# Opportunities and Challenges for Developing a Sustainable Software City: Lessons from Quang Trung Software City in Vietnam

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## ABSTRACT

In the dynamic business environment resulting from rapid technological evolution, firms in high-tech industries have asserted their important role in generating competitive advantages and fostering sustainable growth in domestic economies. Consequently, the topic of how to form and develop a successful as well as sustainable software city model has received increasing attention from both academic researchers and practitioners in the last few decades. In Vietnam, the process of building and operating a high-tech park creates various growth opportunities and many challenges and problems for domestic information technology (IT) brands. This research identifies the opportunities and challenges faced in Quang Trung Software City (QTSC) formation and operating process, one of the largest and most well-known concentrated technology zones in South Vietnam. The authors conducted a qualitative study via in-depth interviews with 15 participants. Overall, our findings indicate that vendors were quite satisfied with the services offered by QTSC. However, the complex procedure for product licenses, lack of community, and unskilled laborers discouraged entrepreneurs from investing in this software city and limited QTSC to enhance sustainable developed targets initially.

Keywords: QTSC; Opportunities; Challenges; Software.

## 1. INTRODUCTION

It is commonly acknowledged that innovation is a critical factor that significantly contributes to economic growth. Especially during the digitalized era, the demand for innovative products, services, and technological solutions is rapidly increasing. Modern business firm managers also gradually change development strategies and transition from traditional factors driven to innovation-driven. This may lie in the fact that innovative technology enterprises can break the traditional constraints of production factors and achieve efficient and sustainable development via establishing a joint network vertically and horizontally. Many scholars have also confirmed the importance of innovation factors in the competitive capacity of emerging economies in the international market.

With the aim to efficiently allocate and utilize resources and enhance productivity in the key economically developed regions, the Vietnamese government and policymakers have been putting major effort into encouraging new startup businesses that specialize in developing innovative solutions and high-tech facilities. However, succeeding with a new business is not an easy task for any entrepreneur. Young companies always have to face challenges such as resource shortage, insufficient management expertise, lack of available talents, and external risks. Therefore, it is reasonable to claim that the sound solution to aid these firms is through the science park model. Science park has been widely recognized for their importance to the development of high-tech enterprises and industrial clusters. The model creates an ecosystem wherein a broad network among innovative organizations, research institutions, and related stakeholders is strengthened. As a hub of the regional innovation system, the science park promotes the knowledge-based industry by strengthening enterprise supports. According to various studies, the incorporation of science parks has fostered regional innovation and economic development, creating several thousand new jobs, R&D opportunities, and the emergence of small and medium enterprises (SMEs) with increased information and communication technologies (ICT).

Following the premises of other successful science park models from other emerging countries, Vietnamese's first concentrated high-technology zone, namely Quang Trung Software City (QTSC) was established in 2001 under the Government's decision. The purpose of the said establishment was to provide essential support for potential domestic firms seeking cooperation from and developing the IT industry. Located in District 12 of Ho Chi Minh City, with approximately 43 hectares, QTSC is a major facilitator of innovative and information services for approximately 20,000 citizens, including accommodation areas, operation facilities, and software and product development enterprises. In addition, with its preeminent infrastructure and high levels of security, QTSC is also considered an ideal place for studying, living, and working.

According to several academic and practical studies, urban industrial cities are formed and operated both by essential factors such as transportation, human resources, and ecological functions—and special factors, like those related to technological, social, and agglomeration issues (Yan and He, 1996; Fang, 1996; Hanying and Chuanglin, 1997). However, there are few related research about IT organizations in transitional countries such as Vietnam. Specifically, there is still a lack of available information and data on the determinants of growth and innovative processes in Vietnamese high-tech enterprises, especially within the narrower research scope of IT companies operating in QTSC.

This research aims to better understand the factors contributing to the success of the software city model in the case of QTSC. The authors also identify and analyze the real demands of tenants and suggest lessons and solutions for policymakers. To achieve this, the strategic analysis and recommendations are conveyed via the results of in-depth interviews. We conducted 15 group meetings, including six focus group discussions with

QTSC board of managers and directors, and nine group discussions with 15 participants, who are either top managers or Chief Executive Officers (CEOs) with expertise and deep knowledge in the field of information technology. Based on available schedules of interviewees, each interview was invited at least two participants to discuss and share opinions with each other. Through 21 in-depth questions, 10 main themes were discovered incentive policies, entrepreneurship, startups, human resources, training quality, outsourcing, investment, the smart city, information security, and community in QTSC. Both opportunities and challenges appeared related to each theme. However, overall, QTSC may be facing more negatives than positives. Figure 1 provides a short summary of the main themes inferred from interviews. Base on the results obtained, this paper aims to answer the following research questions:

R1. Why do enterprises choose QTSC as a location?
R2. What are the opportunities for QTSC?
R3. What are the challenges QTSC faces?

## 2. LITERATURE REVIEW

### 2.1. Definition of science park with sustainable management

The literature on high-tech and science parks has been developed since the 1950s to provide useful insights into their technical, logistical, administrative, and financial infrastructures to help new businesses gain a foothold in an increasingly competitive market (Lai and Shyu, 2005). Per Baptista and Swann (1998), a cluster is defined as a group of same-industry organizations relocated in one geographical place or centered within a nation's science-based park. The process of clustering and interchanging can operate most effectively and efficiently when the related enterprises are concentrated in one geographic region. QTSC's system of organization is concentrated in the fields of IT and software development.

Most science parks are located near universities and colleges to increase interaction with these institutions (Guy, 1996). Therefore, organizations in general or firms in particular located in high-tech parks tend to gain new knowledge and information from external sources such as higher education institutions, consultants, and community entrepreneurs more often than enterprises located outside the park (Lorenzoni and Ornati, 1988). For this reason, Löfsten and Lindelöf, (2002) stated that the gaps between science parks and off-park firms could represent and reflect the motivations of the enterprises and the benefits of a science park location. Felsenstein (1994) similarly stated that science parks play an essential role in the innovation process. Consequently, authorities can raise funds for science parks for strategic tools to enhance research-based industrial and innovative activity (Löfsten and Lindelöf, 2002).

