NDSM Theatre

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The NDSM Wharf is located on the northern shore of the IJ in Amsterdam. Reclaimed from the IJ around 1876 it came first in use in the early 1900’s. During the last century the NDSM Wharf has seen different kind of functionality but the industrial character still remains. The graduation project focuses on the future functionality of the NDSM Wharf and how it can fit in with the plans of Amsterdam for the growing metropolis.

1. Introduction
For a very long time Amsterdam has been a harbour city, getting wealthy through trading and ship industry. The biggest example was of course the Verenigde Oost-Indische Compagnie (VOC), flourishing in the 17th century. The VOC made Amsterdam the richest city in world, and this age is known as the Dutch Golden Age. After the VOC it was both trading and ship building that kept Amsterdam rich. Amsterdam was the largest competitor of Rotterdam, which is now the most successful harbour city of Europe. The location of Amsterdam was the main reason for its success, but also the main reason for its demise. The IJ was most important for Amsterdam: it was their key to transport, trading and wealth. Naturally the shores of the IJ were very precious.

Originally Amsterdam had an open connection to the sea via the Zuiderzee, now IJsselmeer. Because of the way Amsterdam is situated in relation to the Zuiderzee, sediment was growing rapidly on the bottom of the IJ. The many efforts to remove this sand became useless. Around 1800 the entrance to Amsterdam via the Zuiderzee was hardly accessible for larger ships and Amsterdam had to act fast. It was then that they decided to create another way to the sea, a canal. The technical advisor of the Queen was against a direct opening with the sea (via Haarlem) because it could be too dangerous for the city of Amsterdam. Therefore it was decided to dig a canal to the north, via Purmerend, Alkmaar and ending in Den Helder. This canal (the Noordhollandsch Kanaal) was finished in 1824. The canal was very long (80 km) and 40m wide. Back then it was the widest and longest canal in the world. Due to the industrial revolution the size of ships grew and grew and it was not too long before this canal became too small for the ships.

Noordzeekanaal
25 Years after the opening of the Noordhollandsch Kanaal the technical advisor of the Queen gave permission to make a direct link between Amsterdam and the sea via Haarlem. The Noordzee Kanaal was opened in 1876 and had a big impact on Amsterdam. Not only did it create many jobs in a time of crisis, the new canal also brought fresh water into the Amsterdam canals, improving the living conditions in the city. At the same time the Noordzee Kanaal was dug, new polders in the IJ were created. In total 5.500ha of polder. The grounds were sold and the benefit was used to finance the Noordzee Kanaal. The new polders were turned into industry zones, with housing for the employees. This was the start of the development of Amsterdam Noord as a part of the city Amsterdam.
Amsterdam around 1850 (G. Schuurman, 1850, Nationaal Archief).

Amsterdam around 1875, after the construction of the Noordzee Kanaal. Reclaimed land from the IJ. (G. van der Stok, 1875, Historisch Centrum Noord).

**NDSM**
The (former) NDSM Wharf is located in one of the polders which were reclaimed from the IJ during the digging of the Noordzee Kanaal in 1876. The company NDSM, short for Nederlandsche Dok en Scheepsbouw Maatschappij v.o.f., is a merger of two smaller companies: NSM and NDM. The merger existed between 1946 and 1984.
The first company, NSM, was founded in 1894 and was located on the southern shore of the IJ until the relocation in 1919. In 1919 NDSM moved to the northern shore of the IJ where she became the largest shipbuilding company in the world in 1937.
The second company, NDM, was founded in 1920. NDM was a cooperation of many small ship repair companies with the hope of withstanding the competition of the fast growing Amsterdame Droogdok Maatschappij (ADM). NDM was located directly next to NSM.
After the Second World War the demand for new and larger ships grew, due to the increase in global trade. The private sailing, both for passengers and goods also increased after the war. This increased the demand for repair and replacement of older ships. In 1946 NSM and NDM merged and became NDSM. Although the two companies became one, the activities stayed the same: on the former NDM wharf (west) repairs took place; the old NSM wharf (east) was still the place where new ships where build. NDSM played an important role in the ship industry. The company developed ground breaking technologies that are still used today and a few of the world’s fastest ships (of their age) where build in Amsterdam. For Amsterdam, and particularly Amsterdam-Noord, NDSM meant industry and work. Most of the inhabitants of Amsterdam-Noord used to work, or know at least one person who used to work for NDSM sometime in their life.

In 1978 things went downhill for NDSM. Funding for shipbuilding companies were reduced and one by one wharfs were closing down. In 1984 NDSM filed for bankruptcy. In 1987, three years after NDSM, the company Shipdok Amsterdam bv. came to the eastern part of the former NDSM wharf and continued to repair ships. Shipdok was in business until 2005, when they also filed for bankruptcy.

