Exploring the Influence Factors for Creation One Knowledge Hub of Science Park: Comparison between Silicon Valley and Hsinchu Science Park

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Abstract--**The industrial economy has been changed due to the globalization that the science park become a key factor to a national economic competitiveness. The science park plays an important role at new technological innovation development and high-tech industries development. It relates the whole national economic growth and industry's innovative capabilities. This study through literature review, AHP and expert method draw out these influence factors and conceptual framework. These main influence domain factors include "Technology Knowledge (TK), Knowledge Spillover (KS), Learning Environment (LE), Innovation Performance (IP), Absorptive Capacity (AC), and Regional Development (RD)." This research through expert's questionnaire and AHP method outcome which factors have direct impact and which factors have indirect effects to the knowledge hub of Science Park.**

The results states "Innovation Performance (IP)" is the most important factor in main-factor domain, which is very important factor for creating knowledge hub of Science Park. Under "Technology Knowledge (TK)" domain the respondents of Silicon Valley and Hsinchu Science Park have consensus selection "Organization trust" the most important sub-factor for this domain. The "Market orientation" also was evaluated the most important sub-factor in "Innovation Performance (IP)" main factor domain. In "Regional Development" main factor shows out "Localized competition" was the most important sub-factor for building up knowledge hub of Science Park. The experts of Silicon Valley and Hsinchu Science Park are more consensus viewpoint on creating one high-tech knowledge hub of Science Park.

I. INTRODUCTION

National competiveness bases on country resources, industrial competitiveness, and economic capability, especially on science park, which lead to develop a unique set of capabilities in a competitive environment [1]. Therefore, many developed countries adopt the science park to achieve national economic development based on high-tech firms within the science park area. The typical terminology of the science park is as serves as a boundary and/or central organization a core around with R&D institutions, high-tech firms, center of government research, and even local suppliers and financial communities [2, 3]. The goverment of developing countries eager to establish venture capital industries and technology parks that can help country's whole economic development. Saxenian and Hsu [4] point out when creating a new institution or a new science park, countries must pay attention on expansion of the training and education of employees. Consequently, this study explores what factors impact on creating a knowledge hub of Science Park, comparison the difference with from these parks by its knowledge content, knowledge spillovers between industrial actors and academic institutions and density of social network knowledge [5].

Scholars stated that knowledge hub is an institution or network to share and exchange development experience in order to bring economic competitive advantage [6, 7]. The main purpose of knowledge hub is knowledge and information sharing, creation, acquisition and development of new technology knowledge [7]. In the meantime, knowledge hub provides easy access to high-tech firms, research and development of new products, collaborate with universities, research institutes and others to share their ideas and information, to obtain new patents and to solve technical problems ensuring that knowledge transferred to meet the market demands [8, 9].

Porter [10] points out that knowledge hub consist of (a) economic factors; (b) demand conditions, and (c) supply chain management. In other word, the collaboration at the knowledge hub directs to technology innovation through education program accelerating learning growth and enhancing the knowledge transformation. In addition to, knowledge hub focuses on demand led and supply led businesses to stimulate their operation, based on sharing information and comprehensive knowledge for creative industries [11]. Consequently, the knowledge hub is to create environment that supports more secure and dignified livelihoods for local communities to provide coordination of information, to plug knowledge gaps to influence international and national policy.

Knowledge hub of Sciences Park in developed countries concentrates to build new knowledge promoting investment in technological innovation areas, furthermore it effects on sustainable economic development. For examples, Singapore knowledge hub focuses on technology opening up R&D inclusion of every citizen in knowledge production, usage and dissemination [12]. Thus, knowledge hub would be essential for competence, integrity, social value, humanities education and hedging against the risk [1, 13] that the output indicators of the knowledge hub are technological innovation, value added production and regional economic growth. Besides, in order to generate a novel linkage and to facilitate effective knowledge network in developed and developing countries, knowledge hub offers a strong opportunity for collaboration toward innovation, new capacity, and value added production within the area [7]. It is a multi–stakeholder-learning platform and local innovation system characterized by internal and external network and knowledge sharing capabilities at the policy and strategic level providing a ready source of intellectual capacity both for industry development and for regional economic growth

[14]. Knowledge hub is to bring a deep understanding of (a) human resource flows; (b) institutional linkages; (c) industrial cluster and (d) innovative ideas [15].

The advantages of the Science Park are presence of qualified researchers, who mobilize resources, transfer knowledge and encourage high quality research relevant to the industry. Meanwhile, they generate new knowledge between private and public sectors, create technical collaboration, adaptation of new technologies and strengthen technical personnel transmitting knowledge through education and training system and providing learning opportunities [14, 15, 16]. This study compares Silicon Valley of California and Hsinchu Science Park of Taiwan exploring the best matching factors of the knowledge hub of Science Park considering their performance and weight of criteria. Silicon Valley has almost 60 years and Hsinchu Science Park has almost 30 years development experience, respectively. Silicon Valley and Hsinchu Science Park are the most frequently cited industrial and science parks in the world, where major concentrations are semiconductor and computer industries. Saxenian and Hsu [4] study specified as IT industries in United States and Taiwan are differently specialized and remain at the different levels of technological development. Different perspectives of the different science and industrial parks underlies key factors of the knowledge hub toward national competitive advantages [1].

II. LITERATURE REVIEW

A. Science Park

The concept of Science Park originated in the late 1950s to provide technical, logistic, administrative, and financial infrastructure for young enterprises to enhance its competitiveness in globalized market [17, 18]. Science based value added–enterprise complex can be found at the regional extent (United States, Japan, Taiwan and other countries) or inter- urban scale [19]. Felsenstein [20] identified that science parks are seedbed for innovation and relates to the function in a regional economic development and informal flow of knowledge, education and experience. Science Park composed of a knowledge infrastructure (as knowledge hub) that creates positive externalities promoting innovation and entrepreneurship [20]. Knowledge intensive industrial districts seek high-tech new production and facilitate new technological knowledge transfer [21]. Leydesdorff et al. [22] research the number of firms in the geographical unit as a factor in the weighting and the result shows that industrial structure and knowledge base may differ depending on aggregation level. Knowledge based of science parks which industrial cluster used in (a) analyzing learning and innovation behaviors; (b) providing mentorship and consultancy; (c) training–trainers; (d) generating policy analysis; (e) hosting resource center; (f) effect on the local economy; (g) research collaboration; (h) patenting and licensing; and (i) creating and supporting regional networks [9, 20, 23, 24]. In fact, high knowledge activities are expensive, yet it increases innovation and customization capabilities [25].

In a new era, the countries started to focus more on activities demanding with intellectual content, higher education and life-long learning, investment in R&D, education, training, branding, marketing, and knowledge intensive services [2]. High tech firms and knowledge based industries heavily rely on external relationship and network in order to implement effective and faster knowledge domains. It noted that single organization and/or high–tech firms itself cannot bring any changes and cannot successfully innovate in isolation due to lack of knowledge [21, 26, 27].

B. Knowledge hub

The knowledge hub will provide a proper knowledge exchange and/or the evolution of knowledge patterns responding to the new requirements composed of knowledge infrastructure, such as a university or a research institute [20, 21, 28, 4] point out that multinational corporations are no longer privileged vehicle for transfers of knowledge and skills, instead it needs to specialize, cooperate and upgrade their capabilities. Knowledge hub links to the national innovation system through knowledge flows that modern high-tech sectors of economy often based on indigenous knowledge [29] and firms may have difficulties without sufficient knowledge. Knowledge is a novel topic for scholars [30] and plays an important role influencing to the responsible innovation and technological growth with knowledge pool stimulation to the large diversity of areas [26]. Evers [14] states “knowledge input into production and acquisition of new knowledge creates a new ‘epistemic landscape” with a new design of knowledge production and innovation”. Epistemic landscape consists of knowledgeable and highly educated manpower, academic and research institutions, and companies with strong R&D.