In addition, creating an efficient and sustainable managed environment is also a target of modern and hi-tech cities. Although the prominence of sustainable management upgraded in recent years, there are numerous challenges both in developed and developing and newly industrialized nations (Elabras Veiga and Magrini, 2009). The concept of sustainable development creates direction to adopt principles by involving countries, to be specific, the nations will adopt political and management strategies which pay attention to the three ''Es": environmental integrity, social equity, and economic performance (Elabras

Veiga and Magrini, 2009). Similarly, according to Berkes et al (2000), sustainability is a method of determining the relationship between ecological, social, and economic aspects (Tan Yigitcanlar and Kamruzzaman, 2015), which are described below. To sum up, sustainability is a moral principle that describes how humans should interact with nature and take responsibility to one another and future generations (Baumgärtner and Quaas, 2010; T. Yigitcanlar and Dizdaroglu, 2015). Similarly, Flint and Raco (2012) figured out that the sustainable development of the city is considered upgrading the standard. These are ecology, culture, institutions, society, and economy without leaving a burden; it can be perceived as a developed and grow model that needs combinations between incentives from the environment, local and regional ranging, and ecological systems (Geertman et al., 2013).

To be specific, economic factors relate to the quality/quantity of the infrastructure in the field of the economy (for example, resources/materials, labor structure, and transport infrastructure) in the city; social-cultural equity involves the quality/quantity of the population or social and cultural provisions (for example demographic structure, knowledge structure, and cultural heritage). Ecological integrity relates to the quality/quantity of natural components, for example, quality and availability of natural resources (water, air, soil) and biodiversity (Rotmans et al., 2000).

## 2.2. Factors in developing a science park

### 2.2.1 Preeminent service and environment

Based on previous studies from Chen et al. (2013) and Yan and Chien (2013), the term of eco-setting refers to a friendly relationship between a science park and the environment; these connections are usually created and fostered by forms of "green parks" or "green tenants". To be more specific, the management in Green Park tends to prioritize environmental sustainability in compliance with local environmental standards. Methods and steps, such as the use of cleaner and renewable energy sources to prevent or reduce environmental damages and pollution, are also taken. Similarly, in Green Tenants, member companies implement procedures and policies that protect the surrounding ecosystem (Wasim, 2014).

And over the last few years, industrial ecology also emerged as a possible guideline for improving environmental and business efficiency and reforming the industrial system in a way that is consistent with notions of sustainability. Industrial ecology discusses natural resource flows from extraction to production, product usage, reuse, and return to the ecosystem and the cumulative impact of all of these phases on the environment. That can lead to a good result that materials were cycled through industrial processes in the same way as they are in natural environments, the byproducts from one method will become feedstock for another, and the concept of waste would be led to disappeared (Elabras Veiga and Magrini, 2009).

As "going green" is becoming a trend in many industries, investors are more aware of how companies' daily operations have become more responsible to the environment protection (McPeak and Guo, 2014). This phenomenon has made stakeholders more favorable to adopting environmentally friendly procedures in production processes. It is recommended that science parks adhere to the environmental standards of local authority by setting the adjustment or control of environmentally friendly coordination as a priority (Wasim, 2014). They may also proactively take innovative and novel measures to improve their environmental index, such as using renewable energy sources and reducing, reusing, and recycling plastic products mentioned above.

### 2.2.2. Networking

Through cooperation in environmental and resource issues, member companies aim to improve their environmental, economic, and social efficiency. By cooperating, this group of companies aims to achieve a mutual profit more significant than the sum of individual benefits each organization can achieve by focusing solely on its results. An eco-industrial park aims to increase the economic performance of participating businesses. While their environmental effects and green park infrastructure design is one of the components of this strategy (new or retrofitted), cleaner manufacturing, pollution control, energy optimization, and intercompany partnering are all part of this strategy. An eco-industrial park also looks for benefits for nearby communities to ensure that the construction has an excellent net effect (Elabras Veiga and Magrini, 2009).

Based on other studies from Koçak and Can (2014); Yun and Lee (2013), a science park is established based on collaboration and sharing information built upon external and internal networks. Networking initiatives are arrangements to ensure links between different high-tech park departments that include but are not limited to connections among parks, science park management boards, and tenants, as well as among tenants themselves (Wasim, 2014). Several studies have suggested that the networking is crucial for firms operating in science parks. It provides diverse forward and backward linkages in the value chain and may create access to domestic and foreign sources of investment (Chung et al., 2011; Liefner et al., 2006).

### 2.2.3. Business support

Business support refers to the services providing linkages and relationships to firm members operating in science parks (Berbegal-Mirabent et al., 2012; Hu, Lin, and Chang, 2013; Vanderstraeten and Matthyssens, 2012). These services cover unlimited factors, including incubators, business development, and training services, intellectual property rights (IPR) management, technology transfer, financial support, settlement management, and investment consultancies (Wasim, 2014).

Business incubation is an enterprise-assisting process that accelerates the successful development of startup and fledgling companies by supplying entrepreneurs with an array of targeted resources and services (Tavoletti, 2013).

### 2.2.4. Location

Besides, a cluster of manufacturing and service companies located on a common property is referred to as an eco-industrial park (Elabras Veiga and Magrini, 2009). Location describes a high-tech city's geographic proximity to organizations and facilities that prompt commerce and trade, including R&D organizations, government agencies, universities, city centers, airports, seaports, and railways (Wasim, 2014). Moreover, firms currently tend to locate in which contains acquired regional competitiveness without any geographical limitations to expand the knowledge of economy and acceleration of technological science, such as IT, biotechnology, nanotechnology, and life science; and globalization (Lee et al., 2017). A good location near the city center and airport supports occupants and interconnections with major national industrial zones or modern labs. By choosing such locations, science parks can enjoy the benefits of existing high-tech facilities and infrastructures as well as close interconnections among nearby potential partners (Sofouli and Vonortas, 2007).

### 2.2.5. Infrastructure

Wasim (2014) suggested that three main factors—physical, social, and communications infrastructure—significantly contribute to completing a science park. Physical infrastructure refers to the available capacity of space and place to satisfy the expected lessees.

### 2.2.6. Incentives

According to Li and Ni, (2012); Wang and Liu, (2009), incentives are defined as the financial and nonfinancial benefits given to tenants in science parks. The park can connect with well-reputed universities and colleges to create linkages for its lessees, like R&D equipment, a high-quality workforce, professional consulting, and training activities. Enterprises could also be provided with financial advantages such as access to funds and grants, tax waivers, subsidies on R&D activities, and single window clearance (Wasim, 2014). Moreover, public authorities can support science parks by expanding their assistance services for lessees. In addition, the management board should create a progressive achievement – a master plan in developing processes, in dealing with emerging technology companies (Parry, 2014).

