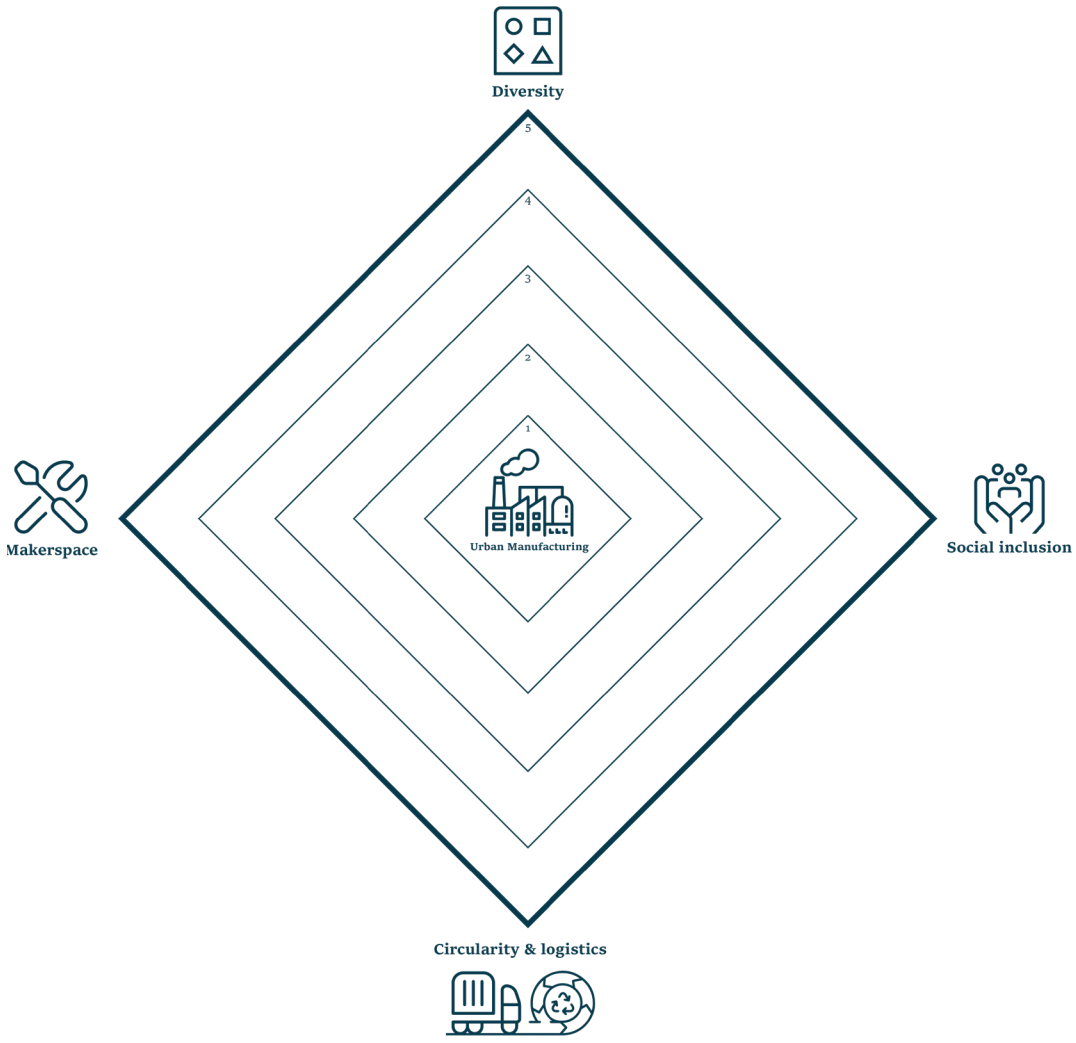
Crafting Resilient Neighbourhoods: The Role of Urban Manufacturing



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Introduction

This study addresses the imperative of enhancing social resilience in urban environments, with a focus on Rotterdam. The city faces diverse challenges, including environmental risks that impact social cohesion. In response, the municipality has formulated a 'Resilient Rotterdam Strategy' to bolster the city's resistibility and recoverability. In this context, the importance of social interaction in fostering resilient communities is underscored, leading to the proposition of introducing makerspaces as "third spaces" to bridge the gap between formal and informal urban life. The study advocates for transforming mono-functional neighbourhoods into multifunctional ones by reintroducing urban manufacturing, particularly makerspaces, to promote social networks and enhance social resilience.

1.1 Towards a resilient Rotterdam

The well-being of individuals within urban environments relies on a complex network of interrelated institutions, infrastructures and social structures (The Rockefeller Foundation & Arup, 2014). Urban areas attract residents due to their role as hubs of economic vitality and promising opportunities. However, cities also serve as locations where various pressures build up and unexpected disruptions can occur (The Rockefeller Foundation & Arup, 2014). In Rotterdam, environmental risks that play out at a city scale, such as inequality, health and climate crises, pose new challenges and may result in social breakdown (City of Rotterdam, 2022). Contemporary literature shows a growing interest in common needs and solutions to face these risks (see figure 1). In policy terms, enhancing inclusion and self-reliance at community level is also gaining ground (City of Rotterdam, 2022; The Rockefeller Foundation & Arup, 2014; Steiner & Markantoni, 2014). The ability to change behaviour in order to influence the future seems essential to deal with these future shocks and stresses (Doff, 2017). Thus, a requisite for the cultivation of social resilience is evident. The ability of communities to adapt and change in an ever changing, chaotic and unpredictable world.

To deal with these significant number of current and potential crises, as outlined above, the municipality of Rotterdam formulated a 'Resilient Rotterdam Strategy' (City of Rotterdam, 2022). This strategy aims to handle future crises thanks to four capabilities: resistibility, recoverability, learning ability and adaptability. The Rockefeller Foundation and Arup (2014) describe social resilience as follows:

"The capacity of cities to function, so that the people living and working in cities – particularly the poor and vulnerable – survive and thrive no matter what stresses or shocks they encounter"

Shocks are disruptive events which can occur acutely and unexpectedly, whereas stresses are disruptive developments which gradually puts more and more stress on urban systems (City of Rotterdam, 2022). Resilience

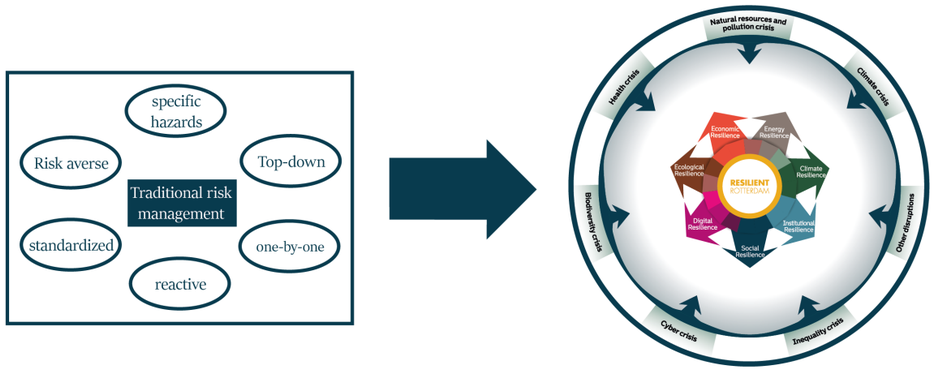


Figure 1: The transition from conventional risk management practices to the adoption of a 'Resilient Rotterdam Strategy' (Image by author, based on City of Rotterdam, 2022)

holds significant importance as it moves away from traditional risk management that relates to specific hazards. It acknowledges the potential occurrence of both stresses and shocks and focuses on enhancing the performance of a system to face multiple hazards (see figure 1). Moreover, research shows that resilient neighbourhoods are also more liveable in daily life, when they are not exposed to shocks or stresses.

As mentioned above, social resilience is often used by policy makers. Nevertheless, Doff (2017) points out that scientific literature is critical on the concept. For instance, Wilson (2012) argues that the concept is not yet theoretically developed. The processes, drivers and indicators of social resilience are to some extent still unknown. Yet, many authors agree on the importance of social structures and interconnectedness (Linnell, 2014; Doff, 2017; Blokland, 2017). Creating communities and networks within and between communities is the main pre-requisites for social resilience. In this context, the presence of social interaction is considered as the starting point for resilient communities (Keck & Sakdapolrak, 2013).

1.2 Building resilience through social encounters

Resilient communities benefit from social interaction and collaboration between formal actors, such as local institutions and informal actors, such as residents (Veldacademie, 2021). Although the need for collaboration between formal and informal actors is recognized, there is still a significant disparity between both and much uncertainty about adequate ways of working together. Richard Sennet (2018) describes a similar problem and expands upon this issue in a more comprehensive manner. He argues that modern urban dilemmas frequently arise when the two essential elements that shape urban life diverge, namely the ville and cité. The ville can be described as the built environment, which is characterised by formality, policies, plans and structure. The cité consists of the living environment or city life as informal, sinuous, complex and contradictory. Ideally, the two should fit together seamlessly: how people want to live should be reflected in how we build our cities. However, reality proves to be more recalcitrant and they appear to have grown further and further apart. For instance, segregation and friction between diverse groups, each with their own behaviour, manners and ideas, cannot be solved from the cité alone. Sennet (2018), for instance, does not believe in friendly relations and full integration of different population groups, but does think that superficial brotherhood can be among the possibilities.

To achieve superficial brotherhood, being familiar with each other, encounters and social contact is fundamental. The importance of contact is also stressed in psychology as the most obvious remedy against intolerance, nuisance and loneliness. Psychologist Pettigrew, among others, proved that contact actually works. It leads to more trust, togetherness and more help back and forth. Blokland concluded in her study 'Oog voor elkaar: sociale controle en sociale

veiligheid in de grote stad' that people who regularly chatted with strangers in Rotterdam shopping streets had a more positive judgement of others. This trust was then associated with a higher rating of safety. There are different ways of facilitating these social encounters. In the next paragraph, I will elaborate on this topic by introducing a new strategy.

1.3 Makerspace

Perhaps facilitating informal encounters could bridge the gap between the separated ville and cité. Based on the current literature we can already conclude that facilitating these social encounters have positive effects on safety and social networks (Blokland, 2008a). However, in the current literature, research about social encounters has mainly been written from an urban point of view. For instance, Platts-Fowler and Robinson (2016) mention the importance of so-called third spaces for enhancing social resilience. Third spaces are informal public places where people come together, for instance green spaces such as parks. This research will introduce another type of third space, the makerspace.

The current mono-functional layout leads to anonymous districts characterized by unemployment and a high level of opportunity inequality. Therefore, mono-functional neighbourhoods should be transformed into multifunctional ones by reintroducing urban manufacturing, in particular makerspaces, into residential neighbourhoods. Stepping away from the current mono-functional residential neighbourhoods and advocating for multifunctional areas where working and living coexist. Combining living and working could promote local interactions, creating social networks capable of creating more resilient communities (Slade & Lassance, 2019). Moreover, the net result could be lower levels of unemployment, lower mental health issues and community building (Hill et al., 2018). Consequently, this research will explore strategies for the reintroduction of urban manufacturing within residential neighbourhoods.

1.4 Research question

In this study, the reintroduction of urban manufacturing in residential areas will be employed as a tool to stimulate interaction among residents, ultimately aiming to enhance social resilience in these neighbourhoods. This research emphasizes the importance of multi-functionality, diverging from contemporary mono-functional residential neighbourhoods. Primarily, a literature research will be conducted to explore the theoretical underpinnings of multi-functionality and urban manufacturing. In addition, research of their correlation with social resilience will be undertaken. To provide precise insights into these inquiries, fieldwork will be carried out in Feijenoord, a district situated in the southern part of Rotterdam. Thus, to answer the questions below, literature research will be combined with conversations and interviews with small urban manufacturing business in Feijenoord.

Therefore, the main question of this research paper is:

How can we combine housing and urban manufacturing to enhance social resilience in residential neighbourhoods?

An answer to this main question will be formulated by answering the following sub questions.

What are the main preconditions for mix-used developments?
What is the contemporary relationship between urban manufacturing and housing?
Fieldwork: What are the requirements and preferences of the existing urban manufacturing businesses in Feijenoord concerning makerspaces?

