A challenging practical experience
The Trek-in; a durable and innovative hikers' cabin

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Abstract

Small buildings pop up everywhere across our natural environment. Their purpose is a place where people can stay the night. Unfortunately, together they give a disorganized impression of the landscape. Students of the Eindhoven University of Technology were asked to design a durable and innovative hikers' cabin, to change that tendency.

A competition led to the concept for a new hikers' cabin. This competition was won by two architectural master students and after that developed in a multidisciplinary project of six students who subscribed for a challenging practical experience within their education. These six students had different educational backgrounds, were from different disciplines within the Department of the Built Environment, were at different stages in their education and had to cope with the different interests of all the other participants. Nevertheless, they were able to develop an integrated design, the Trek-in.

Keywords: building process; learning experience; multidisciplinary; project in practice.

1 Introduction

The recreational sector in the Netherlands has various types of accommodations for overnight stays in nature. Among these, hikers' cabins offer a good and affordable location for travelling tourists. Apart from these hikers' cabins, lots of other small buildings pop up everywhere across our natural environment. Unfortunately, together they give a disorganized impression of the beautiful landscape. Students of the Eindhoven University of Technology (TU/e) were asked to design a durable and innovative alternative for the outdated hikers' cabin, to change that tendency and revitalize the image of the hikers' cabin. They designed it on the instructions of Stichting Natuurkampeerterreinen (SNK), a Dutch coordinating organization of natural campsites.

The students got the opportunity to experience a real and total building process, with the realization of their design as ultimate goal. Something most architects and building engineers experience after their graduation, but this was already during their education. This paper will be about the different steps of the building process of this project in practice and the challenges that has to be faced from the point of view of one of the students participating in this exceptional project.

2 Bouwkundewinkel

2.1 Competition

The Bouwkundewinkel is a science store, connected to the Department of the Built Environment of the TU/e. It is a kind of shop, staffed by students and supervised by an employee of the Department. They help groups and individuals, who have problems or questions in the architectural field, but lack the financial resources to turn to a regular consultant or architect, by connecting them with students. (Bouwkundewinkel, 2013) That is also what they did with the question of SNK. The Bouwkundewinkel connected its anniversary activities with the request and organized a design competition for a new, innovative and durable design for a hikers' cabin (Bouwkundewinkel, 2011).

The preconditions of the competition were that the design could be placed anywhere and that the new hikers' cabin would be durable.

2.2 Adwoodphere

Five entries were submitted for the competition. In the winning concept of Xaviera Burón Klose and Tim van der Grinten, the Adwoodphere, two more preconditions were added. The designers, both master students studying Architecture, wanted the hikers' cabin to be recognizable and feel familiar. They visualized how the new hikers' cabin could look like, in which way it would be durable and how it could be built and used. Their entry was very convincing to the judges, among them the client who really believed that this concept could turn into a real building.

Figure 1: The Adwoodphere; the winning concept

3 TU/e project

3.1 Multidisciplinary project

The concept is continued in a multidisciplinary semester project, just like 'regular' projects at the TU/e. All students of the Department of the Built Environment who have chosen a technique related track were invited to subscribe.

Four students subscribed for this challenging practical experience. Paul Kemme and Luuk de Kluiver were bachelor students of the bachelor track Building services. Wendy van Kessel, also a bachelor student, and Kristel Hermans, master student, were responsible for Building- and Construction technology. Together with the two designers, they formed a multidisciplinary team, with the intention to complement and optimize the concept to such a level that a prototype can be realized.

During the project the students were focusing on their specific discipline in pairs, but they were working at the same place as the others during the week. This means that ideas could immediately be exchanged and discussed with the students of the other disciplines to create an integrated design. Trying to understand one another ideas was an important condition to incorporate these ideas into the own discipline.

The team of students was coached by several tutors from various disciplines of the Department of the Built Environment. Each pair of students has its own tutor. Once a week they discussed the progress and if necessary, also the problems that occur. There were some moments during the project were the students gave a presentation for all tutors, these moments were to check the integrated aspect of the project.

All bachelor students at the TU/e have to do a final multidisciplinary project. They choose the discipline in which they will continue their education. Six disciplines will be combined in one team. This project is different, because the six students are at different stages in their education; three students did not finalize the bachelor track at that moment, while the fourth already started with a master track after finalizing the bachelor track at the TU/e. The two designers finalized a Higher Professional Education (HBO) before they started the master education at the TU/e. This different educational background caused quite some trouble in the beginning of the project; the different students had different approaches. The former HBO students had a practical approach, while the others were more working on a theoretical substantiation. This different point of view also caused some trouble with communicating. It took some time and intermediation of tutors to be able to work as one team on one, and the same goal. However, the shared urgency to develop a real project made them all to overcome their dissension. Unless the difficult start, the different educational backgrounds and disciplines, when these students finally came to terms, the close collaboration had a positive influence on the result; the result was very well thought from so many points of view.