**Table 1. Review summary**

| Factors | Theories and Definitions |
|---|---|
| Preeminent service and environment | Eco-setting is considered as referring to the "eco-friendly relationship between a science park and environment." (C. P. Chen et al., 2013; M.-R. Yan and Chien., 2013). The science park should follow the environmental standards of local authorities by adjusting or controlling environmentally friendly coordination as a priority arrangement (Wasim, 2014). |
| | Industrial ecology emerged as a possible guideline for improving environmental and business efficiency and reforming the industrial system in a way that is consistent with notions of sustainability (Elabras Veiga and Magrini, 2009). |
| Networking | According to Koçak and Can (2014) and Yun and Lee (2013), a science park is established based on collaboration and shared information as well as resources and observably required strong and strict networking roots. |
| Business support | Business support refers to the services providing linkages and relationships to businesses that operate at science parks (Berbegal-Mirabent et al., 2012; Vanderstraeten and Matthyssens., 2012). |
| Location | Location refers to [the] geographical proximity of a science park to organizations and infrastructure promoting trade and commerce. They include but are not limited to industries, R&D organizations, government agencies, universities, city center[s], airport[s], seaport[s], [and] railway[s] (Wasim, 2014). |
| | A cluster of manufacturing and service companies located on a common property is referred to as an eco-industrial park (Elabras Veiga and Magrini, 2009). |
| Infrastructure | Wasim (2014) suggested that a combination of three main factors (physical, social, and communications infrastructure) supports the completed infrastructure of one science park. |

| Incentives | According to Li and Ni (2012); Wang and Liu (2009), incentives are considered to be benefits given to tenants in science parks in both financial and nonfinancial forms. |
|---|---|

## 3. METHODOLOGY

The selection of an appropriate research methodology is a critical decision for conducting an effective scientific paper. It is primarily based on matching research objectives to the characteristics of the usable methods (Yannis and Nikolaos, 2018). In this research, we conducted a qualitative case study to identify the opportunities and challenges facing organizations operating in QTSC. In performing our case study, we conducted research strictly aligned with the achievement of the objectives listed above to establish evaluative questions appropriate for exploiting the research themes.

The targeted participants in our research included top managers, CEOs, directors, and team leaders with deep knowledge of and experience in the fields of artificial intelligence, IT, software development, and product development. In addition, participants needed to work at companies that were in the IT industry were located in the QTSC area and had existed for a sufficiently long time to have cooperated with QTSC's management board.

With the assistance of QTSC's management board, we conducted in-depth interviews with 15 participants who satisfied these requirements. The interviews were conducted over four days (October 11, 14, 17, and 18, 2019) before the COVID-19 pandemic. The interviews took place in QTSC Building 1, Quang Trung Software Park. Moreover, we also conducted six focus group discussions with the QTSC board of managers in marketing, finance, quality control, research and development, human resource management, and public relation.

Throughout the conversations with participants, main ideas were carefully noted in a Microsoft Word document and then copied into the computer. Each meeting lasted about 60 minutes to 90 minutes and could include more than one participant; as such, they could expand on, discuss, or even argue with each other's ideas. After the interview, we used the NVIVO qualitative data analysis software to identify themes and increase the data's credibility and conformability.

## 4. RESULTS

*4.1 Supportive government policies for sustainable growth of business*

As described in Table 1, if either domestic or foreign firms make new investments in QTSC, they would be supported by the assistance listed above. Regarding preeminent services and the environment of QTSC, links to the outside environment play an essential role for parks. QTSC has constructed an appropriate workplace environment with numerous trees, landscaping, and a water treatment system to become a green software city. Furthermore, a one-stop service is one of the free services provided by QTSC to assist enterprises in handling administrative procedures and creating a convenient business environment for organizations investing or doing business in QTSC. High-tech authorities

should set up an optimized environment for autonomous organizations to achieve target sustainability.

At this time, the firms' operating management and business performance in QTSC are rated as efficient (participants #6 and #12). In addition, QTSC offers good one-stop services such as import and export procedures and assistance with visas. Since QTSC has a good relationship with local authorities, firms in the science park are provided necessary support when dealing with any task involving the government (participant #12). Participants also stated that their firm's main reasons to be a member of QTSC included tax incentives, convenient location, and reasonable rent prices.

However, participants #1, #2, #10, #13, and #15 admitted that there were several drawbacks to operating in QTSC. For example, the proposed personal income tax incentives were not consistently applied; investment licenses, tax issues related to transfer prices, tax collection, and tax procedures were also expensive and complex (participant #6). Tax deduction is very complicated; if there is any mistake, firms require the assistance of a competent authority (participants #1 and #2). In addition, the authorities should pay attention to improving procedures and offering better advice and service (participant #1).

Similarly, administrative procedures are still hierarchical and not transparent—for instance, the process of registering or re-registering a business code, changing business ownership, adjusting investment capital, establishing new enterprises, and investment registration (participants #1, #2, #10, #13, and #15). Moreover, few effective policies support investment expansion and R&D implementation, and policies such as tax administration law, new business laws, and investment laws tend to make it difficult for businesses to implement administrative procedures (participants #1 and #2).

## 4.2 Entrepreneurship in QTSC for sustainable growth of business

Many international organizations have invested in QTSC to take advantage of the science park's convenience, effectiveness, and efficiency, including Concentrix, Hexaon, KDDI, Swiss Post Solutions, and Hitachi Consulting. At present, QTSC hosts approximately 140 domestic and global information and communications technology companies. As mentioned in the previous section, one of QTSC's main purposes is to provide support for entrepreneurs and partners to gain access to the Vietnamese market affordably and generate internal and external networks and share available resources when deploying large-scale projects the international level. QTSC has established mutually beneficial business partnerships that can further companies' business interests is necessary to create product promotion opportunities for customers. QTSC offers knowledge, insights, and rewards to enhance the performance of its customers dramatically.

Participants #1, #2, #6, and #10 confirmed that their business performance was very good while located in QTSC. Specifically, they were satisfied with the services offered by QTSC, such as good rental prices, guaranteed security, and efficient operational control. Located in HCMC, the biggest economic center of Vietnam, tenants of QTSC can reach Tan San Nhat International Airport in about 15 minutes and the city center in about 45 minutes. In addition, QTSC conducts numerous related projects such as a biotechnology center, a high-tech agricultural zone, a high-tech medical zone, and a new urban area that lies to the west of HCMC. A metro system connecting these regions is building and planning to finish in the coming years. All of these help QTSC become a strategic place that is convenient and time saving for trade and collaboration. However, activities and collaboration among firm members were not sufficient (participant #2). The support and incentives that local authorities offered to new members of the science park were very

attractive early on but decreased after the first five years. After this period, due to tax and other preferential policies, businesses operating in QTSC have no competitive advantage over those operating in other neighboring countries in the long term.

Furthermore, it usually takes too long to get a business license. Since there is no proactive legal policy to protect domestic businesses, foreign firms tend to have a superior competitive position (participants #3, #4, #5, and #9). In the product development stage, attracting more foreign capital is essential. Participant #9 agreed that the government should support enterprises by intervening in and simplifying this procedure; however, in some fields, such as human resource training, the state does not need to do anything. The quality of labor workforce should be decided by demand and supply for labor.