Knowledge is a key input and output factor of an economic activity and entrepreneurial development [2] and is crucial strategic resource for organizational success, which is relevant for the achievement of certain goals that difficult to quantify its worth [16]. Knowledge framework entails: (a) making information accessible; (b) building knowledge and expertise and (c) sharing and exchanging the knowledge [12]. Andersson et al. [25] stated the major knowledge hub processes derived from 30 articles, which are: (a) external transfer from knowledge transfers and national system of innovation, country’s cultural factors, firms property rights, spillovers, and technology transfer; (b) sourcing from external side, knowledge acquisition mode, and firm’s internalization mode, (c) internal transfer from country’s environmental factors, knowledge flows, transfer mechanisms, expert’s role, and level of knowledge acquisition, and (d) integration from compatibility between knowledge bases, realized absorptive capacity and cultural intelligence.

Knowledge hub development enhances innovation performance, generates networks, creates human capital and jobs, build capacity of skilled force, exchange tacit knowledge and create a tick industrial atmosphere building business locale [13, 19, 31, 32]. Besides, the knowledge hub is a system to affect entrepreneurship, shape pathways to cluster and manages commercialization efforts [32, 33] and to create, store and transfer knowledge spillover and artifacts defining new technologies [34] through generating knowledge policy, internal and external networking, governance, knowledge sharing, innovation systems and learning experiences [35, 13, 36]. Therefore, the knowledge hub activities significantly impacts on technology, innovation and knowledge interrelated phenomena that technology are used to solve real world problems, innovation is a new idea for more effective process and knowledge is understanding of facts, information and skills [25]. Youtie and Shapira [7] found knowledge hub advances technology and regional economy.

Knowledge hub is dynamic in developed countries because it has regulation flows from government toward innovation, financial flows between government and private companies, human flows between companies and local community and knowledge flows from university to industry and collaboration network among related stakeholders [11, 37]. Hence, the knowledge hub is essential for government, firms, universities and industry that provides financial incentives and knowledge spillover and develops a proper learning method and technology capacity to enhance sector and industrial development. Martini et al. [13] stated that the primary actors in the knowledge hub are local government, which responsible for regulation and facilitating funds, secondary actors are academicians, who responsible for knowledge dissemination to create and share knowledge within the area, and tertiary actors are business entities developing economic activities within the area. Knowledge hub is one of the triple helix models based on knowledge cluster to create economic corridors and to reinforce knowledge assets that integrates R&D institutions, strengthens vocational education program and forms dynamically adaptive competences [2, 13, 38]. According to the Youtie and Shapira [7] many universities seek a variant of the knowledge hub model to impact on regional innovation, which found that entrepreneurial universities have positively impacts on R&D and patent, knowledge spillovers and regional economic development.

C. Technology knowledge

Van Wyk [39] stated the "technology" applies to various very different and unrelated phenomena that technology knowledge is become increasingly strategic and decisive for economic development of countries [40]. Carayannis et al. [2] defined the technological learning as process by technology driven firms to create, renew and upgrade enacted capabilities based on tacit and explicit knowledge resources.

Foreign technology import

The corporate innovation dependents on high–level of technological knowledge and firm's complex technological knowledge enhances at high levels of prior knowledge and absorptive capabilities [27]. Gilbert et al. [41] point out technological knowledge significantly influence to new firm's product innovation and plays secondary role to the cluster environment in influencing firm's performance. Cohen and Levinthal [42] pointed that sophisticated technological knowledge should be successfully integrated into firm's activities. This statement approved by the Domenech et al. [43] research that R&D collaboration is useful mechanism for creation of technological knowledge. Technology knowledge has two different contexts: foreign technology import and domestic technology purchase, which are reflect to the firm's technological capacity from external sources.

Technological linkage

Scholars point out technology and innovation has been the explosive force behind economic development and firm-base competitive advantage [39, 40, 44]. Guo and Guo [23] stated technological complexity influence on technological learning behavior in the knowledge network, in addition to technological knowledge required for technology development and improvement. Rubin et al. [45] identifies technological knowledge that is critical for both on and off park firms and a more comprehensive sources of knowledge. Moreover, they found that technological knowledge bearers in two sources: At first, university knowledge source as the university plays a critical role for entrepreneurs by providing facilities and expert consultancy, but in early stage university plays a modest role due to the organization's cultural difference and incentive structures. At second, know–how knowledge source as the informal technological knowledge between incubator shareholders in a tacit knowledge form.

Technology transfer

Besides, previous studies argued that technological knowledge fosters comparative advantages and high values for firms providing broader application opportunities [36]. Technology knowledge will be gained through right technology transfer activities of local universities, which tend to focus on creation of start–up companies resulting in faster technology cycles and in increasing competitiveness in global market [25, 46] Technology transfer occurs through foreign direct investment, joint ventures, licensing, import and export of goods and personal mobility [47]. Leisyte [33] pointed that knowledge hub handles technology transfer activities on behalf of university and manages facility sharing between university and industry. Technological transfer has great potential for promoting innovation and competitiveness at the regional level that university and research centers play crucial role for technology transfer, furthermore it develops university and industry interaction and information flow [20, 48]. According to the Padilla–Perez [47] research the technology transfer is process of developing indigenous capabilities through global–local interactions and expands production capacity, to increase human capital through training and instruction, and to generate and manage technical change. The research result suggests that proper policies are essential to encourage knowledge–intensive technology transfer to the host region and to absorb the technology transferred. Technology transfer shared for both on–park firms and off–park firms [45].

Organizational trust

However, in technology intensive industry, trust is critical due to the technology and risk relation. Trust relies on social norms and behaviors, and information sharing is a key factor of the organizational trust [49]. According to the Seppanen et al. [50] research trust based on three components: dependability, predictability and faith, yet there are number of dimensions of trust, which has not universally agreed. Spatial proximity fosters trust relations over a long–term period leading to confident and cooperative local business environment [51]. Ashleigh and Nandhakumar [52] states from an inter–organizational perspective, the concept of trust underlies the sharing of votal knowledge, which is the most difficult concept to dealth with due to the diverse definitions. Seppanen et al. [50] concluded their research that trust is a key concept in the knowledge based competition in the network era.

Technology infrastructure

The technology infrastructure include university labs for basic research or input suppliers [42]. It is essential to stimulate information dissemination based on market needs and in research development [53]. With connection to the knowledge hub, it must provide all required technological infrastructure, such as facilities, new technologies, laboratories and trained staffs, which all should be accessible for both industry firms and academics [9]. Considerably, Walcott [19] refers key features of the knowledge hub designed to commodify lab bench into successful market production including shared physical (electricity, telephones, computers) and human (secretariat, legal, accounting) supports, dormitories or housing for workers and other facilities (store, conference centers, parks and etc.). Overall, an efficient performance of the knowledge hub affected by various factors of the technology knowledge and the knowledge hub needs a more comprehensive approach in order to meet minimum technological requirement of firms and academics. Thus, this study applied technological knowledge and its related sub-factors to explain a proactive way of the knowledge hub.

