

# Reflection

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## Keywords

Continuous variation, SMART environment, optimized networking, Startup incubator, Flexible workscape, Optimized daylight, Human behavioral patterns.

## Research and design

The architecture track 'Robotic Building' (previously called Hyperbody) introduced various tools that help me cope better with complex problems without reducing any information. Suddenly with the help of advanced analysis software I am able to comprehend various dynamic design input such as daylight, wind, sound, material stresses, behavioral patterns, etc. In addition 'Grasshopper', which is a visual scripting language, allowed me to convert this data towards a design and optimize it accordingly. This search for the fundamental understanding of design inputs and how to interpret it into a design became an obsession and explains most of my actions during the graduation process.

The qualities I try to achieve with my design are all derived from my research question: *How can a building positively influence startup survival rates?* My focus is on the less tangible design qualities that affect startups such as creativity, productivity, collaboration, networking and relaxation. Networking for example is very important for startups because they usually can't survive on their own, they need external (financial) help. Program like a watercooler, routing, coffee machine, cafeteria, bar, etc. all increase the likelihood that a networking event will happen. But in the end if the occupants do not feel comfortable they tend to network less even in social situations. Which means networking is inherently related to the mental wellbeing of the occupants. The human psyche is affected by numerous external factors such as stressful situations, need for privacy and the ability to relax. This in turn is related to color, the density of the occupants, biophilic design, views, ventilation, daylight, but also the height of the space and most importantly cognitive behavior. Basically EVERYTHING is related, but luckily most of these dependencies can be measured and design rules can be derived from it. From my perspective this is the holy grail of architecture. Having a fundamental scientific understanding of human behavioral patterns and using it to design a space that actually does what it is supposed to do. A few examples of still quite generic human behavior patterns are (Bell et al, 2001):

- Humans are inherently lazy, if an opportunity doesn't present itself, it will not happen.
- Social field of vision – Determines when privacy becomes an issue based on recognizing faces and expression from certain distances.
- Biophilic attraction – The visual connection with nature reduces stress hormones
- Out of sight out mind – Reduces stress hormones by not only mentally but also physically switching between tasks
- We are wall-hugging creature – We tend to avoid standing in open spaces

These are still quite generic patterns because the researcher lacked accurate tools to analyze how humans behave. Luckily, there have been a few developments this era that might fundamentally change architecture within the coming decades. These are 'Big Data' and the increasing accuracy of body sensors which can help architects recognize more accurate behavioral patterns. Which in turn can result in higher performance designs. Sadly, I was not able to use this for my research and even then I recognize that the scientific papers about human behavior are already incredibly complex. Even though a lot of these topics have enough 'scientific' proof, they are not always consistent in relation to each other. Never fully relatable to my design, because all the reference use either

different contexts, target groups or work philosophies. And not to mention pseudo-scientific papers that can be very confusing if not recognized early on. Trying to make sense of this data and how to use it in architecture was my main struggle during my graduation. My design does try to incorporate a few of these patterns such as:

- Continuous landscapes to increase wayfinding, stimulate walking and the chance to meet random people.
- Activity based workspaces to create a clearer separation between activities and therefore reduce stress.
- Close proximity between every workspace and greenery to induce relaxation.
- A minimal amount of walls to prevent unnecessary seclusion.

But still this is only the tip of the iceberg. It is of course very unlikely that all these behavioral rules apply to everyone, but I believe if a majority is affected by these rules, it will be worth using as input.

The illustration (1) to the right shows a word cloud of my project, a textual representation of my building if you will. This word cloud has been constantly updated during my graduation to provide me with an overview. It however also showed me how much every design aspect is related to one another. Robotic Production tries to embrace this integrative approach of designing. Mainly to minimize the loss of information and therefore performance that happens when switching between the different aspects of architecture such as construction, program, climate, urban design. This need for integration and all the dependencies in the word cloud were very overwhelming for me. I was not able to constantly comprehend these dependencies when switching from macro meso to micro scale and back. This resulted in many tutoring sessions without anything to present except research. In the beginning I recognized that postponing my graduation did not feel like the end of the world. I was learning so much about the fundamentals of architecture. Luckily, the need to graduate for financial and social reasons resulted in a decrease of my holistic perspective. In hindsight, I could have created this need much earlier by designing a more strict planning with real deadlines and actually following through.