*4.3 Community*

The science park's culture is defined as a business environment that fosters the exchange of creativity and learning while meticulously adhering to IPR (Wasim, 2014). According to factors for sustainable park of Hommen et al. (2006), organizations in a science park familiarize startups with entrepreneurial actions, culture, and IPR values. There is a general agreement among scholars that network creation is indispensable for the growth of a science park because the services it offers to its target group include networking support throughout its value chain (Wasim, 2014). Networking refers to the links between tenants and organizations outside the park, between tenants and affiliated colleges, and between tenants. Several firms from developed economies have generated incentives for networking activities. For instance, Science Technology Parks at the Indian Institute of Technology, Madras (IIT-M), has already applied for a project called the Earning Credits System, wherein companies in the park earn a certain number of credits if they create connections with IIT-M to stay in the park (National Research Council, 2009).

In general, the connections and interactions created and fostered by QTSC are considered highly successful. Currently, numerous multinational corporations in the software and IT industry have decided to invest in QTSC, including KDDI Vietnam Corporation, Hitachi Vantara, Swiss Post Solutions, and Digi-Texx Corporation as well as well-reputed domestic enterprises like TMA Solutions, Misa, Larion, and Vina Data. Altogether, they have created a large-scale community with approximately 165 IT companies in Vietnam. Through this community, the organizations inside the software city can enjoy relationships that allow them to collaborate, interact, and connect with others in the domestic market and the global market and share links and resources when working on large projects. Nevertheless, in particular, the community between companies does not function well, with only 10 businesses joining the CEO club (participants #1, #2, and #8). This club usually organizes and arranges meeting for CEOs ebulliently discussing the matters regarding the development of quality at their company. It also encourages the club's members to exchange business ideas, experiences and build stronger mutual benefits.

In short, the community in QTSC currently includes only ten people, who are taking part in this club, and has not operated well as its initial expectations. This may be because of the lack of clear goals or resources; many businesses wish to engage in technology exchange but have not achieved the desired result due to a lack of connections. That may be because each business operating in QTSC has different purposes. Accordingly, QTSC needs to strengthen the organization of exchange activities to increase cohesion between enterprises in this area (participant #2).

In QTSC, meetings and sharing may not actually connect business entrepreneurs (participants #3, #4, and #5). Various participants stated that they did not expect much

support because there is no expectation for sharing information in Vietnam. Participant #6 commented that content remains general with regard to the community in QTSC, rather than focused on details. In addition, there is little benefit for businesses, as the advantages of the organizations have not been exploited, and business networks have not been completed.

In summary, participants noted that sharing information and community awareness have not been effective. Regarding networking activities, there exist only personal networks that do not share information or projects among QTSC members (participants #1, #2, #5, #6, #7, #8, #9, #10, #12, and #13). For this reason, the CEO of QTSC confirmed that there should be IT training facilities in the software technology zone to create and foster symbiotic relationships between members in the area.

### 4.4 Startup businesses in the field of information technology

In 1942, Schumpeter proposed the idea of creative destruction: the idea that a startup is the process or action of building a venture company based on new invented merchandise. Simultaneously, entrepreneurial activity has been defined as the creation of an organization managed by a person, which is described as a process rather than something that simply exists (Katz, J., and Gartner, 1988). Based on these definitions, startups and entrepreneurship are increasingly attracting the attention of numerous researchers.

In the case of QTSC, financial support is the most favorable factor for investors— for example, a corporate income tax rate of 10% for 15 years (with a maximum of 30 years for newly established enterprises with large-scale projects in the field of IT, which need to attract special investments). Tax exemptions are applied for the first four years from the date of taxable income, with a 50% reduction for the next nine years. An equipment import tax exemption is applied for products that could not be manufactured in Vietnam when the enterprise was established. Moreover, machinery and equipment that are temporarily imported for project implementation and then re-exported are exempt from value-added tax (VAT) and import taxes. VAT for software products and services consumed in Vietnam is zero percent, as is export and import tax for exported software products. Software cities also create incubator environments: QTSC assists IT businesses in the startup process using this incubator model.

Participants #3, #4, and #5 stated that Vietnamese high-tech companies currently operate with 30% focus on outsourcing and 70% on products. While they can make the product, it costs them five times as much to create the same product compared with foreign output. As a result, they offered some recommendations for startups: Vietnam needs value-added products. Without catching up in technology and management, it cannot achieve good outcomes. Therefore, the country should push producers to invest in R&D, and products must be protected to ensure high quality output. For example, changing orientation to make software of Viettel, e-wallet/digital wallet Momo, accounting software MISA and so on are some illustrations of successful businesses. If we can do that, we can develop the IT industry.

Participant #1 added more information about startup intentions. Starting a new business means that entrepreneurs must accept venture capital, the reality of which is quite different from how it is described in books. To be successful, practical and empirical skills as well as experience are needed. The startup trend came into regression, and Vietnamese startup enterprises were abusing the *Shark Tank* show; investors will automatically enter and assist if the project goes into depth analysis combined with PR brand personal plans and a good product (participants #3, #4, and #5). Consequently, participants summarized

that to avoid wasting resources, both educators and businessmen, who have knowledge and professional experience, should generally not motivate students to start a business or abuse the term "starting a business." Participants #6 and #7 agreed that the startup process is hard; entrepreneurs often deal with difficulties such as lack of professional skills, knowledge, experience, or capital. A large number of failed cases are less frequently mentioned by many people (participant #6); administrative procedures and political trends might create more risk for young people who do not have much practical experience.

Participant #2 also stated that, when encouraging young people to start a new business, self-help activities should be based on the truth; in addition to capital, starting a business also requires knowledge and should involve no delusions. Participant #2 adding that more than 90% of entrepreneurs will fail after starting a business - this opinion is similar with ideas of Vietnamese experts in the field of technology in Shark tank, TIKI and LAZADA[1] are currently dealing with losses, and the creative thinking of students in Vietnam is not nurtured from childhood. Therefore, the government must have specific policies, teach practical knowledge for entrepreneurs, and employ a practical approach to reducing risk for businesses. Participant #1 preferred to find helpful connections and information through startup clubs, forms of cooperation, or even reality shows such as the Shark Tank series.

