



Designing Human-Centered Support for DIY Campervan Layout Decisions

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Acknowledgements

Although a Master's thesis is formally an individual assignment, it is never truly completed alone. This project would not have reached its final form without the guidance, knowledge, time, and support of the people around me.

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Thank you all for helping me turn a personal interest into a graduation project that I am proud to complete.

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Preface

This thesis marks the end of my time as a student in Delft, a journey that began more by chance than through a carefully considered plan. When I was in high school, I had little idea of what I wanted to study. During an open day, I had one empty space left in my schedule and registered for Industrial Design Engineering almost at random. That spare slot ultimately became the reason I moved to Delft.

The environment at Industrial Design Engineering is one of possibilities. Students are encouraged to be curious, creative, and entrepreneurial, and to explore problems that do not fit neatly within one discipline. Over time, this also shaped the kind of designer I became. I discovered that I especially enjoy projects that combine technical problem-solving with creativity, and that allow me to move between thinking, designing, and physically making.

Eventually, that combination led me to an empty van. Converting my own campervan began as a personal project but quickly developed into something much larger. It required me to learn about construction, materials, technical systems, spatial planning, and many other subjects I had barely encountered before. I enjoyed the freedom of creating something entirely around my own needs, but also experienced how difficult it can be to maintain an overview when every decision appears connected to several others.

Even after completing the conversion, the subject continued to interest me. I found myself wondering how I would have approached the project differently with the knowledge I had gained, and how other beginning DIY-ers could be supported without taking the design process away from them. What began as a practical hobby gradually became a design challenge and eventually the subject of this graduation project.

I am grateful to everyone who contributed to this project through their guidance, participation, feedback, practical help, and support. Completing this thesis has not always been a straightforward process, but it has taught me a great deal about both the subject and myself as a designer.

What began with an empty space in an open-day schedule has now ended with a full campervan and a graduation thesis. I could hardly have planned it that way, but it feels like a fitting conclusion to my time in Delft.

Enjoy reading.

Kamiel Ketting

A handwritten signature in black ink, appearing to read 'Ketting', with a large, stylized flourish that loops around the name.

Executive Summary

Converting a van into a camper is a complex and highly personal DIY process. Beginning DIY camper builders have access to extensive online information, examples, products, and professional services, yet often struggle to turn these fragmented resources into a coherent interior that fits their own needs. Existing support mainly explains how individual components can be built or offers predefined solutions. Less attention is given to helping DIY-ers understand spatial consequences, compare alternatives, and develop confidence in their own decisions without taking away the autonomy that makes DIY meaningful.

This graduation project investigates how DIY camper builders can be supported in developing a personal interior layout while retaining ownership of the design process. Using a user-centred design approach, the project combined literature and user research with the analysis of existing support, concept development, and full-scale prototyping. The findings show that camper conversion is not a linear process in which all requirements can be defined beforehand. Needs and priorities continue to develop through designing, making, testing, and use. The research also indicates that DIY-ers do not primarily need more information, but support in deciding what is relevant to their situation and translating this into spatial choices.

These insights led to VanPlan: a reusable, full-scale modular mock-up system that enables DIY-ers to construct, experience, compare, and adapt proposed layouts inside their own van before building them permanently. Adjustable modules, representations of technical components, examples, and workshop guidance provide structure while leaving the final decisions with the participant. Rather than delivering a predefined or construction-ready interior, VanPlan helps users investigate how their ideas support everyday activities, which compromises they create, and what still requires further development.

The project demonstrates the potential of physical and reversible experimentation as a form of DIY support. More broadly, it argues that effective DIY support should strengthen users' judgement instead of replacing it: guiding the process without prescribing the outcome, making consequences tangible, and allowing requirements to develop through action. VanPlan provides an evidence-informed direction for applying these principles and a foundation for further technical, service, and market validation.

Glossary

Throughout this thesis, multiple definitions and abbreviations are used, below is a list of these with explanations.

Word	Definition
Camper	A motor vehicle with space for living
Campervan	Van converted to a camper
Campervan conversion	The act of converting a van into a camper
DIY(-er)	Do-It-Yourself
Embodied experience	A physical experience
SDT	Self-Determination Theory
Spatial Decisions	Decisions about placement of objects, i.e. interior
Vanlife	Full-time living in a (converted) van

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Approach

0.1 Introduction

This report outlines the design process for a new intervention aimed at supporting DIY-ers in designing functional and personalized camper layouts. The process follows the Double Diamond model from Design Council (n.d.), which includes four key stages: Discover, Define, Develop, and Deliver. This approach allows for a structured exploration of the problem space, followed by the creation of a solution that best addresses the needs of the users.

0.2 Discover

This phase focuses on exploring the problem space in order to develop an understanding of the context, users, and challenges of DIY campervan conversion. The goal is to identify user needs, barriers, and opportunities for design. This will be achieved by combining insights from literature, user research, and industry practices.



Methods used

- Literature Research
- Questionnaire 1 - Camper layouts, compact living strategies, and DIY community insights (n=50)
- Questionnaire 2 - Barriers in the camper conversion process (n=34)
- Semi-structured interviews with DIY-ers (n=6)
- Camper exhibition visit
 - Semi-structured interviews with camper conversion companies (n=5)
 - Observational study of professionally converted campers

0.3 Define

This phase synthesizes the insights gathered in the Discover phase into a clearer problem framing. The aim is to identify the core design challenge and translate the findings into a problem brief that guides the design process.



Methods used

- Thematic Analysis (Braun and Clarke, 2006)
- Persona
- List of Requirements

0.4 Develop

This phase focuses on generating, exploring, and refining possible solution directions. Through iterative development, different concepts are evaluated and improved in response to the identified requirements.



Methods used

- How-to questions
- PMI
- Scenarios
- User Testing

0.5 Deliver

This phase centers on the further elaboration, evaluation, and validation of the selected concept. During this phase, I want to assess how well the design addresses the identified challenges and supports novice DIY-ers.



Methods used

- Scenarios
- Process Tree

INTRODUCTION

PROBLEM BRIEF

FINAL PROTOTYPE

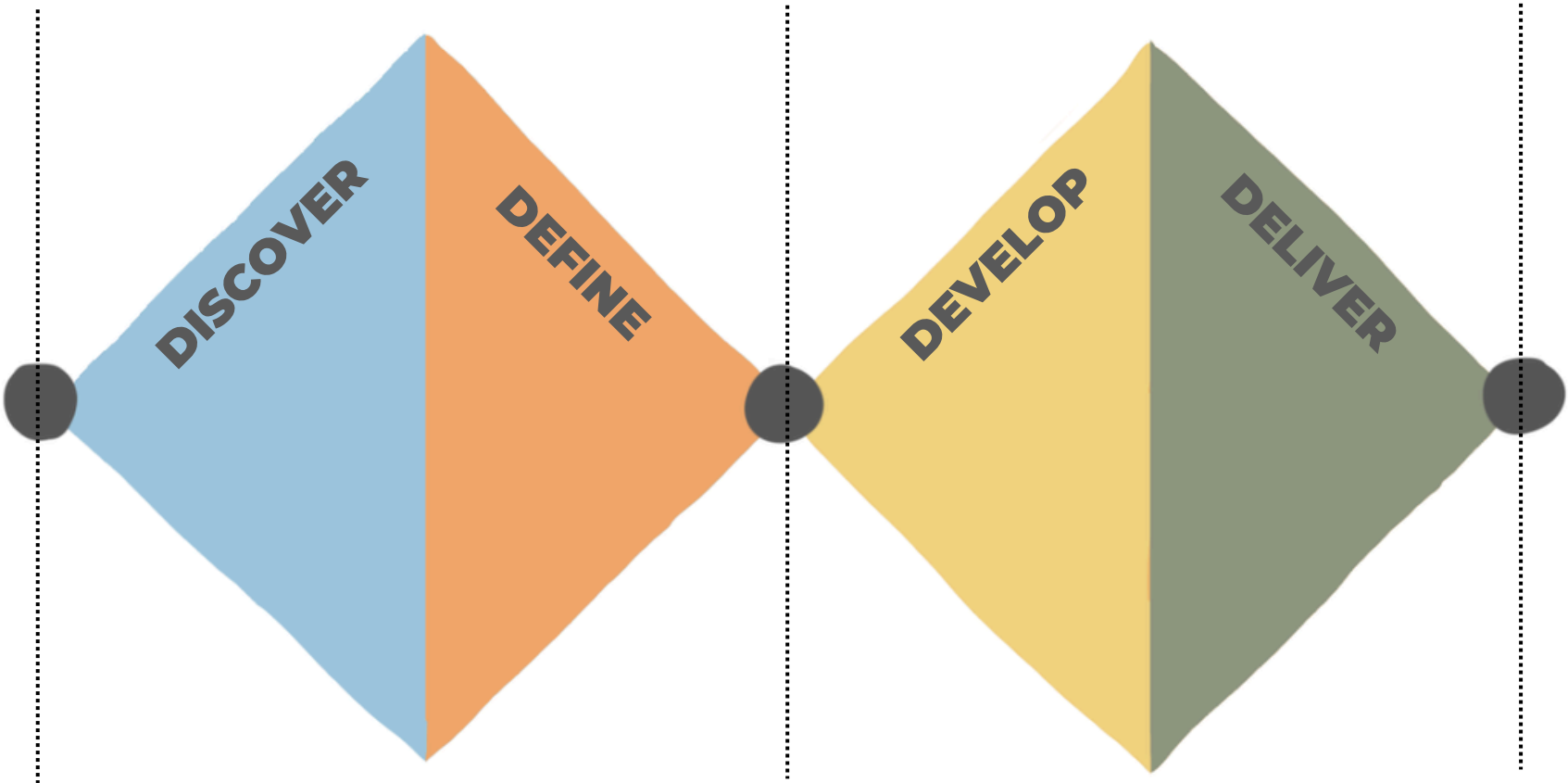


Figure 0.1 Double Diamond Structure

1. INTRODUCTION

1.1 Context and Background

1.2 Project Goal

1.3 Relevance of Project



1.1 Context and background

1.1.1 Context & rise of Campervan conversion

During the COVID-19 pandemic, camper travel experienced a significant rise in popularity. As international travel restrictions limited traditional holidays, many people sought alternative and more socially distanced ways of travelling. Campervans offered autonomy, flexibility, and a sense of safety. At the same time, social media platforms accelerated the visibility of mobile living. Influencers popularized the idea of life on wheels, and trends such as #vanlife became, and remained, popular. The aesthetic of freedom, minimalism, and self-sufficiency inspired a broad audience (Rizvi et al., 2021).

1.1.2 Factory conversion or DIY

For many campervan travellers, DIY-ing a campervan is the only financially accessible way to participate in this lifestyle. Professionally manufactured campers often come with a high price tag (see section 2.4.2). For others, commercially available campers do not fully meet their specific needs or preferences, leading them to invest in a DIY project that better reflects their personal requirements. In parallel with the rising interest, the availability of online information has grown rapidly. Forums, Facebook groups, YouTube tutorials, and self-built camper exhibitions provide extensive peer-generated knowledge and inspiration.

1.1.3 Range of Choices

Although campers are often stereotypically perceived as large white motorhomes, the DIY community demonstrates a far broader spectrum. Vehicles that DIY-ers use for campervan conversion range from compact city vans and former delivery vehicles to large cargo vans and trucks. The most commonly used base vehicles are small to large panel vans (see figure 1.1), which vary significantly in length, height, and interior volume (Rizvi et al., 2021). Each vehicle type imposes different spatial constraints, structural limitations, and ergonomic possibilities.

Apart from vehicle selection, interior approaches vary just as widely. At one end of the spectrum, some individuals travel with little more than a mattress in the back of a van (Desjardins & Wakkary, 2016). At the other extreme, self-built campers can include installations comparable to professionally converted vehicles.

In addition to built-in systems, users must consider movable equipment and personal belongings, such as outdoor furniture, cooking equipment, and storage accessories (Vrolijk op Reis, 2025).

Furthermore, regulatory requirements further shape the design space. In the Netherlands, a vehicle must have specific elements permanently installed inside the camper to be eligible for motor vehicle tax reduction (halftarief motorrijtuigenbelasting) (Belastingdienst, 2024). The RDW (Rijksdienst Wegverkeer) sets additional requirements to get a camper registered as a camper, which is needed for tax reduction (RDW, n.d.).

This wide spectrum of possibilities and constraints means that DIY-ers face numerous interdependent design decisions. For inexperienced DIY-ers, this complexity increases the likelihood of suboptimal spatial decisions and creates a significant cognitive and practical barrier to entry (Suzuki et al., 2023).

Demands Belastingdienst:

- At least two fixed seats in the living area (rotatable front seats allowed)
- A fixed sleeping facility meeting minimum size requirements
- At least two fixed and closable storage compartments
- A fixed kitchen unit with water supply and drainage
- Sufficient interior space to fit an imaginary volume of 170 cm (height) × 200 cm (length) × 90 cm (width), potentially achieved through a pop-up roof

Additional demands RDW:

- A seating area with a (removable) table
- A fixed cooking facility
- Storage space

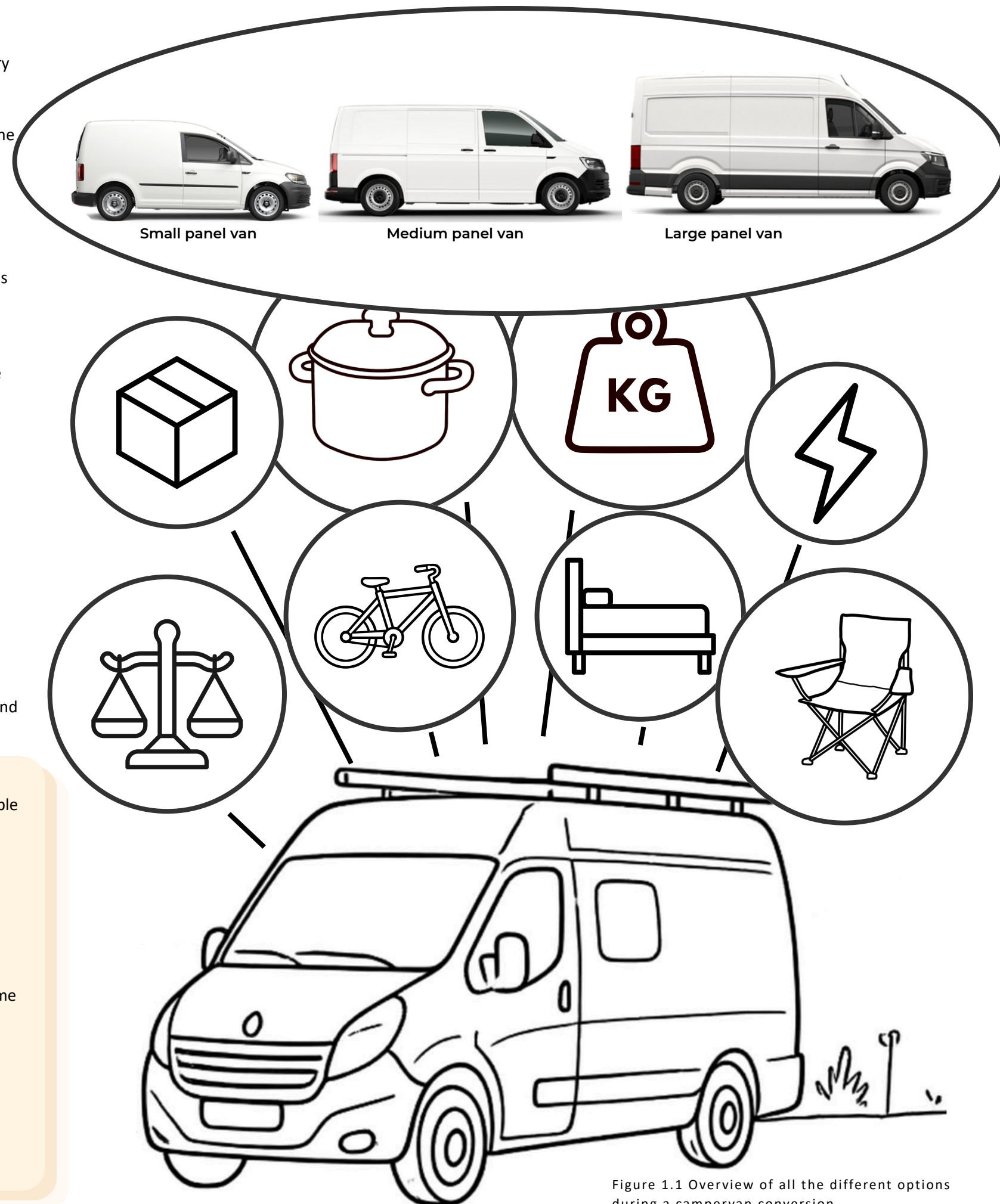


Figure 1.1 Overview of all the different options during a campervan conversion

1.1.4 Information in DIY communities

For nearly every system or accessory I have mentioned, extensive information can be found online. There are many tutorials, step-by-step guides, comparison videos, and discussion threads that explain all of the topics surrounding DIY campervan conversion.

This aligns with findings from Kuznetsov & Paulos (2010) on user-driven innovation. They show that individuals increasingly develop and share product modifications within peer communities. Digital platforms facilitate this exchange by enabling distributed, experience-based learning outside formal professional contexts.

Online communities often function as informal knowledge repositories, where practical solutions are documented and refined collectively. Research on peer-to-peer learning environments highlights that such communities can significantly lower barriers to participation in technically complex activities by providing accessible and experience-based guidance (Kuznetsov & Paulos, 2010). In the context of this project, this means that individuals without formal design or engineering training are able to undertake comprehensive and complex projects, such as campervan conversions.

However DIY camper builders note that user-generated information is frequently fragmented, context-specific, and sometimes contradictory (see section 2.2.3). There are no standardized principles for DIY camperbuilding, and advice from other DIY-ers is often based on personal experience. As a result, there is a lot of conflicting information available. This makes it more difficult for newcomers to begin converting a camper themselves.



Figure 1.2 Author on first trip with campervan

1.2 Project Goal

For novice DIY camper builders, one of the main challenges is creating the overall design before starting the conversion process. Although extensive information is available on various components (e.g., insulation, electricity, furniture design), there is no clear framework for combining all of these into a personal and functional layout. Therefore, the challenge is not to inform them about specific components, but to help them understand how each choice impacts the final result and how decisions are interconnected. Current design tools are often insufficient in supporting the creativity and intuition of novice DIY-ers when it comes to designing camper layouts (Rizvi et al., 2021).

To further understand this challenge, the project first required a deeper exploration of the current situation of DIY campervan builders. Therefore, during the Discover and Define phases, the project addresses the following research question:

How are DIY-ers currently designing and building their campervan, and what support do they have?

By answering this research question, the project aims to build a solid understanding of the current context in which novice DIY-ers design and build their campervans. This includes identifying their main struggles, recurring themes within the conversion process, and the types of support they currently rely on. These insights form the basis for defining the problem statement and provide direction for the subsequent ideation phase, in which possible design interventions can be developed based on the needs and challenges identified.

1.3 Relevance of Project

The relevance of this project is divided into two parts. On the one hand, there is the scientific grounding of the project, on the other hand, there are my personal views and ambitions.

1.3.1 Scientific Grounding

The relationship between people and the objects they use has been fundamentally shaped by the industrialisation of society. As Hoftijzer (2023) argues, industrialisation created an increasing separation between production and consumption: products are designed, manufactured, distributed, and consumed through systems that are often distant from the people who eventually use them. This results in people often having limited understanding of how things are made, how they can be repaired, or how they could be adapted to their own needs.

Within this context, DIY offers an alternative way of relating to objects. Instead of positioning people as passive consumers of ready-made products, DIY allows them to become actively involved in the design and making process (Atkinson, 2006). This is particularly relevant for campervan conversion, where users do not simply purchase a finished product, but shape a living environment around their own routines, values, and lifestyle.

