Attraction and Retention of Startups in Urban Innovation Districts

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Preface

Here is the thesis of my graduation research, the ending of the master "Construction Management and Engineering" at the faculty of Civil Engineering and Geoscience, Delft University of Technology. This research is conducted under the department of Management in the Built Environment together with OTB (Research for the Built Environment), Delft University of Technology.

This report gains insight of the management of attraction and retention of startups in the urban innovation districts (UIDs). After the theoretical research on framework of attraction and retention of startups and empirical research conducted in the Merwe-Vierhavens (M4H) in Rotterdam, the advice to M4H is proposed. I hope the result of this report can help managers of M4H as well as Municipality and Port of Rotterdam to improve their management of attracting and retaining startups. In addition, it is also valuable for other potential old waterfront areas which have the vision to redevelop into innovation districts.

Almost six years ago, I stepped into the gate of Chongqing University in China and chose to study the major Civil engineering. After four years hard working, chose to study abroad in TU Delft. Instead of studying Civil Engineering, I changed my major to Construction Management and Engineering. During my master, I learned a broader filed about civil engineering, including project management, financial management and even legal and governance. Thanks to the help of Yawei Chen, I discovered the interesting research topic about the urban innovation district, which is one of the important methods of urban planning.

In the graduation period, I enjoyed the happiness as well as the depression when facing difficulties and challenges. The empirical research conducted in the Merwe-Vierhavens (M4H) was an unforgettable experience, which is also the first time to interview with people. As an international student who cannot speak Dutch, I felt the warmness and openness when communicating with interviewees.

I would like to thank my graduation committee Ellen van Bueren, Yawei Chen and Arie Romein for their patience, time and support in my graduation research. In addition, I would like to thank all the interviewees, including managers from municipality and port authority, entrepreneurs in M4H as well as related researchers. Their support and time are important for this research. Last but not least, I would like to thank all my friends for their accompanying and family for their support and love.

Donglin Lyu
Delft, April 2019

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Management summary

Introduction

With the development of global economy, the knowledge economy has become the new tendency and the knowledge-intensive industries have become the main power of economic growth (Smith, 2002). During this process, cities are playing more and more important role and the policymakers gradually turn to focus on the role of place and geography, specifically, clusters or districts, which contain research institutions, companies, start-ups, incubators and accelerators (Van Winden et.al., 2013; The Brookings Institution, 2018). One example is the Urban Innovation District (UID), which can be defined as "*Geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators*" (Katz and Wagner, 2014).

Many researches on UIDs focus on physical characteristics, guiding principles, evaluation framework or audit indicators of innovation districts (Pluijmen, 2017; Wagner et al., 2017; Morisson, 2017; Van der Veer, 2016; UrbanGrowth NSW, 2016; Cosgrave et al., 2013), etc., not so much on the one specially element, startups part, especially on the opinions and feelings of entrepreneurs. Therefore, getting insight of the factors that startups would care about when they are choosing and growing in a certain place will help managers of innovation district to successfully attract and retain startups, which can promote the development of innovation ecosystem in UIDs.

The aim of this research is to provide potential advice to district managers how to attract and retain startups into UIDs, thereby creating an innovative environment and filling the research gap about the part of startups preferences. In line with this aim, the research question is:

"What are the factors should be considered when attracting and retaining startups into Urban Innovation Districts (UIDs) and in what ways could these factors be enhanced by district managers?"

The scope of this research is the "re-imagined urban area model" innovation districts in the Netherlands, which is one of three UID models. This kind of UID generally used to be near or along historic waterfronts and aim to regenerate industrial /warehouse districts to a new defined district with innovation part (Katz & Wagner, 2014).

Methods

This research is a multiple case study research, in which the case of Merwe-Vierhavens is studied in detail. In order to define possible improvements on the management of attracting and retaining startups in Merwe-Vierhavens (M4H), firstly large amount of literatures will be reviewed to understand key terms and develop the list of preferences of startups. After that the empirical research will be conducted, including three case studies through literature review and interviews with related researchers, entrepreneurs as well as managers in M4H. Based on the developed framework and feedbacks attained from interviews in M4H, the organized advice

will be elaborated. Finally, conclusions of this research together with reflections and recommendations will be given. The research design is presented in ***Figure 0.1***.

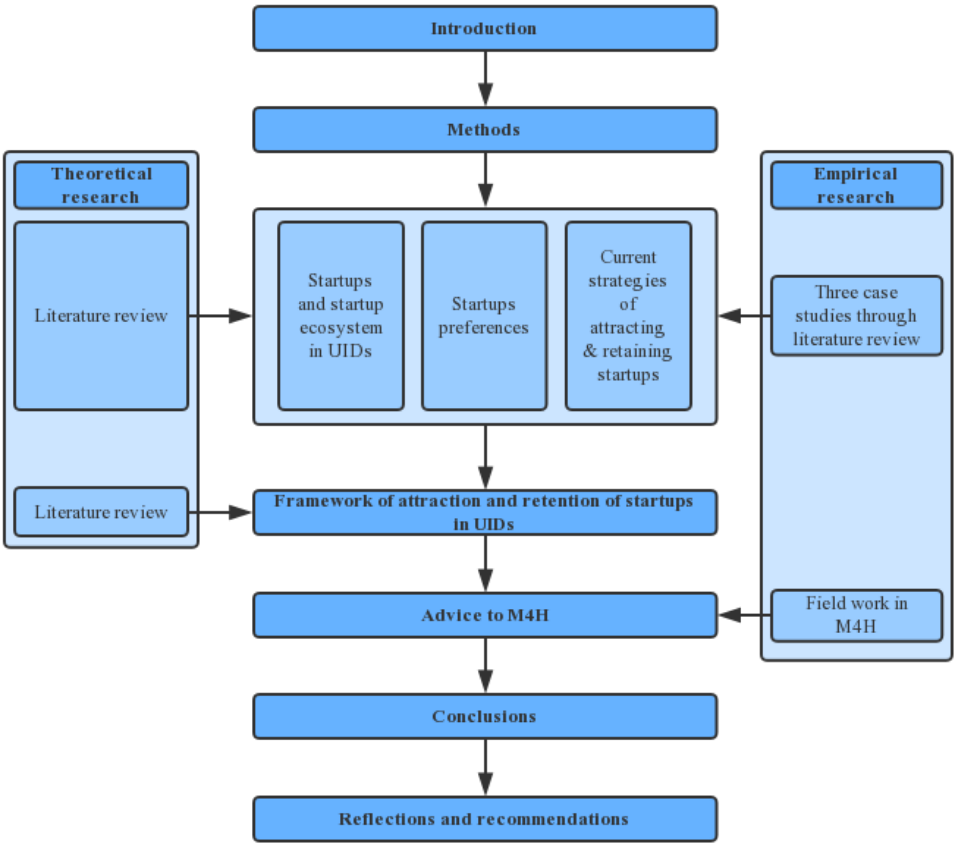

Figure 0.1 Research design

The selected methods in this research are literature review and semi-structured interviews. Literature review is used to understand the definition of startups and its lifecycle, the factors of attraction and retention of startups in UIDs and current strategies of area managers to enhance these factors. The semi-structured interviews are conducted with entrepreneurs from selected startups/scaleups and managers from Merwe-Vierhavens, Municipality or Port of Rotterdam & related researchers in the Netherlands.

Theoretical research

The aim of theoretical research is to understand the definition of startups, startups ecosystem in UIDs and preferences of startups. And the expecting result is the list of factors of attracting and retaining startups in UIDs.

Innovation and entrepreneurs are the only ones who could result in economic growth and development (Spencer & Kirchhoff, 2006). According to Audretsch's theory (Audretsch, 2004), innovation, growth and entrepreneurship are not separate from each other. On the one hand, entrepreneurship functions in the process of transforming innovative ideas, new knowledge to

real business model and product. On the other hand, the outcome of innovation and new technology can promote the power of entrepreneurship, which is always involved in launching a start-up.

With the development of global economy, the knowledge-intensive industries have become the main power of economic growth (Smith, 2002). And this requires urban planners and policy makers of cities to positive cope the competition in knowledge economy. Thereby, innovation district has become one of the most important strategies to realize that (Morisson, 2015). The definition of "Urban Innovation Districts (UIDs)" was developed by Katz and Wagner, which is "*geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators*" (Katz and Wagner, 2014). According to their theory, there are three kinds of innovation districts: Anchor plus model, Re-imagined urban areas model and Urbanized science park model. And the focus of this research is the Re-imagined urban areas model, which used to be near or along historic waterfronts and aim to regenerate industrial /warehouse districts to a new defined district with innovation part (Katz & Wagner, 2014).

The assets that UIDs can provide are divided into three categories (Katz and Wagner, 2014): Economic, Physical and Networking assets. Economic assets are the companies, institutions and organizations that that drive, cultivate or support an environment full of innovation. Physical assets are the physically infrastructure, no matter privately or public owned, to stimulate the connectivity and collaboration inside UIDs. And networking assets are the relationships between different stakeholders in innovation districts and aim to create a more interactive and innovative environment in UIDs. The development of UIDs relies on the synergistic relationship between these three assets.

Startups play an important role in the innovation development (Davila et al., 2003). According to the theory of Steve Blank, "*A startup is an organization formed to search for a repeatable and scalable business model* (Blank, 2010)." The process of development of startups can be defined as the process "*from idea to business and talent to organization*" (Startup Commons, 2018). And six steps, three development phases are divided in the lifecycle of startups, as shown in ***Figure 0.2***. Specifically, the typical milestone in the development is the existing of validated products/services, which is corresponding to the end of validation phase.

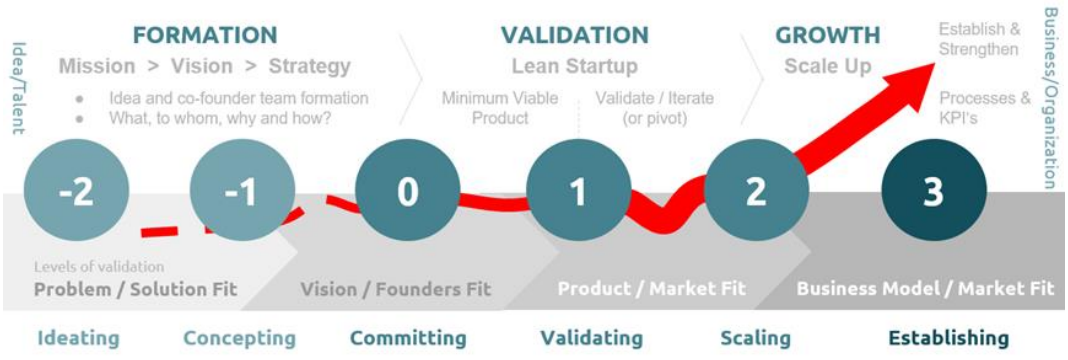

Figure 0.2. Startup development phases (Startup Commons, 2018)

The creation and development of startups rely on various actors and resources in the startup ecosystem, which is defined as "*the ecosystem formed by people, startups in their various stages and various types of organizations in a location (physical and/or virtual), interacting as a system to create new startup companies*." (Startup Commons, n.d.). In general, there are five various organizations in startup ecosystem: Universities and Research organizations, Funding organizations, Support organizations, Service provider organizations and Large corporations.

In order to gain insight of preferences of startups at various development stages in UIDs, two kinds of startups are divided: early and late-stage startups, which have the difference whether there are validated products/services. And the preferences of startups are studied from five factors: infrastructure, financial, human capital, networking and others. According to literature, ***Table 0.1*** gives an overview of the factors of attraction and retention of startups in UIDs.

Table 0.1 List of factors of attraction and retention of startups in UIDs

	Factors of attraction and retention of startups in UIDs
Infrastructure	Natural/social amenities (proximity to natures, café, bars, restaurants, public space); Transport; Workspace (including common space, lab, facilities); Housing options; Digitally-accessible (High-speed internet, computers, Wireless network)
Financial	Funding; Subsidies; Services (business, legal, financial, etc.); Rental price; Access to customers/markets
Human capital	Trainings for startups/entrepreneurs (business skills, management, technical skills, etc.); Talents; Skilled workforce
Networking	Interactions between people; Peer-to-peer networking in startups; Cross-sector networking in startups; Networking with other actors in startup ecosystem; International networking
Others	Openness and tolerance; Safety of the environment; Intellectual property issues; Innovative and cultural environment

Empirical research

In this part, the empirical research is conducted, including three case studies through literature review and M4H through field work.

Three case studies through literature review

In order to gain insight of practical management on how to attract and retain startups in UIDs, three innovation district cases (22@ Barcelona, Boston's Innovation District, Knowledge and Innovation Community in Shanghai) are chosen to study through literature review.

These three cases are all re-imagined urban areas and has developed into relatively advanced stage. In addition, they are under various levels of government intervention compared with each other: low government intervention in Boston's Innovation District, average in 22@ Barcelona and high in KIC, which provide a broad research scope of innovation districts with different institutional levels. Strategies used to attract and retain startups in UIDs are studied from five categories and concluded in ***Table 0.2***.

Table 0.2 Strategies on attraction and retention of startups in UIDs

Strategies to attract and retain startups in UIDs	
Infrastructure	Offer various amenities; Improve the public & private transport; Offer working and living spaces suitable for startups;
Financial	Create various funding platforms; Provide appropriate subsidies for certain startups; Provide supporting financial services;
Human capital	Collaboration with universities to attract young talents; Offer various trainings through incubators, accelerators, co-working spaces, universities etc.; Create attractive environment for talents in society;
Networking	Create creative public spaces for people; Organize various attractive events; Provide collaborations between various local and international actors (universities, research institutions, big corporations, startups, organizations, citizens, even other innovation districts);
Others	Engage much more actors into the startup ecosystem, like the citizens; Make the innovation districts as showcases of products/services of startups; Treat the process of development of innovation districts as a startup business;

In the study of the three cases, it found that apart from the actors in the startup ecosystem, there should be a role of governance to integrate all the resources and coordinate actors to service the startups. In addition, actors in the startups ecosystem are classified based on the function and three systems are developed as shown in ***Table 0.3***.

Table 0.3 Three systems in the startup ecosystem

Actors in the startup ecosystem	
The governance system	Formal and informal
The financial system	Funding organizations (banks, venture capital firms, large corporations, governments); Service provider organizations (financial services);
The knowledge creation and diffusion system	Universities and Research organizations; Support organizations (incubators, accelerators, co-working spaces); Large corporations; Service provider organizations;

And then the framework of attraction and retention of startups in UIDs is proposed, as shown in Figure 0.3. This framework is centered with startups in UIDs, surrounding with five various factors of attraction and retention (***Table 0.1*** List of factors of attraction and retention of startups). And the management strategies on that (***Table 0.2*** Strategies on attraction and retention of startups in UIDs) are realized based on the networking between governance system, financial system and knowledge system (***Table 0.3*** Three systems in the startup ecosystem).

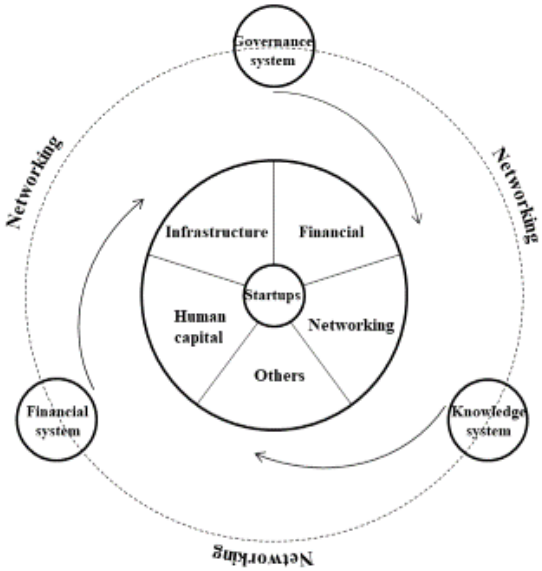

Figure 0.3 Framework of attraction and retention of startups in UIDs

Merwe-Vierhavens

The field work is conducted in Merwe-Vierhavens (M4H) through interviewing with 23 interviewees from related researchers, managers and entrepreneurs in M4H. The main objective is to gain the feedbacks from them about current management on attraction and retention of startups in M4H and in further the challenges are concluded in ***Table 0.4***.

Table 0.4 Challenges of attracting and retaining startups in M4H

Challenges of attracting and retaining startups in M4H	
Infrastructure	Lack of basic social amenities; Inconvenient public transportation for people inside M4H; Entrepreneurs have no willing to live in M4H; Poor and insufficient working spaces for startups, especially for manufacturing startups;
Financial	Funding platforms for startups are still limited; The funding opportunities for the potential projects (not only for startups) are limited; The conflict between area development and rising rent price for startups; Manufacturing startups are more sensitive to the rising rent price due to the growing demand on the space;
Human capital	Lack of incubators or accelerators in M4H; Lack of employment platform for startups and scaleups; ECE mainly focuses on the early-stage startups and have little attention to late-stage startups;
Networking	Networking in M4H is still limited in separate startup hubs; The organized networking events are still at a standstill on the level of early-stage startups; Physical proximity between startups is limited, especially for manufacturing startups;
Others	Information and policy opacity;

	Lack of showcase of new products/technology of startups;
Networking between three systems	No detailed development plans; Slow decision making; Lack of strong leadership and division of responsibilities in different scales in the development of startup ecosystem; Lack of a big starting point;

Comparing the theoretical framework and findings in empirical research in M4H, there are some added value to the previous framework, as shown in ***Table 0.5***.

Table 0.5 Added value to the theoretical framework

Added value to the theoretical framework	
Infrastructure	Manufacturing startups have more requirements for working space; Acceptance of living close to the working space;
Financial	Manufacturing startups are more sensitive to the rising rent price due to the larger demand on space; The conflict between real estate development and rising rent price for startups;
Human capital	Early-stage startups prefer partners and late-stage startups prefer employees;
Networking	Networking events should be more targeted on the different requirements of early and late-stage startups; Physical proximity is much preferred by startups, especially for manufacturing startups;
Others	Information and policy transparency both to inside and outside the UIDs;
Networking between three systems	Detailed development plan is needed; Strong leadership is needed in the early development of startup ecosystem; Scale problem on the implementation of strategies should be considered;

Based on the theoretical framework and the challenges and opinions refined from the feedbacks in the interviews, the advice to M4H can be proposed from five categories as well as the networking between three systems in M4H. The detailed contents are summarized in ***Table 0.6*** to ***Table 0.11***.

Table 0.6 Potential strategies to deal with infrastructure challenges in M4H

Challenges	Points in the framework	Potential strategies
Lack of basic social amenities	Social amenities	Build social amenities such as bars, restaurants, café within M4H, especially around the startup hubs.
Inconvenient public transportation for people inside M4H	Transport	Construct and improve the roads for cyclists and pedestrians to improve the walkability in M4H. Design and construct the public transportation like bus, tram.
Entrepreneurs have little willing to live in M4H	Housing living	Take the feedback as a reference to the housing planning in M4H.
Poor and insufficient	Workspace	Speed up the improvement of the work space for

working spaces for startups, especially for manufacturing startups		manufacturing startups, especially the heating system. Provide much more space for startups through accelerating the renovation of abandoned warehouses and constructing new buildings. Take the special requirements (flexible, open, innovative) of manufacturing startups when improving or constructing space.

Table 0.7 Potential strategies to deal with financial challenges in M4H

Challenges	Points in the framework	Potential strategies
Funding platforms for startups are still limited	Funding	Engage more actors in the financial system to provide wider funding platform for startups.
The funding opportunities for the potential projects (not only for startups) are limited	Funding	Establish the funding platform for innovative projects of no matter startups, scaleups or companies in M4H.
The conflict between area development and rising rent price for startups	Rent price; Subsidies	Study on preferential policies to cope with possible situations that startups cannot afford the rent due to the high real estate price in the future, especially the manufacturing startups, to retain them in M4H.
Manufacturing startups are more sensitive to the rising rent price due to the growing demand on the space	Rent price	

Table 0.8 Potential strategies to deal with human capital challenges in M4H

	Points in the framework	Potential strategies
Lack of incubators or accelerators in M4H	Trainings for startups/entrepreneurs	Attract incubators physically located in M4H, like Yes!Delft; Treat ECE as a start point to develop an incubator for startups at various development stages;
Lack of employment platform for startups and scaleups	Talents; Skilled workforce;	Establish the employment platform in ECE to attract students from Erasmus University; Strengthen the collaboration with universities nearby to attract young talents working in M4H;
ECE mainly focuses on early-stage startups and little attention to late-stage	Trainings for startups/entrepreneurs	Help ECE to expand the scope of services for startups through developing more incubation programs

Table 0.9 Potential strategies to deal with networking challenges in M4H

Challenges	Points in the framework	Potential strategies
Networking in M4H is still limited in separate startup hubs	Interaction between people; Networking between startups;	Organize events between the startup hubs in M4H to provide platform for them to connect, communicate and even collaborate with each other
The organized networking	Networking between startups;	Based on the study on the requirements

events are still at a standstill on the level of early-stage startups		of startups, organize themed networking activities to attract them.
Physical proximity between startups is limited, especially for manufacturing startups	Networking between startups; Networking with other actors in startup ecosystem;	Attract related research institutions or universities physically located to attract innovative talents working in M4H.

Table 0.10 Potential strategies to deal with others challenges in M4H

Challenges	Points in the framework	Potential strategies
Information and policy opacity	Information and policy transparency (Added value)	Outside: Update the basic information and development progress through social media; Organize activities to attract people to visit M4H. Inside: Develop website or app providing the updated information of M4H, including policies, development progress, new coming startups, activities, etc.
Lack of showcase of new products of startups	Innovative and cultural environment	Integrate products/services of startups into the district and build the platform to collect feedbacks from the people in M4H

Table 0.11 Potential strategies to deal with the challenges of networking between three systems in M4H

Challenges	Potential strategies
No detailed development plans	Finish the detailed plans ASAP, in which the timeline, responsibilities, involved parties, expecting results of every project should be included.
Slow decision making	Reorganize the management team or build up a dedicated team to be responsible for developing the startup ecosystem in M4H through integrating the resources and actors in the three systems with rapid response to the feedbacks from startups/scaleups; Tasks, risks and responsibilities should be defined between various actors according to specific situations, including managers from different scales (district, city and beyond city scale).
Lack of strong leadership and division of responsibilities in different scales in the development of startup ecosystem	
Lack of a big starting point	Considering the strategy of attracting big corporations or universities to M4H

In order to deal with challenges in M4H, first of all, detailed development plans containing major actions with timeline should be made. After that, the infrastructure part should be focused on as a precondition for attraction and retention of startups, which is also the current ongoing task in M4H (Interviewee 3, 2019). And the feedbacks on infrastructure part can provide insight of requirements of startups, especially manufacturing startups. The rest of the strategies should be synergistically advanced according to dynamic situations in the near future in M4H.

The advice provided to M4H mainly focus on detailed strategies without considering the

division of responsibilities among district, city and beyond city levels. It is found in the three case studies that division of responsibilities among different levels varies with management structure, level of government intervention and development stages etc. The division of responsibilities should be planned according to the detailed development plans about the startup ecosystem in the near future.

Conclusions and recommendations

The main objective of this research is to understand the preferences of startups and improve the management of attracting and retaining them in UIDs. Through the theoretical research and empirical research conducted in three selected cases and M4H in the Netherlands, the conclusions can be made.

The preferences of startups can be concluded from five categories: infrastructure, financial, human capital, networking and others. For example, in the infrastructure part, natural/social amenities (proximity to natures, café, bars, restaurants, public space), transport, workspace (including common space, lab, facilities), housing options, and digitally-accessible (High-speed internet, computers, Wireless network) are the factors that startups care about.

The strategies used to enhance these factors are also studied through literature review, which are also corresponding to five categories in the list of factors. For example, the strategies in infrastructure part are to offer various amenities, improve the public & private transport as well as offer working and living spaces suitable for startups. In addition, three systems in startup ecosystem are classified: the governance system, the financial system and the knowledge creation and diffusion system, which cooperate together to provide resources and support that startups favor.

Based on theoretical framework and challenges refined in the field work in M4H, possible advice is proposed to improve the management on attraction and retention of startups from five categories as well as the networking between three systems.

The limited scope of this research also leaves room for further researchers. Apart from re-imagined urban area, other two kinds of models of UIDs can also be studied on how to attract and retain startups. In addition, the feasibility of the proposed advice to M4H still needs to evaluate in practice in the near future. And the theoretical framework needs to be improved and studied, such as the division of the factors, influence of various level of government intervention, different preferences of startups from different industries and so on.

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Part 1 Introduction

Chapter 1 Introduction

1. Introduction

This chapter discusses the background of the research, problem statement, as well as research goal, scope and question. In addition, the relevance, including societal and scientific relevance are also elaborated.

1.1. Background of the research

With the development of global economy, the developed countries have experienced the transition from an agricultural economy to industrial economy to knowledge economy. And the knowledge-intensive industries have become the main power of economic growth (Smith, 2002). As the definition of OECD, knowledge economy refers to "economies which are directly based on the production, distribution and the use of knowledge information" (OECD, 1996). An economic, institutional and regulatory environment are the main requirements of maximizing the potential of knowledge economy (Kefela, 2010).

During the way to knowledge economy, cities are playing more and more important role because there are more diversities of economic groups, faster spreading of knowledge & technology, big & specialized labor markets and luxury market (Van Winden et.al., 2013). Many examples of knowledge economy, such as Silicon Valley in California, proved that global cities can increase knowledge base through paying more attention to the investment in Research and development (R&D) and higher education to reach high levels of competitive advantage around the world (Koukoufikis, 2016).

In order to gain the growth of economy and reduction of unemployment rate, policymakers of cities gradually turn to focus on the role of place and geography, specifically, clusters or districts, which contain research institutions, companies, start-ups, incubators and accelerators (The Brookings Institution, 2018). The knowledge locations in the city, like technology parks, open innovation campuses, science parks and creative clusters, are developing gradually in past decade years (Van Winden et.al., 2013). The theory of innovation districts has been popular around the world since the 1950s the concept of urban innovation districts (UIDs) has been proposed in 2014 (Katz and Wagner, 2014).

The definition of urban innovation districts can be defined as "*Geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators*" (Katz and Wagner, 2014). UIDs are multiple use areas including housing, office, retail and can change the location preferences of people through creating new transport infrastructure and social networking (Katz and Wagner, 2014). Due to the low rents, high urban amenities, convenient location and other attractions, an increasing number of innovative startups and creative companies are choosing to locate in these districts, where they can work with other startups from similar or different fields. In addition, the sponsor of UIDs can be public party like government, universities or private part like corporations, startup communities

or collaborations between them. From the point of urban planning, the development of innovation districts can combine innovation ecosystem with urban redevelopment. The successful practice has been made in many American and European countries since early 2000s (Morisson, 2015). For example, Barcelona (Spain), Boston (Massachusetts), Chattanooga (Tennessee), Detroit (Michigan), Montréal (Canada), Philadelphia (Pennsylvania), are building their own version of an innovation district (Morisson and Bevilacqua, 2018).

According to the definition of innovation district, startup is one of the most important shareholders in the development of innovation ecosystem and districts. Startups are active in stimulating new ideas and transforming ideas into practice (Morisson, 2015). This research focuses on how to successfully attract and serve startups in innovation district in order to realize the sustainable development.

1.2.Problem statement

In recent years, innovation districts have become popular in the Netherlands in recent years, which have the ambition to put a specific region as an 'innovation hotspot' (Zeemeijer, 2016). For example, Strijp-S in the Eindhoven which was the former industrial of Philips, has been successfully transformed to an innovation district containing creative companies and housing since 2000. These innovation districts aim to at least equal American success although the Netherlands cannot make a successful example of Silicon Valley in California. However, there are not so many researches on innovation district and the secrets behind the successful innovation districts around the world are still partly hidden (Van Winden et.al., 2013).

Many researches on UIDs focus on physical characteristics, guiding principles, evaluation framework or audit indicators of innovation districts (Pluijmen, 2017; Wagner et al., 2017; Morisson, 2017; Van der Veer, 2016; UrbanGrowth NSW, 2016; Cosgrave et al., 2013), etc., not so much on the one specially element, startups part, especially on the opinions and feelings of entrepreneurs. And it is very important to attract ambitious, high-speed growth entrepreneurs into innovation ecosystem and successful entrepreneurs can have the leading roles for startups as well as building an ecosystem community (Wal & Corbishley, 2014). Therefore, getting insight of the factors that startups would care about when they are choosing and growing in a certain place will help managers of innovation district to successfully attract and retain startups, which can promote the development of innovation ecosystem in UIDs.

Compared with corporations, another important shareholder in innovation district, startups even are better innovators, especially when it comes to new products or service (Hill, 2017). Lack of competitive startups in innovation district will hinder the development of innovation, which is the main power and advantage of UIDs.

Therefore, in order to build an innovative and successful UIDs, it is required for policy makers and district managers to gain insight of what startups' characteristics are, what factors they care about and how could these factors be enhanced in the management of innovation district, thereby filling the knowledge gap partly.

1.3.Research goal and main research question

The main goal of this research is to provide potential advice to district managers how to attract and retain startups into UIDs, thereby creating an innovative environment and filling the research gap about the part of startups preferences. In order to realize this goal, 3 progressive sub-goals are developed: 1. Gaining insight of startups; 2. Knowing the strategies of attracting and retaining startups; 3. Promoting cooperation between startups and managers in innovation districts.

Gaining insight of startups

The main object of study is startups; therefore, it is important to make clear of the definition of startups, lifecycle of startups and the main actors in the startup ecosystem. Before collecting the detailed factors of attraction and retention of startups, a conceptual model will be made to divide the factors into five categories.

Strategies of attracting and retaining startups

It is not enough only to know the factors that startups care about. In order to improve the management of attraction and retention of startups into innovation districts, how to steer on the management of these factors is much more important, which means the strategies and measures taken by district managers. Gaining insight of them can help us to understand the vision of managers and clarify possible conflicts between management strategies and preferences of startups.

Cooperation between startups and managers

The realization of attraction and retention relied on the cooperation between startups and managers in UIDs. The preferences or requirements of startups should be gained insight of while the related strategies should be improved continuously based on the requirements, and both of them are dynamic processes. Therefore, this asks for the timely and effective response between startups and managers, which in further is the cooperation between startups and managers. And the cooperation can also be improved with the development of the innovation districts.

To achieve these three goals, the main research question of the research is:
"What are the factors should consider when attracting and retaining startups into Urban Innovation Districts (UIDs) and in what ways could these factors be enhanced by district managers?"

In this main research question, "*factors should consider*" refers to the preferences of startups when they are settling down in a location and staying in a place. "*ways could these factors be enhanced*" means strategies of attracting and retaining startups. And "*district managers*" are not only limited with project managers, but also all the people and authorities involved in the development of UIDs.

1.4.Research scope

For the geographical scope, this research focuses on the UIDs in the Netherlands. As mentioned in problem statement part, innovation districts become more and more popular in the Netherlands. One reason is that during the development of economy, some old/traditional industrial areas gradually faded out of the historical stage and some of them need regeneration. At the same time, with the rising population of residents and rising house price, some of these areas can be developed with housing planning, which can relieve housing pressure to a certain extent. In this way, the outcome of this research can provide advice to the "re-imagined urban area model" in the Netherlands.

For the innovation district part, the scope of this research focuses on the "re-imagined urban area model" innovation districts, which generally used to be near or along historic waterfronts and aim to regenerate industrial /warehouse districts to a new defined district with innovation part. It's one of the three UID models (Katz & Wagner, 2014), another two models are "anchor plus" model and "urbanized science park".

The cases selected in this research contain three cases through literature review and one case by field work in the Netherlands. The former three cases, 22@ Barcelona, Boston's Innovation District, Knowledge and Innovation Community (KIC) in Shanghai are studied through literature review to develop theoretical framework of management on attraction and retention of startups. The latter case is the area Merwe-Vierhavens (M4H) in Rotterdam Makers District, which is the main focus of this research.

M4H has a direct connection with the city on the right bank of the Maasoever, including the public transport station Marconiplein and was used for fruit handling for years. At present, the juices cluster Vierhaven is still alive but the fruit handling in Merwehaven has been largely withdrawn due to containerization (RDM, 2017). The new identity of this innovation district is the manufacturing industry with key technologies, which requires the development of innovative technologies and other supporting industries. Through interviews with managers, researchers and startups, together with theoretical framework developed after studying former three cases, the advice to M4H on how to attract and retain startups will be developed.

