Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Christiaan Hanse
Student number	4576977

Studio		
Name / Theme	Circular adaptable real estate reuse	
Main mentor	Hilde Remøy	Real Estate Management
Second mentor	Karel Van den Berghe	Urban Development Management
Argumentation of choice of the studio	Adaptive reuse (of heritage) fits well within the studio theme of adaptable real estate reuse. The circular aspect is included in the function which the reused asset is aimed to accommodate and the reuse itself. In addition, in this lab, expertise is present relating to values of real estate (such as those of heritage), assessment, circular development as well as real estate management in general which are all themes the research touches upon and aims to contribute to by its results.	

Graduation project	
Title of the graduation project	A circular^2 perspective on adaptive reuse of industrial heritage: facilitating urban manufacturing towards a circular city
Goal	
Location:	Several cases of industrial heritage in port-and industrial urban areas in cities in the Dutch context
The posed problem,	For many years, the concept of adaptive reuse of buildings has been researched. A focus on heritage and specifically the implementation of circular economy frameworks is however relatively new. Adaptive reuse of heritage is often concerned a circular strategy for its material reuse. However, there are many more dimensions to circularity in adaptive reuse, ranging from socio-economic values in urban environments to buildings facilitating and stimulating

	the circular economy by their new functions. One of the functions that can benefit of the added values of industrial heritage is the urban manufacturing industry. In return, urban manufacturing can provide several values to its urban context and contribute to development of the circular city due to ongoing developments in this sector. To date, integration of circular economy and adaptive reuse of heritage frameworks is limited and fragmented. An overarching conceptual framework for adaptive reuse in a multidimensional way is missing, and current research often avoids practical solutions and guidelines that can be used by developers and planners.
research questions and	**RQ** How can adaptive reuse of industrial heritage facilitate the developing urban manufacturing industry to contribute to the circular city? **SQ1** What is the role of urban manufacturing towards the circular city? **SQ2** What functions does the urban manufacturing industry and its urban support network consist of and what are their requirements? **SQ3** What are the added (tangible and intangible) values and synergies of adaptive reuse of Industrial heritage for the Manufacturing industry, users and their surroundings? **3.a** What are the added values of Industrial heritage? **3.b** What are the added values and synergies of combining adaptive reuse of industrial heritage and the manufacturing industry? **SQ4** How, and to what extent can these values strategically be used through adaptive reuse of heritage for the manufacturing industry? (development)

	4.a What are determining factors for the suitability of industrial heritage for the urban manufacturing industry? **4.b** What are success factors for adaptive reuse of industrial heritage for development of the urban manufacturing industry?
design assignment in which these result.	Assessment and development framework for accommodating the urban manufacturing industry in reused heritage assets based on the values, requirements and success factors

Process

Method description

This research will consist of mixed-method research which is both explorative and qualitative and will consist of a theoretical and empirical part. First, a literature review is conducted to define the context and problematisation and establish a relevant theme. The in-depth literature review aims to elaborate on the concepts discussed in the problematisation, providing answers to what the role of urban manufacturing is towards the circular city, what the urban manufacturing industry and its support network consist of and what their demand is, what the added values of heritage are for the urban manufacturing industry, and finally how these values can be used by a preliminary overview of the criteria and success factors for adaptive reuse of industrial heritage for urban manufacturing which provides input for the framework. The next step is to select an analyse a set (3) of case studies covering each of the categories of manufacturers defined in the literature review and selecting corresponding interviewees per case. Analysing project documentation and interviews are part of this phase. Per case at least one manufacturer and one location manager/initiator or involved public party are consulted. The semi-structured interviews are aimed at providing and insight into the values, criteria and success factors for urban manufacturing in industrial heritage from different perspectives to validate, and expand the ones found in literature. Coding will be used to organize the outcomes of these interviews, referring to the values, criteria, and success factors that will be used to assess heritage assets the framework. In addition, an expert review and questionnaire are used to enlarge the representativeness of the empirical research. The outcomes are used to develop and apply (test to a design case) the assessment and development framework that is the intended design output of this thesis.