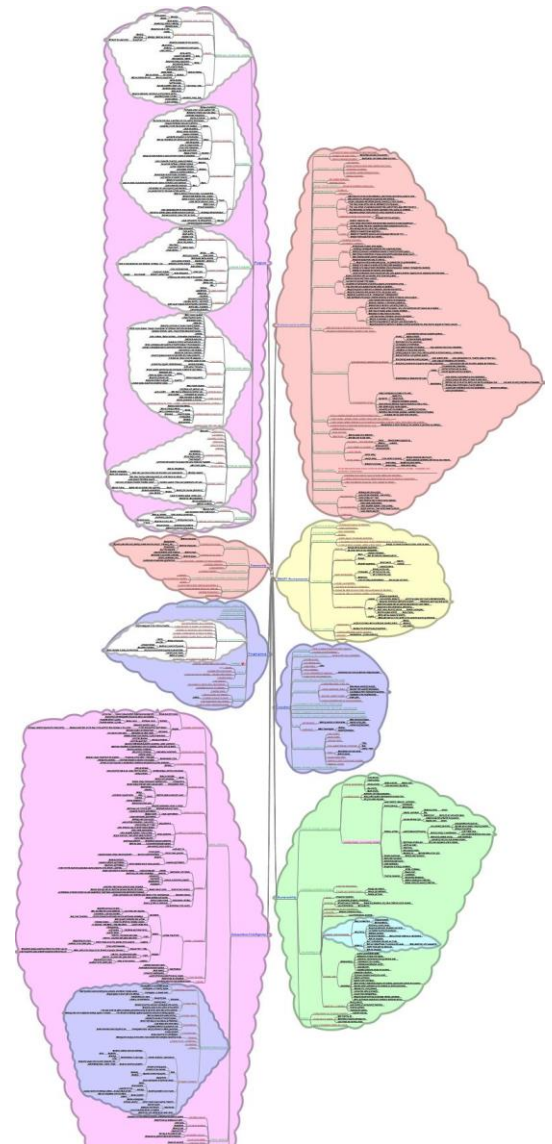


Illustration 1: Word cloud graduation

### Robotic Building (Hyperbody)

The theme of the graduation lab has shifted a little bit during my studies. Our main tutors H.H. Bier and N. Bioria divided the track into two themes resp. 'Robotic Production' and 'Smart Environments'. My interest has always been towards smart environments and therefore I choose Bioria as my main tutor. I recognize that there is huge variety of needs between individuals. Doesn't matter which target group you design for. I believe that designing for the individual requires spatial flexibility of the program, the interior and even the material. The theme Robotic production on the other hand focusses on integrating these same needs within the building components resulting in a continuous variation that can support a gradient of activities. With the help of robotic production tools any shape can be achieved. The material(s) of these components can even add additional

functionalities such as transparency, softness, etc. However if you look at the history of architecture you see that repurposing a building is almost inevitable. There are so little buildings that stand the test of time. My first P2, the one I did not pass, I designed student housing with this reason in mind. I created a space that was completely flexible, hyper functional if you will. Walls could move, be replaced and create a huge variety of different configurations to account for these individual needs (ill 2.) The system was very simple, but could lead to very complex behavior. It was more like a machine than architecture. According to my tutors during the P2 however it missed a certain level of architectural expression. In the beginning, I could not completely comprehend this reasoning, because according to my research it met the functional requirements of the students. But this started to make more sense during my second P2, where I changed from housing to office design. In addition my main tutor Bioria, including the theme SMART environments, left the faculty during my first P2. This resulted in some internal struggles, because my new main tutor became Bier and her main focus is robotic production. This meant I had to shift my design direction quite a lot to fit inside the theme of Robotic Production and get proper tutoring. I had to explain to myself what the benefits are of integrated building components and whether this can be equal or even have a better performance than SMART environments. Once I started designing more freeform spaces I started to recognize what this architectural expression meant. The freeform shapes and the lack of repetition resulted in spaces that will spatially surprise the occupants while still meeting the functional requirements. In the end, I designed something in between the two themes. Freeform continuous landscape with optimized interior elements that is enhanced with flexible partitioning.