D. Knowledge spillover

Knowledge spillover is invisible [34], homogenous [54], intangible and difficult to measure [30] and is an explanatory factor of economic activities, market growth and innovation [55]. Knowledge as object knowing in practice that knowledge acquired through interaction, demonstration, imitation, performance and shared experience [55]. Knowledge is crucial resource to shape strong economy and social development in intensified global competition [21, 40]. However, knowledge is difficult to codify and often only serendipitously recognized [54] and knowledge flow is uncertain, therefore it is essential to infiltrate and localize new knowledge through regions strengthening interactions among various actors in a region to synergize knowledge and motivate industries [21]. Knowledge sharing and flows are important aspects on innovation. The quality of the knowledge depends on locally specific functions in the knowledge infrastructure [22]. In spite of, spillover explains local concentration of economic and innovation activities [55].

Knowledge spillovers have knowledge inflows and knowledge outflows that knowledge inflow is positive effects for firms; however knowledge outflow have positive and negative effects on a firm to the leakage of intellectual capital and intangible asset [51]. Knowledge spillover measurable by the patent citation and knowledge production function [34]. Each industry has different knowledge spillover [56] and the university knowledge spillover becomes a central issue for technology transfer [57]. Moreover, knowledge spillover contributes to corporate innovation [30] and has positive impact on regional growth [34]. Knowledge spillover theory of entrepreneurship highlights entrepreneurs important on local knowledge spillover (Schmidt, 2015) and increase technological opportunity [34]. The theory identifies source of entrepreneurial opportunities new knowledge and ideas that entrepreneurial activity will be greater where investments in new knowledge are high [54]. Cohen and Levinthal [42] the result suggests that the positive absorption incentive associated with spillovers is greater in industries where difficulty of learning. Entrepreneurial university plays a key role for knowledge–based societies arranging universities, industries and government agencies [34] and firms have higher growth and market valuation due to the knowledge spillover [30].

Horizontal spillover and vertical spillover

Literature distinguishes horizontal spillover as effect on local competitors and vertical spillover as effect on local customers and suppliers [23, 58]. Hallin and Holmstrom Lind [58] pointed that the horizontal spillover refer to the leakage of knowledge to firms in same industry that may effect on subsidiary's local competitors in terms of production improvement in the local market. In spite of, vertical spillover occurs through the leakages and relationship. The result suggests that the horizontal spillover is not common compared to vertical spillovers, yet the business relationship with local firms is an important mediating factor of horizontal spillover. Moreover, Chyi et al. [59] found that domestic and international knowledge spillovers impacts on production of HSP firms in the semiconductor industry. Their research found that international knowledge spillover has a positive impact on net sales than domestic knowledge spillover. A firm, university or government engages in bottom up planning will have future rewards in the long–run [13]. Knowledge spillover and catch up, brokering and bottom up is processes to link globalization to entrepreneurship in emerging economies [32]. In a summary, the knowledge spillover is unintentional knowledge transmission, which improves technology using either bottom–up and top down approaches.

Geographical proximity

Audretsch and Feldman [54] explored the theory of knowledge spillover that suggests geographic location influence on entrepreneurial decision since access to knowledge is greater. Moreover, they pointed that the geographic space is a key factor of innovation and technological change. Geographic proximity is critical for both on– and off– park firms and positively influence by knowledge output because they keep using knowledge sources to find technological solutions, and knowledge can easily spillover to have economic value in different applications [45, 54, 60, 61]. In addition to, geographic proximity links to firm's innovation performance [30]. Several studies extends that the geographical proximity minimizes inter–firm transaction cost [51] and search costs for both firms and academicians [30, 60]. Tödtling et al. [44] found that geographical procximity supports knowledge links to universities, researchers and firms to support more radical forms of innovation.

Communication

Successful strategies of knowledge hub involve interpersonal contact and communication to enhance regional innovation system [48]. The open communication has significant association with their technology acquisition from foreign companies. Moreover, active communication between knowledge transferors and acquirers provides an efficient teaching platform, thus multinational corporation willingness to share their technology through extensive conversation. This suggests that knowledge spillover significantly depends on quality of communication that without proper communication turns out mistakes on knowledge sharing.

******Mentoring*

Mentoring is one of the essential factors in Silicon Valley that start-up entrepreneurs solve their problem and solving capability through advice and mentoring [16]. Mentoring facilitates knowledge transfer and supports learning by doing [62]. Obviously, scientists, research and development personnel provide knowledge and mentoring expertise [63].

Labor mobility

Various factors affected to the knowledge spillover, which one is labor mobility that speeds up knowledge dissemination creating links between firms and institutions [23]. Stanko and Olleros [56] stated that the labor mobility allows for optimal resource allocation within an industry increasing performance and the research found that labor mobility has negative effect on innovations, yet beneficial to overall sector performance, in spite of, labor mobility demonstrates a significant, positive relationship with profit. As well as high job mobility cross organizations develops denser social networks in the region, for instance Silicon Valley [57]. However, the knowledge spillover through the knowledge hub is less costly and involves mobility of human capital [60].

E. Learning environment

The studies show that learning environment increases knowledge sharing between organizations, allows learners and teachers to adopt new behaviors and responsibilities consistent to reality in various components [62]. Learning environment must be consistent with teaching culture that is changing in this globalized era. Learning environment is based on a theory of learning to meet the needs of learners. In fact, learning environment is a place of community that people could access to various resources for creativity, collaborative problem–solving, global awareness and self–learning [42, 62]. Cohen and Levinthal [42] the result indicates that learning environment modifies the effects of appropriate ability conditions, but it is questionable whether spillovers encourage R&D in some industries. They predict that an increase in technological opportunity will elicit more R&D in more difficult learning environment and a more challenging learning environment increases the level of R&D to build absorptive capacity. Furthermore, their result suggested that firms are sensitive to the characteristics of the learning environment in which they operate.

Ruismäki et al. [62] pointed that an effective learning environment guided by learning by doing, constructivism and collaboration and designed to be adaptable and flexible. Dobos [64] stated safety confidentiality and learning space are essential in the learning environment that the better conditions provide higher level of satisfaction for learners. Furthermore, his research concluded that decision–makers gave high importance to the impact of learning environment in order to receive better training results. Consequently, Van Geenhuizen and Ye [26] made emphasis on open knowledge networking is an important process of learning environment that result drives to the innovation with regard to knowledge domains and knowledge partners.

Cultural difference

A number of studies reveal that the cultural difference less or more effects to the learning environment. For instance, the cultural difference has detrimental effects on knowledge management from information flows to knowledge transfer that organizational culture influence on source of innovation of a firm [65]. Park [66] stated that the cultural difference referred as a major obstacle on learning environment that makes difficulties on collaboration and provides negative influence on partnership. Therefore, in some concern, the cultural difference minimizes the knowledge transfer.

Online network

The globalization of education leads to the concept of "online network" environment supported by internet–based electronic system for a comprehensive learning and educational competence. Nowadays, the technology becomes an efficient tool for knowledge creation and computer related tools facilitate interesting learning environment [62]. Online network has perceived usefulness and direct effect on study results and interface is easy to use. In the future, many innovations and new technologies come to the learning environment to expand online network and e-learning. Ruismäki et al. [62] point out that in the future, the development of educational technology brings new opportunities to the education that technology in education will play a key role for students' skill needed in the 21st century.