1.5.Relevance

The research may be relevant in two different ways and the societal relevance and scientific relevance will be elaborated shortly.

1.5.1. Societal relevance

Improving the management on the attraction and retention of startups in UIDs can promote the innovation development in innovation districts since startups are the driver of innovation and new technology.

One expecting result of this research is to provide advice on the attraction and retention of startups, and this advice can not only provide tailored environment for startups but also give managers a view of the requirements of startups. In this way, the better development of startups will lead to the improved innovation ecosystem in UIDs, which can in turn attract and retain much more entrepreneurs into districts. And the process is indeed the cooperation between startups and managers. With the success of attraction and retention of startups and improvement of innovation development, the general competitiveness of UIDs will be improved.

As a part of the city, the development of UIDs can also promote the city transformation and globalization to the new economy. And the entrepreneurs, especially young talents in the city can participate in this process and develop the skills for the future.

1.5.2. Scientific relevance

In past few years, there are more and more reports recording the successful UIDs around. However, the researches on secrets behind the successful innovation districts are often lacking (Van Winden et. Al., 2013). Gaining insight of what factors that startups care about in innovation district and learning how to enhance these factors can supplement the theory about startups side in UIDs and therefore fill the research gap partly.

Part 2 Methods

Chapter 2 Research design & methodology

2.Research design & methodology

In the previous part, the background of this research, problem statement, research goals were discussed clearly and the research question was given in general. And the relevance from societal and scientific views are also introduced. This part mainly introduces the research design and strategies used to study the startups preferences and management strategies on it, and finally provide advice to the authorities of Merwe-Vierhavens (M4H) based on previous theorical research and empirical research.

Firstly, the research objectives and research sub-questions will be discussed, following the research design and selected methods. Finally, the development of the advice and validity & generalizability on the research design will be elaborated.

2.1.Research objectives

The aim of this research is to provide advice on how to attract and retain startups into UIDs in the Netherlands. In line with this aim, the objectives of this research can be developed step by step:

1. To understand the definitions of startups and startup ecosystem in UIDs;
2. To understand factors startups in different development phases in UIDs care about;
3. To gain insight of strategies to enhance these factors by district managers to attract and retain startups in UIDs;
4. To provide advice to improve the management.

The main objectives are shown in ***Figure 2.1***.

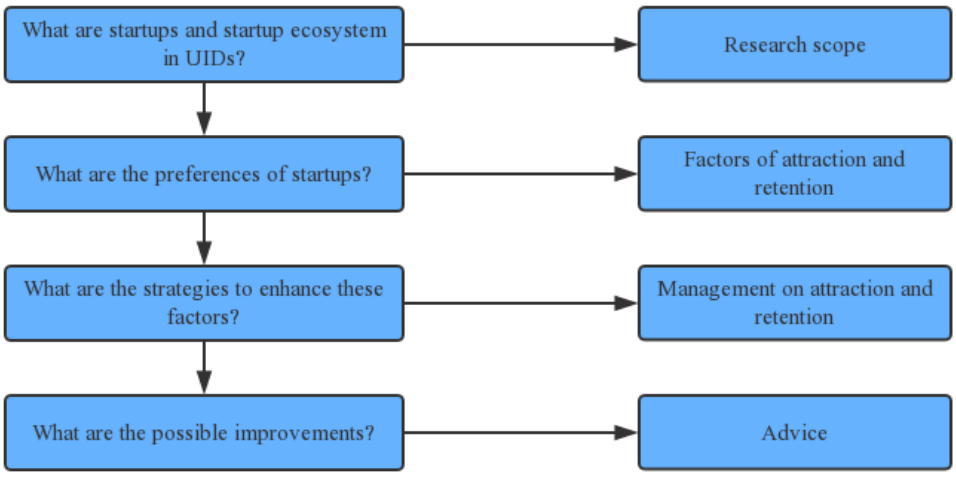

Figure 2.1 Main objectives of the research

2.2.Research sub-questions

In order to answer the main research question formulated in previous chapter, the main research question is divided into four research sub-questions, which are formulated based on the main objectives. At the same time, the purpose, method of collecting data and potential outcomes will be given under each sub-question.

SQ1. What are the startups and startup ecosystem in UIDs?

- ✓ Purpose: This question will help to give a clear overview of the term startups, including the definition and lifecycle, which means the different development phases in the life of startups. In addition, to understand the actors in startup ecosystem and their functions can also help to gain insight of startups in UIDs.
- ✓ Method of data collection: The data can be obtained through literature review related with startups and UIDs.
- ✓ Potential outcomes: A deep insight of startups, its lifecycle and various actors in the startup ecosystem.

SQ2. What are the factors of attraction and retention for startups in UIDs?

- ✓ Purpose: The answer to this question is the main objective of this research and it is beneficial to understand the preferences of startups in different development phases. It can also provide the theoretical basement for the next research.
- ✓ Method of data collection: The factors of attraction and retention for startups can be analyzed based on literature review.
- ✓ Potential outcomes: A list of preferences of startups in UIDs.

SQ3. What are the strategies used to enhance these factors in order to attract and retain startups in UIDs?

- ✓ Purpose: This question can help to gain insight of strategies and means used to attract and retain startups at present, which will provide study base for development of advice to M4H in this research.
- ✓ Method of data collection: The data can be collected through literature review based on three case studies.
- ✓ Potential outcomes: A framework of attraction and retention of startups in UIDs.

SQ4. How can district managers improve the management of attracting and retaining startups in Merwe-Vierhavens (M4H)?

- ✓ Purpose: The answer to this question can provide advice to district managers how to better attract and retain startups into UIDs.
- ✓ Method of data collection: The answer to this question can be developed through comparing the framework developed and interviews with related researchers, managers and entrepreneurs in Merwe-Vierhavens (M4H).
- ✓ Potential outcomes: An organized advice provided to district managers of Merwe-Vierhavens (M4H).

2.3.Research design

Research design is a set of methods of collecting data and analyzing them. There are five kinds of research designs and how to choose research design will reflect the consideration of priority to a set of factors of the research process (Bryman, 2012).

This research is a multiple case study research, in which the case of Merwe-Vierhavens is analysed in detail. In order to define possible improvements on the management of attracting and retaining startups in Merwe-Vierhavens (M4H), firstly large amount of literatures will be reviewed to understand key terms and develop the list of preferences of startups. After that the empirical research will be conducted, including three case studies through literature review and interviews with related researchers, entrepreneurs as well as managers in M4H. Based on the developed framework and feedbacks attained in M4H, the organized advice will be elaborated. Finally, conclusions of this research together with reflections and recommendations will be given. The research design is presented in ***Figure 2.2***.

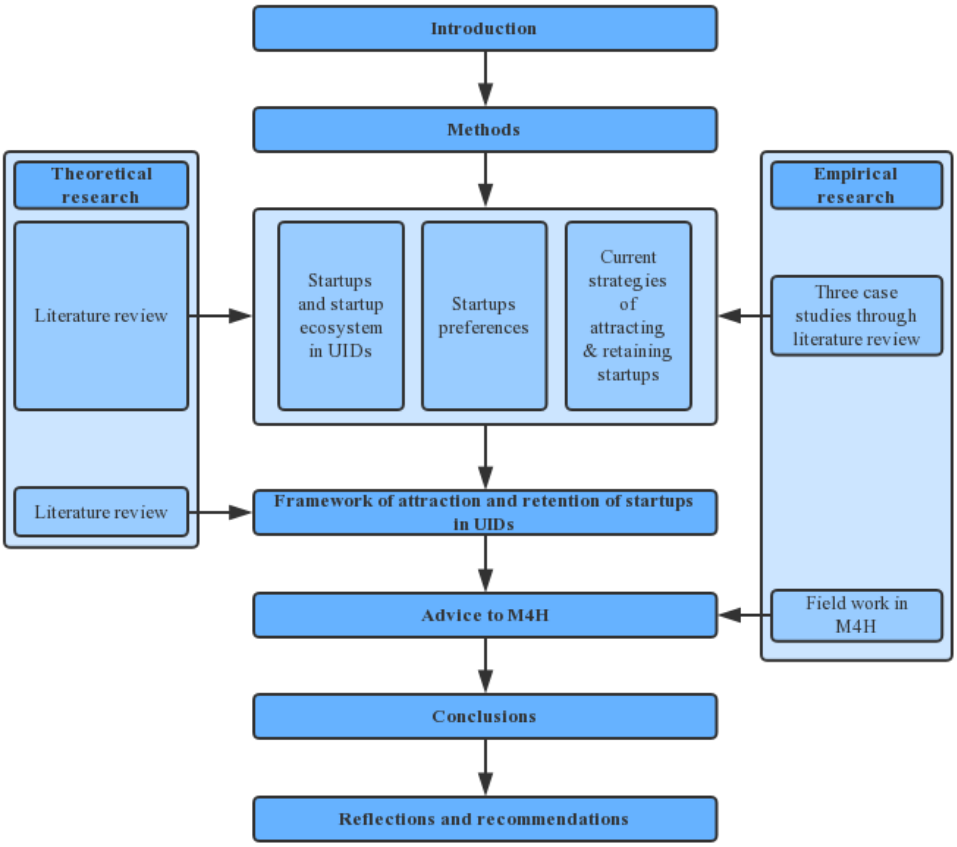

Figure 2.2 Research design

2.4.Cases

Two sets of cases are selected to study the definition of startups, preferences of startups in various phases and strategies used to attract and retain startups in UIDs. The first set of cases contains three selected cases: 22@Barcelona, Boston's Innovation District and Knowledge and Innovation Community (KIC) in Shanghai, in which literature review will be made to gain insight of strategies used by district managers when attracting and retaining startups in UIDs. Together with the list of preferences of startups proposed in theoretical research, the framework of attraction and retention of startups in UIDs will be developed. And then the field work will be done in Merwe-Vierhavens (M4H) to attain feedbacks from interviewees about strategies used in M4H. Finally, an organized advice will be provided for district managers in M4H.

The reasons why choosing the Merwe-Vierhavens (M4H) as the case to study are listed following:

- ✓ This district was used to be an industrial area and was launched about four years ago to be redeveloped into an urban innovation district in Rotterdam;
- ✓ This urban innovation district belongs to the re-imagined model, which is exactly the focus of this research;
- ✓ The identity of this UID is the manufacturing industry with new technologies, which aims to attract the innovative makers to locate in this area and promote the development of manufacturing clusters. And most of them are startups, which is also the main objective of this research;
- ✓ Although the development of M4H is still in the early stage and the main task of managers is the infrastructure development, M4H has already attracted certain number of startups in this area and the advice to M4H on how to attract and retain startups can be helpful to promote the development of startup ecosystem in this area.

Three cases (22@Barcelona, Boston's Innovation District and Knowledge and Innovation Community in Shanghai) are chosen as example cases through literature review because of the following reasons:

- ✓ These three projects are all being developed as Urban Innovation Districts;
- ✓ They all belong to the re-imagined model, the same kind of innovation district model with the target case M4H;
- ✓ These three cases are already in an advanced development stage with average development duration of over ten years;
- ✓ These cases have rich experience not only in attracting startups, but also retaining them, which are valuable projects to study and conclude general strategies for following research;

2.4.1. Merwe-Vierhavens

The Merwe-Vierhavens (M4H) is one part of the Rotterdam Makers District, which was launched by the Municipality of Rotterdam and Port of Rotterdam in November 2015 (RDM, 2017). The identity of M4H is the new manufacturing industry due to the industrial heritage

and requirements of the Rotterdam city. At present, the port is still being used and some areas are not available for the redevelopment until 2025, when the lease contracts expire. While because of the geographical advantage and low rent price, M4H has already attracted certain parts of startups with different backgrounds and the startup ecosystem gradually formed (Stadshavens Rotterdam, 2015a).

2.4.2. Three example cases

The three selected cases, 22@Barcelona, Boston's Innovation District and Knowledge and Innovation Community in Shanghai, are studies through literature review to gain insight of practical management on attracting and retaining startups in UIDs.

22@ Barcelona is the first innovation district starting from 2000 and have become a model for other innovation districts around the world (Morisson, 2017). Boston's Innovation District, officially launched in 2010, was initiated by the former mayor and collaborated with real estate companies to create an innovative area different with traditional real estate models. Knowledge and Innovation Community (KIC) in Shanghai has developed quickly since 2003 and grown a lot relying on the strong leadership and support from the local government. In addition, these three innovation districts are all re-imagined urban areas and developed under various levels of government intervention compared with each other: low government intervention in Boston's Innovation District, average in 22@ Barcelona and high in KIC, which provide a broad research scope of innovation districts with different institutional levels.

2.5.Selection of research methods

A research method is a technique for collecting data and it can contain one certain instrument (Bryman, 2012). In accordance with the research objectives and the research question, the research methods used in this research are literature review and semi-structured interviews. The introduction of every method and how to use it in this research will be elaborated in the following paragraphs.

2.5.1. Literature review

Literature review is a kind of method to gain insight of previous researches related with own research objective, it includes what has been known about certain objective, what concepts, theories and research methods have been applied to, what possible controversies are regarding with the objective and who are the main contributors are (Bryman, 2012). In addition, a literature review is not simply a summary of sources, instead, it should have a clear and organizational link between every part and contains not only the summary but also reasonable synthesis (Randolph, 2009).

The literature review of this research is concentrated on the definition of startups and its lifecycle, the factors of attraction and retention of startups in UIDs and current strategies of area managers to enhance these factors. The potential outcome of literature review is a framework of attracting and retaining startups in UIDs. And this framework contains startups preferences

and also the management on them in UIDs.

2.5.2. Semi-structured interviews

Semi-structured interview is the method that often be used in social research like this case study. In semi-structured interviews, the interviewer will firstly begin with a set of introductory questions in general which are related with the objectives they are studying. And these questions will be treated as a starting point for future communication or discussion with interviewees. Therefore, this kind of method allows interviewers to explore any related topics in detail and interviewees to express their views in their own terms freely during interviewing. Since semi-structured interviews often contain open questions and discussions after the introductory questions, usually it is better to tape-record interviews and transcript these tapes afterwards for analysis (Cohen & Crabtree, 2006).

In this research, the semi-structured interviews are conducted with entrepreneurs from selected startups/scaleups and managers from Merwe-Vierhavens, Municipality or Port of Rotterdam & related researchers in the Netherlands. The potential outcomes of interviews are gaining insight of the current strategies on attraction and retention of startups and feedbacks on the strategies as well as possible advice to M4H.

In practice, due to the GDPR (General Data Protection Regulation) law valid in 25 May 2018, the municipality, startup hubs or other organizations cannot provide the basic information or personal email addresses of startups/scaleups. In addition, there are no reliable sources of information about startups in Rotterdam, no matter in M4H. And this leads to the difficulties in contacting entrepreneurs from target startups/scaleups. Fortunately, startups normally gather in the UIDs and there are several startup hubs in M4H. The solution is to do the field trips to every startup hub and get in touch with startups/scaleups through the recommendation of the managers of startup hubs. And the detailed interviewees are listed in Chapter 5.

2.6.Development of the advice

The advice provided to M4H is mainly the combination of the developed framework and the field work conducted in M4H. In the theoretical research, definitions of key terms and the factors of attraction and retention of startups are developed. In the empirical research, the framework of attraction and retention of startups is framed through three case studies. And then the current strategies used, the feedbacks from interviewees, and challenges in M4H are discussed. Finally, an organized advice is proposed to M4H based on previous data.

In the development of advice to M4H, the challenges developed based on the feedbacks are defined as a starting point. And then through comparing the challenges and theoretical framework, some advice can be provided through referring to the framework. While for the new challenges or added value to the framework, the possible advice is proposed based on the opinions of interviewees according to their own experience in M4H.

In addition, the management on attraction and retention of startups together with the develop of the UIDs are the long-term processes. Therefore, the advice to M4H should be defined priorities but not used in practice at the same time. Due to the method that the advice is developed through the literature review and opinions of interviewees, it needs further practical test in M4H if the managers would adopt the advice.

2.7.Triangulation and validity

In both the theoretical and empirical research, biases may have an effect on the triangulation and validity of this research.

In the literature review, large documents are studied and preferred theories are selected as the base of the developed framework. In this process, there may be biases both from readers and writer. For the readers, the interpreted literatures may be different from the writer's intention. And for the writer, the subjective judgement may influence the selection and combination of theories, which refers to the theory triangulation issue. No matter in the interpretation of the UIDs and related theories about startups, or the development of theoretical framework, more than one theoretical scheme are involved in the literature review.

In addition to the triangulation, the validity in the qualitative research can be divided into internal and external validity. The internal validity refers to the problem whether the findings incorporating a causal relationship between variables are sound. And the external validity means the question that whether the results of the research can be generalized in other cases beyond the specific research context conducted in this research (Bryman, 2012).

In this research, for the internal validity, the relationships between five kinds of factors and the attraction and retention of startups at various development stages are studied. In addition, the relationships between the preferences of startups and the management on them in UIDs are also developed as a main objective. Due to the fact that they are all based on limited number of cases, three case studies through literature review and one field work in M4H, the relationships may be not valid in other cases.

For the external validity, which parallels the transferability (Bryman, 2012). In the process of development of theoretical framework, three UIDs around the world are studied, especially the strategies on the attraction and retention of startups. The three cases have different backgrounds and management models, therefore, the strategies refined may have the issue of institutional transferability. Compared with the M4H in Netherlands, the institutions can be different with other countries. Furthermore, the results developed for M4H may also not be generalized in other cases. The single case cannot represent all re-imagined model innovation districts in Netherlands, therefore, the final advice provided to M4H can only be valid under certain conditions and further empirical research should be conducted in other innovation district cases.

Part 3 Theoretical research

Chapter 3 Theoretical research

3. Theoretical research

This chapter elaborates the related theories that will be the basis for the following empirical research. The aim of this chapter is to gain insight of factors that startups care about when attracting and retaining them in UIDs. In order to realize this aim, firstly, the explanation of several critical definitions will be made, such as innovation, startups, startup ecosystem and UIDs, etc. And then the conceptual model of factors will be made as a basis for further study and preferences of startups at different development stages will be discussed separately. Finally, the general list of factors of attraction and retention of startups in UIDs is given.

3.1. Innovation

Before extending the contents to startups and urban innovation districts, it is necessary to understand the origins of innovation, the links between innovation, growth and entrepreneurship as well as the basic research models of innovation. In addition, the relationship between innovation and city, which also means the importance of innovation development in cities, will be elaborated.

Creative destruction

The developed countries have experienced the transition from an agricultural economy to industrial economy to knowledge economy. And the knowledge-intensive industries have become the main power of economic growth (Smith, 2002). The shift to knowledge-intensive industries was initiated by technological innovations (Morisson, 2015).

Thinking about innovation and its added value for this economic growth has its origins in evolutionary economic theory. Evolutionary economics is based on the idea of economic selection when it comes to activity in an area. This is caused by the introduction of new, innovative companies that old, traditional companies make unnecessary (Atzema et al., 2009). And this process was known as “creative destruction”, first camp up with by Schumpeter. According to Schumpeter, innovation consisted of 'new products and services, new technologies, new resources and new organizational types' (Schumpeter, 1934). It was also mentioned that innovation and entrepreneurs are the only ones who could result in economic growth and development (Spencer & Kirchhoff, 2006).

Innovation, growth and entrepreneurship

Schumpeter mentioned the important function of small new companies, founded by entrepreneurs is creating new and advanced innovations to replace old technologies and companies (Schumpeter, 1934). Audretsch described the relationship between innovation, economic growth and entrepreneurship is that “Entrepreneurship plays a crucial role in promoting economic growth by serving as a mechanism facilitating the spillover of knowledge. Thus, an important new direction for public policy to promote innovation and economic growth involves instruments promoting entrepreneurship (Audretsch, 2004)”.

According to Audretsch's theory, innovation, growth and entrepreneurship are not separate from each other. On the one hand, entrepreneurship functions in the process of transforming innovative ideas, new knowledge to real business model and product. On the other hand, the outcome of innovation and new technology can promote the power of entrepreneurship, which is always involved in launching a start-up.

The Triple Helix and Quadruple Helix model

In the past decades' years, the understanding of the process of innovation has changed gradually from a linear process to a changing, complex and interactive process (Simmie, 2001). The "Triple Helix" model (***Figure 3.1***) for innovation emphasized on three 'helices' that intertwine and evolved the role of universities, the nature of knowledge hubs like Silicon Valley (San Francisco), and the role of institutions and governments (Carayannis & Campbell, 2009). This model expressed the collaboration between universities, industries and government in promoting innovation and creating a sustainable innovation ecosystem, which is also the main objective of this model (Etzkowitz & Leydesdorff, 2000). In addition, the three actors play different roles in different phases of business growth (Morisson, 2015), that means in the first phase of foundation and validation, the universities and governments matter a lot while in the following acceleration and growth part, institutions often provide much help in the process of innovation development.

Figure 3.1 The Triple Helix and Quadruple Helix model (Carayannis and Campbell, 2009)

Based on the Triple Helix model, Carayannis and Campbell added the fourth factor, "media-based and culture-based public" and created the Quadruple Helix Model (***Figure 3.1***) (Carayannis & Campbell, 2009). The fourth helix can be defined as the "civil society" element, combined with others to create a well-functioned innovation ecosystem for the knowledge-based economic growth. And innovation districts are planned based on the Quadruple Helix model of innovation (Morisson, 2015). This model also enriches the concept of open innovation, which means that "not only focusing on internal ways to market, companies can search external organizational with business models that are more suitable to realize the commercialization of new technologies" (Cherbrough & Crowther, 2006).

Innovation and city

With the globalization and knowledge development around the world, cities have become central economic and political actors in the knowledge economy (Morisson, 2015). Urban planners and policy makers of cities have to realize that the economic shift to knowledge-

intensive industries requires them to positive cope the competition in knowledge economy. And the competition which aims to attract knowledge-intensive industries and develop innovation ecosystem between cities is enhancing because of the innovation redistribution (Morisson, 2015).

Thereby, innovation district has become one of the most important strategies used by urban planners and policy makers of cities to catch up in the knowledge economy. Morisson (2015, p.41) concluded the reasons why cities prefer innovation districts: *"1. To (re)development an unproductive part in a city; 2. To attract, create or retain talented individuals and innovative companies; 3. To become or remain an innovation hub."* With the shift to globalization, open innovation and advanced technologies around the world, cities have become the main battlefield for innovation and technological competition (Morisson, 2015).

3.2.Urban innovation districts

Innovation districts, as the main strategies to develop innovation for urban planners and policy makers, have an irreplaceable function for the development of cities. In this part, the history, models, and assets of UIDs, as well as the innovation ecosystem and the classic framework of innovations districts will be discussed to gain insight of the urban innovation districts.

From close-off science parks to open innovation districts

Sciences parks and other kinds of knowledge hubs have been developed/developing around the world to promote knowledge transformation between universities and industries, to position as incubators for startups, to regenerate unproductive parts of cities, to lift a city into the knowledge economy, to attract foreign investment (Van Winden et.al., 2013) etc.

The most famous type of 'knowledge locations', sciences parks, rised in the early fifties and quite a few definitions have been introduced (Dinteren & Jansen, 2017). In general, science parks contain a mix of premises for businesses, start-ups and research institutes without housing or entertainment function and often managed by public or semi-public companies (Van Winden et.al., 2013). According European Commission report (EC, 2014), for the science parks in Europe, two-thirds of them are located on university grounds, with the aim to increase knowledge spillover and promote the communication between universities and industries.

With the development of knowledge economy and urban planning, people realized that the knowledge economy is not only restricted to the technological realm, a close-off science park and employees preferred a much more creative and open environment (Van Winden et.al., 2013). In addition, companies realized it's better to engage their end users into the location and progressive companies created all kinds of interactions with end users (Van Winden et.al., 2013). Therefore, the open innovation district came into being.

The first innovation district around the world was officially launched by the municipality of Barcelona at 2000, the Barcelona's @22 district, which has become "Barcelona model" and been replicated around the world (Morisson, 2015). Compared with science parks, the

innovation district differs in the following parts (Dinteren & Jansen, 2017): 1. Innovation districts are often located in urban areas and developed based on existing districts, which means not newly open; 2. A shift from the Triple Helix to the Quadruple Helix model; 3. Innovation districts often focus on boarder area beyond the knowledge transformation part, such as housing; 4. Sometimes specialization is not the key anymore. For example, 22 @ Barcelona has four different kinds of clusters: Energy and Design, ICT, Medtech and Media.

The researches on the innovation districts have lasted for more than 20 years (Raco, 1999). Boix and Galleto defined it to sub-geographies in cities, often quite small and highly concentrated with innovative companies and startups (Boix and Galleto, 2009). The definition of "Urban Innovation Districts" was developed by Katz and Wagner in 2014, which is "*geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators*" (Katz and Wagner, 2014). It is worthy to mention that UIDs are not only about mixed-use development, which means mixed-use housing, office and retail, but also their location and urban form (Hanna, 2016). And these refer to the models of UIDs.

3.2.1. Models of UIDs

Regarding the different locations and urban forms of UIDs, Katz and Wagner (2014) proposed that there are three kinds of innovation districts and most innovation districts belong to one of these. The normal location, characteristics and iconic example are listed in ***Table 3.1***.

Table 3.1 Models of Urban Innovation Districts (Katz and Wagner, 2014)

UID model	Anchor plus model	Re-imagined urban areas model	Urbanized science park model
Location	Downtowns/midtowns of central cities	Near/along historic waterfronts	Suburban and exurban areas
Characteristics	Mixed-use development centered around major anchor institutions and a rich base of related firms, entrepreneurs and spin-off companies involved in the commercialization of innovation	Industrial/warehouse districts undergoing a physical and economic transformation to chart a new path of innovative growth. Change powered by transit access, a historic building stock, proximity to downtowns in high rent cities. Supplemented with advanced research institutions and anchor companies.	Traditionally isolated, sprawling areas of innovation are urbanizing through increased density and an infusion of new activities that are mixed as opposed to separated.
Example	Kendall Square in Cambridge	Boston's South Waterfront	North Carolina's Research Triangle Park

3.2.2. Assets of UIDs

Previous parts gave a view of urban innovation districts from the macro perspective, but in order to gain insight of the drivers in the innovation ecosystem, it is important to know the components or factors in innovation districts. Katz and Wagner (2014) concluded that there are three kinds of assets in UIDs: economic assets, physical assets, networking assets and the innovation ecosystem is a synergistic relationship between these three assets.

Economic assets

Economic assets are the companies, institutions and organizations that that drive, cultivate or support an environment full of innovation (Katz and Wagner, 2014). It can be divided into three variables in detail, together with example contents and their functions are summarized in ***Table 3.2***.

Table 3.2 Economic assets of UIDs (Katz and Wagner, 2014)

Economic assets			
Variables	Innovation drivers	Innovation cultivators	Neighborhood-building amenities
Contents	Research and medical institutions, large firms, SMEs, startups, entrepreneurs	Incubators, accelerators, proof-of-concept centers, tech transfer offices, co-working space	Medical offices, hotels, restaurants, coffee bars, local retails, etc.
Functions	Developing cutting-edge technologies, products and service for the market	Supporting the growth of individuals, firms and their ideas.	Providing important services to residents and workers in UIDs

In the asset of innovation drivers, Katz and Wagner (2014) addressed the importance of four distinguished actors in UIDs: 1. Kinds of industries that prefer the economic growth; 2. Universities that promote innovation commercialization to develop local economy; 3. Entrepreneurs that promote economic development and reduce unemployment; 4. A mixing of firms that create optimal environment for innovation.

The main focus of innovation cultivators indeed is startups. Incubators can provide training and service to help entrepreneurs to turn crazy ideas into practical product or service, while accelerators can promote the further growth of startups into scaleups. In addition, the co-working spaces are usually provided for entrepreneurs or startups.

Physical assets

Physical assets are the physically infrastructure, no matter privately or public owned, to stimulate the connectivity and collaboration inside UIDs. According to the ownership, it can be divided into assets in public realm and private realm. And there is another asset focusing on the special investments in public transportation inside and outside. The detailed contents and functions of these three variables are listed in ***Table 3.3***.

Table 3.3 Physical assets of UIDs (Katz and Wagner, 2014)

Physical assets			
Variables	In the public realm	In the private realm	That knit the district together
Contents	Public space like parks, plaza, streets; Digitally-accessible like wireless networks, high speed internet and so on	Privately owned buildings and spaces like micro-housing, research and office complexes	Investments in infrastructure, public transportation, etc.
Functions	Facilitating the building of networks	Supporting the innovation-driven demographic	Eliminating barriers that hinder relationship-building and connectivity

Networking assets

Networking assets are the relationships between different stakeholders in innovation districts and aim to create a more interactive and innovative environment in UIDs. Katz and Wagner (2014) divided it into different variables based on the functional scope: strong ties and weak ties. And they are equally important in innovation districts. The former focuses on the network in one similar industrial field and the latter aims to improve the communication between different sectors. Their contents and functions are shown in ***Table 3.4***.

Table 3.4 Networking assets of UIDs (Katz and Wagner, 2014)

Networking assets		
Variables	That build strong ties	That build weak ties
Contents	Workshops and training sessions for specific fields, cluster-specific meetings, industry-specific conferences etc.	Networking breakfasts, innovation centers, tech-jam start-up classes etc.
Functions	Strengthening relationships within similar fields	Building new, often cross-sector relationships

Innovation ecosystem

Innovation ecosystem is the vital element in realizing the potential of innovation districts. Based on previous three kinds of assets, Katz and Wagner (2014) gave the definition to the innovation ecosystem "*a synergistic relationship between people, firms, and place that facilitates idea generation and accelerates commercialization*". In this definition, the term "people", "firms" and "place" are exactly synonyms of "networking assets", "economic assets" and "physically assets". The three assets and innovation ecosystem are shown in ***Figure 3.2***.

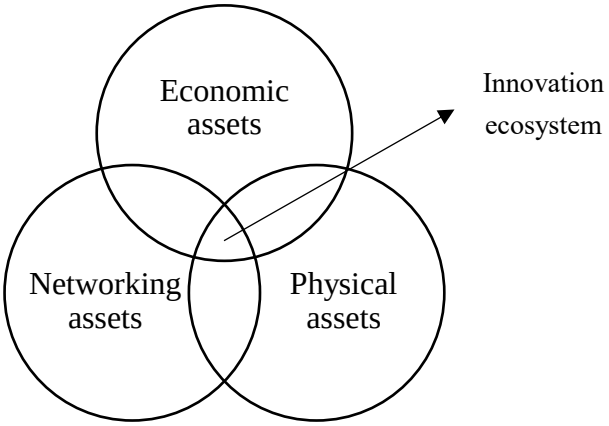

Figure 3.2 Innovation ecosystem in UIDs (Katz and Wagner, 2014)

Apart from the theory developed by Katz and Wagner, Massachusetts Technology Collaborative (2016) defined the innovation ecosystem as "*the large and diverse array of participants and resources that contribute to and are necessary for ongoing innovation in a modern economy*", which emphasizes on the different actors and resources. Since various innovation districts have different stakeholders, development focuses and strategies, the innovation ecosystems in UIDs vary a lot. Anyway, it all have the same goal of promoting innovation based on modern economy requirements through the networking of all the stakeholders and resources.

3.2.3. Innovation district and innovation ecosystem framework

It is not enough to just understand the concept of UIDs, innovation ecosystem and their main characteristics, the development process of innovation districts and creation of innovation ecosystems should also be studied to learn the methods of going into one innovation district.

Morisson (2015) defined the innovation district as top-down innovation ecosystems with the aim to promote innovation development and cities competitiveness, which are an organic unity of urban planning, collaborative, productive and creative under the strong leadership. In practice, the leadership is usually from the local government and lasts about 10 to 15 years. After that, the artificial innovation district can develop into the self-sustaining one without the strong leadership (Morisson, 2015). The transformation of this innovation district framework is shown in ***Figure 3.3***.