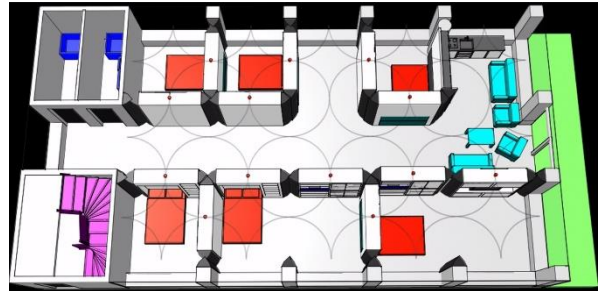
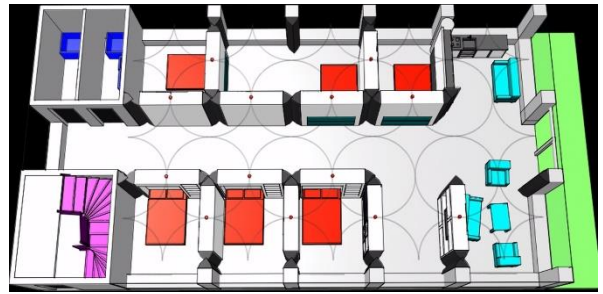


Illustration 2: P2 student housing

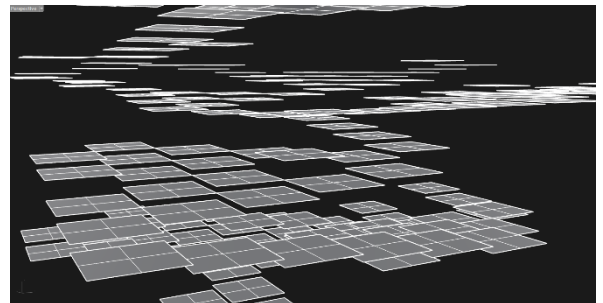


Illustration 3: floor generation

Robotic Production uses a problem-based methodology but solves them with the tools that are available today. And if the tools, both physical or digital, can't solve the problem we try to hack them to extend their capabilities. This hacking process however is incredibly extensive and requires the students to learn new skills and unconventional design methods to solve the problem. I experienced constantly that this hacking process is very difficult and sometimes even impossible for me. Which means that the solution space is limited by the design tools, production techniques, but more importantly my own experience in scripting. Illustration 3 is an example of a failed experiment where I tried to generate the floors of the design with the help of a recursive strategy. Every iteration one 1m<sup>2</sup> floor is generated somewhere in the building while evaluating the positioning according to daylight, routing, views, structural requirements, programmatic requirements and more. However scripting this took weeks, because I constantly had to learn new scripting methodologies to make sense out of it. In the end, I didn't have enough experience to create a script that was able to generate viable designs. I ended up scrapping this approach and went for a floor generation script (ill 4.), created by a programmer/architect, that came close to what I was trying to achieve with my concept. In the end, I had to hack the script quite a lot to get what I looked for, but still I believe that if I had more experience my