Physical environment

Overall, the knowledge hub – learning environment involves various stakeholders to provide institutional stability, credibility, access to verities of knowledge [7]. Learning environment of the knowledge hub must contain all required conditions to enable researchers and entrepreneurs with diverse backgrounds could discuss, exchange and develop new ideas [12]. Learning environment must be creative and innovative producing synergies and development of an epistemic culture because learning processes are intrinsically social and collective phenomena [51]. Stein [67] defined the four critical elements of a learning environment: (a) content or tasks and processes that learners have to perform; (b) context or situations surrounding and supporting learners; (c) community or group of people to communicate; and (d) participation or center of the learning process.

Collaborative construction

Dynamic environment opens up market niche and firms strive to deliver products and generate rents for the firm by satisfying customer demand [68]. Lane and Lubatkin [8] stated three methods of learning from external knowledge: (a) passive or firms acquire articulable knowledge about technical and managerial processes from journal, seminars and consultants; (b) active or provide a broader view of other firms capabilities, but it has limited capacities to contribute new capabilities; and (c) interactive or face – to – face interaction between firms and academic institutions, but it does not sufficient for effective inter-organizational learning. In this perspective, the level of collaboration is a major determinant in the learning environment that collaborative construction measured by a qualitative evaluation of the processes [16].

Participatory approach

Participative and supportive learning environment encourage participants involvement, facilitate learning experience to knowledge and skills transfer and improve working performance [64]. Learner centered learning environment covers fairly stable and slowly changing dimensions, such as economic, cultural, social and professional background [64].

F. Innovation performance

National system of innovation theory considers that the firm plays a leading role in the innovation activities [34] and knowledge dissemination and knowledge hub plays a key role in industrial innovation [13]. Innovation relies on knowledge and is important driver of the economy introducing a new or significantly improved product, system, service, program, process or method [25, 68, 69, 70]. Innovation is evolutionary and cumulative process that innovation activities positively affect on performance as an organizational outcome, reduce costs, enhance corporate value and achieve competitive advantage at the international market [1, 21, 70]. Innovation derived from a result of an interactive process of knowledge generation, diffusion and application and relied heavily on external support [21, 44]. Lin [30] emphasizes that knowledge based innovation causes volatility due to uncertain outcome and idiosyncratic volatility consistent with information risk.

The effectiveness of innovation is a competitive strategy, which means innovation strategy could be effective to improve performance in particular environment, but may not be effective other environment [68]. Yet, Kamasak [53] find that innovation strategy, customer and supplier relationship, innovation culture and technological capability are positively related to the innovation performance. Therefore, well established relation with suppliers and customers provide advantages to firms obtaining valuable information and knowledge leading to innovation performance. Firms must set strategic goals before they begin to search for innovation source, because the knowledge hub does not set short–term goals, instead focuses on long–term research purpose [65].

Outsourcing

Furthermore, Stanko and Olleros [56] the findings show that outsourcing has dramatic and positive relationship with profit and benefit the fastest growing industry sectors, but demonstrate negative innovation effect. Van Geenhuizen and Ye [26] stated that early 2000s many companies engaged in open innovation through outsourcing and research collaboration and enhanced due to the increased speed of technology development and increasing global competition. Related to this open knowledge relation established to support niche programs, low cost market entry and technology capability building.

R&D intensity

Firm specific R&D inputs are beneficial for knowledge spillover and positive impact on innovation performance. Hence, R&D collaboration improves the quality and quantity of the innovation [34, 53] that the most innovative countries provide the greatest investment to R&D and new economic knowledge [54]. Moreover, Domenech et al. [43] stated that the effectiveness of public R&D spending as a driver of regional innovation performance as well as strongly depends on region's absorptive capacity. Cohen and Levinthal [42] suggest that when targeted quality of knowledge is less, than increase occurs in the relevance of knowledge and have a more positive effect on R&D intensity. Their research result indicates that effect on R&D intensity of increasing appropriability was significantly greater in industries where applied sciences are more relevant to innovation than the basic sciences.

Market orientation

The result indicates a significant positive effect of the interaction between market concentration and approrpiability level as market concentration increases have positive effect on R&D increases [42]. Saxenian and Hsu [4] stated that success of entrepreneurs depends on being fast to the market. Prajogo [68] shows that process innovations are more beneficial in higher competitive environment than low competitive environments. In addition to, geographical conditions have different effects on various economic sectors due to the differences in the character of innovation performance [22] that firms located within one geographic area have higher innovation performance [41]. Moreover, the majority of new product innovations locate in cities indicating that the innovation is an urban activity [54]. Song et al. [71] indicate to achieve high innovation performance, firms should strengthen implementation of market orientation with a properly designed ownership structure.

Value chain

Chen et al. [89] stated that the knowledge sharing across various supply chain partners is a major concern for both researchers and practitioners. Broad collaboration improve firms' innovation performance, however large firms have more resources than small firms [72], but small enterprises become an engine of innovative activity in certain industries [54]. Moreover, Leydesdorff et al. [22] find that the knowledge–base of the region is carried out by medium–tech companies, yet, high–tech companies contribute in the smaller context. The collaboration contributes to improving knowledge of firm's value chain and to developing the firm's innovative products and services [43]. Clusters or network are mechanism for diffusion of knowledge and production of innovation [40] that entrepreneurs based on knowledge and research create wealth and value–added production chain and beneficial to knowledge spillover, moreover clusters of imitative entrepreneurs connect to the global value chain and drive regional growth [32, 34, 55, 66]. According to the Prajogo's [68] research, the impact of product innovation on business performance is stronger in a more dynamic environment than less dynamic environment.

Expert mobility

Globalization increased the skilled international labor mobility that if market is lack of local knowledge supply then skilled foreign labor imported to advise, monitor and implement the adaptation of new technologies and production practices [73]. The ability to exploit external knowledge is critical for innovative capabilities [42]. Innovation performance encourages new patterns of expert mobility in both knowledge enhancement and research development [13]. Audretsch and Feldman [54] pointed that innovation cluster where knowledge externalities reduce the cost of scientific discovery and commercialization. Integration process is a combination of knowledge from different source to generate new knowledge and applying for innovation [25]. At the result, it could say that internationally mobile talent contributes to the creation and diffusion of knowledge, therefore, the government should ensure that not to penalize the mobile skilled workers [69]. Moreover, OECD's report pointed that migration regime of expert mobility and skilled labor must efficient, transparent and simple [69].

Patent

Besides, innovation measured by input (financial and human resources), output (number of new products or practices), intermediary (number of patents), process (speed and extent of development), or perceptual scale (mean industry innovation) [70, 74]. Considerably, the innovative output was a function of innovative inputs [54]. For instance, Taiwan's technological achievements are reflected in international comparisons of patenting that 1990s Taiwan received US patents at an accelerating rate [4]. Internal R&D and patenting stimulated and supported by cooperation with universities and research organizations that knowledge links of firms and universities stimulate more advanced innovations [44]. Felsenstein [20] states on the output side, on park firms have a greater number of patents than off park firms, but most firms engaged in modification of existing technologies rather than development of a totally new innovation. In addition to, Fritsch and Franke [61] pointed that the public research institutions seem to affect only the propensity to patent but not the number of innovations. Relying on scholar's research, the number of patent applications related to the number of product innovation, which is a firm's competitive advantage, hence patents are intermediate measure of an innovation output [53]. The direct outcome of the knowledge hub consists of patent and publication, in spite, indirect outcome include commercial exploitation of results and follow up opportunities generated by knowledge hub [16]. OECD [69] point out that economy increasingly based on knowledge and innovation, the development of fully functioning knowledge networks significantly impact on efficiency and effectiveness of the innovation. Lau and Lo [46] suggests, if firms want to improve innovation performance they need to strengthen absorptive capacity. Consequently, absorption of innovative fundamental knowledge requires link to other regions [75].