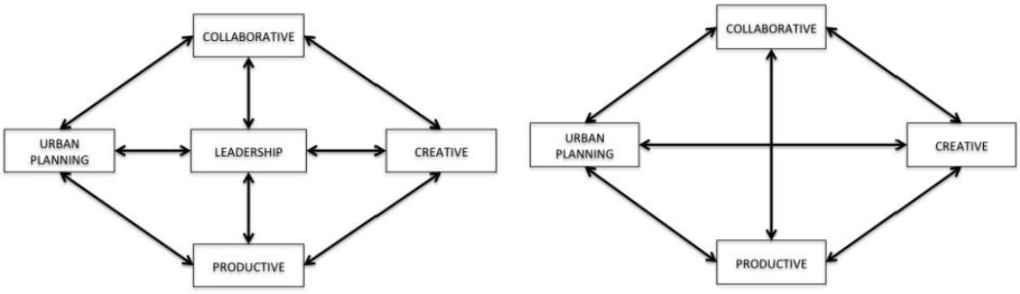

Figure 3.3 The innovation district's framework (artificial one and self-sustaining one) (Morisson, 2015)

It is also noticeable that there is a critical order during these layers in the development process of UIDs. Firstly, the strong local government leadership will guide the building of pre-platform and coordinate all kinds of resources. In addition, urban planning aims to provide infrastructure and attract various actors physically into innovation districts. After that, productive means the identity of target industries in this area. And the collaborative refers to the collaboration between various actors. Finally, the creative layer goes into providing a creative environment for individuals to test new ideas and methods to do things (Morisson, 2015).

Apart from the framework of innovation districts, there are also methods to describe the development process of the innovation ecosystems. Wal and Corbishley (2014) proposed a conceptual framework to describe how innovation ecosystems be created through the lifecycle of innovation districts.

There are two assumptions for this framework (Wal and Corbishley, 2014): 1. There are four main constituents in the innovation ecosystem: startups, academic institutions, government and large corporations; 2. The synergies between these four actors decide the performance of the innovation ecosystem. Taking the TechCity London as an example, in the very beginning, this area was crowded with software startups, which means it is startup led cluster. After that, the government was engaged in and attracted investment from the big corporation, Google. Finally, universities were active in collaborating with startups in TechCity. The development process of the innovation ecosystem can be expressed in ***Figure 3.4***.

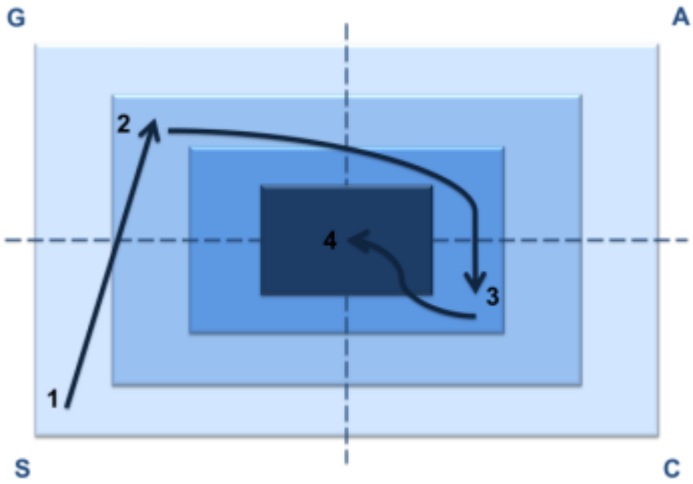

Figure 3.4 Development road of TechCity (Wal and Corbishley, 2014)

3.2.4. Conclusions

Urban innovation district is one kind of the knowledge locations that adapt to the requirements of different economic development periods. In the period of modern knowledge economy and urban development, UIDs aim to promote the innovation development of cities as well as be an important strategy to urban regeneration and economic revitalization for urban planners and policy makers.

Three various models classified the UIDs based on the location and functions, in which the "re-imagined" model is the objective of this research. After that, the three categories assets in UIDs gave the insight and defined the innovation ecosystem as the synergies between these three assets. Finally, Morisson (2015) and Wal & Corbishley (2014) proposed the development process of innovation districts and innovation ecosystems separately, which provided the entry points of the research on UIDs.

3.3.Startups in urban innovation districts

In the previous parts, the concept of innovation, relationship between innovation and cities, history of UIDs, main characteristics of innovation districts and two research frameworks of studying the development process of innovation districts and innovation ecosystems have been introduced. Apart from the contents about UIDs, another objective of this research is the startups. The problems like which kinds of business groups can be called as startups, what are the development stages in the lifecycle of startups and mostly, which actors are interacting with startups in UIDs, will be discussed in this part.

3.3.1. Startups

The main objective of this research is the startups in UIDs, therefore it is important to understand it. In this paragraph, the concept of startups, its lifecycle and the main development stage scaleups will be introduced.

The concept of startups

Startups play an important role in the innovation development (Davila et al., 2003). There were numerous researches on startups describing it as the main driver to economic growth, employment creation and innovation promotion (OECD, 1996; Porter, 1998; Davila et al., 2003). However, the definition of startups has not reached the consensus until Luger and Koo (2005) defined three characteristics of startups: new, active and independent, which gave the qualitative judgment on startups. The detailed explanations are shown in ***Table 3.5***.

Table 3.5 Three characteristics of startups (Luger and Koo, 2005)

	Characteristics	Contents
Startups	New	Did not exist before during a given time period
	Active	Engaged in the trading of goods or services
	Independent	Operated independently on a legal financial and functional basis from another company (parent company)

Luger and Koo's definition focuses on the main characteristics of startups, while the famous definition of Steve Blank (2010) developed emphasized the business model part: "*A startup is an organization formed to search for a repeatable and scalable business model*" (Blank, 2010). In other words, the process of creating and developing a startup is the process of looking for, testing and delivering business models.

In addition, startups have positive effect on the regional economic growth directly and indirectly (Koster & Van Set, 2013). In the direct effect, startups can create jobs in the short term because it need staffs. In the indirectly effect, the competition between growing startups and existing companies in the innovative products or service can promote the economic growth and employment creation in the long term.

Lifecycle of startups

The concept of startups gave a general view of the scope of startups. And the development process of startups, which means the lifecycle of startups should be studied further to gain insight of startups.

Startup Commons have been studying the basic ideas of startups for many years, and it proposed the first vision development trajectory of startups in 2013. After the improvement during past few years, the latest vision described the lifecycle of startups as "*idea to business and talent to organization*" (Startup Commons, 2018).

This framework divided the lifecycle of startups into three phases with six milestones. For the three development stages, the main mission of formation part is to develop the potential strategy from original ideas or problems. After that, the validation part contains the work of MVP (minimum viable product) and validate it. Finally, the growth phase means that scaling up based on the validated product or service, which focuses much more on the market part. In addition, making use of any internal and external resources went through these various phases. The descriptions of the six milestones are listed in ***Table 3.6*** from two perspectives.

Table 3.6 Milestones in the lifecycle of startups (Startup Commons, 2018)

	Idea to business	Talent to organization
Ideating	Initial ideas/business models on a target market	One person/vague team
Concepting	Mission and vision with initial strategy	Two/three core persons (and additional team with lighter commitment)
Committing	Able to develop/already own initial product/service version	Co-founders shareholder agreement signed
Validating	Validated product/service version; Initial user growth and/or revenue	Continue to attract external resources (people) for future revenues
Scaling	Further growth in users/market share/revenues	Engage in more people when needed
Establishing	Got great growth and will continue to grow like a startup	An organization close to a company

The combination of the three development stages and six milestones is shown in ***Figure 3.5***.

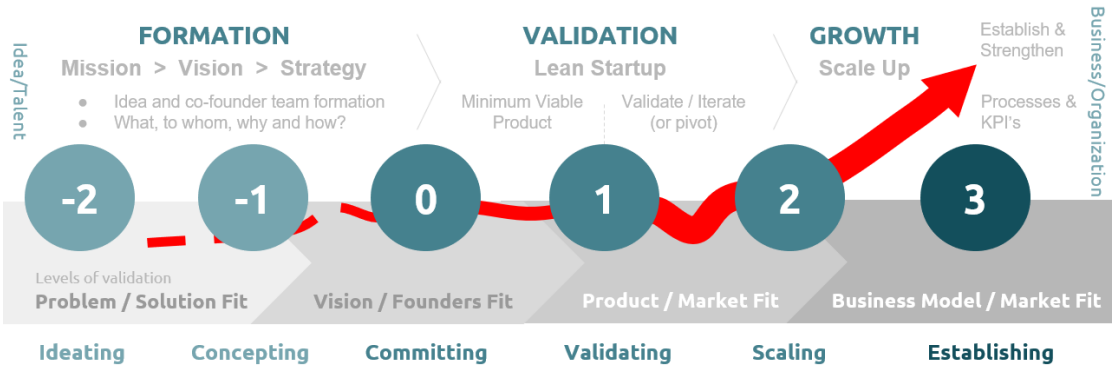

Figure 3.5 Startup development phases (Startup Commons, 2018)

Scaleups

In recent years, there is a tendency to focus on the term "scaleups". It can be used to describe that a new startup which has reached the scaling stage as well as an old company which has found a new scaling product/service/business model (Startup Commons, 2018). Compared with startups, scaleups have the same high growth ambition and very scalable business model but a higher market validated business model (Startup Commons, 2018).

For the quantitative definition, OECD described scaleups as "*an enterprise with average annual growth in employees or turnover greater than 20% per annum over a three-year period, and with more than 10 employees at the beginning of the period*" (Eurostat, 2007).

This research is about how to attract and retain startups in UIDs. And for the retention part, it is also important to consider the further development stage beyond startups, which means the scaleups.

3.3.2. Startup ecosystem

Startup is not an isolated island in the urban innovation districts, and there are many other actors interacting with startups as well as various resources needed. These resources, actors and interactions between them form the startup ecosystem.

The definition of startup ecosystem developed by Startup Commons is "*A startup ecosystem is formed by people, startups in their various stages and various types of organizations in a location (physical and/or virtual), interacting as a system to create new startup companies.*" (Startup Commons, n.d.). The organizations and their main functions to startups are listed in ***Table 3.7***.

Table 3.7 Organizations and their functions in the startup ecosystem (Startup Commons, n.d.)

Organizations	Contents	Functions
Universities and Research organizations	Higher education systems	Provide talents, trainings, knowledge, funding
Funding organizations	Community of funders	Provide various funding
Support organizations	Like incubators, accelerators,	Core business guidance from the idea to

	co-working spaces, etc.	late growth
Service provider organizations	Like legal, financial services etc.	Provide service apart from the core business
Large corporations	Big companies	Offer technology support, business training, networking and funding

There are some points should be noticed: 1. The detailed contents of startup ecosystems vary a lot in different nations, cities and regions because of various types of organizations, cultural environment as well as development strategies; 2. Startup ecosystems can be influenced by both external and internal factors, such as economic background, market environment, policy changes, etc. 3. Startups ecosystem is a dynamic system and the organizations, resources, interaction can keep changing with the development (Startup Commons, n.d.).

For the development of startups, the incubator and accelerator are the two important organizations in startup ecosystem. It is not only because that these two organizations have direct connection with startups, but also, they are platforms that can connect with other organizations and resources for startups in various development phases.

Incubator

According to the definition of the National Business Incubation Association (NBIA), "*business incubation is a business-support process that helps launch startup and fledgling companies by providing entrepreneurs with an array of needed resources and services*" (NBIA, 2014). The concept of incubator can date back to 1959, the first business incubator was founded in New York. And it became popular around 1970s. At present, there are more than 3500 incubators around the world (Isabelle, 2013).

In general, incubators are physical spaces for charging rent/membership fee, which can provide various incubation services, like trainings, courses, networking workshops and so on (Dee et al., 2015). According to NBIA's survey in the United States, almost 93% incubators are nonprofit organizations and a third are attached to local universities (NBIA, 2017). Apart from the physical incubators, there is a tendency of virtual incubators, which only provide online service (Nowak and Grantham, 2000). In addition, it is noticeable that the survival rate of startups with incubators is higher than those without incubators and the former ones can grow faster (Hackett, 2004).

Accelerator

There are no accepted consensuses about the definition of accelerators and it was treated as a new generation incubation model (Pauwels et.al., 2016). Compared with incubators, the accelerators have more clear focus on the accelerating growth of startups (Bosma and Stam, 2012). Compared with incubators, accelerators are often kind of programmes which are high selective and short duration. The detailed differences between incubators and accelerators are shown in ***Table 3.8***.

Table 3.8 Distinctions between incubators and accelerators (Isabelle, 2013; Dempwolf, Auer, & D'Ippolito, 2014; Bone, Allen & Haley, 2017; Cantu, 2014)

	Incubators	Accelerators
Clients	For early-stage startups	For next stage, or high-growth firms
Selection process	Competitive selection, mostly from the local community	Competitive selection of firms from wide regions or even nationally (or globally)
Terms of assistance	1 to 5 or more years (33 months on average)	Generally, 1- to 3- month boot camps
Focus	Focus on physical space over services; Typically rent/fee-based	Focus on services over physical services; Typically, growth-based
Investment	General not-for-profit Usually does not have funds to invest directly; does not take equity	General for-profit Invest in teams of co-founders; takes equity in every investee

Connecting incubators and accelerators with the lifecycle of startups, the typology of them is shown in ***Figure 3.6***.

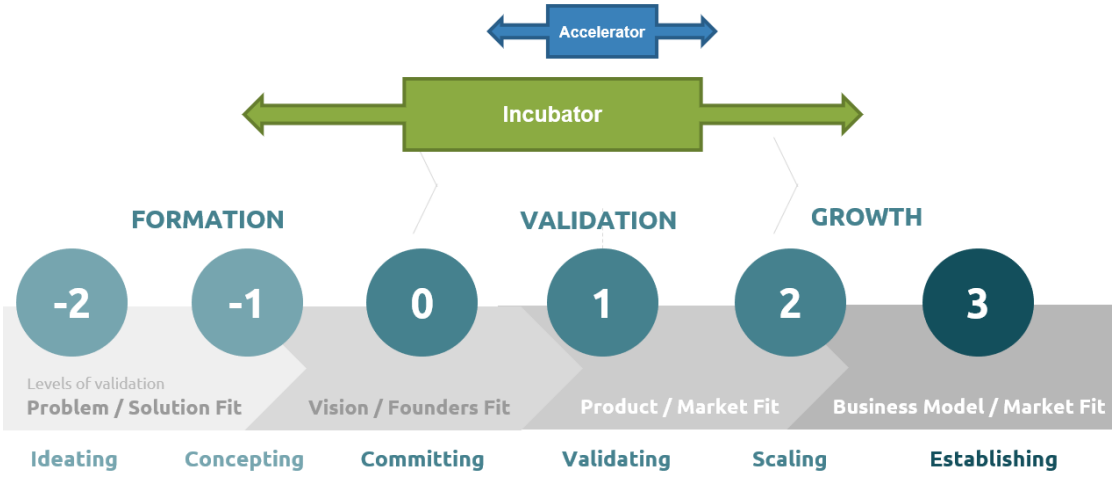

Figure 3.6 The typology of incubators and accelerators (Startup Commons, 2018; Dee et al., 2015)

It is important to know that both incubators and accelerators can have various initiators, such as universities, local governments, large corporations and so on. In addition, they can also be treated as physical or digital platforms for attracting investment, connecting startups with universities, large corporations and other actors. Connected with the lifecycle of startups, the incubators focus on a longer time in startups' life, mainly including formation, validation and even part of growth phase. While the accelerators look into a shorter time around validating phase.

Considering the startups in UIDs, Virginia (2016) concluded the common features of three types of innovation districts (***Table 3.9***). Compared with the elements of startup ecosystems, it is easy to find that the innovation district is tailor-made for the birth and development of startups.

Table 3.9 Common features of innovation districts (Virginia, 2016)

Innovation districts	**Incubators Providing Facilities, Mentoring and Training to Early Stage Startups**
	Accelerators Offering Supportive Services and/or Capital to Firms With Growth Potential
	Flexible Office/Lab Space Available on a Short-term Basis with Management in Place
	Programs Fostering Networking and Collaboration Among Diverse Individuals
	Attractive/Affordable Housing Options for Knowledge Workers with Unique Demands
	Facilities Satisfying the Needs of Large Firms Interested in Accessing a District's Resources
	University Faculty, Programs and Research Centers Operating Continually On-site
	Common Areas, Design Features and Retail Outlets Encouraging Informal Interactions

3.3.3. Conclusions

The startups in urban innovation districts can promote the innovation development and economic growth in local regions. And the innovation districts are also the fertile soil for startups in various development phases.

Specifically, the early-stage startups cover the phases of formation and validation and the late-stage startups go through the growth phase until the end of lifecycle of startups. Considering the retention of startups, for the development after growth phase, the term “scaleups” is introduced generally and will also be covered in the empirical research. The development of startups relies on the cooperation between various actors in startup ecosystem, which contains universities and research organizations, funding organizations, support organizations, service provider organizations and large corporations.

3.4.Attraction and retention of startups in UIDs

In previous parts, the concept and lifecycle of startups, the components of startup ecosystem and the connection between various phases of startups and common features of innovation districts were elaborated. This part will focus on the factors of attraction and retention of startups in different development stages in UIDs.

Back to the lifecycle of startups and main objective of this research, the factors of attraction and retention of startups in UIDs will be divided into two parts: early-stage startups and late-stage startups, which are separately corresponding to development phases of formation & validation and growth phase. And the boundary between these two stages is the end of validation part, which has a clear sign of the market-validated product/service. After validating the business model of startups, it can be called as late-stage startups and will go into the scaling up/growth phase, otherwise, it is still the early-stage startups.

This part starts with the conceptual model as a guidance of studying the factors of attraction and retention. After that, the research scope is divided into two parts: early-stage startups and late-stage startups. Finally, the list of factors of attraction and retention of startups will be given

based on the conceptual model.

3.4.1. Conceptual model of factors

Before the further discussion about this topic, it is important to frame a conceptual model as a starting point to study the factors that startups prefer, which means specifically the classification of potential factors.

The three kinds of assets and common features of innovation districts discussed previously provide a good basement for the conceptual model. However, more focus should be made on the startups part, which can turn to the startup ecosystem and related contents mentioned previously.

According to the theory of Katz and Wagner, physical assets are the all kinds of infrastructures in the innovation districts, no matter the private buildings or public space, which are also parts of startups needs. The economic assets are the various economic entities, including big corporations, organizations, startups and service amenities. From the view of startups, the economic part can be more specific and closer to the management of a team, a company. For example, they need funding from the funding organizations and financial service from service provider organizations. Therefore, the second sort is financial part. In addition, the networking assets in innovation districts mean the strong and weak ties between similar fields and cross-sectors, which can be expanded to the networking between various organizations in the startup ecosystem to describe the synergies in the system. It is also noticeable that according to the definition of startup ecosystem, apart from the startups, various organizations and interactions between them, the people side is also very important. Coming back to the startups, as a kind of early company, people side refers to the human capital part. Finally, due to the explorative nature of the conceptual model, the "others" part was added to keep the place for other kinds of factors of attraction and retention of startups.

The conceptual model is shown in ***Figure 3.7***.

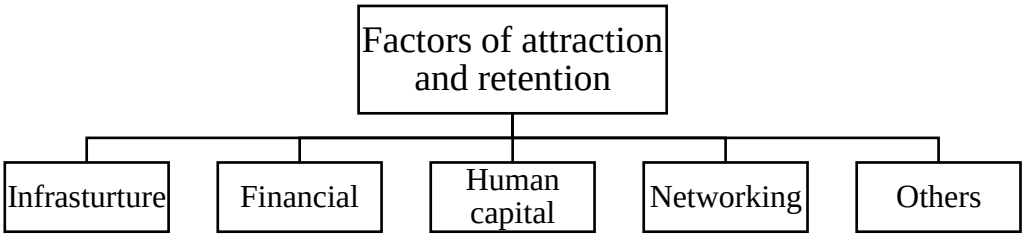

Figure 3.7 Conceptual model of factors

In addition to the classification of factors and startups during various development stages, it is also valuable to realize that startup is an entrepreneurial team and every entrepreneur is an

individual (Startup Commons, n.d.), a live person, which means apart from work side, entrepreneurs should also have an attractive environment to live and play in UIDs. Therefore, not only factors in business development process of startups should be considered, but also possible factors of living and playing parts in UIDs.

3.4.2. Attraction and retention of early-stage startups

The early-stage startups cover the formation and validation part, including the phases of ideating, concepting, committing and validating. During this stage, the startups developed from the aspiration stage to business model discovery stage, product/service development stage and finally to the direction of initial sales (Dee et al., 2015).

In the very beginning, when the entrepreneurs are searching for the location for their future startups, the attractiveness of the innovation district itself normally will be considered first. According to the theory of Zenker, the urbanity and diversity are the most important factors for attracting creative people (Zenker, 2009). And the urbanity and diversity contain the things like openness and tolerance of a city, a variety of shopping opportunities, a wide range of cultural activities (Zenker, 2008).

For the quality of life (QoL) in cities or regions, the quantity and quality of amenities is an objective indicator (Ballas, 2013), which can make some places much more attractive for both living and working (Mulligan & Carruthers, 2011). The amenities can be divided into natural and social amenities. The former refers to the natural environment, such as the climate, proximity to mountains/lakes, and so on. And the latter contains the nearby restaurants, bars, public spaces, plaza, health care service, crime levels (safety), etc (Mulligan & Carruthers, 2011).

From the theory of Landry (2008), the young entrepreneurs are one part of the creative class and also an important driver to create the creative milieu, which was described as an atmosphere that promotes the creative economy (Landry, 2008). Especially, the creative milieu is a place or region that has the necessary preconditions (hard and soft infrastructure) to create a stream of new ideas an innovation (Landry, 2008). For the hard infrastructure, it contains cultural facilities, universities, as well as service facilities, such as transport, health care and kinds of amenities. And the social networks, connections and human interactions form the soft infrastructure part.

Bask to the factors of business part, generally entrepreneurs need three kinds of things: 1. Personal development; 2. Professional development; 3. Solving specific business challenges and issues (Dee, et al., 2015). And the typical example of personal development for early-stage startups is the lack of confidence (TransUP, 2017). These needs are also the reason why there are so many programmes provided for early-stage startups, such as trainings, workshops in incubators and accelerators as well as various startup competitions. And all these offers provided by these programmes can be concluded into business support and access to networks (Dee, et al., 2015).

The business support to startups mainly comes from mentors, programme managers, external

experts and peer support (Dee, et al., 2015). For the mentorship mechanism, there is a debate about the focus on the number or the quality of mentors, but consensus is that matching process between mentors and entrepreneurs is quite important. For the external support provided by programme managers and related experts, there are mainly two kinds of proframmes, incubator (a longer duration) and accelerator programmes (featured with limited time) (Miller and Bound 2011). And these programmes can come from support organizations, service provider organizations, universities as well as large corporations. For early-stage startups, normally they begin with one founder and/or several cofounders. In the process of formation and validation, they need to work with other talents, entrepreneurs or like-minded people to negotiate problems, implement strategies and develop products/services (Salamzadeh & Kawamorita, 2015).

For the peer support, especially for early-stage startups, the peer-to-peer networking (support) is a vital learning mechanism because of "*everything you touch, someone has done it before*" (Dee, et al., 2015). This would help young entrepreneurs to gain insight of the successful startups (peers) to learn and maybe get support from successful late-stage startups (TransUP, 2017). And this kind of networking should not only exist in regular events, such as startup weekends/meet-ups, but also the physical location. The advantage of physical peer networking is that if the startups failed, they can also offer valuable human resource to other growing startups (Dee, et al., 2015).

In addition to peer-to-peer networking, new entrepreneurs and early-stage startups also prefer to participate in cross-sector events/activities in order to quickly get engaged into the multilateral startup community interactions (TransUP, 2017). In fact, the important reasons why young entrepreneurs choose to live and work in urban districts are startup weekends, business events, coffee places where the can meet with venture capitalist, business meetings in informal locations and after-work happy hours for socializing and networking (Morission, 2015). And Kaufmann and Schwartz (2008) even proposed that startups should take the formal trainings to improve their networking abilities.

Apart from these business support and the networking factors, the physical workspace is also the basic requirement of startups. And the physical space often contains: permanent workspaces, temporary workspaces, workshop/event spaces, meeting rooms and play & common room areas (Dee, et al., 2015). At the same time, the digital facilities, such as high-speed internet, computers, wireless network are also essential. For some programmes attached with universities, the labs and additional facilities can also be needed, like the 3D printing facilities (Dempwolf et al., 2014). And as a return, the space and facilities providers will take regular rent or membership fees. Since generally the incubators are not for profit and focusing on growth of early-stage startups (Allen & Haley, 2017), there can be discount or subsidies for the rental price.

Regardless of which development stage startups are in, they all need money to keep the lights on, the team happy, and the momentum going (Truong, n.d.). Most startups would have financial problems for various reasons in different development stages (Salamzadeh, 2015). There are many channels to get access to financing, and mainly are the banks, VCs and governments form the financing ecosystem for startups (Spender et al., 2016). For early-stage startups, seed capital

is the earliest source of investment and it can come from banks, crowdfunding and personal savings. And after the formation part, angel investor funding is the main source in order to attain further growth of early-stage startups (Truong, n.d.).

For the early-stage startups in validation phase, they are developing the validated products/services. However, they often lack commercial skills and taking risk of commercialization and further development (TransUP, 2017). Thus, it is necessary to enable them to ask advice of customers, who are getting increasingly involved in the commercialization as a co-producer of products/services (Spender et al., 2016).

Conclusion

The factors of attraction and retention of early-stage startups are shown in ***Table 3.10***.

Table 3.10 Factors of attraction and retention of early-stage startups

	Factors of early-stage startups
Infrastructure	Natural/social amenities (proximity to natures, café, bars, restaurants, public space); Transport; Workspace (including common space, lab, facilities); Digital infrastructure (high-speed internet, wireless network);
Financial	Funding (seed capital, angel investor funding); Rental price; Subsidies; Access to the customers;
Human capital	Trainings for entrepreneurs and startups; Talents;
Networking	Interaction between people; Peer networking; Cross-sector networking;
Others	Openness and tolerance; Safety; Innovative and cultural environment;

3.4.3. Attraction and retention of late-stage startups

The late-stage startups cover the growth part, including scaling and establishing phases. In this period, startups have already developed validated products/services, and focus on KPI based growth in customers, revenues, market traction & share (Startup Commons, 2018). Although maybe at this time, startups are still not be profitable, the growth and development potential are higher than previous stages of development and founder or investors can choose to exit or continue with the startups.

Compared with early-stage startups, the preferences of entrepreneurs and basic requirements as a business part keep the same. For example, the natural/social amenities, transport, digital infrastructure and safety of the environment. These factors or preferences do not change with the different development stages since startups and entrepreneurs will treat them as the priority.

However, it is noticeable that although the physical requirements of startups in early- and late-stage phase are close to each other, there are still differences. For example, the physical workspace has the categories of permanent and temporary workspaces (Dee, et al., 2015). And the startups which survived in the early-stage phase can change the temporary to permanent workspace or move to another location which are more suitable to the future development. For the permanent workspace, change of the rental price is also a concerning for them. Correspondingly, some entrepreneurs may consider to live in the innovation districts, where are mixed use districts and have the housing planning.

As for the three requirements of entrepreneurs proposed by Dee (2015): personal development, professional development and solving specific business challenges & issues. The late-stage startups focus much more on the latter two ones. For instance, the professional service legal and accounting advice are much more important in the faster growth phase since many startups fail due to external issues, like limitations in the markets and legal issues (Salamzadeh & Kawamorita, 2015). Correspondingly, the related business support will focus more on the trainings about market skills, team management and tailor-made support.

Late-stage startups are more interested and prefer to expend their market share cross border. In this way, the international networking can be a requirement. And in order to realize this aim, they are mainly looking for specialized partnerships, communications with other startups or big corporations (TransUP, 2017). In other words, the collaborations with other business organizations and/or companies are much strengthened, especially the big corporations. Startups can get access to corporate resources, assets, capabilities and even funding to scale up. The corporations can also become customers of startups, which will speed up the process of market fit products/services (Kohler, 2016).

With reference to the market fit products or services, one of the issues that late-stage startups need to face is that they have to develop and test their business in the markets rather than still in their offices or laboratories (TransUP, 2017). Thus, access to the markets and the possible support during this process are essential for the further growth of late-stage startups.

"Networks are the locus of innovation" and the interacting actors in startups' network can give the direction of innovative products/services (La Rocca & Snehota, 2014). Apart from the network with big corporations, the collaborations with the intermediary organizations, which contain funding organizations, support organization and service provider organizations, also have the positive effect on the late-stage startups' product innovation (Zhang & Li, 2010). And the networks of startups are dynamic. Taking the academic derivative startups for example, the early-stage startups prefer to engage academic institutions into their business, while in the late development stage, customer is their main focus (Pérez Pérez and Sánchez, 2003).

In addition to the involvement of customers part, the development of startup teams is essential as well. It is important for startups, especially late-stage startups to attract and connect skilled workforce or entrepreneurs in order to form a competitive team (TransUP, 2017). And this can

also turn to the network with other actors, especially universities, which have the strong resources for the talent pool.

For the late-stage startups, the funding mainly contains venture capital financing and mezzanine financing & bridge moans. And mezzanine financing & bridge moans are in the time when the startups are going to scale significantly with the commercial products (Truong, n.d.). Before this stage, venture capital focuses on the balancing between innovative and commercial technologies (Spender et al., 2016).

In the process of commercializing new technologies, the intellectual property issue may arise, especially in the cases of academic spin-offs. If universities or research institutions focus on IP protection too much, it may create the obstacle in the industry engagement (Wal and Corbishley, 2014).

Conclusion

The factors of attraction and retention of late-stage startups are shown in ***Table 3.11***.

Table 3.11 Factors of attraction and retention of late-stage startups

	Factors of late-stage startups
Infrastructure	Natural/social amenities (proximity to natures, café, bars, restaurants, public space); Transport; Workspace (referring to permanent space); Housing; Digital infrastructure (high-speed internet, wireless network)
Financial	Funding (venture capital, mezzanine financing & bridge moans); Services (business, legal, financial, etc.) Access to market;
Human capital	Trainings for startups/entrepreneurs (referring to market skills, team management, etc.); Talents; Skilled workforce;
Networking	International networking; Networking with other actors in the startup ecosystem;
Others	Safety; Intellectual property issues;

3.4.4. List of factors of attraction and retention of startups

After gaining insight of factors of attraction and retention for startups at various development stages, the general list of factors for startups is developed through combining them together.

In this process, it is found that startups at various development stages have different preferences. For example, in the human capital part, early-stage startups would like the trainings for entrepreneurs and startups building while late-stage startups prefer trainings much more related with market skills, team management, which are contents in the late business development. In order to develop a unified list for the following empirical research, these preferences are

concluded as the trainings for entrepreneurs and startups. This approach is also used in other factors and the possible conflicts will be discussed as a reflection in chapter 6.

The list of factors of attraction and retention of startups in UIDs is shown in ***Table 3.12***.

Table 3.12 List of factors of attraction and retention of startups in UIDs

Factors of attraction and retention of startups in UIDs	
Infrastructure	Natural/social amenities (proximity to natures, café, bars, restaurants, public space); Transport; Workspace (including common space, lab, facilities); Housing options; Digitally-accessible (High-speed internet, computers, Wireless network)
Financial	Funding; Subsidies; Services (business, legal, financial, etc.); Rental price; Access to customers/markets
Human capital	Trainings for startups/entrepreneurs (business skills, management, technical skills, etc.); Talents; Skilled workforce
Networking	Interactions between people; Peer-to-peer networking in startups; Cross-sector networking in startups; Networking with other actors in startup ecosystem; International networking
Others	Openness and tolerance; Safety of the environment; Intellectual property issues; Innovative and cultural environment

Part 4 Empirical research

Chapter 4 Case studies through literature review

Chapter 5 Merwe-Vierhavens

4. Cases studies through literature review

In order to gain insight of practical management on how to attract and retain startups in UIDs, three innovation district cases (22@ Barcelona, Boston's Innovation District, Knowledge and Innovation Community in Shanghai) are chosen to study through literature review. The findings of this part are the strategies on attraction and retention of startups in UIDs as well as the theoretical framework used as a basis for the field work conducted in M4H.

In every case study, first of all, the basic information will be introduced. And then strategies used by district managers are discussed from five categories: infrastructure, financial, human capital, networking and others, which is also the division of list of factors. In addition, the scale problem of these strategies, which means division of responsibilities in district, city and beyond city scale, will also be discussed. Therefore, the general strategies on attraction and retention of startups are concluded. Finally, the framework of attraction and retention of startups is developed based on previous analysis about practical strategies used in three cases.

4.1. Management on the attraction and retention of startups in UIDs

The specific factors of attraction and retention for startups at early and late development stage have been discussed in the previous chapter and the list of factors is proposed. This part will go into the management on the attraction and retention of startups by district managers based on division in the list of factors. At the same time, the division of responsibilities in district, city and beyond city scale will also be studied.