Since 2011 the former NDSM wharf is a home for artists and musicians. NDSM became a breeding ground for culture, festivals, artists and musicians.

*Historical picture of NDSM (1969).*
2. Framework

Amsterdam is still growing and expanding. The capital is a desirable place for people to live, but the city is also full. Over the past decades it has expanded in almost every direction and has now reached its limits. Recently, developments in Amsterdam-Noord have begun, mainly focussing on the IJ shores. The EYE museum and surrounding apartment buildings are a clear example of these developments. It is clear that the municipality of Amsterdam has set their will on making Amsterdam-Noord a high functioning part of Amsterdam. The NDSM wharf is one of the areas that is to be developed in the coming years.

NDSM has two very distinctive characters: the historical industrial character, and the current artistic/cultural character. In the Structuurvisie 2040 Amsterdam describes two cases which will greatly influence the future character of NDSM. Their first intention is to expand the city centre of Amsterdam to the other side of the water, thereby making the IJ the heart of Amsterdam, instead of a border. Their second intention is to turn the new heart of Amsterdam into a cultural area. The latter is already visible due to the construction of the Muziekgebouw aan het IJ and EYE filmmuseum and several other projects that are about to be realized.

However the current plan focused on NDSM holds 43% housing and another 30% for offices and companies. This program does not reflect the historical and present character of NDSM. Nor does the current plan fit the future intentions for the IJ and Amsterdam-Noord, which were described in Structuurvisie 2040.

What would be a better solution for NDSM? How to combine the historical industrial character, the current artistic/cultural character and the future metropolitan conditions?

Proposal for expansion of centre.
(Structuurvisie 2040, 2011)

Cultural initiatives around the IJ.

Project Framework

The goal of this graduation project is to propose a building that fits the future metropolitan conditions, but also takes the historical and present character of NDSM to heart. The concept for the building and concept is based on research and interpretations of the current and future character of the location. In 2040 NDSM will most likely have a metropolitan character, resulting in a mixture of public functions, private functions, and public space. The cultural character of the former wharf is still important and makes the distinction between NDSM and the other area’s around the IJ. The metropolitan character is combined with the dire need for housing, resulting in a very mixed program and a high urban character.

NDSM is located ideally with respect to Amsterdam Central Station, making the site valuable and the programmatic interpretation for the proposed building important. According to the current and future character of the area, the building will accommodate several functions, with the main focus on public/cultural functionality. The complex will therefore be a variation of housing, restaurants, retail, pubs, public area and a theatre/opera house. The graduation project will focus on the theatre and additional functionality and give an architectural hint to the rest of the complex.
Since the valuable character of the location it is the goal for this graduation project to make the theatre suitable for several other functions, such as concerts (symphonic, chamber music, and contemporary), opera and theatre productions, and conferences. By making the NDSM theatre adaptable for different types of activities, the building will always be relevant to its surroundings. There is always some activity going on, making it a lively part of the future Amsterdam metropolitan area.

3. Methodology
The Hyperbody graduation studio focusses on a research driven design approach. Using associative and computational tools to research the complex relationship between social, environmental, spatial and technological aspects of the design framework. The MSc3 period focusses on researching these complex relationships and formulate an architectural formation which fits the design framework. During this semester several workshops are attended to learn the computational tools. MSc4 focusses on translating the architectural formation into a complex architectural project, using a predominantly top-down design approach.

This Hyperbody graduation studio consisted of 7 students whom where all assigned the same site. By using a negotiation tool, locations were assigned for each student to develop his or her graduation project. In several cases links with other graduation projects were made. The location finding process, the design process and all references (theoretical and practical) contributed to the outcome of the graduation project.

Approach location finding
How to assign a design location to seven students whom are all located on the same site? Every student had its own ideas and interpretations on the future characteristics of the site and which type of building would most likely fit that scenario. The site could be divided subjectively by giving every student the location they liked best (and in case several students wanted the same, by means of a draw) or it could be done objectively. Each student did its own research on the location – past, present and future. Then 7 probability maps were made: history, public space, culture, education, office, housing and events. The lighter the colour, the more likely that functionality was taking place in that location in 2040. The maps by the 7 students were overlapped and created a more objective dataset of probable functionality. Besides the probability maps every student had to formulate a wish list for his or her project. Which character, to be defined as a percentage of the 7 parameters, suits my graduation project best? The dataset of probable functionality was computationally tested with the personal wish list. The outcome for every student was their design location and a collection of functional probability points. The points showed the most likely location where a specific type of function could happen.
Approach design process

After the personal design locations were assigned the resulting data was used as a base for the design process. The first step in this design process is to look out for attractor points in the direct area. Attractor points can be functions, access areas or meeting areas where people would be attracted to or repelled from. With a simulation it is possible to use agents (swarm-like particles that represent people) to determine the attraction of functionality around your design location and on your design location. The outcome gives information which area attracts more people, what the entrances to your area could be, etc. It also gives a first hint of routing to, from and throughout your building and its geometry.

