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Facilitating start-ups in port-city innovation ecosystems: A case study of Montreal and Rotterdam



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ABSTRACT

Facilitating start-ups located in the port-city interface is one of the current policy strategies of municipalities in many port-cities worldwide to encourage innovations in constantly evolving port areas. This could help the re-development of vacant ex-port land, while also offering new economic orientations for the city and the port. The aim of the paper is therefore to explore what conditions are needed to facilitate and encourage start-ups in innovation ecosystems in the port-city interface. The analysis is based on two in-depth case studies of the port-cities of Montreal (Canada) and Rotterdam (the Netherlands). The results indicate that government initiatives to actively facilitate start-ups in formerly industrialized port areas are quite successful. However, the functional linkages between start-ups and port activities remains rather limited, if not entirely absent, and the impact on the functioning of the innovation ecosystem at large is not substantial. Other factors such as capital, collaboration and proximity are valued more than the physical location of the start-up. In this, other actors in the ecosystem besides the municipality and the port authority also play a key role. Furthermore, start-ups often feel limited in their innovative capacity because of stringent regulations and institutional rigidity. Governments and port authorities could facilitate in this respect by working more demand-driven in terms of unburdening and creating more institutional support, instead of imposing top-down rules and regulations to try to govern the ecosystem, which in itself can be considered a contradiction in terms.

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1. Introduction

Port development and the evolution of the port-city interface has been at the centre of scientific attention for decades (see e.g. Bird, 1963, 1971; Hoyle, 1989, 2000; Hayuth, 1982, 1988; Norcliffe et al., 1996). The current scientific debate mainly focuses on the future spatial and institutional development of port-cities (e.g. Wiegmans and Louw, 2011; Daamen and Vries, 2013). In this, ports and cities can either compete for land or find a way to cooperate. In the competition case, the port and the city can be considered as spatially, economically and organizationally quite isolated and conflicting systems, in which port activities are more aimed towards the global economy, whereas the economic activities of the city are more related to the direct surroundings and the adjacent regions (Kuipers et al., 2015). In the cooperation case, the port-city interface can be considered a fruitful location for

innovation ecosystems, where successful cooperation between port and city can take place (Atzema et al., 2009).

This paper explores the conditions for successful cooperation between the port and city by looking at the potential of start-ups and innovation ecosystems in port-cities. Port-cities might be expected to operate differently towards innovation because of the economic importance of the port sector and the special role of the port authority in terms of (port) governance. In this light, facilitating start-ups located in former industrialized port areas could help the re-development of vacant ex-port land, while also offering new economic orientations for the city and the port. Or, as Hall and Jacobs (2012, pp. 203–204) point out: “Stronger ties between port business community, workers and research and education institutes may be encouraged, in which both the port authority and the local government can act as a facilitator. Policy-makers can set up policy platforms that bring a wide variety of local industries together, in particular knowledge intensive business services, to think about each other’s business problems. This cross-fertilization can be supported by encouraging spinoffs and start-ups, and not just focusing established firms”. Therefore, the aim of the paper is to explore what additional and

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different conditions are needed to facilitate and encourage start-ups in innovation ecosystems in port-cities as compared to non-port cities.

Facilitating start-ups located in the port-city interface is one of the current policy strategies of municipalities in many port-cities worldwide to encourage innovations in port areas (Duvivier and Polèse, 2016). However, start-ups are not a new phenomenon, for the starting-up and closing-down of businesses is a continuous process, and the failure rates of start-ups can also be as high as 90%. At the same time, recent research into spatial dynamics of start-ups confirms the highly stable locational pattern of start-ups in urbanized economies (Koster and Hans, 2017), which reinforces the urgency to analyse the potential of start-ups for port-cities. Especially in the light of challenges such as the energy transition, ICT developments (e.g. big data and Internet of Things) and new technologies like 3D printing, robotics and drones, it could be argued that port authorities and city governments could benefit from increased and long-term cooperation with start-ups in innovation ecosystems. However, the question remains whether and how port-city governance can or should promote and exploit these opportunities, and whether municipal governments indeed should actively promote start-ups in innovation ecosystems. This results into the following research question: “How can governments facilitate the potential of start-ups for port-cities?” The exploratory analysis of this paper is based on two in-depth case studies of the port-cities of Montreal (Canada) and Rotterdam (the Netherlands), in which over twenty interviews have been conducted with various stakeholders in the innovation ecosystems.

The paper is structured as follows. Section 2 develops the analytical framework for studying the geography of innovation ecosystems in the port-city interface. Also, the methodology and data collection is described. Section 3 describes the characteristics of the innovation ecosystems in the port cities of Montreal and Rotterdam. In Section 4, the potential of start-ups in the innovation ecosystems of the port-cities of Montreal and Rotterdam is analyzed. The final section contains the discussion and conclusions of the paper.

2. An analytical framework for innovation ecosystems in port-cities

2.1. Towards a framework for innovation ecosystems in port-cities

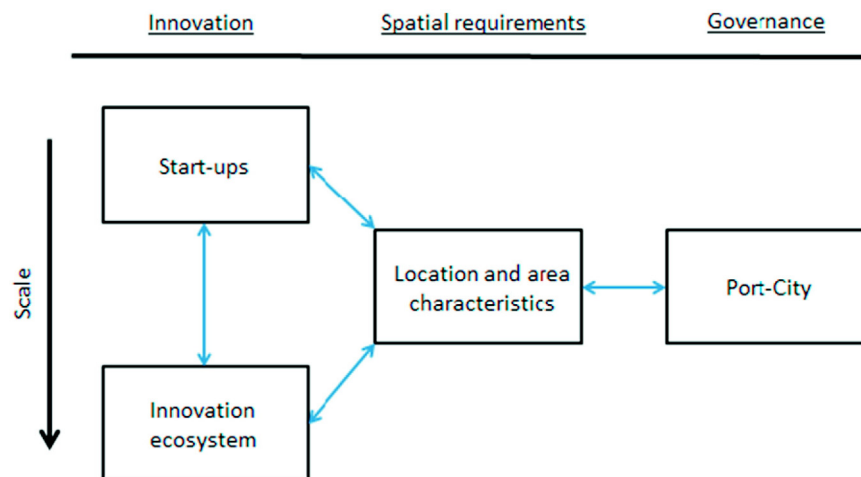
Ever since Bird (1963) published the first conceptual model of port development, spatial and transport scientists have continued analyzing and conceptualizing the relation between port form, port function and the port’s spatial and functional relationships with adjacent cities.

Particularly the work of Charlier (1992) has made the links between ports and cities explicit by discussing waterfront redevelopment and the regeneration of port functions in derelict areas. The relation between ports and cities is also taken up by Olivier and Slack (2006) in their review of port research literature, in which they take a holistic view towards port-city development and suggest an interdisciplinary dialogue between transport and economic geography to deal with the new empirical realities in the port-city interface. The port-city interface has also been extensively studied by Hoyle (1989, 2000), Hayuth (1982, 1988), Charlier (1992) and Norcliffe et al. (1996).