*4.5 Human resources in the Vietnamese market*
The Vietnamese IT workforce is considered cheap labor (participant #5), which may be a strength of this resource compared with other high-cost foreign workforces. The Vietnamese IT workforce is young, can learn skills quickly, and offers competitive prices (participant #6). Nevertheless, the low labor cost should be considered over the long term. Therefore, QTSC should have suitable policies for sustainable development since if there is a shortage of human resources, labor costs will become a disadvantage because it is not attractive enough for a high-quality workforce (participant #6). According to participants #1, #2, #5, #6, 7#, #8, #9, #10, #12, #13, and #14, there is a lack of human resources in general, but depending on the company, each organization has its own requirements. They also expressed that employees usually change jobs after only a few months. Moreover, Vietnamese students lack knowledge, job skills, self-confidence, and competency to evaluate the value of products (participants #3, #4, and #5). This may be why participant #9 stated that human resources are being depleted, and participant #10 noted that difficulty in human resources was related to the lack of skilled employees and a virtual value that does not meet real standards. In addition, new graduates currently must apprentice for six months; some schools connected with QTSC have specific short-term programs to train IT students. For example, FPT University offers a nine-month program for its own students.

Vietnam's IT industry faces a virtual value problem; in other words, the real value of human resources is quite low (participants #7, #8, #9, #10, #13, #14, and #15). In addition, the IT industry faces challenges including a lack of leading of experts, no concept of job security, gaps in education quality, and lack of loyalty to firms (participants #7, #8, #9, and #14).

Because some students do not understand fundamental software and IT concepts, the human resource departments of participants #3, #4, and #5 always require graduating students to complete an internship prior to becoming official staff. This led to stereotyping: The trainers in big companies in general and in IT business in particular refer and recruit

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[1] Lazada Group is an e-commerce company owned by Alibaba. Tiki is the name of a leading e-commerce website in Vietnam.

students from well-reputed colleges such as HCMC University of Technology or University of Science, Vietnam National University -HCMC. Alternatively, recruiters aim to hire candidates with at least three years' professional experience (participant #6).

### *4.6 Training quality*

As mentioned in Table 1, with eight human resource training centers and more than 10,000 students specializing in IT, QTSC provides human resources with reliable quality and qualifications, from technician to master. Regarding software and IT education quality, students from Vietnamese schools usually graduate with a good degree (participant #13). Similar with above opinion, participant #2 stated that the strengths of Vietnamese IT workforce are young, quick learning, and have competitive price. By contrast, he/she believe that the sustainable development of training is not significant paid attention at the priority. Participant #12 also pointed out above, there was a shortage in human resources, after which more universities with diverse rankings and students appeared, especially in IT and business administration. Participant #12's company recruits students from inside and outside the IT industry; competency matters more than which school students attended. Students who attend well-known schools usually receive better opportunities, so students from provincial schools must work harder to prove themselves (participant #12).

In contrast, participant #9 believed that the basic training program has too many credits and practice time should be reduced. In this situation, the model of field placement is a cornerstone of social work education that encourages students to show how they apply theories and expertise into practice in actual circumstances (Tortorelli et al., 2021). In addition, participant #13 added that college students should complete an internship in two months after their second year and a project internship in the four months after their fourth year. Field placement or internship for students during the semester required a clearly different approach in order to accomplish program requirements and accreditation and licensing requirements for graduation (Tortorelli et al., 2021). Enterprises, as well as academic institutions, often offer training programs. Usually, it is necessary to retrain one new employee for six months before making them an official staff member (participant #7). Currently, it is also very difficult to recruit a workforce: of 100 recently graduated engineers, only 10 will able to read the technical drawings, and many ITs graduates only know doing data entry and word processing (participant #2).

The main focus is thus the development of practical training (participant #12). Participant #1 recommended a connection between schools and businesses, which would help share knowledge and standards and guide students to choose a better career and job position. In addition, companies should help young people and staff to learn English. Besides, the growth of long-term human resources generally requires coordinated efforts and strategies from all national, regional, and international training organizations. The challenges posed by the globalization of markets and economies are not unique to any one country or institution. As a result, in order to develop sustainable human resources, strong networks and partnerships among regional and international organizations and institutions are needed (Fien et al., 2009). According to the endogenous growth theory in general, economic growth caused by the workforce having a good education and technological innovation can be highly substantial and sustainable for economic productivity. The faster growth of human capital leads to faster economic growth in general (Cabauatan and Manalo, 2018).

### *4.7 Outsourcing*

According to the theory developed by Richmond et al. (1992), outsourcing is viewed as a chain of activities that allow for the contracting of special professional actions that put the vendor in charge of performing specific transferred responsibilities that maintain components of the production process of the customer's organization. Outsourcing has also been identified as the process of manufacturing semi-finished products and services or completed products and services from an outside organization if those actions are traditionally performed inside (Simchi-Levi et al., 2003). The high-tech industry and outsourcing business in Vietnam has been promoted and encouraged, leading the country to become one of the top ten nations in outsourcing services and in the digital content market (W. S. Turley and Selden, 2019).

Outsourcing is seen as the cheapest option in the software and IT markets and is often brought to Vietnam (participant #2). Therefore, Vietnam should be geared towards outsourcing and production. Without product development, general development will be difficult, so when the demand for outsourcing is saturated, there will no longer be outsourcing orders (participants #3, #4, and #5). Participants #2, #3, #4, #5 and #6 agreed that Vietnamese IT companies mainly serve to outsource others' ideas, both in Vietnam and in the international market. Outsourcing is not sustainable competitive development; if they are strong IT companies and achieve large market shares, they usually have foreign direct investment (FDI). In addition, selling software to the government is still difficult, for example: BOT software (participant #6), while Vietnamese products might be better than India's (participants #10 and #13).

Participant #12, however, believed that the market in Vietnam is still not focused on outsourcing or production; for example, India focuses on software outsourcing whereas Taiwan pays attention to hardware outsourcing. Participant #1 stated that Vietnam's outsourcing needed more market share and that Vietnamese businesses were not worried about products in the IT field.

Vietnamese software organizations should add value to merchandise rather than outsourcing based on orders (participants #10 and #13). Authorities should also make active policies to encourage Vietnamese products, as innovating one technology solution requires approximately USD 1 million and takes two to three years to deploy (participants #3, #4, and #5).

Another observation about the current government incentives noted that the national leaders need to observe other countries to meet actual societal demands. For example, participants made recommendations regarding how to adjust operations or let entrepreneurs contribute their opinions since Vietnamese companies are fully capable of producing good commodities but do not have any information on how to do so (participants #6, #8, and #9).

*4.8 Investment*

Regarding the legislation of investment in QTSC, the science park strongly believes that it has a great deal of support from national and local authorities to foster and develop software and IT markets in Vietnam. The management board of QTSC also stated that its responsibility is to manage and expand QTSC and assist IT businesses and investors who intend to perform entrepreneurial activities in HCMC.