At the same time a list of functional relationships for the opera house was set up. An opera house has many different functions (from the main performance hall, to dressing rooms, delivery access and ticket counters), with their own characteristics (from very public and open, to very private and closed) and interfunctional relationships (dressing spaces close to the performance hall, wardrobe near the entrance). The logic and relationships between these functions were mapped and integrated with the routing simulation. After several iterations the simulations showed the most optimal setup of the functions (in relation to each other and in relation to exterior input) and the most probable direction of routing to, from, and throughout the building. The resulting data was then translated into architecture an architectural formation which was presented at P2.
Translating routing data into a design
The resulting routing data at P2 showed two very distinct outcomes: a private routing layer for artists and employees and a public routing layer for visitors. The private layer was very direct and located at the lower parts of the building. The public layer was more extensive, weaving through different functions, and located in the higher areas of the building. The two layers only came together in the performance spaces and slightly in the foyer areas.
The results were shaped into complex architectural layers using a top-down design approach. Sightlines between the different routing layers became very important, but also the transition from entrance to performance. Visiting a theatre is after all not only about the performance, but also about seeing all other visitors and experiencing the visit.

Translation from routing data into a complex multi-layer system.

Translating function boxes into architecture
The functional simulations resulted in the optimal setup for functions in relation to each other, the routing and outside parameters. They have always been represented as boxes, conform their needed space. These boxes needed to be translated into architectural space. These boxes were translated into point clouds, where each point becomes an individual member that can react to its surroundings. The geometry is informed by outside (environmental) parameters (by changing their location, or changing the density of points) and the relationships between different point clouds that are intruding each other. This top-down design approach resulted in a transformation of separated boxed, into one conglomerated mass. The figure below demonstrated this process.
References
As for research into the location there are many official documents used, the *structuurvisie 2040* of the municipality of Amsterdam and the current development plan for the area. These document, and more, are acquired via the municipality of Amsterdam. The group *IloveNoord* organises several meetings a year about developments in Amsterdam-Noord. These meetings are attended by the municipality of Amsterdam, project developers and inhabitants of Amsterdam-Noord. So far the meetings have been very useful and inspirational and brings me into contact with inhabitants of the NDSM wharf who give a great insight on how the location actually works.

A large part of my friends live in Amsterdam-Noord, meaning they give their opinion on urban developments from another perspective than the municipality. It is a great insight and makes you address the design problem from more than one side. It also means I very often visit the direct area around the design location, so I get a good feeling of the actual way things work around there. To top it off, my history thesis (MSc2) was about northern slopes of the IJ in relation to the city of Amsterdam. This historical research gave me a good foundation to build criteria upon.

Besides the theoretical references and reference projects mentions earlier in this reflection, three projects related to opera were of great relevance to this project. First the *Guangzhou Opera House* by Zaha Hadid was visited. From the outside the building looks like no ordinary opera house, meaning it could be experienced and studied with an open mind. The opera house has several entrances, but it is not clear which of the entrances is for which occasion. The interior is bright and spacious, but with the same bad detailing as the exterior façade. The curvilinear character of the interior worked disorientating, although there was only one direction to go: to the auditorium. The interior of the auditorium is in great contrast with the rest of the building and detailed perfectly. The auditorium is designed in such a way to optimally accommodate the acoustics. The use of colour and materials created an emerging experience on the audience. The visit to Guangzhou Opera House showed a possibility for a non-standard opera house.

The second relevant project is *the Stopera* (opera house) in Amsterdam. A unique opportunity presented itself to visit the opera house behind the scenes, early September 2012. During a full day all aspects from an opera house were visited: the design and workplaces, the costume departments, the rehearsal spaces, the technical basement (with tilting performance platform) and the theatre tower (including technical attic). The tour showed how much technology is used to create a work of
art, and how many specific requirements there are to keep in mind when designing an opera house. This day proved to teach more about technology and opera than any book could.