Another advantage in motivating more people to commit to DIY-ing, is its potential contribution to sustainability. In contrast to throwaway culture and planned obsolescence, DIY practices often involve reuse, repair, adaptation, and longer-term care (Atkinson 2006). A campervan conversion typically starts from an existing vehicle and gradually transforms it into a personal living space. Through the investment of time, effort, and creativity, the resulting camper becomes more than a functional object. It gains a personal biography and emotional value, which can increase attachment and stimulate more careful use, maintenance, and repair over time (Mugge et al. 2009).

Campervan conversion provides a particularly rich context for these benefits of DIY. Unlike a smaller or more isolated making task, it requires the DIY-er to combine many different fields into a single design. The converter repeatedly moves between researching, making, testing, solving unexpected problems, and adapting earlier decisions. This creates opportunities to develop practical skills, design judgement, and confidence in dealing with unfamiliar challenges.

Encouraging participation in campervan conversion is therefore not only relevant because of the vehicle that is produced. Its broader value lies in enabling people to become active designers and makers of their own living environment. DIY-ers must decide what they need, understand how different choices affect one another, and take responsibility for the resulting compromises. The knowledge and self-sufficiency developed through this process may also support later DIY projects.

Promoting DIY in this context does not mean that every camper conversion is automatically sustainable. However, it can encourage a more active relationship with products and materials. Here, existing objects are adapted, maintained, repaired, and developed over time instead of only being consumed as finished products. The value promoted in this thesis therefore lies both in the personalised camper that is created and in the more capable, involved, and self-sufficient DIY-er who emerges through the process.



Figure 1.3 Author converting his campervan

1.3.2 Personal Ambitions

In the summer of 2025, I designed and converted a campervan myself. During this process, it became clear how much complexity and how many interdependencies are involved in making design decisions. Although I could rely on a design education and help from others, the design process turned out to unfold differently in practice. The process was largely intuitive and fragmented, which corresponds to how many DIY-ers work. This resulted in an approach in which I often made decisions on the fly, without a complete overview of the spatial and functional consequences.

This experience formed the reason to approach the camper conversion process again, but this time from an explicit design perspective. My aim is to approach DIY campervan conversion from the way a designer looks at complexity, coherence, and trade-offs, rather than solely from the perspective of the maker. In doing so, I want to explore how the conversion process can be approached in a more structured way, so that it becomes more accessible to a broader group. However bringing more structure should not limit the autonomy and creative freedom of the DIY-er. My ambition is to offer beginning DIY-ers more guidance in the design process, particularly in understanding how different choices influence one another and together determine the final result.

This ambition functions as a guiding framework within the project. The insights and final design outcomes are evaluated based on the extent to which they contribute to overview, confidence, and agency for the user. In this way, this objective provides direction for both the research and the concept development.

Within this process, I have a preference for designing solutions that are tangible. Where possible, I want to explore how users can actively experiment with spatial choices, for example through physical or visual forms of support. At the same time, the final form of the intervention remains open, so that it can align with what proves to be most effective and feasible during the research.

During the project, I will be aware of the DIY context. In this way, the project contributes not only to my own development, but also to the community from which this knowledge originally emerges.

2. DISCOVER

- 2.1 Introduction
- 2.2 User Journey
- 2.3 Role of Experience
- 2.4 Existing Solutions



2.1 Research

2.1.1 Introduction

The Discover phase aimed to develop an understanding of how DIY-ers approach the process of converting a van into a camper. Rather than focusing only on the final camper interior, this phase explored the broader trajectory of the conversion process. It looks into how DIY-ers define their needs, design their camper, build their camper, and continue traveling and readjusting their camper. A DIY camper conversion is not a single design task, but an extended and iterative process in which spatial, technical, financial, and personal considerations continuously influence one another.

2.1.2 Methods

The research for this project was conducted in two stages: preparatory research carried out during Graduation Launchpad (IDEM308), and the main research carried out during the thesis itself, which built directly on the findings of that earlier stage.

During Graduation Launchpad, my aim was to explore existing academic knowledge relevant to DIY campervan conversion and to investigate how this knowledge relates to the actual practices of DIY camper builders.

Literature review

I began with a literature review on compact living principles in apartments, multifunctional and transformable furniture, DIY camper design, DIY design practices, and DIY communities. The aim was to map which design principles, methods, and strategies are presented as effective within these fields. This review gave me an academic frame of reference, but I lacked data from real-world practices by DIY camper builders.

First questionnaire

To find out if findings from the literature are also reflected in the real world, I distributed a first questionnaire through Dutch and Belgian online communities for DIY campervan builders and was completed by 50 participants. It focused on camper layouts, the application of compact-living strategies,

and knowledge sharing within DIY communities. This gave me a broad overview of how camper interiors were actually designed and built, and how knowledge circulates within DIY communities. However, when analysing the responses, I noticed that the questionnaire captured outcomes, but very little about the process of getting there. The literature had suggested that DIY-ers face barriers such as financial constraints, time pressure, and difficulty knowing where to start, but I had no data confirming whether or how these barriers were actually experienced. This gap prompted a second, more targeted questionnaire.

Second questionnaire

The second questionnaire focused specifically on barriers during DIY camper conversion projects: decision-making difficulties, financial concerns, time constraints, and uncertainty about where to begin. It was distributed through Dutch and Belgian Facebook groups for DIY camper conversions and completed by 34 participants. This confirmed that these barriers were indeed widely experienced. The literature review and both questionnaires together made up the research conducted during Graduation Launchpad. Selected findings from this research are included in this thesis, with the full review in Appendix F.

Interviews

Going into the thesis itself, I still lacked insight into how these barriers, along with motivations and design decisions, unfold over time during an actual conversion project. The questionnaires had told me what people experienced, but not in what order or why. To address this, I conducted six semi-structured interviews with Dutch and Belgian DIY-ers who had converted a van themselves. These were recruited from the first questionnaire respondents who had volunteered for follow-up interviews. Rather than treating the literature and questionnaire findings as separate topics, I used the interviews to position them within a chronological process, making it possible to see when specific motivations, design decisions, knowledge gaps, and moments of uncertainty emerged, and how they influenced one another throughout a project.

Field study

Having built a picture of the DIY-ers’ own process, I was still missing the professional-market perspective: what solutions already exist for people who want a camper but make it themselves, and how do companies guide customers toward a van that fits their needs? To explore this, I conducted a field study and market exploration at CamperExpo Houten. Here I had short 15 minute interviews with 5 different camper companies. Here I focussed on how professional camper builders presented their services and what guidance or customisation they offered. This showed me which forms of support were already available on the market, and helped identify where opportunities remained to support novice DIY-ers.

Together, these four methods allowed research to be expanded over time. Each method adds to the foundation laid by previous methods. It provided a good understanding of the DIY campervan conversion process. The insights from all these studies are presented via a user journey.

Although I have also gone through my own DIY campervan building process, this personal experience was not used as research data in this project. It did, however, help me understand and relate to the situations described by participants during the questionnaires and interviews. In this sense, my own experience functioned as background knowledge that supported interpretation, without being treated as part of the formal findings.



Figure 2.1 Professionally converted campervan by Overland Campers. Source: (Overland Campers. (n.d.). Overland Campers. <https://www.overlandcampers.nl/>

2.2 User Journey

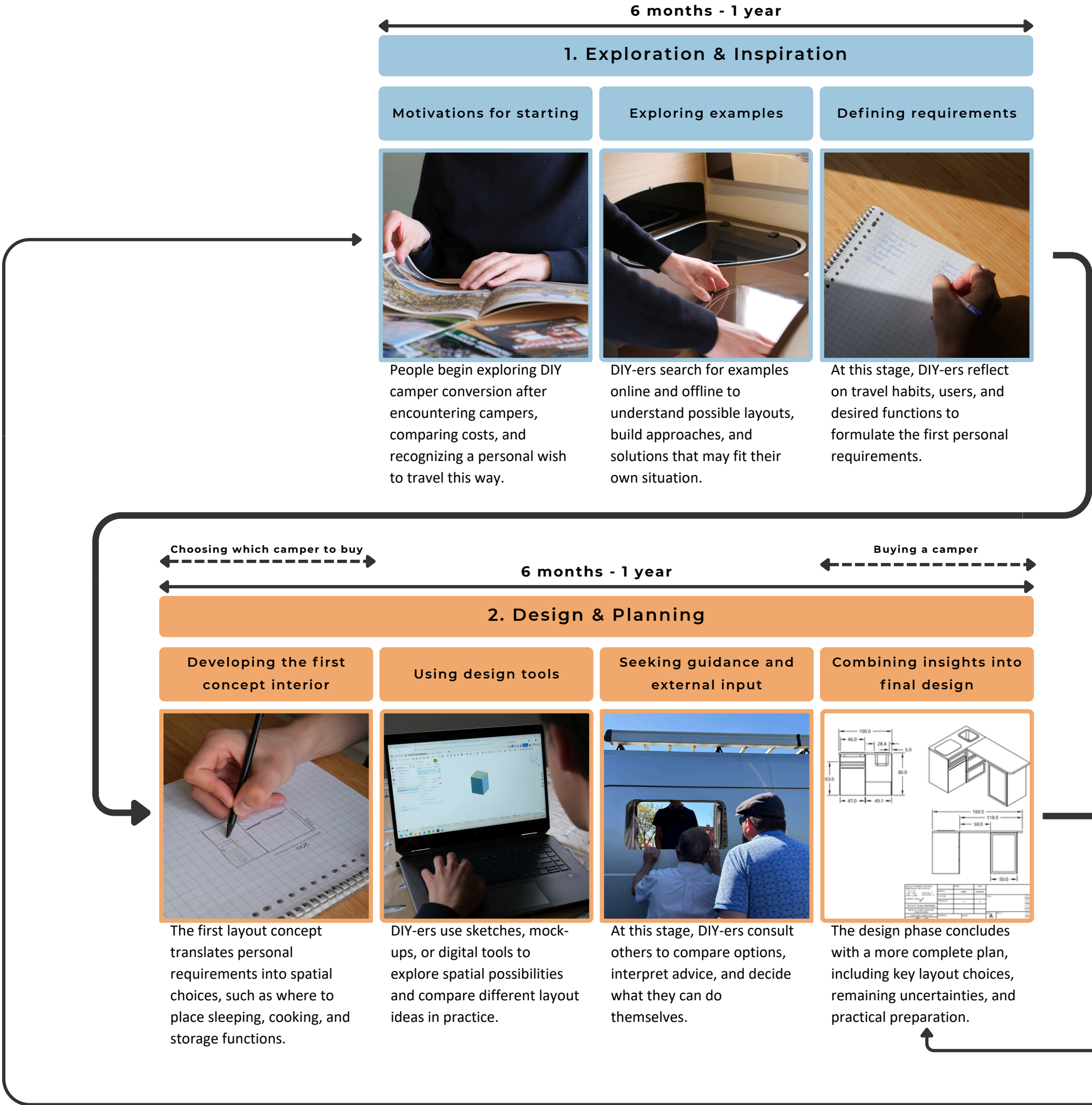
2.2.1 Introduction

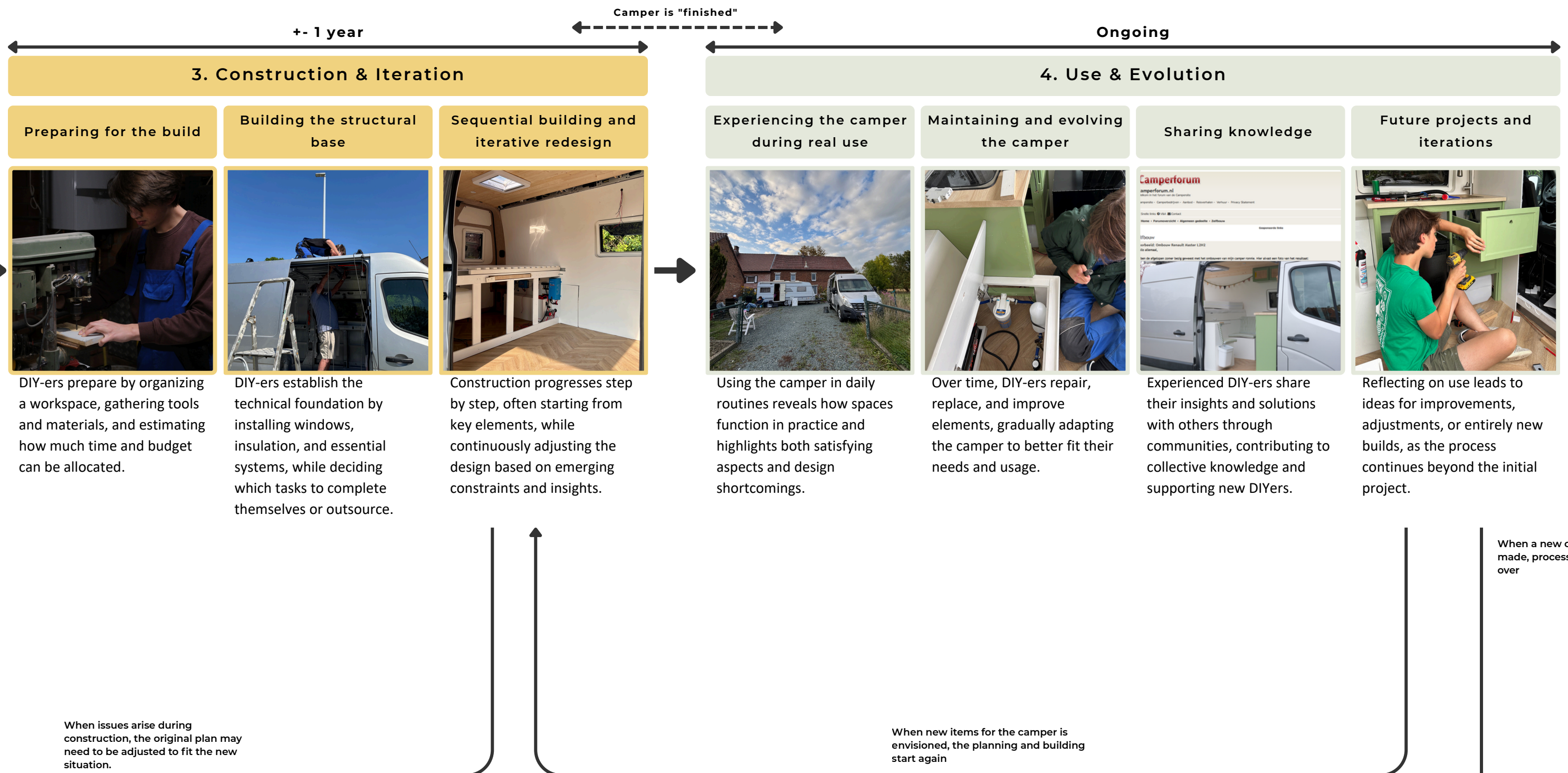
This section presents the complete user journey of the camper conversion process from the perspective of a novice DIY-er. As described in section 2.1.2, the six semi-structured interviews were specifically used to position the findings from the literature review and questionnaires within a chronological process. Analysing the interviews showed that DIY-ers' experiences consistently clustered into four recurring phases, which form the basis of the user journey presented here:

- 1. Exploration & Inspiration
- 2. Design & Planning
- 3. Construction & Iteration
- 4. Use & Evaluation

The journey visualizes how the challenges, decisions, and knowledge of DIY-ers evolve across these phases. It focuses on novice builders specifically, since they enter the process without an existing foundation of camper-specific knowledge, while more experienced builders may skip certain steps or approach them with greater confidence (see section 2.3).

Although the phases are presented sequentially, the process itself is rarely linear in practice: DIY-ers often revisit earlier decisions, adjust plans during construction, and continue modifying the camper after it has already been used. The journey should therefore be understood as an iterative trajectory rather than a fixed step-by-step process. However, structuring the process in a linear way helps identify where novice DIY-ers experience uncertainty, where support is currently available, and where gaps remain throughout the conversion journey.





3. Defining requirements

After exploring examples, DIY-ers gradually begin translating inspiration into personal requirements. At this stage, interviewees described noting down their travel habits, i.e.: how many people will use the camper, climate of destination, or expected level of comfort. In this sense, a camper is not treated as a generic product. It is instead treated as a highly personal environment shaped by intended use, travel routines, and lifestyle.

This is clearly illustrated with an example from the interview: One interviewee, who mainly stayed at campsites, had no use for large water tanks as water is readily available at campsites. Another interviewee wanted to stay off-grid for several days and be able to take a shower. This means they require a significantly larger water storage. This example reflects broader literature showing that what constitutes a “good” compact living layout differs fundamentally between individuals, as they have different needs (Gronostajska & Szczegiński, 2021; Saied et al., 2024).

However, beginners often struggle to imagine all future uses of a campervan in advance (Suzuki et al., 2023). This makes requirement-setting difficult, as users are forced to make decisions about future situations they have not yet experienced.



Figure 2.5 Author writing down requirements of own camper

2.2.3 Phase 2:
Design & Planning

1. Developing the first interior concept

In the second phase, DIY-ers begin translating personal requirements and collecting inspiration into a more concrete spatial concept. At this stage, decisions are made regarding the placement and configuration of core elements such as the bed, kitchen, storage, and technical systems. Because camper interiors are highly constrained spaces, these decisions are strongly interdependent.

Interviewees described this stage as the moment when the project starts to become more real, but also more complex. Once the question shifts from “what do I want?” to “how do I fit it all into the van?”, the need for trade-offs becomes much more apparent.

Interview findings also indicate that this phase often takes a considerable amount of time, with planning periods of six months to one year described as common. A major reason for this is that many DIY-ers have limited prior knowledge of the fundamentals of campervan conversion and technical systems. They do not yet possess the expertise needed to make decisions with confidence.

Insights from the interviews and questionnaires show that topics such as 12V electrical systems, water installations, and ventilation often require extensive research before participants feel able to move forward. This means that concept development is not only a spatial exercise, but also a process of building enough confidence to commit to choices that feel technically and practically viable.

“I first spent a year exploring what would be practical, and then spent another year converting the van during weekends.”

- Interviewee 5

2. Using design tools

Once DIY-ers have a general sense of what they want, the challenge becomes how to visualize and test these ideas. Rizvi et al. (2021) argue that vanlifers lack tools that adequately support the conceptualization of future living spaces. While 3D planning tools may help organize layouts, they often do not support more intuitive and personal forms of design exploration, and they may require advanced skills to be useful.

Suzuki et al. (2023) similarly show that different design media support different aspects of the interior design process. In their comparison of cardboard mock-ups, CAD-based planning, and AR-based planning, they found benefits and limitations which each method. For CAD-based planning, they've used the program VanSpace3D. An unrelated example of the program is shown in figure 2.7. For AR-based planning they've developed a program specifically. Participants with clearer and more predefined interior concepts preferred physical prototyping, because the openness of cardboard allowed them to imagine what the prototype represented. However, for participants with less-defined ideas, this same openness could become difficult to work with, as there was little to reference or build upon. These participants benefited more from digital tools that already included furniture elements, as these provided starting points and inspiration.

CAD- and AR-based planning supported more precise placement and personalization, but also introduced a technical learning curve. It could also restrict creativity when participants had a specific idea that was difficult to model digitally. Differences in spatial perception were also observed, as digital environments could make spaces appear smaller than physical prototypes.

Questionnaire participants reported using multiple design tools. Sketching was the most commonly used design method (74%), followed by mock-ups (33%) and CAD programs (33%). This suggests that most DIY-ers rely on accessible and intuitive methods rather than advanced digital tools. A few participants did report creating highly detailed CAD models, sometimes including cutting plans, but these users generally had prior professional experience with such software. Interviewees without this background often described such tools as inaccessible and instead relied on rough sketches, approximate measurements, and a more global design plan.

“I’m more from the older generation, so I relied more on sketching.”