QTSC meets the priority requirements of any science park regarding the availability of infrastructure services, including unlimited streets, car parking, a water distribution system, ServerHub, and an uninterrupted power supply. Moreover, QTSC has also

generated social infrastructure, which refers to facilities such as sports areas, medical clinics and centers, multiplex dormitories and apartments, emergency response centers, gyms, kindergartens, shopping malls, food courts, clubhouses, and immigration services, all of which can help raise parks' brand value.

Finally, QTSC has established a state of the art of communication infrastructure, which refers to the high speed intra-park, domestic and international data and voice connectivity, IP based plug and plug services, [and] high tech data centers of a standard science par. Science parks usually improve and adjust their infrastructural facilities to suit customers' demands; these activities help them collect early lease contracts from potential tenants and offer clients better conditions for development.

To develop its management structure, since 2016, QTSC has taken the initiative to apply new technologies and techniques to promote QTSC as a modern software park and position itself as Vietnam's first smart city.

*4.9 The smart city*

The science park's authorities have already cooperated with some experts to make a formal application to create an Internet of Things (IoT) platform for management processes, organizational control, assist clients, and update the quality of service. Smart office systems, facial recognition systems, license plate recognition, spatial asset management systems, environment management and monitoring systems, smart street lighting systems, smart water systems, and a smart bike-sharing system are a few illustrations of such a platform. In the near future, QTSC intends to keep developing more innovative methods, such as providing specialized security systems with the most advanced and control centers or establishing basements and libraries for integration solutions. The park will support other science parks to penetrate and adapt to the smart city model in the next step.

Based on our tour of QTSC, we believe that basic needs like internal road systems, power, water supply systems, and drainage systems, roads from downtown to QTSC, crossover bridges, and public transportation are satisfactory initial demands of investors. Furthermore, telecom systems are equipped and connected by fiberoptic cables using Multiprotocol Label Switching that is immediately linked with four international Internet portals. In addition, QTSC is an Internet service provider and can thus quickly meet clients' requirements. QTSC has also designed a professional technical team and power systems back up with 24/7 service and a data center that meets Tier 3 standards (TUV Nord: Quality Management System ISO 9001:2008, Information Security System ISO/IEC 27001:2013).

In line with the statement above, QTSC combines businesses to make a smart city for the nation's cities and provinces. Participant #12 noted that QTSC does well in promotion, provides good solutions, and supplies human resources for firms inside QTSC. Participants #1 and #6 both said that the QTSC infrastructure is quite good. However, large enterprises tend to move from QTSC to other science parks due to the facts of professionalism in service (participants #3, #4, and #5), lack of utilities (participant #6), lack of Wi-Fi coverage, and unavailable identity management (participants #1 and #3). In addition, in light of the concern that its location is remote and public transport connectivity is limited (participant #13), QTSC is not yet considered "smart." For this reason, all participants believed that customers preferred E-town (one IT location around four kilometers from QTSC). To be more specific, with the slogan "the best business environment" for telecommunication – IT enterprises community and other industrial centers, E-town campus located on Cong Hoa road is the primary economic traffic link for the Tan Binh district. Some central districts and industrial parks in the west of the city have

been complex buildings and infrastructures. To tackle this service problem, QTSC should consider factors like food supply systems, landscape, building standards, and utility areas for workers, including both junior and senior staff (participant #1).

**Table 2: QTSC's service are equivalent to factors.**

| Factors | QTSC's Services and Physical Structures |
|---|---|
| Preeminent service and environment | QTSC constructed an appropriate work environment with numerous trees, landscaping, and water treatment systems. "One-stop service" is one of the free services offered by QTSC to assist enterprises in handling administrative procedures and creating a convenient business environment for organizations investing or operating in QTSC. |
| Networking | A variety of multinational companies in the software and IT service industry have decided to invest in Vietnam and have chosen QTSC as their destination. |
| Business support | *Corporate income tax rate of 10% for 15 years.<br>* Tax exemption for first four years from the date of taxable income, with a 50% reduction for the next nine years.<br>* Equipment import tax exemption for products that could not be manufactured in Vietnam at the time the enterprise was established.<br>* Machinery and equipment temporarily imported for project implementation and then re-exported exempted from VAT and import tax.<br>* 0% VAT for software products and services consumed in Vietnam.<br>* Export and import tax for exported software products is zero percent. |
| Location | * It takes tenants about 15 minutes to reach Tan San Nhat International Airport from QTSC and about 45 minutes to get to the HCMC city center.<br>* Numerous related projects: biotechnology center, high-tech agricultural zone, high-tech medical zone, and new urban area. |
| Infrastructure | In order to improve our management system, QTSC has taken the initiative to apply new technologies and solutions since 2016 towards promoting QTSC as a modern software park and positioning ourselves as the first smart city model in Vietnam |
| Incentives | With eight human resources training centers specialized in IT, QTSC provides the most human resources with reliable quality and qualifications, from technician to master. This includes more than 10,000 students.<br>QTSC also connects with more than 30 universities and colleges in HCMC that have IT training programs. This incentive plays the role of an effective bridge between human resources training institutions and employers who use human resources in IT. |
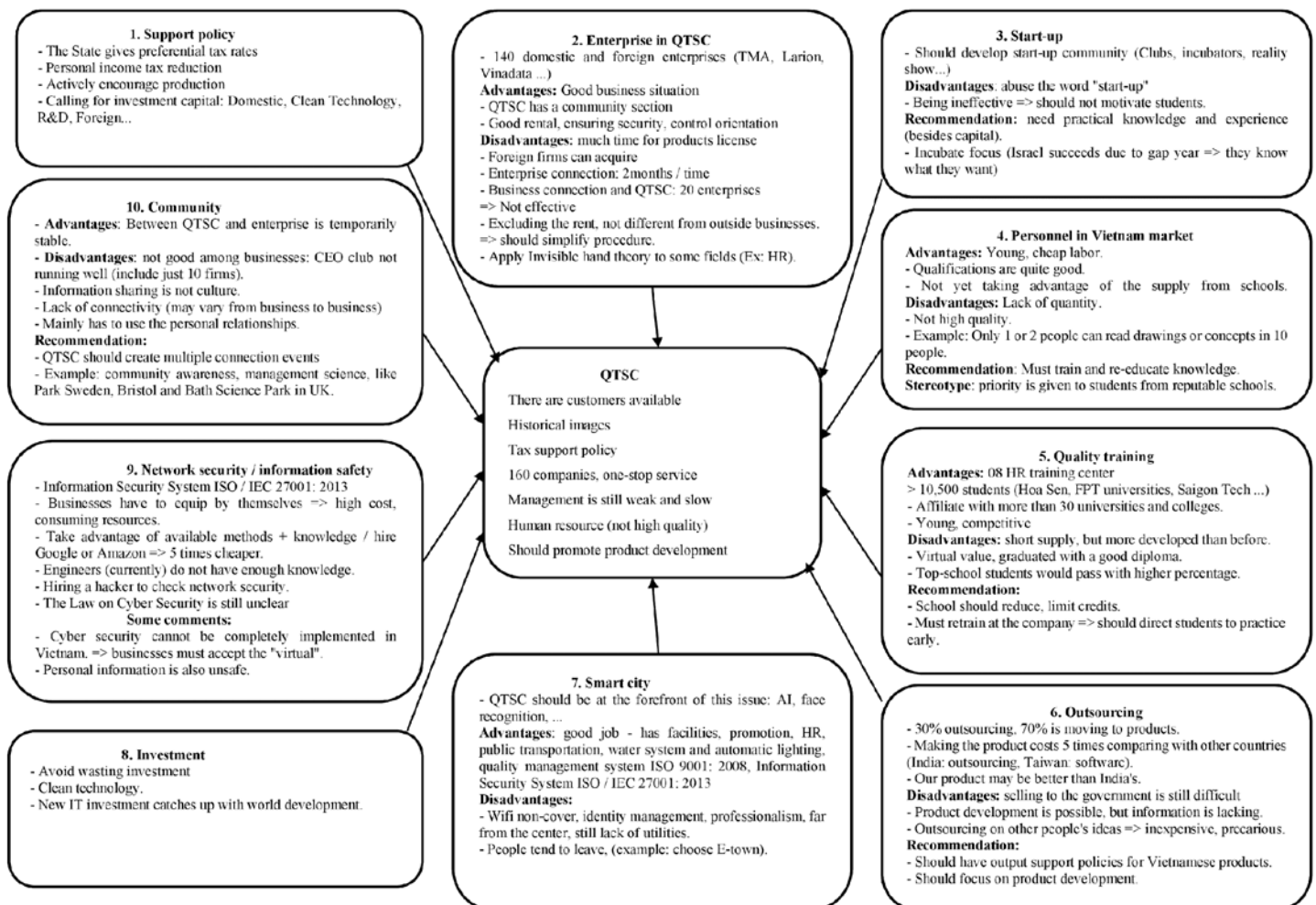
**Figure 1.** Summary of main themes