3.2 Practical experience

'Regular' projects are related to real topics, which are fitted in the education; students work on a more or less real question on an existing location, but they receive support and feedback only from their tutors. With this project in practice, the client was really involved in the process.

Besides the client, also a sounding board group attended presentations. Sometimes students, tutors, client and sounding board group came together, on other moments only students and tutors. Besides, sometimes also students, client and sounding board group have met.

The client loved the concept that did win the competition from the very start and was focused on realization. The sounding board group was formed by people who use and exploit hikers' cabins themselves. They had a very functional, but often unclear point of view. Showing them the scenario of how the building could be used made them realize that maybe something else would be more preferred, which made them ask for an adaptation of the design. It asked creativity of the students to integrate these requests with their architectural and technical principles. Seeing the result was not always satisfying to the sounding board group. Sometimes, it made them realise that it did not work out the way they expected it to do; things had to change back. In some cases it really means doing one step back in the process and continue again. Other times it shows possibilities that were not considered before; possibilities to optimize other points of attention of the students. Talking with the sounding board group was criticizing the program of requirements. They did tough requests, but also added useful information to the team of students. In the end, the users and operators are the target groups; the design and the possible use should be attractive to them.

The interaction with client and sounding board group was a new experience to the students; it was an opportunity to experience how the reality in the building industry will be. The fact that this project took place within their familiar, educational environment of the Department, with support of tutors, made it possible to learn how to deal with different situations, different interests and readjusted requirements. It became very clear that it is important that everyone knows and acts his or her role, tasks and responsibilities. They need to keep communicating to make the project succeed. All the individual thoughts and actions are not useful when they do not contribute to the integrated whole.

3.3 Trek-in

The Adwoodphere had a pointy tent-like shape that everyone knows from campsites. This 'recognition by meeting' will be of positive influence on the relationship between man, building and environment. Another theme in the design is the balance between open and closed; on one hand, the building is a shelter that provides privacy to the user, on the other hand, the design opens up to the environment. Together, these themes result in a ground plan in which functions are housed in niches in the walls on two sides of an open, living area. This area is the transition between the wide natural environment and the intimacy of the functions in the niches.

The main ideas are preserved during the second stage of the process, but the configuration is optimized by changing the outdoor living area into an indoor space. The students also decided to prefabricate the building in modules, whose dimensions are optimized for transport. Prefabrication results in a high basic quality, a long lifespan and reduces the numbers of acts on the building site. The ones who buy the building do not have to put single elements together to create a building anymore; the building company will assemble the foundation and the prefabricated modules in only one day. Changing the dimensions and the partition in modules also influenced the positioning of the functions inside the building.

The outline design was visualized with a façade of wood, because this material is strongly related to the natural environment in which the hikers' cabins are placed. A research to sustainable building materials confirmed the choice of using wood. It is also a good choice to enable prefabrication.

Being self-sufficient in energy would be the most ideal situation. This stays a utopian situation, due to technical impossibilities and safety aspects. Incorporating solar panels is already a possibility, so these were taken into account in the design as well as in the technical execution. Unlike the outline design, the solar panels became an option. It is up to the client to invest in sustainable energy or not.

These examples show how information was exchanged between different disciplines and how the students were working on an integrated design. The design, which resulted from this TU/e project, is called 'Trek-in'.

4 Woodchallenge

4.1 Contribution

The Trek-in is submitted for the Woodchallenge to conclude the TU/e project. The Woodchallenge is a Dutch competition for students who focus their project on the challenging use of wood (Centrum Hout, 2011). The competition is initiated by 'Centrum Hout', a centre in which all knowledge about building with wood is available for architects, building contractors, clients and suppliers (Centrum Hout, 2013).

The entry of the Trek-in contains a model, a project description, a summary and a report, which explains the final design from the first concept till the last technical detail drawing. There were 25 entries, which were divided in a category for buildings and one for furniture. The *Trek-in* is chosen as the first-prize winning entry in the category for buildings at the award ceremony of December 1st, 2011.

The panel of judges of the Woodchallenge emphasizes the multidisciplinary aspect in their assessment: "Everything is incorporated in the design, from experience, functionality and aesthetics to the more technical aspects such as energy, ventilation, insulation, materialization, durability, prefabrication, transport and details." The judges really believed that this design could turn into a real building, which stresses the possibilities of building with wood (Juryrapport Woodchallenge, 2011).

