network configuration of higher diversity, especially the issues of managing multi-directional complexity and interest conflicts need to be examined.

It suggests that while STPs and CCIPs are both growing in a crossing-sector context, an important question for them is how to select and decide with whom to co-operate, among the various related businesses and individuals. Yet to further enhance their cross-sector adaptability, the CCIPs provide a rich source and base to increase and integrate human capital beyond the fixed-contracts of commercial dealings and the less dynamic management. This is essential at the micro organization level, so as not just to become the fittest but to 'make the most of the best'.

3.2 : Cooperation and Competition

'Any given organism's ability to survive and reproduce depends on what niche it is filling, what other organisms are around, …and real organisms of co-evolution constantly circle and chase one another in an infinitely complex dance of co-evolution' (Waldrop 1992: 259). In other words, the relative advantage or disadvantage of every agent is constantly changing in a nonlinear fashion with competition and co-operation are at work simultaneously for limited resources (Anderson 1999).

Taiwan's experience has shown that the regulatory, market, political and technological conditions have all played a role in transforming the STPs into the cluster of wider and deeper network embeddedness. On the one hand, in practical terms, those STPs are situated away from existing residential areas but close enough to gain needed labor, infrastructure, supportive industries, finance, utilities, schools, etc. On the other, the STPS networks grow globally into pattern of research and development, production and distribution with organization and individuals acting as network agents to weave the social and personal relationship and value network. In other words, the STPS cooperation and competition network involves the local-global and social-commercial aspects.

Whereas for the CCIPS in Taiwan, the undercapitalized reality of the CCI in Taiwan means that most creative and cultural producers can hardly afford adequate distribution and marketing of their works, and that their networking practices are therefore mainly motivated to seek corporate investment and public participation. Especially the limited local market in Taiwan makes it become a rather common practice for the creative and cultural producers to develop the market-driven networks to create access to potential markets.

Yet while increasingly the high-tech corporate strategically position themselves as financing-and-marketing entities to the creative sector and various cross-over relationships and partnerships have been initiated, making their network relationships increasingly expanding and complicated. However within the context of the STPs and CCIPs, it suggests that instead of seeing the STPs and CCIPs as market-driven through their own generic distribution system or isolated within their own models, it is beneficial to explore how their production capacity and human competence could incorporate and accommodate each other.

3.3 : Connectivity and Interdependence

It has been found that the different degrees of connectivity in the network represents the strength of coupling and dependencies on related agents, and the co-evolution process depend on the precise structure of landscapes and how they are coupled (Kauffman 1993). However,

organizational scientist also indicated that the degree of connectivity should be balanced and not ever-increasing as greater connectivity means greater interdependence between related agents, and a high degree of dependence *may* not always be beneficial for the ecosystem, as it affects the flexibility for adaptation (Mitleton-Kelly 2003)

Taiwan's experience in developing high-tech industries is recognized worldwide as an instructive example demonstrating a top-down sectoral strategy and cluster-based policy in which competition among firms is promoted and cross-industry linkages and complementarities are emphasized (Chen at al 2006). Such a policy has contributed to the development of STPs and more profoundly, Taiwan's entrepreneurial transformation was significantly impacted due to the government's investment in STPs since the 1980s.[10] Empirical study has also suggested that while the Taiwanese high-tech entrepreneurs recognize the need to pursue the best deal in their commercial transactions, they also recognize the value of deeper personal and people relationships in gaining competitive advantage, which again encourage the networking at the individual level (Chang ed. 1999).

Likewise, while externally, the economic impacts have contributed to the emergence and growth of the CCIPs, at the same time, internally, it is found that the entrepreneurial nature of creative and cultural businesses has remained as the central drive of CCIPs in Taiwan, as they are respectively trying to retain the creative and commercial control over their development, and to develop their own character (CCA 2010).

However, while it suggests that at the individual, firm and management levels of both STPs and CCIPs, they are seeing themselves as undertaking an 'enterprise', it in fact brings out the issues beyond the roles of formal and informal relationships in the processing of network formation, but more on the issues of the 'intermediary' (Gamlen and Allen 2007; Chen et al 2009) for both industrial clusters, to maximize the 'embedding effect' **(**Ferrary and Granovetter 2009**)**. The intermediary should act as brokering and agency within the bigger network, finding the right balance between the flexible and the rigid, specialization and integration, the random and the planned, the creative and the commercial, the opportunities and constraints within and beyond the park boundaries, so as to facilitate and smooth the collaborative process between the two.