## 5. DISCUSSION

In this section, the authors discuss the results and how they can be interpreted from the perspective of previous studies and the research questions. The findings and their implications should be discussed in the broadest context possible. Future research directions are also highlighted.

### 5.1 Research Question 1: Why do enterprises choose QTSC as a location?

The most influential factors that encourage firms to join QTSC are existing customers and reasonable office rental costs. Participant #12 said that their company was first established in the central district and grew from only a few dozen employees to 500–700, which led to a large office and high budget. The leaders of the organization decided to enter QTSC

because of its ecosystem and communities. QTSC organized many events to help businesses build their brands and promote and connect with foreign companies. In addition, participant #2 wanted to support government policy at that time and assist software companies in gathering in technology parks (participant #12). After a few years operating in QTSC with a 24,000-m$^2$ office, other reasons to stay in the science park included good infrastructure, training, human resources, and the four existing laboratories (participant #12). However, in the coming years, QTSC should take advantage of its strengths to do many other things in light of more demanding requirements from clients, such as listening business owners' thoughts on their businesses and creating a CEO club to immediately absorb business opinions.

It has proven difficult to transform the sustainable development idea from rhetoric to fact, despite international and government institutional efforts. The priority has been on the connections between the economy and the environment, with the social and community aspects of sustainability receiving much less focus (Elabras Veiga and Magrini, 2009). Moreover, our results demonstrated several gaps between the experience of on-site and off-site organizations with regard to innovation and marketing or market research problems. Science parks are likely to draw a more inspired group of entrepreneurs than off-park locations. On-park companies specifically put more emphasis on market analysis. However, there seems to be no direct connection between market research or R&D and the introduction of new products. Participant #1 briefly gave some recommendations regarding policy and market research for the city's leaders. Transparent legislation, evaluation of QTSC's position, information about products, and interest from existing vendors are essential. Moreover, market investigation is crucial, but this project requires high costs and public business information, which should be available for entrepreneurs' reference.

### 5.2 Research Question 2: What are the opportunities for QTSC?

This paper discovered three main activities that can assist QTSC in enhancing and creating its opportunities: maintaining QTSC's strengths; creating an impressive image for QTSC; and considering investment and cooperating with the city's developers.

### 5.2.1. Maintaining

Based on the main fields of the companies in QTSC (software and high-tech solutions in manufacturing and outsourcing), the park should be oriented towards developing these services. In addition, trying to maintain and continuously improve facilities at a reasonable price is one of the best ways to enhance competitive advantage. Furthermore, QTSC developers can take advantage of supportive policies and enjoy good connections with local committees to contribute and establish assistance for members. This step will aid marketing efforts and introduce QTSC to other citizens. All of the activities that help achieve a sustainable and durable community inside the IT park are also necessary.

Moreover, eco-industrial parks, which QTSC are targeting to reach is being popular in various nations as a novel model. This model could reconcile mutual benefits for the community, environment and economic growth because it can reconstruct industrial performance and application so as to reach the standard of sustainable development objectives (Elabras Veiga and Magrini, 2009).

Participant #6 agreed with the above and added other suggestions that could help QTSC improve its quality: invest in utility services, consider supporting tax incentives for

the renewal of a new license, review Internet coverage, and support major businesses in their recruitment efforts.

### 5.2.2.   Creating

After a development period of 19 years, QTSC has already gained prestige and reputation in the general market and in the field of IT in particular. Many changes can help QTSC keep growing in quality and size. For example, QTSC might consider building an image of a real complex that can supply unique, modern, and synchronized infrastructure. Because with 20 years of establishment, building, and development, QTSC had the honor to receive many noble awards such as Labor Order, First Class by State, certificates of merit from ministries, ministry-level agencies, and locals or even golden prize of the Vietnam National Quality Awards 2020... In addition, QTSC was chosen to the online voting round in the Administration Category of the "Smart City Asia Pacific Awards" organized by IDC and awarded the second prize of Ho Chi Minh City Creative Awards in 2019. Those prizes above are some proofs for QTSC proves itself can support business by a specialized area for research and growth with many advantages, universities and IoT ecosystem centers; working area with preferential policies on rent and good connecting communities. As a result, figure 2 shows the new logo and intention to change its slogan.