The factors of attraction and retention of startups can be concluded in general while the management on those in UIDs varies a lot since various innovation districts have different situations and development strategies. In order to gain insight of the practical strategies on how to attract and retain startups in UIDs, three cases were chosen as examples: 22@ Barcelona, Boston's Innovation District and Knowledge and Innovation Community (KIC) Shanghai.

The three chosen cases have different development trajectories. 22@ Barcelona is the first innovation district and have become a model for other innovation districts around the world (Morisson, 2017). Boston's Innovation District was initiated by the former layer and collaborated with real estate companies to create an innovative area different with traditional real estate models. KIC in Shanghai has developed quickly and grown a lot relying on the strong leadership and support from the local government. In addition, these three innovation districts are all re-imagined urban areas and developed under various levels of government intervention compared with each other: low government intervention in Boston's Innovation District, average in 22@ Barcelona and high in KIC, which provide a broad research scope of innovation districts with different institutional levels.

4.2.22@ Barcelona

22@ Barcelona was officially launched in 2000 with the establishment of a municipal company, 22 ARROBA BSC S.A., specializing in the development of 22@ Barcelona project. While the starting point of this project can date back to 1998, when the document Poblenou about the renovation of industrial areas was published (Barcelona City Council, 2016). Poblenou was used to be the 5th largest textile industrial district in the 19th century and was planned to be transformed into the knowledge and innovation center of the city (Morisson, 2015).

22@ Barcelona covered the area of 198.26 hectares, about 115 city blocks, with the total infrastructure investment of €180 million and the potential building area about 4,000,000 ㎡, including 3,200,000 ㎡ for the productive activities and 800,000 ㎡ for other uses, such as housing, facilities (Barcelona City Council, 2016). As shown in ***Figure 4.1.*** The main aim of this project is to realize the transformation in urban, economic and social part (Barcelona City Council, 2016). To be specifically, it aims to redevelop the industrial area into a modern, mixed-use, sustainable district. And there are five chosen high-tech clusters: media, information and communication technologies (ICTs), medical technologies, energy and design. As a result, the project can increase the city competitiveness in the development of knowledge economy (Morisson, 2015).

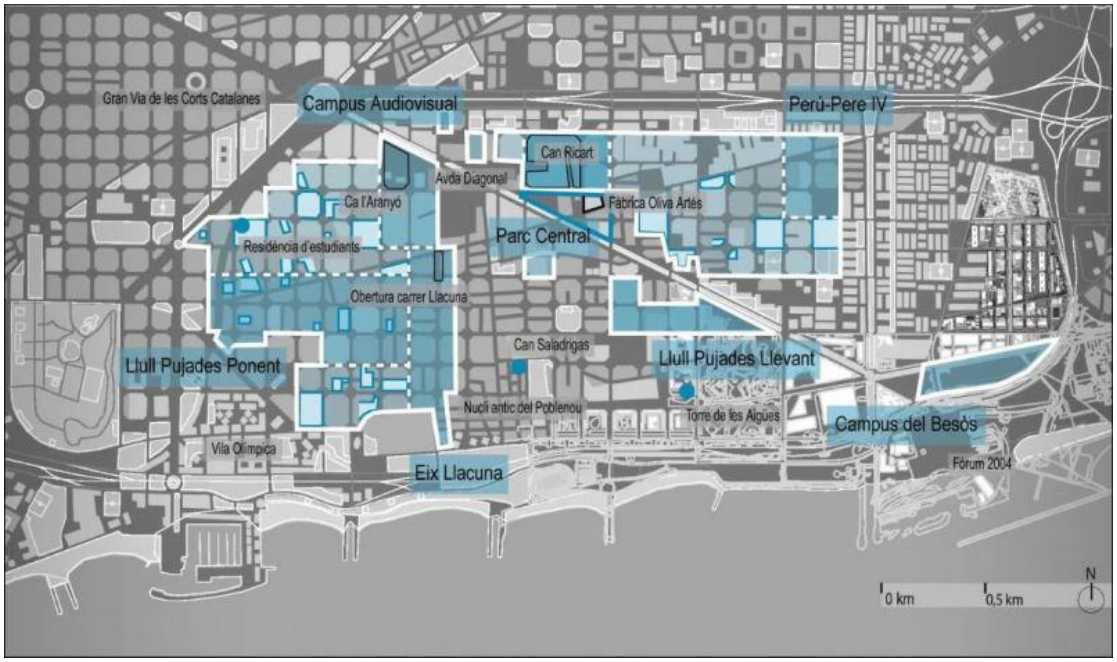

Figure 4.1. 22@ Barcelona (Barcelona City Council, 2016)

In order to realize the planned vision, there are many strategies and means used by area managers for the last almost 20 years to attract and retain various people and organizations, especially the startups. Under the governance of municipal company 22 ARROBA BCN, S.A.U., there are three planning mechanisms (Barcelona City Council, 2016): the Modification of the General Metropolitan Plan (MPGM) for the renovation of Poblenou (2000), the Special Infrastructure Plan (PEI) for Poblenou (2001) and the Modification of the Special Plan for

Historical/Artistic Architectural Heritage of the city of Barcelona (2006). With this management structure, the local government partly engaged in the development of the innovation district. In 2011, the municipal company dissolved and replaced by the 22@Network, which was still headed by the municipality. And at present, it has already become a self-sustaining innovation district without the strong leadership (Barcelona City Council, 2016; Morisson, 2015).

Infrastructure

From the view of attractiveness of places and quality of life, the three urban development regulations, which are in city level, provided clear guidance. The land of 22@ are private owned and the MPGM encourages the private owners and real estate companies to build spaces for innovative activities by giving more construction rights (Morisson, 2015). In addition, the regulation required that 30% of the built area should be transformed to the city, including 10% to social housing, 10% to 7@ amenities and 10% to green spaces. As a result, there have been 4,000 subsidized housing units constructed until 2015 and more than 114,000 ㎡ of new public and green spaces at present (22@Barcelona, n.d.). And this can also promise that the innovation district will develop to the direction of complexity, sustainability and diversity. The PEI proposes the plan of improving 37 kilometers of streets in 22@ Barcelona to improve the traffic situations in this area (22@Barcelona, n.d.). The funding of this plan contains 60% from landowners, 10% from the city council and 30% from public service operators (Oliva, 2003). Reducing the number of main streets and increasing the number of secondary streets can help to reduce traffic problems and increase the accessibility of the district. The Modification of the Special Plan for Historical/Artistic Architectural Heritage in the city of Barcelona aims to protect the industrial heritage in this area, which also creates a cultural environment.

Apart from housing, amenities and transport in the city level, 22@ Barcelona also provides spaces and infrastructure for SME companies as well as flexible spaces for startups in the district scale. The personalized service is the Space search, which encourages companies to look for the working spaces that meet their own requirements in this district. And the up-to-date information on vacancy and infrastructure as well as the advice on how to better take advantage of these infrastructures are open to public (Barcelona City Council, 2009).

Especially, 22@ Barcelona landing platform can provide startups with high-quality rent offices flexibly by the week or the month (22@Barcelona, n.d.). In addition, the largest public business incubator in Europe, Barcelona Activa is located in this area. And the important part of 7@amenities, the MediaTic building, which has 9 floors covering the area of 14,000 ㎡, provides the co-working space to entrepreneurs, startups, seed accelerators, private and public organizations (Barcelona Activa, 2012).

Financial

For the small and medium companies, including startup, the municipality of Barcelona proposed the service InnoActiva in the city level, which is also the service program in the incubator Barcelona Activa. The main objective of InnoActiva is to help SME which are engaged in research, development and innovation projects as well as situated in the city Barcelona to get access to the public financial support through aids and subsidies

(22@Barcelona, n.d.). Apart from the funding from the support of the city, companies which are already in 22@Barcelona or have the willing to move to the district, can also receive a series of supporting financial services through 22@ Barcelona Project Aid Management Unit (UGAP), which is based on the district scale. For example, one of the free services is to organize many workshops or events about public financing for projects to help companies, including startups, to get access to some representatives and experts from various fields, who can offer valuable information and resources (Barcelona City Council, 2009).

In addition, 22@ Barcelona also created a strong network of different private finding, 22@ Capital, which provides a broader platform to connect venture capital firms in and beyond the city with innovative startups or projects with high development potential (Barcelona City Council, 2009).

There are five fields chosen as high-tech clusters in 22@ Barcelona: media, information and communication technologies (ICTs), medical technologies, energy and design. In order to increase the competitiveness and business opportunities of startups and companies in this district, 22@ Barcelona promotes the connection between companies and various research organizations through engaging them into kinds of projects, programs, which also provide a platform to get access to market and customers (Barcelona City Council, 2009).

Human capital

22@ Barcelona favors both local and international talents and the internship project, 22@Staying in Company provides a platform with the innovative companies and valuable talents. And the five programs under 22@Staying in Company: 22@MASTER, 22@BECAT, 22@FP, MIT-SPAIN, 22@MBA, and 22@DEGREE create a comprehensive range of talent-attracting platforms, which are involved in the local universities, international universities, technological training centers in the district, joint program with MIT, target field MBA and so on (22@Barcelona, n.d.). And the implementation of these projects depends on the division of labor cooperation among departments in district, city and beyond city level.

In order to attract and retain entrepreneurs into this district, 22@Entrepreneurs (emprededores in Spanish) was proposed to build a network of support infrastructures for local as well as international entrepreneurs, like incubators, temporary housing plan and other supporting services (Barceló, 2005).

Networking

With all the organizations and resources, 22@Barcelona created a strong platform in the district level, 22@Network, which currently contains 66 members of companies, institutions and organizations regardless of the various sectors (cross-sector networking) and any businesses, including startups in 22@Barcelona (22@Barcelona, n.d.). In addition, 22@Update Breakfast, monthly organized meeting from 2004, is open to all companies and professionals in the district to exchange experiences & ideas and news in the district will also be announced (Barcelona City Council, 2016).

There are also many other programs to promote the networking among various actors in the district: 22@SynergyS for the collaboration between research institutions and industries, the Smart City Campus for networking between companies, startups, institutions, universities in ICT; the 22@ Tecnologico for technology centers and startups & companies; the 7@Amenities, on the other hand for the collaboration between many various actors, like startups, entrepreneurs, accelerators and venture capital firms (Morisson, 2015; Barcelona City Council, 2016; Barceló, 2005; 22@Barcelona, n.d.).

In addition, 22@Barcelona also created the international platform to attract and connect with foreign business, companies and universities in/beyond the city level. The typical example is the LANDING Program, which links the international resources with the Spanish Innovation system. Especially for international startups, it offers an international incubator to help startups to dispel concerns about the adaptation to the new environment (22@Barcelona, n.d.).

Others

In order to increase the popularity of 22@Barcelona as well as promote the innovation development in business, 22@Urban Labs provides a platform for startups or companies to text their products/services for the near future through engaging citizens inside (Barcelona, 2012). And this is a new kind of networking in city level between startups, companies and citizens as well as an innovative way to validate products/services for startups.

In addition, the 22@Voluntariat, which is a kind of volunteer program to engage anyone working in 22@Barcelona in volunteering on social and cultural activities, promotes the development of cultural environment in the district level(22@Barcelona, n.d.).

Conclusions

In conclusion, the management strategies of attracting and retaining startups in 22@Barcelona are listed in ***Table 4.1***.

Table 4.1 Management strategies of attracting and retaining startups in 22@ Barcelona

Factors	Management strategies
Infrastructure	the Modification of the General Metropolitan Plan (MPGM); the Special Infrastructure Plan (PEI); the Modification of the Special Plan for Historical/Artistic Architectural Heritage; Barcelona Activa; Space search; 7@ amenities; Landing platform;
Financial	InnoActiva; 22@Capital; Project Aid Management Unit (UGAP); Market access; 22@Innovation;
Human capital	22@Staying in Company; New training centers of universities in Barcelona; Technological centers; 22@ entrepreneurs;
Networking	22@ Network; 22@ Update Breakfast; 22@ Tecnologico; 22@ SynergyS; 7@ amenities; International platform;
Others	22@ Urban Labs; 22@Voluntariat;

From the division of the responsibilities when implementing these strategies, it is found that in

22@Barcelona, the district authorities and the municipality are engaged in every kind of factor more or less. In addition, the support beyond the city level are also essential in financial, human capital and networking part.

According to the official statics, there are 4,500 companies in 22@Barcelona and 47.3% of them are new start-ups after 11 years development (22@Barcelona, 2011). To conclude, for the management on attraction and retention of startups, there are some characteristics in 22@Barcelona:

1. **One centralized leadership organization established at the beginning to organize all the resources for startups**; According to the theory of Morisson (2015), 22@Barcelona has become a self-sustaining innovation district from the beginning artificial one. However, during more than 10 years development, the municipal company 22 ARROBA BCN, S.A.U. were planning and organizing various supporting programs for startups;

2. **Clear regulations about the urban planning for startups**; MPGM, PEI and the Modification of the Special Plan for Historical/Artistic Architectural Heritage of the city of Barcelona promised the flexible workspaces, accessible locations, green public spaces, housing options, attractive environment and rich social amenities for startups;

3. **Strong platforms for startups in financial, human capital and networking**; With the leadership of the municipal company, the resources in the startup ecosystem are organized in order. No matter the public financing service InnoActiva in the incubator, or provide funding platform 22@ Capital, they all provide smooth financing channels for startups. The 22@Entrepreneurs and 22@Staying in Company can not only attract entrepreneurs into this district, but also help startups already in 22@ to get access to the local and international talents. And the 22@Network and other various platforms give startups more space and opportunities to get access to customers/markets, other actors and even international resources;

4. **Multiple channels to create a comfortable and cultural environment to attract and retain startups**; The 22@ Urban Labs creates an urban laboratory to engage the citizens in testing prototypes of startups or companies, which can not only get access to customers, but also increase the branding influence of 22@. And the 22@Voluntariat can develop an open, safe and cultural environment for the district and the neighboring, which is also one of the preferences of startups.

4.3.Boston's innovation district

Compared with 22@Barcelona, Boston's innovation district has relatively low governance intervene. It was established based on a Mayor's vision. In 2010, the former Mayor Thomas M.Menino announced officially the plan to transform the Seaport District to Boston's innovation district (Rodriguez, Congdon, & Ampelas, 2015). The Seaport District, also known as South Boston waterfront, is close to Boston's central Business District. In 1804, it was the hub of industrial areas and it was isolated area due to the poor transportation infrastructure until

1995, when the Massachusetts Turnpike was extended and the Ted Williams Tunnel was constructed. After that, it developed gradually and was ever dubbed a “bustling waterfront” in 2007 (Rodriguez, Congdon, & Ampelas, 2015). However, the outbreak of the 2008 financial crisis hit local development and by 2010, it was a mixed-use area with several new vacant office buildings, upscale apartments and bars (Rodriguez, Congdon, & Ampelas, 2015). And it is a typical example of the re-imagined urban areas model.

The Boston’s innovation district contains four districts: Fort Point, Fan Pier, the Seaport World Trade Center, and Boston Marine Industrial Park (BMIP), covering 405 hectares (Morisson, 2015), as shown in ***Figure 4.2***. And the main objectives of Boston’s Innovation District are: 1. To redevelop this district into an “agile” neighborhood; 2. To create an entrepreneurship environment (attract and retain college graduates and promote the establishment of startup communities); 3. To promote the whole city’s competitiveness (Morisson, 2014). In addition, it was established only based on the Mayor’s vision without any clear plans or schedules (ECPA, 2011). And there are four main features in the Mayor’s vision: 1. Industry-Agnostic. This district has no limits with the kinds of industries, which means it is open to any innovative startups, SMEs and big corporations; 2. Clusters. The district prefers to cluster innovative entrepreneurs to create innovative environment; 3. Experimental. The development process of the innovation district will be experimental; 4. The city as host instead of universities or big corporations (Rodriguez, Congdon, & Ampelas, 2015).

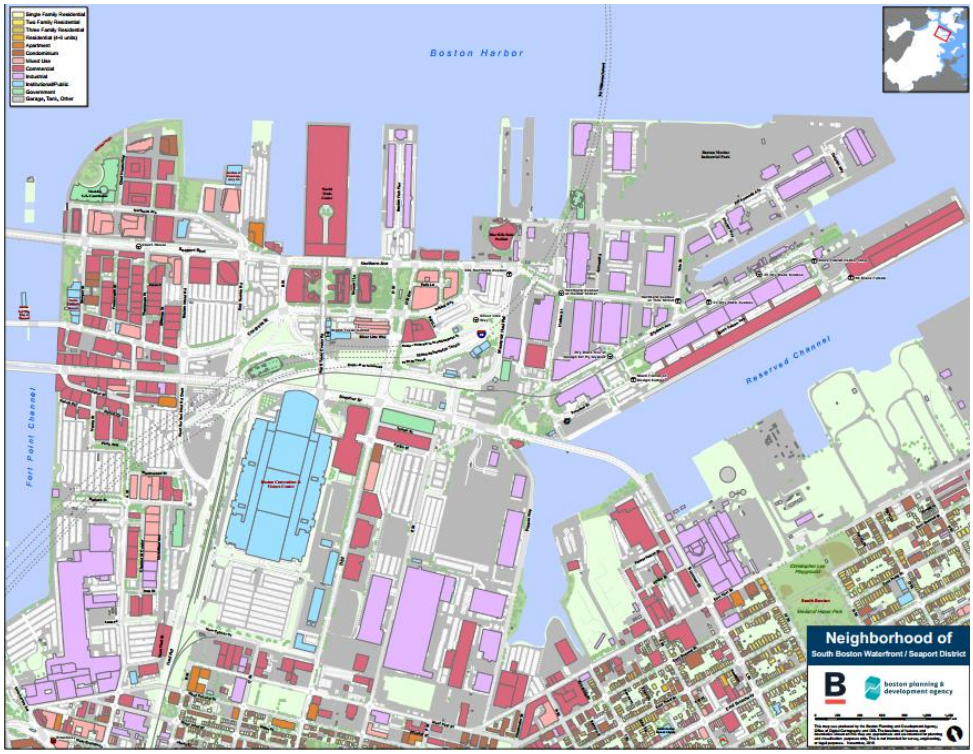

Figure 4.2 Boston’s Innovation District (BPRA, 2017)

The low governance intervene reflects in most of the land is privately owned and little money investment from the city council. The development of this innovation district relied on the public relations to collaborate with other companies or organizations (Morisson, 2015).

Infrastructure

In order to create attractive environment for entrepreneurs and startups, in the city level, Boston Planning & Development Agency (BPDA) had the negotiation with the real estate development companies to add the innovative and untraditional features into the projects (Morisson, 2014). The typical example is the Seaport Square's project, the planning approved by BRA pointed that there are about 42.3 % area for the residential, 19.3 % area for the retail, 6.2% for the office and research, 7.7% area for the hotel and 9.2% area for the educational and cultural activities (BPRA, 2017). And this project also contains the planning to improve the infrastructure, including new streets, sidewalks, green public spaces and the Northern Avenue Bridge (BPRA, 2017).

For the housing planning, BPRA approved plans for 12,000 new residential units with the requirement that 15% of the units should be affordable housing and 15% of them should be "micro-units" assigned to the workers in the district (Rodriguez, Congdon, & Ampelas, 2015). For the working space, the first innovation building in the district, the Factory 63, has 38 affordable live-work units and shared conference rooms. In addition, WeWork and Cambridge innovation Center (CIC), the co-working space provider companies, also opened in the innovation district (Rodriguez, Congdon, & Ampelas, 2015).

For the neighboring amenities, the Mayor flavored untraditional bars and restaurants in order to provide unique atmosphere for the district. Therefore, the BPRA invited famous chains to treat the district as an experimental site to test their new ideas and concepts and it succeed through the collaboration with Legal Seafoods (Rodriguez, Congdon, & Ampelas, 2015). It is noticeable to mention that due to the entry of global company Vertex Pharmaceuticals, in the beyond city level, the State invested in $50 million to improve the surrounding infrastructure (Rodriguez, Congdon, & Ampelas, 2015). Together with the South Boston Waterfront Sustainable Trabsportation Plan (2014), the transportation is much more efficient (Morisson, 2015).

Financial

The turning point of the Boston's Innovation District was the entry of MassChallenge, the world's largest start-up accelerator, and in order to attract it, in the city level, BPRA offered a one-year rent-free lease (Rodriguez, Congdon, & Ampelas, 2015). After that, the global company Paypal also opened an incubator in 2013. These attracted a lot of venture capital firms, private investors and large corporations to form the funding streams for startups.

In addition, Boston's first public innovation center, District Hall, financed by the Morgan Stanley, was open in 2013 and managed by the Venture Café Foundation (Rodriguez, Congdon, & Ampelas, 2015). The Venture Café is a non-profit organization attached to Cambridge Innovation Center (CIC) and it organized regular events or workshops to provide the platform for entrepreneurs, startups and investors, which is also a source of the funding (Venture Café, n.d.).

Human capital

Given the high attention on the young talents and technology, in the city level, the Mayor's office made the contract with Babson College in 2011 to build 3,500 square feet of classroom space (Rodriguez, Congdon, & Ampelas, 2015). Together with the incubators and accelerator MassChallenge in the district, they can provide various trainings and attract many young talents for startups in this innovation district.

Networking

In the second year after opening, the District Hall organized 562 events for startup networking meetings and training sessions and over 70% space rental value was donated for startup community (Rodriguez, Congdon, & Ampelas, 2015). At the same time, the presence of many big corporations, like Vertex Pharmaceuticals, Gazelle, NPR digital, PayPal, attract the innovative startups and collaborate with them (Morisson, 2015). The Venture Café in the district level mentioned before also provide a platform for the networking between investors, startups and entrepreneurs.

And the district management team have close networking with people (including startups) in the district and they even have a communications campaign to build connections with entrepreneurs to gain insight of their needs (Rodriguez, Congdon, & Ampelas, 2015).

Others

Industry-agnostic and experimental features of the Mayor's vision themselves defined an open and inclusive environment and the process of development and exploration of the innovation district is innovative.

Conclusions

The management on attraction and retention of startups also followed the conceptual model and the main strategies are shown in ***Table 4.2***.

Table 4.2 Management strategies of attracting and retaining startups in Boston Innovation District.

Factors	Management strategies
Infrastructure	Provide flexible housing options; Attract new and different dining and entertainment options (Innovation Uses); Gain $50 million state investment for infrastructure improvement; negotiation with real estate companies; Various co-working spaces;
Financial	Accelerator Mass Challenge; PayPal incubator; Venture café; Cambridge innovation Center (CIC);
Human capital	Physically engaged in educational institutions; More incubators, accelerators and professional services firms;
Networking	Public innovation center: District Hall; Venture café; Various events and meeting; Communications strategy of management team;
Others	Industry-agnostic and experimental features;

With the development of less than 10 years, Boston's Innovation District is still in its infancy. Most of the strategies are initiated by the district and city authorities and the support beyond the city level is limited with the state investment in the infrastructure part.Since the year 2010, the incubators and accelerators have accelerated over 1,000 startups in Boston's Innovation District and more and more big corporations are coming into the district (Immerman, 2019). Although Boston's Innovation District is modeled on 22@Barcelona (Morisson, 2015), it still has some notable characteristics on the management of attracting and retaining startups:

1. **Public relations to attract startups**. In the process of the development of the district, the city council don't have the money to invest in the infrastructure part, and the BPRA had to negotiate with the real estate development companies to add the innovation features into the urban plans to attract entrepreneurs and startups, like certain percentage of affordable housing, co-working space and space for innovations uses. Although the level of governance intervene is low, the mayor's office and the management team made full use of the public relations to attract accelerators, incubators, universities, big corporations and even innovative restaurants to locate in the innovation district, which created an attractive environment for the startups and entrepreneurs;

2. **Large corporations provided various resources to attract and retain startups**. Big corporations acted as various roles that existed in the startup ecosystem to attract startups. They can not only provide startups with possible funding, but also incubators (PayPal), co-working space (CIC, Vertex Pharmaceuticals), lab space (Vertex Pharmaceuticals), and so on.

4.4.Knowledge and Innovation Community (KIC)

Knowledge and Innovation Community (KIC) is the "experimental field" project of the urban transformation to knowledge and innovation-based community in YangPu District, which is listed the second in the number of innovation institutes in 2017 in Shanghai, China. And the KIC was officially launched in 2003 and the initiator is Shanghai YangPu Central Community Development Co. Ltd, which is the joint venture of Shui On (Developer, 87% ownership) and Shanghai Yangpu University City Investment and Development Co. Ltd (Public sector development partner, 13% ownership). The total investment is about $15 million and the local government participated a lot in the process of project approval and relocating the existing residents and business (ULI, 2015).

The project is located in the subcenter of Wujiaochang in Yangpu District with an area of 49 hectares and close to Fudan University, Shanghai University of Finance and Economics, Shanghai Second Medical University, and Tongji University. Before the project was launched, there were only some small factories, the old Jiangwan Stadium and housing for workers. The development concept of KIC is the "three-zone integration for interlinked development" which was proposed by the local government in 2004. The three-zone refers to the university campus, public community and science & technology park and the interlinked development aims to create a high-quality mixed-use urban environment (ULI, 2015).

The urban planning was made by Skidmore, Owings and Merrill (SOM), ARUP Group Limited and Shanghai Urban Planning and Design Research Institute (ULI, 2015). According to the plans, KIC contains four programs: 1. KIC Plaza/KIC Corporate Avenue as the flagship office and R&D center; 2. the University Avenue/KIC village; 3. Jiangwan Stadium area with kinds of sport centers and facilities; 4. the residential, educational and hotel complex to the north of KIC village. The masterplan is shown in ***Figure 4.3***.

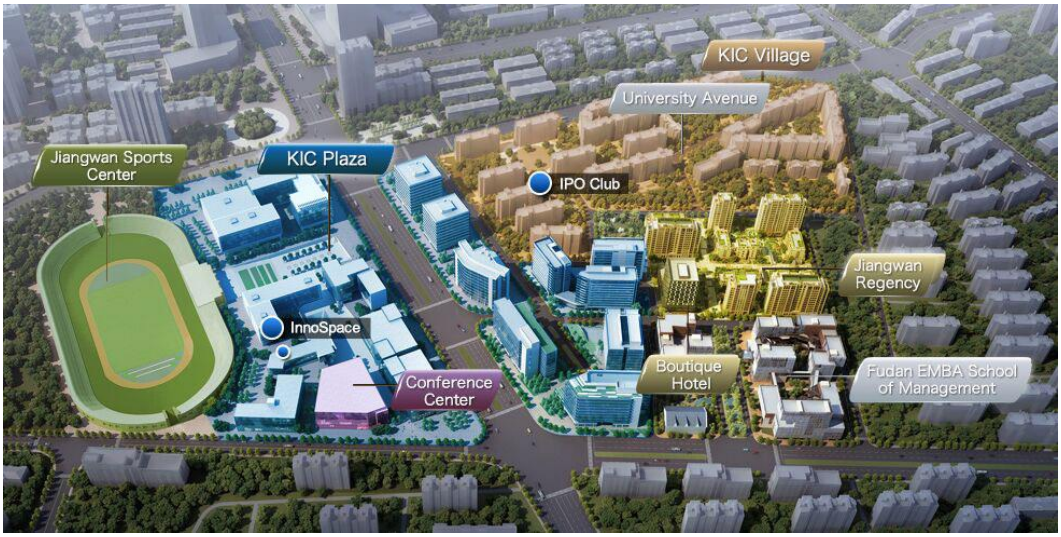

Figure 4.3 Masterplan of Knowledge and Innovation Community (ULI, 2015)

In order to develop an innovation and knowledge-based community, the startup is the main power behind and KIC especially appeals to young people (ULI, 2015). And the strategies used to attract and retain startups are also developing during past 15 years.

Infrastructure

In the living environment part, KIC proposed LOHAS, the lifestyle of healthy and sustainability in the district level. The mixed-use lifestyle of restaurants, bars, retails, housing, offices, schools, entertainment facilities are existed in every developed district. And the sustainability not only reflected that KIC meets the requirements of the LEED (Leadership in Energy and Environmental Design) Neighborhood Development, but also a reserved community garden, where residents can grow their own gardens. The improvement of Jiangwan Sports Center, KIC Plaza and Boutique hotel also provide attractive environment for startups. In addition, in the city level the completement of Metro line 10 nearby in 2010 and sidewalks, bicycle lanes made KIC more accessible and convenient.

Especially for startups, the existing tech startup accelerator, InnoSpace can provide about 60 tenants at the same time to early-stage startups for three months and after graduation from InnoSpace, the startups can choose to work in the SOHO (small office/home office) on University Avenue, which is an office developer company focusing on providing smart and warm office to small companies, especially startups.

Financial

The accelerator InnoSpace have a platform to help startups to get access to venture capital and customers. The Sinovation Ventures in the district, which is a technology-savvy investment firm with over 300 portfolio companies, can also provide various financing channels for startups. In addition, in the city level, KIC successfully attracted Shanghai University Student Technology Entrepreneurship Foundation to offer startups in various development stages a rich financial service platform. A similar organization like Venture Café in Boston's Innovation District, the IPO club is a startup-oriented café to provide various educational programs as well as a platform to startups with other actors, like investors, customers, and so on.

In addition, KIC establishes and maintains a good interactive relationship with many investment funds beyond the city level focusing on industrial investment and the management committee actively establishes venture capital funds to provide financial support for companies and startups in various development stages. For example, KIC collaborated with Shanghai Time Innovation Management Co., Ltd., to establish an early venture capital fund with a total amount of $6 million.

Human capital

KIC made full of the location advantage with several universities in the city to attract kinds of resources. Regularly, KIC hosts events to organize students and professors in universities to visit the district to bring human resources for companies, including startups. There are many internship projects in the district to attract university students and KIC also encourages enterprises to establish lab spaces in universities, where startups in universities can get access to. Apart from local universities, more than one hundred scientific research institutions, IPO club, InnoSpace can provide opportunities for startups to get various trainings and services.

In order to further attract talents, KIC also established the YangPu District government's Overseas Talent building, which can not only help overseas talents who returned from abroad with work and residence permits, but also provide various programs to help them to establish their startups (ULI, 2015). For the startups in KIC, the tax service or other services related with government affairs can turn to the Governance Service Center in the district.

Networking

Apart from the physical networking convenience resulted from infrastructure improvement, social amenities, public spaces, KIC has its own strong Eco-system, as shown in ***Figure 4.4***.

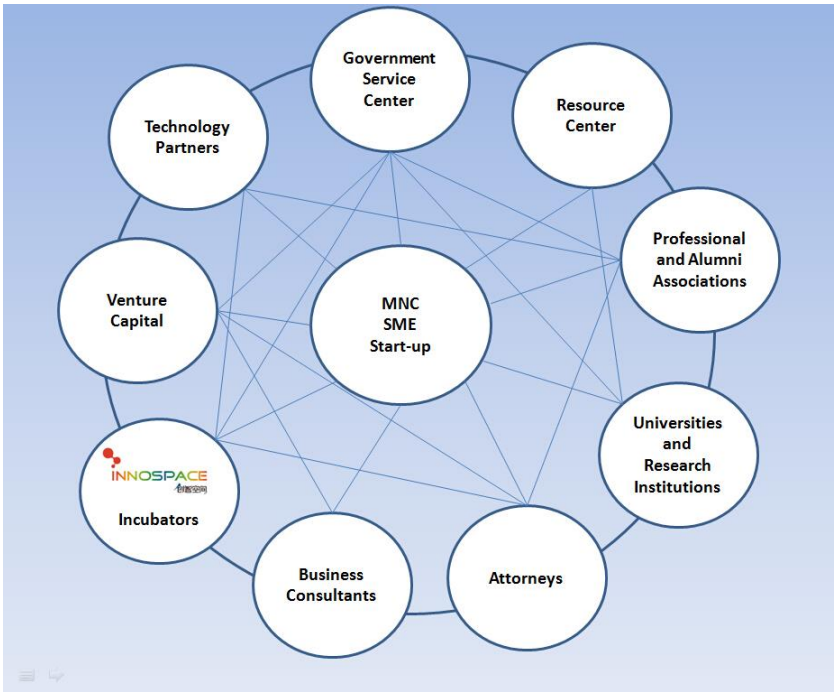

Figure 4.4 KIC Eco-system

It is noticeable that the startup is one of the main objectives in KIC Eco-system. And this kind of knowledge innovation cooperation service platform, which integrates multi-domain resources, is designed to foster a good entrepreneurial environment and encourage innovation and growth for startups. The starring point is that the establishment of Professional and Alumni Association is another supplementary resource of universities for startups. KIC is active in collaboration with local and overseas alumni associations to attract innovative entrepreneurs into the district.