3.4 : Heterogeneity as Catalysts

As noted by Kauffman (Waldrop 1992:317) that 'once a sufficient diversity of objects accumulated at a higher level, a autocatalytic phase transition happen and get an enormous proliferation of things at that level and these proliferating entities then proceed interact and produce autocatalytic sets at a still higher level.' The diversity of agents not only enhances the evolvability by triggering autocatalysis, but also provides the possibilities of various patterns of recombination as the building blocks for evolution (Anderson 1999).

Indeed as the STPs in Taiwan are proud of their relatively high degree integration with its upstream and down-stream partners and with related science institutions, as those network resources remain crucial to the STPs as they provide important infrastructure such as laboratories and specialized labour force. However a mixed result of such a *networking with science institutions* of the 'STPS factors' to the innovativeness of the STPS tenants has been found (Chan and Lau, 2005); on the other, study on the micro factors shows that *company's openness to networking* has positive effects on the innovativeness of tenants on STPs (Venckuviene and Snieska 2010). Such findings suggest that STPs need to bring in a higher

10 Cluster Buster: Can policy makers create an ecosystem for entrepreneurship? *The Economists*. 16 November 2010

degree of non-linearity and diversity to their current practices.

While CCIPs in Taiwan is defined and positioned as a rather overarching entity, a base which can build industrial networks through a mix cultural and creative activities of community building, R&D, teaching and experiment, production and consumption, trading and marketing. Yet it has also been found that they need to further open up and bring in more actors and agents to stimulate their creative process and strengthens their business practices (CCA 2010).

Putting the STSPs and CCIPs together, as the high-tech sector tends to rely on standardized procedures, and in-house training and education in their knowledge development. Whereas in contrast, skills and knowledge in creative and cultural industries are often tacit, and embedded in web-like social context and personal experience. As a result, it has been suggested that the two sets of knowledge resources can be *transformed* but not *transferred* (Chen et al 2009). It implies that in the context of STPs and CCIPs, the issue of diversity and randomness represents not only the diversity of the members' skills, education and background, but also the variety and richness in the forms of their interaction, so as to generate transformative dynamics.

The task is therefore to acknowledge the values of the mixed ecology within and across departments, firms and parks, and to avoid seeing the composing agents are homogeneous or average. In other words, the intrinsic diversity and the complicated dynamics between the individuals need to be further encouraged, so as to energize the individual agents to build out of their personal connections into a viable business relationships to create values.

Part 4: Discussion and Conclusion:

Given the above discussion, apart from the condition-specific implications, four potential types of network relationships between the STPs and CCIPs can be drawn: namely *commercial collaborations*, *technological connections, creative alliance,* and *innovation partnership*. These relationships require management to minimize the potential interest conflicts and impacts on the technological as well as creative process which remains essential to both parks. Finally, reflecting between the relatively developed model of STPs and developing model of CCIPs in Taiwan, a set of network order: namely co-evolving from within, on their co-evolutionary path is outlined below.

Co-evolving from Within:

Adaptation to the changes and requirements brought by the network across all levels, so that an integrated network strategy could be formed leveraging their core-competences and strategic growth of the parks. As the initial review suggests, there might be an industry-specific difference in terms of the nature and extent of the networking practices. In particular, once such a networking principle is emphasised or internalised, for the park management, it requires an awareness that in order to further encourage the wider network, an internal synergy within the park has to be achieved. This can be seen from several aspects:

Firstly, STPs in Taiwan demonstrates their strength also lies with the broadening range of high-tech tenants and productions on the park. Yet internally, a relationship-oriented and social approach to create a sense of a distributed planning and open learning process has been suggested, which will serve as the foundation to build the network partnerships outwardly, and a fundamental and collective strategy for its future growth.