More recently the main scientific interest focuses on the future spatial and institutional development of port-cities (e.g. Wiegmans and Louw, 2011; Daamen and Vries, 2013). However, up to now in port geography literature, the potential of start-ups and innovation ecosystems in port-cities remain a relatively new and underresearched aspect of port development (cf. Ng et al., 2014). We argue that facilitating start-ups located in former industrialized port areas could help the re-development of vacant ex-port land, while also offering new economic orientations for the city and the port, for instance in terms of employment opportunities. As Hoyle argues, “[a port-city] interface may be conceptualized as an interactive economic system, especially in terms of employment structures” (Hoyle, 1989, p. 429). We propose a new analytical framework to better capture this. To this end, first, a definition of innovation ecosystems and start-ups is provided. Second, by examining location and area characteristics through the economic geography concept of proximity, start-ups and innovation ecosystems will be linked to the geography and governance of port-cities. These major aspects are joined in the framework below (Fig. 1).

We thus identify four components that are interrelated and of relevance: 1) start-ups, 2) the innovation ecosystem, 3) location and area characteristics, and 4) the port-city. To the left side of the framework, the innovation is determined by the start-up that develops the innovation and the wider innovation ecosystem that the start-up is embedded in. The start-up component is mainly based on factors such as availability of knowledge, ideas and talent (Luger and Koo, 2005). The innovation ecosystem stresses the importance of entrepreneurship and access to markets and other aspects of the innovation system needed to foster innovation (Stam, 2003; Cahoon et al., 2013).

The spatial requirements of the port-city interface have been added to the center of the framework to discuss location and area characteristics like accessibility, proximity, and locational preferences of start-ups (Boschma, 2005; Hall and Jacobs, 2010). This is the part which potentially can be facilitated by the municipal government and where the



Source: authors’ own

Fig. 1. Analytical framework for innovation ecosystems in port-cities.

relation with the geography of the port-city becomes relevant. Finally, to the right side of the framework, this spatial component is raised to governance on the port-city level because besides the port-city interface, other city areas might also host start-ups (Hall and Jacobs, 2012; Hall et al., 2013), or other actors such as port authorities might be involved. The different dimensions and indicators are briefly outlined in the following sub-sections.

2.2. Start-ups

Start-ups are usually small companies with a limited number of employees (or owners) who together work on new ideas or products and seek market introduction. Luger and Koo (2005) define start-ups as new (i.e. recently established), active (i.e. in the business of selling goods or services) and independent (i.e. not related to larger companies in regulatory, financial or functional ways). Organizations such as incubators and accelerators can function as a connection between start-ups and potential customers and investors (Bergek and Norrman, 2008; Isabelle, 2013). Another possible trigger for start-ups is private equity funding. Although a venture capitalist can bring money, experience and (tacit) knowledge to a start-up, some start-ups are reluctant to engage with a private investor because it lessens their independence (Freeman and Engel, 2007). By means of production synergies and cooperative learning, the (technological) risks of start-ups can be limited to some extent (Simmie, 2001). Therefore, the relation between the start-up and the innovation ecosystem is important.

2.3. Innovation ecosystem

Innovation ecosystems can be defined as “the large and diverse array of participants and resources that contribute to and are necessary for ongoing innovation in a modern economy” (Massachusetts Technology Collaborative, 2016). Ecosystems include entrepreneurs, investors, researchers, venture capitalists, as well as business developers, policy-makers and students. Innovation ecosystems are conceptually closely related to clusters of innovation, regional innovation systems or innovative milieux. The common denominator is that they all focus on interactions and mutual learning (Moulaert and Sekia, 2003). In this, the role of human capital is highly relevant for the success or failure of innovation ecosystems. Human capital involves the access to a skilled workforce, knowledge and talent for future developments. These include institutions and public umbrella organizations, private sector, communal networks and academics (i.e. universities). Studying innovation ecosystems therefore also means analyzing the inter-organizational network relations in which firms are involved (Stam, 2003).

When looking at a port and its hinterland the innovation ecosystem is usually framed as a regional innovation system (RIS). In this system and its associated networks port authorities can play a leading role in enhancing the overall innovation strategy, facilitating social collaboration and knowledge creation among stakeholders (Cahoon et al., 2013). Looking at the added value in terms of employment and investments, the economic importance of ports can be best approached regionally or even nationally (De Martino et al., 2013). When speaking of a port-city innovation ecosystem and its impact it is therefore relevant to look beyond city borders to the governance of the wider port-city region (Hall et al., 2013).

2.4. Location and area characteristics

Geographic location is a key factor for both start-ups and other actors in the innovation ecosystems. Start-ups and innovation ecosystems have spatial requirements which are best captured by looking at location and area characteristics. In this, we mainly use the proximity between firms concept stemming from economic geography (Boschma, 2005). Also Bathelt et al. (2004) have looked into the relation between proximity and knowledge co-creation between firms, leading to

innovations. We explore the concept of proximity between firms in the light of innovation ecosystems in the port-city interface, in which the start-ups can be seen as firms that are potentially sensitive towards different types of proximity.

Different types of proximity include territorial, cognitive, organizational, social, relational, cultural and institutional (Boschma, 2005). Territorial proximity is concerned with the absolute and relative proximity between actors, in which available physical space and accessibility are of prime importance. Cognitive proximity deals with mutual learning, which is facilitated by agglomeration externalities. Organizational proximity embeds joint agreements between organizations, for instance with respect to programming. Social or relational proximity usually happens at the micro-level of networking between individuals. Clusters are presently the privileged spatial frame for the conciliation of social or relational proximities (De Langen, 2002). They facilitate organizational and cultural proximity, for instance collaboration, complementarity as well as facilities and services sharing between companies. Institutional proximity refers to overlaps in formal and/or informal regulations between actors.

In the port-city, the different types of proximity interact with each other in complex ways. On the one hand, ports' inclusion in global supply chains is disrupting organizational and cognitive proximities between port users (Hall and Jacobs, 2010). On the other hand, institutional and social proximities seem to be the way to counterbalance the globalization of activities, but at the same time it has proven difficult to attract new industries to a region if they are technologically distant from the present local activities (Neffke et al., 2011). Also, territorial proximities are now recognized to ensure innovation and local value capturing. Finally, it is increasingly recognized that knowledge exchange and innovation are to a greater extent determined by cognitive proximities instead of territorial proximities (Atzema et al., 2009) and that the knowledge economy requires even more relational proximities (Jacobs et al., 2011). While social or relational proximities might serve entrepreneurship; too much cognitive proximity can also lead to in-breeding and lack of openness. Innovation ecosystems in the port-city region involve multiple stakeholders with different types of proximities and are cutting through different types of formal and informal institutions. Because of this complexity, port-city governance is needed.