Literature and general practical preference

The literature used in this study refers to several main concepts found in scientific research. These are found in the fields of Real Estate Management, Urban Development Management, Urban Planning and Circular Economy. First of all this relates to the values and strategies for adaptive reuse of (cultural) heritage and the relation with circular economy frameworks. In addition, literature on the urban manufacturing industry, the relation to circular economy, developments in this sector and their demand regarding accommodation (locations) have been consulted. In addition, success factors for implementing urban manufacturing and development principles for adaptive reuse in the context of circular economy have been derived from literature. Interviews with practitioners of manufacturing and related stakeholders including an expert review, and the questionnaire are meant to validate and elaborate on these outcomes from literature. Finally, the literature provides input for the framework development which based on several criteria, evaluation methods and existing assessment frameworks.

Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

Adaptive reuse of heritage and urban manufacturing, referring to a new use (adaptive reuse) both fit well within the studio theme of circular adaptable real estate reuse. In addition both adaptive reuse and urban manufacturing are part of several circular economy strategies. The master track MBE is operating between different scales and with stakeholders from all master tracks and different fields in practice. This research operates within this perspective by combining MBE-related fields like Real Estate Management and Urban Development Management in its selection of methods and literature. In addition, this integrated perspective relates to the master programme, where spatial planning (urban development), social, economic and environmental values and sciences are combined in the different professions within the built environment.

2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

Societal relevance

As society, the economy and the environment are continuously developing, the built environment is under pressure to adapt to new requirements, users and new (building) standards. An increasing number of buildings and sites is recognised as cultural heritage. Many of these have lost their original functions (Arbab & Alborzi, 2022) and the number increasing in some areas (Provincie Zuid-Holland, 2020). As the costs for functional maintenance are increasing, these buildings are at risks of unwarranted use (Arbab & Alborzi, 2022), decay and vacancies which can negatively impact the surrounding urban environments, as a large share of buildings in need is located in urban areas (Foster, 2020; Girard & Gravagnuolo, 2017). Reuse of these buildings would be an opportunity, as heritage is known to provide several added social and economic values to their urban surroundings. These are for example related to the cultural and architectural aspects of these buildings (Arfa et al., 2022), but also to the ability to revitalise urban districts (Foster & Saleh, 2021b), providing urban identity and liveability (Pintossi et al., 2021) which is reflected in for example increased value of real estate (Dell'anna, 2022). Therefore, turning

cultural heritage into a resource instead of a societal cost would be a relevant strategy to further research (Saleh et al., 2020).

The societal, economic and especially environmental developments require the transition to sustainable urban development and use of resources. The concept of circular economy is aimed to contribute to this by decoupling economic activity from finite resources, focusing on eliminating waste and pollution, circulate products and materials at their highest value and regenerating nature (Ellen MacArthur Foundation, 2013). Currently, industrial heritage sites have been increasingly transformed into residential and commercial urban areas while production moved outside of urban areas (Grodach & Gibson, 2019; van den Berghe & Vos, 2019). This has resulted in decoupling of spaces of production and consumption, resulting in a more linear urban system (Hausleitner et al., 2022). In addition, such developments are often coupled with gentrification, displacement, standardisation, loss of heritage authenticity and irreversible alterations to industrial infrastructure (Arbab & Alborzi, 2022; Hill, 2020; Jansen et al., 2021; Kohn, 2010; Mathews & Picton, 2014; Wang & Wang, 2018). This is problematic from the perspective of heritage values, availability of space for the urban circular economy and sustainable urban development from a social, environmental and economic perspective.