It is worth mentioning that in the international platform, KIC established partnership with many abroad innovation districts, universities and organization. For example, the collaboration with Hong Kong's Cyberport IT district made the cooperation on talent exchanges, information sharing and marketing (ULI, 2015). All these networking can provide startups in KIC an international vision and broader platforms.

Others

In order to further attract innovative students in universities and create more innovative environment, the developer of KIC provided a land with the area of 6.3 hectares for Fudan university to build the campus of Fudan University School of Management and the condition is that the campus has to be open to the public (ULI, 2015). Another action is to develop the University Avenue into a commercial street with the theme of cultural and creative, which contains special bars, fashion clothing stores, creative retails, etc.

Conclusions

To conclude, the management strategies of attracting and retaining startups used in KIC Shanghai are listed in ***Table 4.3***.

Table 4.3 Management strategies of attracting and retaining startups in KIC Shanghai

Factors	Management strategies
Infrastructure	LOHAS (the lifecycles of healthy and sustainability) life style; Accelerator InnoSpace; Improvement of Jiangwan Sports Center; KIC Plaza; SOHO (small office, home office); Boutique hotel; Kindergarten; Construction of Metro line 10;
Financial	Accelerator InnoSpace; Shanghai University Student Technology Entrepreneurship Foundation; Sinovation Ventures; IPO club
Human capital	IPO club; YangPu District government's Overseas Talent building; Collaborations with universities nearby; Government service center;
Networking	Construction of University Avenue; Entry of international corporations; Collaborations with local and international universities; Over 100 events every year; Partnership with many international innovation districts, organizations, large corporations like Hong Kong's Cyberport IT district and Silicon Valley; Professional and Alumni Association;
Others	Negotiation with universities to open campus; Cultural and creative theme commercial street;

KIC has developed into the advanced stage after 15 years, and this innovation district attained much support from the municipality with high government intervention. The district and city authorities are engaged in the management from all five kinds of factors and the beyond city level management reflects in financial, human capital and networking part.

According to the official statistics, there were more than 200 startups in KIC village in 2015. During the time from 2015 to the end of 2017, KIC succeed in helping 115 entrepreneurs to start their business, creating 596 jobs. At the same time, over 140 entrepreneurial activities were organized covering more than 40,000 entrepreneurs. Compared with previous two innovation districts, KIC has its own characteristics:

1. **Strong support from the local government to create innovation environment for startups**; The support from the government not only reflected the project approval and relocating the existing residents and business at the beginning, but also the resources integration and networking efforts for startups in the whole process. The foundation of Government Service Center, promotion to the establishment of various venture capital funds, accelerators, incubators, overseas talent innovation and entrepreneurship base and collaborations with local and international universities, research institutions, innovation districts. All of the supports together create an innovation environment for attracting and retaining startups in KIC.

2. **The international platform provides startups with a broader stage**; The development of KIC is not only limited to local region, but focusing on international stage. This strategy attracts many international entrepreneurs, startups, big corporations and organizations to locate in KIC, which enriched the innovation environment for startups.

3. **Various strategies to retain startups in KIC**; For the startups graduated from incubators or accelerators, KIC also built SOHO units to provide long-term live/workspaces and KIC village

to create startup community. In addition, the University Avenue also provides space for some service startups to open stores, which can not only offer services to people there, but also help startups to retain in KIC.

4.5.Conclusion

Based on the list of factors of attraction and retention of startups, the management strategies on them are learned through these three chosen innovation districts. The strategies used are concluded and listed in ***Table 4.4***.

Table 4.4 Strategies on attraction and retention of startups in UIDs.

Strategies to attract and retain startups in UIDs	
Infrastructure	Offer various amenities; Improve the public & private transport; Offer working and living spaces suitable for startups;
Financial	Create various funding platforms; Provide appropriate subsidies for certain startups; Provide supporting financial services;
Human capital	Collaboration with universities to attract young talents; Offer various trainings through incubators, accelerators, co-working spaces, universities etc.; Create attractive environment for talents in society;
Networking	Create creative public spaces for people; Organize various attractive events; Provide collaborations between various local and international actors (universities, research institutions, big corporations, startups, organizations, citizens, even other innovation districts);
Others	Engage much more actors into the startup ecosystem, like the citizens; Make the innovation districts as showcases of products/services of startups; Treat the process of development of innovation districts as a startup business;

It is also found that the division of responsibilities among different levels (district, city, beyond city) varies with specific circumstances in UIDs, including management structure, level of government intervention, development stages and son on. For example, with high government intervention and long duration of development, the city authorities provide much more support and preferential policies in KIC compared with other two cases.

Apart from the management strategies of attracting and retaining startups in UIDs, some lessons are also learned from these practical cases:

1. **The governance system guaranteed the execution of these strategies**; No matter the high government intervene of KIC (public sector directly becomes the second shareholder), average one of Barcelona (establish a municipal company), or low one of Boston's Innovation District (plan as a third party), the governance system is essential to the running of the innovation

districts, especially the startups. Because startups are normally fragile with less experience and lack of funding, and if there no policy preferences and governance support to them, it is not easy for them to survive from the brutal competitions in the market environment.

2. **The level of government intervention is related with management and institutional structure.** The three cases chosen have various levels of government intervention, which is related with their own management and institutional structure. In Boston's Innovation District with low government intervention, most of the land is privately owned and little money was invested from the government. While in 22@Barcelona, the municipal company was established at the beginning and local government partly engaged in the development of UID. However, in KIC Shanghai, the public sector directly become one shareholder of the development company and local government participated a lot in the process of project approval and relocating the existing residents and business.

3. **The single actor in the startup ecosystem may provide multiple resources;** It is easy to find that some actors have multiple functions in startup ecosystem in the practical strategies. For example, universities can not only provide talents or knowledge for startups, but also offer trainings like support organization (incubators, accelerators) as well as funding like funding organization. Big corporations can also act as investors, support organizations and service organizations with the rich resources on technology, market and networking.

4. **The successful attraction and retention of startups rely on the networking between various actors and resources;** The realization of the management on attraction and retention of startups heavily rely on the networking of various resources and actors. For instance, the foundation of the innovation center District Hall in Boston's Innovation District, is the product of a cross-sector partnership between city council, construction investors, programming operators and managers, etc. And the daily operating to create a startup community needs the engagement of critical stakeholders from the government, business and non-profit organizations.

4.6.Development of the framework

After gaining insight of factors of attraction and retention of startups and management strategies on them, in order to develop the framework of how to attract and retain startups in UIDs, some improvements should be made based on the conclusions in previous part:

1. **The governance role should be added to the management system**; Apart from the actors in the startup ecosystem, there should be a role of governance to integrate all the resources and coordinate the actors to service the startups. The governance system can be formal and informal, top-down and bottom-up model (Sharif and Tang, 2014). At the same time, the level of government intervention can have influence on the governance system for UIDs that government led. And it is also related with management and institutional structure of typical innovation districts.

2. **Actors in the startup ecosystem can be classified based on the function;** Due to the fact that

some actors may act as multiple roles, it will be clearer to classify them according to the functions to startups. Apart from the governance system, Spender et al. (2016) concluded the other two kinds of systems in startup ecosystem: the financial system and the knowledge creation and diffusion system from large amounts of literatures (Spender et al., 2016). Connected with the actors in startup ecosystem concluded by Startup Commons, the financial system refers to the funding organizations and anything related with financial in the service provider organizations, which enable startups to get access to the financial support. The knowledge creation and diffusion system refers to the mechanisms of knowledge production and diffusion between startups and other actors like universities and research organizations, incubators, accelerators, big corporations, etc. The classification is shown in ***Table 4.5***.

Table 4.5 Three systems in the startup ecosystem

	Actors in the startup ecosystem
The governance system	Formal and informal
The financial system	Funding organizations (banks, venture capital firms, large corporations, governments); Service provider organizations (financial services);
The knowledge creation and diffusion system	Universities and Research organizations; Support organizations (incubators, accelerators, co-working spaces); Large corporations; Service provider organizations;

Based on the previous literature review and analysis, the framework of attraction and retention of startups in UIDs can be developed and is shown in ***Figure 4.5***.

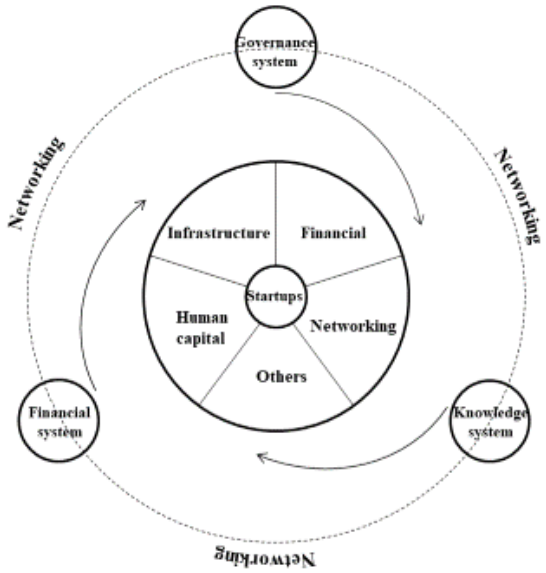

Figure 4.5 Framework of attraction and retention of startups in UIDs

This framework is centered with startups in UIDs, surrounding with five various factors of attraction and retention (***Table 3.4.4*** *List of factors of attraction and retention of startups*). And the management strategies on that (See ***Table 4.4*** *Strategies on attraction and retention of startups in UIDs.*) are realized based on the networking between governance system, financial system and knowledge system (See ***Table 4.5*** *Actors in the framework.*).

This framework can guide managers of UIDs on how to attract and retain startups. The five kinds of factors are the starting point, which can provide the insight of preferences or requirements of startups in UIDs. And then the three systems have various responsibilities in enhancing these factors. Knowledge system is responsible for the knowledge creation and diffusion in startup ecosystem in UIDs, while financial system provides related financial support and services in the development process of startups. And the main objective of governance system is to regulate startup ecosystem and control the development direction. At the same time, implementation of these strategies replies on networking between these three systems. For example, the development of incubators or accelerators in startup ecosystem is not only involved in the trainings for startups (knowledge system), but also creative of possible funding platforms (financial system) as well as organization and coordination of governance system.

5. Merwe-Vierhavens

After the development of the framework of attraction and retention of startups, the foild work is conducted in Merwe-Vierhavens (M4H) to gain insight of the preferences of startups, strategies used by district managers and possible challenges in M4H. And the research method used is the semi-structured interviews with 23 interviewees, including the managers from the authority of M4H, startup researchers, founders of startup hubs in M4H, entrepreneurs of startups & scaleups in various development stages as well as one manager from a company starting from a startup in M4H. The detailed basic information of them and interviewee numbers are listed in ***Table 5.1***. And the interview protocols are listed in ***Appendix***.

Table 5.1 Interviewees

Organization	Function	Interviewee
Economic department, Municipality of Rotterdam	Project manager	Interviewee 1
Rotterdam Makers District	Employee	Interviewee 2
Rotterdam Makers District	General manager	Interviewee 3
Rotterdam Makers District	Sales manager	Interviewee 4
Port of Rotterdam	Financial manager	Interviewee 5
Startup research organization WetechRotterdam	Program manager	Interviewee 6
Startup hub the SuGu warehouse in M4H	Founder	Interviewee 7
Startup hub the Keilewerf in M4H	Founder	Interviewee 8
Startup hub the Erasmus Centre for Entrepreneurship (ECE) in M4H	Head of finance	Interviewee 9
Startup incubator Yes!Delft	Community manager	Interviewee 10
Early-stage startups in M4H	Founders or employees	Interviewee 11—15
Late-stage startups in M4H	Founders or managers	Interviewee 16—20
Scaleups in M4H	Founders or employees	Interviewee 21—22
A company starting from the startup in M4H	Manager	Interviewee 23

In this chapter, firstly the basic information of M4H will be introduced, including the history of this area, development vision and masterplan. After that, the management on the attraction and retention of startups conducted by district managers at present is elaborated. And then, the challenges of M4H are developed based on the theoretical framework and feedbacks attained in interviews. Finally, the added value to the framework through comparison between theoretical and empirical research as well as the advice provided to M4H are proposed.

5.1.Case information

The city of Rotterdam is famous for the port of Rotterdam, which is the largest port in Europe. With the transformation to the new economy, the sight of busy ships and loading in the port gradually faded away. The new challenges of economic development, smart industry and clean transport have emerged. In order to embrace these changes, the Stadshavens Rotterdam programme was launched by the city of Rotterdam and port authorities, which aims to broaden the economic profile and take full advantage of the unique assets of Rotterdam (Stadshavens Rotterdam, 2015b). And the study case of this research, the Merwe-Vierhavens (M4H) is one part of the Stadshavens.

In November 2015, the port of Rotterdam, together with the municipality of Rotterdam, officially launched the largest innovation workshop in Europe: Rotterdam Innovation District (RID), which is located to the west of city center and on both banks of the river the Maas. The establishment of it is aligned with the Stadstavens Rotterdam programme to cope with the transformation to new economy and globalization (Deloitte, 2015). The RID comprises two areas: Merwe-Vierhavens (M4H) on the northern bank and RDM Rotterdam on the southern side (as shown in Figure 5.1). The identity of this district is the new manufacturing industry focusing on three kinds of technologies: additive manufacturing, Robotization and Material Science (RDM, 2017). And in 2018, the name of this innovation district was changed to the Rotterdam Makers District with the consideration of the unique industrial assets and the DNA of the city of Rotterdam (RDM Rotterdam and M4H Rotterdam together form the Makers District, 2018; Interviewee 2, 2019).

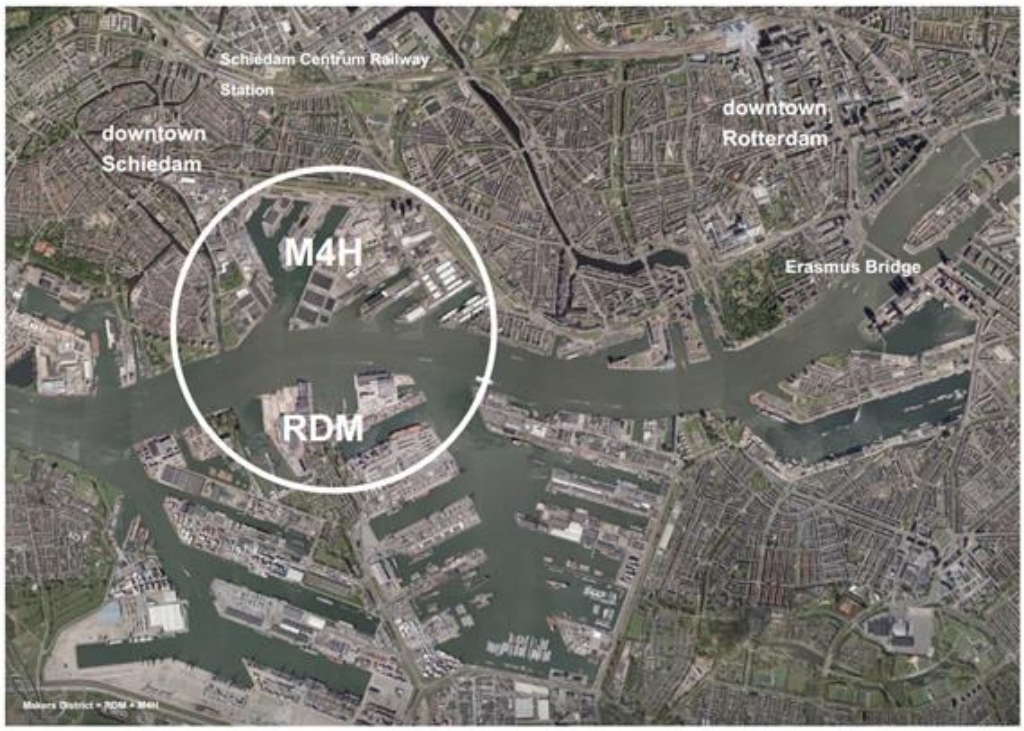

Figure 5.1 Rotterdam Makers District (RDM, 2017)

RDM Rotterdam, which mainly focuses on the port-related manufacturing industry and education and research related to the fields, has developed for around ten years. And the land and buildings in RDM are 100% owned by the Port of Rotterdam (Interviewee 4, 2019). There are three educational institutions (Rotterdam University, the Albeda College and the Zadkine College) established together with 1200 students at present. In addition, there are 35 companies including start-ups, SMEs in the field of maritime & offshore (RDM, 2017).

The study case of this research is M4H, compared with RDM it has much more space and still at early development stage, which has greater potential of accommodating more startups and developing startup ecosystem. And it has a higher connectivity (as shown in ***Figure 5.2***). The Rotterdam and Schiedam stations connected to the rest of the Randstad, trams and the metro connected with the international Rotterdam/ The Hague Airport, metros, trams and bicycles connected with the city center in minutes all make the transportation is convenient (Stadshavens Rotterdam, 2015a).

Figure 5.2 The location of M4H. (Stadshavens Rotterdam, 2015a)

M4H was used to be the fruit handling area and now is still at the early development stage with many spaces available and vacant buildings. And the land and real estate are mixed owned by the Municipality of Rotterdam and Port of Rotterdam while there are also private owners in the real estate part (Interviewee 4, 2019). On the way of development to new economy, there will be a balance between companies in various growth phases: start-up, grown-ups and corporates. Specifically, to further stimulate innovation by (potential) startups, the Erasmus Centre for Entrepreneurship (ECE) at the Erasmus University Rotterdam and the innovation programme PortXL have been established by district authorities (RDM, 2017).

Development vision

With the development of new economy and globalization, in the next several decades the Stadshavens Rotterdam will be redeveloped into a mix used place with living, working, playing and the boundaries between them are getting blurry. As one of the areas of Stadshavens, M4H is located where port and city meet and has unique advantages of a beautiful waterfront area, industrial heritage and available spaces for innovative activities (Stadshavens Rotterdam, 2015a). At the same time, the combination of traditional craftsmen and high-tech spot of Erasmus University Rotterdam and the Technical University of Delft provides M4H much more innovative opportunities.

Based on these advantages, together with RDM, the Rotterdam Makers District has the vision to transform this area to an innovation ground where new manufacturing related startups, scaleups and businesses are active in. And in 2025, RMD can become one of the most prominent area for smart manufacturing in North-West Europe (Stadshavens Rotterdam, 2016).

The RDM and M4H have different identities in this big vision. RDM, surrounded with Rotterdam University, the Albeda College and the Zadkine College, mainly offers spaces for prototyping and educational research, while M4H with more much spaces and industrial heritage, can provide adequate space for startups or scaleups to grow further if necessary. As a result, the synergy of RDM and M4H can fit in with all the lifecycles of startups for innovative activities (Deloitte, 2015).

Development masterplan

The transformation of RMD not only focuses on the business part, but also the housing part, which makes this area an attractive place for entrepreneurs. The RDM has developed for ten years with the physically infrastructure almost done and it does not have the housing planning due to the limited space (Interviewee 3, 2019). And M4H is still at an early stage of development and has the planning of residential development. However, there are no detailed plans for the housing part until 2025 because many real estate contracts are still validated before that time and it is unpredictable at the moment (Stadshavens Rotterdam, 2015a).

Therefore, the development masterplan of M4H is adapted by flexible and gradual transformation. Before 2025, the main work is to improve the infrastructure environment, including the old warehouses, empty buildings and roads in the district (Interviewee 3, 2019). After 2025, the development of available spaces will consider the public participation and future changes in this area.

5.2.Current management on attraction and retention of startups

With the vision of the transformation to an innovation ground where new manufacturing related startups, scaleups and businesses are active in, M4H also focuses on the attraction and retention of startups. The core objective is to attract innovative entrepreneurs and help them to start & grow their own business here (Interviewee 2, 2019). And specifically, M4H proposed “De Rode

Loper" to help companies and entrepreneurs to settle in this area. There are six main elements in this program (RDM, 2017):

1. Easily access to the networks in the larger innovation ecosystem in the Netherlands, such as investors, universities;
2. Low-threshold to universities and research organizations to promote cooperation with students and researchers;
3. Connection with prominent innovation incubations, makers spaces and other support organizations and service provider organizations (legal, financial, etc.);
4. Easily access to investment and subsidy schemes such as SOFIE and the Port Fund;
5. Availability of public spaces where parties inside and outside the Makers District can meet and present themselves (such as workshops, entrepreneurial meetings, meet-ups, etc.);
6. Transparency with regard to the planning framework;

Based on the theoretical framework developed previously, the management on attraction and retention of startups in M4H will be discussed from view of three systems and five categories of factors in the following part.

5.2.1. Three systems

In the developed framework, the main actors in the startup ecosystem are the government system, the financial system and the knowledge creation & diffusion system, which are all playing important roles in the lifecycle of startups in M4H.

The governance system

Due to the fact that the land in M4H is owned together by the Municipality of Rotterdam (50%) and the Port of Rotterdam (50%), the governance of this district is also organized together by these two authorities and they teamed together to organize a management team physically located in the innovation district. Therefore, M4H is the government-led UID and the level of government intervention is high.

Headed with the general manager, there are several sub-teams focusing on various working fields, such as the planning team which makes decisions and gets permissions from municipality and port authority, communication advisors which are responsible for the advertising and social media, as well as project team working on the measuring and monitoring of the development in RMD (Interviewee 2, 2019). In the early development of innovation district, this kind of governance still belongs to the top-down model.

In the connection with startups, the main strategies used by the governance team are to attract various startup hubs, organize or attract incubation programs and networking events between main actors in M4H. The startup hubs in M4H contain the Erasmus Centre for Entrepreneurship (ECE), the SuGu warehouse, Keilewerf 1&2 and the SPEK Design Dock. The program organized by the port authority is Port XL, which is an accelerator program focusing on the port related startups (Interviewee 3, 2019).

The financial system

In order to attract innovative entrepreneurs into Rotterdam, the Stadshavens Development Fund for Innovation and Economy (SOFIE) was established in 2013 by the municipality and port of Rotterdam. In addition, the Innovation Quarter, a startup service organization with funding from governmental partners, can also provide financial support and services to startups in west Holland, including M4H. And the funding platforms and services provided in the startup hubs as well as various programs and events are all the actors in the financial system for startups in M4H.

The knowledge creation and diffusion system

There are no universities or educational institutions in M4H at present. In the other side, Rotterdam University of Applied Sciences, the Rotterdam University, the Albeda College and the Zadkine College located in RDM can be the creation of knowledge. With the attractive environment, there are also many graduate students from TU Delft choosing M4H as the location to start their businesses (Interviewee 4, 2019). And the various startup hubs with the similar functions with co-working spaces, incubators and accelerators can be the breeding ground of new knowledge and innovative technologies. It is also noticeable that the Port XL indeed is a platform between startups and big corporations, which can provide technological and financial support for selected startups.

5.2.2. Five categories of factors

Under the networking between the three systems, various strategies are used to attract and retain startups in M4H. This part will discuss these strategies and means based on the literature review and interviews with managers from the authorities in the order of the five categories of factors in the developed framework.

Infrastructure

Given to the more convenient location and available spaces, the differences of M4H are the growing spaces for the further scaled businesses and housing planning compared with the physically developed area RDM. And the biggest assignment at present is the physical environment improvement in the district level, including the renovation of old buildings and warehouses, improvement of roads and public spaces (Interviewee 3, 2019).

In practice, the projects mainly focus on the eight areas in M4H (as shown in ***Figure 5.3***): 1. Productiecampus, heart area of M4H with the ambition to be transformed into an innovation tech industry area; 2. Marconiplein, the entrance of M4H aiming to redevelop to a mixed live-work zone in high density; 3. Vierhavensblok, with many warehouses and aim to provide spaces for small-scale creative manufacturing businesses; 4. Keilehaven, close to the water with the potential to develop into mixed area with small-scale manufacturing and facilities; 5. Fruit terminal Rotterdam, the zone that is still be used due to the long-term lease with undefined development plan; 6. Vierhavens, new connection to Vierhavensstraat in the area; 7. Marconistrip, the space for the housing planning with a mixed-use function; 8. Merwehaven, urban living environment with space for 2000-3000 houses. There are many buildings and warehouses in poor conditions in these areas and the renovation is a long-term process. In order

to meet the requirements of manufacturing startups in this area as soon as possible, the Scaleup building will be open in around 2020 to accommodate startups or scaleups which need much more space with the development (Interviewee 4, 2019).

Figure 5.3 Eight development areas of M4H. (RDM, 2017)

Apart from the infrastructure improvement plans of the authority, the startup hubs also focus on the improvement of the working spaces provided for startups.

The Erasmus Centre for Entrepreneurship (ECE), is the campus 100% owned by the Erasmus University Rotterdam and focuses on the creation of entrepreneurs for the new economy. ECE is a commercial organization but does not aim at making money. They organize various entrepreneurship programs for registry fee and provide mainly startups or scaleups with co-working spaces and services for the rent (Interviewee 9, 2019). It is located in the Rotterdam Science Tower and has been expanding from one floor at the very beginning to seven floors at present. At present, it contains around 60 startups in the building. Apart from the co-working spaces, the café bar, meeting rooms, lecture rooms, lunch areas and free drinks every Friday can provide a nice environment for entrepreneurs in ECE (Interviewee 9, 2019).

The SuGu warehouse, with the full name of Startups and Grownups, aims to provide a co-working place for startups and scaleups in the new economy. There are about 18 tenants focusing on innovative manufacturing and the basic requirement of the entering companies is that they have to be involved with the fields of plastics, manufacturing or design (Interviewee 7, 2019). "*That's my philosophy. I believe the cluster of these three kinds of fields can have a positive effect on the sustainable development of their businesses and the guarantee of the rent*", said the founder of SuGu warehouse. And the biggest task at present of SuGu warehouse is also the renovation of the old building because of the inadequate spaces and poor heating facilities in winter (Interviewee 7, 2019).

The manufacturing startup hub Keilewerf 1&2, started in 2014 and now contains around 50 creative makers focusing on furniture making, art designing, filmmaking, surfboard shaping, etc. Their main objective is also to provide tailored working spaces for manufacturing entrepreneurs. After almost 5 years expanding, the Keilewerf 1 has become a place for makers and Keilewerf 2 more for designers, where is quieter and more suitable for thinking and design. Apart from the traditional manufacturing, there are also some innovative makers, such as 3D printing, laser cutting etc. The combination of the traditional and innovative clusters can promote the communications, even collaborations between them (Interviewee 8, 2019).

The SPEK Design Dock is also a community for creative entrepreneurs, designers and makers in M4H. The space is also redeveloped from the old building built in 1929 and finished the transformation in 2002. Apart from the working space, it also provided meeting points, café bars and entertainment area for the entrepreneurs working in it (Interviewee 20, 2019).

Financial

The funding opportunities provided for startups in M4H can be divided into two approaches: the official published fund, which mainly refers to the SOFIE and the Innovation Quarter, and the networking platform established in various programs and events.

For the official published fund, in the city level, the Stadshavens Development Fund for Innovation and Economy (SOFIE) is one part of the European Regional Development Fund (ERDF) and it aims to invest in the revitalization of the City Ports like M4H. The conditions for the funded projects are: 1. Visible effects in the city port area; 2. Reasonable efforts has been made to gain the funding in the market but failed; 3. Certain social added value such as the creation of jobs; 4. The potential to get the return on investment; In the last several years since the establishment of this fund, there are some projects which succeeded in getting the fund, including the Floating Farm in M4H and the Rainmaker in SuGu warehouse.

In addition, in the beyond city level, the Innovation Quarter, is a startup service platform focusing on the West Holland region. The main objective of it is to help the innovative startups to grow through integrating the resources and innovation hubs (including ECE) in the West Holland. And through the connection between ECE and Innovation Quarter, startups in M4H can also gain the funding and financial support to start and grow.

In the district level, the networking platform refers to the platform provided by the startup hubs in M4H as well as the financial opportunities occurred in various organized events and programs. For example, the Get Started Programme, organized regularly every year by ECE, is a programme to help innovative entrepreneurs to establish their business from the idea phase. In the late section of this programme, the potential startups will be selected to present in the Innovation Market, where startups can meet with many investors or venture capital firms to gain the funding from them (Interviewee 13, 2019). In the workshops and lectures organized by ECE, startups can also get the opportunities to enjoy the service and access to the target customers.

Another example of the financial support for startups is the Port XL programme, which is a city level accelerator programme for maritime industry related startups established by the Port of Rotterdam four years ago. The idea was inspired by Yes!Delft, the startups incubator mainly for university students. The difference with Yes!Delft is that Port XL only focus on maritime industry and the process of late-stage development phase of startups, which means that the expecting outcome of Port XL is to solve real problems in industry for big corporations. Every year there are about 30 selected startups to participate in the three-month programme and each startup can get 15,000 euros subsidy. All the technology service and financial support are provided by the partners of Port XL, such as Shell, Boskalis, Van Oord and so on (Interviewee 5, 2019).

"*We can provide rent discount for coming startups on the condition that they can give something back. No matter the money return on the investment, or something innovative, new and attractive. And of course, we have to take the risk since most of the startups even cannot survive in the first year*", said the sales manager of the RMD (Interviewee 4, 2019). It can be seen that M4H makes effort to attract startups to settle down through providing rent discount for startups that are potential from their judgement.

Human capital

Talent is the largest factor that founders would care about when they are going to choose a location to start their business according to the State of European Tech Report 2017 (Pitchbook, 2017). "*In Rotterdam, there are 67% tech talent from TU Delft, 23% from Hogeschool Rotterdam and 7% from Erasmus University*", said the founder of research organization WeTechRotterdam (Interviewee 6, 2019).

With the close location to TU Delft, Erasmus University, the Albeda College and the Zadkine College, RMD values the opportunities to collaborate with universities in the city and beyond city level. Typical example is the development of RDM, which is the collaboration between Port of Rotterdam and the Rotterdam University with the investment of 100 million euros (Interviewee 2, 2019). In M4H, the innovation hub ECE, is the education campus of the Erasmus University and also a platform between university students and M4H. And the enrolled entrepreneurs out of the Erasmus University in ECE can also get the services and resources from the university (Interviewee 9, 2019).

Apart from the creative students from universities, M4H also has a broader vision of attracting talents from the society. Due to the fact that Port XL is an accelerator programme and focuses on solving practical challenges in three months, the thresholder is higher than Get Started programme in ECE. Most of the entrepreneurs participated in are the first-line experts with rich experience in maritime industry. With the high return and opportunities to sign cooperation contracts with big corporations, many innovative talents apply for this programme and it has to take time to pre-select potential startups every year (Interviewee 5, 2019).

Networking

The networking related with startups in M4H can be divided into two categories: the formal organized theme networking events (top-down model) and informal networking opportunities (bottom-up model). The former one contains the online networking within startup and between startups with other actors, as well as the face-to-face interactions in various theme events. While the latter one is the unique outcome of innovation districts since the advantages of innovation cluster and proximity between different people and organizations. For example, entrepreneurs can just meet up with each other by chance and chat with each other around the table or in the bars. In general, innovation districts can be the breeding ground to generate the creation of this kind of bottom-up networks (Morisson, 2015).

In practice, the West Practice Rotterdam is a network organization developed with the partners in M4H and surrounding areas and aims to strengthen the innovation network in the district and city level in order to create an inclusive ecosystem in the RMD for the transformation to the new economy (Interviewee 3, 2019). Supported by the involved partners in this area, West Practice can organize various networking events every year. For example, the Keiletafel is an event organized by the Ondernemersvereniging M4H (OVM4H) regularly with the aim to provide a face-to-face communication platform for the entrepreneurs in M4H. In this event, an inverted fruit crate is provided as a stage and every entrepreneur can introduce their business or innovation ideas in minutes (Kavakou et al., 2017).

Apart from the events organized at district scale, the several startup hubs also have their own networking activities. In ECE, there are not only various formal theme workshops and guest lectures from universities, companies or successful startups to attract entrepreneurs to communicate with each other, but also providing the informal public space for startups. For example, every week in Friday evening, there will be the free drinking on the 10th floor in the bar. And all the startups in ECE can be there to talk with each other about anything they want (Interviewee 9, 2019). In addition, the manufacturing startup hub the Keilewerf will organize their festival "Keilefest" every few months. During this festival, the makers in the hub can have fun with each other and the same time, the hangar will be open to the public to show what they are doing and the possibilities they can offer (Kavakou et al., 2017). In this way, the group of makers can develop into a community and the seemingly isolated warehouses can also attract the public to engage in their work spaces.