2.5. Port-city governance

Governments can facilitate the potential for start-ups in port-cities. Facilitating can be directly aimed at the start-up, but also at the functioning of the wider innovation ecosystem. As huge landlords in city-centers, ports are also natural partners of cities and may have their card to play in collaborative urban planning (Woudsma, 2012; Hall and Jacobs, 2012). Depending on the interests and power of the stakeholders involved, governments at different levels can choose either a low regulation or a high support route related to start-up policies (Van Stel et al., 2007). In the low regulation route, governments enable start-ups to start off their business as quickly and cheaply as possible, with minimal regulations. In the high support route, information, advice, training and finances are provided to actively support the start-ups in starting off their business. What type of route to take is dependent on the specific characteristics of the governance network (Wolfe, 2013), so the context has to be consciously studied. The governance component encompasses the port-city region as a whole. Governments can offer some opportunities to the start-ups through the role of formal regulations and through more informal governance arrangements in creating a favourable start-up climate in terms of support and policies in all identified fields above.

2.6. Methods and data collection

Qualitative interviews have been performed with start-ups and other stakeholders in the innovation ecosystems of the port-cities in

Montreal (Canada) and Rotterdam (Netherlands). Interviewing with start-ups was used to explore why they have chosen a particular location in either of the cases (Montreal and Rotterdam), and what factors have contributed to this location decision. The definition of Luger and Koo (2005) mentioned before – new, active and independent – was used to select the start-ups for the interviews. In both case study areas, respondents have been selected that: 1) are established max. 5 years ago; 2) are active with their business in the port areas either functionally or spatially and 3) are neither dependent on leader firms, nor are a spinoff from other companies.

Start-ups are but one type of stakeholder in the entire port-city innovation ecosystem. Based on a stakeholder analysis in each of the case study areas, additional stakeholders have been identified and interviewed, including incubators, accelerators, port authorities, port companies, universities, innovation districts and municipalities. Table 1 summarizes the data collection. By exploring two entirely different cities, the importance of understanding context-specific, place-dependent factors is stressed (see Pierre, 2005). Based on an initial screening of academic literature stemming from innovation theory, economic geography and urban planning a topic list was created. The topic list used was identical for both cases, which ensured a common basis of comparison between the two case study areas. The total of 23 in-depth semi-structured interviews (Table 1) have been recorded and transcribed, which allows for a rich set of data that can be used in the analysis.

3. Innovation ecosystems in the port cities of Montreal and Rotterdam

This study focuses on two case study areas which are both in the process of developing innovation ecosystems and facilitating start-ups in industrialized old port areas: Montreal (Canada) and Rotterdam (the Netherlands). As such, they can be seen as two rather typical examples from both the American and the European continent of contemporary port-cities trying to address innovation in their port areas, dealing with redevelopment of vacant ex-port lands and actively promoting start-up activities. Although they do not stand out as worldwide best practices of innovative (port-)cities, they do follow the general trend of engaging in various strategies to stimulate innovation through all kinds of triple-helix collaborations, ecosystem approaches, urban entrepreneurialism, and the like (cf. Harvey, 2002). Port-cities are distinctive from other (non-port) cities in a number of ways, including the availability of large sites with quay access, usually but not typically a relatively lower educated labor force, relatively larger freight transport flows through the city and higher levels of environmental damage due to freight transport. Rotterdam and Montreal are similar in these respects, which distinguishes them from non-port cities. In both cities, the relation between innovation ecosystems, start-ups and the port-city poses

interesting challenges, but the context is different. In this section, both cases will be introduced.

3.1. Montreal: port, city and start-ups

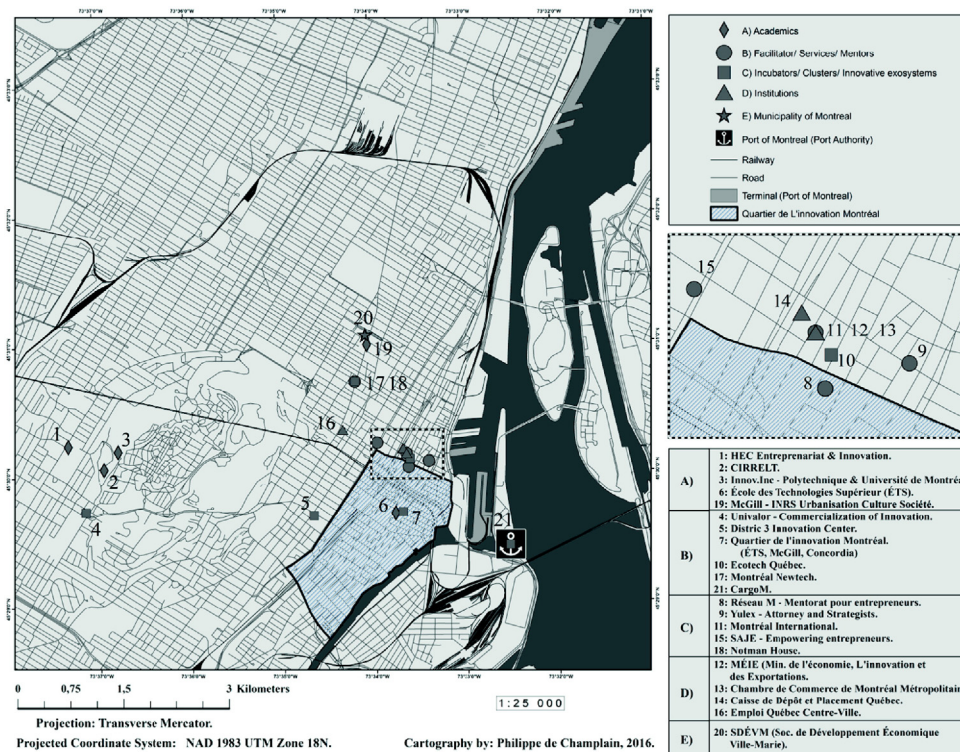
The case of Montreal is interesting, because it is a major metropolitan area (over 4 million inhabitants) that is undergoing an adjustment having been replaced by Toronto as the financial and business center of Canada. Despite this, Montreal retains important cultural and knowledge based capital, along with some more traditional manufacturing and transport-oriented sectors. The city of Montreal has a great interest in regeneration in both traditional and non-traditional economic activities. The new mayor of Montreal gave impetus on innovative ecosystems with his politics to build a ‘smart and digital city’ in Montreal. For instance, Concordia University has recently established a new innovation hub called ‘District3 Center’, which aids the formation of new start-ups and to which currently over fifty start-ups are affiliated. Also, the old port area of Montreal was set as the location for the 2016 International Start-up Festival, a global gathering of entrepreneurs, founders, investors and mentors. Recently, a Hackathon was organised by the Port of Montreal, paying specific attention to addressing port-issues through innovative start-up ideas.

Start-ups have been important actors in the historical development of the port of Montreal (Slack, 1988). Nowadays, some of the port activities have spatially as well as functionally diverged from the city, but at the same time there are still spaces of major and persistent conflict in the port-urban interface. The city has already gained port territory on the industrial district around the Quartier de l’Innovation in the Griffintown District, a nineteenth century industrial district located at the eastern locks and basins of the old Lachine Canal that was closed in 1970 (Fig. 2). Becoming obsolete after containerization, the area is now converted in residential, touristic and recreational places. The city and its residents are however still claiming more space in the Old Port District, which belongs to the federal government and is still hosting some port activities. The port – with a throughput of 30 million tons/year – is also intensifying its activities on sites adjacent to low income zones such as Maisonneuve and Hochelaga by renovating general and bulk cargo berths for containers. Tensions exist there since the 1990s at least, crystallized around two issues: the access to the river Saint-Lawrence and the road congestion generated by the trucks driving in and out of the port area. The Port of Montreal is one of the main Canadian gateways, that services extensive hinterlands penetrating deep into the US Mid West and Ontario. The port hosts over 2000 vessels per year and 60 to 80 trains per week. The port activity translates into 2,1 billion dollars in added value to the Canadian economy (Port of Montreal, 2017). In this context, it is interesting to analyse the spatial and functional relations between the port authority and port businesses

Table 1
selection of respondents in Montreal and Rotterdam.