What is the correlation between mix-used areas and the social networks of a neighbourhood?
Fieldwork: What social connections or networks do the existing businesses in Feijenoord have within the neighbourhood?

1.5 Research method

To answer the main question, this research will contain both literature research and fieldwork. First, extensive literature research will be done on the concepts of mix-used developments and urban manufacturing. Both concepts will be studied to get a better understanding on their preconditions and how it contributes to the overall dynamics of a city. Moreover, the social dynamics of these concepts will be elaborated, including their impact on community engagement and social encounters. This literature research will result in four preconditions essential for succcessful urban manufacturing. The preconditions will be further elucidated through the examination of relevant case studies.

Moreover, fieldwork will be executed to examine the requirements of small-scale urban manufacturing businesses in Feijenoord concerning workspaces and social networks. These enterprises have intricate ties to both social dynamics and urban manufacturing realms. Functioning as social enterprises with distinctive social objectives and directly or indirectly influencing the city's manufacturing sector. The social aspect is crucial, as it has the potential to significantly enhance the overall resilience of the neighbourhood.

It is important to note that this fieldwork does not stand alone. The existing businesses are currently situated in temporary warehouses slated for demolition to facilitate housing development. Consequently, this research also serves as an exploration into the extent to which these existing businesses could be accommodated within the new developments. With the aim of averting the emergence of a mono-functional neighbourhood, these businesses could play a pivotal role in shaping a mixed-use, vibrant, and socially robust environment. Therefore, the outcomes of the interviews will be transformed into detailed narratives delineating the distinct social contributions of various businesses.

Additionally, this research primarily focuses on the positive impacts of urban manufacturing on social resilience, rather than examining the financial feasibility of urban manufacturing. Consequently, while this study highlights the social benefits and potential for community enhancement through urban manufacturing, the financial viability of such initiatives requires further exploration. Therefore, additional research is needed to assess the economic sustainability and feasibility of integrating urban manufacturing into neighbourhood developments.

To answer the main question, the results of both studies will eventually be combined and compared to formulate the prerequisites for spatial interventions that mix living and working.

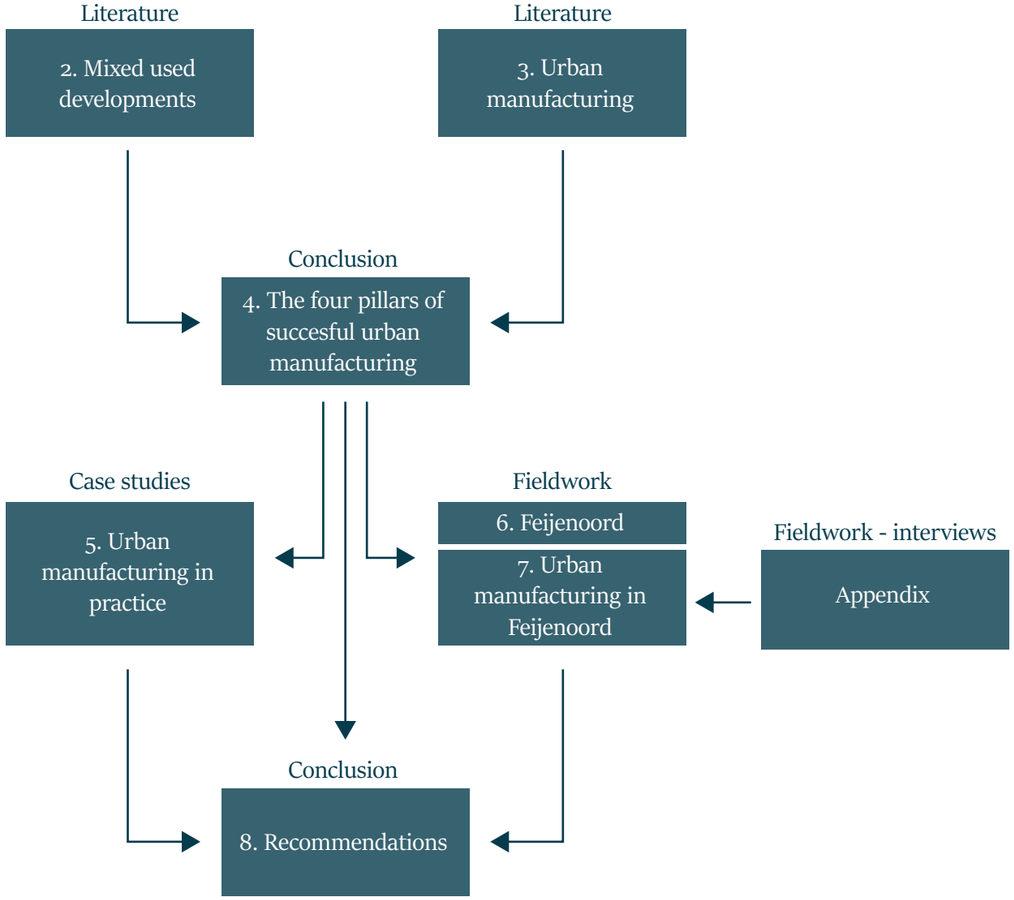


Figure 2: Research Method (Image by author)

2

Mixed-use development

This chapter delves into the fundamental principles of diversity and mixed-use development in urban planning, drawing on seminal works by Jane Jacobs and subsequent urban theorists. The generators of diversity are explored, emphasizing the importance of multifunctional neighbourhoods, short building blocks, diverse building ages, and a dense concentration of people. The theoretical underpinnings of mixed-use development are then examined, highlighting the varying definitions and scales. The concept of the compact city, characterized by high-density, mixed-use, and efficient public transport, is introduced as a sustainable urban form. However, debates on its social equity impact are addressed, with Burton's research indicating both positive and negative effects on social equity. The need for a nuanced approach to the compact city concept, focusing on existing communities and preserving mixed-use settings, is underscored.

2.1 The generators of diversity

Many architects and urbanists advocate for diversity, as it is the key to successful urban places and natural to big cities (Montgomery, 1998; Jacobs, 1961). The importance of diversity was first introduced by Jane Jacobs. In 1961, she argued in 'The Death and Life of Great American Cities' that we have to deal with combinations or mixtures of uses, not separate uses, as the essential phenomena to understand cities. The diversity, generated by cities, is a result of the amount of people living close together, as they have different tastes, needs and skills. Thus, the most lively, stimulating and secure urban areas are places of complex variety representing different needs of different people. Montgomery (1998) adds that a large representation of small-scale business activity is necessary as well. These businesses should not only trade with consumers, but also with other businesses to create constant innovation and new networks.

To generate this diversity in streets and neighbourhoods, Jacobs (1961) distinguished four indispensable conditions (see figure 3). First of all, a neighbourhood should fulfill not only one primary function but preferably more than two. These different functions must insure different schedules and purposes. To create safe and lively living environments, people must appear at different times. The result will be the presence of 'eyes on the street' all day long, which promotes personal safety. Secondly, building blocks should be short to create permeability. Instead of mutual isolation of paths, people should be able to turn around corners easily. The availability of diverse routes for individuals to traverse from point A to point B on various streets would, in turn, increase the supply of feasible spots for commerce. Thirdly, Jacobs (1961) argues that a district must contain buildings that differ in age so that they vary in the economic yield they must produce.

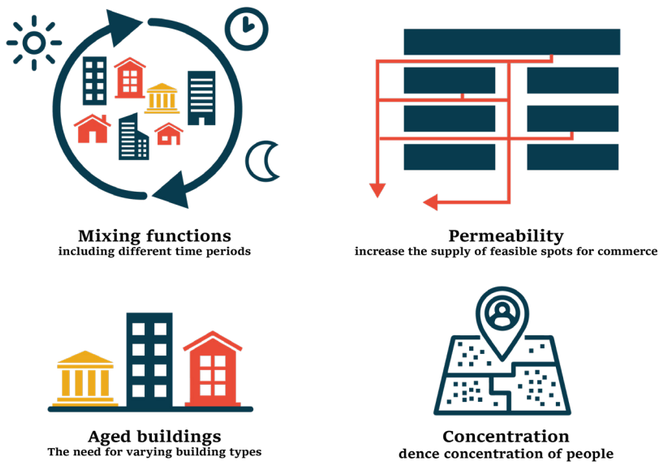


Figure 3: Generators of diversity (Image by author, based on Jacobs, 1961)

For instance, a neighbourhood with only new buildings will attract people that can support the high costs of new developments. Therefore, diversity means a mingling of high-, middle-, low-, and no-yield enterprises. Finally, living environments should have a dense concentration of people. Concentrations of people in cities, characterized by size and density, should be viewed positively as a source of vitality and richness of differences. Dense concentration of people could enhance public street life and promote economic and social variety.

2.2 Mixed-use in theory

Since Jane Jacob's book, the term mixed-use development became very popular in planning literature. However, mixed-use developments often fail because in reality they are not mixed at all (Montgomery, 1998). Therefore, it is important to get a better understanding on what mixed-use actually is. For instance, the Urban Land Institute (1987) defines mixed-use as a plan with at least three functionally and physically integrated revenue-producing uses. Hoppenbrouwer and Louw (2007) argue that a combination of two functions can be defined as mixed-use as well. They note that there are other aspects to mixed-use besides functions. First of all, the geographical scale should be taken into account. According to Rowley (1996) four different scales can be distinguished: the neighbourhood, a public space such as a street, a building block and an individual building. As previously mentioned, Jane Jacobs refers to mixed-use on the scale of a neighbourhood or district. Although a neighbourhood may be mixed, an individual building may not be mixed at all. Thus, functions can be mixed at different spatial levels (Hoppenbrouwer & Louw, 2007). Moreover, the dimension of time is essential to mixed-use development as well (Jane Jacobs, 1961; Hoppenbrouwer & Louw, 2007; Rowley, 1996). In this context, time refers to the fulfilment of different functions within a time-period, for example an hour, a week or a year. A school, which is being used during daytime, can be used as a community centre during the night. We can speak of a sequential use of space when a place is being used by multiple functions after each other.

There are other important dimensions to mixed-use, besides functions, time and scale. For instance, Rowley (1996) argues that mixed-use is determined by its key features: grain, density and permeability. The grain refers to the mixture of its components: people, activities, buildings and spaces. A fine grain consists of multiple small elements that are widely dispersed from one another. A coarse grain is defined by extensive areas of one element which is separated from another element (Hoppenbrouwer & Louw, 2007). For instance, historic towns are usually characterized by a fine grain whereas modern cities are planned with a coarse grain. Secondly, the density of activity is dependent on the number of users and the mix of uses. Jane Jacobs (1961) concludes that densities of 100-200 dwelling units per 0.4 hectares are necessary to create vital cities. Thirdly, permeability refers to an urban layout that allows choice in pedestrian movements, created by

arrangement of streets and paths. City districts which have small building blocks tend to generate more lively streets (Montgomery, 1998). For a city district to be successful, they need as many building blocks as possible, they should only rarely exceed 90 by 90 metres. Based on Rowley's model, as previously described, Hoppenbrouwer and Louw (2007) developed a model with different typologies for mixed land use, consisting of housing and working (see figure 4). This model demonstrates the complex and varied ways in which mixed-use developments can emerge. By incorporating vertical dimensions alongside considerations of time and urban scales, it provides a solid foundation for contemplating mixed-use development scenarios.