- Interviewee 1

Figure 2.6 Author sketching first interior concept

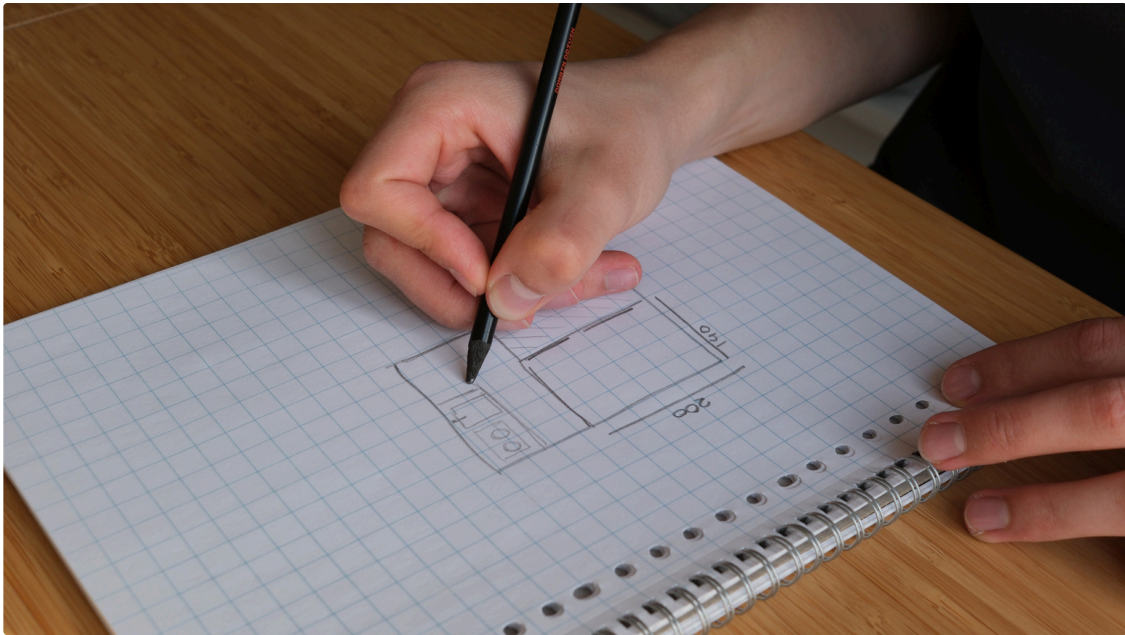


Figure 2.7 Interior of campervan designed with VanSpace3D. Source: VanSpace 3D. (n.d.). Vanspace 3D. <https://www.vanspace3d.com/>

Applying compact living strategies

This phase also involves making design decisions that respond to the spatial limitations of the van. Compact living literature emphasizes strategies such as ergonomic prioritization, functional overlap, vertical stacking, integrated storage, and visual openness as ways of optimizing small spaces (Hu, 2019; Shabanova, 2025; Gronostajska & Szczegielniak., 2021; Brischetto et al., 2019). Zoning and multifunctional furniture are also frequently identified as relevant strategies, because they allow limited space to support multiple activities over time (Shabanova, 2025; Mouamani et al., 2025; Brischetto et al., 2019).

The questionnaire and interview findings indicate that many participants use some form of transformable furniture, particularly for sleeping arrangements. Beds that convert into couches were especially common. At the same time, a substantial group of the questionnaire respondents reported that they did not want transformable furniture at all. This again

highlights the highly personal nature of camper design: principles from compact living literature are useful, but they are not applied in the same way by every DIY-er.

“There is sometimes too much information available, and it is difficult to know which information suits me best.”

- Participant 2nd Questionnaire

Figure 2.8 Interior of camper with compact living strategies applied. Source: Fiat Ducato. (2026, April 11). Quirky Campers. <https://www.quirkycampers.com/uk/for-sale/fiat-ducato-mwb-l2h2-brand-new-conversion/>



3. Seeking guidance and external input

As the number of interdependent choices grows, many DIY-ers begin seeking additional guidance. Questionnaire and interview findings show that this phase is often experienced as overwhelming. Participants described feeling uncertain about which options to choose, particularly when multiple online sources suggested different or even contradictory solutions.

In this situation, external input becomes important. Interviewees reported that talking to experts was often highly valuable, although who counted as an “expert” was not always clear-cut. In some cases, DIY-ers paid companies for advice or help on specific technical or spatial issues. In other cases, they turned to experienced DIY-ers in online communities. As in the orientation phase, these “expert amateurs” function as informal sources of expertise.

“The thousands of choices, and always feeling like you might be making the wrong one. Even though the advice I kept getting was: just do it!”

- Participant 2nd Questionnaire

4. Combining insights into a preliminary design plan

By the end of this phase, most DIY-ers arrive at a preliminary overall design. For some, this takes the form of a highly detailed and accurate plan. For others, especially those with less technical or design experience, the result is a more global concept with measurements for key elements and substantial room for improvisation during the build. In both cases, DIY-ers usually have a global idea of the technical systems they want to include, how the main functions will be arranged, and which parts of the build they may need help with.

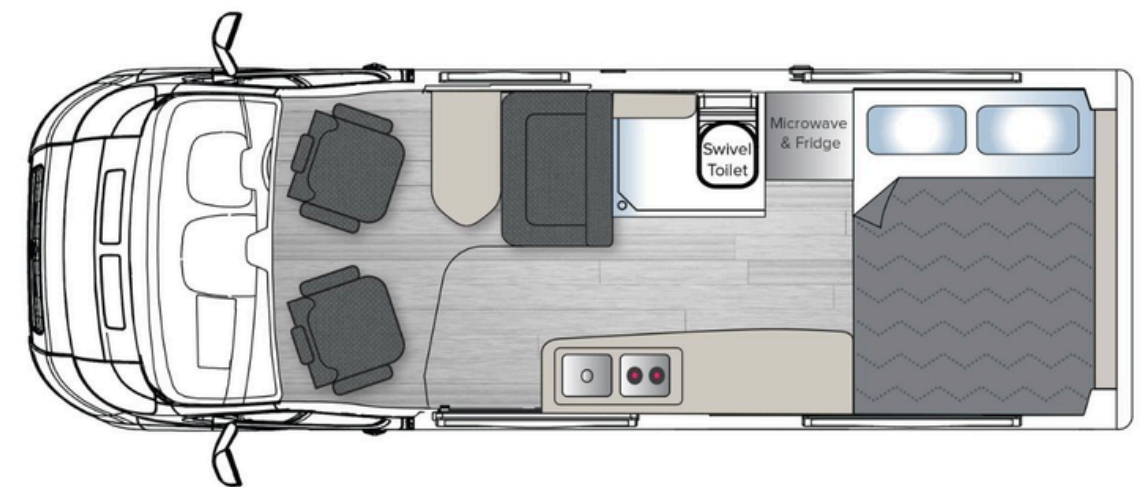


Figure 2.9 Floorplan of campervan Source: 4K RV. (2025, August 6). Trek - 4K RV. <https://4krv.com.au/caravan/trek/>

2.2.4 Phase 3: Construction & Iteration

1. Preparing for the conversion

Once a preliminary design has been developed, DIY-ers move into the construction phase. Before actual building starts, practical preparation already presents a challenge. Interviewees and questionnaire answers often described difficulties in finding a suitable workspace and having access to the tools needed for a conversion. Many had to work on the street or on a parking lot, which made the process more difficult. Participants without a designated working area reported greater difficulty in maintaining continuity and progress, compared to participants with access to a garage, driveway, or workshop. In addition to limited access to tools, the need to assemble and dismantle a temporary workspace each day was experienced as a significant burden, especially when only limited time was available for building.

2. Building the structural base

The first stage of construction typically focuses on establishing the structural base of the camper. This often includes work on windows, pop-top roofs, insulation, electrical infrastructure, and other fixed systems that define the technical and spatial framework of the interior. At this stage, DIY-ers also make concrete decisions about which technical tasks they will carry out themselves and which they will outsource.

Findings from the interviews and questionnaires indicate that these decisions are among the most difficult in the entire process, as they often involve permanent changes to the camper or systems with significant consequences if installed incorrectly. Openings such as windows and ventilation must be executed properly in one go, as mistakes can lead to water ingress and long-term damage to the interior. Similarly, errors in electrical or gas systems may create serious safety risks for users. As a result, uncertainty surrounding technical decisions often intensifies at this stage.

"Access to a workshop is a barrier. I spent almost as much time setting up and cleaning up as I did actually building."

- Participant 2nd Questionnaire

"An important barrier was having to account for things that only become apparent later"

- Participant 2nd Questionnaire

"The biggest barrier was committing to permanent changes."

- Participant 2nd Questionnaire



Figure 2.10 Author at workshop

Figure 2.11 Author installing MaxFan



Figure 2.12 Author installing electrical wiring



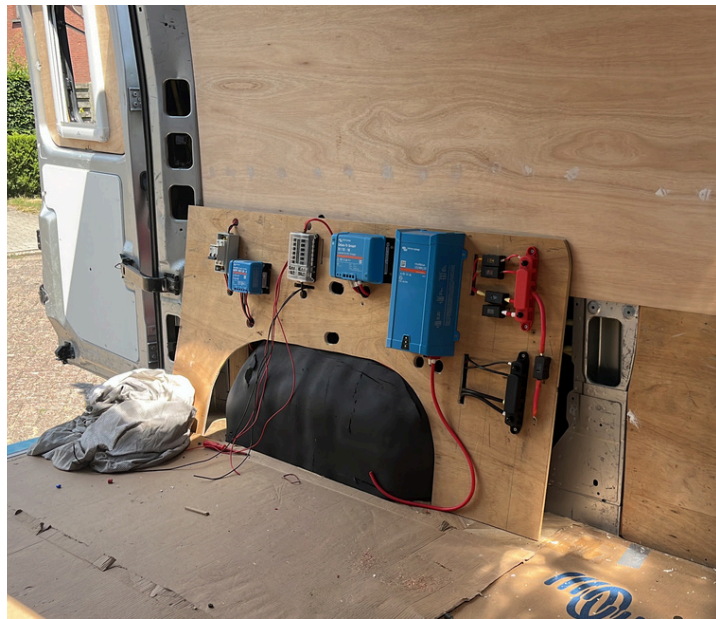


Figure 2.13 Photos of sequential building in the case of the camper of the author

3. Sequential building and iterative redesign

Although many DIY-ers enter this phase with a complete design, the findings show that construction rarely follows that plan in a straightforward manner. Instead, the camper conversion process remains highly iterative. Interviewees reported building the interior sequentially around one or more anchor points, such as the bed. This is illustrated in figure 2.13, where first the fundamentals (electrical system, insulation, windows) are placed. Then an anchor point, the bed, is installed. And then the kitchen gets fitted into the van. Once each elements is placed, the original broader plan gets reconsidered. DIY-ers would specify this plan based on the space, constraints, and possibilities that emerged.

In this sense, building and designing continue to occur simultaneously. As practical limitations emerge during construction, earlier decisions are revisited and revised. Layout and technical systems continuously affect one another. This means that after quickly editing one part in the beginning, it can have unforeseen consequences later on.

Learning when progressing

A central feature of this phase is that practical knowledge develops through execution. Interviewees described how certain decisions with building the campervan only became fully understandable once they had been physically installed.

As a result, components are not always implemented in the most suitable way. A decision that works for one part of the camper may create difficulties for another, for example by limiting access, reducing available space, or complicating the installation of surrounding systems. Trial and error is therefore often necessary to understand how the different parts fit together in practice.

When mistakes are made earlier in the process and only recognized later, they can become a source of frustration. This is particularly true when they are difficult or costly to reverse. This is also reflected in the literature. Desjardins et al. (2017) note: *“As much as we know where the sounds come from when driving the van, there are some noises we know cannot be changed, since they are related to how the campervan was built, particularly how different sections are connected together”*.

At the same time, this learning process can be demanding. Unlike mistakes made during sketching or planning, errors in the build phase often have direct financial or practical consequences. Nevertheless, over time, DIY-ers gain confidence and competence by working through these issues.

“As you work and observe, your plan evolves.”

- Interviewee 4

2.2.5 Phase 4: Use & Evaluation

1. Experiencing the camper in real use

Once the camper is sufficiently complete to be used, DIY-ers enter a phase in which the interior is evaluated through actual travel. Whereas the building phase mainly reveals how individual components and construction decisions affect one another, the use phase reveals how the camper functions as a complete living environment. Living in the campervan therefore becomes the ultimate test of whether earlier design decisions support the intended routines and ways of living.

For several interviewees, this is an important evaluation point. By this point, the campervan is sufficiently complete to be used, but often it's not finished. Interviewees described how actual use often led to layout changes, additions, or refinements. In this sense, the building phase does not end when the interior becomes usable. Rather, it extends into early use, where living in the camper becomes part of the design process. Desjardins et al. (2017) describe a similar dynamic in their autobiographical campervan conversion project. Here, they developed the campervan over multiple stages while repeatedly living and travelling in the different stages of the campervan. This process allowed them to discover needs and possibilities they had not anticipated beforehand, and gradually reshaped their understanding of what the campervan should be and do. Their work shows that using a camper in unfinished or provisional form can be a productive way of learning, as design decisions are tested against everyday experience rather than abstract assumptions alone.

Brischetto et al. (2019) note that more experienced caravan users are often more accommodating of certain inconveniences than less experienced users, who may compare the camper more directly to conventional housing. This suggests that the opinion on the eventual design of the interior is shaped not only by the design itself, but also by prior expectations and experiences.



Figure 2.14 First real-use of the
camper of the author

2. Maintaining and evolving the camper

Interview and questionnaire findings show that the camper is rarely considered fully finished once it enters use. Instead, participants often continue to repair, replace, and improve elements of the interior over time. Some of these changes are relatively minor, such as reorganizing storage or adding convenience features. Others are more substantial and involve replacing underperforming or broken components, or revisiting earlier design choices that no longer feel appropriate.

This ongoing process also gives DIY-ers increasingly intimate knowledge of their own camper. Over time, they learn where compromises were made, which decisions turned out well, and which parts of the build were less successful. In this sense, everyday use gradually transforms the DIY-er into an expert on their own interior. At the same time, the camper becomes more specifically tailored to its owner. Desjardins et al. (2017) note that, through ongoing development and adjustment, a prototype becomes increasingly suited to the person living with it rather than to a generic user. As use continues, personal belongings gradually find fixed places, routines become embedded in the interior, and the camper increasingly reflects the specific habits and preferences of its owner.

“Every year you try to improve something”

- Interviewee 3

3. Sharing knowledge with others

As DIY-ers gain more experience, many also begin contributing back to DIY communities. Questionnaire and interview findings indicate that some participants share their lessons learned through forum posts, social media, websites, or conversations with other DIY-ers. In doing so, they become part of the same knowledge-sharing ecosystem that inspired them at the beginning of the process.

This reflects the role of DIY communities described in the literature, where users not only consume knowledge but also contribute to it. Kuznetsov & Paulos (2010) report that these communities are strongly driven by creativity and novelty: sharing is often tied to the perception that one’s work is worth showing to others. As a result, not all makers choose to share their projects, particularly when they consider their solutions too simple, too ordinary, or insufficiently original.

“[...] I really wanted to pioneer and share my knowledge.”

- Interviewee 2

4. Future projects and new iterations

A striking finding from both questionnaires and interviews is that DIY campers are rarely perceived as final. Instead, DIY-ers frequently imagine how they would improve or redesign their camper in the future. In some cases, this means making continuous small improvements to the current van. In other cases, it leads to the ambition of undertaking an entirely new conversion project.

Rizvi et al. (2021) report that vanlifers often feel strong pride in their vans while simultaneously imagining future iterations. This duality was also reflected in the current study: satisfaction and pride in the self-built camper often coexisted with an ongoing awareness of what could be done better next time.

Figure 2.15 DIY-er thinking about future iterations. Source: Vakantiebeurs Berlin. (n.d.). [europages.nl. https://europages.nl/ondernemingen/city-berlin/vakantiebeurs.html](https://europages.nl/ondernemingen/city-berlin/vakantiebeurs.html)





Figure 2.16 DIY-converted campervan of the author

2.2.6 Conclusion

The user journey shows that a DIY camper conversion is not a straightforward sequence of decisions, but an iterative process in which designing, building, learning, and using continuously influence one another. Novice DIY-ers start by gathering inspiration and information, but gradually need to translate these examples into real action. Throughout this process, uncertainty often arises because decisions are highly interdependent and because the consequences of choices are difficult to fully understand in advance.

A central insight from the journey is that many challenges occur at the moment where abstract ideas need to be translated into concrete design decisions. Novice builders may have access to lots of information online, but still struggle to determine what is relevant for their own situation. This becomes especially important during the design and planning phase, where layout choices, technical systems, budget, skills, and future use all need to be considered together.

The journey also shows that the camper is rarely fully finished after the initial build. Instead, actual use often reveals new needs, mismatches, and opportunities for improvement. This means that DIY camper design should be understood as an ongoing and adaptive process rather than a one-time planning task.

These findings suggest that design support for novice DIY-ers should not only provide information or fixed solutions. Instead, it should help users explore possibilities, understand trade-offs, relate examples to their own needs, and make more confident decisions before and during the build. This provides a basis for identifying where existing forms of support are already available and where new design opportunities may be found.

2.3 Role of Experience

2.3.1 Introduction

The user journey presented in section 2.2 describes the journey of a novice DIY camper converter. During the interviews conducted for this research, it became clear that experience level changes this journey considerably. Participants who had already completed a previous conversion described their process very differently from first-time builders. They made fewer adjustments afterwards, relied less on online information, and anticipated practical problems earlier in the process. These differences directly affect which problems a DIY-er encounters, and therefore what kind of support the intervention needs to offer. Therefore, the level of experience needed to be defined more precisely, so that during the following phases I could use the insights from the user journey more meaningfully.

This chapter therefore first defines the different levels of expertise relevant to campervan conversion. It then discusses how these levels affect the way DIY-ers move through the conversion journey. Finally, it connects this to design consequences, specifically the need to balance between structure and autonomy, based on the Self-Determination Theory (Ryan & Deci, 2000).

2.3.2 Levels of expertise

To define the different levels of experience, this project adopts Dreyfus' scale of expertise as described by Dorst and Reymen (2004) in Levels of Expertise in Design Education. This model describes how designers progress through distinct levels of perceiving, interpreting, and solving design problems. It was originally developed to give design education a theoretical basis for understanding how design ability develops from novice to expert. The model distinguishes seven levels:

- 1. Novice — considers only the objective, context-free features of a situation as given by experts, and follows strict rules to deal with the problem.
- 2. Advanced beginner --- starts to notice situational aspects and exceptions to the strict rules of the

- novice, and is guided by rules of thumb, rather than fixed rules.
- 3. Competent — selects which elements of a situation are relevant and chooses a plan based on personal goals; this requires a much higher involvement in the situation, gives the process a trial-and-error character, and introduces a clear need for learning and reflection.
- 4. Proficient — immediately sees the most important issues and an appropriate plan, and then reasons out what to do.
- 5. Expert — responds to a situation intuitively and performs the appropriate action straightaway, without conscious problem-solving or reasoning.
- 6. Master — no longer treats standard ways of working as self-evident, but as one option among others; shows deep involvement in the field and heightened sensitivity to context.
- 7. Visionary (world discloser) — actively works to extend the domain itself, defining new issues and opening up new ways the domain could work.

It is important to note that these levels are not equal for all the skills of the user. A single user may operate at different levels depending on the specific task or phase within the project. For example, a user may be competent in woodworking, but a novice in electrical system design (Dorst & Reymen, 2004).

This project assumes that users have at least an advanced beginner level in general DIY tasks. Users who operate below this level are unlikely to possess the basic skills and confidence required to engage in a complex and resource-intensive project such as campervan building. As a result, the "novice" DIY camper converter addressed in this project is never a true novice according to the scale of Dreyfus. Rather, they enter campervan conversion as at least an advanced beginner: already able to recognize some situational nuance from general DIY experience, but without the campervan-specific judgment of a competent or proficient builder.

2.3.3 Difference in Design

The role of experience in DIY campervan conversion cannot be understated. It should be noted that the interview participants were themselves experienced DIY-ers, reflecting retrospectively on their first and later conversions. The information from the interviews of the experience of a novice DIY-er is therefore based on how experienced builders describe having gone through that phase, rather than on direct observation of first-time builders in the moment. This information is complemented by questionnaire responses from true beginners going through the process, as well as by existing studies on the DIY process of converting a campervan (Desjardins, 2016; Suzuki et al. 2023). Together, these sources suggest that experience influences the practical execution of the build, and also the way DIY-ers approach the design process itself. Experienced builders describe perceiving, structuring, and solving design problems differently now than they recall doing during their first build.