Figure 2: Quality Tech Solution Complex

In addition, QTSC must fulfill its role as a pioneer in IT and AI; as the country's first smart science park, it can serve as a model for other regions (participants #2 and #6). To achieve this, participants advised some steps that could be taken to improve quality and innovate: access control via smart card security, making each building "smart". The piloting building in advance to ensure the model is suitable and expand for the whole QTSC. Planners should take a deep and clear perspective on IT development, analyze specific assessments, and evaluate appropriate directions alongside IT management (participant #1). Likewise, QTSC authorities are observing a significant opportunity to diversify internal facilities according to miniature urban models and should create a chain of connections, including specialized satellite centers, software outsourcing, R&D, training, and so on.

As an information agency and center, QTSC also plays an important role in introducing and linking the Vietnamese high-tech and software industries to the international market. This park can apply advanced technology solutions and promote the smart city model to localities throughout the country. This is similar to the idea that the software park could be expanded to a series in which newly formed software parks would inherit the QTSC brand name (William S Turley and Selden., 2013).

### 5.2.3.   Considering and cooperating

QTSC can examine the idea of seeking investment capital from domestic and foreign private investors to obtain more capital for investment and development. The park can cooperate with regional high-tech park developers and take advantage of their experience to develop QTSC according to the urban technology model.

### 5.3. Research Question 3: What are the challenges QTSC faces?

The support from QTSC is generally good, but whether it will continue depends on many other factors, including preferential policies, rental prices, and utility services. Compared with e-Town, QTSC's utility service is not attractive. Figure 3 illustrates the limitations and challenges of QTSC.
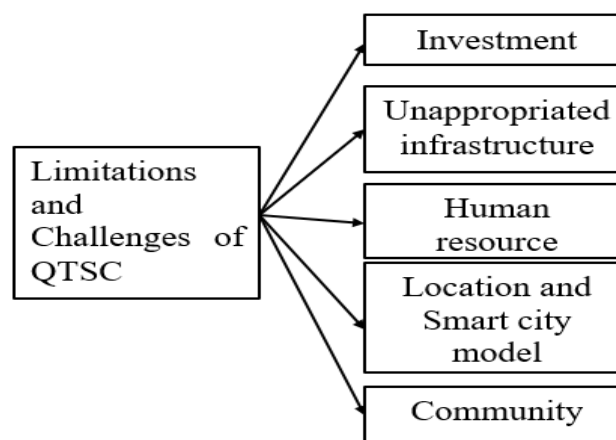


**Figure 3.** Limitations and challenges of QTSC

First, because of the characteristics of the national entrepreneur business, QTSC still has some concerns related to calls for development funds. Second, although its infrastructures (e.g., the electricity system and telecommunications facilities) have been one of its most important strengths, they have been degraded and are not being upgraded at a suitable pace. Third, in the eyes of investors, the growth of new technology firms can be improved if administrators, decision-makers, and academics understand the potential benefits of university cooperation. Although the local linkage structures are weak, this does not mean that overall linkage structures are weak or that the science park's effect on the local economy is negligible. Therefore, universities are starting to establish creative new industrial relations forms, such as limited partnerships, R&D seed funds, and the like.

Participant #12 said that the best option is for local human resources to work locally. Investing in IT does not require much investment. The most important factors are professional human resources and infrastructure suitable for high efficiency and technology transfer. As long as there are good human resources, it is possible to develop high-level technology and IT. The problem in central and western Vietnam is that talent has left for big cities.

QTSC is only one of a series of policy instruments intended to promote the growth of innovative firms. In spite of a good geographic location connected with surrounding areas, there is little in the form of transportation from the city center to QTSC. Students from Vietnam National University HCMC who want to visit QTSC will deal with long

distances, and the tax incentives are few and not sufficiently different from companies outside the park (participant #12). Moreover, with regard to internal transportation, QTSC still does not operate effectively and efficiently. The management board has not applied creative products and solutions of member companies to reconstruct and oversee the infrastructure of the software park. Moreover, the connections and relationships between enterprises in QTSC are not close and supportive of one another. Many of the challenges indicated above (investment, inconsistent infrastructure, location, and community) are similar to those listed in a KPMG report in 2017; in addition, some businesses may not clearly understand the general activities of the park.

# 6. CONCLUSION

In sum, there are some general patterns in the thinking of almost all participants who evaluated QTSC: Development chain of software city or science park should pay attention to the differences and advantages of each locality.

In addition, participants offered some recommendations for planners. Planners should mobilize participants in the domestic business community (including information on the development strategy for the smart city) because enterprises can contribute many different aspects (e.g., solution design, technology, consulting, concern of sustainable development) when evaluating the feasibility of solutions. A handbook and articles regarding how to perfect the workflow should also be deployed; the Research and Development (R&D) Institute (With the objective as a home for R&D star-up business, QTSC R&D Labs is a special area of research and development for new products and solutions. The lads would create a public environment and support IT companies for research and application, attracting many leading experts on R&D to work in QTSC) should also advise on the next five-year development strategy. The planners might also consider more specific methods for the city about QTSC such as implementing incentives policies and regulations more than 5 years for IT and software enterprises and performing a communication signing ceremony; planners need to arrange to meet each particular group of tenants to understand the system.

Similar to the above, to improve the efficiency and effectiveness of the community inside the park, the planners of QTSC should revise the sources of information obtained through the tax clubs like HCMC Tax Agent Club and, through those clubs, update data promptly. Furthermore, the online handbook, website, and email list should also be updated continuously to provide timely information proactively.

Entrepreneurs want to eliminate high costs and find skilled labors; they can connect with universities and recruit workforce when human resources are still students in school. Sophisticated regulations related to feeling, teamwork, and even caring factors should be considered to improve employee loyalty and cohesion. For example: Women during menstrual days shall be allowed to take a rest of up to 30 minutes per day at workplace. In addition, a female worker who is raising a child under 12 months of age shall be allowed to take 60-minute break daily at work place from February, 2021, according to the Government latest Decree No. 145/2020/ND-CP. Moreover, the tendency to work from home, the pandemic brought by Covid-19 has had a devastating influence on students, workers, businesses can affect office rentals, and employees regularly changing jobs can influence human resources.

In addition, the fact of building the process and evaluation criteria to help step by step raise the information technology park towards sustainable development as well as building a model for the development of the information technology park in the direction of sustainable development that are some suggestive comments of person #2 for whole long-term expansion of QTSC. Suppose there are some recommendations on the state management side to help businesses develop sustainably. In that case, the business community suggests reforming the union fees and utilizing this capital for better public benefits.

Finally, a high-tech park is subjective in nature, predominantly depending on the targets and regulations deriving from the master development and improve the current business environment to attract more investors and recruit more talent employees. As a result, the leaders of high-tech parks must adjust to match specific needs and requests as well as adapt to the factors and best practices for diverse regional settings.

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