2.3 The Compact City

The growing interest in mixed-used developments, as previously described, let to the concept of the "compact city". In general, the definition is explained by a high-density, mixed-used city, with efficient public transport and an urban structure that encourages cycling and walking (Burton, 1999). According to Ahfeldt & Pietrostefani (2017) the compact city can be described as follows:

"It idealises a city that is urban in general terms of density, but also in more specific terms such as a contiguous building structure, interconnected streets, mixed land uses, and the way people travel within the city"

The compact city is in part a reaction on the car-oriented and monofunctional 'urban sprawl' of many modern European cities. Among policy-makers the compact city is the most sustainable form as it protects rural areas and reduces car traffic (Van der Waals, 1999). Furthermore, there is enhanced access to services and amenities, improved utility and infrastructure provision, and revitalization of inner urban areas (Burton, 1999). However, the compact city is not without its critics. Counter arguments include an

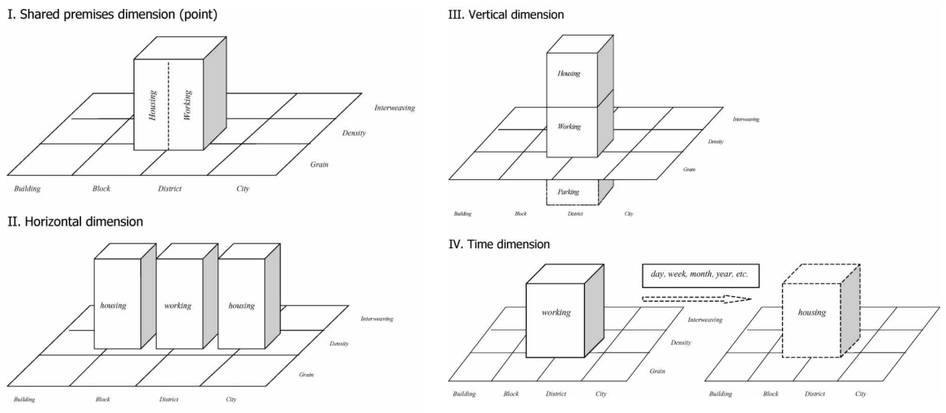


Figure 4: A conceptual model of mixed land use for four dimensions (Hoppenbrouwer & Louw, 2007)

overcrowded environment resulting in lower liveability. This debate in current literature can best be explained by the fact that the concept is an umbrella for multiple urban characteristics that could potentially have different effects on different outcomes (Ahfeldt, G. M., & Pietrostefani). As this research aims to enhance social resilience in residential neighbourhoods, the most important ambiguous claim about the compact city needs verification: the compact city is a socially equitable city.

Most literature on the compact city focuses on environmental impacts such as energy, emissions and noise (see, for example, Van der Waals, 1999). Limited research has been done on the social effects of urban compactness. Burton (1999) was the first one that researched the effects of high-density, mixed-use cities on social equity. She concludes that the density of urban form may influence social equity in a variety of ways, both positive and negative. However, the results reveal that urban compactness may be a highly significant influence on social equity. First of all, her findings suggest that, in cities with a high density of households, low-income groups are relatively less disadvantaged in relation to the access to facilities such as stores and shops. Secondly, lower levels of social segregation are associated with higher housing density. A high proportion of flats and terraced houses accompanied by a high proportion of low-income groups provides lower levels of segregation. Thirdly, Burton (1999) concludes that compactness offers improved use of public transport by low-income groups for travel to work. However, Burton's findings indicate negative aspects as well: less domestic living space, lack of affordable housing, increased crime levels, and lower levels of walking and cycling.

Another important notion about the social effects of the compact city is made by Foord (2010) in "Mixed-Use Trade-Offs: How to Live and Work in a 'Compact City' Neighbourhood". High-density, mixed-used cities suggests that the range and mix of non-residential activities is fully supported by the existing communities. However, current developments rarely establish this support as they encourage a new transient population for whom the compact city concept is a temporary life-style. Therefore, it is important to focus on the needs of existing communities and start with the non-residential functions that are already there before implementing mixed-use developments. In this context, Rowley (1996) concludes as well that we should focus on the conservation of existing mixed-used settings, rather than to create new ones.

3
Urban manufacturing

Prior to endorsing mixed-use developments, it is crucial to comprehend the reasons behind the prevalent functional separation in contemporary cities and the factors that led mixed-use neighbourhoods to evolve into mono-functional ones. First, a comprehensive overview delves into the historical evolution of manufacturing, emphasizing its integral role in daily life until the industrial revolution and subsequent detachment from cities. Secondly, Rotterdam's urban transformation, marked by functional separation, reveals contemporary challenges such as housing market pressures affecting urban manufacturing. Finally, important insights will be distilled from an important research and fieldwork project conducted in multiple European cities.

3.1 Industrial urbanism

Up until the industrial revolution, manufacturing was closely integrated in peoples everyday life as manufacturing took place within individual households. Despite this shared past, cities and industries grew apart. According to Hatuka and Ben-Joseph (2017), different phases can be identified to explain this process. When the industrial revolution started, cities and industries evolved together. Cities became logical centres of production. As a result, cities experienced unprecedented population and economic growth. However, cities could not meet the basic necessities regarding water disposal and housing. Moreover, air pollution caused by factories forced cities to rethink the relations of industry with its surroundings. From the 19th century planners searched for a city that was able to facilitate industrial urbanism while providing liveable conditions. Resulting in the core idea of functional separation, which ultimately influenced the design of cities and industry. Consequently, the deindustrialization started in the Western World. Countries diminished their industrial capacities and undertook the development of planning tools aimed at spatially segregating industrial activities from other land uses. However, today we are standing at the beginning of a new era, arguing that manufacturing remains vital to local and regional economic growth (Hatuka & Ben-Joseph, 2017). Moreover, it could result in far lower levels of unemployment, lower mental health issues and community building (Hill et al., 2018).

As local manufacturing becomes more dominant in the next couple of years, Rappaport (2017) argues that a new form of industrial urbanism can arise: a hybrid factory. New technologies can be integrated into more confined space, including reduced levels of noise and air pollution. As a result, new mixes can occur between manufacturing and working, living, educating and creating. Brussels is possibly one of the pioneers. The city is exploring innovative ways to the integration of different functions in both the design process and policy implementation (Borret, 2015). Despite the presence of numerous initiatives, a substantial portion remains unrealized. An intriguing example is the NovaCity project, situated in Anderlecht, where various functions are intricately blended with residential spaces, organized to create opportunities for encounters and interactions. Secondly, people often think about industry in an economic or political context. However, Hatuka and Ben-Joseph (2017) argue that the detachment from geography and community is becoming unsustainable. They state that manufacturing processes are likely to reverse the trend towards the globalization. As manufacturing will be more localized, the importance of manufacturers communities and workspaces will be increasing. Moreover, they predict that community based manufacturing cooperatives will also have an important role in incubating new products.

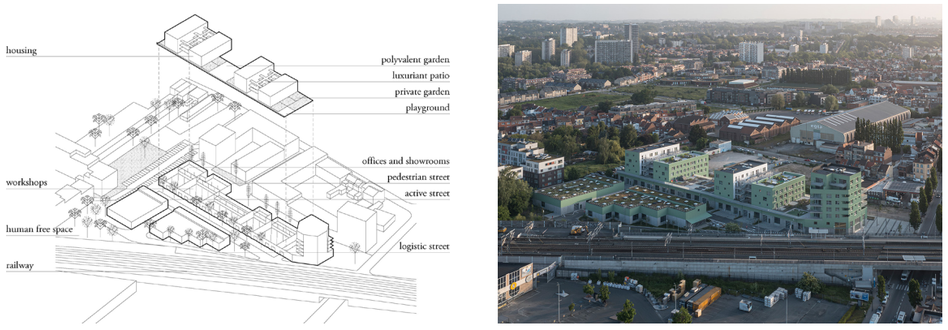


Figure 5: NovaCity by &bogdan (https://www.bogdan.design/projects/novacity/, retrieved on 28 January 2024)

3.2 Urban manufacturing in Rotterdam

In Rotterdam, the city and its industry grew apart as well. Beginning in the late 19th century, the port of Rotterdam grew together with additional port related industries, such as shipbuilding (Hill et al., 2018). However, slowly Rotterdam started to shift from a city with a mix of industry, trade, and socio-economic functions to a city that was dominated by a strict separation of functions (Hill et al., 2018). For instance, after the Second World War Rotterdam's reconstruction was based on the modernist principle of functional separation resulting in less diversified developments, as previously mentioned. Nowadays, the strategy of the municipality shifted and focusses on developments oriented towards the city. The port is seen as a source of innovation and waterfront redevelopments are mainly linked to the economic diversification and mix with other uses (Aarts et al., 2012). However, today's pressure on the housing market limit the possibility of achieving a diverse economic system, specially urban manufacturing (Hill et al., 2018). Moreover, gentrifying the inner city to make it attractive for investors and increasing the prices per square metre make it difficult for small making and manufacturing businesses to start a business in Rotterdam (Stouten, 2017). To conclude, for decades the port and its industry have been a driving force and employer for Rotterdam. The low-income 'working force' developed the city both social and physical. However, the last decades of automation and technological development has decreased job opportunities for practical educated people.

Thus, urban manufacturing and employment is still under pressure. Consequently, the number of square meters of business space is shrinking (City of Rotterdam, 2023). It is increasingly difficult for more and more Rotterdammers to find work at an acceptable distance from their homes. Many relatively small businesses, such as gyms, service providers and retail, are located in large business parks on the outskirts of the city. Affordability is the main reason (City of Rotterdam, 2023). This leaves only a limited number of locations available for large companies with a high environmental category that need good accessibility. The municipality calls this phenomenon 'scheefwerken'. Instead of framing this as a problem, we should see it as

an opportunity. Small businesses with a low environmental category can be relocated in residential areas. This will create more space in business parks at the periphery of the city for large companies. In addition, mixing functions in residential neighbourhoods, as described in last chapter, will result in more resilient neighbourhoods. Steiner and Markantoni (2013) conclude that locations with more diversified services and resources are considered more resilient by their residents. Thus, to create attractive, sustainable and resilient urban environments, it is important to make room for affordable work functions that align with the needs of its residents.

In Rotterdam, multiple ongoing developments show how a productive urban environment could look like. For instance, the M4H (Merwe 4 Haven) which is a former fruit transshipment area, leaving behind many vacant buildings. Nowadays, multiple craft manufacturing companies are located in the Keilewerf, from creative entrepreneurs to companies in the circular manufacturing industry. In the future, this area will be partly transformed to a living and working environment. See chapter 5 for a more for a detailed description and analysis of the developments in the M4H. In the southern part of Rotterdam, relatively smaller but same developments are starting to emerge. While modest in productive scale, several initiatives focus on the synergies between creative industries and the traditional making skills of its residents. An interesting example are the social enterprises located in a warehouse in Feijenoord. Despite variations in size and industry, these enterprises collectively establish a community dedicated to making a positive social impact. This impact is manifested through initiatives such as job creation and the establishment of learning pathways for individuals facing challenges in accessing the labour market. An example is Oxious Talent Factory, a textile atelier using waste streams from the textile industry providing jobs for resident in the neighbourhood who have knowledge of textile making. These are important initiatives because they both produce urban manufacturing products and bring people together in deprived areas. In chapter 6, these businesses will be further explored

3.3 Cities of making

In practice, planning and design for urban manufacturing is highly challenging. Therefore, Croxford et al. (2020) elaborated a narrative on how urban manufacturing and the city need each other. They conducted fieldwork in a number of cities and combined it in a booklet 'Foundries of the Future: A Guide for 21st Century Cities of Making'. In this book the authors combine the similarities in terms of problems, challenges and solutions they encountered. Moreover, they translated their findings into fifty patterns, providing a tangible framework to comprehend the various issues surrounding urban manufacturing. Including these patterns in this research is crucial as it offers concrete architectural preconditions for urban manufacturing based on extensive research and fieldwork.

