

# Reflection Graduation studio The Why Factory 2016 – 2017

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## **The Why Factory**

The Why Factory (T?F) is a global think-tank and research institute at the Delft University of Technology and led by professor Winy Maas. It explores possibilities for the development of our cities by focusing on the production of models and visualisations for cities of the future.

## **Theme of research studio - student**

In the past years the graduation lab had an overall theme for students to frame their projects in. The ambition for this year was to combine all the previously studied themes. The brief only held that the building should be within 100x100x100 meters, and a part of the program should be housing. Students had to provide their projects with a theme themselves.

I chose to study self-sufficiency and came to the decision to add food production to the building. This topic was previously studied by the why factory and I could build on the acquired knowledge and reflect on that. Previous projects studied specific food groups (pig city) or a specific location at a large scale (food city NL, food racks in Barcelona).

My project is about a producing a full diet and the impact on one building block. How would a housing block look if we would grow all our own food? What would we need if we were all vegan? How well would this perform? It also explores the relationship with housing and the possibility of improving the quality of dwelling.

There was also no given location for the housing block. This is a deviation from a usual project at the TU Delft. A site is seen as a combination of specific parameters like latitude and longitude, rainfall and temperature data, FAR and people density. The location is a reduction of an actual site, so it becomes more widely applicable. It also means that the project can adapt to these parameters changing. The project is a system for designing buildings according to relevant parameters.

As the studio we have chosen the FAR and people density of Barcelona as a common starting point for the individual projects. I also place my project in an urban environment to show both the source and solution of the design problem. Population growth and expanding urbanization require more food production which impacts the planet negatively. However densifying food production in the city could relieve the negative impact we impose.

## **Research question**

*How can food production and dwelling be combined into a food self-sufficient housing block in an urban context?*

## **Research methodology and design**

The Why Factory's approach to research and design is to perform research by design.

To answer the research question, different possibilities are generated. An analysis of the different options allows comparing and evaluation. A conclusion leads to a design decision.

For every aspect of the design problem or research question a sub question is formulated. For every question options are generated, analyzed and a decision is made. Designing is done in steps, by choosing an option for every sub question. The design develops in this way until it becomes more concrete and realistic. When building technology is integrated in this research, the design can become a proof on concept.

Research is the creation of critical questions and the production of design options. The final design consists of a series of conclusions of the research.

### **Research method of studio and student**

All students in the why factory are encouraged to adopt the research method of The Why Factory. That also counts for my graduation project. As a considerable part of the work we did was done collectively, this common research method was important to be able to compare and combine that work.

When producing design options for a research question, the main act becomes designing again. Sketching with pen and paper is still at the heart of my design process. Not every sketch is researched with the same level of scrutiny. Not every design option has its goal specified and its performance quantified. Small explorations and iterations are done by sketching. If something of interest is discovered, a more rigorous study is performed by creating, analyzing and evaluating 3d models.

### **Preliminary results**

#### **Collective research results**

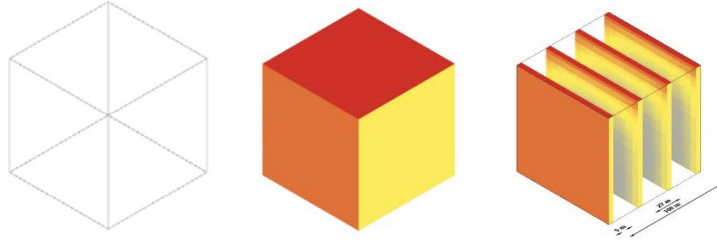
The product of the collective research is an overview of relevant topics of architectural design and a catalog of the design options within each topic. Running through this overview step by step, comparing options could be done in a software environment. We call this software the Blockmaker.

#### **Personal research results**

My preliminary results are shown by vertical farms being dispersed in the envelope. To maximize the amount of food that can be grown within a certain envelope, a sun catching surface should be spread around the maximum bounds of the envelope. This catches the most sunlight energy meaning the maximum amount of energy potentially being able to be transformed into food.

A second requirement for food production however is the amount of surface. The minimum amount of surface to place crops on should be distributed in such a way that the most sunlight is being caught.

A third step is to distribute sunlight over the required surface. Too much sunlight on a specific unit of surface is not productive since a plant can only grow so much in a given amount of time.



About 130 people could be fed in a mass like this. With a vegan diet, produced by hydroponic farming technology, with the sun exposure of the Netherlands.

The combination of the mentioned parameters leads to this outcome. The method of measuring this outcome allows to test other locations, other diets, and other farming methods.

### **Reflection on methodology**

#### *Why this method?*

I have understood the research approach of the why factory as a way of making the design process more **explicit, structured** and **logical**. Making the design process explicit and structured allows the designer to be critical about decisions and to learn from that and make the design more logical.

#### *Objectivity the goal?*

Architectural research can be made more structured, logical and explicit in an academic environment but that will not make it objective. Architectural research is not objective in a scientific way. There is merit in the effort of doing this however: becoming more critical about design decisions and informing design with facts and numbers from other (scientific) disciplines. Especially for future scenarios this is a way to keep projects from being naïve.