It is worth noting that the networking between startups, especially for the manufacturing startups, is quite important for their growth in further. "*The big laser cutting machine around the corner is quite expensive. However, it was covered by three workshops together in this warehouse. And I think this situation can only happen here because we share anything possible in this community, such as machines, materials…… If some startups cannot do the projects asked by customers, we can even share the projects, the business*", said the founder of the Keilewerf. The idea of "sharing" is another kind of bottom-up networking between startups and can always happen in startups in manufacturing industry (Interviewee 8, 2019).

In order to provide public space and attract much more people physically coming to M4H, the

Ferro area is planning to be transformed into a public space for innovative music and business events from the old factory of American chemical company Ferro, which was producing paint and varnishes in M4H and now has moved to Spain. This area is characterized by the large light blue gas holder, also known as the Ferro Dome. After the establishment, the Ferro Dome can accommodate about 6,000 visitors at the same time (Stam, 2016).

At the international scale, Get in the Ring, located in the Rotterdam Science Tower building in M4H, is a global network of organizations to deal with challenges faster. With the platform of a global network of various accelerators, incubators and organizations providing ongoing support to startups in over 100 countries, it will organize various networking events and one of the biggest is the Global Startup Pitching competition organized every year. After the open applications around the world, selection events, public voting and finally the startup heroes will be revealed in the Global Meetup. The winners can gain access to the committed capital of up to €10mln. For other startups participated in this competition can also have the opportunity to connect with international partners and investors with the help of the strong networking (Interviewee 1, 2019).

Others

In the developed framework, the last factor that startups would consider is a supplement to the possible missing preferences of startups. Engaging more actors like the citizens into the startup ecosystem in the strategies is an important mean to promote the innovation environment. From the theoretical part, it is the development of innovation clusters with the transformation from the Triple Helix to Quadruple Helix model. And the added helix is the “civil society” element, like the 22@Voluntariat in 22@Barcelona and the theory of “three-zone integration for interlinked development” in KIC. From the view of startups, the aim of these strategies is to broaden the horizons of startups, integrate much more resources to promote the innovation development in the district as well as the surrounding areas. In the process of attracting and retaining startups, this point is also the concerning of M4H.

In the city level network platform West Practice, the innovative project the Metro Map and Learning Routes was proposed and has been developing with the development of M4H. The main objective of this project is to provide various learning opportunities for the residents of Delfshaven nearby with the help of the Rotterdam Makers District. At the same time, the entrepreneurs and partners in this area can get access to the possible workforce and ideas in this process. In this metro map with learning routes (as shown in ***Figure 5.4***), all kinds of local learning places are marked and people can improve themselves by determining their own learning routes, learning workplaces in practice or through the digital mini-diploma platform Open Badges.

For example, thw BouwAkademie, located in Keilewerf 1, is an organization to help people who have difficulty finding a job to get a job in the field of upcycling and reusing construction waste materials. As a result, the jobs are provided for the needed people and the environment can become more sustainable.

Figure 5.4 The Metro Map and Learning Routes

With the involvement of nearby citizens, the environment here can become more attractive and innovative for young entrepreneurs. And the startups already existed there can have more opportunities with human capitals and networking.

Conclusion

The general manager of the RMD expressed their original intentions of launching this innovation district: "*Considering the new possible challenges in the future, we are trying to prepare for the next economy, especially the energy transition for the industry city Rotterdam, which is also a big challenge for the port authority. Secondly, an attractive city for the next generation is needed and urgent. Finally, the general important point is the development of inclusive society, where the next generation can have the right knowledge and skills to live in. Like other cities around the world, they are also working on these we believe that the innovation district can promote this develop process in the near future. And we believe innovation district can promote these development processes.*" (Interviewee 3, 2019).

With these expectations, innovation districts take the responsibility of promoting the economic, technological and social development of one city. Connected with the industry heritage in this area and DNA of the city Rotterdam, the Rotterdam Innovation District was changed the brand to Rotterdam Makers District, which focuses on the new manufacturing with innovative technologies. Although the Rotterdam Makers District was launched less than four years ago and M4H is still at the early development stage (physical infrastructure part), it is noticed that the main factors and strategies on attraction and retention of startups are provided no matter in top-down or bottom-up model.

This chapter mainly introduces the management on the attraction and retention of startups in the order of the developed framework, which means the detailed strategies used in M4H from five kinds of factors under the networking of three systems in startup ecosystem. In conclusion, the three systems in the startup ecosystem are complete and functioning in M4H (as shown in

Table 5.1). And the detailed strategies on attraction and retention of startups in this district are concluded in ***Table 5.2***.

Table 5.1 The actors in the three systems in M4H

	Actors
The governance system	The collaboration between the Municipality of Rotterdam and the Port of Rotterdam (High level government intervention);
The financial system	Funding project like the Stadshavens Development Fund for Innovation and Economy (SOFIE); the Innovation Quarter; Financial services provided by startup hubs; Financial support opportunities in organized programs and events at various scale;
The knowledge creation and diffusion system	Universities and research institutions like Rotterdam University of Applied Sciences, the Rotterdam University, the Albeda College, the Zadkine College, TU Delft; Various startup hubs in M4H; Big corporations;

Table 5.2 Strategies on attraction and retention of startups in M4H

	Strategies on attraction and retention of startups
Infrastructure	Development vision of eight main areas in M4H (including housing planning, road improvement, amenities, etc.); Attract and retain various startup hubs providing work spaces for startups; Construction of the Scaleups building for grown startups;
Financial	Various funding platforms, such as SOFIE, the Innovation Quarter; Services in the Get Started Programme to incubate early-stage startups; Services in Port XL to connect big corporations with late-stage startups; Rent discount from the Sales Department of M4H;
Human capital	Collaborations with nearby universities to attract innovative students, such as TU Delft, Erasmus University, the Albeda College and the Zadkine College; The accelerator programme Port XL to attract talents in the society; Education campus of Erasmus University, ECE in M4H; Various trainings in the startup programmes, such as the Get Started Programme, Port XL, etc.;
Networking	The network organization West Practice Rotterdam in M4H, including many events in area scale; Various networking events at the hub scale, such as the free drinking in Friday in ECE, the festival “Keilefest” in Keilewerf, etc.; The bottom-up network of “sharing” idea between manufacturing startups; The planning of the big public entertainment space of the Ferro Dome; International startups network platform, Get in the Ring;
Others	The development of Metro Map and Learning Routes to engage citizens into the innovation district;

Due to the fact that M4H is still at early development stage, many strategies are only limited in

district level and currently the main objective of district managers is to improve infrastructure environment. Therefore, the feedbacks from entrepreneurs and researchers can help to gain insight of the situations about attraction and retention of startups in M4H.

5.3.Feedbacks on the management on the attraction and retention of startups

After gaining insight of the management on attraction and retention of startups in M4H through literature and interview with five managers from Municipality and Port of Rotterdam, in this part, the related practical feedbacks will be elaborated through interviewing with various actors in the startup ecosystem in M4H.

Except for the 5 managers in M4H, the interviewees in this research contain 1 startup research organization in Rotterdam, 1 startup hub, incubator in Delft, 3 startup hubs in M4H, 10 startups and 2 scaleups as well as 1 company starting from the startup in M4H. Specifically, in the 10 startups there are 5 early-stage startups and 5 late-early startups to gain insight of the possible different opinions from startups in various development stages. In addition, the objective of this research is not only to attract startups but also retain them in innovation districts. Therefore, as the development directions of startups, the opinions of scaleups and a formal company which succeed in surviving previous development stages can guide the direction of management on how to retain startups in M4H to a certain extent.

Connected with the practical situation in M4H, although the identity of this innovation district is the makers district and manufacturing startups are over welcome in this area, there are still certain amounts of startups not focusing on manufacturing industry. And the combination of manufacturing and non-manufacturing startups can provide much more opportunities for the development of this innovation district (Interviewee 1, 2019). The distribution of the manufacturing and non-manufacturing related organizations in each group of interviewees is shown in ***Table 5.3***.

Table 5.3 Distribution of interviewees

Number Interviewees	Manufacturing	Non-manufacturing	Total
Managers			5
Research organization			1
Startup hubs	2	2	4
Early-stage startups	2	3	5
Late-stage startups	2	3	5
Scaleups	1	1	2
Company	1	0	1
			23

In this part, the feedbacks of interviewees on the management on attraction and retention of startups will be elaborated not only based on the developed framework, which means the five factors and networking between three systems, but also the general vision on the development

of M4H. Finally, the conclusions of challenges at M4H will be developed based on the previous feedbacks.

The vision on the development of M4H

As discussed previously, the vision of M4H is to develop the new manufacturing in this area in order to enhance city competitiveness in the transition to the new economy. While in the process of realizing this vision, the attitude of authorities on the way of development can also be dynamic.

Municipality and Port of Rotterdam have the power, willing and dynamic strategies to attract and retain startups

Compared with other actors in the innovation ecosystem, startups are more fragile and sensitive to the market (Interviewee 7, 2019). And the M4H is a government-led innovation district, which has more power, resources and network to help startups to grow. In addition, although the development vision of M4H was proposed with the establishment of this innovation district nearly four years ago, the attitudes of authorities on startups are dynamic.

"*Municipality is a company with very a strong network and I think the Municipality and Port of Rotterdam didn't know that they have so much power to attract and help startups. And with the development of RMD, they have recognized that they should do something directly with startups but not only leave these works to startup hubs, especially in the retention part, which is always the missing part in last few years.*" (Interviewee 2, 2019).

From the point view of the manager of RMD, it is noticed that the authorities will also reflect their strategies on startups and adjust in time. The startup hubs in M4H are all private organizations with their own interests while the municipality and port authority have much more resources can be used to better attract and retain startups. In a word, the authorities should do something to help startups because they have more power. In addition, from the view of investment risk, the authorities are the only organization willing to do this.

"*We have invested a lot in supporting the startups and can hardly earn it back, just in order to make sure the innovative startups will survive and grow. However, you cannot make sure that the startups you invest will not go into bust in one year. I think we are the only organization in Rotterdam that has the financial power and the long-term view to make this development possible. I don't think there is one real estate development company are at the willing to take the risks.*" (Interviewee 4, 2019).

Due to the high risks and uncertainties in startups as well as the early development stage of M4H, the strategies used by managers are dynamic based on the actual situation.

"*How to develop this area is also a part of innovation process and the redevelopment of this area is a long-term process, which does not always go as the same speed as startups who grow into scaleups. We just have a vision now and have to start from nothing.*" (Interviewee 1, 2019).

The current situation and requirements of startups ask for the strong leadership of the governance system. According to the theory of Morisson, M4H is still the artificial innovation district and this situation will last about 10 to 15 years before developing into the self-sustaining one without the strong leadership. And the management should be dynamic according to the changing situation and in the right direction to the planned vision.

Few entrepreneurs know the development vision of M4H

In the interview with 13 entrepreneurs in M4H, including 10 startups, 2 scaleups and 1 company, the questions about the vision, objective and current situation of M4H are asked. The results showed that few entrepreneurs in M4H have the idea about the vision, objective or current situation in this area. In the interview, three levels of familiarity were divided among the 13 entrepreneurs in M4H: no idea, know little and well-known. "*No idea*" means that they absolutely don't know the vision or objective of M4H, and some of them even have no idea that M4H is an innovation district. "*Know little*" refers to that they know M4H is an innovation district and the government is going to redevelop this area. However, for the detailed vision and current situations in this area, they are also unclear. "*Well-known*" means they have a clear mind about the objective of this innovation district and always pay attention to the development process of M4H. The proportion of these three levels of familiarity with M4H is shown in ***Figure 5.5***.

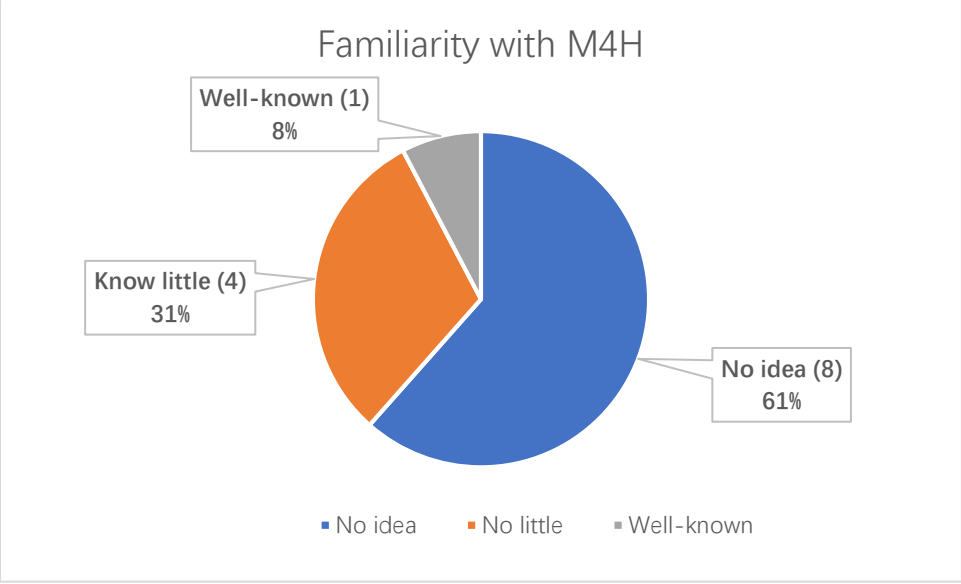

Figure 5.5 The proportion of familiarity about M4H in entrepreneurs interviewed with

"*I started my own business in SuGu warehouse from 2014. At that time, there were no other tenants in this warehouse and the reason why I chose here was the cheap rent price. During the growth in past several years, I heard little about the innovation district and didn't get any support from the government or other organizations*" (Interviewee 17, 2019)

About 61% of the interviewees have no idea about the vision or planning of M4H, let alone the

related policies or organized events at the area scale.

"*I heard that the government are redeveloping this industrial area. But I have thought it is more like residential real estate redevelopment, not the innovation district. Because I only saw there are more and more people living in the two renovated buildings nearby.*" (Interviewee 12, 2019)

Over 30% interviewees noticed that there are some changes happening in this area and the initiator is the government. However, as for the detailed development direction, they are not clear. And among them, one entrepreneur explained that "*I only focus on my own business and if there are some useful resources in the development of the innovation district for me, I would like to know. But for now, there are not.*" (Interviewee 22, 2019).

"*I keep an eye on the development of the RMD because the main work of my startups is to help our clients to improve their projects in the direction of sustainability and I have some clients just in this area, including the municipality. One part time employee of our startup is also working in another company in RMD and we will have some communication about the progress of this innovation district.*" (Interviewee 18, 2019)

Only one entrepreneur knows a lot about the M4H and pay attention to the progress in this area because it is related with their own business.

From the feedbacks of these three groups of interviewees, it can be concluded that the familiarity with M4H is positively related to the relevance of the M4H to their business. The more M4H is related with their own business, the more familiar with this innovation district.

Both managers and entrepreneurs prefer the combination of various kinds of startups

Corresponding to the vision of M4H, in the practical management, the Sales Real Estate Department has the responsibility for deciding which kind of business can come here to steer the economic development in this area.

"*For the Rotterdam Makers District, we have specific kind of target companies, which are the next generation manufacturing companies, including the startups. In detail, we made the innovation matrix to divide them into five categories: digital manufacturing, new materials, robotica/mechatronica, machine learning/IOT and design.*" (Interviewee 4, 2019).

The RMD, including M4H has a clear mind about the target businesses when they rent or sell out the space in this area. However, some startup hubs are already existed over there before the establishment of the innovation district, such as ECE, the SPEK Design Dock and there are more entrepreneurs from other industries coming due to the cheaper rent price here compared with the city center.

"*If you say no to some types of organizations or startups in other fields, then you will limit the opportunities of cross-overs in this area. We won't say no to other kinds of startups or companies, but we will lead them to specific locations in this area. For example, at present,*

ECE is a better place for digital startups. The combination of digital and manufacturing startups is interesting." (Interviewee 1, 2019).

"*As a startup hub, we welcome all kinds of makers, but we don't want like 20 3D printers in the same spot even though they are very competitive or successful. Mix makes everyone stronger together.*" (Interviewee 8, 2019).

In the view of managers of M4H, although the identity of this area is the new manufacturing, the combination of various kinds of companies or startups is the situation they would like to see. And the entrepreneurs in M4H also prefer so.

Infrastructure

Just as the introduction of the general manager of RMD, at present, the RDM is physically done and the biggest task is the construction of facilities and the improvement of infrastructure in the district level. After almost four years development, two white buildings in the Marconiplein are being renovated for housing and every startup hub has various degrees of progress no matter in working spaces or in service. In the interview with entrepreneurs with different backgrounds in M4H, there are some feedbacks on the infrastructure part in this district.

Lack of basic social amenities

Given the fact that there are still some traditional port-related companies working in M4H, the outlook of this area is quite industrial and small amount of people are living here. Although there is one small business district which contains several stores, retails and restaurants, it is located on the boundary of M4H and a little far away from the heart part of this district.

Under this circumstance, the four interviewed startup hubs: ECE, SuGu warehouse, Keilewerf and the SPEK Design Dock, all have their own little separated lunch areas and rough café service. But they still look forward to better social amenities in M4H.

"*In ECE, there is one public place for startups to have lunch and I will bring my own lunch over there. However, when my customers or investors come here, there are no suitable better restaurants or café to meet with them nearby.*" (Interviewee 16, 2019)

"*In SuGu warehouse, at present, there are no organized spaces for lunch or drinks, and some of tenants sometimes sit together to have the lunch. I hope to have the lunch time or drinks on Friday and people can hang out after working.*" (Interviewee 17, 2019).

"*I haven't been to other places in M4H except this building because you can see there are nothing outside. I prefer to have a walking during lunch time or drinking with people or even strangers after work, but there are no places to go.*" (Interviewee 19, 2019).

At present, there are not so many residents living in this area, but certain number of entrepreneurs from startups and scaleups are working here. The social amenities like restaurants, bars, café can not only meet the basic requirements of people, but also provide opportunities

for people to meet with each other, which can increase the livability and vitality of M4H.

Inconvenient public transportation for people inside M4H

M4H has a better location compared with the other part of RMD, RMD and have the convenient transport to Rotterdam city center, Schiedam and Delft through metros, trams or highway. However, the public transportation in M4H is not so convenient and entrepreneurs prefer this situation could be improved.

"*The connection between this area with other places is great and we can come to work here conveniently. And there should be public transport like bus stops inside this district. The area of M4H is as large as the city center of Rotterdam and the existing roads are more for trucks or cars. Fortunately, there are some roads under construction and hope it will be finished soon.*" (Interviewee 15, 2019)

This concern is also related with the history and current situation of M4H. As mentioned before, there are still many running port-related or industrial companies here and the lease with them will last until 2025 (Interviewee 3, 2019).

On the one hand, the infrastructure in this district was designed and constructed for the industrial area. Therefore, there are many roads for trucks or cars and few for pedestrians and cyclists. On the other hand, before 2025, the areas where those running industries are located cannot be developed and the infrastructure will keep using. And the good news is that the roads for pedestrians and cyclists are under construction in some areas.

Entrepreneurs have no willing to live in M4H

The vision of this innovation district includes the function of mixed-use, like working, playing and living. M4H has the housing planning dur to the larger space compared with RDM and there are continuing residents moving into the renovated buildings in the Marconiplein. In the interview with entrepreneurs in M4H, the question about housing in this area was asked and the result shows that no one is living or has the willing to live in M4H.

"*I would never live here even if the environment of M4H can be improved a lot in the future. I prefer to separate the working and living places.*" (Interviewee 22, 2019)

"*If the working and living places are over close with each other, it may be easier for you to sleep a little bit and save a lot of time on the way. Some people may prefer it, like someone from other countries, but I won't. Because I don't like to take work with me in the living place.*" (Interviewee 21, 2019).

The interest on living in M4H of these entrepreneurs working here is little. And the main reason is not the industrial outlook and inconvenient environment here, but the natural resistance to live close to the working space. This finding can be used as a reference for the housing planning in this innovation district.

Poor and insufficient working spaces for startups, especially manufacturing startups

As startups or scaleups, the working space is the biggest concern in the infrastructure part. In the empirical research, it is found that the poor and insufficient working spaces are the main concern for startups, especially the manufacturing startups because compared with other kinds of startups, the manufacturing one requires more space and this requirement is growing with the development of business.

The non-manufacturing startups are mainly located in ECE, which can provide relatively better office environment compared with other places in M4H. In past three years, ECE campus has grown for more than 100% with now 7 floors in the Rotterdam Science Tower and they are still growing (Interviewee 9, 2019).

"*This building (ECE) is fine but not everything works well. There are not enough toilets and provided lunch is expensive. Every time I wait for the elevator, it will cost me a lot of time. Although the parking lot nearby is free, it is so dirty and old.*" (Interviewee 21, 2019).

"*The view of outside is nice but the offices inside look more like government offices. The white walls, low ceilings and industrial vibe are not my taste. If you let me choose, I would like a more inspiring and attractive working environment for my startup.*" (Interviewee 16, 2019).

"*We can use some public spaces here and mostly I need the meeting rooms to meet with my clients. However, there are many startups and scaleups in this building (ECE), and you have to book it in advance. I totally understand the process of booking but usually I cannot make the appointments with my clients ahead of a week. I think the availability of the meeting rooms is not so great.*" (Interviewee 11, 2019).

The non-manufacturing startups/scaleups in ECE are mainly digital businesses and their working environment is limited the office and meeting rooms. Therefore, they have higher demand on the office environment, enough availability of meeting rooms, supporting service on toilets, parking lot, elevator, etc.

While for the manufacturing startups/scaleups, they care more about the enough spaces for materials, machines and much more space for the future growth.

"*The largest difficulty for our startup now is to find a bigger space. Now we have 500 square meters and plan to expand to 1000 due to the growing business.*" (Interviewee 20, 2019).

Apart from the bigger space compared with non-manufacturing startups, the manufacturing startups also look forward the working space with "*Freedom*", which means more open spaces, less walls, space to move the machines and flexible facilities (Interviewee 8; Interviewee 15; Interviewee 17; Interviewee 20). And this point is also caught by the real estate department of Port of Rotterdam, "*Our strategy is basically to develop the right things, which mean our product, the real estate, has to perfectly fit with the demand of startups. They need flexible space, affordable price, and inspiring environment.*" (Interviewee 4, 2019).

"*This building (SuGu warehouse) is too old and the poor heating system is a big concern. It costs me 150 euros per day to keep the space warm in winter. Fortunately, it's still possible to heat up because my startup is on the ground floor, while for other startups on the higher floor, it's even impossible to heat up.*" (Interviewee 17, 2019).

Due to the poor heating system and insufficient space in SuGu warehouse, the startup CEAD has moved to Delft. CEAD is an innovative startup focusing on the composite additive manufacturing, which is quite suitable for the vision of M4H.

No matter the non-manufacturing startups which prefer better office environment or the manufacturing startups which would like open, flexible and affordable space for production, the current conditions in M4H cannot meet the requirements of these startups. In addition, with the growth of startups, these conflicts will more acute and there already some potential startups moving out of this area for a better working environment.

Financial

In the financial part, the interviewees gave the feedbacks on the points in the theoretical framework, including the funding situation, rent price change and the challenges faced by the manufacturing startups.

Most of the entrepreneurs interviewed are self-funded

The research on the sources of funds at the beginning of startups was conducted in the 13 startups, scaleups and company. The result shows that 62% of them are self-funded and rest of them got the funding from individual investors during incubation programmes (2) or big corporations (2) or the competition prize (1). As shown in ***Figure 5.6***.

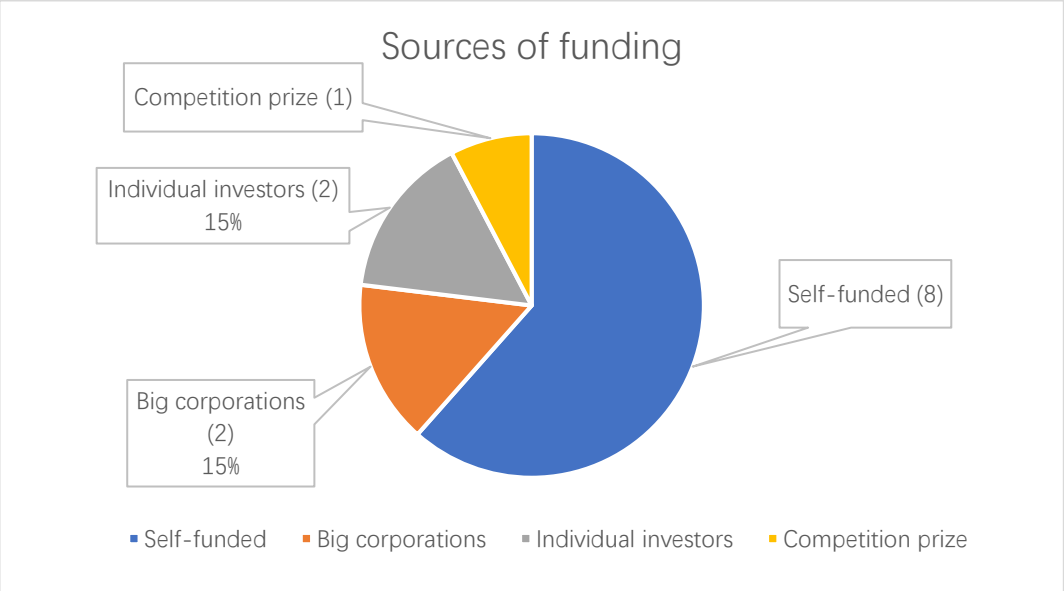

Figure 5.6 Sources of funding in interviewees

In addition, among the 13 interviewed business, 8 startups/scaleups were founded before the establishment of the Rotterdam Makers District and they are all self-funded. With the

development of the startup ecosystem, 4 startups/scaleups got the funding in M4H no matter from big corporations or the individual investments during the incubation programmes in ECE. And the rest one startup is developing relies on the money got from various competitions rather than the external investment because they would like to be independent (Interviewee 15, 2019).

In these startup hubs in M4H, Keilewerf, SuGu warehouse and SPEK Design Dock are co-working spaces indeed and only ECE can provide more than working space due to the function of education campus. Therefore, ECE can also provide some funding opportunities in the networking with its partners.

"*However, the investment part of startups is not ECE's focus. The main objective of ECE is to educate people how to become entrepreneurs and the Get Started programme only focuses on the ideation and formation phases of startups. After that, there are no organized trainings now. Fortunately, they are developing a new programme working on the investment part and late-stage startups, which can help the startups in further in the future.*" (Interviewee 13, 2019).

The funding should not only be limited to startups

In the funding part, some entrepreneurs from scaleups and company, especially the manufacturing business, also pointed that the funding or subsidies should not limited to startups.

"*They gave a lot of funding to startups, but they should also fund entrepreneurs that want to grow bigger and more efficient. As a manufacturing company, we produce large amount of wood waste and we get an idea to transform the waste to the energy through a big burner/stove to heat up the building. In this way, we don't need the gas anymore. But it's very expensive and I hope the government could invest in this project, which can not only solve the poor heating system of this old building but also make full use of the waste to be more sustainable.*" (Interviewee 23, 2019)

In order to develop an innovative startup ecosystem, the existing successful company can have a positive effect on the development of startups. The funding platform for the innovative startups can be extended for the innovative projects to retain business organizations at various scale in the innovation district.

Some startups moving from RDM to M4H due to the rising rent price

The rent price is the vital element considered when choosing a working space for startups (Interviewee 15; Interviewee 17; Interviewee 19). "*My philosophy of starting the startups is to keep the cost down and the rent price is the big part. Most startups fail because they cost a lot of money while still in the ideation phase.*" (Interviewee 22, 2019). After ten years development, RDM are almost full with startups, scaleups and companies. As the description of the managers, M4H can provide much more space to the growing startups in RDM and new coming ones. However, some interviewees expressed different opinions.

"*The startups are disappearing in RDM due to the ring rent price over there and as I know the rent price in RDM is about four times than M4H now. I have been working in the Rotterdam*

Makers District for 7 years and three years ago I moved from RDM to M4H here. I have seen the changing from the very beginning that startups were working together and cooperating with each other to now that some of the startups grew bigger and stay there while still small ones cannot afford any more." (Interviewee 15, 2019).

Some startups in M4H also showed the worries that if one day M4H would develop like RDM with the rising rent price, they have to move to other places again. And the managers even didn't realize this problem before.

"*It's a tricky problem. You cannot redevelop an area at the same time keep the real estate prices at the bottom level, but it can be strengthened and accelerated to develop the area. If we keep the real estate price low, then we will not receive money to invest any further in this area.*" (Interviewee 1, 2019).

The balance between the real estate development and retention of startups should be made in the development of the innovation district. At this moment, the development level and rent price in M4H is not so high but in the future, related conflicts may happen. Therefore, the corresponding strategies can be developed in advance based on the dynamic situation in M4H.

Manufacturing startups are more sensitive to the rent price

As mentioned in the infrastructure part, the manufacturing startups have higher demand on the working spaces, which should be open, flexible and mostly it will grow a lot with the development of business.

"*As a software service startup, we don't have so many demands on the working space. Computers, tables and internet are all the we need and even we grow gradually it is just some increasing tables.*" (Interviewee 12, 2019).

However, for manufacturing startups, the spaces for material storage, running machine, moving machines and even fixing machines are big and growing quickly. Except for one manufacturing startup which hopes to keep focusing on the research part rather than production, all the other manufacturing startups in the interview have the planning to expand the working space in the near future. And this also means the growing space and rent price.

"*I started this startup in 2014 and that time my rent was 500 euros. After about 5 years growing, I expand a lot and now my rent is 3500 euros for one month, not included the heating and lighting… At the very beginning, startup is small and the space needed is little, but when you grow up, you need much more space and maybe the increasing profit is much less than the rising rent.*" (Interviewee 17, 2019).

Compared with other innovation districts like 22@Barcelona, Boston Innovation District and KIC in Shanghai, M4H has a very different identity, which is the new manufacturing industry. As a result, the target startups in M4H may have unique requirements and tailored strategies should be considered when attracting and retaining startups. And the special demand on the

working space is the point that cannot missed.

Human capital

The feedbacks on the human capital in M4H mainly focus on the lacking elements in the startup ecosystem. There are no incubators or accelerators or some organizations like service providers for startups in M4H and this leads to the lack of employment platform for startups and incomplete services for late-stage startups.

Lack of incubators or accelerators in M4H

It is well-known that startup hubs in M4H, Keilewerf, SuGu, SPEK Design Dock are just co-working spaces and they are all private commercial companies for rent. And the misunderstanding of the outside world is that ECE, the education campus is an incubator. However, there are no incubators or accelerators for startups in M4H.

"*We will move to Yes!Delft tomorrow. I have graduated from the Get Started programme in ECE and after this phase, I think I get more resources and help in Yes!Delft. ECE is not an incubator but an education center for entrepreneurs and the Get Started programme is to validate whether entrepreneurs' ideas are business or not. After that, they cannot give more.*" (Interviewee 14, 2019).

Apart from the startup hubs, the incubation programmes in M4H like Port XL and Get in the Ring can only provide limited service for limited startups. Port XL only focuses on the port related late-stage startups with the number of around 30 per year. Get in the Ring is more like a showcase with limited effect on the local startups in M4H (Interviewee 5, 2019).

On the one hand, there are no organizations to incubate startups in the whole lifecycle in M4H. for ECE, they are doing what they are supposed to do to teach people how to become entrepreneurs. But for the innovation district, under this situation, it is difficult to retain potential startups. On the other hand, the incubator or accelerator programmes in M4H has little audience and it is difficult for the local startups to get access to the resources and help.

Lack of employment platform for startups and scaleups

Due to the lack of professional startup service organizations, such as incubators, accelerators and son on, there are also no employment platforms for startups or scaleups. However, this is exactly some startups/scaleups need in M4H.