G. Absorptive capacity

Absorption capacity is introduced by Cohen and Levinthal [42] as "the ability of a firm to recognize the value of new, external information, assimilate it and apply it to commercial ends", which is an efficient determinant of the knowledge hub [27, 36, 66]. The dimensions of absorptive capacity are identifying, acquisition, assimilating, transformation and exploiting external knowledge [42, 74]. The transformation and exploitation dimensions involve a new product development processes and a new application to a given technological platform [76]. Absorptive capacity measured by (a) firm's capacity to renew its product; (b) labor productivity; and (c) relative trade performance in high-tech goods [77]. In this case, the absorptive capacity enables a firm to exploit and explore the technology and market opportunities nationally and internationally [78]. The ability of firm is to depend on internal capabilities represented by number and level of scientific and technological qualified staffs [77] and success of the knowledge hub is the presence of the highly qualified researchers [16].

Zahra and George [74] suggests two subsets as potential and realized absorptive capacities that the potential capacity comprises knowledge acquisition and assimilation of capabilities versus realized capacity centers on knowledge transformation and exploitation. Van de Klundert and Smulders [79] refers that learning and assimilation of techniques may be related to learning by doing. Absorptive capacity is prerequisite of organizational learning [66] and positively impact on transfer value on technology firms [36]. Wu and Voss [78] stated that the absorptive capacity does not always play an important role in international performance of firms; however, organizational absorptive capacity plays a positive role in improving international performance of early internalization firms. Above, these results suggests that lack of organizational absorptive capacity can make firms difficulties in effectively acquiring and assimilating new knowledge from foreign markets.

Local human capital

Investment in the human capital is essential as investment to machinery and infrastructure, but it needs to determine where and how to stimulate the development and growth of the business [25]. Firms located close to a research – intensive university have more and better quality of the human capital [30]. An organization's absorptive capacity depends on absorptive capacities of individual members and sustainable accumulation of the human capital within a firm [42]. Individual absorptive capacity strengthens an organization's absorptive capacity [42] and in knowledge-based economy, university become a human capital provider [13]. The human capital is an accumulated stock of skills and talent to manifest in the educated and skilled workforce of the region, and trained R&D personnel to create new knowledge and ideas. The fact, local industrial companies are shortage of knowledgeable workers [2, 14, 60, 74]. In spite of, Van de Klundert and Smulders [79] stated that the developing countries have substantial lower labor productivity in the high–tech sector, but they are able to assimilate knowledge from developed economy by a relative high-value. Furthermore, the human capital is an opportunities to share knowledge, to flow of international investment, and to sustain viable development strategies to deal with tacit components of transferred technology [2, 73, 74].

Scientific human capital

Considerably, scientific human capital is an essential factor that approved by the Cohen and Levinthal [42] where firms require an existing technologist and scientist who are competent in their field that learning determined by the characteristics of underlying scientific and technological knowledge. Casper [57] examined using the correlation and approved that the correlation exists between establishment of the regional inventor network and university commercialization output that former university scientists move across a series jobs within a regional economy to generate networks within the firm and university. Felsenstein [20] found that on the input side, over 40% of employees on parks were scientists and engineers. The scientific human capitals generates new ideas and absorb new technologies, modify them and create and transfer new technological information that brings cooperation between university as a supplier of knowledge and high–tech industry in the long-term [16, 40, 77]. Domenech et al. [53] stated that if a region has a high proportion of highly qualified workers and active collaborative firms, then it has high levels of absorptive capacity. The results indicates that public R&D investment leads to a high rate of employment or large proportion of highly skilled workers and intensive collaboration of firms.

Import of knowledge

Import of knowledge is knowledge of doing things by the international experts [73]. Martin de Castro [27] stated that learning from outside organization develops dynamic capability applying external new knowledge into the organizational base. Zahra and George [74] suggests that external knowledge source in various forms significantly influences on absorptive capacity. Ewers [73] argued that the local learning result from import of foreign knowledge is a function of place's absorptive capacity that the different types of learning are fundamental to technological capacity and economic development. Saxenian and Hsu [4] stated that a foreign technical specialists provides an alternative and potentially more flexible and responsive mechanism for long–distance transfer of skills and know–how in different culture and environment. At the result, the import of knowledge has a positive impact on net sales [59] and significantly influences on acquisition and assimilation capabilities that each firm in the high–tech sector benefits from external sources. Cohen and Levinthal [42] refer that a firm's absorptive capacity is not only sum of the absorptive capacities of employees; instead it depends on transfers of knowledge across and between subs–units.

Education

There is different factors influence to the absorptive capacity; for instance, reforms of education and training systems can help to increase returns from public investment in innovation [69]. The background knowledge required for effective communication and to enhance the organizational absorptive capacity [42]. Education concerned with the training of technology and helping explorers' to identify information source [39]. Researchers' defined that firms should invest to the prior knowledge in order to foster research findings and development of the industry, which is an important driver of the absorptive capacity [76].

Training system

Prior knowledge permits the assimilation and exploitation of new knowledge [42]. Ewers [73] pointed that education and training systems prioritizes knowledge, thereafter institutionalize skills formation through professionalism and credentials. Park [66] point out revealed that there are no a significant and positive relationship between training system and technology acquisition, which due to a fact that the process of knowledge transfer from foreign experts are for a long–term basis, but the training conducts in a short–term. Perkmann et al. [16] stated that the high–quality researches are result of training and learning opportunities for both academic and industry participants that provides skilled and trained staffs within the knowledge hub. Furthermore, Youtie and Shapira [7] indicated that the training produces new knowledge and defined as is "bread and butter".

Open innovation

Nowadays, in an era of open innovation, collaboration between university and industry provides knowledge flow from firms to universities [33]. Open innovation has two dimensions: (a) external knowledge defined by number of external source of knowledge, and (b) establishing relationship with external agents to exploit innovation [27, 72]. In a summary, the absorptive capacity relies on internal and external information and knowledge from employees, competitors and others to enhance organizational knowledge and innovation performance and become source of firm's sustained competitive advantage [27]. Cohen and Levinthal [42] indicates that absorptive capacity is intangible asset that a firm's decision in allocating resources for innovative activity should be more focused permitting absorption of knowledge from new domains. Even though, the results concluded that there are need of more researches to determine organization's investment in absorptive capacity. Firms could gain competitive advantages by developing strategies on synergies between external knowledge and generation of absorptive capacity [72]. However it is questionable whether absorptive capacity needs to be internally developed or to what extent a firm may have it as either through hire a new personnel or contracting for consulting services or corporate acquisition. Despite of, the absorptive capacity is a dynamic capability pertaining to knowledge creation and utilization [76].

H. Regional development

No active discussion has been taken yet how firms interact with the region to enhance its capacity and achieve competitiveness [46]. Regional economy factors influenced by R&D strategies and ties linking scientists and engineers within the regional economy [57] that significant difference exist regard to the productivity of R&D [61]. Knowledge infrastructure of institutional relations (university, industry and government) considered as a necessary, but not a sufficient conditions for knowledge–based economy [22]. Leydesdorff and Fritsch [22] stated that knowledge–intensive service is important for generation of employment, but does not significantly contribute to the regional economy. Yet, high–quality employment may be important for knowledge spillover across regions. In addition to, innovation policy at the regional level reflects to industrial structure and knowledge infrastructure in a region, though, the synergic effect could be various among regions and sectors.