Montreal			Rotterdam		
Stakeholder	Type	Date	Stakeholder	Type	Date
COMMORG	Start-up	16-5-2016	Vita.io	Start-up	19-5-2015
Le Tableau Blanc	Start-up	16-5-2016	Better Future Factory	Start-up	9-6-2015
Uvolt	Start-up	21-6-2016	Funk-E	Start-up	4-6-2015
Quartier de l’Innovation	Incubator/innovation district	13-5-2016	Jules Dock	Start-up	4-6-2015
INRS Centre Urbanisation Culture Société	University	16-5-2016	Odico ApS	Start-up	22-5-2015
CargoM	Logistics promotion company	17-5-2016	Port-able	Start-up	28-5-2015
Port de Montreal	Port authority	17-5-2016	Invoice Sharing	Start-up	10-6-2015
Ecofuel	Accelerator	18-5-2016	supRmen	Start-up	26-5-2015
InnoCité Mtl	Municipal accelerator	16-5-2016	TWNKLS	Start-up	16-6-2015
			Cambridge Innovation Center	Accelerator	27-6-2015
			Port of Rotterdam	Port authority	8-6-2015
			Erasmus University (two academics)	University	20-5-2015
					2-6-2015
			Municipality of Rotterdam	Municipality	20-6-2015

Source: authors’ own.



Source: authors' own

Fig. 2. the port-city of Montreal.

and the upcoming start-up activities and innovation district in the former industrialized parts of the old port area. While innovation is high on the Montreal policy agenda, at first sight this does not seem like an obvious link made by the actors in the port area.

3.2. Rotterdam: port, city and start-ups

The port of Rotterdam (throughput: 465 million tons/year) serves nearly 30,000 sea-going vessels and over 100,000 inland vessels a year. In terms of employment, the port ensures 175,000 jobs, while the total direct and indirect added value amounts to over 20 billion euros, which is 3% of the Dutch gross domestic product (Port of Rotterdam, 2017a). With its large petrochemical cluster and the innovative APM and RWG container terminals on the Maasvlakte II, the port of Rotterdam is currently facing multiple challenges. First, large investments in container handling capacity combined with limited growth in container volumes poses a challenge. Second, road congestion to and from the port area (via the A15 motorway) is calling for capacity extension which is currently under way (Fig. 3). Next to these two 'traditional' infrastructure challenges, the port is also involved in innovations. Rotterdam envisions to developing its port area into a 'knowledge port' or 'the smartest port in the world' (Port of Rotterdam, 2011). In this light, a stronger focus on new technological developments and markets, such as Internet of Things, Offshore Energy and Smart Maritime Maintenance, can be expected.

The municipality and the port authority have subsidized a diverse array of start-up initiatives like the Cambridge Innovation Center (CIC), Erasmus Center for Entrepreneurship, PortXL, Port Innovation Lab, Venture Café, and RDM Centre of Expertise. Some of these organizations specifically focus on port-related start-ups and cooperate intensively with traditional port corporates like Vopak and Boskalis to address challenges these companies are facing and therewith connect the start-ups to their potential markets and user cases. The main issue seems to be suboptimal cooperation between port and city, which

possibly harms the degree of innovation in the port area (Kuipers et al., 2015). The city (600,000 inhabitants; 2.3 million in the metropolitan area) with a large array of business service companies (e.g. insurers, lawyers, etc.), especially for the port and maritime industry, is complementary to the port. However, an OECD report on the competitiveness of global port-cities observed a mismatch between the port of Rotterdam and the economic performance of the city of Rotterdam (OECD, 2013). It was stated that a leading maritime cluster should be complemented with a higher metropolitan quality of life in order to create a more favourable business climate.

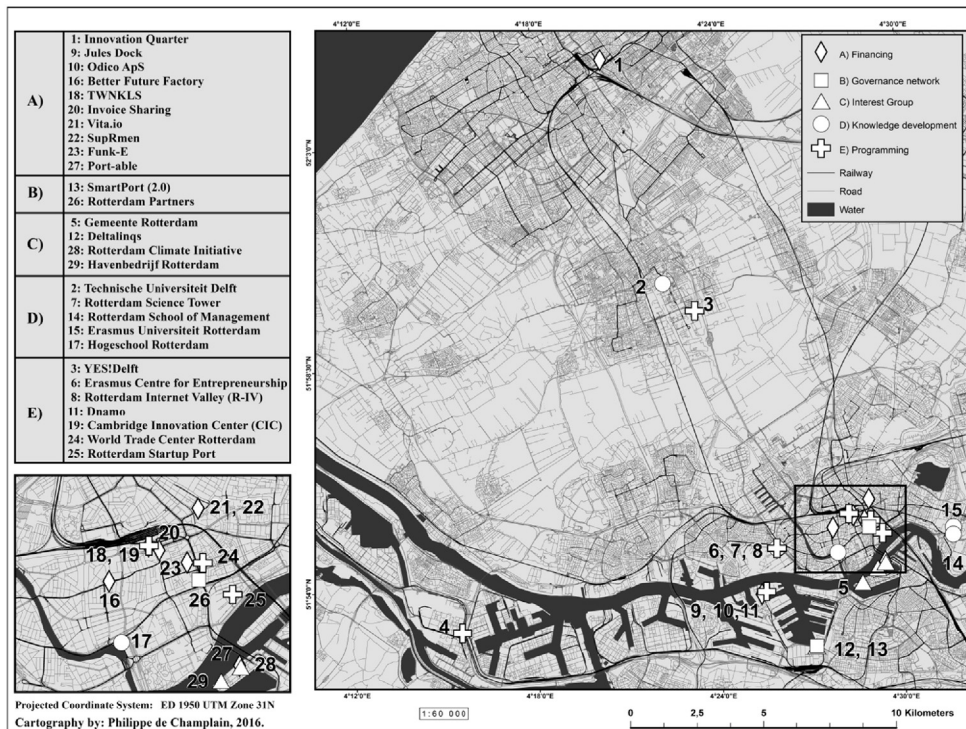
In sum, Montreal and Rotterdam – although being different to one another in terms of port size and city size – are both facing the challenge of spatial transformations in their traditional industrialized areas and are engaged in start-up activities. In addition, they are both experimenting with facilitating innovation quarters on formerly industrialized port zones, like many contemporary ports and port authorities that aim to develop dedicated policies and areas for start-ups related to port activities nowadays. However, the question remains how port-city governance can promote and/or exploit these opportunities. The relation between port, city, the port-city interface, the innovation ecosystem and start-up companies is visualized in Fig. 4.