Therefore, a shift towards more balanced urban development by implementation of circular economy practices such as manufacturing is societally relevant. This does not only benefit the environment by reducing use of finite resources and shortening resources loops, but can also positively impact their surrounding in social and economic terms (della Spina, 2020; Gravagnuolo, Angrisano, et al., 2019; Gravagnuolo et al., 2021). This shift is increasingly visible in the outcomes of policies and the subject of discussion in society, asking to reserve and maintain space within the city for production (Jager, 2022; Ministerie van Economische Zaken en Klimaat, 2022; MKB Nederland Den Haag, 2022; Provincie Zuid-Holland, 2021) The outcomes of the research can be used in decision-making for adaptive reuse, for development of urban manufacturing and in circular urban development strategies. The combination of adaptive reuse of heritage and local circular economy development offers potential due to the mutual added values both concepts can provide (Gravagnuolo, Angrisano, et al., 2019; Tsui et al., 2021). Researching this combination can provide insight into the synergies that exist which can benefit society from multiple dimensions.

Scientific relevance

Currently, research on adaptive reuse of heritage is well established and the connection between adaptive reuse of heritage and circularity is increasingly being researched. A growing body of literature indicates the industrial transition that include processes and resource requirements that make integration of manufacturing in urban areas possible and even preferred in the light of circular economy development (Busch et al., 2021; Girard, 2013; Hausleitner et al., 2022; Hill, 2020). (Tsui et al., 2021) indicate that there is potential for research into the conditions to facilitate circular urban manufacturers. This research aims to look into the accommodation potential of industrial heritage and support networks and can therefore contribute to further research on these conditions. Finally, developing models for design, assessment and development is required because of the complexity of heritage and the multidimensional values of these buildings (Abastante et al., 2020).

Current frameworks are based on indicators and assessment for design and development solutions (Abastante et al., 2020; della Spina, 2019, 2021), decision making and adaptive reuse processes (Bullen & Love, 2011; della Spina, 2020; Kaya et al., 2021), the investment potential (Foster & Saleh, 2021b) and impact and performance of adaptive reuse (Girard & Gravagnuolo, 2017; Gravagnuolo, de Angelis, et al., 2019; Ikiz Kaya et al., 2021). However, an overarching framework to assess the multidimensional benefits of adaptive reuse is still missing (Bosone et al., 2021). In addition, the links between adaptive reuse of heritage and local circular economy development, focusing on mutual benefits of the circular function of the reused buildings, in particular urban manufacturing, has not been widely studied. There is both an academic and

practice gap for the translation of large scale strategies to a local scale and locally understandable guidelines including specific actions or activities for practitioners (Foster, 2020; Foster & Saleh, 2021a; Kaya et al., 2021). This means the development of an overarching assessment and development framework could contribute to combining different fields of academic research on adaptive reuse of heritage and circular development, including manufacturing. It could also help in the translation to the scale of practice, which this research to contribute to with the proposed frameworks.

Cited literature

Abastante, F., Corrente, S., Greco, S., Lami, I. M., & Mecca, B. (2020). *The introduction of the SRF-II method to compare hypothesis of adaptive reuse for an iconic historical building*.

Arbab, P., & Alborzi, G. (2022). Toward developing a sustainable regeneration framework for urban industrial heritage. *Journal of Cultural Heritage Management and Sustainable Development*, *12*(3), 263–274. https://doi.org/10.1108/JCHMSD-04-2020-0059

Arfa, F. H., Lubelli, B., Zijlstra, H., & Quist, W. (2022). Criteria of "Effectiveness" and Related Aspects in Adaptive Reuse Projects of Heritage Buildings. In *Sustainability (Switzerland)* (Vol. 14, Issue 3). MDPI. https://doi.org/10.3390/su14031251

Bosone, M., de Toro, P., Girard, L. F., Gravagnuolo, A., & Iodice, S. (2021). Indicators for ex-post evaluation of cultural heritage adaptivreuse impacts in the perspective of the circular economy. *Sustainability (Switzerland)*, *13*(9). https://doi.org/10.3390/su13094759

Bullen, P., & Love, P. (2011). A new future for the past: A model for adaptive reuse decision-making. *Built Environment Project and Asset Management*, *1*(1), 32–44. https://doi.org/10.1108/20441241111143768