Experience changes the way builders move through the user journey. More experienced DIY-ers can often skip or shorten certain phases because they already possess relevant background knowledge. For instance, they may spend less time searching for general information about topics such as electricity, because they already understand the main principles or know where to find reliable information. Instead of exploring the entire design space from the beginning, they often use their previous design as a reference point and focus on improving specific elements.

When improving their design, experienced DIY-ers often already have a clearer understanding of what they want from their camper. They are able to draw on previous experiences, and as a result they can more easily anticipate how certain layout choices will affect daily use. For example, they may already know how they use storage, how much interior space they need, or which parts of a previous layout worked well or should be improved.

This difference can be understood through Dreyfus' scale of expertise, as discussed by Dorst and Reymen (2004). Novices tend to rely more on rules, examples, and external guidance, while more competent users are better able to identify which aspects of a situation

are relevant and choose a plan based on their own goals and expectations. In the context of campervan conversion, this means that novice DIY-ers may depend strongly on tutorials, standard layouts, or advice from others, whereas more experienced DIY-ers are more capable of judging which information applies to their own situation.

During the construction phase, experienced DIY-ers are also better able to anticipate practical problems. They know that certain design choices have consequences for installation, access, maintenance, weight distribution, or available space. This does not mean that they no longer make mistakes, but they are more likely to recognize potential issues earlier in the process. Their previous mistakes and solutions become part of a personal repertoire that helps them make faster and more informed decisions.

Novice DIY-ers, in contrast, often experience the process as more uncertain and overwhelming. Because they have less experience to rely on, they may find it difficult to judge which information is important, which choices should be made first, or how different systems influence each other. They may also treat examples or rules as fixed solutions, instead of adapting them to their own needs. This can make the design process more dependent on external sources and less connected to their personal way of travelling.

Overall, experience influences how DIY-ers frame the design problem, select relevant information, anticipate consequences, and move through the campervan conversion process. More experienced builders use prior knowledge to verify, adapt, and refine their ideas, while novice builders need more support in structuring the process, understanding trade-offs, and translating examples into decisions that fit their own situation.

2.3.4 Balancing structure and autonomy

When viewed together, the themes discussed above indicate that novice DIY camper builders do not mainly lack inspiration or isolated technical knowledge. Instead, their main challenge lies in translating personal needs into coherent spatial decisions and understanding the practical consequences of those choices. On top of this, they need to gain the confidence to proceed in a process that is iterative, resource-intensive, and hard to predict in advance.

This can be explained with the Self-Determination Theory (SDT) of Ryan and Deci (2000). Humans are born with an inherent tendency to seek out novelty and challenges, to extend and exercise ones capacities, to explore, and to learn (Harter, 1978). However, this intrinsic motivation is not stable and can be easily disrupted by unfavorable conditions. It is therefore essential not only to stimulate motivation, but particularly to understand which factors undermine it and how these disruptions can be reduced, allowing intrinsic motivation to flourish (Ryan & Deci, 2000).

Ryan and Deci (2000) provide, with the SDT, a useful framework to understand motivation in this context. It states that human motivation is strongly influenced by the satisfaction of three basic psychological needs: autonomy, competence, and relatedness. When these needs are supported, intrinsic motivation, performance, and well-being are enhanced.

Autonomy refers to the feeling of having control over ones actions and being able to make meaningful choices. Competence refers to the feeling of being capable of performing tasks and mastering new skills. Relatedness refers to the need to feel connected to, involved with and cared for by significant others and to a broader community.

In addition to intrinsic motivation, SDT describes different forms of extrinsic motivation. In complex projects such as DIY camper building, many tasks are not inherently enjoyable, but are still performed because they serve a greater goal. When these goals are fully understood and accepted, they can become

integrated into a person's own values. This is called integrated regulation, and it results in behavior that feels more self-directed, even though it is still goal-oriented rather than driven by intrinsic enjoyment alone.

This is particularly relevant for the advanced beginners described in the previous section.. On Dreyfus' scale of expertise (Dorst & Reymen, 2004), advanced beginners are guided mainly by rules of thumb rather than by their own judgement. This is because they have not yet built up enough experience to recognise which aspects of a situation are relevant. If these rules are presented only as fixed instructions to be followed, the resulting behavior remains externally regulated: the DIY-er complies with the rule without necessarily understanding it. When the reasoning behind a rule is explained instead, for example why a certain wiring thickness matters or why a particular clearance is needed, the advanced beginner can see how the rule connects to their own goals for the build. This allows the rule to be internalized rather than simply obeyed, turning compliance into an instance of integrated regulation.

This suggests that design interventions should not aim to directly create motivation, but rather to support the conditions under which motivation can emerge and be sustained. By supporting autonomy, competence, and relatedness, a system can help beginner DIY-ers not only stay engaged, but also help with internalizing the value of complex or less enjoyable tasks within the building process.

2.4 Existing solutions

2.4.1 Introduction

The ways in which DIY-ers receive support when building a campervan can be understood through the degree of design contribution from both the user and the professional designer or builder. Based on Keinonen’s Design Contribution Square, these roles are inactive, reactive and proactive involvement. In the context of this project, this means that support differ not only in how much building work is carried out by the user or by a professional, but also in who defines the layout, makes design decisions, and takes initiative during the process.

As shown in the figure on the right, fully self-built camper conversions can be positioned close to do-it-yourself design, where the user takes a proactive role and the professional designer is largely absent. In contrast, factory-built or fully professionally converted campers involve far less user initiative and place most design control with the company or with predefined design systems. Between these positions are several hybrid forms of support, such as technical assistance, modular furniture systems, kit-based interiors, or professionally guided self-build processes. In these cases, users may still make certain decisions or carry out parts of the work, but their design contribution is shaped, limited, or supported by professional knowledge, predefined options, or existing product architectures.

This section explores the forms of support positioned along this spectrum, from technical assistance and modular furniture systems to kit-based interiors and professionally guided self-build processes. For each, it looks at how companies structure their offering and what this means for the degree of design control left with the user, sketching the market of existing solutions available to DIY-ers today.

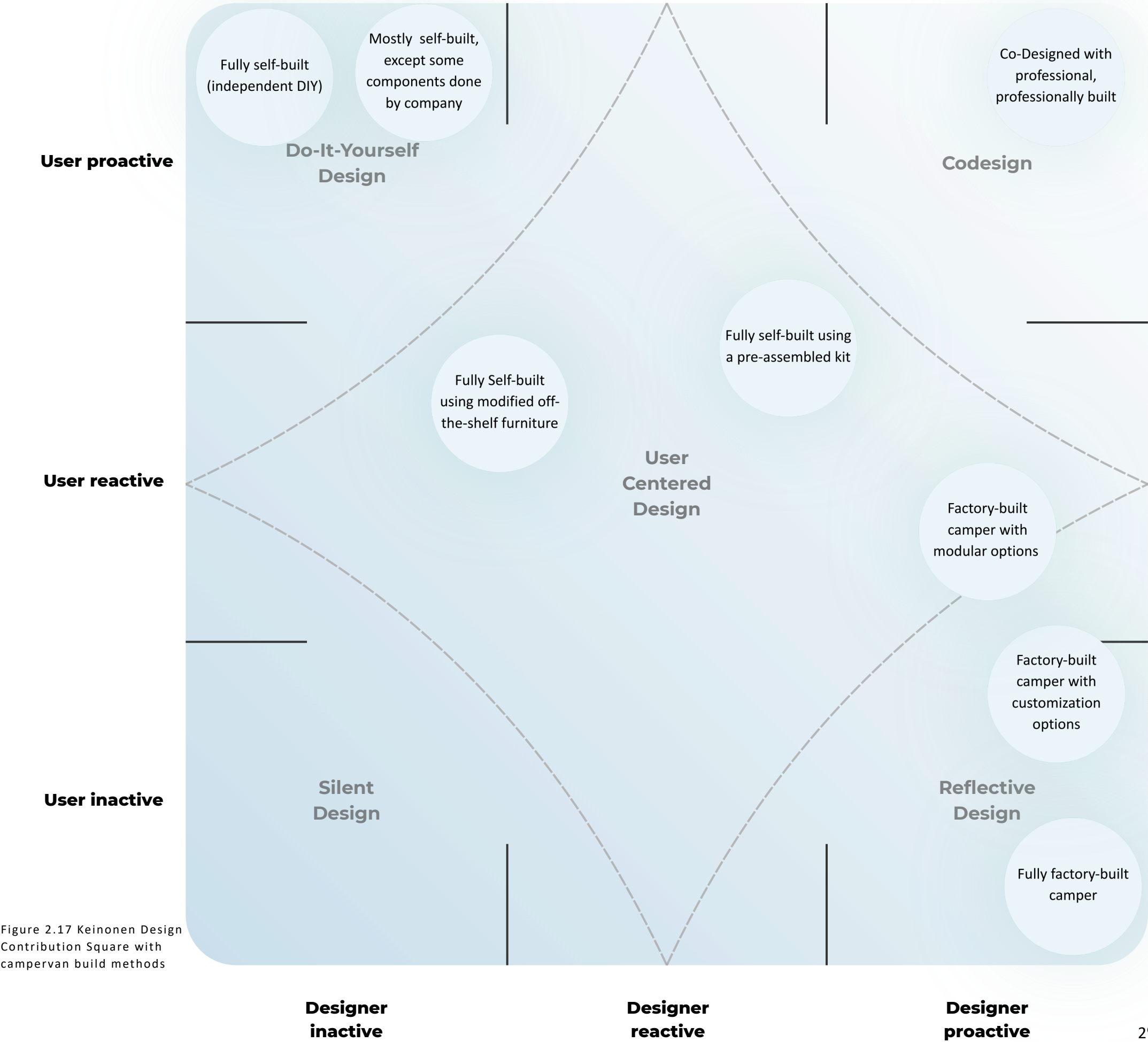


Figure 2.17 Keinonen Design Contribution Square with campervan build methods

2.4.2 Existing Solutions

Fully self-built (independent DIY)

This is the solution addressed directly by this research project and is discussed in detail in section 2.2: the DIY-er defines requirements, makes decisions, builds, and adapts the camper independently over time. This offers freedom and ownership, but also creates uncertainty, especially for novices. Support still exists for DIY-ers in this category. They can for example look for information from other DIY-ers online. In addition, (online) learning courses such as Mooivakonderwijs or Sajenn are available to support knowledge acquisition and preparation, covering topics including regulations, planning, insulation, ventilation, and electrical systems.

The costs of a fully self-built campervan varies greatly. In the Netherlands, a fully self-built van interior can cost as little as 500 euros, up to 50,000 euros for top-of-the-line products (Barendse, 2022). It is up to the DIY-er to decide what to include. Furthermore, costs for online (book) courses around 50 euros per topic, with some subjects split into separate modules (by NOMADS, 2024). A multi-day in-person course (7 lessons of 3 hours) costs around 600 euros (Mooivakonderwijs, n.d.).

Figure 2.18 Self-built campervan built at Mooivakonderwijs, Source: MooiVakOnderwijs. (n.d.). Photo of self-built campervan. Facebook. Retrieved July 18, 2026, from <https://www.facebook.com/mooivakonderwijs/>



Mostly self-built, except some components done by a company (e.g. windows)

For DIY-ers who prefer to carry out most of the conversion themselves but want support for specific technical parts, several forms of technical assistance exist. Heliotroop, for example, enables DIY-ers to install technical systems themselves under professional supervision in a fully equipped workshop. Other providers carry out (parts of) the technical installation on behalf of the user for a fee. These services reduce uncertainty and risk, particularly when dealing with complex systems such as heating, windows, or electrical installations.

Having components installed by a company can quickly become expensive. First, these companies tend to sell the products they install themselves, often at a higher price than the lowest price available elsewhere (a roof vent plus installation material costs 510 euros through the installer, instead of 355 euros bought separately) (De Wit Schijndel, n.d.). Installation itself adds a further 360 euros on top (based on a quote I obtained from a professional installer). For multiple windows this adds up quickly: installing one roof vent, one roof window, and one side window costs around 2,440 euros this way, instead of roughly 790 euros for the same specifications bought and fitted independently. When a company only assists while the DIY-er carries out the work, these installation costs are lower. However, you are still expected to buy the products from the company.

Figure 2.19 Shared workspace. Source: Heliotroop. (n.d.). Heliotroop. <https://www.heliotroop.com/>



Self-built using modified off-the-shelf furniture (e.g. IKEA)

In this solution DIY-ers adapt existing furniture to fit the camper interior, rather than designing and building custom pieces from scratch. This can reduce the technical and design effort required compared to a fully custom build, while still leaving the DIY-er responsible for adapting the furniture to the specific dimensions and requirements of their vehicle.

The cost of this method is simply that of the furniture itself. This is not necessarily more expensive than building from scratch, since mass-produced furniture is relatively cheap. The trade-off is not getting exactly what is needed or wanted. Furniture from retailers such as IKEA is sometimes built from MDF covered with veneer, which can deform in humid conditions. Also, most furniture don't comply with the curves and space constraints present in a campervan interior.

Figure 2.20 Ikea furniture used in a van. Source: 36 Camper Ausbau mit Ikea Möbel | saphranrot. (n.d.). <https://saphranrot.blogspot.com/2021/06/36-camper-ausbau-mit-ikea-mobel.html>



Self-built using a pre-assembled kit (e.g. DeVanTast)

A further step toward simplification is the use of prefab or semi-prefab furniture packages, such as those offered by DeVanTast. Here, the DIY-er only needs to select an interior and assemble the parts themselves using the provided instructions. This lowers the barrier to entry, but also limits the autonomy of the DIY-er. The layout and furniture design have already been determined, and only a choice between packages can be made.

Costs here vary. DeVanTast offers complete packages for around 7,000 euros (including only flatpack wood parts, not furniture or accessories) (Producten – De Vantast, n.d.), whereas a fully self-built interior uses wood costing a maximum of around 1,000 euros (Lars, n.d.). The pre-assembled kit, however, is tailored to fit the van and is designed to suit the conditions it will be used in.

Figure 2.21 Flat-Pack kits for camper conversion. Source: de Vantast – Camper zelfbouw pakketten. (n.d.). <https://www.devantast.nl/>



Co-designed with a professional, professionally built

In this solution, the customer works together with a company that carries out the entire build. The process generally starts with choosing a company whose vision and offering match the customers’ wishes and budget. This is followed by selecting a base configuration that can differ substantially between companies, from a fully finished interior to only the structural shell. From this starting point, the customer can make further decisions about layout, finishes, and additional features, after which the plan is finalized and the camper is built and delivered; some companies also allow customers to return afterward with requests for adjustments. Customer involvement is typically greater for the interiors’ look and feel than for technical systems, which are usually structured through predefined packages or company-led choices, making the process partially personalized but still largely guided by the company.

Costs of a professionally built camper depend on the type of interior chosen and offered by the company. A basic interior costs around 10,000–20,000 euros (including basic, sometimes used, electronics, basic insulation, and a basic interior). A mid-range interior costs about 20,000–40,000 euros and includes A-brand technical systems, good insulation, and higher-end materials such as veneered plywood or solid wood. A high-end interior starts at around 40,000 euros and includes everything from the mid-range category, but larger, higher-quality, and more expensive (Suurmond, 2026).

Figure 2.22 Professional built campervan. Source: Vakantiebeurs Berlin. (n.d.). europages.nl. <https://www.europages.nl/ondernemingen/city-berlin/vakantiebeurs.html>



Factory-built camper with modular options / customization options / fully factory-built

At last, fully factory-built camper is the solution with the least user-involvement. The standard options is a fully pre-made camper with no customization at all. The process is company-led, and the customers’ role is largely limited to selecting among the options that are offered. These options are mostly about aesthetics.

Fully built campers, whether bought directly or configured from a set of options, tend to be somewhat cheaper than a fully custom build. Based on interviews conducted at the CamperExpo, the cheapest option available for a campervan was around 60,000 euros (including the van), while the most expensive models started at 120,000 euros. A new semi-integrated motorhome starts at around 80,000 euros, while a new fully integrated motorhome runs into several hundred thousand euros (NKC, 2026).

Figure 2.23 Professional built campervan. Source: VanJorn (2026, July 21). VAN-Jorn | Modulaire Buscampers | Groningen. <https://vanjorn.com/>



2.4.3 Conclusion

Together, these examples show that substantial support already exists for DIY-ers and buyers alike. In fully self-built conversions, the DIY-er takes a proactive role in defining requirements, making decisions, building, and adapting the camper, which offers freedom and ownership but also creates uncertainty, especially for novices. Professionally built campers reduce this uncertainty by guiding the process through predefined layouts, options, and technical packages, but this also makes the users role more passive, as the company largely controls the design and realization process. Between these extremes, hybrid solutions such as online courses, technical assistance, guided workshops, and prefab or modular furniture systems can lower the threshold for DIY conversion, but they mainly support learning, execution, or assembly rather than the development of a personal layout concept.

The main gap is therefore not a lack of support in general, but a lack of support during the early design and decision-making phase. Novice DIY-ers need help translating inspiration, personal needs, constraints, skills, and future use into a coherent and feasible camper interior. This creates an opportunity for design support that keeps the DIY-er in control, while helping them make more confident and informed design decisions.

3. DEFINE

3.1 Thematic Analysis

3.2 Synthesis of Themes

3.3 Project Goal

3.4 List of Requirements



3.1 Thematic Analysis

3.1.1 Introduction

While the user journey (section 2.2) gave valuable insight into how DIY-ers experience the camper conversion process over time, I found it does not provide a sufficient basis for design direction. Because the journey is structured chronologically, it is difficult to determine which parts of the process matter most for an intervention, or which findings should be prioritized when translating them into concrete requirements. Without this, requirement selection would be more arbitrary than substantiated. To address this, the Define phase does not collect new data, but instead re-analyses the same raw material gathered during the Discover phase (see section 2.1.2) through a thematic analysis. By looking at this data thematically rather than chronologically, eight recurring themes emerged that structure the problem space more analytically than the user journey alone. These themes provide a clearer, more targeted basis for translating the Discover-phase findings into design requirements for the intervention.

3.1.2 Methodology

The findings from the literature review, questionnaires, interviews, and field research, were synthesized through thematic analysis. The analysis was conducted following the approach outlined by Braun and Clarke (2006). In short, interview transcripts, questionnaire answers, field research notes, and literature findings, were reviewed, coded, and compared in order to identify recurring issues and shared experiences. These codes were then clustered into broader themes that capture the underlying dynamics of DIY camper conversion. An example from coding, clustering, and creating themes is presented in figure 3.1.

These themes were iteratively refined by examining whether they captured a coherent underlying meaning and whether they were sufficiently distinct from one another. The analysis moved back and forth between coded extracts and the themes, until no more sufficient distinct themes could be identified. The final themes were used to structure the findings and to derive design implications for the intervention.