4. Facilitating start-ups in innovation ecosystems in port-cities

4.1. The case of Montreal

4.1.1. Start-ups: diversity in functions without a clear link to the port

In general, the interviewees from the start-ups regarded the International Start-up Festival as an important professional event. They indicated that Montreal is a good open-minded place to innovate. According to them the main issue for start-ups that wish to rise to the next level is the need for more collaboration between start-ups and a closer involvement of municipalities. They indicate that incubators and accelerators are places for technological start-ups only. This is illustrated by the



Source: authors' own

Fig. 3. the port-city of Rotterdam.

following examples of start-ups located in or close to the Quartier de l'Innovation (QI) in the Griffintown district.

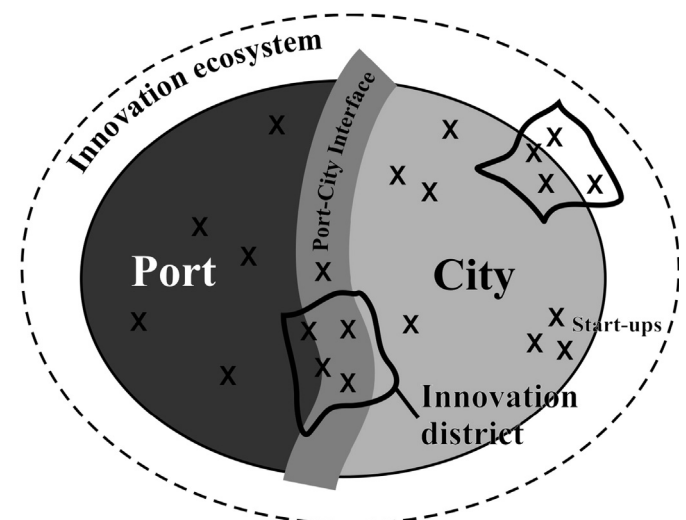
Within the QI, COMMORG is a start-up in internal communication services. Its choice of location was determined by low rental costs. It feels disadvantaged in the QI because the company is not technologically oriented. In contrast, the technical start-up Uvolt develops green mobile batteries, and is one of the big successes of the QI. They are funded and hosted in the QI, and Uvolt is growing. COMMORG on the other hand operates with financial support from crowdfunding (La Ruche Montréal) and federal banking (The Development Bank of Canada). Outside of the QI is Le Tableau Blanc; a start-up which hosts a co-working place. Locating in the QI was considered as too expensive because the firm requires more space than the average start-up. Its clients are start-ups and freelancers. As a non-technological enterprise it does not benefit from major funding, similar to the example of COMMORG. Funding is scarce for non-tech start-ups, despite good contacts with the Métropolitain Montreal Chamber of Commerce and the Board of Trade. The start-up feels constrained by the local regulations which do not allow him to organize music shows or festivals.

4.1.2. Innovation ecosystem: plenty of institutional support

Different forms of institutional support have helped define the specific character and development of Montreal's innovation ecosystem. First, the combination of acquired skills and the desire to innovate is driving Montreal's ecosystem. Montreal hosts four universities (McGill, Université de Montréal, Concordia and Université du Québec À Montréal) which represent a combined enrolment second only to Boston in North-America. In addition there are several technical colleges and schools such as École de Technologie Supérieure, Hautes Études Commerciales and Polytechnique. They have together established several innovation districts to help staff and students define and implement new activities (examples include District3, Centech, Centre Dobson and the before-mentioned Quartier de l'Innovation [QI]).

Second, access to capital is a critical factor for most start-ups to survive in the innovation ecosystem. In Montreal both public and private

sources are accessible. Public funding agencies include federal (Bank of Canada, the Development Bank of Canada), provincial, (Caisse de Dépôt et de Placement du Québec, Fonds de Solidarité du Québec) and municipal (PME.Mtl) governments. There are also taxation concessions and subsidies including tax credits, direct tax discounts, and rental subsidies. These incentives normally do not require match funding from the start-ups themselves, and may constitute important in-kind contributions. For instance, free access to services is provided by public and private sectors, including co-working places (La Gare, La Ruche, La Commune, Salon 1861, etc.) and incubators and accelerators (Notman House, Ecofuel, InnoCité Mtl, Centech, District3, etc.).



Source: authors' own

Fig. 4. Start-ups in the port-city innovation ecosystem.

Several commercial banks (Bank of Montreal, National Bank, Caisse Desjardins) have been instrumental in supporting innovation by providing small initial loans to prospective entrepreneurs with ideas for new products and services. There are venture capitalists from Silicon Valley (Cycle Capital, Funders Institute) that have established start-up networks in Montreal, whose goal is to identify promising new candidates for initial support and then selection for major capital injection, but with a reported selection rate of below 5% of the initial candidates. New types of funding sources are being accessed as well, such as crowdfunding, seeding and hands-on, angel investors, and venture capital. At the same time, the need for legal and accounting help is drawing lawyers (BCF), auditors (Deloitte) and other specialized services onto the scene that are contributing to unique ecosystems. In most cases, however, the accessed capital is hybrid, with various combinations of private-public-individual sources being approached. Partners are required to take risk, because the rate of success is low.

Finally it must be recognized that Montreal has a culture quite different from the rest of North-America. It is based on important community characteristics especially among the young: a unique mix of ethnicity, culture, languages, history, and entrepreneurship. This association is complex, with French-speakers being more deeply engaged in local communal networks whereas English-speakers are more oriented towards more global commercial networks. This produces a dynamic community in which social cohesiveness and risk taking are combined. The social and intellectual capital in Montreal thus is favourable to start-ups, with a large young and well-educated population, that accepts risk taking and yet possess a strong local identity.

4.1.3. Location and area characteristics: importance of relational proximity

In 2013 the Griffintown district was designated as the Quartier de l'Innovation (QI) by the city. The goal is for it to be a whole innovation ecosystem that is integrated and geolocalized. It is impossible to accurately obtain the actual number of startups either in QI or other clusters. For example, District3, just one of the accelerators, but with close links to Founders Institute in Silicon Valley, claims to have assisted 300 startups over 3 years. The QI claims to have the highest number of young entrepreneurs in Montreal. The availability of different types of low cost commercial and industrial space, yet within a short distance from the downtown core and the diverse character of the neighborhood are distinct locational attractions for start-ups. Proximity with clients, peers and partners is therefore a particular requirement in the innovative economy of Montreal. Start-ups can be gathered in co-working places, incubators, facilitators and accelerators where proximities are intense. Relational proximity is of particular importance here. As pointed out by a strategic advisor of Ecofuel – a private accelerator in clean technologies – start-ups need relational proximity with well-established companies, rather than proximity to other start-ups, to benefit from assistance and exploit opportunities that these larger companies can provide them.