#### *Did it work? How and why?*

It worked for the topic of food production. Food production is something that can be quantified and put into spatially measurable elements. When the research topic can be expressed in spatial terms, or when a spatial design options can be expressed to have an effect on the research topic, research by design can take place.

#### *Limitations of the method: Design is not linear*

A problem that arises when explaining a design step by step. It seems that the process of design is linear which it isn't. An iteration loop through different aspects or scales is difficult to explain. Normally when a design is explained linearly this is only the end result being explained step by step. The design process is often less linear and more chaotic.

#### *Balancing structure and freedom*

There is a balance of trying to keep things in a clear step by step research by design overview and a more chaotic design way of working that includes jumps to intuitive conclusions and working on things that are in between different topics of the overview, and don't fit in.

The free, chaotic and discursive nature of design is being structured. Some things cannot immediately be classified into the structure, which can feel limiting in a way. It isn't really limiting but it is an extra step to bring it into a structured overview.

A structure that is ultimately arbitrary although defensible because it helps to keep an overview of the elements of the design the step by step method helps to critically assess every design decision.

### *Collective versus individual*

Within our project the team was constantly experiencing a 'fight' between the specificity and depth of the personal projects and the breadth and generality of the Blockmaker framework. Near the end of the process we decided on a clear division between the projects. This division being: BM is a platform for options and comparing them, while the projects use the framework as starting points for further detailed design.

## **The blockmaker / research method in the architectural context**

Automatization in general has been a force of change since the industrial revolution. Until this day it is threatening job losses globally. It also changes architecture. This can be seen through the increasing use of the computational capabilities of electronic devices. Software like grasshopper and revit automate more and more tasks previously done by designers.

### *What is the blockmaker?*

The blockmaker is an idea for a software that allows you to compare design options for different topics relevant to the design of a building block.

### *Extensive catalog, not exhaustive*

The blockmaker can be used to generate options as possible designs / starting points for design. The options that are in the bm are on a detail level that is still understandable by outsiders of the architectural/building world. Not all the options are inside the bm, additional custom options could be created outside of the bm. This allows someone with more insight to have more control. The bm then serves as a framework to combine it with other sub-aspects of designing a housing block.

### *Platform for comparing*

The BM is a framework for research into design options within topics relevant to building a housing block. The analysis and evaluation parts of the BM allow for it to be a platform for comparison of design options. External options can be imported and evaluated in the same way.

### *Not design AI*

The feedback loop of the design process is done by the user of the blockmaker, not by the software itself. The choice to perform one action or another is the job of the user. The choice can be influenced by analysis data or judging perspective drawings.

### *No final building as output*

The final output of the blockmaker is not a full design. At the end of the process it can be further developed 'by hand'. It is also not necessary to use every 'chapter' in the blockmaker to inform you.

### *Summary*

BM gives ready-made options (with customizability) that fit within its framework so that they can be analyzed and evaluated. This should give a designer information in an early stage of design. The user of the BM makes all the design decisions, not the software. The bm exports can give a basis for further more specific design.

## **The Food Block in a broader context**

### *Global food production*

Food production is extremely relevant in relation to the growing population and the pressing climate problems. There are nourishment problems: famines and obesity. Essential resources like water, phosphorous and topsoil are unequally distributed on the earth and are becoming scarce. The ecological footprint of the global agricultural industry is very big, especially of that the cattle industry. All these issues pressure a fundamental input for human beings: food. In order to provide food security, the food production industry will need to change to prevent these issues from fueling social problems and possibly wars in the future.

Most food is being produced far from the people that consume it. This takes energy to transport and because most trucks drive fossil fuels it means that it produces greenhouse gasses. It also means that it is a challenge to bring fresh produce to the city.

Urbanization and the growing population leads cities to grow. While the city pushes the agricultural fields outwards, agriculture pushes forests and animals' habitats further away until they are too small to support stable and healthy population numbers.

If we can densify food production we can decrease its harmful impact on the world.

### *Self-sufficiency*

Being self-sufficient is a trend nowadays. It is a rejection of globalization, a distrust in that process because local values in culture or history may be lost. It is a romantic dream however, to be fully self-sufficient. Complete autarchy would mean the gathering of your own resources, with your own knowledge and even communicating in your own language. I see being self-sufficiency in food not as complete autarchy. Not being autarchic means both being dependent on and benefiting of the work of others. The question becomes to specify what you want to be dependent on, and what to be in charge of yourself, and how large the self-sufficient unit is.

For my project this is being self-sufficient in a complete diet, and on the scale of a small community.

### **Looking Ahead**

Answers to all sub questions of the main research question produce a basis for a building. The final part of my graduation is about designing the outcome of the design system that my research produced towards a working building.

Technical aspects will be new topics with new questions and design options to analyze, compare and evaluate. Key to this will be to relate them to the core concept of the building and to find synergies. What options make existing aspects of the building even stronger?