In this concise research, not all fifty patterns will be discussed. Therefore, the list of patterns is restructured (see figure 6). Some patterns are combined and some are excluded as they are, for instance, based on organisational aspects. Consequently, a shortlist is made based on relevance focussing on the spatial and social patterns. In general, five different aspects can be distinguished; architecture, circularity, social inclusion, infrastructure and zoning. The architectural preconditions for successful urban manufacturing involve a comprehensive approach that addresses various aspects. Manufacturers require visibility and a high-quality public realm to connect with the local market and emphasize the value of their contributions to the city. Smart use of space and technology encourages collaboration, resource-sharing, and knowledge transfer among manufacturers. Additionally, recognizing homes as part of local production processes allows for micro-manufacturing, with work-live concepts offering flexibility and income generation. Secondly, manufacturing plays an important role in city-scale circularity. It helps to reduce distances from resource to processing site and it contributes to re-use and re-manufacture within cities. Social inclusion is important to encourage knowledge exchange, collaboration, and collective problem-solving among businesses. Additionally, fostering diversity in job opportunities across the city, tailored to the skills and interests of the local workforce, ensures resilience and accessibility. This dual approach promotes a sense of community, enhances economic adaptability,

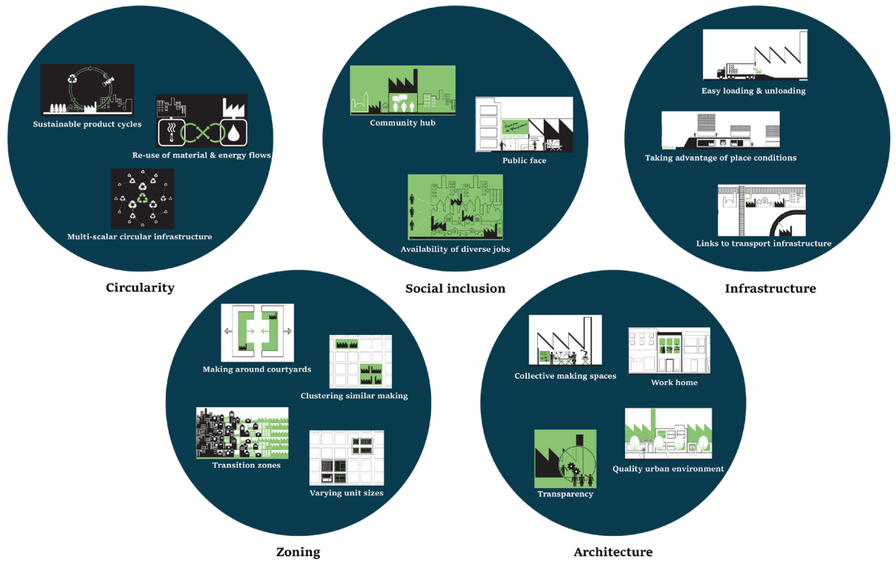


Figure 6: Summary 'Foundries of the Future: A Guide for 21st Century Cities of Making' (Croxford et al., 2020)

and contributes to the overall sustainability and inclusivity of urban manufacturing. The infrastructure in and around buildings should be optimized to create efficient access to distribution networks. Additionally, taking advantage of unique geographical features, such as rivers, canals, and railway arches, is crucial for accommodating manufacturing activities effectively. Finally, effective zoning for urban manufacturing involves strategic considerations such as proximity to industrial areas, varied unit sizes, clustering of similar businesses, and organizing activities around courtyards. This approach optimizes space, fosters flexibility for business growth or downsizing, promotes innovation, and addresses environmental concerns while facilitating coexistence with mixed-use developments. Integrating these considerations into architectural designs can create environments where urban manufacturing thrives economically and enhances the overall vitality of the urban landscape.

4
The 4 pillars of succesful urban manufacturing

Drawing from the previously discussed literature, this chapter concludes by articulating five indispensable pillars for successful urban manufacturing. The first pillar centres on the role of diversity in fostering vibrant urban manufacturing ecosystems. Secondly, the establishment of makerspaces is an integral part of urban manufacturing. Moreover, urban manufacturing can only be a powerful force within cities when it is designed to cater a diverse workforce based on the skills of its residents. Collectivity is essential as it creates interconnectedness between different business and the possibility to share knowledge, spaces and capital goods. Finally, smart and efficient logistics will play a crucial role in realizing sustainable urban manufacturing.

4.1 Diversity: A catalyst for urban manufacturing

Diversity in the context of urban manufacturing emerges as a key driver for innovation and economic growth. Embracing the principles advocated by influential figures like Jane Jacobs (1961), urban manufacturing hubs should be designed to house a mix of small-scale businesses. Taking diversity as one of the preconditions while designing results in the most lively, stimulating and secure urban areas. Moreover, diversity fosters constant innovation and networking not only between businesses and consumers but also among different manufacturing entities (Montgomery, 1998). Additionally, urban manufacturing can only be effective when it includes residential adjacent neighbourhoods or new housing developments in their plans. Within this context, it is important to think about diversity on different scales, from the neighbourhood to an individual building. Another aspect of diversity is time. To create safe and lively living environments, people must appear at different times (Hoppenbrouwer & Louw, 2007; Jacobs, 1961). Architectural planning should prioritize the creation of spaces that accommodate a variety of manufacturing activities, echoing Jacobs' call for diverse functions within neighbourhoods.

4.2 Makerspace: Hubs for collaborative manufacturing

Makerspaces are integral components of urban manufacturing ecosystems and enhance collaborative innovation. These dedicated spaces provide the possibility for individuals to start businesses within a city and collaboratively work with others. Additionally, makerspaces play a crucial role in the concept of a compact city as it contributes to reduced transportation needs, job creation and innovation. In alignment with Jacobs (1961) and Montgomery's (1961) ideas, makerspaces could transform mono-functional residential areas to multifunctional living environments. Emerging technologies and innovations open up opportunities to blend manufacturing with various aspects of life, work and education. Therefore, their architecture should be thoughtfully designed to facilitate interaction and idea exchange. Additionally, makerspaces could be collectively owned to facilitate the sharing of costly capital goods among diverse businesses, fostering collaboration between them. Drawing from Croxford et al.'s findings in 2020, it can be concluded that makerspaces ought to exhibit transparency, be organized around similar making activities, and display diversity in unit sizes.

4.3 Social inclusion: Building stronger communities

Urban manufacturing can be a powerful force for social inclusion when intentionally designed to create jobs according to the needs and skills of its residents. Therefore, urban manufacturing should focus on the synergies between creative industries and the traditional making skills of its residents. By ensuring that urban manufacturing accommodate people of various backgrounds, abilities, and skills, can enhance community building within residential neighbourhoods. Architectural considerations should prioritize accessibility and create spaces that encourage collaboration among diverse businesses. The architectural layout of manufacturing districts should encourage shared spaces. By creating environments where manufacturers can engage with one another, share resources, and collectively address challenges, urban manufacturing becomes a collective effort. Finally, it is important to realise that building stronger communities starts with the conservation of existing communities and maker industries (Rowley, 1996).

4.4 Circularity & Logistics: Sustainable urban manufacturing

In the current literature, little attention is given to the logistical challenges associated with combining living and working. However, circularity and logistics play a crucial role in shaping sustainable urban manufacturing. In line with the principles of a compact city, efficient resource use and recycling should be integrated into the architectural design of manufacturing spaces. Urban logistics, intricately linked with makerspaces, optimize the flow of goods and services. To facilitate efficient circular economy practices, there is a need for a well-coordinated system of integrated infrastructure operating at various scales. This system should manage the flows of resources, including materials and energy, to promote effective circularity.

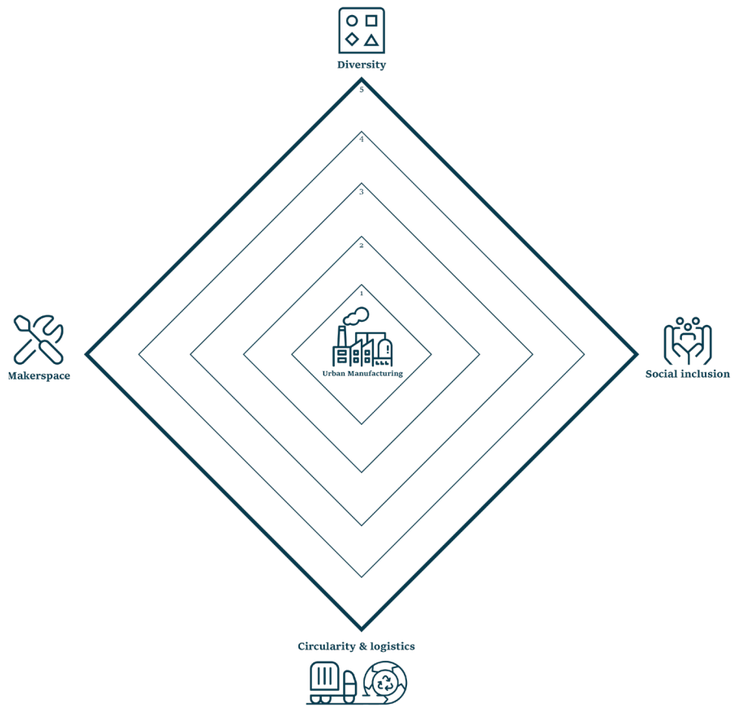


Figure 7: The 4 Pillars of succesful urban manufacturing (image by author)

5
Urban manufacturing in practice

This chapter explores three relevant case studies through the lens of the four pillars of successful urban manufacturing. The Afrikaanderwijk Cooperative, focuses on social inclusion by bringing together entrepreneurs, producers, and social organizations. The Keilekwartier in Rotterdam's M4H port area showcases organic urban development with buildings like Keilepand, emphasizing the circular economy and the creation of makerspaces. Lastly, the text examines Japan's urban structure, particularly Tokyo, as a vibrant example of successful mixed-use developments, emphasizing social diversity and the seamless integration of work and living spaces.

5.1 Afrikaanderwijk Cooperative

The Afrikaanderwijk Cooperative started in 2013 and brings together entrepreneurs, producers and social organizations (Afrikaanderwijk Coöperatie, 2024). When looking at neighbourhoods in large cities through a numerical lens, one might initially see poverty, disadvantages, and other threats. The Afrikaanderwijk Cooperative, however, recognizes the significant diversity of cultures and the multitude of residents and entrepreneurs with their unique talents and skills (Patti, 2016). The Afrikaanderwijk Cooperative grasps the power of local communities and small-scale organizations where learning and working harmonize. Through this approach, they foster opportunities to enhance the self-organizing capability of the area by providing labor and services. Hence, this initiative is crucial for strengthening resilience in this neighbourhood. Examining the five pillars of successful urban manufacturing, the Afrikaanderwijk Cooperative focusses on social inclusion as it is an organisational structure that brings people, businesses and initiatives together. Nevertheless, the majority of initiatives incorporate significant measures aimed at enhancing more circular systems within the city. Considering these principles, it becomes evident that diversity in the Afrikaanderwijk expands. Furthermore, certain initiatives resulted in spatial outcomes, such as an installation or building.

First of all, the cooperative promotes sustainable local production, knowledge exchange, cultural development, and entrepreneurship based on shared responsibility and participation (Afrikaanderwijk Coöperatie, 2024). Their goal is to make Rotterdam South, specifically the Afrikaanderwijk, a stronger and more prosperous area with engaged residents and entrepreneurs. By having work in the neighbourhood carried out by the community, the neighbourhood develops from within. More people gain employment and feel connected to their environment. Therefore, social inclusion is one of the main drivers of this initiative. Nevertheless, circularity plays an important role in many initiatives. For instance, through the Right to Challenge, they took over the cleaning of the Afrikaandermarkt (a food market) from the municipality of Rotterdam. Employees of the cooperative, residing in the Afrikaanderwijk, now collect waste separately and sweep the market clean. This initiative resulted also in the design of a building, specifically a resource station designed by SuperUse Studio (see figure 7). The installation serves as a focal point for the collection of residual streams, thereby encouraging and facilitating recycling and reuse. The resource station itself is largely constructed using recycled and second-hand materials, such as playground tiles and the eye-catching liquid containers. What is inspiring about the Afrikaanderwijk Cooperative is that an initiative, which originated from creating social networks, results in concrete spatial developments that enhance diversity within residential neighbourhoods.