4.1.4. Port-city governance: mainly vertical relations; few horizontal relations

Different levels of government have policies to promote innovation and entrepreneurship. The Federal Government had been involved in funding general local economic development through the CEDC (Canadian Economic Development Corporation). The provincial government is a partner too in this corporation, but it has its own CLDs (Centers Locaux de Développement) whose mission is to support entrepreneurship. Created in 1998–1999 these bodies have been affected by austerity cuts in their funding and recently the municipal government of Montreal has played a more central role. The present mayor of Montreal, Denis Coderre, has been a catalyst and has reorganized the CLD network and its funding, vowing to make Montreal a 'smart and digital city'. A mentor of InnoCité Mtl, the municipal accelerator which hosts mostly social and digital start-ups, believes that this had an important impact on the city's ecosystem and that the publicly supported ecosystem is therefore now

emergent, prolific and diversified. The city is now playing a role in promoting ecosystems of start-ups, through several bodies: Réseau M, Fondation Montreal Inc. and CEIM (Centre d'Entrepreneuriat d'Innovation Montréal), a non-profit company dedicated to fields including information technology, new medias, clean technologies and life sciences). These publicly supported ecosystems are now emergent, prolific and diversified.

The Port of Montreal is not yet very actively involved in governing the innovation ecosystem of Montreal. Furthermore, none of the start-ups nor the promoters that were interviewed had considered the possibilities of linkages with port businesses. In discussions with academics and other observers of business developments in the city, the port and its operations were seen as 'terra incognita'. This is to some extent remarkable, since spatially (i.e. many start-ups locating in former port areas) as well as functionally (i.e. much potential for technology related start-ups to contribute to ICT innovations in the maritime sector) some interesting cross-linkages could be envisioned. What is clear, however, is that historically the port has been apart largely from civic life. The port authority is presently making efforts to engage with local communities, mounting public events and publishing a newsletter, but its activities are still largely unknown to all but those who work in the field. In addition, the port is a major partner in CargoM, an association whose objective is to exploit and expand integration between the transport industry and users, particularly logistics. There is little doubt that port businesses and operations could benefit from the information economy. Many of the challenges facing ports in fields such as logistics, materials science, environmental monitoring are amenable to innovative solutions that start-ups may provide. To engage with start-ups, the port authority needs to open itself up to the innovation communities and ecosystems that are now in place in Montreal, and promote non-traditional activities. The recent Hackathon that was organised by the Port of Montreal is a good example of advancing relations between the port and the start-ups in the innovation ecosystem.

4.2. The case of Rotterdam: various innovation hubs, one innovation ecosystem

In Rotterdam, several public and private investments have been made to realize an innovation ecosystem which is necessary for start-ups to succeed. This infrastructure consists of incubators, accelerators, shared office spaces, test facilities and networking events (Fig. 5). This case study covers several insights of local start-ups, policy makers, academics and the port authority to sketch a complete overview of the settlement climate for start-ups.

4.2.1. Start-ups: creating an entrepreneurial region

According to the Cambridge Innovation Center (CIC) the three main ingredients for a good innovation ecosystem in Rotterdam are money, ideas and talent. Start-ups in Rotterdam do not have a regional focus when searching for talented employees. Because a lot of innovative start-ups ask for a specific type of skilled workforce the scope is more national or international. Opportunities for attracting talented start-ups can be the involvement of students from universities, but also from graduate schools, with start-up initiatives in the city and port. This can be achieved by offering internships, work experience places, guest lectures or excursions. This stimulates the commitment of students in the innovation ecosystem and students get in touch with the possibilities of becoming an entrepreneur themselves. According to the start-ups in Rotterdam there is a tendency from students towards working for a start-up instead of for a SME or corporate. This is stimulated by several initiatives, such as the Erasmus Centre for Entrepreneurship, which connects the academic world to the entrepreneurial world. According to the interviews there is a good infrastructure of top universities and several graduate schools which are involved in the port-city innovation ecosystem. However, there is still a challenge for local authorities to retain the talent in the city and port of Rotterdam by connecting the innovation hubs to

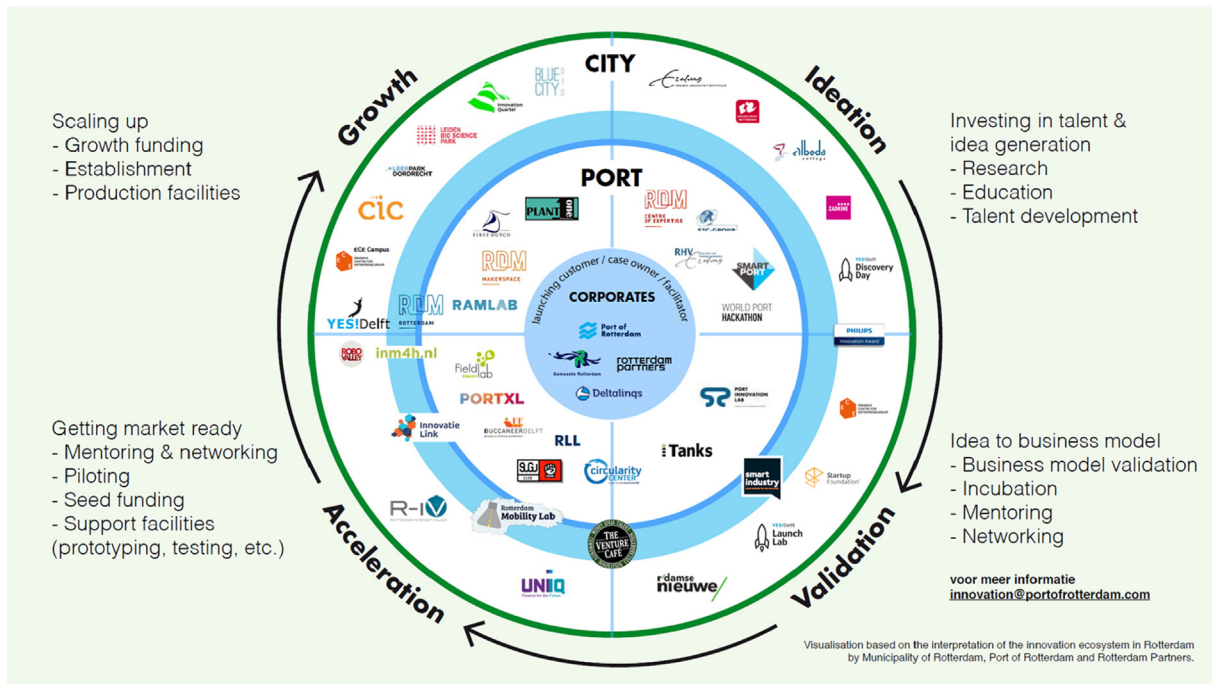


Fig. 5. Port-city innovation ecosystem of Rotterdam. Source: Municipality of Rotterdam, Port of Rotterdam (2017b).

educational organizations and facilitating the initiatives that spin out of it. As one of the interviewees argues:

“What really disappointed me was that when I was studying International Business Administration at the Erasmus University, there wasn't a class or course in which I could learn how to start and run a business. At that time I was actually starting my own company, but there wasn't a lecturer or professor that I could approach with questions on for example my business model.”