"*The biggest challenge for us now is the talent. As a scaleup, we are growing and the talents are urgent. ECE is 100% owned by the Erasmus university but we never ever have employees from there. ECE did organize some events to invite us to be the judges and there are students willing to look for jobs. But this way is too indirectly and a waste of time for me. In this part, I think ECE can take an important role.*" (Interviewee 22, 2019)

The collaborations with universities like TU Delft, Erasmus University didn't get the feedbacks from the interviewed entrepreneurs in the human capital part. And it is also noticed that the

scaleups or late-stage startups have higher talent demand compared with early-stage startups.

Little attention to the requirements of late-stage startups in ECE

In the ECE campus, the only organization that can provide services for startups rather than co-working spaces, mainly focuses on the early-stage startups part, ideation and validation. And this emphasis results in the distance between late-stage startups, scaleups and early-stage startups.

"*ECE do organize some guest lectures, workshops and the trainings in programmes and all the entrepreneurs in ECE can come to attend. But they are mainly about how to validate ideas, find your partners, get investment etc. and our startup is already far away from that part. In other words, these activities are useless for me.*" (Interviewee 16, 2019).

In the interviewees, there are 3 late-stage startups and 2 scaleups in ECE and all of them expressed that the trainings or events organized by ECE have little help with their business part, not including the networking part. At the same time, ECE also noticed this shortcoming.

"*ECE is developing a new programme focusing on the parts after early startups. And I think they are still searching for what is best for them.*" (Interviewee 13, 2019)

Networking

With the poor infrastructure and still industrial outlook, the networking between startups in M4H mainly limited in each startup hub and the networking between various actors in startup ecosystem are mostly the business connections. The feedbacks from entrepreneurs can give the guide to improve the networking part in the startup ecosystem.

Networking in M4H is still limited in separate startup hubs

It is noticeable that in the strategies on attraction and retention in M4H, the networking events or programmes organized are just limited in separate startup hubs and few connections between the several startup hubs.

"*All I care about is my business and how to solve the problems in my work. I have little time to spend on the social networking except that it's related with my business. Apparently, there are no such networking now in M4H.*" (Interviewee 22, 2019).

Other entrepreneurs also expressed the fact that they are so busy with their work and if they know the networking events are not helpful to their business, they would refuse to go (Interviewee 12; Interviewee 18; Interviewee 22). The less business connections between startups lead to the loose networking between startup hubs.

In addition to the business connection or communication, the social networking in the public space in M4H is also lacking. Few activities are organized in the public space, especially for the entrepreneurs.

Various networking events are not so attractive for startups, especially late-stage startups

Even the networking events organized inside startup hubs, the startups also show low interests in these kinds of activities, especially the late-stage startups.

"*ECE do organize networking workshops or activities that a lot of startups can come by and have drinks together. Sometimes we do, but mostly it's a little far away from the networking I need. We are a bit startup plus and we prefer the networking with our potential clients rather than the young university students.*" (Interviewee 16, 2019)

The preferences differences between early and late-stage startups also reflect on the networking part. According to the interview, the entrepreneurs from early-stage startups have higher interests on various networking events, like startup meetup, Friday drinks because they prefer to exchange ideas, opinions or advice with other young entrepreneurs (Interviewee 13; Interviewee 14; Interviewee 15). While for the late-stage startups and scaleups, as discussed before, they valued their time and focus on their business. "*I only went to the networking events for once because it was organized by my client* (Interviewee 22, 2019)." Apparently, the late-stage startups prefer to attend the networking events which can help their business, like access to clients, markets or investors rather than the simple ramble.

Physical proximity is better than online networking, especially for manufacturing startups

Storper pointed that the face-to-face communication are the most efficient form of knowledge diffusion because it provides deep and quick feedbacks that cannot be obtained through other means of communication (Storper, 2013). And the physical proximity is exactly the profit of the innovation district.

"*I missed the time when CEAD was still in this building with me. Both as manufacturing startups, we had same problems like hiring people, designing space. And we can share the machines and help each other with the challenging projects. During lunch time every day, we would discuss about the ideas in the design and technology used in the production.*" (Interviewee 17, 2019).

The cluster of innovative manufacturing is similar with the five chosen high-tech clusters in 22@Barcelona. The cluster is defined by two critical elements: interconnectedness and proximity (Porter, 2008). The interconnectedness means the startups within similar fields as well as cross-sector and the proximity refers to the startups are geographically proximate. And this physical proximity is better than the online networking.

"*We are not a traditional manufacturing company and the software in our machines needs to be updated if we want something new. I hope to work with innovative talents with various backgrounds and the mixed group of makers can do crazy things. Although there are some organized networking meetings with experts from universities or big corporations, from my experience, physically working with the innovative people is more efficient than online or regular meeting ones.*" (Interviewee 23, 2019).

Some other manufacturing startups also expressed that unlike tech or digital startups which may

make money continually replying on working on one or two brand products, the manufacturing startups will receive kinds of orders from various clients and the innovation challenges are constantly emerging in the process of production (Interviewee 15; Interviewee 17; Interviewee 20). As a result, the interconnection between startups and proximity to each other is much more necessary than online networking or the regular simple communications.

Others

In addition to the previous four aspects, the interviewees also proposed some other expectations on M4H based on their own experiences and requirements.

Information and policy transparency

During the empirical research, it is found that most of the interviewees have no idea about the vision or objective of M4H, related policies and the progress of the development. And the transparency is not only aimed at the entrepreneurs inside this district but also the people out of this area to attract much more people especially the entrepreneurs to M4H.

"*Through getting access to the transparency from the municipality, we don't need to get information from private companies anymore. We need to know what Rotterdam wants, the plan, the idea, the project, and which transformation is actually going to happen. For coming startups, the regulations, policies and rent price are all concerns for them. Asking for transparency is our need and right as well.*" (Interviewee 7, 2019)

The information and policy transparency for the entrepreneurs out of M4H, the concerns contain the rent price, office vacancy, surrounding environment and future plan, etc. And this information should be accessible easily online (Interviewee 7, 2019). Apart from the transparency outside the area, the entrepreneurs in M4H also look forward the open information.

"*I'm now working with other two manufacturing startups in this building. Apart from them, I have no idea about other manufacturing startups or scaleups in this area. I really look forward to know what my neighbors are doing and there may be opportunities that we can work together. I think this can be promoted by the government to bring the connections between companies here into the next level."* (Interviewee 23, 2019).

The information isolation also hampers the potential opportunities to collaborate with each other for manufacturing entrepreneurs. Like the "*Sharing*" idea in Keilewerf, the manufacturing startups can share materials, machines and even projects together. However, at present this kind of sharing is only limited inside certain manufacturing startup hubs and the prerequisite to promote in the whole area is that they have to break the information barriers and know each other.

Showcase of new products/technology of startups

Considering the still industrial outlook of M4H and the process products/services validation phase of startups, some entrepreneurs creatively proposed the idea like the 22@Urban Labs in 22@Barcelona.

"*The government can fund projects integrating our products/technology with the infrastructure in this area and similar things are already realized in the Art of Rotterdam. In this way, it can not only provide a showcase for the validated products for startups but also brand M4H because there are many people know here is makers district but have no idea what we are doing. In addition, it is more sustainable and durable than the simple exhibition.*" (Interviewee 15, 2019).

Similar with 22@Urban Labs in 22@Barcelona, they are all strategies to engage more creative actors into the startup ecosystem, including residents, visitors and other entrepreneurs out of the innovation district. It can also be beneficial to create an innovative, open and inclusive atmosphere to attract much more startups as well as retain them in M4H.

Networking between three systems

The realization of these strategies on attraction and retention of startups replies on the networking between three systems: governance system, financial system and knowledge creation and diffusion system. Because in the startup ecosystem, they are the main actors to guide and provide services for startups. In the empirical research, the entrepreneurs and related researchers gave their opinions on the implementing effect of these strategies base on their personal experience in M4H.

No detailed development plans

Although the vision and objective of M4H have been published officially and related strategies have been developed for the RMD, there still no detailed development plans for the next years. Unlike RDM which is owned by Port of Rotterdam, there are many stakeholders in M4H, including the Municipality of Rotterdam, Port of Rotterdam, private real estate development companies and existing industrial companies. After almost four years development, the relatively detailed plans should be made to define some specific actions with timeline, such as who is responsible for which part, when and which transformation is going to make in certain areas, etc.

Due to the lack of detailed development plans for M4H, some startup hubs have complaints about the length of the lease with the government in this area.

"*I don't think the municipality is doing a good job. There are too many interested people/organizations and temporality is their key word. As a startup hub, I would like to become the part of this transformation for a longer term and prefer to buy this building but fail.*" (Interviewee 7, 2019).

"*As a manufacturing startup hub, I want to make a long lease with the government but now we only know that we can stay here until November 2020. And we are going to talk to the city council again to get another year. They even don't know what exactly they will do about this warehouse in the future. For us, every year there are many opportunities to make this place better but we only have one-year contract.*" (Interviewee 8, 2019).

It is known for entrepreneurs in M4H that there are many stakeholders from the three systems engaged in when making plans. But the delay of the detailed plans will hamper the development of startup ecosystem, like the slow infrastructure improvement and distrust of the government's ability to handle affairs. In addition, the detailed development plans with timeline can also give the direction to all stakeholders to promote the development of M4H, especially the startup ecosystem.

Slow decision making

No detailed development plans after almost four years development also refers to the slow decision making of the governance system in M4H. And the low speed of implementation on other parts is also the criticisms from the interviewees.

"*We are here for three and half years and actually nothing happened out of this warehouse. The government spent a lot of time on communication to collect ideas from various stakeholders and in the realization part, I think we should learn from China, where people have a sense of emergency. The big problem here is people don't decide and don't do in a certain way because of the issues of regulations, environmental aspects and locked in interests.*" (Interviewee 7, 2019).

"*Together with other two manufacturing companies here and we have negotiated with them for a year to buy this building. But it's government……*" (Interviewee 23, 2019).

"*The development of this area should be quicker. For now, the working space can meet my requirements but I need a bigger space in the near future.*" (Interviewee 20, 2019).

The general manager of M4H pointed that the biggest task is to improve the physical infrastructure but apparently the speed of decision-making and implementation is not satisfied with the entrepreneurs here.

Lack of strong leadership in the development of startup ecosystem in M4H

According to the feedbacks from interviewees, no matter the low familiarity about M4H among interviewees, the limited networking in M4H or slow decision making due to various stakeholders, they are more or less relevant to the lack of strong leadership of the governance system.

"*I think the reason why we can only make the lease with the government year by year rather than a longer one is that they don't have the boss to say just yes. They have to make decisions on high level.*" (Interviewee 8, 2019).

Based on the theory of Morisson, in the government-led innovation district, the leadership usually lasts about 10 to 15 years and during this time, it is still the artificial innovation district with the strong leadership (Morisson, 2015). However, the facts and feedbacks from the entrepreneurs interviewed don't show out the strong leadership of the governance system, no matter in speed of the physical infrastructure improvement part which is the focus at present or

the development of startup ecosystem part.

Lack of a big starting point

For the development of startup ecosystem or even the whole innovation district, some interviewees expressed their opinions on the reasons for the slow development progress in M4H. And the most popular idea is that a big starting point is expected in this area.

"*I think attracting big corporations is important for M4H now. The strategy used in the Brainport Eindhoven was to physically engage big companies in the area, and now there are around 50,000 people working or living or playing over there.*" (Interviewee 13, 2019)

The entry of MassChallende in Boston's Innovation District, relocation of IBM in KIC Shanghai are all the big starting points for the development of innovation districts. The entry of big corporations or organizations can not only attract much more people into the area but also provide the startups with great resources, like talents, funding and networking. And this view is also accepted by the manager in M4H.

"*At present, there are only small makers in this district. We do lack big innovative corporations or universities physically located in M4H. Although the Erasmus University involves here, there are no students coming. The relatively big organization ECE is just a start to grow and they are still located in floors in the science tower and not really open.*" (Interviewee 2, 2019).

The managers and entrepreneurs both have the idea or kind of imagine to physically engage big corporations into M4H as a starting point for the development of the innovation district, especially the startup ecosystem.

Scale problem on the implementation of strategies

In the interview with entrepreneurs, opinions and expectations were proposed by them. Together with the strategies in theoretical framework, some potential strategies were initially formed. The feedbacks on that were also gained from the general manager of M4H.

"*The main task for us now is the hard part and for the soft part, startup ecosystem, we are working on it together with our colleagues from the municipality. As a manager in M4H, ror the strategies on startups, my concern is the scale problem, which means who are responsible for which parts.*" (Interviewee 3, 2019).

The scale problem on the implementation of strategies is also the issue of division of responsibilities. The scope of work for managers in M4H is mainly limited in innovation district while managers or policy makers from municipality focus on the city level or beyond city area. Sometimes, it is not easy to define boundaries between scales and realization of strategies relies on networking cross various levels. Although implementation of strategies relies on the networking between three systems, the clear division of responsibilities among different levels is also important.

Conclusions: challenges at the Merwe-Vierhavens

In this part, the feedbacks from interviewed entrepreneurs and researchers on the current situations on attracting & retaining startups are discussed based on the theoretical framework, containing five factors and the networking between three systems in M4H. In addition, the general views on the development of M4H were also collected from both managers and entrepreneurs. The main contents are listed in ***Table 5.4***.

Table 5.4 Feedbacks on the management on the attraction and retention of startups in M4H

Feedbacks on the management on the attraction and retention of startups in M4H	
The vision on the development of M4H	Municipality and Port of Rotterdam have the power, willing and dynamic strategies to attract and retain startups; Both managers and entrepreneurs prefer the combination of various kinds of startups; Few entrepreneurs know the development vision of M4H;
Infrastructure	Lack of basic social amenities; Inconvenient public transportation for people inside M4H; Entrepreneurs have no willing to live in M4H; Poor and insufficient working spaces for startups, especially manufacturing startups;
Financial	Most of the entrepreneurs interviewed are self-funded; The funding should not only be limited to startups; Some startups moving from RDM to M4H due to the rising rent price; Manufacturing startups are more sensitive to the rent price;
Human capital	Lack of incubators or accelerators in M4H; Lack of employment platform for startups and scaleups; Little attention to the requirements of late-stage startups in ECE;
Networking	Networking in M4H is still limited in separate startup hubs; Various networking events are not so attractive for startups, especially late-stage startups; Physical proximity is better than online networking, especially for manufacturing startups;
Others	Information and policy transparency; Showcase of new products/technology of startups;
Networking between three systems	No detailed development plans; Slow decision making; Lack of strong leadership in the development of startup ecosystem; Lack of a big starting point; Scale problems on the implementation of these strategies;

Based on the feedbacks from interviewees, the challenges of attracting and retaining startups in M4H at present can be refined in the classification of the framework. And the challenges of attracting and retaining startups in M4H are listed in ***Table 5.5***.

Table 5.5 Challenges of attracting and retaining startups in M4H

Challenges of attracting and retaining startups in M4H	
Infrastructure	Lack of basic social amenities; Inconvenient public transportation for people inside M4H; Entrepreneurs have no willing to live in M4H; Poor and insufficient working spaces for startups, especially for manufacturing startups;
Financial	Funding platforms for startups are still limited; The funding opportunities for the potential projects (not only for startups) are limited; The conflict between area development and rising rent price for startups; Manufacturing startups are more sensitive to the rising rent price due to the growing demand on the space;
Human capital	Lack of incubators or accelerators in M4H; Lack of employment platform for startups and scaleups; ECE mainly focuses on the early-stage startups and have little attention to late-stage startups;
Networking	Networking in M4H is still limited in separate startup hubs; The organized networking events are still at a standstill on the level of early-stage startups; Physical proximity between startups is limited, especially for manufacturing startups;
Others	Information and policy opacity; Lack of showcase of new products/technology of startups;
Networking between three systems	No detailed development plans; Slow decision making; Lack of strong leadership and division of responsibilities in different scales in the development of startup ecosystem; Lack of a big starting point;

For the infrastructure part, the four feedbacks are also the challenges in M4H. Especially, the third point, the result that entrepreneurs have no willing to live in M4H can also be used as reference for making the housing planning in M4H in the near future.

In the financial part, the main problem is the financial system is insufficient or imperfect. In practice, most of the entrepreneurs are self-funded and only 15% of them get the investment through the programmes in M4H. These feedbacks show that the funding platforms provided for startups in M4H are still limited and that is also the reason why ECE is going to develop a new programme focusing on the investment for startups. Secondly, some scaleups and even companies also expressed their demand on the funding for some innovative projects. For example, the project of the manufacturing company aiming to transform the wood waste to the energy for heating the building, which has a poor heating system, cannot be realized due to the high cost. Therefore, the funding opportunities for potential projects are also limited in this area. Thirdly, the movement of startups from RDM to M4H reflects the conflict between the area development and rising rent price for startups. The phenomenon of startups escaping already happened in RDM and the potential challenge still exists for startups in M4H. Finally, in the

empirical research, it is found that the difference with other innovation districts in theoretical research is that M4H has the target business of manufacturing. The manufacturing startups are more sensitive to the rising rent price because their demand on the space is much more at the beginning and it will also grow faster than the non-manufacturing startups in M4H.

For the human capital part, the main challenge is the lack of critical elements in startups ecosystem. The main actors in knowledge creation and diffusion system, such as incubators, accelerators, large corporations are physically lacking, which further leads to the lacking of employment platforms for startups/scaleups. In addition, ECE, the organization closest to the incubator, the various programmes and organized trainings only focus on the early-stage startups and little attention to the late-stage startups in ECE.

The networking in M4H is also limited at present. The first challenge is that the networking is still limited in several separate startup hubs and no substantive communication with each other. In addition, in the startup hubs, organized events or personal networking are still at a standstill on the level of early-stage startups, such as communication on the branding, ideas, etc. While the late-stage startups and scaleups are seldom engaged in the networking events in M4H and they prefer the networking that can help them to get access to clients or partners. Compared with the organized networking events and simple meetings with others, startups, especially the manufacturing startups prefer to work with each other. The physical proximity can promote the advantages of cluster and it is more efficient to solve practical problems in the design and production for startups. However, this physical proximity is limited or not satisfied with startups now.

The challenges in others part, can contain the problems found in the vision on the development of M4H. The main challenge in the vision on the development of M4H is the little familiarity about the innovation district, which is the branding problem. In addition, the requirements for the information and policy transparency show the challenge of information opacity no matter to the outside world but also the entrepreneurs in M4H.

In the implementation of the strategies, there are also some challenges in the networking between three systems in M4H. The first is the lack of detailed development plans for M4H in the near future, which has become the barrier to the infrastructure improvement in some startup hubs and potential networking among startups. On the one hand, the slow decision making and no strong leadership in the three systems have caused the dissatisfaction of entrepreneurs in M4H. On the other hand, the unclear definition of the division of responsibilities in different scales in startup ecosystem part also troubles managers of M4H. And the popular opinion on the urgent action for the three systems is to attract big corporations or organizations as a starting point.

5.4.Added value to the framework

The practical findings in the empirical research provide some added value to the theoretical framework, including the new strategies, practical reflections, potential conflicts and so on. In

addition, some different requirements of startups at various stages are added to the framework. Connected with the vision of M4H, the unique requirements of manufacturing startups are also developed, which can provide theory to the innovation districts which focus on the manufacturing industry how to attract and retain startups in UIDs. The added value to the framework is listed in ***Table 5.6***.

Table 5.6 Added value to the theoretical framework

Added value to the theoretical framework	
Infrastructure	Manufacturing startups have more requirements for working space; Acceptance of living close to the working space;
Financial	Manufacturing startups are more sensitive to the rising rent price due to the larger demand on space; The conflict between real estate development and rising rent price for startups;
Human capital	Early-stage startups prefer partners and late-stage startups prefer employees;
Networking	Networking events should be more targeted on the different requirements of early and late-stage startups; Physical proximity is much preferred by startups, especially for manufacturing startups;
Others	Information and policy transparency both to inside and outside the UIDs;
Networking between three systems	Detailed development plan is needed; Strong leadership is needed in the early development of startup ecosystem; Scale problem on the implementation of strategies should be considered;

Infrastructure

In the infrastructure part, the new findings are the special requirements of manufacturing startups for the working space and living willingness of entrepreneurs working in the UIDs. The former one can provide the reference to the development of innovation districts which have the focus on the new manufacturing industry while the latter one is a note to the UIDs with housing planning.

Manufacturing startups have more requirements for working space

In the interview with the manufacturing startups and startup hubs, it is found that compared with the startups working mainly in the office, the manufacturing startups have more requirements for the working space.

First of all, the bigger area for the machines, materials and working space is the characteristic of manufacturing startups. And this kind of demand will grow quickly with the development of startups. In this way, the UIDs with the vision of promoting the manufacturing innovation have to provide sufficient space for the growing demand of startups/scaleups. In addition, the space has to be flexible and open to allow for moving machines, changing the interior decorations or even various kinds of manufacturing startups due to the high failure rate and liquidity of startups. If one startup fails and leaves, the free space will soon be able to accommodate new startups.

As a result, this puts forward higher requirements for the design of space provided for

manufacturing startups. For example, in the startup hub Keilewerf of M4H, after several years' development, a double-deck design style is developed gradually. The first floor is a more spacious studio for production and manufacturing while the upper floor is an office for makers to design, communicate and meet with their customers. At the same time, in order to allow different types of startups to have a good environment, they separate the startups that focus on design from those that focus on production and will make a lot of noise.

All these requirements of manufacturing startups in infrastructure part should be considered in order to attract and retain them to the UIDs.

Acceptance of living close to the working space

In general, in order to make an inclusive area, the UIDs are the mixed-use district for working, playing and living. In the literature studies, the 22@Barcelona, Boston's Innovation District and KIC in Shanghai all have the housing planning in their development vision and in order to attract entrepreneurs or workers to live there, they even made the preferential policies, like setting aside a percentage of accommodation to young entrepreneurs. However, in this research, it is found that all the interviewees working in UIDs have no willing to live in the district. And the biggest reason is that they refuse to live so close to their working space.

From the scientific view point, it cannot be concluded that all the entrepreneurs working in the innovation district are not willing to live in the same district. But the feedbacks gained in the case of this research can provide the reference to the UIDs with housing planning when they target their customers.

Financial

The added value to the financial part is mainly about the rent price of startups in UIDs. As discussed in infrastructure part previously, the manufacturing startups have bigger demand on the area of working space and corresponding the rent price is a more important factor that they will care about. For all the startups, with the development of UIDs, the rent price will grow gradually and it is also their concern when they decide to stay or leave.

Manufacturing startups are more sensitive to the rising rent price due to the larger demand on space

Even at the very beginning, manufacturing startups will have the requirement of bigger working space compared with the startups working in the office. Although maybe the rent price of makers space is not so high compared with the office space, with the development of manufacturing startups, the growth and growth rate of rent will be larger.

Therefore, the manufacturing startups are general more sensitive to the rising rent because of the larger growth and growth rate of the space. And this is also the point that authorities should consider when retaining manufacturing startups in the UIDs.

The conflict between real estate development and rising rent price for startups

Some entrepreneurs interviewed expressed their dissatisfaction with government intervention

in RDM and are worried about the same thing that the startups have to move out due to the ring rent price, will also happen in M4H in the near future.

Considering the big picture, this is a conflict between real estate development and innovation development. "*The development of innovation districts will drive the development of real estate, but the real estate is not the objective of UIDs and innovation development is*" (Interviewee 2, 2019). However, from the other side, the development of real estate can enhance the economic vitality and attractiveness of the UIDs to some extent. "*If we keep the real estate price low, then we cannot receive the money to invest any further in the UIDs.*" (Interviewee 1, 2019).

Therefore, it is also the conflict between real estate development and rising rent price for startups in UIDs. And in order to attract and especially retain startups in UIDs, the managers should consider this potential problem and take some actions in advance.

Human capital

The new finding in the human capital part is the different preferences to the talents between early and late-stage startups in UIDs. In general, the former one prefers partners while the latter one prefers employees.

Early-stage startups prefer partners and late-stage startups prefer employees

Talent is the largest factor that founders would care about when they are going to choose a location to start their business according to the State of European Tech Report 2017 (Pitchbook, 2017). In addition, startups at various development stage have different preferences to the talents.

For the early-stage startups, they are still in the phases of ideation and validation, during which time they are mostly looking for the like-minded entrepreneurs and/or investors as their partners to start the business. After that, the growing startups or late-stage startups have more demand on the employees who can help to further promote the development.

The difference is valuable for the knowledge creation and diffusion system to provide tailored talent service for startups at various development stages. And as a result, the platform connected with talents and startups in UIDs will be developed better.

Networking

In UIDs, the important strategy used to promote networking is to organize various networking events. Although the biggest task at present in M4H is the infrastructure improvement, the general manager of M4H still expressed that there are already too many events in this area (Interviewee 3, 2019). However, the feedbacks from the interviewees show that the networking effect is not so satisfied. The main challenges are that the organized networking events cannot perfectly catch the requirements of entrepreneurs and compared with the meetings with innovative talents from universities or research institutions, the physical proximity is much preferred, especially for the manufacturing startups.

Networking events should be more targeted on the different requirements of early and late-stage startups

It is found that the entrepreneurs no matter from early-stage startups or late-stage startups, they all have their purposes to participate in the networking events. And mostly they prefer to attend the events on the condition that the possible networking is useful to them.

For the creative students or entrepreneurs from early-stage startups, they are still active in exchanging ideas, validating business or getting inspirations from other entrepreneurs. Therefore, they are more willing to attend some activities like startup meetups, free drinking, startup parties, etc. However, the late-stage startups have validated their products or services and focus on product marketing, clients discovering to increase market share. And they have no time or willing to engage in invalid networking like parties or free drinking. In contrast, they would like to get access to targeted networking events, like job fair for employees, themed industry conferences for experts or clients, and so on.

The significantly different requirements of networking events between early and late-stage startups can provide reference to the authorities, including financial and knowledge system in UIDs.

Physical proximity is much preferred by startups, especially for manufacturing startups

There are no universities or manufacturing related research institutions physically located in M4H and some events are organized to connect universities, big corporations with startups/scaleups. And the feedbacks showed that the working physically with clusters of tech people will be more sufficient, especially for manufacturing startups.

Normally the digital startups working in office can focus on improving several products or service platforms and convincing clients to use their products. However, the manufacturing startups usually get the orders from the clients, which sometimes are only the ideas. After that, they will work on the production part, which can contain emerging technical challenges and every project may be the new one. As a result, the meetings or online networking with related organizations are not so sufficient compared with physical proximity with each other.

Others

In the others part, the new added value to the framework is the information and policy transparency in UIDs. And this contains the transparency to inside and outside the innovation districts.

Information and policy transparency both to inside and outside the UIDs

On the one hand, for the transparency to outside the UIDs, it contains the basic information, especially the vision, rent price and building vacancy, development progress, related policies and so on. The aim is to increase the visibility and attract people, startups and big corporations to come to this area.

On the other hand, in order to retain startups in UIDs, the information and policy transparency

is also important. The development plan of UIDs, policies for startups, development progress, information about the new coming startups and even the working contents of startups in the whole district are all beneficial to the communication and potential collaborations between various actors in the financial system and knowledge system.

Networking between three systems

In addition to the added value in the five factors, the empirical research also gives the remind to the possible problems in the networking between three systems in UIDs.

Detailed development plan is needed

One of the lessons learnt from M4H is that the detailed development plan is needed in the development of the UIDs. The detailed development plan is not only the guide for the networking between three systems to promote the development, but mostly the reference to the actors in UIDs to make their own plans.

For example, there are still no detailed development plans for the old warehouses of Keilewerf in M4H, as a result, the manager of Keilewerf dares not to invest in the facilities improvement in the building due to the uncertain lease term with the municipality. And another startup hub SuGu warehouse has the same concern. "*My team and I have the willing to invest time, money and energy to this building, but it has to be a private one…… Temporality is their key word.*" (Interviewee 7, 2019).

The process of making the detailed development plan may have to collect ideas from various stakeholders and be limited by regulations or policies, but it is vital for the development of the UIDs, including the startup ecosystem.

Strong leadership is needed in the early development of startup ecosystem

The innovation district, as a large-scale project, it will inevitably involve a lot of interests, taking into account the views of many stakeholders. Under this circumstance, a strong leadership is needed especially in the early development stage when the UID is still the artificial innovation district (Morisson, 2015).

On the one hand, the slow decision-making and executive power will delay the development of startup ecosystem and frustrate entrepreneurs' confidence in the governance system. And the other way round, the distrust and dissatisfaction will make it more difficult for the governance system to lead the development of startup ecosystem in further.

On the other hand, a strong leadership can make the networking between the three systems more efficient in the development of startup ecosystem. And this requires a better balance between the stakeholder involvement and decision-making efficiency. The opinions of stakeholders involved in the three systems should be collected and the efficiency of the decision-making should also be considered.

Scale problem on the implementation of strategies should be considered

From the view of managers in the UIDs, the implementation of strategies not only relies on the networking between three systems, but also the division of responsibilities in the governance system among different scales. Therefore, the scale problem on the implementation of strategies should be considered in the development of startups ecosystem. And the scale contains district level, city level and beyond city level.

For example, in the human capital part, the talents attracted are not only limited in district level, and talents from the local city, country, even other countries can be the targets. Therefore, the corresponding strategies on various scales ask for executors from different management levels and the networking between various scales is also needed.

In addition, the division of responsibilities between various scales varies with specific situations in UIDs. This can be related with management and institutional structures in different areas and various governance system in certain innovation districts. Therefore, it is not easy to define in general but this scale problem should be considered in the development of startup ecosystem in UIDs.

5.5.Advice to the Merwe-Vierhavens

Based on the developed framework of attraction and retention of startups in theoretical research, the challenges and opinions refined from the feedbacks in the interviewees, the advice to M4H can be proposed. In the classification of five factors and the networking between three systems, the points in the framework are corresponded with the challenges and the potential strategies are proposed to each challenge and point. Finally, the priority of these potential strategies and division of the responsibilities among different levels are discussed.

Infrastructure

There are four challenges in the infrastructure part and the potential strategies about the first two challenges can refer to the theoretical strategies. In practice, for the social amenities, various amenities should be built such as bars, restaurants, etc., especially around the startup hubs, where the entrepreneurs are frequently active. For the transport inside M4H, the roads for cyclists and pedestrians or possible public transportation like bus, tram can be designed and constructed in M4H.

The third challenge that entrepreneurs have little willing to live in M4H is the added value to the framework. And this new finding can provide a reference to the housing planning in M4H, which means that when attracting people to live in M4H, the positioning of the target customers can be made.

For the last challenge, although providing working space suitable for startups is mentioned, connected with practical situations in M4H, the special requirements of manufacturing startups are gained insight of and interviewees gave their advice on that. The potential strategies to deal with infrastructure challenges in M4H are listed in ***Table 5.7***.

Table 5.7 Potential strategies to deal with infrastructure challenges in M4H

Challenges	Points in the framework	Potential strategies
Lack of basic social amenities	Social amenities	Build social amenities such as bars, restaurants, café within M4H, especially around the startup hubs.
Inconvenient public transportation for people inside M4H	Transport	Construct and improve the roads for cyclists and pedestrians to improve the walkability in M4H. Design and construct the public transportation like bus, tram.
Entrepreneurs have little willing to live in M4H	Housing living	Take the feedback as a reference to the housing planning in M4H.
Poor and insufficient working spaces for startups, especially for manufacturing startups	Workspace	Speed up the improvement of the work space for manufacturing startups, especially the heating system. Provide much more space for startups through accelerating the renovation of abandoned warehouses and constructing new buildings. Take the special requirements (flexible, open, innovative) of manufacturing startups when improving or constructing space.

Financial

In the financial part, there are two main challenges: funding and rent price. For the funding point, the strategies are mentioned in the theoretical part and in practice, various funding platforms not only for startups but also the innovative projects through engaging more actors in the financial system and establishing funding platform for projects.

The rent price point is the added value to the framework and interviewees proposed their advice to that. And the key is to manager the relationship between the development of real estate (possible rising rent price) and innovation district (retention of startups), especially for the target manufacturing startups. Due to the fact that M4H is still at the early development stage and this concern may happen in the future, the potential strategy is to study on preferential policies to cope with possible situations in M4H, especially the manufacturing startups. And the potential strategies to deal with financial challenges in M4H are listed in ***Table 5.8***.

Table 5.8 Potential strategies to deal with financial challenges in M4H

Challenges	Points in the framework	Potential strategies
Funding platforms for startups are still limited	Funding	Engage more actors in the financial system to provide wider funding platform for startups.
The funding opportunities for the potential projects (not only for startups) are limited	Funding	Establish the funding platform for innovative projects of no matter startups, scaleups or companies in M4H.
The conflict between area development and rising rent price for startups	Rent price; Subsidies	Study on preferential policies to cope with possible situations that startups cannot afford

Manufacturing startups are more sensitive to the rising rent price due to the growing demand on the space	Rent price	the rent due to the high real estate price in the future, especially the manufacturing startups, to retain them in M4H.