Figure 8: Resource station designed by SuperUse Studio (photo by author)

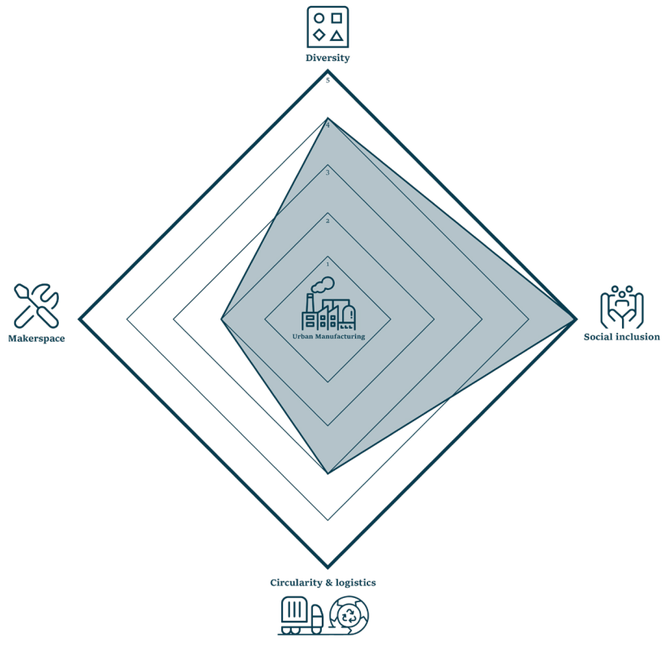


Figure 9: Succesful urban manufacturing, Afrikaanderwijk Cooperative (image by author)

5.2 M4H: Keilepand

The Keilekwartier in Rotterdam, a port area called M4H which is gradually losing its port functions, showcases a unique process of organic urban development characterized by urban manufacturing. It comprises various buildings such as Soundport, Keilepand, and Keilewerf, collaborative spaces accommodating entrepreneurs, spatial professionals, and manufacturing businesses. Apart from the individual ambitions of users and collectives in the area, it is interesting to see that there is a gradual collective awareness of shared values. The vision is to establish the 'Makers District M4H' as a regional hub for innovative manufacturing, fostering the growth of young companies and the development of new technologies (Borra & Urhahn, 2020). Additionally, future housing developments in the area will lead to an innovative mixed-use environment where people both work and live within the same area.

The focus has been on preserving and stimulating existing work activities in the area, aligning with the goal of reinforcing the innovation climate. The community and the Municipality of Rotterdam hopes that vulnerable groups in the city will benefit from increased employment opportunities in support services (Borra & Urhahn, 2020). Besides social inclusion, the creation of makerspaces stands out as perhaps the most crucial pillar for successful manufacturing in this case. A good example is the Keilepand, a old warehouse which is accommodating spaces for designers, furniture makers, a beer brewery, a cheese maker and other businesses. The Keilepand illustrates that noisy activities from furniture makers can be seamlessly integrated with office spaces for designers without causing disturbance. Moreover, it shows good examples of how (maker)spaces can be shared among different businesses. For instance, on the ground level, Food Union offers a spacious professional kitchen that can be rented by catering companies, start-ups, or independent entrepreneurs. Through their concept, they facilitate the sharing of costly capital goods among diverse businesses. This concept could also Currently, the predominant use of the area revolves around business-related activities, particularly within the maker industry, contributing to a perceived lack of diversity. However, future developments holds the promise of transforming the landscape into a more varied and mixed-use environment. Interesting to observe will be the integration of housing with the existing manufacturing businesses, as this blend has the potential to reshape the character of the area.

Figure 10: Keilepand (photos by author)

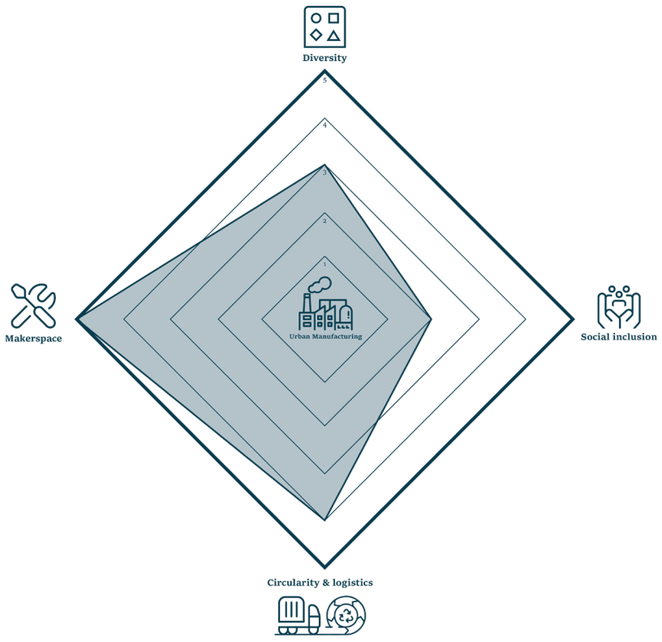


Figure 11: Succesful urban manufacturing, Keilepand (image by author)

5.3 Learning from Japan

Examining the five pillars of urban manufacturing outlined in chapter three, Japan emerges as a particularly intriguing country for closer scrutiny. In 'Emergent Tokyo, designing the spontaneous city' Jorge Almazán and his Studiolab (2022) illustrate, based on five urban phenomena, why Tokyo became one of the most vibrant, adaptable and liveable cities on the planet. The various phenomena yield a profound diversity across multiple scales, from the narrow and segmented alleyways adorned with small shops and bars to multi-story buildings that promote both vertical economies and diversity. Furthermore, the undertrack infills and densely populated low-rise neighbourhoods contribute significantly to enhanced liveability and increased diversity as well. Thus, according to Almazán and Studiolab (2022) Tokyo's urban structure appears to have seamlessly incorporated all essential elements for successful mixed-use developments, as described in chapter 2. However, it is important to underscore that social inclusion remains a pivotal factor within all these phenomena. The small shops nestled in alleys, for instance, foster a robust sense of local community and shared responsibility and the dense neighbourhoods have traditionally been characterized by strong communal life and bottom up organisation (Almazán & Studiolab, 2022). Moreover, Tokyo's urban landscape is a living example of how work- and makerspaces can be combined with living. The book explores how various districts become hubs for craftsmanship, design, and technological innovation. Makers converge, collaborate, and actively contribute to the city's ongoing transformation, drawing inspiration from the longstanding Japanese tradition of seamlessly integrating work and living spaces. This social diversity results in a lot of local trade by small workshops and sometimes even small factories (Jürgenhake, 2019).

The Japanese house is partitioned into a shop and a bedroom, with distinct characteristics. The shop, characterized by direct contact with the public street, serves as a buffer, while the bedroom exudes an intimate and enclosed ambiance, creating a clear delineation between public and private spaces (Jürgenhake, 2019). A particularly interesting illustration of this concept is the Machiya, a traditional Japanese residence that serves as both a living space and a workplace, predominantly featuring a shop. The traditional arrangement follows a hierarchical structure, starting with the shop, progressing through living areas, and ending in the most private spaces, notably the bedrooms and storage. Moreover, a stratification can be found between the public street and the shop (Jürgenhake, 2019). Various elements create a threshold between public and private. Most of the time there is a slightly higher sidewalk mediating between the two. A wooden bench is positioned in front of the shop façade, serving as a platform for displaying merchandise. Occasionally, the adornments on the façade mirror the craftsmanship associated with the shop. Adhering to this Japanese tradition of arranging makerspaces and dwellings has the potential to foster community building, with the makerspace serving as a venue for meaningful encounters and interactions.

Figure 12: Shinmachi Dori, Kyoto (photo edited by author, based on Jürgenhake, 2019)

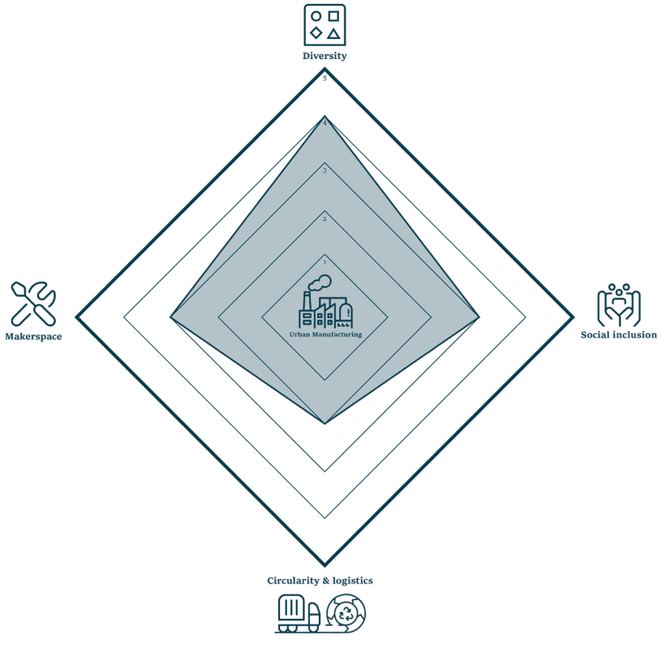


Figure 13: Succesful urban manufacturing, Japan (image by author)

6
Feijenoord

This chapter explores the neighbourhood of Feijenoord including the new development Feijenoord City Waterkant, highlighting various features and challenges. The district of Feijenoord has undergone significant transformations, transitioning from its agricultural roots to become an industrial hub. Over time, Feijenoord has developed into a residential area where living coexists with industrial activities. In the southern part of the neighbourhood, known as Feijenoord City Waterkant, a community of diverse social enterprises operates within the manufacturing sector. As redevelopment plans take shape in this area, there is an opportunity to integrate these enterprises with residential developments, creating a harmonious environment where work and living intersect. By capitalizing on its rich heritage and embracing its diverse community, Feijenoord has the potential to evolve into a sustainable and inclusive urban environment for the future where manufacturing and living coexist.

6.1 History

The history of Feijenoord has been accurately mapped by Van Meijel et al. (2010). Hence, a concise overview of this analysis will be presented to get a better understanding of the history of Feijenoord.

Initially, Rotterdam's urban development was limited to the right side of the Maasoever. The island of IJsselmonde, to which Feijenoord belonged, was on the other side of the water and did not belong to the city (see figure 14). It was an agricultural polder landscape formed by dykes. The dykes not only protected the agricultural land from flooding, but also acted as a main structure where connecting roads and buildings were built. The result of these structures remains visible, even today. Village centres arose where dykes came together. Think, for instance, about the present-day centers of Charlois and Katendrecht. However, Feijenoord remained uninhabited for a long time. Due to its isolated location, the island was initially an ideal place to establish a plague house, a gallows and a city nursery.

Although Feijenoord was reunited to the municipality of IJsselmonde during the French occupation, the idea of re-connecting Feijenoord

Figure 14: Map of Rotterdam, 1839 (Van Meijel et al., 2010)

to Rotterdam as a residential and industrial area followed after the occupation. For instance, a factory was established in the former plague house, the *Fabriek der Nederlandsche Stoomboot Maatschappij*, which soon grew into one of the largest Dutch companies. The ship carpentry yard created employment for over a thousand workers.

The addition to new harbours, a railway line and additional movable bridges Feijenoord expanded its port and industrial function. Simultaneously with the construction of the harbours, the first residential areas were created in the intervening residual areas. In addition, important companies such as *Brouwerij d'Oranjeboom* and *Margarinefabriek Van den Bergh* (now Unilever) established themselves on Feijenoord.

Most of the original housing on Feijenoord was built in the late nineteenth century. At that time, the city council bore responsibility for a safe healthy living environment. The actual construction was completely dominated by private entrepreneurs and characterised by elongated closed building blocks, particularised corners and a tripartite division. Except for *Noordereiland*, housing construction on Feijenoord remained subordinate to the port and industry.

From the 1940s to the 1960s, all attention in the Southern part of Rotterdam went to the construction of so called *tuinwijken*. In Feijenoord, however, little changed. The outdated housing stock attracted mainly foreigners and young people. Only in the 1970s joint ventures between city council and local residents emerged to improve the neighbourhood and add social amenities. In addition, burdensome businesses were relocated and houses were refurbished or replaced with new housing. Most of the docks on Feijenoord lost their original function during that time.

6.2 The neighbourhood

The Feijenoord district is surrounded by several harbours (see figure 15). The *Koningshaven*, for instance, forms the connection between Feijenoord and *Noordereiland*. Traditionally, this is a transit port characterised by the iconic *Hefbrug*. The *Nassauhaven* and *Persoonshaven* are situated within the neighbourhood and divide the district in two parts.

The street pattern is characterised by parallel long streets. The main access road is the *Rosestraat*. This street opens onto the *Hefbrug* and forms the connection between Feijenoord and the inner city. Parallel to this long axis is the *Oranjeboomstraat*. Most facilities such as shops and businesses are located along the *Oranjeboomstraat*. Perpendicular to these long streets, there are shorter streets that extend deeper into the neighbourhood.

