REFLECTION PAPER

Architectural Engineering / 1 million homes

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Florian Reisacher
4739841

Tutors
Mauro Parravicini
Pieter Stoutjesdijk
Engbert van der Zaag

external: Maarten Meijs

Introduction

In the last fifty years the population - of not just the Netherlands in general but also and especially of its major cities - mostly thanks to immigration, rural depopulation and urbanisation has been subject to constant growth, which has resulted in extreme scarcity of living space in the areas of agglomeration – a predicament, relevant for the Netherlands, but equally important for most metropolises across the globe.

While in some places escaping into verticality and forcing density with extreme building heights or minimal distance between different buildings is an option, that is not possible in many situations and other ways of using space more efficiently must be discovered.

One option is evident: Making use of the factor time in the built environment.

The project “Moving Marineterrein” seeks to facilitate densification on the Marineterrein by letting different uses with different time schedules coexist – an architecture responsive to spatial demand.

The relationship between research and design

While there are numerous theoretical examples but little built precedence of kinetic systems responsive to ephemeral spatial demand, there are no built paradigms that react to short term needs of different users and user groups, and the theoretical examples fail to convince owed to lack of technical elaboration.

Whatsoever, in order to make a substantiated proposition for movable architecture, technical elaboration is crucial, which is why I decided to target the most vulnerable part of any movable space defining element, namely its closing mechanism. In order to do so I analysed existing precedence from several more or less closely related fields, but mainly sound insulative or fire protective components.

The aim of the research was to facilitate abovementioned implementation and technical elaboration of further attempts to develop propositions for demand responsive kinetic architecture and especially the closing mechanisms these systems would require by creating a framework of understanding of existing components, systems and their underlying physical or mechanical principles.

However, in parts of the research, especially when it came to investigating exact material compositions and built-ups of different existing sound insulative or fire protective elements, difficulties arose as the necessary detailed information was not available, due to company concealments.

The findings of the research in the further process of developing the design were especially utile for the process of detailing, but even during preliminary design some decisions were informed by it, for example the choice for a parallel moving kinetic element with rebate sealing and hence the predicament of not being able to create flush transitions.

Equally the understanding of the physics of sound propagation and how it can be avoided within a window or door frame, helped a lot detailing the closing mechanisms of the proposed kinetic system.

However, this sequential approach of conducting research as a first step of design prove to be problematic in my particular case as understanding the complexity of this endeavour took me several months and at later stages of design and higher levels of understanding I would have been able to research much more distinctly and bound to the actual needs of my proposition.

Additionally working in an existing structure forced me to sometimes to find compromises or even decide against the knowledge gained in my research as the existing framework was too strong and regimenting already. This to some extent prevented me from translating the technical research "one-to-one" into the final design.

The relationship between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS).

I believe that the choice of my topic closely follows the ductus of the Master of Architecture that in TU Delft is taught with focus on sustainability, increase of efficiency and environmental awareness, finding its engineered solutions and technical elaboration in the studio of Architectural Engineering.

By double-using space and hence reducing the CO2 emissions, creating more living space in areas of higher agglomeration, creating synergies between different uses and ideally reducing the cost per m² of construction and maintenance I intend to exactly follow that line of sustainable architecture TU Delft I have seen in Delft.

Elaboration on research method and approach chosen by the student in relation to the graduation studio methodical line of inquiry, reflecting thereby upon the scientific relevance of the work.

Following Louis Kahn's famous credo *"What was, has always been. What is, has always been. And what will be, has always been"* and thus ensuing the belief that novelty can only occur via different use or reconfiguration of already existing elements while considering the financial and temporal limitations to investigate in a very technical yet unprecedented topic, I decided for an approach based on analysis of existing case studies.

The goal of this approach then was to reduce the complexity of the case studies and to find and determine the underlying principles and logic of the examined systems and mechanisms.

in order to find these underlying principles, case studies and specific details, the process of primary selection and narrowing down of the analysed precedence has been of a heuristic and sometimes disappointing nature: They have been selected within a certain framework according to parameters such as resistance, neatness of the system and materiality and according to other less measurable parallels such as similarity in appearance or purpose of use. A more profound analysis of different systems by different manufacturers has then been used to understand the underlying physical and functional principles of the case studies, their components and the different levels of performance of individual components. After finding and analysing these interdisciplinary analogies, their underlying principles and biography regarding the general problematics the case studies and their components would face in a kinetic system, I tried to predict their workability, durability and anticipated maintenance in that specific environment.

I decided to perform a multiple-case study with literal replication because in a technical subject such as determining the proficiency of a closing mechanism being a student I have to rely on existing case studies with existing data, while I was not able to undertake modifications within the studied cases.

Even though it might appear disadvantageous not being able to modify or influence the particular case studies, by not creating the studied cases myself, but by taking certified and working systems of fire

protection, sound insulation and locking mechanisms form completely foreign fields as precedence, I was then able to make a valid and to a certain extent proven proposition for the locking mechanisms of the proposed kinetic system without any financial cost and in a very time efficient manner.

Since the research can be seen as a guideline for future architects attempting to propose systems with movable space enclosing elements, who intend to substantiate their propositions by elaborating the technical framework of their theoretical concepts, I believe that the written paper can be used as an introduction into detailing in kinetic system as I have used it myself.

Elaboration on the relationship between the graduation project and the wider social, professional and scientific framework, touching upon the transferability of the project results.

I believe that both my research and project tackle a problem of global relevance, increasing in in severity and extent disproportionately: Creating living and working spaces where there is no space, reducing building and running costs of created space and consequently reducing the per capita carbon dioxide emission will be the main consideration of the future built environment, not just in The Netherlands but all over the globe in areas of agglomeration.

Whatsoever, I believe that my graduation project has to be considered as an educative pilot project, a somewhat utopian thought rather than a realistic proposition in this specific context of The Netherlands in 2020. In my opinion a system as excessive and complex as proposed complex at the moment cannot be justified by just aspects of functionality and efficiency, but I do believe that it is a promising thought for future necessities.

To my mind, the technical research conducted can be useful as an introduction into how to construct the most vulnerable part of any kinetic system, but direct application I find questionable owing to the great amount of variables and specifications any movable compound would require.

Discuss the ethical issues and dilemmas you may have encountered in (i) doing the research, (ii, if applicable) elaborating the design and (iii) potential applications of the results in practice.

For my technical research I briefly reflected on the danger of the case study approach when used for social studies. While in my approach analysing the less ambiguous technicalities and physics of existing systems a generic median was intentional, in a social context searching for a generic median can result in marginalisation of parts of our society or even neglection of the already marginalised. A grave danger of the case study approach that in my opinion requires a high level of reflection before choosing it as a research method.

I believe that the thought of sharing space will always entail a series of ethical dilemmas as it is closely related with loss of privacy and ownership. Doesn’t everyone deserve their own space? Should people be forced into being more sustainable?

Therefore, one of the starting points for my design was to find a way of sharing space without constantly feeling the intrusive coexistence of another user group, but by showing the beneficial synergies that can result from collective use of space and amenities.