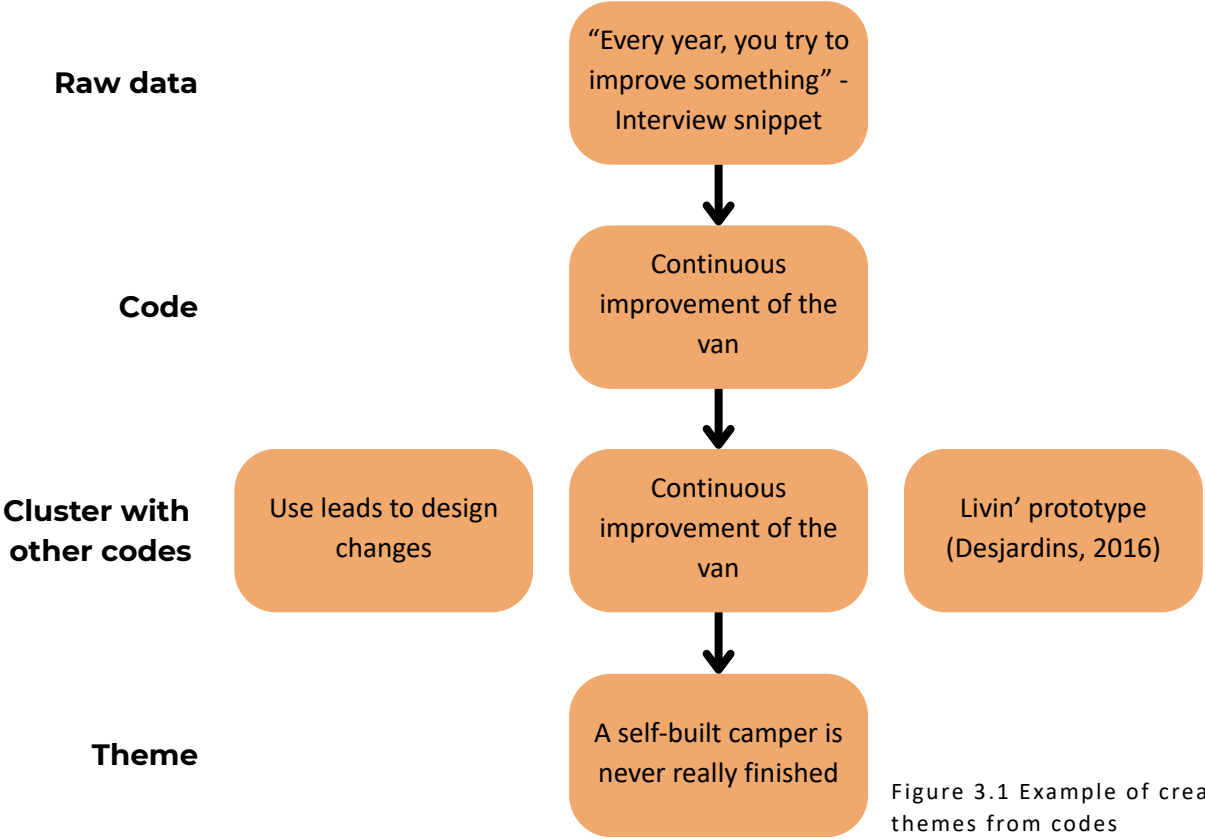


Figure 3.1 Example of creating themes from codes



Figure 3.2 Author clustering codes to create themes

3.1.3 Themes

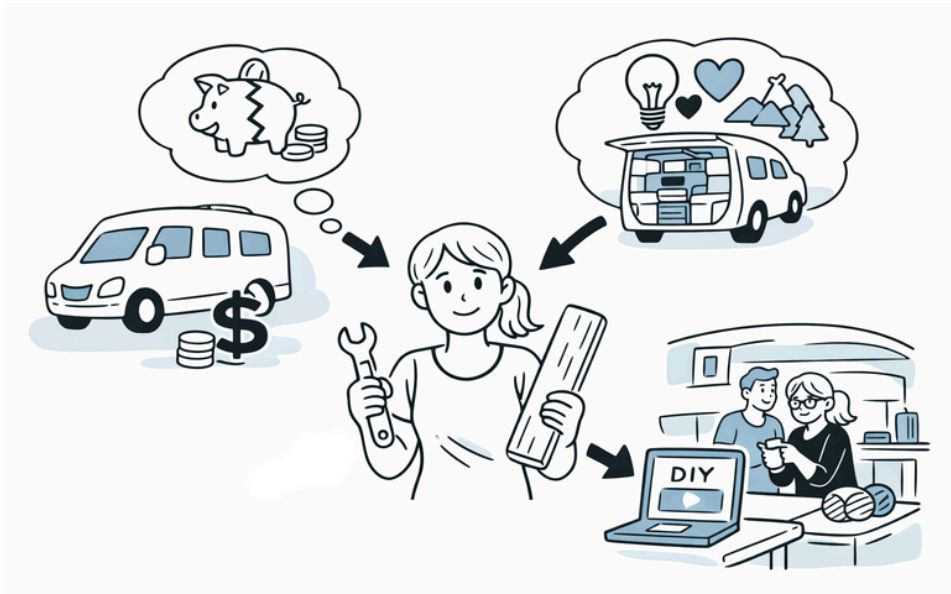
Theme 1: DIY is motivated by both necessity and personal aspiration

Most visible in:

1. Exploration & Inspiration
2. Design & Planning
3. Construction & Iteration
4. Use & Evolution

The decision to start a DIY camper conversion does not stem from a single motivation, but rather from a combination of practical and personal factors. Questionnaire and interview data show that for many participants, the high cost of factory-built campers was a key trigger to explore alternatives. Professionally manufactured campers were often perceived as financially unattainable, which made DIY a more accessible option.

At the same time, DIY is not only a response to financial constraints. Participants also described being attracted to the possibility of creating a camper that better fits their own preferences, lifestyle, and intended use. The ability to design and build something themselves was associated with autonomy, personal relevance, and a sense of ownership. In addition, exposure to existing DIY projects played an important role in making the idea of DIY conversion feel achievable.



Theme 2: DIY camper is not a product, but a translation of the person

Most visible in:

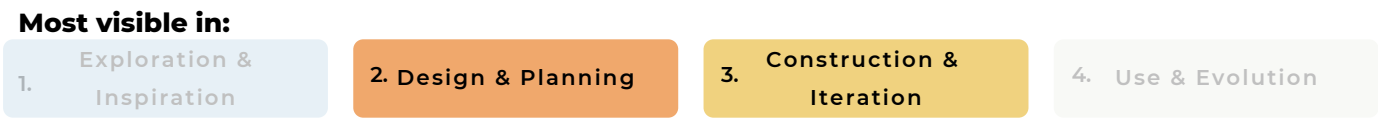
1. Exploration & Inspiration
2. Design & Planning
3. Construction & Iteration
4. Use & Evolution

The data from the interviews and questionnaire shows that the layout of a self-built camper is strongly connected to the user’s identity, lifestyle, and daily routines. The desired layout is not only determined by practical requirements, but also by travel habits, family situation, context of use, and personal preferences. As a result, the question of what makes a “good” camper layout cannot be answered in a generic way; what is suitable differs significantly from person to person and situation to situation.

The DIY camper therefore functions not merely as a item for personal use, but also as a material expression of personal values and patterns of living. Respondents speak proudly about their interior layout and present it not only as a functional solution, but also as something in which their own choices and character are recognizable. This distinguishes the DIY camper from the factory-built camper, which is more often approached as a standard product that is used.



Theme 3: DIY converting is freedom, but freedom can be overwhelming

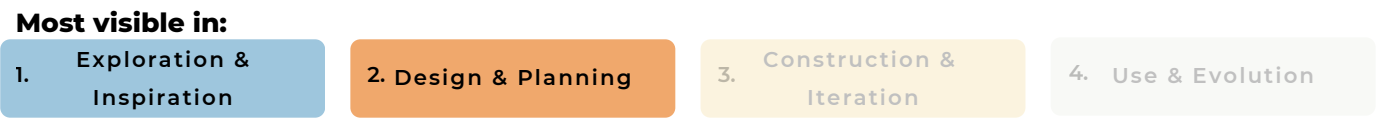


Converting campers themselves gives DIYers a high degree of freedom to tailor a vehicle to their specific needs, lifestyle, and intended use. This autonomy is a key motivation for many: they can develop their own designs and build everything themselves, which fosters a strong sense of enjoyment and pride. In addition, the process often helps them acquire new skills and build confidence, which can be applied to other projects as well.

At the same time, that freedom also brings a heavy responsibility. The DIY-er makes almost all choices themselves. While this may be enjoyable for experienced DIY-ers, for novice DIY-ers it can lead to decision stress, uncertainty, and postponement. Because camper DIY is often also a major financial and practical investment, making the wrong choices quickly feels risky. There is a great deal of room for personal interpretation, but clear frameworks are often lacking. The only hard constraints usually come from regulations, such as the requirements of the RDW and the tax authorities for camper approval.



Theme 4: More information about DIY does not mean more clarity



DIY-ers gather information from a wide range of sources. While this makes inspiration easy to find, it does not necessarily make decision-making clearer.

Much of the available information shows what others have done, but not always why certain choices were made and in which context they were suitable. This also leads to contradictory advice, with different people strongly recommending opposite methods. For beginner DIY-ers especially, this makes it difficult to judge what to trust and which information is relevant to their own situation. As a result, the abundance of information can sometimes increase complexity rather than reduce it.



Theme 5: A DIY camper as an evolving product

Most visible in:

1. Exploration & Inspiration
2. Design & Planning
3. Construction & Iteration
4. Use & Evolution

Findings from the literature, questionnaire, and interviews indicate that a self-built camper is rarely perceived as a finished product. Instead, it remains subject to continuous adaptation, particularly through use. Many DIY-ers undertake trial trips or test holidays during or shortly after the conversion process. These experiences often reveal mismatches between expectations and actual use, prompting adjustments to the layout, facilities, or level of finish.

Moreover, camper interiors are highly personal and closely tied to an individuals’ lifestyle, preferences, and travel practices. As these factors change over time, so do the requirements placed on the camper. Consequently, the interior is not fixed but remains open to modification, refinement, or expansion.



Theme 6: Knowledge emerges during and after building

Most visible in:

1. Exploration & Inspiration
2. Design & Planning
3. Construction & Iteration
4. Use & Evolution

Although many DIY-ers conduct substantial research before starting, the data from interviews shows that much of the most relevant knowledge about camper DIY only emerges during the actual process of building and using the camper. It is during execution that DIY-ers discover what is technically feasible, which solutions work in practice, and where earlier assumptions need to be reconsidered. Knowledge development is therefore not just a preparatory step, but an integral part of the making process itself.

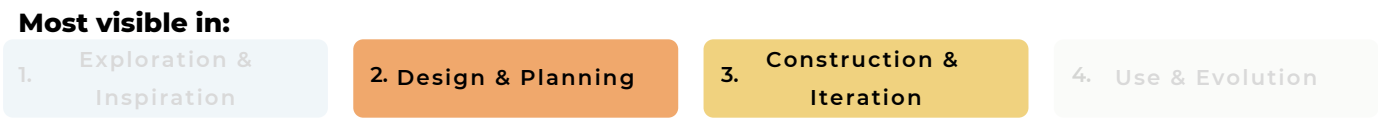
This knowledge also accumulates over time and across projects. DIY-ers who have converted multiple campers consciously apply lessons from earlier builds to new ones. Through use and experience, they come to understand that certain solutions are not always the best fit for their needs, preferences, or way of travelling.

Mostly for beginner DIY-ers, their technical understanding and practical skills continue to grow during the build itself, meaning that only afterwards do they fully recognize how some elements could have been approached differently or improved.

For more specialized or higher-risk components, such as electricity, gas, or water systems, DIY-ers also rely on external sources of expertise. Besides professional specialists, experienced DIY-ers and so-called expert amateurs play an important role in this process. Their knowledge is often grounded in hands-on experience and reinforced through recognition and validation within the wider DIY community. As a result, every conversion generates new insights that inform later adaptations, future projects, and the DIY-ers’ growing body of practical knowledge.



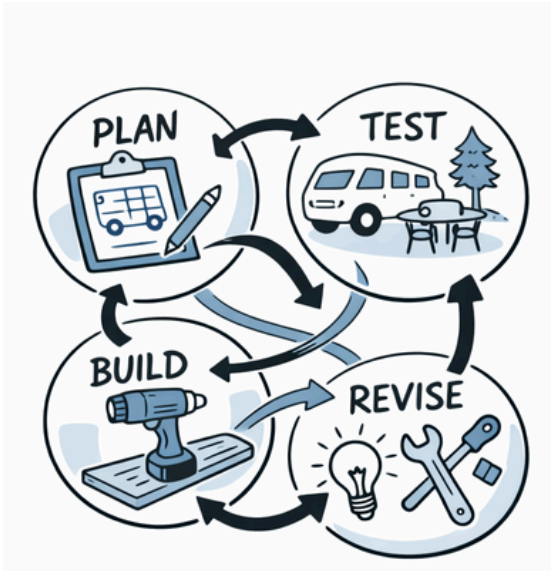
Theme 7: DIY camper conversion process as iterative and non-linear



The data from interviews and questionnaires show that DIY camper conversion rarely follows a strictly linear sequence of predefined steps.

During the building phase, DIYers regularly encounter new constraints, unexpected challenges, or emerging insights. These moments prompt them to revisit earlier decisions, seek additional information, and revise aspects of their design. Resulting in the designing and building stage continuously informing one another.

Many DIY-ers anticipate this dynamic by deliberately avoiding overly fixed plans. Instead, they work with flexible outlines that allow for adjustments throughout the process. This approach enables responsiveness to emerging insights but also means that design decisions are distributed over time, rather than finalized upfront.

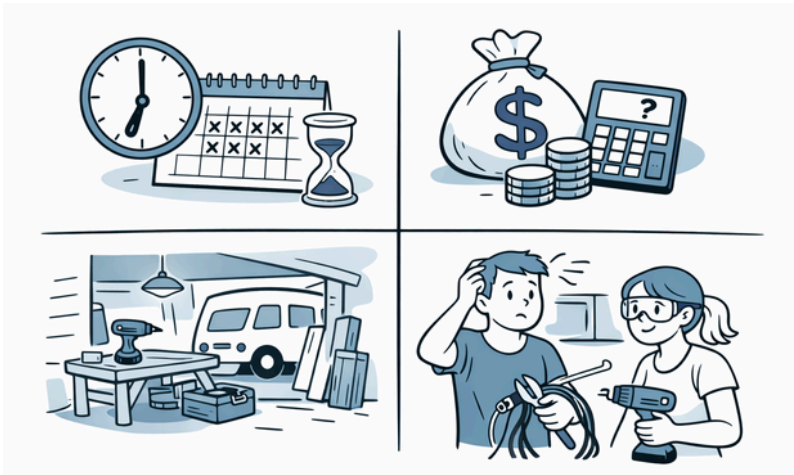


Theme 8: DIY requires substantial resources, time, and practical skills



Finally, data from interviews and questionnaires shows that camper self-build is not only cognitively and technically demanding, but also strongly dependent on available resources and circumstances. Respondents describe the process as lengthy; trajectories of more than a year are more the norm than the exception. Lack of time strongly hinders progress, partly because setting up and dismantling workspaces, preparation, and logistics all require a relatively large amount of extra time.

Financial uncertainty also forms an important barrier. It is difficult to make a realistic estimate of the costs in advance, while the total investment is considerable for many respondents. In addition, practical conditions play a role, such as access to a suitable workspace and having sufficient DIY experience. Especially for beginning builders, components such as electricity, gas, and water are experienced as daunting. Therefore DIY campervan conversion is a trajectory that strongly depends on time, money, space, and practical feasibility.



3.2 Synthesis of Themes

3.2.1 Introduction

The thematic analysis identified eight recurring themes in how novice DIY camper builders experience the conversion process, covering aspects such as the personal nature of the camper, the role of uncertainty, the abundance of information, the iterative character of the process, and the practical demands of building.

While these eight themes make the problem space more analytical than the user journey alone, using all eight directly as a basis for design still leaves a wide range of possible directions, since not every theme carries equal weight for the design of an intervention. To narrow this into a clearer design direction, the eight themes were therefore further distilled into a smaller set of overarching themes. These overarching themes function as guiding principles during the design process: they connect the thematic analysis back to the problem statement, and form the direct basis for the design requirements described in section 3.4.

3.2.2 Overarching themes

1. Supporting confidence without taking away autonomy

Several of the themes point to a central tension between autonomy and uncertainty. Theme 1 shows that DIY-ers want a camper that reflects their own lifestyle, values, and intended use. Theme 2 shows that this freedom is also what makes the process overwhelming, particularly for beginners who must make many decisions without clear frameworks. Theme 3 adds that available information is often too fragmented or context-dependent to resolve this uncertainty. Together, these themes suggest that novice DIY-ers do not primarily need a system that makes decisions for them, but one that helps them build confidence while preserving their sense of authorship and control.

This also explains why many existing forms of support do not fully address the design problem. Much of the professional support available today reduces uncertainty by taking over parts of the process, for example through predefined kits or expert-led execution. While such support lowers risk, it can also reduce the very autonomy that motivates many users to choose DIY in the first place.

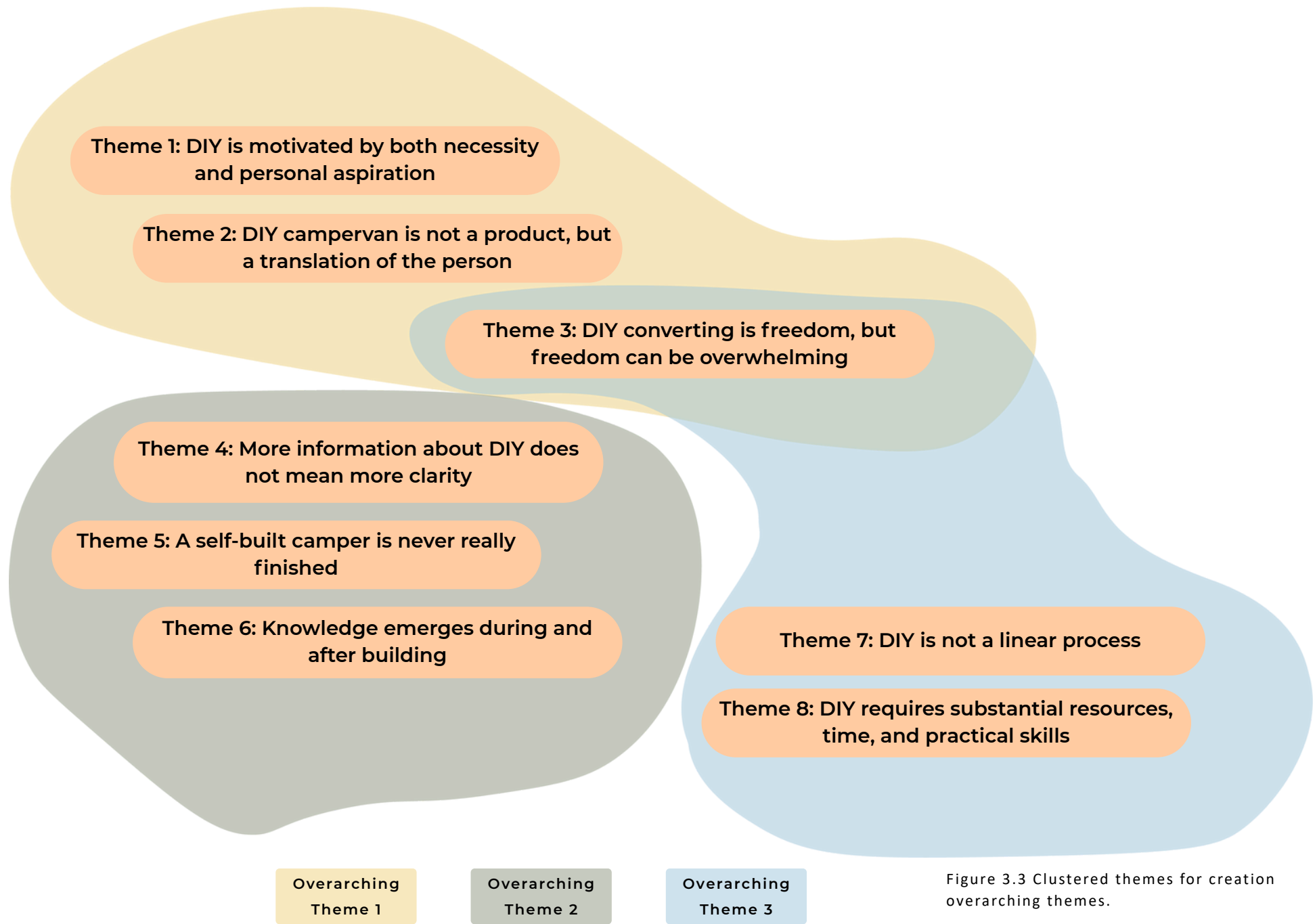


Figure 3.3 Clustered themes for creation overarching themes.

2. Designing for an iterative process rather than a fixed end state

A second overarching theme emerges from Themes 4, 5, and 6. Theme 4 shows that a self-built camper is rarely seen as fully finished, as changes continue during and after use. Theme 5 highlights that much of the relevant knowledge only emerges during building and use, rather than beforehand. Theme 6 shows that the process itself is not linear, but characterized by repeated movement between planning, building, testing, and revising.