Location quotients

Walcott [19] pointed that the location is a major consideration for regional development through transport linkage, cost of land, tax relief, and access to research facilities, and community input and support. In addition to, the location reflects on local strength, development levels in a surrounding region and positive effect on cooperation for innovation [3, 19]. Felsenstein [20] pointed the importance of the understanding of the relationship between knowledge hub location and innovation that it relates to the environment occupying dimensions in geometric space as is not exclusively spatial and a firm's network environment. Location quotients utilized to quantify industrial development and location is an integral factor of innovation. Scholar pointed that all science parks located in urban cities, but it should be located on site distinct from existing industrial areas and proximity to residential neighborhoods [20]. Audretsch and Lehmann [60] the result indicates that the university output influences to the location decision of firms.

Stakeholder network

Today's rapid technological advances require university to be more innovative to meet entrepreneurs and consumers' demand. A university will not be successful alone, due to lack of resource; although, the establishment of the "knowledge hub" will be significantly important to increase stakeholders network to achieve the desired goal. Stakeholder network remains efficient by developing trustworthy and collaborative partnership [89]. Felsenstein [20] noted if local linkage structures are weak, does not mean that the total impact of the knowledge hub on the local economy is negligible. There are induced effect on local income, output, and employment by the knowledge hub. Government requires developing a healthy competitive environment in order to affect stakeholder of nations [13]. The stakeholders of the knowledge hub includes academics, policy makers, public administration, support service provides and recipients of technology [48]. Therefore, the efforts of multi -stakeholders network create capacity of knowledge hub involving on implementation of a suitable choice of the appropriate technology and decision of applicable innovation.

Government capability

Henry's [80] book stated Francis Bacon (1561-1626)'s belief that a reformation of the system of knowledge, including an experimental method, a new method of discovery and of confirmation have more benefit to the economic development. Therefore, the Government needs to take lead in areas that firms find too risky and uncertain through public research and well design support [69]. In addition to, the Government should frequently sponsor the international meetings and conferences to bring engineers and scientists together to pull their innovative ideas and knowledge [4]. Consequently, the Government plays a vital role through its policies in various areas [1]. Chen, Wu and Lin [81] research found that central government plays a critical role providing all necessary nutrition on development of the emerging industries, however it plays indirect role on proper infrastructure and environment of firms. Meanwhile, Carayannis et al. [2] stated that the government have a strong influence on innovation processes via financing and directly involve in knowledge generation and diffusion (universities, public laboratories) through financial and regulatory incentives. In contrast, Yingnan et al. [34] found that government's direct R&D investment programs plays a limited role in a firm specific innovation. The government must understand its responsibility to enhance the activities of the knowledge hub through developing strategies to upgrade technical capabilities of the private sector, and to promote new firm formation and competition in technology industry [4].

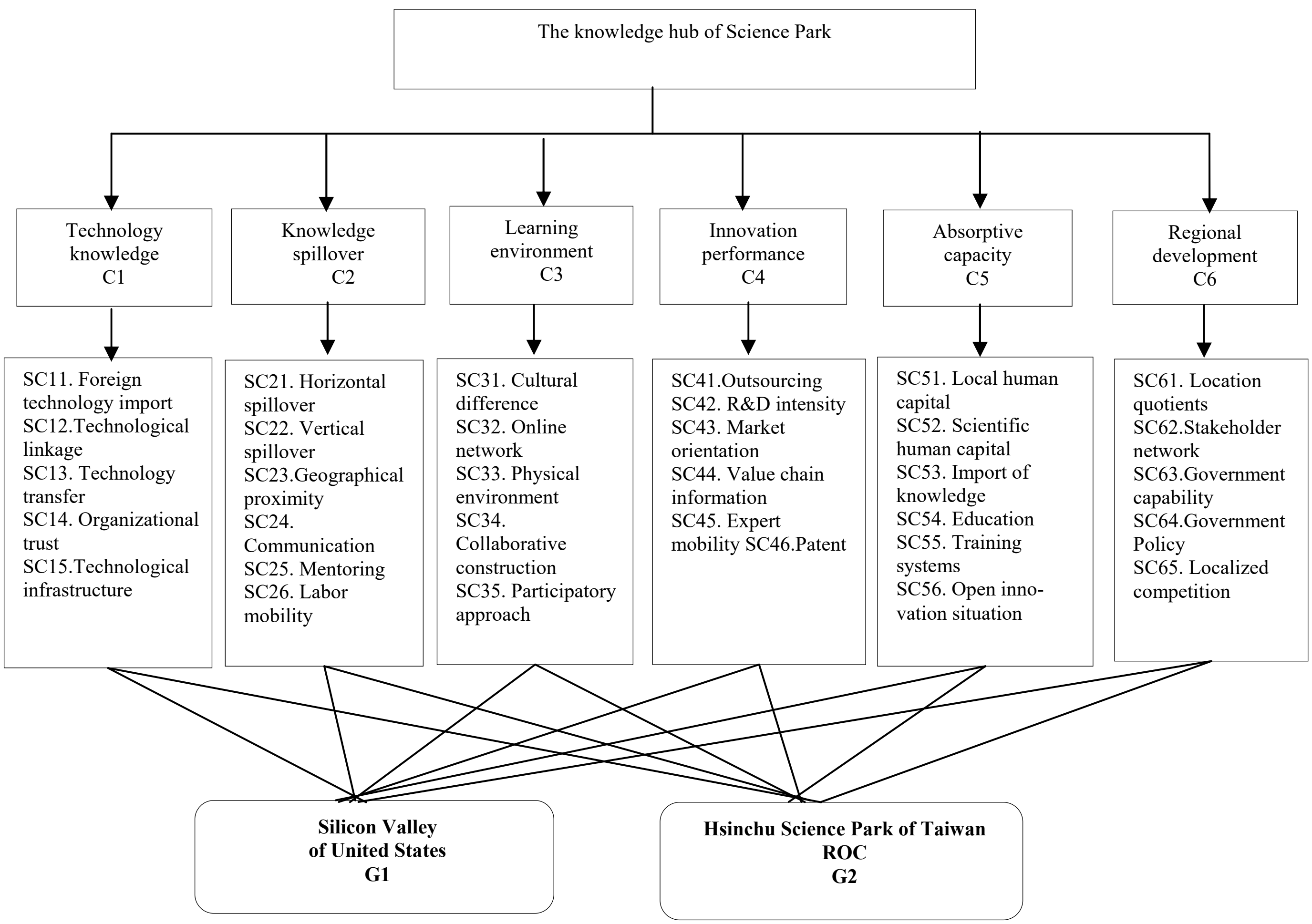

Figure 1. Research framework on Analytical hierarchy process

Government policy

Government supports to develop external factors of innovation source of a firm that government policies allow the private sector to identify the most promising issues and influence on firm's decision of product innovation [65, 69]. Particularly, developing nations could strengthen their competitive position through their policy intervention [79]. But Chen et al. [65] research result does not verify the relationship between a firm choice and the efficiency of government policy. Consequently, government of countries across the world focuses on potentiality of the university to enhance innovation environment to create a regime of science–base economic development [13]. Government is an essential supporter of the industry by employing policy to contribute directly to the specific target [1] and creating macro-economic, political, legal and social environment for businesses and academic institutions [13]. Creating suitable conditions, the government policy must support all stakeholders of the knowledge hub encouraging to increase investment, to boost economic growth, to promote high–tech sector, to support R&D, to create employment opportunities and to strengthen at the international market [4, 13, 40, 54].