Human capital

In the three challenges, the challenges corresponding to trainings for startups/entrepreneurs are mentioned in the theoretical part and the developed strategy is to offer various trainings through incubators, accelerators, universities, etc. In practice for M4H, the advice is to establish an incubator or accelerator to provide comprehensive services for startups at various stages. And the approach can be to attract a new one or develop one based on ECE, which has certain resources and experience of attracting and retaining startups in M4H.

The different requirements for employment platform between startups and scaleups are the added value to the framework. The potential strategies are proposed by interviewees based on the framework and the main point is to strengthen collaborations in further with universities nearby, especially the Erasmus University through ECE. The potential strategies to deal with human capital challenges in M4H are listed in ***Table 5.9***.

Table 5.9 Potential strategies to deal with human capital challenges in M4H

	Points in the framework	Potential strategies
Lack of incubators or accelerators in M4H	Trainings for startups/entrepreneurs	Attract incubators physically located in M4H, like Yes!Delft; Treat ECE as a start point to develop an incubator for startups at various development stages;
Lack of employment platform for startups and scaleups	Talents; Skilled workforce;	Establish the employment platform in ECE to attract students from Erasmus University; Strengthen the collaboration with universities nearby to attract young talents working in M4H;
ECE mainly focuses on early-stage startups and little attention to late-stage	Trainings for startups/entrepreneurs	Help ECE to expand the scope of services for startups through developing more incubation programs

Networking

The first challenge that limited networking between startup hubs is discussed in theoretical part and potential strategy is to organize networking events or provide platforms between them.

The last two challenges are the added value to framework and potential strategies were also provided by interviewees together with their feedbacks. For the various preferences in networking events, the advice is to organize themed activities according to their requirements because entrepreneurs normally participate in networking events with their own purposes. In addition, the issue about physical proximity can be solved through physically attracting innovative talents or organizations to M4H. In this way, the advantage of innovation cluster can appear in M4H. The potential strategies to deal with networking challenges in M4H are listed

in ***Table 5.10***.

Table 5.10 Potential strategies to deal with networking challenges in M4H

Challenges	Points in the framework	Potential strategies
Networking in M4H is still limited in separate startup hubs	Interaction between people; Networking between startups;	Organize events between the startup hubs in M4H to provide platform for them to connect, communicate and even collaborate with each other
The organized networking events are still at a standstill on the level of early-stage startups	Networking between startups;	Based on the study on the requirements of startups, organize themed networking activities to attract them.
Physical proximity between startups is limited, especially for manufacturing startups	Networking between startups; Networking with other actors in startup ecosystem;	Attract related research institutions or universities physically located to attract innovative talents working in M4H.

Others

The second challenge in M4H was discussed and the solution was also proposed in the development of framework. Like 22@Urban Labs in 22@Barcelona, the UIDs can provide platform for startups to show their products/services and at the same time much more people can be engaged in the process.

The added value to the framework is the information and policy transparency. Some interviewees gave their opinions and advice on that. For the transparency for outside, it is more like the advertising to publicize M4H, including development progress, basic information in order to attract people. For inside, it is based on the requirements of some entrepreneurs, who prefer to know what are happening or going to happen in this district, what are other startups doing in order to gain possible collaborations. And the efficient way can be to develop attractive websites or app. The potential strategies to deal with others challenges in M4H are listed in ***Table 5.11***.

Table 5.11 Potential strategies to deal with others challenges in M4H

Challenges	Points in the framework	Potential strategies
Information and policy opacity	Information and policy transparency (Added value)	Outside: Update the basic information and development progress through social media; Organize activities to attract people to visit M4H. Inside: Develop website or app providing the updated information of M4H, including policies, development progress, new coming startups, activities, etc.
Lack of showcase of new products of startups	Innovative and cultural environment	Integrate products/services of startups into the district and build the platform to collect feedbacks from the people in M4H

Networking between three systems

The challenges in the networking between three systems can be concluded as the issues of development path and management system.

The lack of strong leadership and slow decision-making lead to the delay in detailed development plans. The potential strategies gained from interviewees are to build up a dedicated team to promote the development of startups, make development plans as soon as possible. And in this process, the tasks, risks and responsibilities should be defined between various actors, including managers from different scales (district, city and beyond city scale). Finally, attracting big corporations or universities as a starting point, which is the consensus of interviewees concerned about M4H, is also base on the strong leadership and efficient management of M4H. The potential strategies to deal with the challenges of networking between three systems in M4H are listed in ***Table 5.12***.

Table 5.12 Potential strategies to deal with the challenges of networking between three systems in M4H

Challenges	Potential strategies
No detailed development plans	Finish the detailed plans ASAP, in which the timeline, responsibilities, involved parties, expecting results of every project should be included.
Slow decision making	Reorganize the management team or build up a dedicated team to be responsible for developing the startup ecosystem in M4H through integrating the resources and actors in the three systems with rapid response to the feedbacks from startups/scaleups; Tasks, risks and responsibilities should be defined between various actors according to specific situations, including managers from different scales (district, city and beyond city scale).
Lack of strong leadership and division of responsibilities in different scales in the development of startup ecosystem	
Lack of a big starting point	Considering the strategy of attracting big corporations or universities to M4H

Priority of potential strategies

As a large urban project, the development of M4H is a long-term process, which is also a part of innovation process (Interviewee 2, 2019). Although the potential strategies focusing on challenges are important to promote attraction and retention of startups in M4H, some strategies have priority to others.

First of all, detailed development plans containing major actions with timeline to cope with challenges in this district, should be made. After that, the infrastructure part should be focused on as a precondition for attraction and retention of startups, which is also the current ongoing task in M4H (Interviewee 3, 2019). And the feedbacks on infrastructure part can provide insight of requirements of startups, especially manufacturing startups.

The rest of the strategies, including financial, human capital, networking, transparency and networking between three systems should be synergistically advanced according to dynamic

situations in the near future in M4H. They are normally longer-term and ongoing processes. For example, the establishment of incubator or accelerators is normally accompanying with the development of funding platform, employment platform, themed trainings/networking events and so on.

It is worth noting that potential strategies for challenges should not be seen as separate actions but as organic processes in practice. Well-organized strategies based on actual situation and dynamic requirements of startups are also important. In addition, new challenges or situations are also emerging in the future and corresponding strategies must be constantly changing to cope with new problems.

Division of the responsibilities among different levels

The advice provided to M4H mainly focus on detailed strategies corresponding to the challenges in M4H without considering the division of responsibilities among district, city and beyond city levels.

As mentioned in the three case studies though literature review, division of responsibilities among different levels varies with management structure, level of government intervention and development stages etc. Due to the fact that M4H is still at early development stage and there are even no detailed development plans up to the field work conducted in M4H. In addition, the main task in the short term is the improvement of infrastructure, the division of responsibilities in district, city and beyond city authorities should be planned according to the detailed development plans about the startup ecosystem in the near future.

Part 5 Conclusions

Chapter 6 Conclusions

6. Conclusions

In this part, the conclusion of this research will be developed through giving answers to sub research questions and the main research question. In addition, the reflections on theoretical framework, research methods and results will be discussed. Finally, the recommendations on the research results and future research will be given.

6.1. Conclusions

The main objective of this research focuses on how to better attract and retain startups in re-imagined urban area model of UIDs, which can help to promote the development of startup ecosystem, increase competitiveness of city and partly fill the knowledge gap about startups preferences in UIDs. In order to realize this objective, three sub-goals were proposed: 1. gaining insight of startups; 2. knowing the strategies of attracting and retaining startups; 3. promoting cooperation between startups and managers in innovation districts.

In order to achieve these goals, the theoretical framework was developed (Chapter 4). And then the field work (Chapter 5) was conducted in the Merwe-Vierhavens (M4H) to gain insight of current strategies and feedbacks from entrepreneurs on that. After that the challenges and advice to M4H were developed based on feedbacks and theoretical framework. At the same time, the added value to the theoretical framework was discussed.

The main research question of this research is ***"What are the factors should be considered when attracting and retaining startups into innovation districts and in what ways could these factors be enhanced by district managers?"*** And the answer to this question can be developed through answering the sub research questions.

What are the startups and startup ecosystem in UIDs?

The main object of this research is the startup, which district managers aim to attract and retain in UIDs. In addition, startup is not an isolated island in innovation districts and the realization of innovation development requires networking between actors in startup ecosystem. This sub question was answered through literature review on existing researches and documents.

For startups, the definition of it has not reached the consensus until Luger and Koo (2005) defined three characteristics of startups: new, active and independent, which gave the qualitative judgment on startups. And Steve Blank proposed the definition of startups, which mainly focuses on the business model part: "***A startup is an organization formed to search for a repeatable and scalable business model***" (Blank, 2010). Apart from the definition, in order to gain insight of the development process of startups, the division based on lifecycle of startups was made, **early and late-stage startups**. The former covers phases of formation and validation part while the latter refers to startups in growth phase.

For startup ecosystem, according to the theory of Startup Commons, it is formed by **people, startups in various stages and kinds of organizations interacting as an ecosystem to create new startups companies** (Startup Commons, n.d.). Specifically, organizations mainly contain universities and research organizations, funding organizations, support organizations, service provider organizations as well as large corporations. It is noticeable that contents of startup ecosystem vary with different organizations, cultural environment and development strategies. It is a dynamic system and can be influenced by both external and internal factors.

The clear understanding of startups, including the definition and its lifecycle, and startup ecosystem which is the fertile soil for development of startups are the theoretical bases of following study. Connected with characteristics of innovation districts, especially three kinds of assets of UIDs, are also the preconditions of theoretical framework.

What are the factors of attraction and retention for startups in UIDs?

In order to develop the factors of attraction and retention for startups, the conceptual model was proposed in advance based on previous study on key theories about startups and startup ecosystem. The conceptual model contains five kinds of factors that startups care about: infrastructure, financial, human capital, networking and others for supplement. And the study on factors is developed based on these five factors of preferences of startups in various development stages.

Infrastructure

As a group of entrepreneurs working and/or living in UIDs, early-stage and late-stage startups have similar preferences in infrastructure part. Considering the quality of life in UIDs, startups prefer the quantity and quality of amenities, including **natural and social amenities** as well as connectivity of the location, which means the **transport** both outside and inside of the district. For the working part, the quality of **workspace** and **digital infrastructure** in the workspace are needed for startups. In addition, entrepreneurs from late-stage startups may have requirements of **living** in UIDs for convenience of working in the near future.

Financial

Most startups would have financial problems for various reasons in different development stages (Salamzadeh, 2015). And both early and late-stage startups have requirement of various **funding** as well as related **services**. For early-stage startups, due to the lack of experience and money, appropriate **subsidies** may be preferred. In addition, the **rent price** of workspace is also the concern for them. While for late-stage startups, with the development of their business, they may have more demand on workspace and care about the change of rent price in the near future. During the process of development, especially the validation phase, startups need to get **access to customers/market** to validate their ideas/products/services.

Human capital

In general, entrepreneurs need three kinds of things: personal development, professional

development and solving specific business challenges and issues (Dee, et al., 2015). In UIDs, many programmes like trainings, workshops in incubators or accelerators focus on these three points. And they vary with specific requirements of startups in various stages. early-stage startups prefer **trainings** about formation of startups while late-stage startups would like something about market skills or management skills. As a team of entrepreneurs, **talents and skilled workface** are also essential in the development of startups.

Networking

Startup is not an isolated island in UIDs and the networking in startup ecosystem is essential to the development of startups as well as innovation. As a human being, the **interaction between people** in UIDs is indispensable. As entrepreneurs from startups in UIDs, the networking both in similar field (**peer networking**) and different fields (**cross-sector networking**) can provide support for startups. In addition to the networking in startups, communication or possible collaborations **with other actors in startup ecosystem** are also required by startups. For some late-stage startups, with further development, the **international networking** may be needed.

Others

Apart from factors mentioned previously, startups can consider other points when choosing and staying in a working and/or living location. From the general feeling, **openness and tolerance**, **safety**, **innovative and cultural environment** are the concerns. From the business part, as innovation spot of new technologies, the **intellectual property issue** should also be considered in the process of development for startups.

What are the strategies used to enhance these factors in order to attract and retain startups in UIDs?

The list of factors that startups would consider can be developed through studying related literatures, while the strategies vary with specific situations in UIDs. In order to gain insight of management on attraction and retention of startups, three cases were chosen, 22@Barcelona, Boston's Innovation District and KIC in Shanghai, which are all re-imagined urban area model with different levels of government intervention. And concluded strategies are based on the conceptual model and list of factors, which also contains five factors of preferences of startups in UIDs.

Infrastructure

Looking through the three cases, infrastructure improvement is the focus of district managers. **Providing various amenities** like restaurants, bars, café and other public spaces can make the district attractive and livable. The **improvement on the transport both public and private** can not only increase connectivity of the location, but also improve the walkability of the district. In addition, as a mixed-use area, UIDs generally have housing planning to **provide suitable living spaces** for startups apart from the basic requirement of **working spaces**.

Financial

Considering the fact that most startups have financial problems and lack of resources, **various**

funding platforms are created by innovation districts, where startups at various development phases can get access to funding more easily. For some potential and innovative startups, **appropriate subsidies can be provided**. In addition, **financial services are also available** for startups in need.

Human capital

In startup ecosystem, universities are the main sources of young talents and therefore good **collaboration with universities** can help **to attract young talents** as well as skilled workforce for startups. As for the talents in society, various programmes or competitions are organized to **create attractive environment to attract and retain talents from society**. In general, there are many **trainings** like public lectures, programmes **organized in incubators, accelerators, co-working spaces, universities** digitally or physically located in UIDs.

Networking

Providing creative public spaces in UIDs is the main strategy to promote the interaction between people, including entrepreneurs from startups. And the peer and cross-sector networking are promoted through **organizing various attractive networking events** in UIDs, which can provide platforms for entrepreneurs to communicate with each other. In addition, possible **collaborations with other local and international actors in startup ecosystem** are also provided for startups to promote further development through all-round networking.

Others

In order to create an innovative and cultural environment in UIDs, district mangers try to break the boundary of startup ecosystem to **engage much more actors into the ecosystem, like citizens**. At the same time, as an innovation district, it can also **provide showcases for products/services of startups**, which can not only create an innovative atmosphere, but also help startups to validate their products/services. In addition, it is found through gaining insight of these three cases that various UIDs have different situations and **the process of development of innovation districts should be treated as a startup business**.

After concluding strategies of attracting and retaining startups in UIDs, the theoretical framework was developed, which contains the list of factors, strategies on these factors and the networking between three systems in UIDs.

How can district managers improve the management of attracting and retaining startups in Merwe-Vierhavens (M4H)?

In order to answer this sub question, current strategies were studied firstly based on the conceptual framework developed previously. And then interviews were conducted in M4H to gain feedbacks on these strategies as well as general vision on the development of M4H. After that, the challenges in M4H were discussed and added value to framework was concluded from the theoretical view. Finally, the advice to M4H on how to improve the management of attracting and retaining startups was proposed through combining theoretical strategies and practical feedbacks from interviewees in M4H.

Infrastructure

Based on the challenges that lack of social amenities, inconvenient public transportation, poor and insufficient working spaces as well as little willingness of entrepreneurs to live in M4H, the potential strategies were proposed. First of all, new social amenities should be built especially around startup hubs. In addition, the roads for cyclists and pedestrians as well as public transportation like bus, tram are needed. Special requirements of startups especially manufacturing startups should be considered when improving workspaces and the acceptance of living close to workspace can be a reference to housing planning in M4H.

Financial

The challenges in financial part are mainly issues of funding and rent price. And the potential strategies for funding are to provide wider funding platforms for startups through engaging more actors as well as innovative projects. At the same time, the fact that manufacturing startups are more sensitive to rent price due to larger demand on workspace ask for the consideration about preferential policies to cope with these situations in the future in M4H, which is also the concerning to retain them in UIDs.

Human capital

The problems in human part are mainly concentrated in the incomplete startup ecosystem and loose collaboration with universities nearby. As a result, incubators or accelerators are required through attracting new ones or developing based on existing education campus ECE. At the same time, the employment platform should be established in order to connect startups in M4H with young talents from universities nearby. Finally, for the entrepreneurs campus ECE, the service scope should be expanded to the whole lifecycle of startups, including early and late-stage startups.

Networking

The networking between the interaction between people and startups as well as other actors in startup ecosystem are still limited in M4H. Therefore, for the networking between startup hubs, attractive events should be organized. While for networking in startup hubs, specific requirements of startups at various stages should be considered when organizing related events or activities. In addition, compared with online networking or just regular meetings, startups prefer the physical proximity and the corresponding strategy is to attract innovative talents to physically work in M4H rather than digitally one.

Others

The lack of information & policy transparency and showcase of products/services of startups are the main problems in M4H. The potential advice is to improve transparency both inside (developing website or app to provide updated information) and outside (updating basic information through social media and organize activities to attract people) of M4H. In addition, integrating products/services of startups into the district to provide showcases is also the opinion of interviewees in M4H.

Networking between three systems

Based on practical situations in the networking between three systems, first of all detailed development plans should be made as soon as possible. And then reorganization of the management team and clear definition of tasks, risks, responsibilities between various actors can help to deal with issues of slow decision making and lack of strong leadership, division of responsibilities in different scales. Finally, the big starting point like attracting big corporations or universities physically in M4H is preferred by interviewees in M4H.

6.2.Reflections

The reflections of this research can be divided into reflection on theoretical research, research methods and research results. And they will be discussed in the following paragraphs.

6.2.1. Reflection on the theoretical research

The reflection on the theoretical research contains reflection on the literature review, specifically the possible biases in the selection of theories, and reflection on the development of theoretical framework.

Biases in the selection of theories

There may be biases in the selection of key theories in the literature review, which are the bases in the following study.

For example, the definition of innovation districts was proposed by Katz and Wagner in 2014 and the research scope of this research is one of the three models which were also developed by them. According to their theory, three kinds of UID models have their own characteristics, like that re-imagined urban areas are near/along historic waterfronts while anchor plus model districts are downtown/midtowns of central cities. However, there may be some locations that are not only in downtown of central cities but also close to historic waterfronts. Therefore, the division of UIDs may be too general even limited.

Another example is the concept of startups, which is the objective of this research. There are many definitions about startups and different divisions of lifecycle of startups. In this research, the selected definition and division were chosen by the writer and there may be biases in this process.

Reflection on theoretical framework

In the development of theoretical framework, it is noticeable to make some reflections, including development of the list of factors, the influence of leadership on governance structure and scale problem in framework.

The list of factors of attraction and retention of startups was developed through combining the preferences of early and late-stage startups in UIDs. Firstly, the division of five factors that startups care about was proposed by the writer through literature review, and it may be not so

rigorous or even missing some perspectives. Secondly, simply combining the preferences of early and late-stage startups may lead to conflicts between each other. For example, for the early-stage startups, entrepreneurs may still struggle with ideation of products and have no considerations about living or employment. And this also results in the third reflection, priority of these factors for startups. On the one hand, entrepreneurs from different kinds of startups at various development phases may have totally different preferences to these factors. On the other hand, priority of these factors may have influence on the decisions or development visions made by district managers. And these need to be studied in further.

The development of UIDs is the transformation from artificial innovation districts to self-sustaining ones without strong leadership (Morisson, 2015). In the study on strategies of attracting and retaining startups, different levels of government intervention are reflected in three chosen cases. And in theoretical framework, there are also issues of leadership in the governance system. Since the focus of this research is on preferences of startups as well as strategies of enhancing these preferences and the governance structure varies with specific situations of UIDs, the influence of leadership on governance structure was not studied. However, it is very important to implement these strategies and worthwhile to study in further.

The scale problem in theoretical framework mainly reflects in the division of responsibilities of implementing strategies among various scales, such as district level, city level and beyond city level. The reason why this point was not discussed in framework is that this issue varies with practical situations in different innovation districts. For example, as for the infrastructure part, in 22@Barcelona, the construction and improvement were responsible by a municipal company (city scale), while in KIC Shanghai, they were conducted jointly by private and public company (district and city scale) and in Boston's Innovation District, there was also $50 million investment from the state (beyond city scale). Therefore, the division of responsibilities among various scales should be considered based on practical situations of UIDs.

6.2.2. Reflection on research methods

This research is a multiple case study research and the methods used are literature review and semi-structured interviews. The literature review was used to gain insight of key concepts, definitions of related terms as well as factors and strategies of attracting and retaining startups, which are the bases of empirical research. Through semi-structured interviews, current strategies used and feedbacks on those from entrepreneurs in M4H can be gained, which were essential to the development of advice to M4H.

Possible biases in the selection of theories in literature were discussed in previous paragraph. In addition, the strategies in framework were developed through studying on three chosen cases of UIDs and there may be also biases in the selection of cases.

The number of interviewees is only 23 due to the limited time of this research, including one related researcher, three managers of startup hubs in M4H, one community manager of an incubator in the Netherlands, five managers and thirteen entrepreneurs from manufacturing and non-manufacturing startups in M4H. In the semi-structured interview, questions asked by the

writer may be subjective and feedbacks concluded may also be biased. In addition, in order to gain more comprehensive information and opinions, much more interviewees from different parties in M4H should have been interviewed from an academic point view. However, due to the early development stage of M4H, there are limited amount of suitable entrepreneurs present in this district.

6.2.3. Reflection on the research results

The results of this research contain the theoretical framework and the advice developed to M4H. Reflections on the theoretical framework were already discussed in previous paragraph, including the list of factors, the influence of leadership on governance structure and scale problem in framework.

For the advice developed to M4H, it also contains the issue of division of responsibilities among various scales. As mentioned in previous paragraph, this is related with specific situations in UIDs. However, at present, the main task of M4H is the hard part, infrastructure improvement and there are still no visions or plans about the development of startup ecosystem, including attraction and retention of startups in M4H. Therefore, the advice on how to divide these responsibilities at present is still so early and meaningless.

In addition, the advice to M4H were mainly developed based on feedbacks from entrepreneurs in M4H, which were the unilateral appeals from startups. However, the management on attraction and retention of startups asks for cooperation between startups and managers. Therefore, the opinions or feedbacks from managers should also be collected in order to develop a set of practical advice.

Since the advice were developed through a single case study together with literature review, further empirical research should be conducted in M4H to test the advice and make it more specific, reliable and future-proof.

6.3.Recommendations

Based on the development of research results, the recommendations of this research can be made, which contain the recommendations on research results and future research. And both of them are developed from specific (M4H) one and general (UID) one.

6.3.1. Recommendations on the research results

The research results are composed of advice to M4H (specific one) and theoretical framework (general one). And recommendations are discussed from these two points of view.

Regarding the specific advice to M4H, the following recommendations can be made:

- The division of responsibilities among various scales should be discussed in further based on the internal management structure of M4H and future plans about the development of startup ecosystem in M4H.
- The advice to M4H is mainly the unilateral appeals from startups and feedbacks or

opinions from managers in municipality or port authority should also be collected as a complement in order to develop more practical advice.

- The advice is developed based on literature review as well as interviews with limited number of interviewees in M4H and it is not ready for use directly. And the further elaboration and empirical research should be conducted in M4H to develop a set of future-proof advice.

Regarding the general management on attraction and retention of startup in UIDs, the recommendations are as follows:

- Strategies used to attract and retain startups should be connected with specific situations in UIDs, such as the history, management structure, development vision and so on. In another word, they are always case-specific.
- Management on attraction and retention of startups is dynamic. Different kinds of startups at various development phases may have different requirements and correspondingly the management should always meet dynamic requirements of startups and be flexible.
- Case-specific and dynamic characteristics of the management ask for the efficient and smooth communication between startups and managers. Managers can respond to requirements of startups and startups can also engage in the development of startup ecosystem in UIDs.

6.3.2. Recommendations on future research

The recommendations on future research are also divided into specific one (M4H) and general one (UID).

For the future research on M4H, the recommendations are as follows:

- In order to increase the validity of the research, more entrepreneurs from startups in M4H should be interviewed to collect more information and opinions.
- To improve the advice to M4H, the feedbacks of managers from municipality & port authority on these potential strategies can be gained insight of.
- Tracking research on preferences of startups, especially the manufacturing startups which is the target business in M4H, can be helpful to guide managers to better attract and retain startups and promote the development of startup ecosystem.

Regarding the future research on general UIDs, recommendations can be made:

- The scope of this research is the attraction and retention of startups in re-imagined urban area model UIDs. Further similar research can be made on the anchor plus model and the urbanized science park model according to the theory of Katz and Wagner.
- Apart from the division of startups based on lifecycle, the preferences of startups from different industries can be studied. For example, in this research, there are some unique requirements of manufacturing startups compared with internet startups.
- The study on attraction and retention of startups mainly focuses on the innovation district scale, and there are possibilities of developing startup ecosystem beyond the boundary of UIDs in the near future. Therefore, the research on the attraction and retention of startups breaking the boundary of UIDs can be made to gain more opportunities for startups.

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Interviewee 4 (2019, January 24). Interview Sales manager in Rotterdam Makers District /Interviewer: Donglin Lyu.

Interviewee 5 (2019, January 22). Interview Financial manager, Port of Rotterdam/Interviewer: Donglin Lyu.

Interviewee 6 (2019, January 29). Interview Program manager in the WetechRotterdam /Interviewer: Donglin Lyu.

Interviewee 7 (2019, January 25). Interview the Founder of SuGu warehouse in Merwe-Vierhavens /Interviewer: Donglin Lyu.

Interviewee 8 (2019, February 5). Interview the Founder of Keilewerf in Merwe-Vierhavens /Interviewer: Donglin Lyu.

Interviewee 9 (2019, January 30). Interview Head of finance of the Erasmus Centre for Entrepreneurship (ECE) in Merwe-Vierhavens /Interviewer: Donglin Lyu.

Interviewee 10 (2019, February 18). Interview Community manager of Yes!Delft/Interviewer: Donglin Lyu.

Interviewee 11 (2019, January 30). Interview the Founder of a startup in Merwe-Vierhavens/Interviewer: Donglin Lyu.

Interviewee 12 (2019, February 5). Interview the Founder of a startup in Merwe-Vierhavens/Interviewer: Donglin Lyu.

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Interviewee 14 (2019, February 11). Interview the Founder of a startup in Merwe-Vierhavens/Interviewer: Donglin Lyu.

Interviewee 15 (2019, February 14). Interview the Founder of a startup in Merwe-

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Appendix

Appendix A Protocol interviews managers from M4H

Background

For my graduation research of the master 'Construction Management & Engineering' (Civil Engineering and Geoscience) at the TU Delft, I'm doing the research about how to attract and retain startups into innovation district, Merwe-Vierhavens in Rotterdam as a single case study. In this research, the main objective is to gain insight of factors of attraction and retention for startups in innovation districts and the expecting result is to provide advice to Merwe-Vierhavens. In order to obtain the information needed, interviews with related researchers, area managers and startups in Merwe-Vierhavens will be conducted. All the information obtained during the interviews will only be used for academic research and this interview will be anonymous

The interview is semi-structured interview, which contains some main questions as starting points and additional questions or communication can arise from your answers. Please do not limit your answers to these questions and feel free to express yourself.
Now we start the interview.

Introduction

- Please introduce yourself.
- What is your main work every day?
  (working contents anything related with startups?)

Vision

- What is the vision of the municipality of Rotterdam on the innovation development in Rotterdam?
- What is the position of the Merwe-Vierhavens in this vision?
- What is the position of the startups in the development of the Merwe-Vierhavens?

Strategies to attract and retain startups

- Innovation ecosystem
- Do you have certain requirements of which **kinds of** startups are welcome? Or just every kinds of startups can come? (connect with Rotterdam **Makers** District?)
- What are the current policies or strategies to attract and retain startups?
- What is the future plan based on this part?

Theoretical framework

Here is the theoretical framework of this research developed after larger literature review, containing

5 features: infrastructure, financial, human capital, networking and others.

- Does this framework contain all the factors when attracting or retaining startups?
- Any comments or advice on this framework?
- Based on M4H, can you elaborate under every point of this framework? Which points are well done? Which need to be improved?

Appendix B Protocol interviews startup researcher

Background

For my graduation research of the master 'Construction Management & Engineering' (Civil Engineering and Geoscience) at the TU Delft, I'm doing the research about how to attract and retain startups into innovation district, Merwe-Vierhavens in Rotterdam as a single case study. In this research, the main objective is to gain insight of factors of attraction and retention for startups in innovation districts and the expecting result is to provide advice to Merwe-Vierhavens. In order to obtain the information needed, interviews with related researchers, area managers and startups in Merwe-Vierhavens will be conducted. All the information obtained during the interviews will only be used for academic research and this interview will be anonymous

The interview is semi-structured interview, which contains some main questions as starting points and additional questions or communication can arise from your answers. Please do not limit your answers to these questions and feel free to express yourself.
Now we start the interview.

Startups

- What is your idea about the definition of startups?
- How many development stages of startups?
- What is the boundary between startups and scaleups?

Innovation ecosystem

- Which actors should be engaged in the innovation ecosystem?
- What is the position of startup in the innovation ecosystem?
- Based on your research, what is the situation of innovation ecosystem in Rotterdam? Any problems and what are your advice?

Innovation district

- What is your idea about the innovation districts?
- What is the relationship between innovation districts and startups?
- Which actors should be engaged in the innovation district?

Merwe-Vierhavens

- What is your opinion about the development of Rotterdam Makers District?
- Based on your research, what is your advice on M4H?

Appendix C Protocol interviews startups/scaleups/company in M4H

Background

For my graduation research of the master 'Construction Management & Engineering' (Civil Engineering and Geoscience) at the TU Delft, I'm doing the research about how to attract and retain startups into innovation district, Merwe-Vierhavens in Rotterdam as a single case study. In this research, the main objective is to gain insight of factors of attraction and retention for startups in innovation districts and the expecting result is to provide advice to Merwe-Vierhavens. In order to obtain the information needed, interviews with related researchers, area managers and startups in Merwe-Vierhavens will be conducted. All the information obtained during the interviews will only be used for academic research and this interview will be anonymous

The interview is semi-structured interview, which contains some main questions as starting points and additional questions or communication can arise from your answers. Please do not limit your answers to these questions and feel free to express yourself.
Now we start the interview.

Introduction

- Please introduce your startups and yourself. (background, experience)
- What is your motivation to start the startup and which development stage are your startups in? Number of employees?
- Why did you choose this place (Merwe-Vierhavens)?

Infrastructure

- What are the advantages and disadvantages of this office location/lab/facilities/meeting rooms you can use?
- Are you satisfied with the transportation to this place and the transportation within this innovation district? Any advice?
- Are you satisfied with neighborhood amenities? (in the building and outside) Coffer bar, plaza, restaurant and public place for communication or entertainment.
- Where are you living? Do you prefer to live in this innovation district where close to your startups? Any advice?
- Can you feel the advantages that you are located with other startups?
- Are you satisfied with the digitally infrastructure here? High-speed internet, computers. Any advice?
- Are you satisfied with the digital platform provided to you? Online information, online networking with other startups/institutions
- Outlook of the office building, innovation district. The function of incubators in innovation district.

Financial

- How much is the rental price you paid? Can you accept it? Do you have the time limit staying here? Will the rental price increase in the future?

- Have you reached to the stage of getting the funding? Funds, loans, angel investors, venture capital, etc. Any advice?
- Are you available to access to the market? Potential customers? Any suggestions?

Human capital

- Which kinds of training or support you will get here? (business skills, technology support, etc.)
- Can you get some skilled workforce or partners here?
- Do you have the communication or get the support from research institutions (industry/research institutions/universities)? Are you satisfied with that? Any advice?

Networking

- Are you satisfied with the communication between people in the building and out of the building here? Events, workshop. Networking with other startups in similar fields and different fields.
- Do you have the communication with management team in the incubator or authority? If you have some advice, what will you do? Any suggestions?
- How do you think the relationship between startups and corporation? What role do you think the universities, government, startups and corporations?

Others

- Can you feel the innovative atmosphere here?
- Rotterdam innovation district is treated as Rotterdam Makers District. What do you think of this position/brand/identity?
- Have you ever met the situation about intellectual property? What do you think of intellectual property problem in innovation ecosystem?
- Cultural environment of this innovation district?