Secondly, the CCIPS experience shows us that while a park grows, the disorganization, subtlety, mixed ecology and informal approach which characterise CCIPS's distributed networking might be under challenge, as CCIPS's development has been brought about by their local and bottom-up networking flexibility and mobility around the park and various businesses, communities and individuals. Meanwhile, however, increasing intricate issues concerning the management of network resource in multi-party collaborations and different levels of involvement are being introduced to the park management.

Finally, as the co-evolutionary analysis shows, the idea of 'learning' remains central to all the agents while taking their adaptive walk at all levels. Any specific action and route they take to build up a relationship, no matter how formal or informal, intentional or random, provides opportunities for them to learn, both creatively and operationally. Importantly however, the co-evolutionary network also highlight that there is a need for the agents to go beyond simply balancing the tensions between 'science' and 'arts', or tracking the paths of the continuity and change evident in STPs or both of their growth tracks. Therefore the evolving network relationships between the STPs and the CCIPs in the age of service and creative economy deserve continued observation.

To conclude, at a macro level, the recent economic transformation in Taiwan explain much about the expanding landscape of industrial cluster and hence the STPS and CCIPS within it. On a micro-level, however, the co-evolutionary framework projects possible paths that the two distinctive sets of network dynamics can be connected in terms of what they can offer each other creatively by capitalizing on their human capital, and what they can tune with their own specific needs operationally and commercially through co-creating a joint pool of collaboration, and to grow a more subtle, strategic approach towards their networked, innovation-driven yet fundamentally 'people' business. By so doing, the STPS's competence could be further strengthened not only through the cozy and linear supplier-client relationships, but also by embedding itself in an enriched condition with a network tension to enlarge their network knowledge pool and encourage entrepreneurship, which are the very essence of cluster strategies.

The paper is an initial inquiry into one of the most promising yet neglected area -the network synergy that might be generated between the two major forms of industrial cluster, which involves more than a combination of their network resources, but a co-existing and co-evolving ecosystem. Its main contributions are therefore firstly to have taken a cross-boundary and cross-industry perspective by integrating the network landscape of the growing CCIPS into the future roadmap of STPS, an expanding network model which enriches the STPS's people and competence is thus outlined; and secondly, to have put forward the wider social, cultural and creative values and intangible human capital that STPS might generate and contribute to more significantly and timely at the centre of the network study.

###

Reference:

Anderson, P. (1999) Complexity theory and organization science. *Organization Science: A Journal of the Institute of Management Sciences 10*(3):216-232.

Bilton, C. (2007) *Management and Creativity: From Creative Industries to Creative Management*. Malden, MA; Oxford, UK: Blackwell.

Bilton,C. and Cummings S. (2010) *Creative Strategy: Reconnecting Business and Innovation*. London: WileyBlackwell

Chang L.Y (1999) (ed) The Networked Taiwan: The People relationship of Enterprises and Economic Rationality. Taiwan Industries Research Series. Taipei: Yuan-Liu Publishing Ltd.

Chen, C., Huang, C. (2004) A multiple criteria evaluation of high-tech industries for the science-based industrial park in Taiwan. *Information and Management* 41(7) : 839-851.

Council for Cultural Affairs (2010) Comprehensive Report on Cultural and Creative Industrial Parks http://www.cci.org.tw/cci/cci/market_detail.php?sn=3756 (10/01/11)

Cultural and Education Foundation for Environmental Planning and Urban Research (2003) Research Report on Development Strategy of Cultural and Creative Industrial Park in the Globalization. . Research Commissioned by the Council for Economic Planning and Development, R.O.C. http://www.cepd.gov.tw/dn.aspx?uid=4681

Chen , M.H., Wen C.T. Lee B, Peng C.H. (2009) Innovation Intermediaries in Creative and Cultural Industries: The Case of Taiwan. Paper presented at the DRUID Summer Conference, Copenhagen Business School
Denmark, June 17 - 19, 2009.

Chen,C.J., Wu, H.L., Lin, B.W. (2006) Evaluating the development of high-tech industries: Taiwan's science park. *Technological Forecasting and Social Change.* 73(4):452-465.