Within Feijenoord, three different green areas can be distinguished. In the northwest direction lies *Hefpark*, a temporary park created through the initiative of nearby residents. In the northeast direction,

nestled alongside *Nassauhaven*, you'll find *Nassaupark*. To the south, the neighborhood concludes at *Mallegatpark*, charachterized by the gas domes from its history as a former gasworks facility.

6.3 Living and working

As previously explained, Feijenoord shifted from a agricultural polder towards an important industrial area. However, figure 16 shows the reduction in harbour activities in Feijenoord over the past decades. Significant space has been re-purposed for new housing developments on former harbour land. These residential projects primarily line the quay-sides. Consequently, the residential areas are no longer confined between harbour zones. The quays and river have become predominantly public spaces now (Van Meijel et al., 2010).

Despite the recent conversion of industrial zones into residential areas, industry remains present in the neighbourhood. For instance, we can still find larger industries such as *Hunter Douglas* located next to housing blocks. Moreover, former industrial buildings along the *Piekstraat* have been re-purposed into office spaces. Furthermore, significant commercial operations continue to thrive on the former *Unilever* premises situated in the northern region of Feijenoord.

Despite the presence of industrial activities, there are numerous locations within the neighbourhood where a symbiotic relationship between residential living and working can be observed. One such example is the *Oranjeboomstraat*, a pivotal street in the area where shops are centralized. In this area, residents often live above commercial spaces. In certain areas, individuals have the opportunity to incorporate their workspace within their own homes (see figure 17).

6.4 Profile & employment

One way to assess the sustainable living environment in each neighbourhood in Rotterdam is by examining the municipal neighbourhood profile. The profile is based on both quantitative data and facts, as well as the residents' experiences (see Figure 18). In general, we can infer that the neighbourhood lags behind the city's average. While the data indicates that the neighbourhood has become significantly safer in recent years from an objective standpoint, the residents' subjective perception of safety still lags behind.

Figure 15: Map of Feijenoord (image by author)

Figure 16: Transition from port city (brown) to residential city (red) (Van Meijel et al., 2010)

Figure 17: Live-work home (photo by author)

Additionally, for this research, gaining a thorough understanding of the employment characteristics of the neighbourhood is crucial. Feijenoord exhibits a relatively large percentage of unemployed people (see Figure 19). Furthermore, the percentage of economically self-employed individuals falls below the city's average as well. To foster a more resilient neighbourhood with increased financial independence among its residents, it is imperative to offer accessible employment opportunities within the local community. As described in previous chapters, urban manufacturing could play a pivotal role in offering suitable jobs for the residents.

6.5 Feijenoord City Waterkant

The area, Feijenoord City Waterkant, is located south of Mallegatpark. Originally, the plan was to build the new stadium for the football club Feyenoord in this area. As the proposed initiative faced cancellation, the developer made the existing warehouses in the area available for social enterprises to temporarily occupy. These enterprises are intricately connected to both the social and urban manufacturing dimensions. They function as social enterprises with distinctive social objectives and they are directly or indirectly influencing the city's manufacturing sector. Currently, a new ambition document and housing plan have been developed for the area, which means that the social enterprises will eventually need to vacate (see figure 20). However, efforts are being made to find a new location for these businesses within the new plan. This opens up an interesting opportunity to investigate the integration of these enterprises with the forthcoming residential development. Ultimately aiming to maintain and enhance urban manufacturing within the district.

The current economic activity and success of the emerged community of social enterprises could be the foundation of the new development.

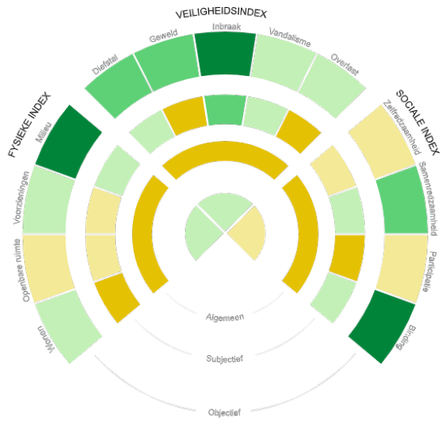


Figure 18: Neighbourhood profile (wijkprofiel.rotterdam.nl, retrieved on 25 January 2024)

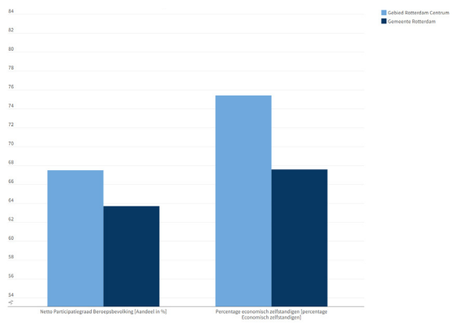


Figure 19: The labour force participation rate (left) & the percentage of economically self-employed individuals (right) (onderzoek010.nl, retrieved on 25 January 2024)

This approach aims to create an ecosystem where work, living, and other functions constantly interact alongside planned housing. In earlier chapters, we have read that this is an extremely complex task, given the dynamic and evolving nature of working and living. Therefore, research will be conducted into the existing social enterprises in Feyenoord. First, the relationship between these businesses and their surroundings will be explored to understand their connection with the existing neighbourhoods. Subsequently, the relationship with housing will be examined to determine how businesses can be integrated with housing to create an attractive and sustainable living environment. Mapping local needs and creating collective values are crucial steps in this process. This involves examining synergies between parties for joint service procurement or sharing capital goods. Determining their societal value and identifying their requirements for business space are also important considerations.

These profiles will be developed through a series of discussions. In the next chapter, the results are presented.

Figure 20: Feijenoord City Waterkant Masterplan (gebiedsontwikkeling.feyenoord-city.nl, retrieved on 15 December 2023)

7
Urban manufacturing in Feijenoord

In this chapter, the findings are presented from a series of interviews conducted with social entrepreneurs based in the Feijenoord City Waterkant area. These findings are organized around the four pillars of successful urban manufacturing. However, the pillar of diversity is not specifically addressed as it pertains to the broader context of all businesses collectively contributing to diversity. Instead, the focus shifts to collaboration, which has emerged as a critical factor enabling these businesses to thrive within the urban landscape. The appendix of this document includes the comprehensive narratives that form the basis of the analysis in this chapter. This detailed documentation provides deeper insights into how collaborative practices are instrumental in shaping successful urban manufacturing ecosystems in Feijenoord.

Collaboration

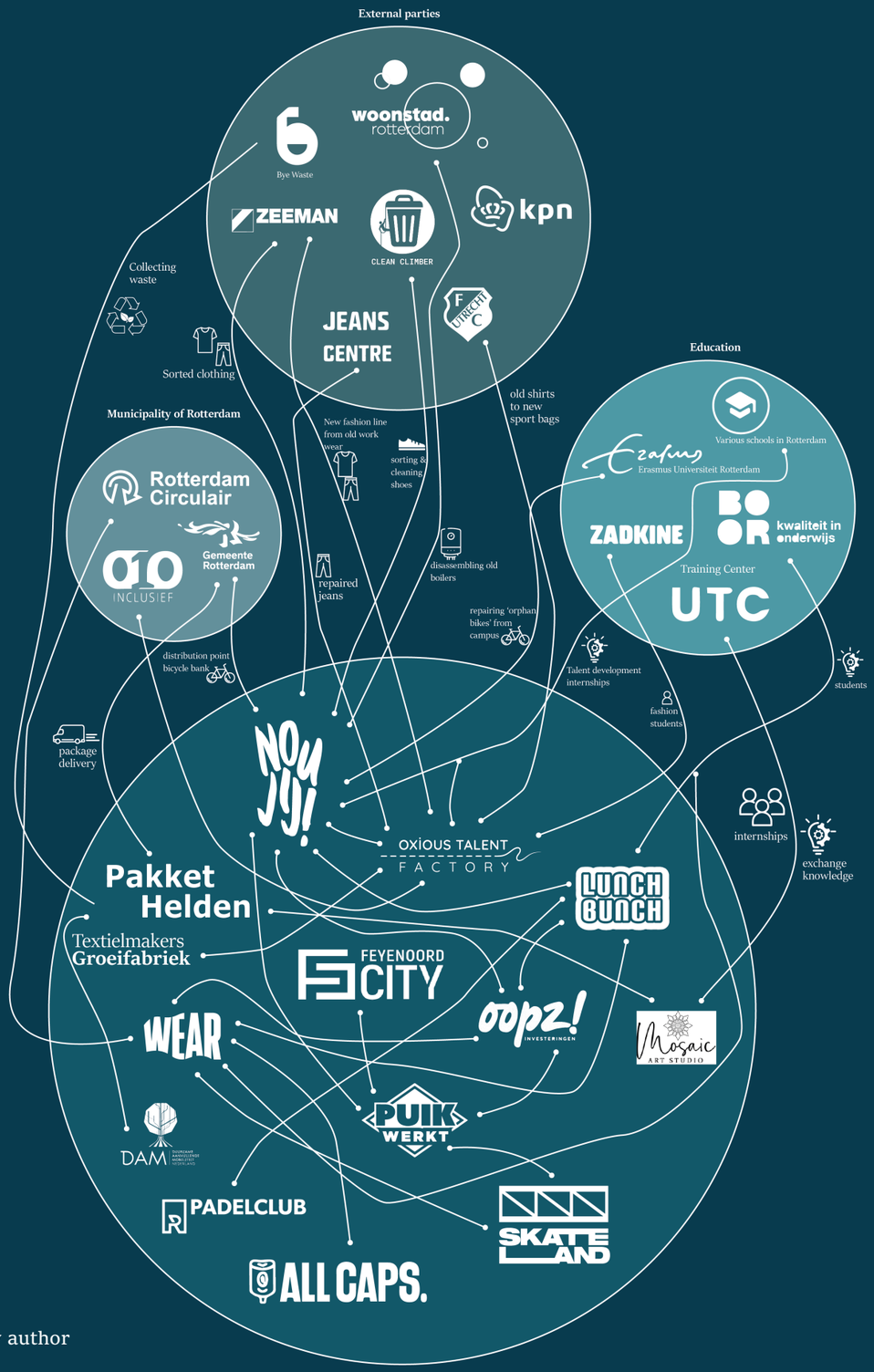


Image by author

7.1 Collaboration

From all the interviews conducted, it is evident that collaboration is essential for the success and long-term viability of urban manufacturing enterprises. While the image on the left page provides a glimpse into this intricate web of partnerships in Feijenoord, it doesn't capture the full extent of the collaborative efforts there.

A vital form of collaboration thrives among the diverse businesses nestled within Feijenoord City. Sharing the same roof and a common social philosophy, these enterprises easily connect with one another. It goes beyond sporadic lending of resources or occasional assistance. Instead, it breeds long-term partnerships that enhance their own operations. For instance, one company sorts out unused clothing and sends it to a neighbouring company. There, they transform the old clothing into new clothing. Together, they breathe new life into old textiles while cultivating a circular environment. As a result of these synergies, Feijenoord City fosters a vibrant community of entrepreneurs, likely far more resilient than standalone ventures.

Secondly, collaborations with educational institutions are essential as they facilitate the transition from education to employment. Several companies in Feijenoord City maintain strong connections with organisations such as the BOOR foundation. Their joint objective is to offer students valuable work experience and training opportunities, empowering them for a smooth transition into the workforce.

Partnerships with commercial enterprises, both within and outside the city, create synergies that drive innovation and growth. Moreover, these collaborations contribute to a more circular economy while simultaneously expanding their market reach and social impact.

Teamwork and knowledge exchange within the companies is important as well. Across various age groups and backgrounds, the workforce in most companies located in Feijenoord City mirrors the diversity of Rotterdam itself. Therefore, there is a rich exchange of knowledge and skills that benefits everyone involved.

"Our employees learn the Dutch language from the trainees while simultaneously sharing their expertise in craftsmanship with them."