Taken together, these themes show that camper DIY should not be approached as a one-time design task that leads to a fixed end result. Instead, it is better understood as an iterative and evolving process in which both the DIY-er and the camper continue to change over time. This has important implications for the intervention: it should allow room for revision, comparison, reflection, and later adaptation. In other words, the intervention should fit a process in which uncertainty is gradually reduced through action, not eliminated in advance.

3. Reducing barriers without overcomplicating the process

Themes 3, 7, and 8 together point to a third overarching theme: the threshold to begin and continue DIY-ing is high. Theme 3 shows that information is abundant but difficult to apply. Theme 7 shows that the process requires considerable time, money, tools, and practical capability. Theme 8 shows that many people start building from a mix of financial necessity and personal aspiration, meaning that they often enter the process with strong motivation but limited resources.

This means that an intervention should be conceptually helpful, while also remaining accessible in practical terms. If it requires expensive tools, specialist knowledge, or large upfront investments, it risks reproducing the same barriers already present in DIY. At the same time, the findings show that some complexity cannot be removed entirely, particularly where safety-critical systems or technical installations are concerned. The challenge is therefore to lower unnecessary thresholds while still acknowledging that some parts of the process will remain demanding.

3.3 Project Goal

3.3.1 Project Goal

The synthesis of themes provides a clearer understanding of the challenges faced by novice DIY camper builders. The overarching themes show that the main challenge is not a lack of motivation or a lack of available information. Instead, the challenge lies in making sense of complex and fragmented information within a process that is uncertain, personal, and iterative. For novice DIY builders, this makes it difficult to translate personal needs and intentions into concrete spatial design decisions, and to move forward with confidence.

At the same time, existing forms of support often reduce uncertainty by taking over part of the decision-making process or by offering fixed solutions (see chapter 2.4). However, this conflicts with the autonomy, creativity, and ownership that motivate DIY builders in the first place (Ryan & Deci, 2000). This creates a tension between providing guidance and preserving control.

Therefore, I want to design a system that supports DIY-ers in designing their campervan interior. The focus of this support will be on the broader interior design of the camper, rather than on highly detailed design decisions. I chose to focus on the broader lines because much of the individual expression in DIY camper building lies in the execution and detailing of the design (see theme 2). These details are also strongly dependent on the skills, tools, budget, and preferences of each builder (see theme 8). By not defining this level too strictly, the system can provide guidance without taking away the freedom to adapt and personalise the design.

Furthermore, I want to address how information is shared between DIY-ers. First, the way information is currently shared often lacks structure, making it hard to compare solutions or find relevant information at all. A structured system, whether digital or physical, could make it easier to locate and organise this information.

Second, even well-organised information often only shows the outcome of a design choice, not the reasoning behind it. When this is included, other DIY-ers can better judge whether a given solution would also fit their own situation. This allows different camper designs and decisions to be compared more meaningfully.

Furthermore, I want to create a system that provides more structure to the way information is shared between DIY-ers. This could be either a digital system or a physical structure with a similar function. The goal is not only to make information easier to find, but also to make the reasoning behind design choices more visible. When DIY-ers share not only what they built, but also why they made certain choices, other builders can better understand whether a solution could also fit their own situation (see theme 4). By using a shared structure, different camper designs and decisions can also be compared more easily.

The project will focus mainly on novice DIY camper converters, as the research shows that they have the strongest need for structure and guidance. More experienced builders often already have their own methods, knowledge, and confidence to make design decisions. The system will therefore not specifically exclude more advanced users, but it may be less suited to their needs.

This leads to the following project goal:

Novice DIY camper converters need support during the designing phase of a camper interior based on their specific needs and preferences, while also being able to share their outcomes and the reasoning behind their own design choices with other DIY-ers in a structured way.

Or, in other words:

How can a system support novice DIY camper converters in designing their camper interior, while also enabling them to share insights from their own design outcome with other DIY-ers in a structured and meaningful way?

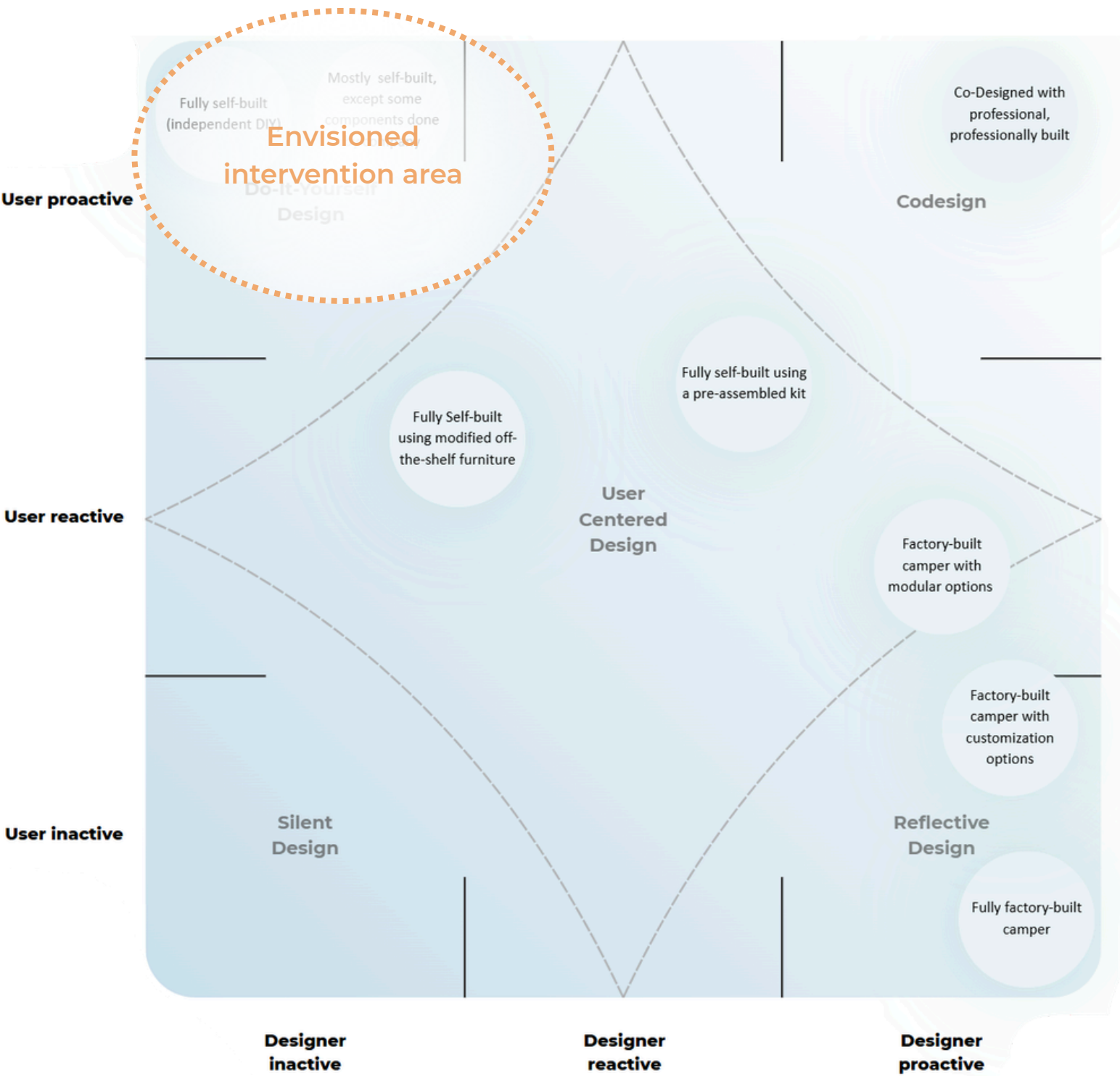


Figure 3.4 Keinonen Design Contribution Square with envisioned intervention area

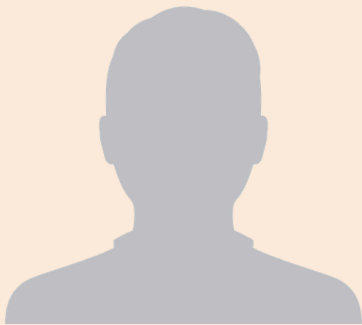
3.3.2 Personas

The following personas represent the main user types considered during concept development. They were created based on findings from the literature review, the second questionnaire on barriers in the DIY camper conversion process, and the semi-structured interviews. The personas were developed using the persona method described in the Delft Design Guide (Boeijen et al., 2020).

Rather than representing specific individuals, the personas combine recurring patterns in experience, goals, behaviour, and difficulties found across the research. Their main purpose is to support concept development by making differences between user types more tangible. In particular, they help distinguish between advanced beginner DIY-ers who need support in structuring the process and more experienced DIY-ers who are confident in making, but still struggle to integrate camper-specific knowledge and design choices.

Throughout the concept development process, the personas are used as reference points to evaluate whether proposed interventions respond to real user needs. They help translate research findings into design directions by highlighting where users need guidance, comparison, experimentation, or greater insight into the consequences of their decisions. The resulting design requirements are presented in the following section.

Persona 1



Experience Profile:

General DIY: Advanced beginner
DIY Camper Conversion Advanced beginner

Goals:

- Understand what is needed in a camper to fulfill their travel needs
- Develop a personal and feasible camper layout
- Avoid costly or unsafe mistakes
- Understand where to start

Main Barriers:

- Fragmented and sometimes contradictory information
- Difficulty translating travel needs into spatial choices
- Afraid of doing something wrong
- Feels that everything is too technical

Current Behavior:

- Searches tutorials, forums, and social media for inspiration
- Compares many examples but struggles to determine which ones fit the intended use
- Delays decisions because afraid of making the wrong one

Support needs

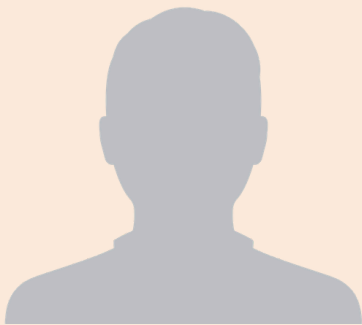
- A clear overview of the design process
- Relevant examples linked to personal needs
- Neutral guidance and understandable comparisons

“

I recently decided that I want to build my own camper after seeing others do it online. I have saved many examples of interiors that I like, but they all show different solutions. I know that I want the camper to feel personal and provide freedom while travelling, but I have not yet determined what I really need or how the interior should be organised. I find it difficult to turn inspiration into a coherent plan and do not know which decisions I should make first.

”

Persona 2



Experience Profile:

General DIY: Competent
DIY Camper Conversion Advanced beginner

Goals:

- Develop a functional and well-considered camper design
- Understand the reasoning behind technical and spatial choices
- Further develop camper-specific knowledge and skills

Main Barriers:

- Information is detailed but fragmented
- Difficult to compare alternatives across different sources
- Limited experience anticipating long-term consequences in a camper
- Unclear how layout and technical systems affect one another

Current Behavior:

- Researches technical subjects independently
- Compares several solutions before making a decision
- Wants to understand how choices influence the complete design

Support needs

- Transparent comparisons and trade-offs
- Clear relationships between layout, systems, cost, and construction
- Freedom to adapt or reject suggested solutions

“

I already have experience with DIY projects and I feel confident using tools. I have built furniture and done home improvement projects before, so I am not afraid to work with materials or solve practical problems myself. However, I have never built an entire camper before. I want to understand how systems like 12-volt electricity and basic water systems work, instead of simply copying instructions without knowing why. I want to develop my skills further so that I can make informed decisions and create a camper that fits my needs.

”

3.4 List of Requirements

3.4.1 Introduction

The themes resulting from the thematic analysis were translated into design requirements through an interpretive synthesis process. For each theme, the underlying tensions, user needs, and recurring difficulties were examined in order to determine what kind of support an intervention should provide. This translation was guided by questions such as: what makes this part of the DIY process difficult, what does the user need in order to move forward, and what should the intervention therefore enable, clarify, or support?

This resulted in an initial set of design implications per theme. In a next step, overlapping implications were compared and clustered into a more concise set of requirements. These were then reformulated into more testable requirement statements and prioritized using the MoSCoW method.

3.4.2 Requirements

Must haves:

1. The intervention must contribute to DIY-ers experiencing more overview and confidence in their own layout decisions after use than they would without the intervention.
(Theme 3, 4)
2. The intervention must help users translate personal needs, lifestyle, and priorities into concrete spatial decisions.
(Theme 1, 2, 5)
3. The intervention must be accessible and usable for advanced beginner DIY camper builders according to Dreyfus' scale of competence.
(Theme 1, 3, 4, 8)
4. The intervention must stimulate new insights through experimentation, comparison, or feedback.
(Theme 5, 6 & 7)
5. The cost of the intervention must not exceed 200 euros per DIY-er.
(Theme 1, 8)

Should haves:

6. The intervention should enable users to develop and iterate on a complete layout concept within approximately one day (or a workshop of up to six hours), assuming the user requirements are already known.
(Theme 8)
7. The intervention should enable useful exchange of experiences and feedback between DIY-ers.
(Theme 4, 6)

Could haves:

8. The intervention could communicate required time, skills, and resources connected to design choices.
(Theme 6, 8)

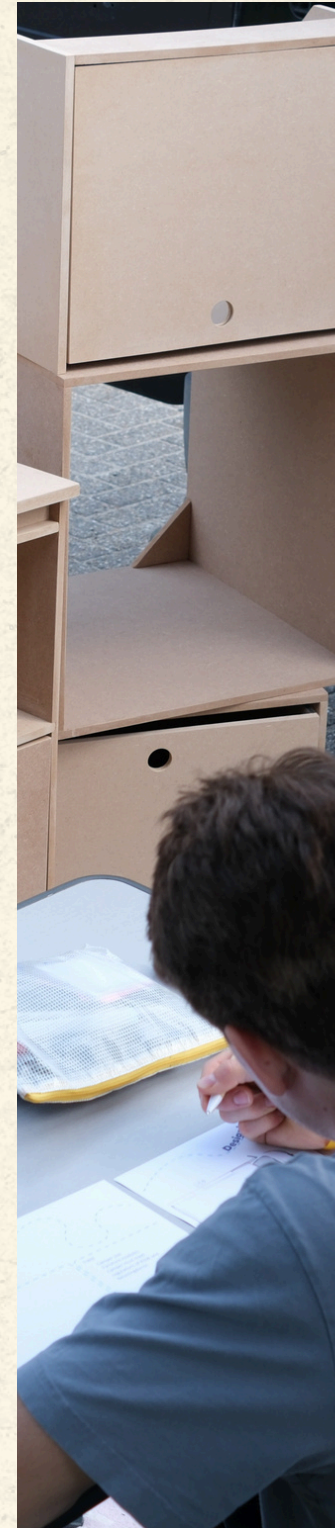
4. DEVELOP

4.1 Ideating

4.2 Concepts

4.3 Evaluating

4.4 Iterating



4.1 Ideating

4.1.1 Introduction

The ideation phase explored possible directions for translating the design requirements into concepts. Based on the findings from the Discover and Define phases, the initial focus lay on developing more holistic forms of support for the DIY camper design process. This was because the greatest opportunity for impact appeared to lie in helping novice builders navigate the overall complexity of designing a camper layout, rather than solving one isolated product or component issue.

Therefore, the main design question during ideation became: *how could DIY builders be supported through shared structures, without losing autonomy over their own design?*

The ideation focused on systems that could organize knowledge, design choices, tools, modules, and experiences in a way that remained open to individual interpretation. Existing examples from maker platforms, camper conversion companies, shared workspaces, and instructional communities were used as inspiration to understand how structure can support creativity rather than replace it.

Although the main focus was holistic, more product-level concepts were not immediately dismissed. Some of these ideas addressed specific challenges in a more concrete way and were valuable for exploring alternative directions. However, because these concepts were less aligned with the overall design requirements and the intended level of systemic support, they were less likely to be developed further as final concepts.

4.1.2 Exploring Concepts

During concept development, several existing forms of shared support were explored as possible directions for supporting novice DIY campervan builders. These directions were derived from the findings of the Discover and Define phases, where fragmentation of information, uncertainty in decision-making, and the difficulty of translating ideas into a spatial layout emerged as important challenges.

The explored directions included:

- shared information platforms, such as forums, blogs, and knowledge bases;
- shared design tools, such as configurators or digital planning tools;
- shared interior examples and floorplans;
- shared learning formats, such as courses and workshops;
- shared experiences, such as peer feedback, mentoring, or community-based support.

These categories were used as starting points for ideation. First, ideas that had emerged earlier in the process were clustered according to these forms of support. After this, comparable solutions from other domains were explored, such as other maker platforms, shared workspaces, instructional communities, and product systems. This helped to understand how different types of structure can support users without fully taking over their decision-making process.

Based on these starting points, a series of possible interventions was generated using How-To questions. These How-To questions helped translate the design requirements into more concrete design opportunities. For example, instead of asking only how users could receive more information, the ideation focused on questions such as: how to help users compare layout options, how to make spatial consequences visible, how to support experimentation before building, and how to let novice DIY-ers learn from others while still making their own decisions.

After generating a range of ideas, the concepts were evaluated using the PMI method: Plus, Minus, and Interesting. This method was used to reflect on the strengths, weaknesses, and potential of each idea. The

evaluation was informed by the design requirements, with specific attention to autonomy, accessibility for novice DIY-ers, overview and confidence, experimentation, and the ability to translate personal needs into spatial decisions.

Ideas that mainly focused on providing users with more information or general design guidance were considered useful, but not sufficient as primary concepts. For example, a technical system planner, such as a tool for designing an electrical system, could be valuable for novice DIY-ers, since this is often experienced as one of the more difficult parts of the conversion. However, when used in isolation, such a planner does not necessarily help users understand what the chosen system means for the camper design as a whole, or which spatial and practical trade-offs are involved (req. 1, 2).

General design methods, design books, or step-by-step design approaches were rejected because they often remain too abstract or indirect for the specific challenge addressed in this project. Novice DIY-ers may still struggle to translate such guidance into concrete spatial decisions inside their own van (req. 2). In addition, methods that strongly prescribe one fixed sequence, layout logic, or building approach risk reducing the user’s sense of autonomy (req. 1).

Therefore, these ideas were considered more suitable as supporting elements within a broader concept, rather than as stand-alone interventions. In contrast, concepts that helped users compare options, understand trade-offs, test spatial consequences, and make their own informed decisions were evaluated more positively.