Dodgson M, Mathews J. Hu M.C and Kastelle T. (2006) The changing nature of innovation networks in Taiwan: from imitation to innovation? Paper to be presented at the 2006 DRUID Summer Conference http://www2.druid.dk/conferences/viewpaper.php?id=188&cf=8

Ferrary, M., & Granovetter, M. (2009). The role of venture capital firms in Silicon Valley's complex innovation network. Economy and Society, 38(2), 326-359.

Gamlen, P. and Allen, J. (2007) Formal versus informal knowledge networks: challenges for R&D management. *R&D Management* 37(3)179-196.

Huang Y.F, Chen C.J., Chang, H.H. (2009) A multiple criteria evaluation of creative industries for the cultural creativity centre in Taiwan. *International Journal of Entrepreneurial Behaviour & Research*.15 (5)473 – 496

Isaak, R. (2009). From collective learning to Silicon Valley replication: The limits to synergistic entrepreneurship in

Florida R (2002) *The rise of the creative class*. Basic Books: NY.

Florida R (2008) *Who's your city?* Basic Books: NY.

Kauffman, S. A. (1993) *The Origins of Order: Self-Organization and Selection in Evolution*. New York; Oxford: Oxford University Press.

Kung, S. F. (2008) Role of Science Park in the Formation of High Technology Industrial Cluster – Case of Southern Taiwan Science Park. Paper presented at the 25th IASP World Conference.

Liou H.Y. and Han B.D. (2008) The Cultural and Creative Parks without Directions. National Policy Research Report. National Policy Foundation (May 27, 2008)

Lewin, A. Y., and Volberda, H. W. (1999) Prolegomena on coevolution: A framework for research on strategy and new organizational forms. *Organization Science: A Journal of the Institute of Management Sciences* 10(5): 519-535.

Mitleton-Kelly, E. K. (ed.) (2003) *Complex Systems and Evolutionary Perspectives on Organizations: The Application of Complexity Theory to Organizations*. Oxford: Pergamon.

Montgomery, J. (2003) 'Cultural Quarters as Mechanisms for Urban Regeneration: Conceptualising Cultural Quarters', *Planning Practice and Research*. 18 (4) : 293–306

Montgomery, J. (2003) 'Cultural Quarters as Mechanisms for Urban Regeneration: Case Studies from the UK, Ireland and Australia', *Planning Practice and Research*, 19, 1, March 2004.

Potts J, Cunningham S, Hartley J, Ormerod P (2008) Social network markets: A new definition of the creative industries' *Journal of Cultural Economics* (forthcoming)

Porter, E. Michael (2005) Local clusters in a global economy, pp 259-267 in Hartley J. (ed.) *Creative Industries*. Malden, MA; Oxford: Blackwell.

PIDA (2010) Advanced Research Park-The New Focus of Central Taiwan Science Park. OptoLink International Edition. 2010. Vol 3: 49-50

Pratt A., and Jeffcutt P. (2009)(eds) Creativity, Innovation and the Cultural Economy *London:* Routledge

Sun. M.C. (2004) The Future of High Technology Industries in Taiwan. Taipei: CommonWealth Publishing.

Tsai B.H.' 'and Li Y.M. (2009) Cluster evolution of IC industry from Taiwan to China. *Technological Forecasting and Social Change* . 76(8): 1092-1104

Stephen Chen, Chong Ju Choi, (2004) Creating a knowledge-based city: the example of Hsinchu Science Park, *Journal of Knowledge Management*, 8 (5): 73 – 82

Venckuviene V and Snieska V. (2010) Venture capital a tool in fostering innovativeness of Tenants in Science and Technology Park: Lithuanian Case. *Economics and Management* 15: 310-317

Waldrop, M. M. (1992) *Complexity: the Emerging Science At the Edge of Order and Chaos*. London: Viking.

Yang M. C. (2009) Creative Space: Theories and Practice of Cultural and Creative Industries Parks in Taiwan. Taipei: Wu-Nan Publishing Ltd.

Yen. Y.C, and Kung S.F. (2010) The Analysis of Policy-making Network of the Formation of Innovation Platform- The Case of the Southern Science and Technology Park. Paper presented at The 2nd Annual Conference on Development Studies. National Taiwan University. 2010, 11.20