Social Inclusion

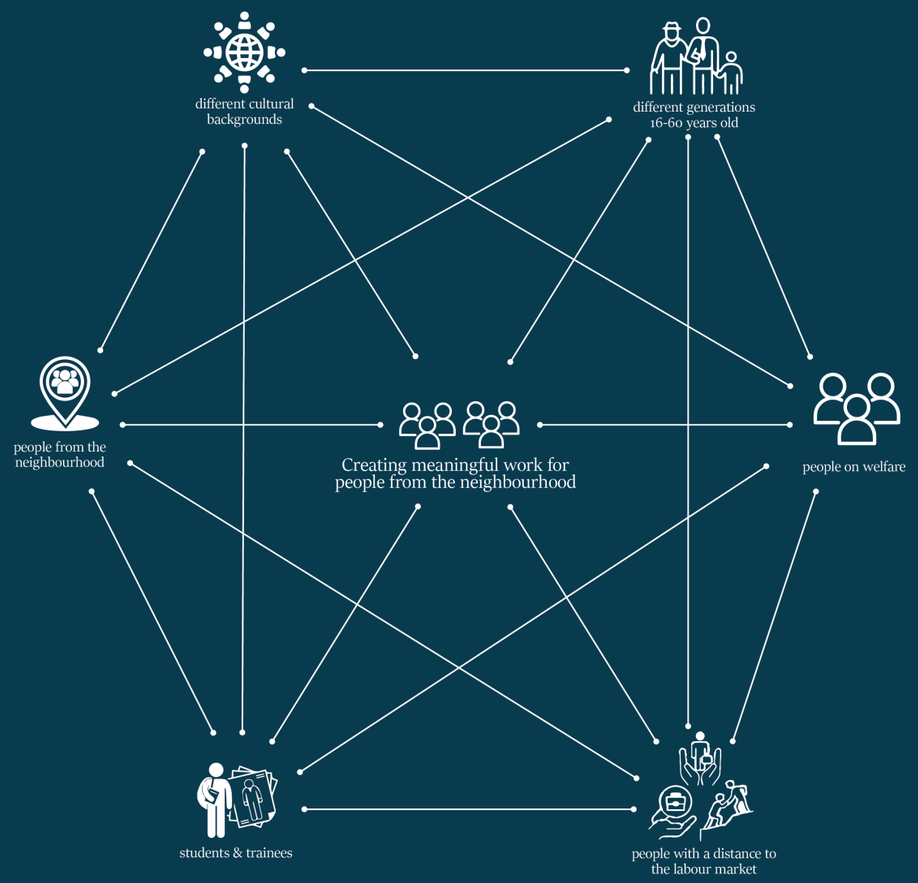


Image by author

“If you start doing something like this somewhere outside the city, 90% of the people who work here just drop out.”

7.2 Social inclusivity

The companies in Feijenoord City showcase a concerted effort towards fostering social inclusivity within the local community.

Most social enterprises prioritize offering employment opportunities to individuals from the neighbourhood often sidelined by traditional economic structures, such as those with limited education, marginalized backgrounds, or other challenges. This workforce comprises individuals with diverse backgrounds, spanning different ages, cultural backgrounds, and life experiences. Many of these workers hail from the local neighbourhood, partially drawn by the approachability of the social enterprises.

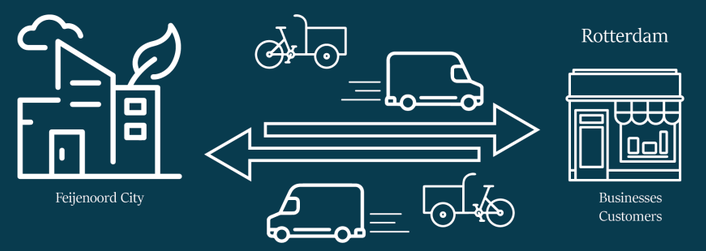
The overarching goal of these social enterprises is to promote social inclusivity by providing a supportive environment where everyone feels valued and empowered. By embracing inclusivity and respect for diverse norms and values, these social enterprises not only foster personal growth and development but also contribute to the broader local community.

By facilitating collaborations, mentorship programs, and personalized support, these initiatives aim to create pathways for individuals to reintegrate into the workforce. Thereby enhancing their economic independence and enabling active participation in society.

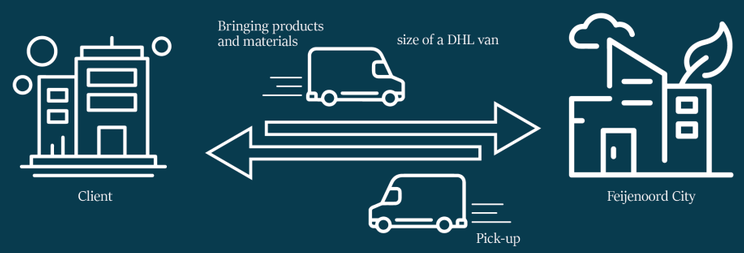
Ultimately, these initiatives represent a paradigm shift towards a more inclusive economic model, where all individuals, regardless of background or circumstance, have the opportunity to contribute meaningfully and build a better future together.

Logistics

Almost all employees live in Rotterdam and rarely use the car for their commute.



Every day, a small van and several cargo bikes distribute throughout Rotterdam.



Supply and removal of materials is highly variable and not every week.

Materials are occasionally transported by large trucks.

Image by author

7.3 Logistics

In examining the logistics practices across various enterprises in Feijenoord City, it becomes evident that a tailored approach is essential to accommodate the diverse needs and scale of production within each business.

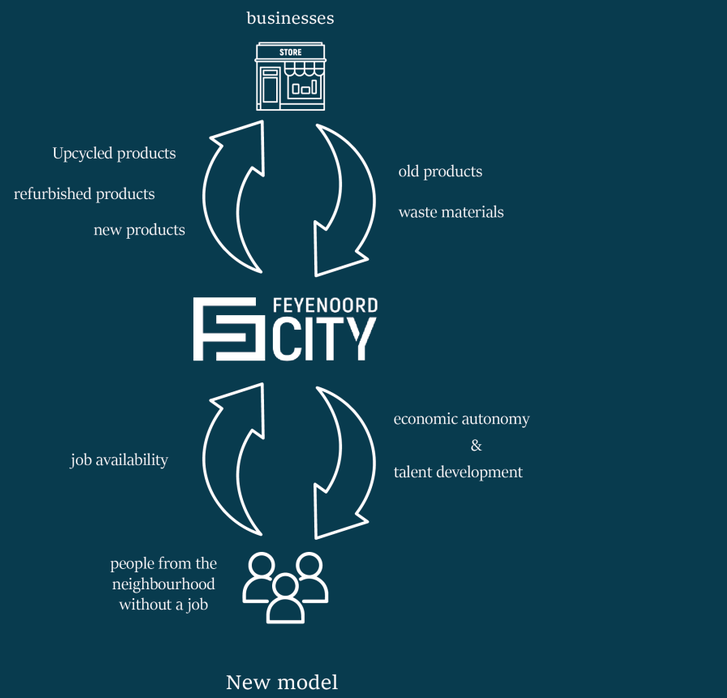
The use of vans for deliveries emerges as a common thread among these enterprises, aligning with their focus on minimizing environmental impact. This preference for smaller vehicles reflects the localized nature of their logistics flows, with deliveries often occurring in smaller streams rather than large, bulk shipments. However, maintaining good accessibility for larger trucks remains crucial for accommodating larger occasional deliveries and pick-ups. One notable social enterprise, a delivery and logistics company, uses cargo bikes for its operations. This strategic move underscores the growing significance of cargo bikes in the distribution of goods, a sentiment echoed by other companies emphasizing their importance for future logistics as zero-emission zones will be introduced in many cities.

The frequency of deliveries varies significantly among businesses. Catering and logistics companies experience daily deliveries and dispatches, highlighting the continuous demand and fast-paced environment within these industries. In contrast, other businesses report that the delivery of goods occurs on a less frequent basis, often weekly or monthly.

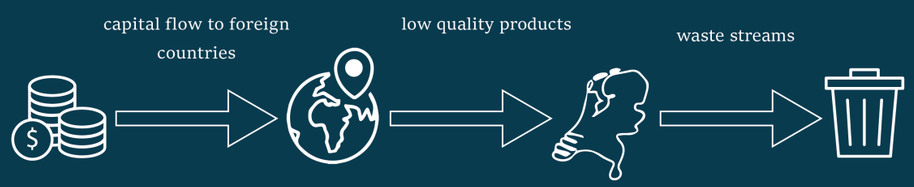
Most people do not have a driving license and carry out their daily routines within a 500-meter radius. Therefore, various social enterprises mention the importance of being located within the neighbourhood. The accessibility to public transportation emerges as a critical factor due to its role in facilitating the daily commute for most employees who reside in close proximity. In general, they predominantly depend on walking, cycling, or using public transport to reach their destinations. Additionally, this reduces the need for extensive parking facilities and minimizes the environmental impact associated with car travel.

“Most people living in the neighbourhood carry out their daily routines within a 500-meter radius. For a company to effectively engage with these individuals, it’s crucial to be located within the neighbourhood.”

Circularity



New model



Old model

Image by author

“Transforming waste into local wealth can revolutionize our economy while offering sustainable solutions and fostering community engagement.”

7.4 Circularity

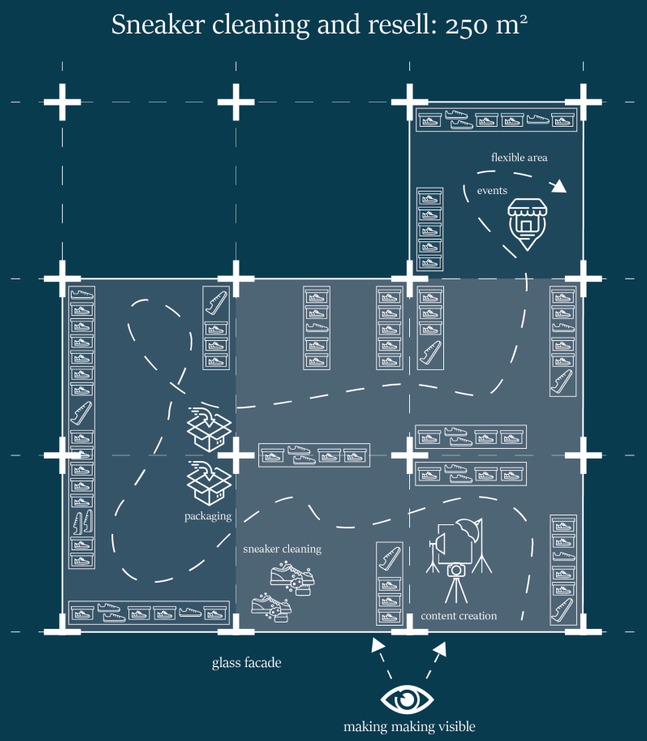
Central to the circular practices observed is the innovative re-purposing of materials and resources. Whether it’s transforming textile waste into fashionable garments or refurbishing old coffee machines, these practices underscore a profound shift away from the linear ‘take-make-dispose’ model towards a more regenerative approach. Such initiatives demonstrate how materials can be kept in use for longer, reducing the environmental footprint and fostering a culture of sustainability.

Equally important is the focus on social inclusion within circular concepts. By tapping into underutilized local talent and offering refurbished goods at accessible prices, these companies not only mitigate waste but also ensure that everyone, even those on a tight budget, can contribute to a more circular future. This synergy between circular economy principles and social benefits amplifies the impact of their practice.

Moreover, the pursuit of circularity within these companies often leads to innovation in product and service development. The adoption of circular principles acts as a catalyst for rethinking business models and operations, driving companies to explore sustainable alternatives and innovative solutions to traditional challenges.

Finally, the effort to shorten supply chains represents a substantial step forward in the pursuit of sustainability. By reducing reliance on external sources from abroad and optimizing internal processes, these companies are not only minimizing their environmental impact but also setting a precedent for future-proofing businesses against the challenges of resource scarcity and environmental degradation.