This facilitation process can involve offering network possibilities, possible financing for pilots but also a potential office or test facility for students that start an enterprise in Rotterdam. On the other hand, we could also state that despite the institutional back-up provided by e.g. universities, in the example above the start-up has ‘survived’ nonetheless. This is in line with work by Jacobs et al. (2014) who looked at the survival rate of new entrepreneurs in the Utrecht region and found that university support hardly played a role in the success of these start-ups. It is therefore hard to say based on these few individual cases, for instance, by what percentage the success rate of start-ups would increase with more or decrease with less institutional support. Additional research is needed here.

4.2.2. Innovation ecosystem: connecting the old to the new

Some complementary advantages can be found with start-ups and the potential of crossovers between start-ups and corporates from different markets. One of the potential roles for port corporates in the start-up ecosystem can be functioning as a launching customer when a specific start-up offers a relevant solution for the companies' challenges. An example is a recently closed deal between a software start-up Portcall and the port corporate Vopak who are both involved in the PortXL programme by the local port authority. This example stresses the importance of connecting the old, conservative port business to the new, innovative start-up world. These types of connections can be stimulated by involving corporates in the existing incubation programs or matchmaking events, but also by setting up new innovation programs based on specific challenges of the corporates.

Looking at the possibilities for private equity funding, people refer to the Silicon Valley-model in which angel investors and venture

capitalists operate as dedicated mentors for the start-up community. Herewith the challenge is localizing these angel investors which often operate ‘under the radar’. But one of the interviewees argues that localizing the good start-ups is a challenge too:

“The focus of one of our programs is to attract potential angel investors to our community. But that is just one side of the story. The other side is a huge load of start-ups, of which the majority has no experience with selling their product. You don't want to confront potential angel investors with the unexperienced start-ups.”

Recently, a Rotterdam millionaire, together with the port authority, launched an investment fund called the Rotterdam Port Fund, which especially targets innovative port and maritime companies. There is also a role for incubators and accelerators in involving investment funds in their programming and therewith making capital more accessible for start-ups. The regional investment company Innovation Quarter recently decided to open a new office in the Cambridge Innovation Center (CIC) in Rotterdam to be nearby the start- and scale-up community.

4.2.3. Location and area characteristics: proximity and room for experiments

It can be stated that it is not essential for a port-related start-up to be located in the port area. Several start-ups prefer other locations in the city which are more accessible, while still being able to have functional linkages with the port. For physical innovative products a location in the port area can be of added value because it enables working on a larger scale in an industrial setting (e.g. 3D printing or robotics). As one of the interviewed start-ups argues:

“I was looking for a place to install my robots and then I realized that I needed an industrial environment. This location within the port offers the possibility to explore the new innovative manufacturing industry.”

For digital innovative products the accessibility (by car or public transport) of the office space is of major importance to the start-ups. These types of start-ups will therefore prefer the Rotterdam Central District. Start-ups in Rotterdam underline the added value of proximity to other start-ups, but also to their markets, corporates and investors. They acknowledge the advantage of proximity to other entrepreneurs. Cross-sectoral knowledge exchange is especially of interest here.

Overall the knowledge intensive start-ups in Rotterdam seem to value basic location preferences, which can be fulfilled by the current supply in the city. With the redevelopment of the Merwe-Vierhaven city-port area together with the RDM Campus on Heijplaat as the Rotterdam Innovation District (RID), the demand for larger scale production and test facilities by start-ups that are scaling up their business can be met too.

4.2.4. Port-city governance: the entrepreneurial state

Discussions on the role of regulations often start from the assumption that there is a strong tension between regulations and innovation, because innovations are new and regulations are based on existing, common practices. According to the start-ups in Rotterdam the first step needed is to become more efficient by shortening the current procedures. Especially port-related start-ups are struggling with validating their product and business model according to strict requirements in the port sector (safety, security, etc.). It is unfavourable to be required to go through long-term regulation procedures before setting up a test location in the port. These test locations can be essential in validating the product and therewith acquire the first clients. More generally viewed, regulations can also enlarge the threshold for potential entrepreneurs to start their own company.

There also is a potential role for the municipality and the port authority in Rotterdam in unburdening the start-ups and assisting them with regulatory duties. By being actively visible and involved in the several incubation programs, this potential role is already partly fulfilled. According to the start-ups in Rotterdam, public parties can also play a key role in the marketing and communication of the innovation ecosystem. They acknowledge that a public party like the municipality is the designated actor to make the innovative capacity in the city and port visible for a wider audience. By doing so, there can be a positive impact on the attractiveness of the innovation ecosystem for (foreign) corporates, investors or other start-ups. A means to promote and stimulate the innovative climate of the city is to facilitate or organize events during which start-ups can get in touch with corporates. For instance, the municipality of Rotterdam provided the Venture Café a subsidy for starting weakly programming to strengthen the connections within the port-city innovation ecosystem. This indirectly covers a financial aspect in the ecosystem. Most entrepreneurs find it undesirable when public organizations provide grants directly to start-ups. A more favourable option would be indirect financing by facilitating a complete infrastructure of incubators, accelerators and comprehensive programming (e.g. matchmaking, events, etc.) of which companies can benefit.

Finally the CFO of the Port of Rotterdam recently graded his own port a 4.5 out of 10 for innovativeness in relation to for example the retail- and financial sector (FD, 2016). This can be seen as a striking statement, because the port has only recently started investing intensively in innovation, while other sectors are far ahead. This statement therefore stresses the relevance of cooperating with the city of Rotterdam, where the retail- and financial (services) sectors are largely present. From a strategic point of view a constant cooperation between city and port in stimulating crossovers between sectors and finding new partnerships can be a promising pathway. The recent launch of the Rotterdam Innovation District in the port-city interface is a new possibility to accelerate the innovative capacity of the port and facilitate a spatial and entrepreneurial connection between city and port.

5. Conclusions and discussion

This paper has focused on the facilitation of start-ups in port-city innovation ecosystems, which is a policy desire of many contemporary port-cities worldwide. For the port cities of Montreal (Canada) and Rotterdam (the Netherlands) we have addressed the question: "How can governments facilitate the potential of start-ups for port-cities?". To address this question, we have developed an analytical framework for studying the potential of start-ups for port-cities, which consists of

four elements: 1) the start-up, 2) the innovation ecosystem, 3) location and area characteristics and 4) port-city governance.

Overall, the results indicate that government initiatives to facilitate start-ups in formerly industrialized port areas are quite successful. However, the functional linkages between start-ups and port activities remains rather limited, if not entirely absent, and the impact on the functioning of the innovation ecosystem at large is not substantial. This questions the particularity of the port-city innovation ecosystem. Other factors such as capital, collaboration and proximity are valued more than the physical location of the start-up inside or outside the port area. Other actors in the ecosystem besides the municipality and the port authority play a key role, in particular private investors (angel investors, multinationals), incubators and accelerators. Furthermore, start-ups often feel limited in their innovative capacity because of stringent regulations and institutional rigidity. Governments and port authorities could facilitate in this respect by working more demand-driven in terms of unburdening and creating more institutional support, instead of imposing top-down rules and regulations to try to govern the ecosystem (cf. Van Stel et al., 2007), which in itself can be considered a contradiction in terms. The port-city could try to focus more on innovations in general and less on port-city innovations in particular. The main conclusions from the case studies are summarized in Table 2.