Busch, H. C., Mühl, C., Fuchs, M., & Fromhold-Eisebith, M. (2021). Digital urban production: how does Industry 4.0 reconfigure productive value creation in urban contexts? *Regional Studies*, *55*(10–11), 1801–1815. https://doi.org/10.1080/00343404.2021.1957460

della Spina, L. (2019). Multidimensional assessment for "culture-led" and "community-driven" urban regeneration as driver for trigger economic vitality in urban historic centers. *Sustainability (Switzerland)*, *11*(24). https://doi.org/10.3390/SU11247237

della Spina, L. (2020). Adaptive sustainable reuse for cultural heritage: A multiple criteria decision aiding approach supporting urban development processes. *Sustainability (Switzerland)*, *12*(4). https://doi.org/10.3390/su12041363

della Spina, L. (2021). Cultural heritage: A hybrid framework for ranking adaptive reuse strategies. *Buildings*, *11*(3). https://doi.org/10.3390/buildings11030132

Dell'anna, F. (2022). What Advantages Do Adaptive Industrial Heritage Reuse Processes Provide? An Econometric Model for Estimating the Impact on the Surrounding Residential Housing Market. *Heritage*, *5*(3), 1572–1592. https://doi.org/10.3390/heritage5030082

Ellen MacArthur Foundation. (2013). *TOWARDS THE CIRCULAR ECONOMY Economic and business rationale for an accelerated transition*.

Foster, G. (2020). Circular economy strategies for adaptive reuse of cultural heritage buildings to reduce environmental impacts. *Resources, Conservation and Recycling*, *152*. https://doi.org/10.1016/j.resconrec.2019.104507

Foster, G., & Saleh, R. (2021a). The adaptive reuse of cultural heritage in European circular city plans: A systematic review. *Sustainability (Switzerland)*, *13*(5), 1–15. https://doi.org/10.3390/su13052889

Foster, G., & Saleh, R. (2021b). The Circular City and Adaptive Reuse of Cultural Heritage Index: Measuring the investment opportunity in Europe. *Resources, Conservation and Recycling*, *175*. https://doi.org/10.1016/j.resconrec.2021.105880

Girard, L. F. (2013). Toward a smart sustainable development of port cities/areas: The role of the "Historic Urban Landscape" approach. *Sustainability (Switzerland)*, *5*(10), 4329–4348. https://doi.org/10.3390/su5104329

Girard, L. F., & Gravagnuolo, A. (2017). *Circular Economy and Cultural Heritage/Landscape regeneration. Circular business, financing and governance models for a competitive Europe Horizon 2020 "CLIC" Circular models Leveraging Investments in Cultural heritage adaptive reuse View project*. https://doi.org/10.6092/2284-4732/5472

Gravagnuolo, A., Angrisano, M., & Girard, L. F. (2019). Circular economy strategies in eight historic port cities: Criteria and indicators towards a circular city assessment framework. *Sustainability (Switzerland)*, *11*(13). https://doi.org/10.3390/su11133512

Gravagnuolo, A., de Angelis, R., & Iodice, S. (2019). Circular Economy Strategies in the Historic Built Environment: Cultural Heritage Adaptive Reuse. *STS Conference Graz*, *2*. https://doi.org/10.3217/978-3-85125-668-0-08

Gravagnuolo, A., Fusco Girard, L., Kourtit, K., & Nijkamp, P. (2021). Adaptive re-use of urban cultural resources: Contours of circular city planning. *City, Culture and Society*, *26*. https://doi.org/10.1016/j.ccs.2021.100416

Grodach, C., & Gibson, C. (2019). Advancing Manufacturing?: Blinkered Visions in U.S. and Australian Urban Policy. *Urban Policy and Research*, *37*(3), 279–293. https://doi.org/10.1080/08111146.2018.1556633

Hausleitner, B., Hill, A., Domenech, T., & Muñoz Sanz, V. (2022). Urban Manufacturing for Circularity: Three Pathways to Move from Linear to Circular Cities. In *GeoJournal Library* (Vol. 128, pp. 89–103). Springer Science and Business Media B.V. https://doi.org/10.1007/978-3-030-78536-9_5

Hill, A. V. (2020). *Foundries of the future : a guide for 21st century cities of making*. TU Delft Open.