The Makerspace



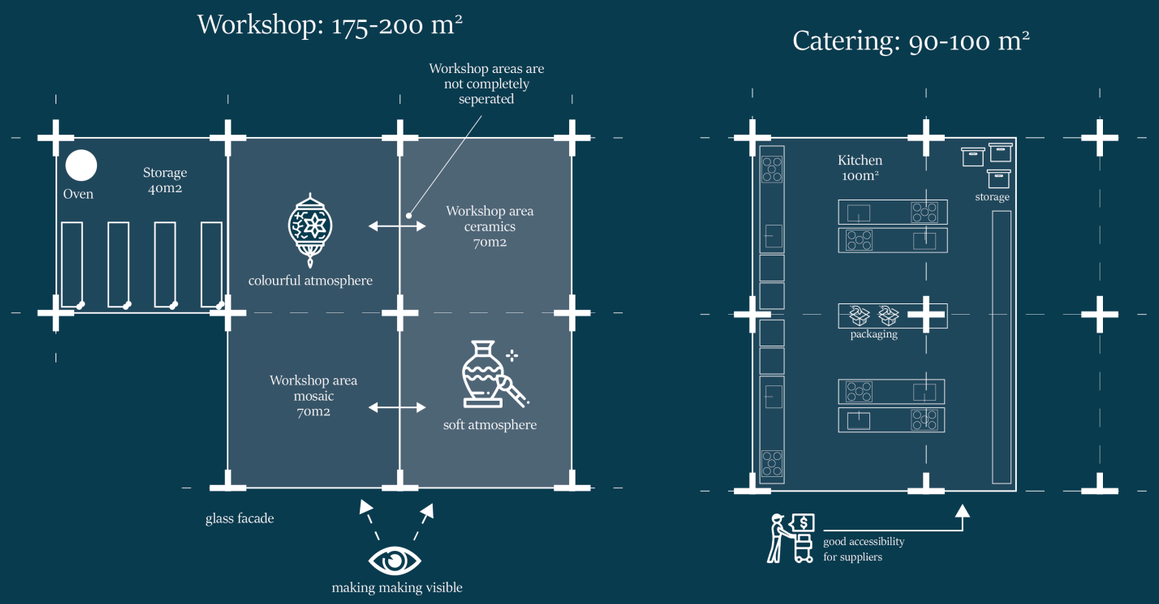


Image by author

7.5 The makerspace

Drawing from the insights provided, several key conclusions and recommendations can be formulated to guide future planning and development of business spaces for similar companies.

A predominant theme is the necessity for business spaces to be highly adaptable. Companies operate within a wide range of activities requiring spaces of varying sizes, from as small as 50 square meters to as expansive as 800 square meters. A conceptual design that allows for easy adaptation to specific size requirements is crucial. This includes modular designs or flexible floor plans that can accommodate the unique spatial needs of different companies, ensuring that the spaces are both efficient and cost-effective.

Another critical requirement is the need for certain businesses to maintain visibility to the neighbourhood and their clients. This visibility is not solely for the sake of aesthetics but serves as a vital link to community engagement and business activities' transparency. Design features like a glass facade or the strategic placement of workshops and retail areas can invite public interest and foster a connection between the businesses and their local communities.

The functional demands of business operations also dictate specific ceiling heights. Some companies require high ceilings of at least 6 meters for storage and operational activities, while others can operate within a 3.5 to 4-meter height. The possibility of incorporating split levels within a minimum plinth height of 8 meters adds another layer of flexibility, enabling businesses to maximize space utility for storage, additional installations, or creating distinct work areas within the same footprint.

The findings suggest that concerns related to sound or air pollution from these business activities are minimal. This opens the opportunity for innovative urban planning where business spaces can be integrated within residential areas. Such integration not only optimizes land use but also enhances the dynamism of neighbourhoods by bringing economic activities closer to where people live, potentially contributing to vibrant, mixed-use communities.

"The Nike Air Max drew inspiration from the daring inside-out architecture of Centre Pompidou, we should rethink storage spaces with a similar innovative mindset."

“In five years, we have the potential to annually save the municipality €2 million in benefits.”

7.6 Affordable business space

While the primary focus of this research is not on the financial feasibility of urban manufacturing, it is important to acknowledge several observations derived from the fieldwork conducted.

The affordability of business space plays a crucial role in the viability and success of enterprises within the urban manufacturing industry. Especially for those businesses that focus on particular social and circular objectives. Affordable business spaces enable these companies to operate within urban settings, where they can contribute significantly to the local economy and community welfare. Without affordable business spaces, the companies discussed in this study risk gradual disappearance from the urban landscape. Consequently, the city would lose the significant benefits these enterprises contribute in terms of circularity, social resilience, employment, and logistics.

Most interviewees highlighted the significant challenge of finding suitable business space at an affordable price. Eventually, they all found temporary accommodation in Feijenoord. In preparation for the area’s development, Stigam made vacant business spaces available to entrepreneurs. By offering these spaces almost for free to entrepreneurs, a hub and community of social enterprises have been created, providing them with the opportunity to grow and unite their forces. Nonetheless, it is universally recognized that this opportunity was distinct and of a temporary nature. Therefore, strategies must be explored to sustain such incubators in the city for the future.

The involvement of the municipality in providing affordable business spaces for these enterprises emerges as a significant point of discussion among those interviewed. There is a strong call for a more enabling role for the municipality, especially in supporting businesses that not only create commercial value but also have a significant social and circular impact.

Finally, the municipality is encouraged by the entrepreneurs to play more than just a regulatory or controlling role. Instead, the municipality should be an active partner in supporting social enterprises. For instance, by providing affordable business space or facilitating hubs where different enterprises can collaborate. By investing in such enterprises, municipalities stand to not only create more job opportunities but also realize substantial cost savings. For instance, the municipality could offer a reduced rate to social enterprises proportional to the savings they generate for the municipality. This would also contribute to the municipality’s broader social and economic goals, such as reducing unemployment.

8

Crafting Resilient Neighbourhoods Through Urban Manufacturing: Recommendations

To answer the main research question, this chapter combines the findings from extensive literature research and fieldwork to formulate prerequisites for spatial interventions that craft resilient neighbourhoods through urban manufacturing. The derived twelve recommendations are systematically organized according to the four pillars of successful urban manufacturing, as described in chapter 4. The recommendations can be used as a checklist in future urban development projects that seek to reintegrate manufacturing into urban neighbourhoods. It not only provides a framework for implementing these interventions but also ensures that each element contributes effectively to the overarching goal of enhancing urban resilience.

Diversity as a Catalyst for Urban Manufacturing

1. Design for Diversity

Urban manufacturing hubs should integrate various manufacturing activities, varying in both size and function, fostering lively environments throughout different times of the day.

2. Programmatic Diversity

Urban manufacturing boosts neighbourhood resilience most effectively when it is part of a broader ecosystem that includes not just production but also housing and education. Integrating these elements transforms manufacturing zones into vibrant, multi-use hubs that encourage innovation, learning, and stronger communities.

3. Collaborative Power

Partnerships with educational institutions and different businesses bolster innovation, skill development, and a circular economy. These synergistic relationships not only improve individual enterprise viability but also strengthen the entire manufacturing ecosystem.

Makerspace: Flexible hubs for collaborative manufacturing

1. Flexible Makerspace

Makerspaces should be highly adaptable. A conceptual design that allows for easy adaptation to specific size requirements is crucial.

2. Addressing Environmental and Spatial Requirements

Thoroughly assess the environmental needs of various businesses, such as noise and air pollution control. Cluster businesses based on similar operational characteristics and environmental impacts.

3. Affordable Makerspaces

Ensuring the affordability of business spaces is fundamental to the success and sustainability of urban manufacturing enterprises. Engaging municipalities at the beginning of the planning process is important.

Social inclusion: Building stronger communities

1. The Power of Local Communities

Focus on the skills and needs of the local community, promoting the integration and participation of all social groups in society.

2. Urban Manufacturing as Pathway to Employment

By facilitating mentorship programs, and personalized support, urban manufacturing can strive to create pathways for individuals to reintegrate into the workforce.

3. Design for Interaction

Architecturally design makerspaces as a venue for meaningful encounters and interactions between residents and businesses. Makerspaces can bridge the gab between private and public, bringing people together to build stronger communities

Circularity & Logistics: Sustainable urban manufacturing

1. Circular Urban Manufacturing

Embracing circular principles spurs innovation and optimizes supply chains, enhancing resilience against resource scarcity and setting a sustainable precedent for urban manufacturing.

2. Shorten Supply Chains

Urban manufacturing can shorten supply chains. By reducing reliance on external sources from abroad and optimizing internal processes, cities can be more self-sufficient while creating job opportunities.

3. Accessibility

Positioning urban manufacturing sites close to residential areas and public transport reduces travel requirements and lowers barriers for community involvement.

9
Discussion

This research establishes a theoretical framework for integrating urban manufacturing with housing, aiming to enhance the resilience of neighbourhoods. It examines the potential of urban manufacturing to act as a cornerstone for economic and social sustainability within urban settings. This chapter sets the stage for further investigations that could expand our knowledge and provide new insights. Highlighting that additional research could significantly expand our understanding and provide new insights into crafting resilient neighbourhoods through urban manufacturing.

9.1 Literature

The literature research provides a framework through its four pillars of successful urban manufacturing. This offers a solid theoretical foundation for understanding the relation between urban manufacturing, housing and social resilience.

Urban manufacturing, by its very nature, can serve as a significant economic engine for local communities. The concept of makerspaces, as outlined in section 4.2 of the research, highlights the potential for job creation and innovation. Makerspaces not only facilitate small business growth within the urban fabric but also contribute to reducing transportation needs, which aligns with the compact city model. However, the literature research currently lacks a detailed exploration of how these economic activities specifically affect the local economy. Consider, for example, the employment opportunities and financial independence of the residents in the area. During fieldwork, these aspects turned out to be rather important. Strengthening these aspects can create a stronger local economy and thereby enhance resilience within the neighbourhood.

Therefore, future research should focus on empirical studies that examine the specific economic impacts of urban manufacturing initiatives. This could include studies tracking economic outcomes for residents in neighbourhoods with strong urban manufacturing sectors compared to those without. Additionally, detailed case studies of successful urban manufacturing hubs could provide a blueprint for replicating economic success in other contexts.

9.2 Case studies

The research provides valuable insights through three case studies, each focusing on different pillars of successful urban manufacturing. The case studies discussed in the research are instrumental in understanding the dynamics of small-scale urban manufacturing environments. They explore how such set-ups can enhance community resilience by fostering close-knit interactions and localized economic activities.

However, the limited scale of these case studies poses a question about their applicability to larger, multi-use developments. The small scale might not capture the complexities and opportunities presented by larger mixed-use developments. The integration of manufacturing with housing in expansive projects requires a different scale of planning and resources, which these case studies may not fully address. Given the current design assignment of designing a large mixed-use building that integrates makerspaces with work/live dwellings and diverse apartment typologies, examining larger-scale projects could yield new insights.

9.3 Fieldwork

In the context of urban manufacturing and its impact on the resilience of residential neighbourhoods, the focus on social entrepreneurs within this research is strategically chosen. Social entrepreneurs inherently align urban manufacturing with social dimensions, such as utilizing local talent, enhancing educational opportunities, and creating local employment possibilities. This alignment not only supports the economic fabric of urban centres but also significantly contributes to the social resilience of these communities.

However, the scope of influence extends beyond social enterprises. For instance, interactions between social entrepreneurs and more commercially oriented companies or freelancers can yield fruitful exchanges as well. One of the interviewed entrepreneurs highlighted valuable collaborations with larger, more commercial entities, suggesting that diverse business models and philosophies can coexist and mutually benefit from each other's practices. This aligns with one of the key pillars of successful urban manufacturing: diversity. Given these insights, there is a compelling case for further research to explore how different types of businesses contribute to the resilience of urban manufacturing landscapes.

9.4 Financial feasibility

Paragraph 7.6 clarifies that the financial feasibility of urban manufacturing was beyond the scope of this research. Nonetheless, fieldwork indicates that the affordability of business space is critical to the viability and success of enterprises in the urban manufacturing sector. Without affordable business spaces, the companies discussed in this study risk gradual disappearance from the urban landscape.

Therefore, further research will be necessary to demonstrate the financial viability of urban manufacturing. These studies could explore various funding strategies and systems such as work corporations, social impact bonds or co-operatives. Each of these models offers unique mechanisms for financing that could support the sustainable development of urban manufacturing spaces.

10
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