Figure 2: The Trek-in and the team participating in the Woodchallenge

4.2 Continuation

By winning the Woodchallenge, the Trek-in gained an even greater notoriety. Besides good contacts and publicity, winning the competition also reinforced the design team in the commitment for not losing the qualities and features of the design during the further development.

5 Construction team

5.1 Design adjustments to cost containment

The intention of the TU/e project was to complement and optimize the first concept to make possible the realization of a prototype, but two more steps had to be taken.

The costs did not have a high priority during the previous step in het process. Cost-saving interventions had to be done first as the initial design would have been too expensive. It was important to reduce costs with about 50% to keep the building interesting for its target group. Every space and function had to be considered again and every detail had to be 'undressed' to see if anything could be more efficient for the building process. It was also decided to move to an innovative method of constructing in wood to reduce the weight of the modules. Every member of the construction team had to deploy to the fullest to make significant savings without losing the essence of the design. It surprised the designers how flexible the design turned out to be and how well optimizations could be included in the existing idea. This design adjustment resulted in the thirteenth version of the floor plan and shape, in which the first starting points are still recognizable.

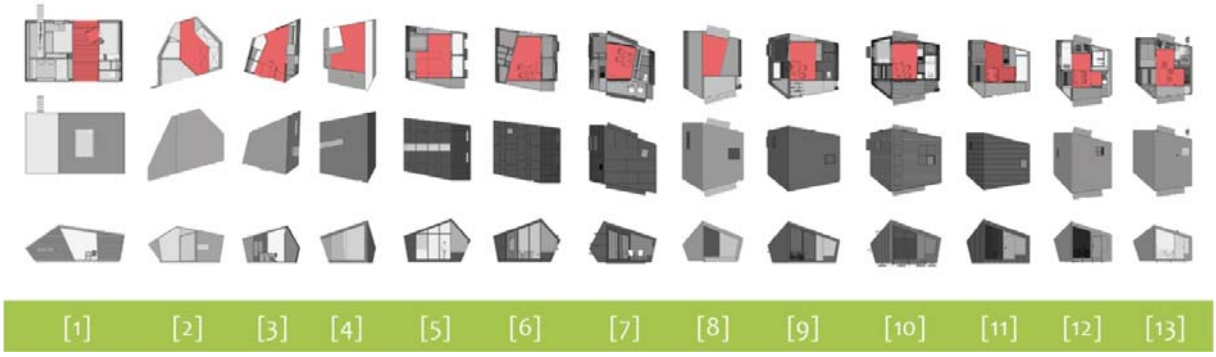

Figure 3: An overview of the design process (top row: lay-out, middle row: view from top, bottom row: front view)

Something else that could not be lost out of sight were the regulations concerning transport, building on poor accessible campsites and making buildings for temporary stay. These points were already partly answered during the TU/e project. Nevertheless, it is necessary to look at the regulations during the further development of the design. The end result should comply with the regulations; otherwise none will get sold and used.

5.2 Construction team

The second step was completing the construction team, which already exists of the SNK the three master students (Tim van der Grinten, Xaviera Burón Klose and Kristel Hermans) and a teacher (Faas Moonen) of the TU/e. The client searched for building companies willing to create a prototype of the final design. The Trek-in should be implemented in the network of SNK (STIRR, 2011). This means that the prototype is only the beginning of a process for a company. If the prototype turns out to be a success, many more Trek-ins should follow. The contracts will be awarded to the building company who builds the prototype. Even though, it seems to be a pretty hard job; building companies recoil from the challenging shape and the innovative way of building (Moonen 2013)..

The first attempt to find a traditional building company turned to nothing. In realizing innovations this is always a critical but essential point in the process and the way out is rarely found in the obvious approach.

It needed a coincidence to bring the team in contact with demolition contractor A van Liempd and subsidiary company 2Life-Art, who build furniture and small playhouses with materials, reclaimed from demolition projects. These companies were really interested in building the prototype of the Trek-in. The construction team became an elaboration of SNK, TU/e, A van Liempd Sloopbedrijven and 2Life-Art. In which the TU/e is represented by the students Xaviera Burón Klose, Tim van der Grinten and Kristel Hermans under the supervision of Faas Moonen.

5.3 Prototype Trek-in

The collaboration with the demolition contractor gave the Trek-in an extra dimension; not only the form, compact configuration and way of making, but also the materialization is unique. Materials come from demolition projects, therefore hardly any new materials are needed; wood can be recycled and still remain of high quality. Where possible, other materials, such as plumbing, insulation and kitchens from demolition projects are used. This gives every new Trek-in a very personal (hi)story. The Trek-in is now a unique example for a large audience to get inspired and acquainted with durable building by offering waste materials a second life.