First, looking at the start-ups, we observe that both in Rotterdam and Montreal capital and investments are crucial for them to survive in the ecosystem. In general, start-ups are in need of any support they can get; be it finance, business, employees, etc. Therefore, collaboration between different sectors of start-ups and relational proximity with knowledge institutions is crucial, which is in line with what we learn from the economic geography discourse on entrepreneurialism in relation to proximity (e.g. Boschma, 2005; Hall and Jacobs, 2010). This is deemed more important than spatial or territorial proximity, i.e. the

Table 2
Overview of the main findings from the case studies.

	Montreal	Rotterdam
Start-ups	<ul style="list-style-type: none"> - Fragmentation between different sectors; need for more collaboration - Capital and investments are crucial to survive in the ecosystem - No clear functional linkages with the port area 	<ul style="list-style-type: none"> - Local ties with knowledge institutions can be strengthened, e.g. through pilots - Capital and investments are crucial to survive in the ecosystem - Capitalising on functional linkages with the port is going on
Innovation ecosystem	<ul style="list-style-type: none"> - Presence of universities who can function as incubators - Different forms of private and in-kind funding compensate a lack of municipal investments - Importance of local culture 	<ul style="list-style-type: none"> - Best practices of private funding (e.g. angel investors) - Possibilities to connect the port sector with innovations (e.g. port corporates functioning as launching customers)
Location and area characteristics	<ul style="list-style-type: none"> - Proximity to (downtown) facilities and fellow start-ups and clients - Cheap rents in former industrialized port areas 	<ul style="list-style-type: none"> - Accessibility and proximity to markets are important for 'digital' innovations - Proximity to the port mainly important for testing and experimenting with physical innovations (e.g. 3D printing)
Port-city governance	<ul style="list-style-type: none"> - Cooperation beyond city borders; multiple levels of government involved - Port authority is starting to become more involved in the ecosystem (e.g. start-up festival, Hackathon, etc.) 	<ul style="list-style-type: none"> - Municipality should focus on unburdening the ecosystem in terms of regulations; more institutional support - Port authority has been slow to adapt to the innovation ecosystem

Source: authors' own.

actual physical location of the start-up. So the functional linkages between start-ups and the former industrialized port areas in which they tend to locate is in many cases not so well established, although there is potential for more functional cross-overs than there are at present. We have identified that the differences between regular and port-specific innovation processes are not very large in this respect. Start-ups are more triggered by basic locational requirements than by port-specific features per se.

Second, and related, is the critical importance of the innovation ecosystems in terms of coaching, advice, knowledge transfer, co-working, etc. This is in both cases supported by strong knowledge institutions which are instrumental in stimulating entrepreneurship among students and define and implement new activities and skills that are necessary for innovative companies. In Rotterdam the universities and graduate schools are actively involved in several incubation and acceleration programs and therewith indirectly stimulate the spin-off of start-ups from universities. Montreal has a dynamic community favoring start-ups, with a large pool of potential talent to pull from (i.e. four universities). It should be stressed that also in this case, the links with port activities or the port authority are not (yet) commonplace, and that while institutional support is beneficial it most likely is not a prerequisite for start-ups to survive in the ecosystem (cf. Jacobs et al., 2014).

Third, when looking at the location and area characteristics, we observe that relational proximity is of prime importance for the success of start-ups and the functioning of the innovation ecosystem. In Montreal, this mostly relates to proximity of facilities and services, fellow start-ups and potential clients. In Rotterdam, relational proximity and accessibility is valued over physical proximity to the port. This especially holds true for 'digital' innovations, which can be considered rather foot-loose in terms of their locational preferences in the port-city. In contrast, some physical innovations such as 3D-printing purposefully locate in the port area because they value the available space and industrial setting of the port area to test and experiment with their products. The main reason for start-ups in Montreal to locate in the port area is cheap rents of the office spaces. Looking at this, it makes more sense for governments to try to facilitate knowledge crossovers in the ecosystem at large instead of in the innovation clusters in port areas per se. This also implies keeping a wider focus for different land uses in the port-city interface instead of actively promoting these areas for dedicated start-up activities only.

Finally, regarding port-city governance, in both Rotterdam and Montreal the municipality plays a proactive role in promoting entrepreneurship and innovation. At the same time, the municipality could also be more supportive either in actively co-funding or in unburdening in terms of regulations and creating more institutional support for the start-ups and the ecosystem. As for the differences, the Rotterdam port authority – after a slow start – is now much more actively involved in several innovation programs than the Montreal port authority. Therefore, the economical and functional linkage between start-ups and the port is stronger in Rotterdam, whereas the Montreal programs focus mainly on tech-related companies without connecting actively with the port. However, recently also the Port of Montreal is starting to become more active in the innovation ecosystem. Overall, our impression is that the rather reactive character of the port authorities is reflected in their roles as facilitators in the innovation ecosystem, and thus their real influence is rather limited.

Several interesting research questions remain, especially relating to the port-specific or distinctive dimensions of innovation processes in port areas. At present, spatial linkages exist but functional linkages between start-ups and port activities are limited. What could play a role here is that many freight transport innovations are business-driven and are done inside transport companies such as terminals or bus transport companies (see e.g. Van der Straten et al., 2007; Wiegmans et al., 2007). Because many innovations take place internally they never end-up in a start-up or in external statistics or reports. This was observed in Montreal, where the port company CargoM is developing its

own apps and technologies without any involvement of start-ups whatsoever. If the innovation works and saves costs, it will be implemented, if not, it will disappear. Also the work of Wiegmans and Geerlings (2010) into sustainable port innovations shows that it is difficult to realize successful innovations in port areas and that especially innovations having impacts in the wider transport chain do show success potential.

Looking forward to potential future research avenues, our case studies present a first overview of start-ups in port-city innovation ecosystems. We found some interesting conclusions with regard to start-ups, their positioning in the innovation ecosystem and the limited influence of municipal governments and port authorities in governing this. Of course, the exploratory case studies of Rotterdam and Montreal cannot justify more generic conclusions in this respect. Further research could thus focus on creating a more comprehensive overview by conducting empirical fieldwork in other spatial or institutional contexts and with additional start-ups and other stakeholders that are part of the ecosystems. An interesting extension could also be to look beyond the administrative borders of the port-city to the wider port-city region or port gateways. This could shed more light on the question whether or not port authorities and municipal governments actually should engage actively in the ecosystem. Our impression is that the economic development activities of most start-ups have little to do with the transport function of the port, or even with the maritime economy at large. In this sense, it could be questioned whether the port authority or the municipal government would be a sensible and legitimate manager of e.g. an innovation cluster or the wider ecosystem. But it also inspires more bottom-up, user-oriented research which puts the characteristics of the start-ups and their spatial and functional requirements much more up front. This could lead e.g. to user-driven typologies of urban environments linked to different types of start-ups. Finally, our case studies have been analyzed using qualitative data. A very interesting future research direction would be to use quantitative techniques, to measure for instance competitiveness, entrepreneurship, sector composition, patents and the like in order to move on in our understanding of start-ups in port-city innovation ecosystems.

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