Ikiz Kaya, D., Dane, G., Pintossi, N., & Koot, C. A. M. (2021). Subjective circularity performance analysis of adaptive heritage reuse practices in the Netherlands. *Sustainable Cities and Society*, *70*. https://doi.org/10.1016/j.scs.2021.102869

Jager, J. (2022, November 16). *Gemeente Rotterdam zet rem op verdere teruggang ruimte voor werken*. Stadszaken. https://stadszaken.nl/artikel/4736/gemeente-rotterdam-zet-rem-op-verdere-teruggang-ruimte-voor-werken

Jansen, M., Brandellero, A., & van Houwelingen, R. (2021). Port-city transition: Past and emerging socio-spatial imaginaries and uses in Rotterdam's makers district. *Urban Planning*, *6*(3), 166–180. https://doi.org/10.17645/up.v6i3.4253

Kaya, D. I., Pintossi, N., & Dane, G. (2021). An empirical analysis of driving factors and policy enablers of heritage adaptive reuse within the circular economy framework. *Sustainability (Switzerland)*, *13*(5), 1–25. https://doi.org/10.3390/su13052479

Kohn, M. (2010). Toronto's distillery district: Consumption and nostalgia in a post-industrial landscape. *Globalizations*, *7*(3), 359–369. https://doi.org/10.1080/14747731003669735

Mathews, V., & Picton, R. M. (2014). Intoxifying gentrification: Brew pubs and the geography of post-industrial heritage. *Urban Geography*, *35*(3), 337–356. https://doi.org/10.1080/02723638.2014.887298

Ministerie van Economische Zaken en Klimaat. (2022). *Kamerbrief Het verschil maken met strategisch en groen industriebeleid*. www.rijksoverheid.nl/ezk

MKB Nederland Den Haag. (2022, December 8). *Den Haag moet meer ruimte geven aan maakindustrie*. MKB Nederland Den Haag. https://mkbdenhaag.nl/den-haag-moet-meer-ruimte-geven-aan-maakindustrie/

Pintossi, N., Ikiz Kaya, D., & Pereira Roders, A. (2021). Assessing Cultural Heritage Adaptive Reuse Practices: Multi-Scale Challenges and Solutions in Rijeka. *Sustainability (Switzerland)*, *13*(7). https://doi.org/10.3390/su13073603

Provincie Zuid-Holland. (2020). *Erfgoedmonitor 2020*.

Provincie Zuid-Holland. (2021). *Verstedelijking en functiemenging*. https://www.zuid-holland.nl/onderwerpen/ruimte/verstedelijking/

Saleh, R., Drouillon, P., & Ost, C. (2020). *D4.5 Circular Business Model Workshops for Cultural heritage adaptive reuse*.

Tsui, T., Peck, D., Geldermans, B., & van Timmeren, A. (2021). The role of urban manufacturing for a circular economy in cities. In *Sustainability (Switzerland)* (Vol. 13, Issue 1, pp. 1–22). MDPI AG. https://doi.org/10.3390/su13010023

van den Berghe, K., & Vos, M. (2019). Circular area design or circular area functioning? A discourse-institutional analysis of circular area developments in Amsterdam and Utrecht, The Netherlands. *Sustainability (Switzerland)*, *11*(18). https://doi.org/10.3390/su11184875

Wang, Y.-W., & Wang, X. (2018). Industrial heritage valorisation and creative industry urban regeneration. *Built Heritage*, *2*(2), 76–92. https://link.springer.com/article/10.1186/BF03545695