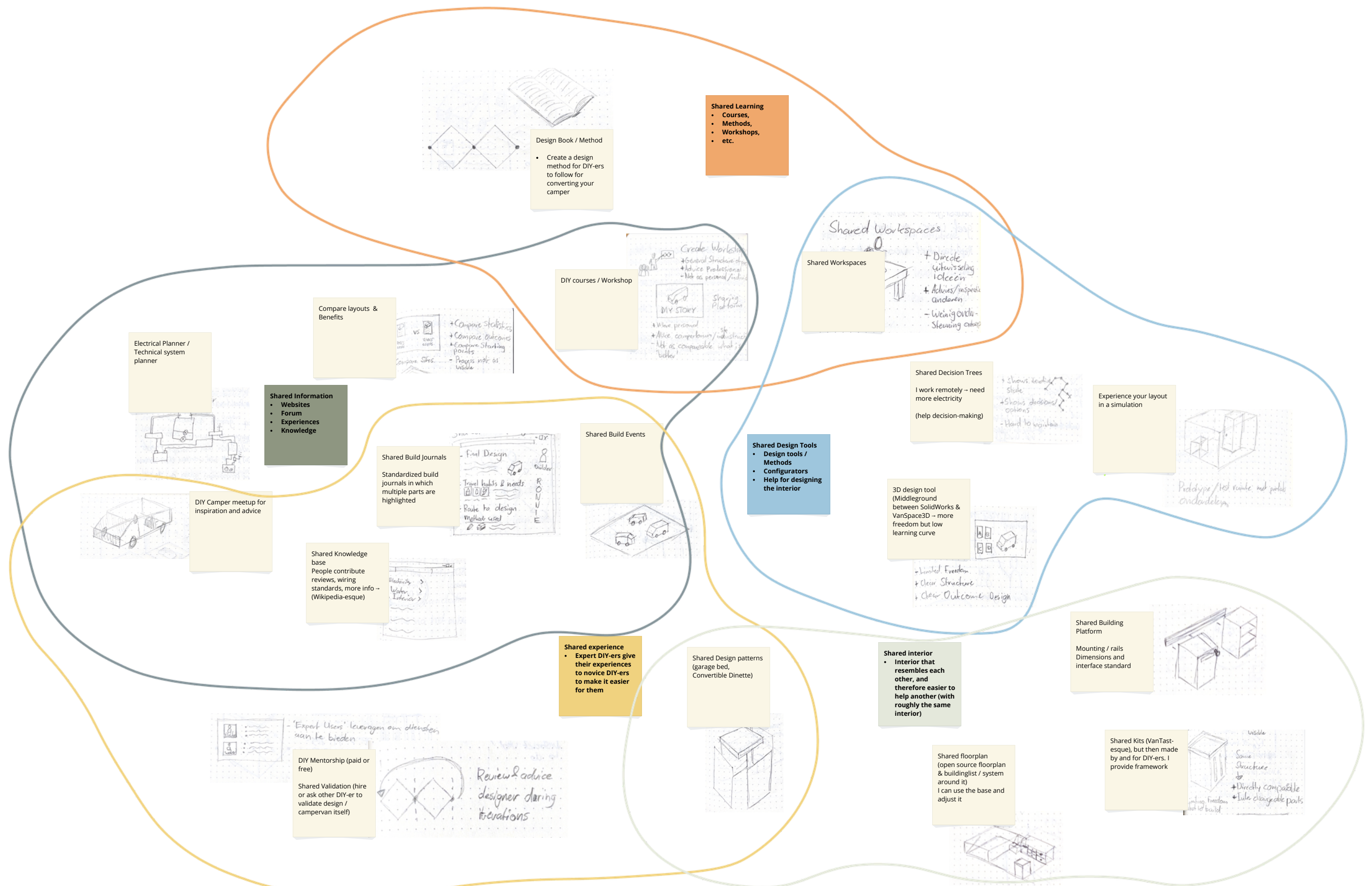


Figure 4.1 Different concepts explored and clustered

Two concepts, made from several smaller concepts, were selected:

- A configurator: a tool that helps users structure information, compare options, and gradually build a camper design based on their own needs and preferences. This concept developed from ideas around shared design tools, technical planners, and decision-support systems.
- The MaakPlaats workshop: a physical mock-up environment where users can test layout ideas at full scale using movable modules. This concept developed from ideas around shared learning spaces, physical experimentation, peer feedback, and full-scale prototyping.

These two concepts were selected because they address the main design challenge in different ways. The configurator supports users in structuring information, exploring options, and building up a personal design direction. It helps users move from scattered inspiration toward a more coherent overview of their needs, systems, and layout possibilities. This responds to the lack of suitable campervan interior design tools identified earlier in the project.

The MaakPlaats concept responds to a different gap. While digital tools can support overview and comparison, they cannot fully communicate what a layout feels like at full scale. The MaakPlaats therefore focuses on embodied spatial testing. By using physical mock-up modules inside an empty van, users can experience dimensions, movement, accessibility, and daily routines before committing to a final layout. This makes the consequences of design decisions more tangible.

Together, the two concepts show two possible ways of supporting novice DIY-ers without taking over the design process. The configurator provides structure and overview, while the MaakPlaats enables physical experimentation and reflection. Both concepts preserve the autonomy of the DIY-er, because they do not prescribe one correct layout or method. Instead, they help users explore possibilities, understand consequences, and make more confident decisions based on their own needs and priorities.

During concept development, existing products and systems were also used as inspiration. For example, maker platforms, modular furniture systems, and digital configurators were analysed to identify useful design principles. Elements such as neutral starting points, adaptable components, structured comparison, and user-led customization were considered valuable for this project. These principles were not copied directly, but translated into the context of DIY campervan conversion.

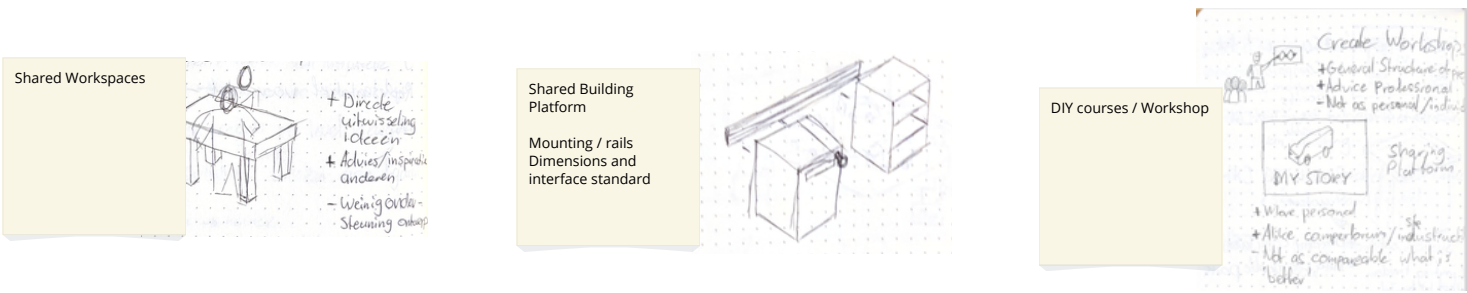
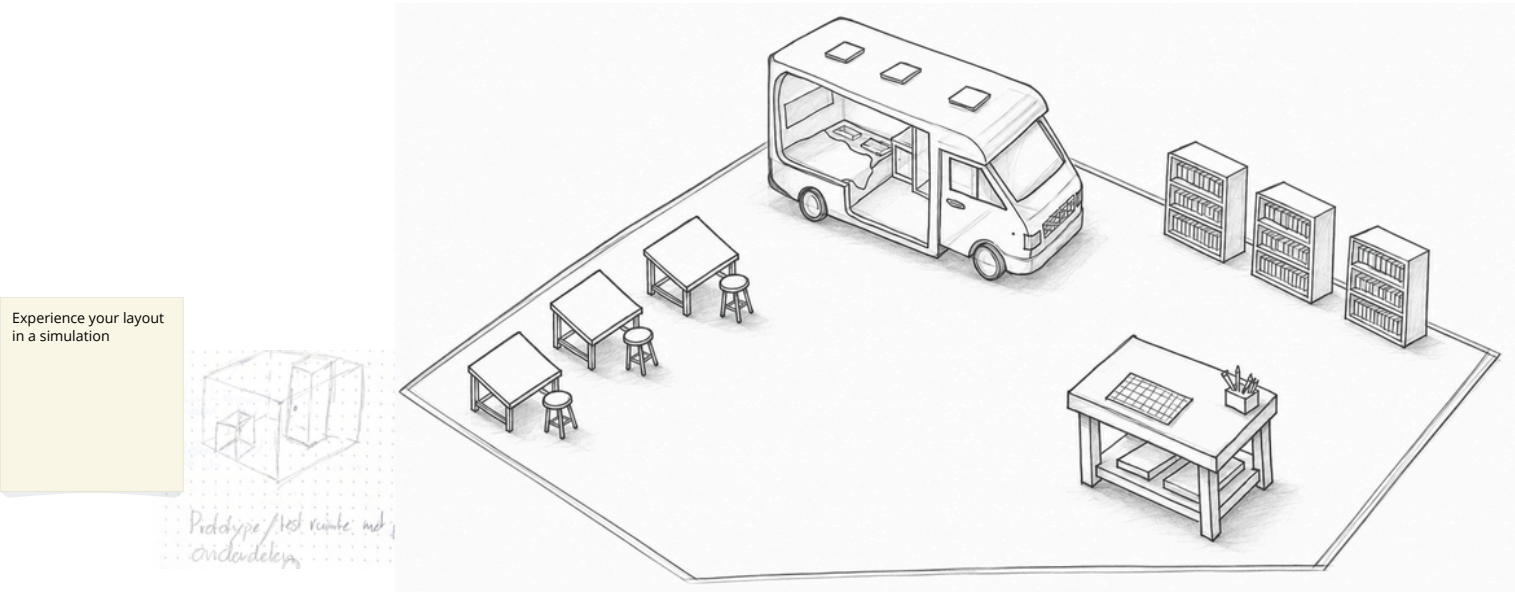
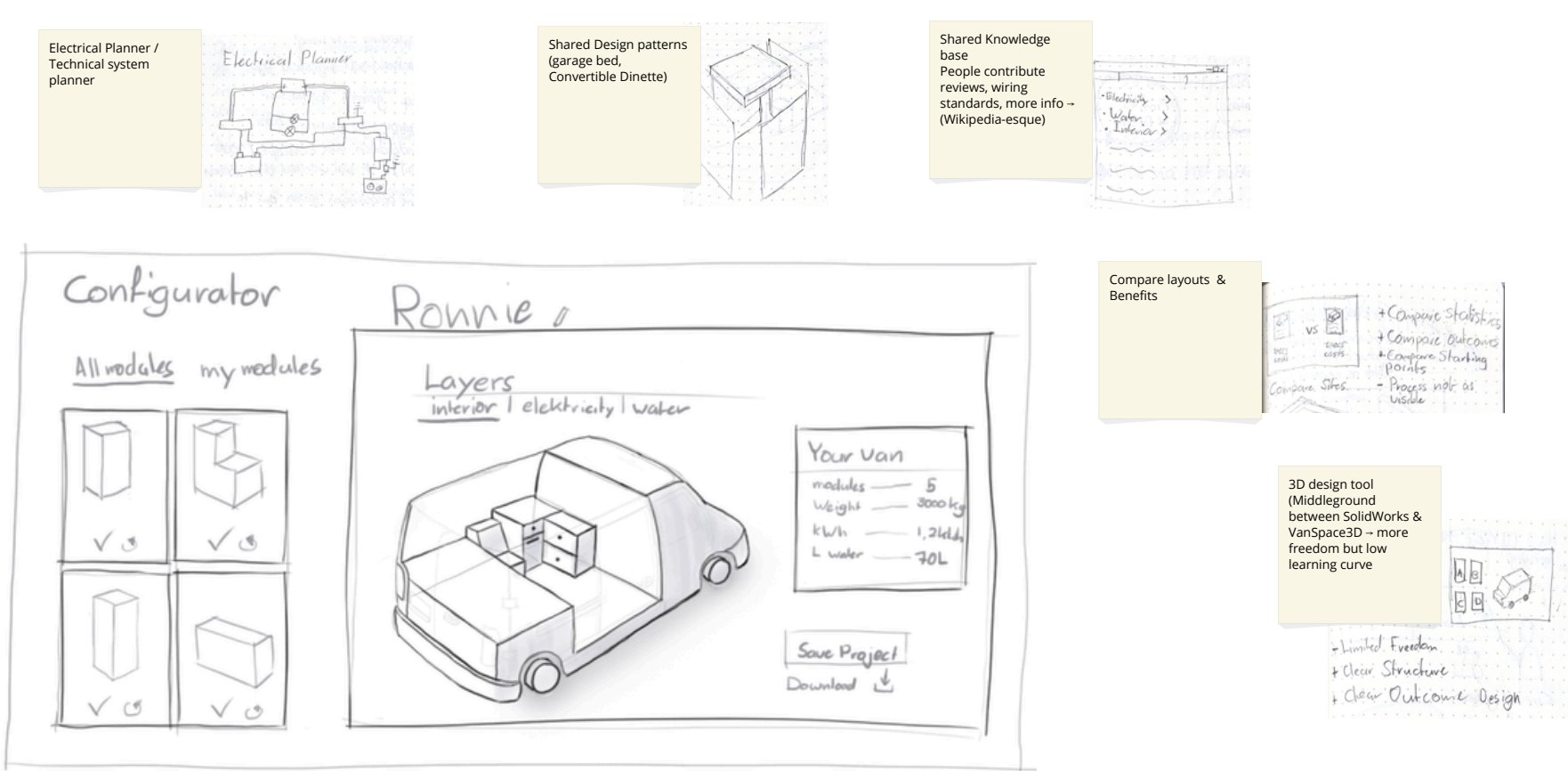


Figure 4.2 Concept sketches combining several smaller ideas into an integrated concept.



4.1.3 Design Philosophy

A recurring pattern observed among professional camper conversion companies was the use of modular design principles. Many companies work with a standardized base structure to which customers can add personal preferences, layout variations, or optional features. The extent to which modularity is applied differs per company and depends on their design philosophy, production method, and level of customization, as discussed in section 2.4.

Within the DIY camper community, modularity appeared less common as an explicit design principle. However, most DIY builders already think in functional zones, such as a bed, kitchen, table, or storage area. Therefore, the value of this modular philosophy does not lie in simply naming these functions. Instead, it lies in using these functional parts more deliberately and explicitly as design units that can be compared, tested, discussed, adapted, and improved.

What is a module

In this project, a module is defined as a functionally coherent part of the camper interior: a group of components that, together, fulfil one clear function. This can be sleeping, cooking, storage, seating, etc..

A module is deliberately not defined by size, construction method, material, or product type. It does not need to be a single removable furniture piece, a standardized product, or built in one particular way. What counts as one module is left to the freedom of the designer: a sleeping area might be reduced to a single bed frame, while a kitchen could be treated as one integrated block, or split into several separate cabinets for water, cooking, and storage. Both are valid modules. The only requirement is that whatever is grouped together forms one coherent, self-contained unit. This unit can be considered, discussed, disassembled, or exchanged *as a whole*, rather than as a collection of loose, unrelated parts.

This way of thinking relates to Design for Disassembly and to the strategy of "clumping" as described by Bas Flipsen (2023), where related components are grouped into manageable units. Applied to DIY camper conversion, this means parts of the interior can be understood as functional chunks: chunks that do not

have to follow one prescribed construction method, but should be recognizable and self-contained enough to be considered, compared, shared, or adapted separately from the rest of the interior.

Why modules?

Structuring the interior this way brings three main benefits. Firstly, it makes the design process more manageable. Instead of facing one overwhelming design problem, novice DIY-ers can break the camper down into smaller, more manageable decisions. They can compare specific parts (or modules) of a layout, such as different sleeping solutions, kitchen positions, or storage strategies, rather than complete layouts at once. This also makes it easier to understand how one choice affects the rest of the interior (req. 1).

Secondly, it supports exchange between DIY-ers. Because a module is self-contained, it can be shared, discussed, or adapted on its own, without requiring the rest of the design to come with it (req. 7). Rather than copying an entire camper layout, users can exchange and adapt a single storage solution, kitchen setup, or seating arrangement, and translate it more easily to another vehicle, lifestyle, or set of needs.

It supports disassembly, iteration, and sustainability. DIY camper conversion is rarely a linear process, and many decisions are reconsidered during or after building (req. 4). Grouping the interior into clumped, self-contained modules makes early choices less permanent. Individual modules can be removed, replaced or improved without tearing apart or redesigning the whole camper. This also has a

sustainability benefit, as materials and components within a module can be reused, repaired, or repurposed on their own, rather than being discarded along with an entire layout when only one part no longer fits the user's needs.

Role of modules in the concepts

Within the further concept development, this philosophy was not selected as a stand-alone concept. Instead, it was used as an underlying design principle for the two main concepts. In the configurator, modular thinking helps structure choices into understandable categories. In the MaakPlaats workshop, it is translated into physical mock-up elements that allow users to test and compare parts of their layout at full scale.

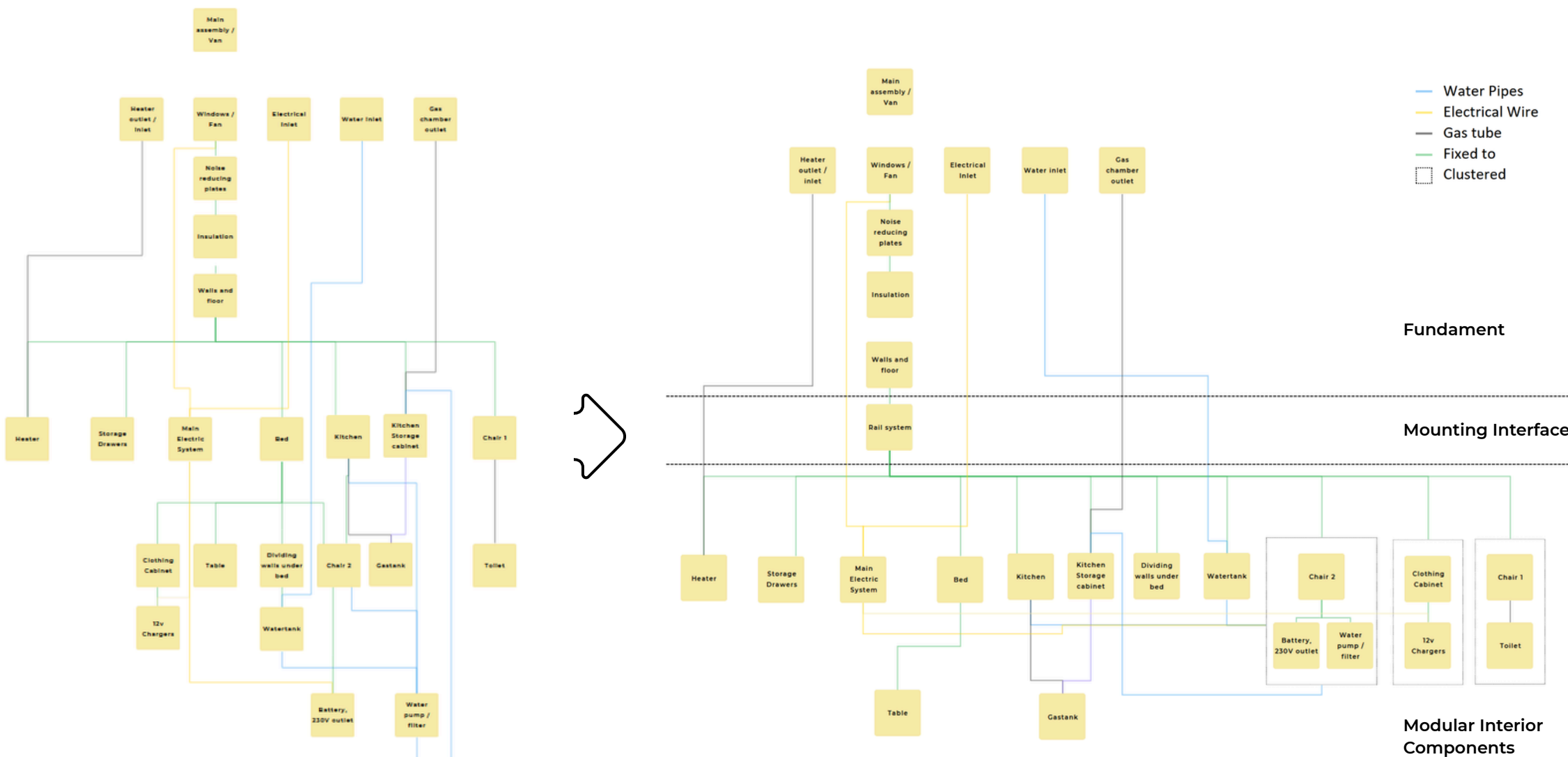


Figure 4.3 Disassembly Maps of campervan without (left) and with modules (right)

4.1.4 External References

After selecting the configurator and the MaakPlaats workshop as the two main concept directions, both concepts were developed further. To make the concepts more concrete, use scenarios were created based on the personas. These scenarios helped explore how the personas defined in section 3.3.2 might interact with the concepts, what kind of support they would need, and where the concepts could fit within the campervan design process.

During this development phase, existing platforms and design projects were used as inspiration. For the configurator, MakersWorld was analysed as an example of how a digital platform can support different levels of DIY expertise. MakersWorld is a platform where users can share 3D-print files. Novice users can start by using files created by more experienced makers, without needing to model objects themselves. Over time, they may start adjusting print settings, modifying existing models, or eventually creating their own designs. This creates a gradual learning path in which users can participate at different levels of difficulty while still experiencing ownership over their process.