III. RESEARCH METHODOLOGY

A. Analytical hierarchy process

The analytical hierarchy process (AHP) introduced by Thomas Saaty [82] is a theory of measurement through pair-wise comparisons to deal with complex decision–making and relies on the judgments of experts to derive priority scale by involving many attributes of varying degrees of subjectivity. AHP is a part of operations research that attempts to apply modeling and statistics to decision selection and execution of the decision within the territory. Analytical hierarchy process has scale measurement from 1 to 9 and. AHP is based on a well establish mathematical structure of consistent matrices and their related capability to produce approximate or true weights [83].

In the traditional formulation of AHP, human judgment is represented as exact numbers, but, human preference is uncertain and may be reluctant or unable to assign exact numerical values to the comparison judgments [84], means, AHP may not fully reflect a style of human thinking and ineffective when applied to ambiguous problems. AHP is flexible to integrate with different techniques like Linear Programming, Quality Function Deployment, Fuzzy Logic and etc., which enabling to extract benefits from combined methods and to achieve a desired goal in a better way (Vaidya & Kumar, 2006). Indeed, the combination of Fuzzy theory with AHP develops the mediate this shortfalls and solves the alternative selection and justification problems [84, 85].

B. Research Framework

This study structured "factors" and "sub–factors" in hierarchy levels driven from the literature considering the knowledge hub of Science Park conceptual. The overall goal of the decision is to find the best matched factor for knowledge hub of Science Park as at the top level of hierarchy. Factors and sub–factors are criteria at the intermediate levels. Finally the decision lay down to the last level of hierarchy as the location alternatives of the knowledge hub that how factors impact to the Silicon Valley of California, and Hsinchu Science Park of Taiwan of the Figure 1.

C. Questionnaire design and the objective for data collection

Our explanatory factors derived from literature review and experts' practical experiences, which six determinants selected to provide information related to the knowledge hub development. Each determinant has five to six sub–factors that a total of 33 sub–factors are indirectly impact to the knowledge hub of Science Park site. Consequently 38 variables contained in the questionnaire. The questionnaire was sent to companies included into the Silicon Valley of California, Hsinchu Science Park of Taiwan, and relevant universities. In accordance with the purpose and the research framework, minimum a total of 90 experts' opinions should be collected through the questionnaire on the preference of the selected criteria.

Silicon Valley Park, we sent to 78 people of companies and universities inside the Silicon Valley, such as Berkeley University of California, California State University, Carnegie Melon University – Silicon Valley campus, Golden Gate University, San Jose State University, San Francisco State University, and Stanford University.

Hsinchu Science Park website as http://www.sipa.gov.tw/english/home.jsp records 480 companies information including their website and e-mail address. We sent questionnaire to 88 companies listed into the website via the e-mail address of a relevant person. Some of the websites gave errors and some e-mail bounced back due to the recipients' e-mail address error. And some companies have a company policy that does not participate in research studies of this nature.

IV. EMPIRICAL ANALYSIS

A. The respondent Sampling

This study received 48 sampling response from Hsinchu Science Park in Taiwan and 10 sampling from Silicon Valley Park in California. The basic data of respondents as follows Table 1 and Table 2. The data collection always was lacked from Silicon valley Science Park due to the space difference. This study will continue following the data collection from Silicon Valley Science Park in California.

TABLE 1
THE SAMPLING BASIC INFORMATION OF HSINCHU SCIENCE PARK IN TAIWAN

Classify	Contents	Number	%
Gender	Female	17	35.42
	Male	31	64.58
Age	21-30	1	2.08
	31-40	12	25.0
	41-50	19	39.58
	51-60	12	25.0
	Over 60	4	8.33
Education	Vocational	6	12.5
	Bachelor	20	41.67
	Master	9	18.75
	Ph.D.	13	27.08
Occupation	Upper management	28	58.33
	Middle management	7	14.58
	Researcher	4	8.33
	Manager	1	2.08
	Professors	5	10.42
	Experts	3	6.25
Organization type	Public	3	6.25
	Academic	8	16.67
	Private	37	77.08

TABLE 2
THE SAMPLING BASIC INFORMATION OF SILICON VALLEY SCIENCE PARK IN CALIFORNIA

Classify	Contents	Number	%
Gender	Female	2	20.0
	Male	8	80.0
Age	21-30	2	20.0
	31-40	2	20.0
	41-50	4	40.0
	51-60	2	20.0
	Bachelor	3	30.0
	Master	2	20.0
	Ph.D.	5	50.0
Occupation	Upper management	1	10.0
	Middle management	4	40.0
	Researcher	2	20.0
	Analyst	1	10.0
	Professors	2	20.0
Organization type	Private	7	70.0
	Academic	3	30.0

B. Comparison the main factor impact to knowledge hub between SV vs. HSP

Silicon Valley is the nickname given to an area in the southern part of the San Francisco Bay in California, United States [86], which established in 1950 Santa Clara County with 3 million people [87]. The first semiconductor producer in Silicon Valley was Fairchild Semiconductor in 1957 and first commercial production was in 1961. By the 1975 five of top 10 semiconductor producers located in Silicon Valley and accounted 43% of output of the industry and 80% of the integrated circuit entrants in the Silicon Valley area were not prior producers [87].

Taiwan is one of the world's largest high–tech manufacturer in semiconductor industry. Taiwan is the third largest producing country in the world and it maintains its long–term competitive position through investment in research and development (R&D) and in strengthening Hsinchu Science Park [18, 81, 88, 89]. Hsinchu Science Park is the Taiwan's knowledge hub and Hsinchu is knowledge based urban city [21].

This study compares between Silicon Valley and Hsinchu Science Park on the main factors, which impact to the knowledge hub of Science Park. The result states the most impact factor to knowledge hub of Science Park is "innovation performance" ranking first. Absorptive capacity is ranking second by Silicon Valley Park evaluation and ranking third position by Hsinchu Science Park. However, "learning environment" rank second by Hsinchu Science Park and rank third by Silicon Valley Park. The others two main factors ranking is same priority. Consequently, the results shows "Innovation Performance (IP) very important impact factor when created one new knowledge hub. Specially, Science Park relies on high-tech knowledge base to do development. Therefore, Silicon Valley Park and Hsinchu Science Park have same viewpoint on main impact factors (Table 3).

TABLE 3
COMPARISON THE MAIN FACTOR FOR KNOWLEDGE HUB OF SCIENCE PARK BETWEEN SV VS. HSP

Main Factor (domain)	Weight (Silicon Valley)	Ranking	Weight (Hsinchu Science Park)	Ranking
Technology knowledge(TK)	0.147	5	0.147	5
Knowledge spillover(KS)	0.099	6	0.125	6
Learning environment (LE)	0.162	3	0.189	2
Innovation performance (IP)	0.239	1	0.221	1
Absorptive capacity (AS)	0.195	2	0.169	3
Regional development (RD)	0.157	4	0.148	4

C. Comparison the sub-factor for knowledge hub of Science Park between SV vs. HSP.

Silicon Valley is a successful cluster and recognized to be an engine of the information industry in the United States of America (Chen et al., 2006; Evers, 2011) that other science and industrial parks adopt its experience when establishing science park in the country. For instance, Hsinchu Science Park of Taiwan. Silicon Valley is a well–established and top–ranked research institution with commercialization in the region and engine of prosperous development of information industry in the United States (Chen et al., 2006; Youtie and Shapira, 2008). Silicon Valley based on two theories of an organization: (a) "early–age liability" theory, and (b) "location economics" theory, which explains why survival rate of companies is higher in Silicon Valley than other science parks around the world (Mattar, 2008).