Users will contribute to the long lifespan of the building, despite the fact that their use will be visible. Each new scratch will tell an extra story, because demolition materials are already used. This will only strengthen the character of the building. As a visible sign of use has no negative influence on the design, people will find it worthwhile to commit themselves to the preservation of this extraordinary, durable building, the Trek-in.

Working drawings were needed to realise the prototype. TU/e projects are normally shorter and do not include these drawings. In consultation with the building company and their tutor, the students were able to understand the exact way of making and the problems that will occur in the workshop. Based on their design and technical execution, together with that practical information, they created the working drawings. This was a useful feedback moment on the technical aspects as devised during the TU/e project. Seeing the Trek-in be built up, also made the students aware of the space and how space is created in the design. It was exceptional to see how much the renders look like the real building, and how drawings became a real building of which the door can be opened and entered.

Figure 4: The comparison between an indoor render (left) and a photo of the prototype (right)

5.4 Feedback of users

The prototype is placed for a month at natural campsite "De Barendonk" in Beers to get tested. The first test was how to transport the modules and how to assemble the foundation and modules. The second test was focusing on the use and experience of users. People could stay a night in the Trek-in and received a questionnaire afterwards. They were asked a couple of questions and were able to write down additional experiences. The results are brought together by the client. The students and 2Life-Art included these points of attention in an upgraded design.

Figure 5: The prototype of the Trek-in at "De Barendonk"

5.5 Dutch Design Week

The most points of attention could immediately be changed in het prototype. This prototype is officially presented during the Dutch Design Week 2012 at the TU/e (DDW, 2012), the place where it all started. Many invited people visited the opening, but during the week also many other people visited the Trek-in.

Having the Trek-in on the campus, near the building of the Department, was a special experience. That has been the place where all the ideas were thought. From that same desk and chair we were now able to see the realised prototype of that design and how people react to this. A moment that made us realise how much has happened from the first e-mail of the SNK to the Bouwkundewinkel till this presentation. This process took 1000 days.

5.6 Continuation

It was already a valuable learning experience to make working drawings and to see how the design and technical drawings became a real building, but the official presentation was not the last step in the process. The Trek-in is not only a special project for students, but also a special type of building. Most buildings are made once, while the Trek-in is going to be made in series. This means that the building process will be repeated more often. It is valuable to evaluate and improve the way of making for a more efficient building process for the second Trek-in. Evaluating the result was again a very useful feedback moment. Further optimizations will be done by the building company.

Figure 6: Already three Trek-ins are realized: at “De Barendonk” - Beers (photo left), at marina “Marnemoende” - IJsselstein (photo middle) and at “It Dreamlân” - Kollumerpomp (photo right)

6 Conclusion

From the first moment, the goal of the client was to realize a real building, a prototype of a new, innovative and durable hikers’ cabin. Their request was implemented by the Bouwkundewinkel and students were invited to create concepts. Choosing the winning concept was probably the shortest and easiest step in the total process. No one really knew how many more steps needed to be taken and what kind of challenges had to be faced and overcome; this counts for the client as well as for the students who did not experience a total building process earlier.

Working on a project in practice attracts six students. In a multidisciplinary TU/e project they were responsible for their own discipline, but at the same time they had to work as a team and come to an integrated design. Having the responsibility but also the ultimate goal to realize a real object was an important aspect in overcoming individual driven ideas towards the benefits of multidisciplinary teamwork.

Besides the content-related aspects, the students learned that there are also other influences, such as the input of the client and the ambiguous directions of the sounding board group. Although everyone knows the importance of good communication, this project confirmed how complicated it can be and stressed again how important it is.

Winning the Woodchallenge was a very positive moment, which encouraged everyone again to believe in the design and believe in the strength of a team which really wants to reach its goal.

In contrast was the following period when there was no building company that dared to complement the building team and build the prototype. This could have been the end of this project. The optimalization of the design could continue, which kept at least one track in the project going on.

Finding a building company puts the process back on track. The students were involved in the building process and experienced how the design became a real building and how the technical aspects were executed. This was a very valuable feedback moment on the design process. The presentation of the prototype of the Trek-in at the Dutch Design Week was the culmination. In approximately one hour, 1000 days were shown in presentations, which was really a moment to be surprised about how much has happened. It made the students look back at how they started the process, with the hope of realizing a prototype in the end. Now remarking how much they have learned and that it, with this team, has become possible to realize the design.

The TU/e had been a save environment for the students to experience what is going on in a real building process. Besides, this project brought good contacts and a special portfolio project, which we will probably be mentioning for the rest of our lives.

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