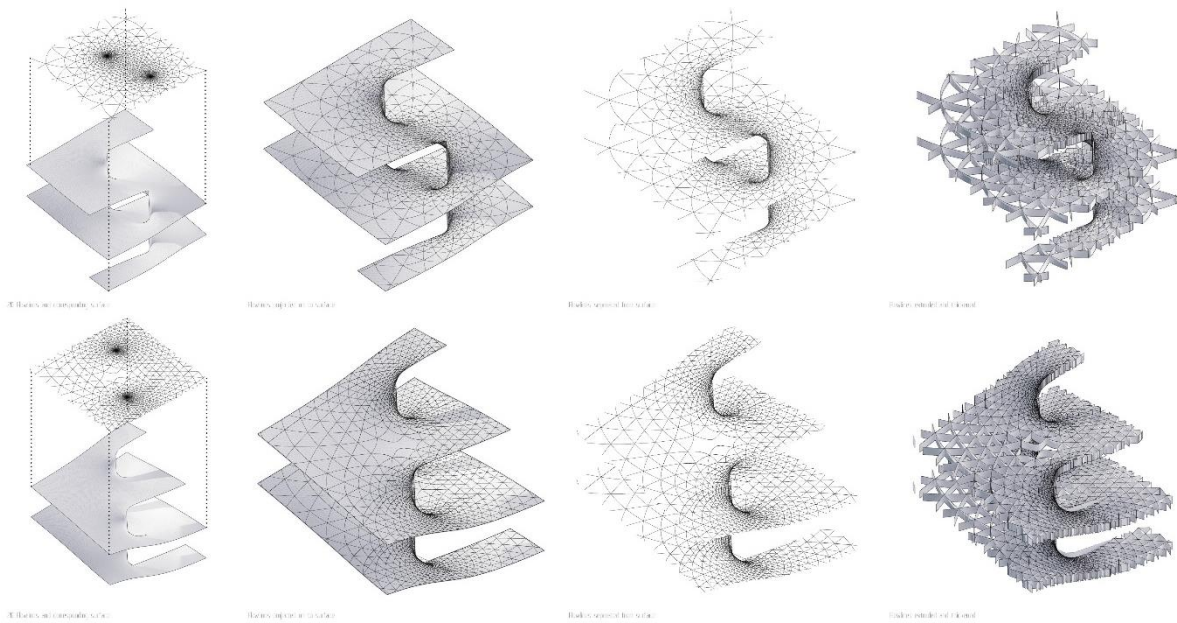


Illustration 4: Original script from Daniel Piker (2009). Illustration from Tobias Power (2014)

previous approach could have generated a building with a higher building performance compared to my final script. These limitations are of course part of architecture. Robotic Production is one of the few tracks that looks at what is actually needed instead of limiting the design problem according to the tools we already have, like conventional architecture. But once you get accustomed to being on the frontline of architectural innovation you learn that almost any building shape is plausible in the 21<sup>st</sup> century. So hence my obsession for the 'perfect' workspace. I believe it is possible, but this a task for a complete office instead of a graduating student.

### The bigger picture

Designing an incubator is not new, they have been popping up everywhere the last decade. Unlike a normal office, an incubator has to deal with a lot more complexity due to the different needs of every single freelancer/startup/small company that resides within the building. If you look at the history of office spaces you see a shift from only working in the office towards a balance between working and relaxing. All because various research showed that productivity, a financial reason, increased when the occupants are happy. But now the accumulation of knowledge and most importantly innovation has been recognized as a qualitative tool for measuring a countries prosperity instead of economic growth. Although productivity can lead to innovation, sharing knowledge is the most effective way of achieving this. And I believe that my continuous landscape will enhance this sharing process due to the various visual connections, accidental meeting spaces and the programmatic balance it provides. In addition, there is a lot of research that proofs that activity-based workspaces are very healthy for the mind and body. You have to physically move when changing tasks, which again promotes more accidental meetings. Open workspaces however generally fail because overall productivity decreases due to a lack of visual and acoustic privacy. My design remain one opens space but allows people to seclude themselves with flexible partitioning if need be. But even with sound absorbing materials and acoustically optimized ceilings, sound can travel relatively much further in a continuous landscape and therefore privacy/sound issues will occur.

Sadly, I will not be able to proof my interior concept due to a lack of experimentations on a 1:1 scale and the lack of papers/references that look at the effectiveness of workspaces which are remotely comparable to my design. And even then scientific validation remains very important. As an example, I use a reference for my design (ill. 5) created by RAAAF architecten (2014) which is an extremely non-standard workspace. It shows a lot of potential in how different body proportions and positions can be supported. But sadly it has never been correctly analyzed before it was demolished. This requires occupants to adjust to the new workspace, which takes about a month, before you can start documenting valid results. This real life experimentations are required to determine if a space will be used as intended. And hopefully I can be part of this process, because 'normal' sitting actually has caused quite a lot of health problems.



Illustration 5: RAAAF architecten (2014)

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