The results states in Table 4 which there are five sub-factors under “Technology Knowledge” main factor that included “foreign technology import”, “technological linkage”, “technology transfer”, “organizational trust” and “technological infrastructure” . The finding found “Organizational trust” is the most important sub-factor which weight is 0.323 in Silicon Valley, also ranking number one in Hsinchu Science Park weight is 0.221. The second ranked sub-factor in Silicon Valley is “technology infrastructure”. The Silicon Valley is long time and old Science Park. There is strong and complete “technological infrastructure” for semiconductor industry. Consequently, the respondents reply “technological infrastructure” is second important factor when creating a new knowledge hub. But, Hsinchu Science Park respondents reply “Technology transfer” is second important factor for a knowledge hub. Hsinchu Science Park pick up the new technology from foreign company in USA or Japan, therefore, why they select the “Technology Transfer” for second evaluation criteria.

There are six sub-factors base on “Knowledge Spillover” domain which included “horizontal spillover”, “vertical spillover”, “geographical proximity”, “communication”, “mentoring” and “labor mobility” evaluation criteria. The results shows “mentoring (weight, 0.303)” is ranking number one sub-factor under this domain by Silicon Valley Park respondents. But, Hsinchu Science Park respondents select “communication (weight, 0.222)” sub-factor for the most important criteria. Others, sub-factors ranking no difference for Silicon Valley Park or Hsinchu Science Park.

There are five sub-factors under “Learning Environment” domain which included “culture difference”, “online network”, “physical environment”, “collaborative constructions” and “participatory approach” evaluation criteria. The result states that the “participatory approach” ranks number one under “Learning Environment (weight, 0.2352)” was selected by Silicon Valley Park respondents. “Collaborative constructions” selected the most important sub-factor by Hsinchu Science Park. Its weight is 0.2978, where is the main difference between with Silicon Valley and Hsinchu Science Park respondents.

There are six sub-factors under “Innovation Performance” domain which includes “outsourcing”, “R&D intensity”, “market orientation”, “value chain information”, “expert mobility” and “patent” six evaluation criteria. Silicon Valley Park and Hsinchu Science Park respondents consistency selected “Market Orientation” for the most important criteria which weight is (0.2481, 0.2218). Consequently, “Market Orientation” is key criteria for creating a new knowledge hub.

There are six sub-factors under “Absorptive Capacity” domain which included “local human capital”, “scientific human capital”, “import of knowledge”, “education”, “training systems” and “open innovation situation” six evaluation criteria. Silicon Valley respondents focus on “Training systems (weight, 0.2411)”, but the Hsinchu Science Park selected “Open innovation situation (weight, 0.2042)” for the most important sub-factor. Others sub-factors is same ranking both for Silicon Valley and Hsinchu Science Park respondents.

TABLE 4
COMPARISON THE SUB-FACTOR FOR KNOWLEDGE HUB OF SCIENCE PARK BETWEEN SV VS. HSP

Main Factor	Sub-Factor (Evaluation criteria)	Weight (Silicon Valley)	Ranking	Weight (Hsinchu Science)	Ranking
Technology knowledge (TK)	foreign technology import	0.097	5	0.149	5
	technological linkage	0.174	3	0.207	3
	technology transfer	0.163	4	0.221	2
	organizational trust	0.323	1	0.221	1
	technological infrastructure	0.243	2	0.203	4
Knowledge spillover(KS)	horizontal spillover	0.061	6	0.127	6
	vertical spillover	0.070	5	0.144	5
	geographical proximity	0.099	4	0.149	4
	communication	0.282	2	0.222	1
	mentoring	0.303	1	0.181	2
	labor mobility	0.184	3	0.177	3
Learning environment (LE)	cultural difference	0.2092	4	0.1201	5
	online network	0.1098	5	0.1681	4
	physical environment	0.2348	2	0.1684	3
	collaborative construction	0.211	3	0.2978	1
	participatory approach	0.2352	1	0.2455	2
Innovation performance (IP)	outsourcing	0.0734	6	0.0652	6
	R&D intensity	0.1553	4	0.1769	3
	market orientation	0.2481	1	0.2218	1
	value chain information	0.2124	2	0.1604	5
	expert mobility	0.1731	3	0.1619	4
	patent	0.1376	5	0.2137	2
Absorptive capacity (AS)	local human capital	0.1161	5	0.0897	6
	scientific human capital	0.1107	6	0.1364	5
	import of knowledge	0.1592	4	0.1707	4
	education	0.1676	3	0.1988	3
	training systems	0.2411	1	0.2003	2
	open innovation situation	0.2053	2	0.2042	1
Regional development (RD)	location quotients	0.0974	5	0.1517	5
	stakeholder network	0.1403	4	0.1984	4
	government capability	0.1882	3	0.2033	3
	government policy	0.259	2	0.2203	2
	localized competition	0.315	1	0.226	1

There are five sub-factors under "Regional Development" which includes "location quotients", "stakeholder network", "government capability", "government policy" and "localized competition". Silicon Valley and Hsinchu Science park respondents selected "Localized competition" for the most important sub-factor. Its weight is (0.315, 0.226), respectively. Others' criteria ranking is same that shows both Science Parks respondents have similar consensus on this domain.

V. CONCLUSSION AND CONTRIBUTION

Both Silicon Valley and Hsinchu Science Park focuses on semiconductor industry, which has a very important position on computer industry, ICT field, and new electronic technology developing. The IC design service is one of the key sub-disciplines in semiconductor industry development. Hsinchu Science Park of Taiwan and Silicon Valley of California are good examples of Marshallian external economies in which the localization of skill, specialized materials and inputs, and technological know–how generate cost reductions for individual firms and increasing returns to the region whole [4]. Taiwan also is one of the main production central of semiconductor market where the demand of additional semiconductor and IC design service engineers are high that the park achieved worldwide reputation in the semiconductor and computer industry [18]. Silicon Valley Park and Hsinchu Science Park are very good example for knowledge hub developing on high-tech Science Park. The purpose of this study is for creating one knowledge hub of Science Park in developing countries based on focus areas focusing on interrelation of sub–factors and factors to be successful in the long–term and to build strong economic growth of the nation.

The result shows "Innovation Performance (IP)" is the most important factor in six main-factor domain. The respondents of Silicon Valley and Hsinchu Science Park has similar viewpoint on main-factors. Under "Technology Knowledge (TK)" domain Silicon Valley and Hsinchu Science Park have consensus selection "Organization trust" ranking the most important sub-factor. The "Market orientation" evaluated the most important sub-factor in "Innovation Performance (IP)" factor domain. In "Regional Development" main factor data shows "Localized competition" was the most important sub-factor for building up knowledge hub of Science Park.

The results from questionnaire shows that respondents of Silicon Valley and Hsinchu Science Park have more consensus viewpoint on creating one high-tech knowledge hub. Although, two Science Parks are located in different places regions, yet, both Science Parks have similar development history that impacts on creating the knowledge hub.

This study builds up one evaluation knowledge hub model base on literature review, AHP method, expert method, and outcome one knowledge hub of Science Park conceptual framework. The conceptual framework offers reference to others industry, institute, and research organization when they want to creating the new knowledge hub. This research also offers one complete theoretical discussion and development for scholars when they to do new research.

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