ICSS
The International Community ‘Space’ Station

Reflection

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Introduction

This research and project have been, at the same time, a pleasant and challenging journey. Embarking on an unprecedented project for the faculty and my mentors was hard work from which I believe I have learned more than I could have wanted. Most of the methods and approaches in the project were reached after many iterations and dead ends. The field of space architecture is relatively new. Yet, there is definitely potential for architects to be involved in projects in outer space because a space station has three levels of design - Life support systems, basic human needs, and crew psychology and comforts. When space missions become one year long and more step three becomes just as important as the other two. As architects, we could coordinate all three levels in order to achieve a coherent and synergetic design.

Fundamental for this project has been to learn about community formation and the value of public parks to our built environment and how through social space we can build a resilient society. This has intern allowed the design process to flourish.

Research to Design

When doing such a project researching can be done mainly by looking at methods from Earth from a different perspective and learning as much as possible from those, literature study of both previous research papers in the field, and documentation of astronaut experience. At a later stage, it would be beneficial to prototype parts of the design to prove its concept. Using the first three methods, was key to establishing what Earthly environment and experience I would like to emulate and how to adapt those to the space environment. Taking values from Earth, and more specifically Het Park, Rotterdam, was important because there are not yet any elaborate projects that look into the human experience as a starting point for a space station design. This means that there was no new humanitarian information coming into the field except the already existing analysis of previous space stations which had limited architectural input. However, the method of researching the public park had a few limitations; mainly, the process of adapting concepts like publicness and community to space lacks solid proof of concept which makes it difficult to evaluate the success of the resulting design (Table 1).

Table 1 Limitations of research

Theme	Benefit	Limitations
Location of research	Being close and accessible made it possible to visit many times and do thorough research.	There is limited scope having one park and one city in one country. The project in the end is for international use.
Park	It is a place that has a lot to offer to human life and communities and a lot can be learned.	It is difficult to draw lines and classify consents and ideas to translate to outer space situations.
Sketching approach	A lot of details and intricacies about human interaction with their environment can be noticed.	The skill to sketch and to convey information through sketches depends on the skill. It is difficult to convey emotions. Sketching does not have sounds or colors. These are themes for even more chapters and ideas for future research. Being consistent and rigorous with every sketch is subjective.
Period of research	Three seasons were covered which shows a large spectrum of the function of the park.	Summer was not in the scope of this research and there might be more insights from that season.
Earth environment	Here we have a pool of knowledge that we can apply to designs in space.	The difference in gravity makes concepts look very different in space. Without appropriate experience in that environment, the translation method is limited.
Open area	Not being limited by only closed environments and going to the source of a value that is to be recreated provides a deep understanding of the goal.	Life in a closed space is different from the one in the open and maybe people like alternative experiences. There is also a lot to be learned from already enclosed and small environments on Earth.

The research in the park is structured very typically for Explore Lab and follows their guidelines. There are a lot of humanitarian topics of research. The body of work produced has had a few pieces of research specifically in a park. The new perspective that has been undertaken here contributes with its novelty and my personal perspective. The project has been unconventional, however, Explore Lab such a theme is well placed and allowed it to thrive.

Graduation topic in a wider view

Even though the project is in outer space, the research was very local and human. This comparison and scope provide a new perspective on both architecture on Earth and in space. The trade-off is that neither of the themes is researched to the maximum possible extent. Architects are beginning to get more involved in space projects and there is a dedicated stream of research being developed in that direction. It will be a place where architects are involved due to their skills in bringing many different specialties to collaborate and coordinate and to design what is important for the human interaction and experience in future habitats. However, the physical application of architecture work will take a lot more time to be implemented thoroughly. It is important to produce research results in the field from now so that they can be applied later.

Explore Lab has been the perfect place to work on a non-standard topic. Although there is limited expertise on the topic in the faculty, the project has been met with a lot of support. There are parts of space architecture that are well applicable to Building Technologies but there are just as many for architecture students. The master track at TU Delft is the right place for pushing the boundaries in our field and always exploring the next steps to its progression.

There is more to be gained from architects designing for space. As we know, a new place with new constraints opens our minds to new ways of approaching a topic or problem. We might question norms and rules that are followed here on Earth. For example, if we do not walk in microgravity, why do we need floors? Simple situations in outer space might have many thought-provoking conundrums that will stretch our perception of what is vital to us, our values, and, ultimately, how we do architecture here on Earth. Space architecture perhaps could be of greatest interest to the research of two major streams of thought - the human-machine interaction and the human-environment interaction. On one hand, there is the space station's shell and services- a habitat machine, a living organism, built into the nothingness of space. It will be the epitome of smart living and the eventual consequence of our attempts to make our smart homes and cities here on Earth. On the other hand, is the human utilizing their environment created within the space station and the purposeful designing of that environment for positive affordance. The question of how the body occupies its setting in different gravity levels than the one on Earth is essential to designing an efficient habitat that supports a person's health and comfort. This research focuses on the second of the two major topics identified here although they are related.

Transferability

The results can be applied to landscaping projects, public spaces, and public buildings. It can help increase people's consciousness of the value of our public parks and the necessity to preserve them.

Through the design are explored themes like modularity, flexibility, remote construction, reusability, and community formation amongst others. Those can be evaluated with a new perspective in a project in outer space which might contribute to their development on earth.

Learning process

From the begging, I started the project with many assumptions and had one idea of what the research and design might look like. With every step of the way, I changed many parts and reevaluated my decisions. At the start, I had research that was focused on complex modular systems. With feedback, I realized that first I need to know what exactly I am trying to create and what the goal is since the field of space architecture is just as broad as architecture on Earth. This led me to start from the fundamentals of life and community on Earth and build up from that point.

After P2 I had many comments on both the research and the design and I shifted my view from trying to research human body interaction to the values that people find in the public park and what are the key elements that contribute to those.

In the design process, it was challenging to think beyond current space station examples and to push the idea further in order to add more architectural value. It took many iterations, explorations, and discussions with experts in different directions to gain an understanding of what is appropriate and realistic speculation for a project in outer space. My mentors helped me to keep the project aligned and to bring it beyond my personal prejudice. Only through a deep understanding of both the Earthly values and the space environment was I able to bring them into one.