The last project that was of great importance for this graduation project, was the opera Carmen. Carmen was performed five times in the Auditorium of TU Delft between November 12 and November 20, 2012. This opera was part of the official celebrations for the 170th anniversary of TU Delft and organised by 5 enthusiastic students from TU Delft. Being one of the five organisers for this opera, and also participating in the choir, gives a special view on what is needed to make an opera. The fact that the rehearsals and performances did not take place in an opera house, made it very clear what functions and services were dire for a production. Being surrounded by opera experts and organising a large opera on location might have been the most informative reference for this entire graduation project.

4. Reflection
So far this document has revealed the underlying context, research and methodology for this graduation project. This last part will reflect on these aspects and answer if the chosen approach and decisions where the correct ones or how it could be improved if there is a next time.

Methodology
Graduation in Hyperbody is a research driven design approach with the goal to create non-standard and/or interactive architecture. During MSc3 several computational designs tools were introduced by means of workshops. These workshops taught the basis of the tools, which everybody individually could apply to their project. The tools gave a very firm direction to the design approach and resulted with an architectural hint at P2. These tools were also used in MSc4, but later the design approach transitioned from bottom up to top-down architectural decision making.

My personal background with Hyperbody in previous projects lie with fabrication and rapid prototyping. Meaning I had no experience with the computational design tools which formed the core of Hyperbody graduation. Learning to work with these new tools and new design approach was very inspiring, but was at times also quite hard. Questions such as “how can I use these tools to create the project I want” were not easily answered. Or it is not very clear how tools may help in the design and decision making process, because I have no knowledge of their existence.

Looking back on the process I see that the design tools could have been utilised more extensively, but I only see that now that I have more knowledge about the tools. However, the way they were utilised in the end and how the results formed the project is in accordance with the methodology.

Research and design & relevance and output
The study plan proposed several research topics, which included the location, the functional program and the concept for the graduation project. These topics are also addressed earlier in this document. I took the outcomes of the different researches as important building blocks for the project. The research into the history of NDSM and its predicted future gave idea to the concept of the entire project. The concept of the project was verified by reflecting it on research into the functional program. Meaning that all information sources, both large and small, were taking serious and were crucial when making design decisions.

Most research was done into the functional program (building for the performing arts) for this graduation project. Partially because designing such a building is quite the challenge, and on the other hand because I’ve become intrigued with the topic. The area surrounding the stage is one of the most complex areas in the entire building, it is where science, art and architecture come together. The opportunity to visit the backstage of the Stopera in Amsterdam was invaluable for this project. Even as the opera Carmen which I organised. There is only so much you can learn from books
and drawings, but to be actually walking backstage and confronted with everything that is needed for a production is where most important information is. Research is at the base of all design decisions during this graduation process. Most importantly the functional program of the building in relation to the direct and wider location and the future. But also at a smaller scale where geometric design decisions influence the character and experience of spaces. During every aspect of the design process I’ve reflected on the decisions that I was about to make: do they fit in with the framework that I set myself, do they fit in with the context the building will be in in 2040, do they fit in with the methodology of the graduation studio. Therefore I dare say that the NDSM theatre suits its location, its future and its design methodology.

**Time planning**
The graduation studio was started in February 2012. At P2 a special time planning was proposed for the second half of the graduation studio (fall 2012). This planning was consulted with study advisors. After P2 the project was set on ‘hold’ for a semester, so I could work full time on the organisation of the opera *Carmen* for TU Delfts 170th anniversary. The idea was to continue working 2 days a week on the graduation project during summer, September and October. And to be back to working full time on the graduation project in January 2013.

Unfortunately for the graduation project, the planning did not work out in reality. The opera *Carmen* grew to be a much larger project than anyone involved could have anticipated, and it was very hard to find volunteers to do the extra work (many named the universities binding study advice as their reason to not be able to help out). This led to giving up on the graduation project completely for the entire semester. In the end it was halfway March before I managed to be working full time on the project again, meaning the original planning to graduate in April and June were too naïve.

Because of this long break the project lacked direction for a long time. The basis – that which was created before P2 – was standing strong, but everything that was applied ‘on top’ kept tumbling down. It took quite a long time (summer 2013) before the graduation project was back on track and heading in the right direction. Looking back on MSc4, taking a semester off in the middle of a graduation project was not the best idea (concerning the graduation project). It took way too long to get back on track, and that long process killed motivation for a while. On the other hand to be involved with *Carmen* and be completely immersed in the opera world turned out to be invaluable for both the graduation project and personal experience. It would have been very hard to design a building for the performing arts without being so passionate about it and so completely absorbed in it. In the end there would not have been an ideal solution for combining *Carmen* and graduation, but it would have made the second half of the graduation process flow smoother it were possible to continue working on the project during *Carmen*. 