This principle was considered relevant for DIY camper conversion. Novice camper builders may not yet be able to design a complete layout or module independently, but they can learn from examples, adapt existing ideas, and gradually build confidence. For the configurator, this inspired the idea that users should not only receive fixed recommendations, but also be able to explore examples, compare alternatives, and understand how more experienced DIY-ers approached similar design choices. In this way, the configurator could support learning without requiring users to start from scratch.

External reference: Existing 3D-printing platform Makersworld

Users are able to share their own designs. Lots of different designs shared by users

Popular designs are visualized and promoted by the site.

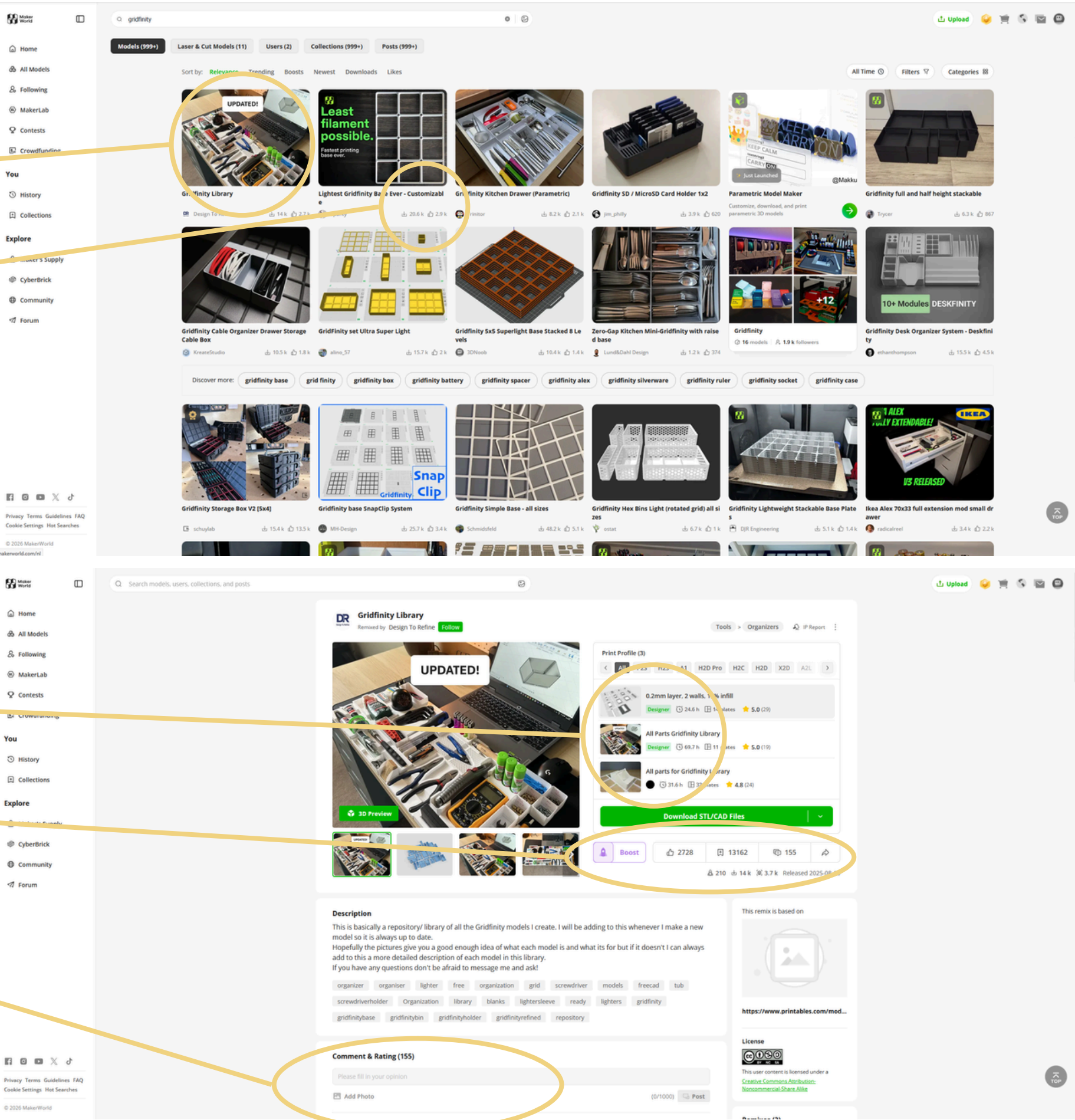
Figure 4.4 Results from searching a model on MakersWorld. Source: MakersWorld Gridfinity. (n.d.). MakersWorld. Retrieved July 9, 2026, from <https://MakersWorld.com/nl/search/models?keyword=gridfinity>

Different manners of manufacturing highlighted, with a rating for each way.

Users are able to review, save, like or superlike the design.

Users are able to leave comments with tips, iterations on the design, or thank the designer.

Figure 4.5 Page for specific model on MakersWorld. Source: MakersWorld Model. (n.d.). Retrieved July 7, 2026, from <https://MakersWorld.com/nl/models/1709415-gridfinity-library?from=search#profileId-2841683>



For the workshop concept, inspiration was taken from the MaakPlaats developed by Perdeck (2015). In this project, DIY-ers with different levels of experience came together in a shared workspace to design and make their own coffee maker. The process consisted of three phases: see, think, and make. Participants first explored existing coffee makers, working principles, construction methods, and available materials. They then used these insights to design and build their own coffee maker, while being supported by an expert facilitator. As part of the thesis, the concept was evaluated through several facilitated sessions conducted across multiple days, each following the same workshop format.

What was especially relevant for this project was the hands-on exploration of the design space. Instead of only explaining possibilities, the MaakPlaats allowed users to physically explore, compare, and learn through making. This principle was translated to the campervan context by developing a workshop environment in which DIY-ers could explore layout possibilities at full scale. The phases of see, think, design, and make were adapted into a campervan layout process: users first explore examples and requirements, then define their own needs, create layout options, and finally test these physically with mock-up modules.

As the concepts became more detailed, their practical limitations also became clearer. The configurator was explored through a digital prototype in Figma, which helped define the structure, screens, and possible user flow. The MaakPlaats workshop was further developed using Onshape and Blender to explore the spatial setup, mock-up modules, and the way users could physically test layout ideas inside a van.

External reference: Master Thesis on Concept MaakPlaats

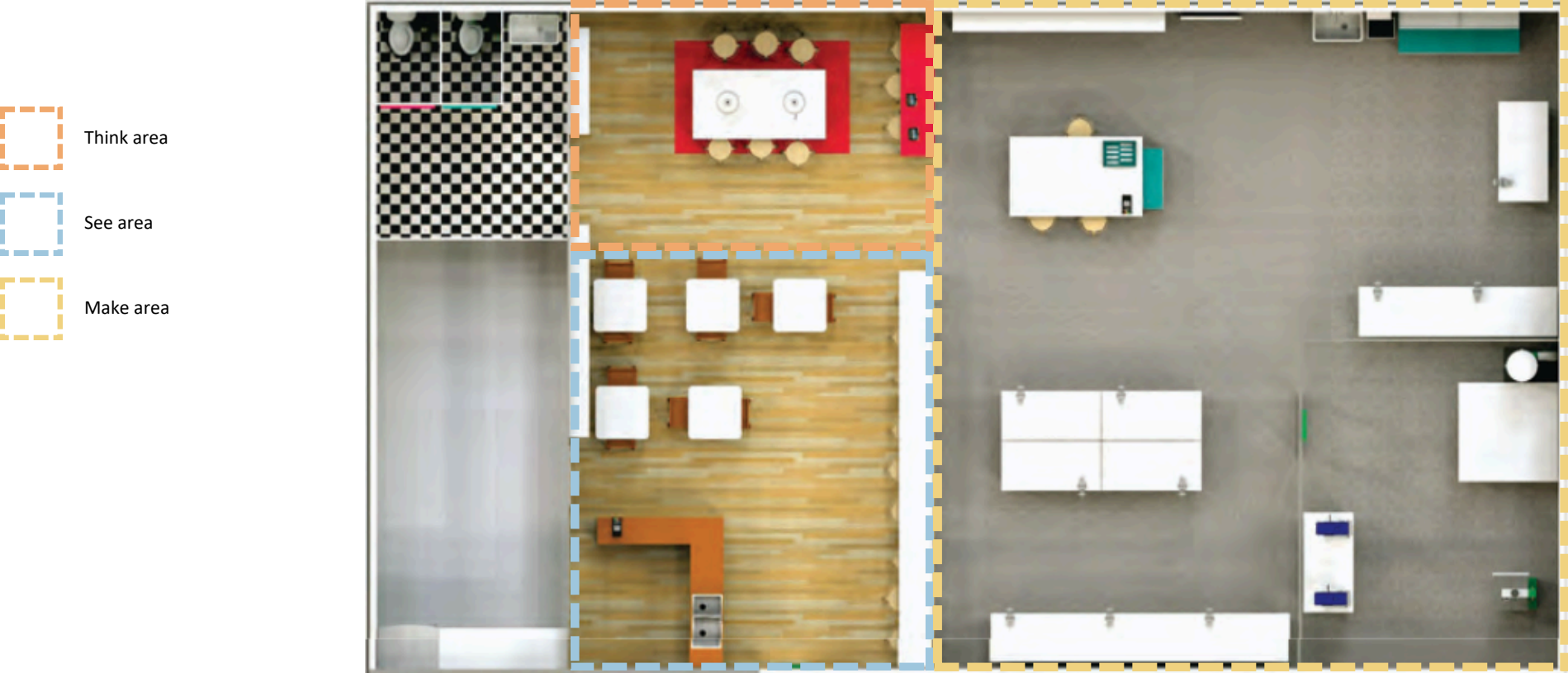
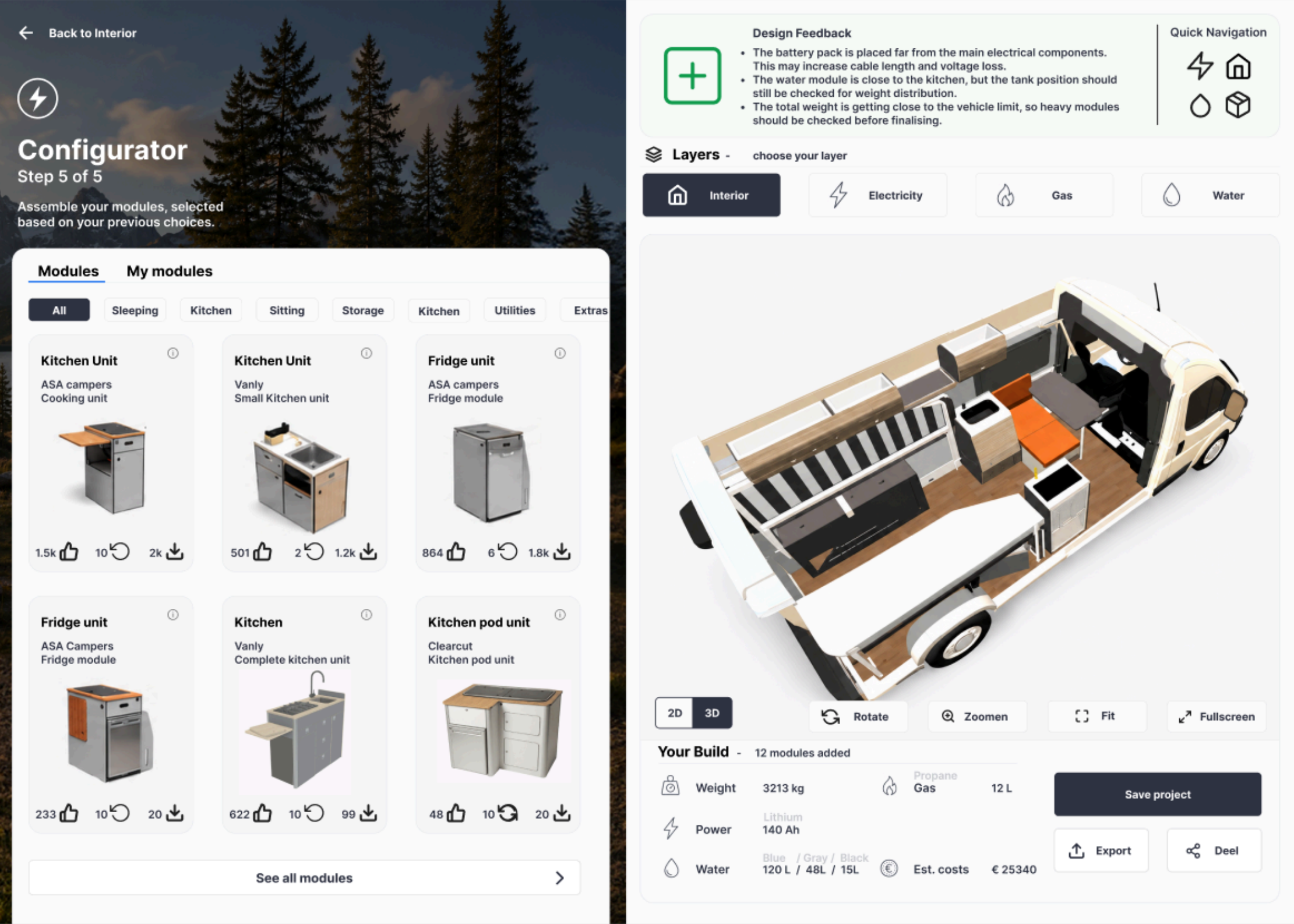


Figure 4.6 Floor plan of the original MaakPlaats concept, used as an external reference. Source: Perdeck, N. (2015). How designers can facilitate DIY design [MA thesis]. TU Delft.



Figure 4.7 Render of the original MaakPlaats concept, used as an external reference. Source: Perdeck, N. (2015). How designers can facilitate DIY design [MA thesis]. TU Delft.

Figure 4.8 Configuration page of proposed concept



4.2 Concepts

4.2.1 First Concept: Configurator

During the analysis phase, it became clear that novice DIY builders often struggle with translating fragmented information into decisions that fit their own design. Existing online platforms provide large amounts of examples and tutorials, but rarely guide users through the reasoning behind design choices or help them structure their own decision-making process. This concept draws inspiration from online maker and customisation communities such as MakersWorld, Thingiverse, and Printables. On these platforms, users share final outcomes, but also exchange editable files, modifications, and personalized adaptations. These platforms lower the threshold for making by combining inspiration, personalization, and community-driven iteration.

Concept definition

The concept proposes an online configurator that guides DIY builders step-by-step through their camper design, rather than confronting them with a complete layout from the start. It is designed as a guided design environment that supports reflection and understanding throughout. This directly supports the requirement to help DIY-ers translate personal needs, lifestyle, and priorities into concrete spatial decisions (req. 2), while remaining accessible to users at different levels of competence (req. 3).

Users first define their travel habits, needs, and preferences, which the system turns into a profile compared against earlier users' profiles and choices. This allows the configurator to suggest options relevant to DIY-ers with similar vans, habits, priorities, or experience. As shown in figure 4.9, they then move through separate design sections: structural base, technical systems, furniture, interior layout. Each section offers options, examples, and profile-based recommendations. In the electrical systems section, for instance, users can compare battery setups and see what each means for their expected electricity use. Users who want more depth can move 'outward' toward the underlying principles and more abstract information. Users who don't can instead follow a recommended setup with a short explanation of its trade-offs and use it directly as their decision for that section. The assumption is that more novice DIY-ers are more likely to lean on the recommended route, while more experienced DIY-ers are more likely to compare alternatives and adapt an existing solution. However, all experience levels are treated the same, and less-experienced DIY-ers are able to become more knowledgeable about a certain topic: users have autonomy over their own learning process.

Decisions made in the different sections are stored and combined into an increasingly complete camper overview. Each decision can be revisited at any point as new insight, preferences, or constraints emerge. At the final stage (figure 4.8), users select and drag in modules recommended based on earlier choices. These modules are created and shared by other DIY-ers, open for anyone to contribute, but only surface as a system recommendation once used and positively rated by enough other builders. This keeps contribution open while ensuring recommendations are informally vetted by community use, and is where the concept most directly supports exchange of experience and feedback between DIY-ers (req. 7) and stimulates new insight through comparison and feedback (req. 4).

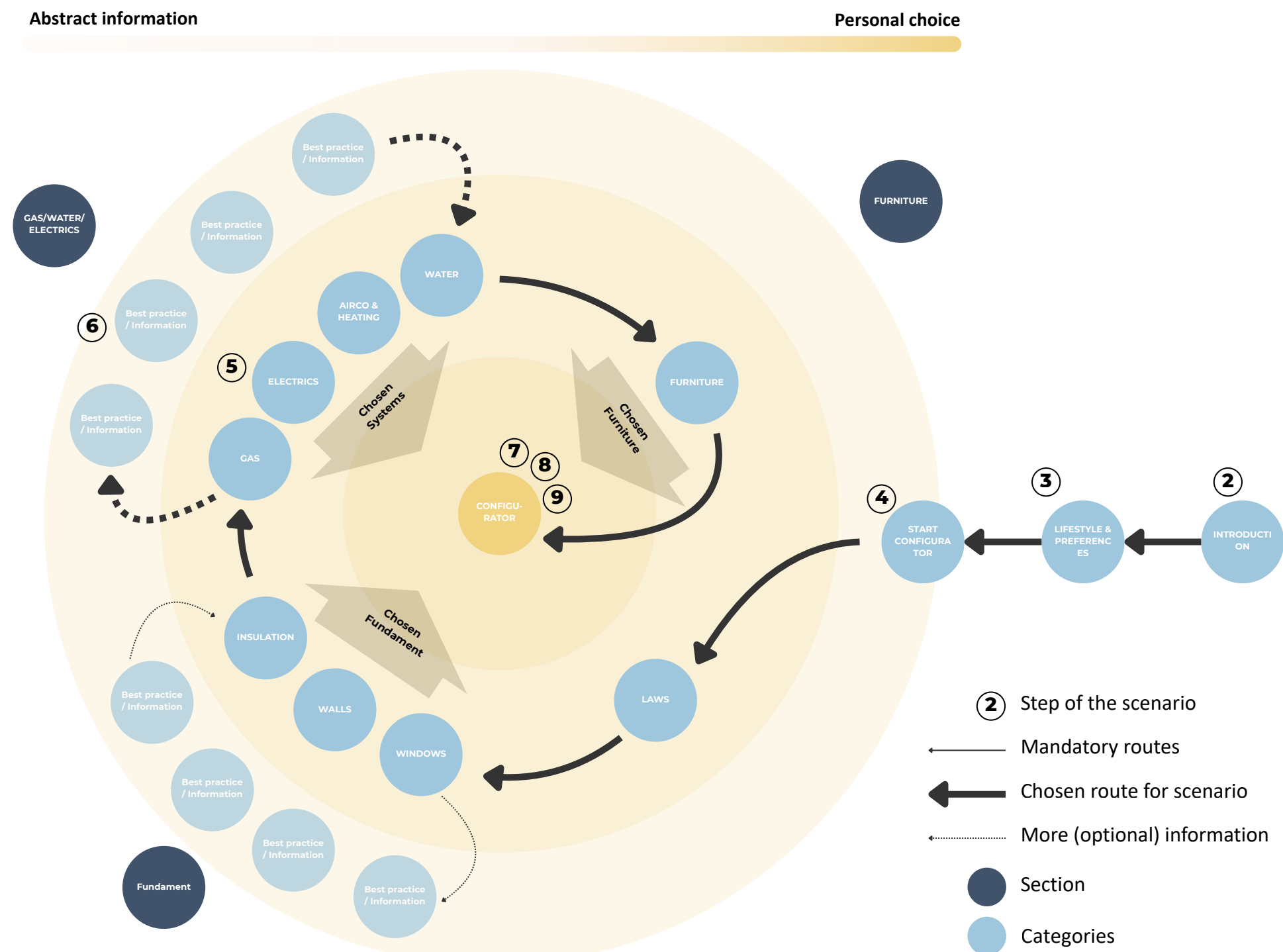
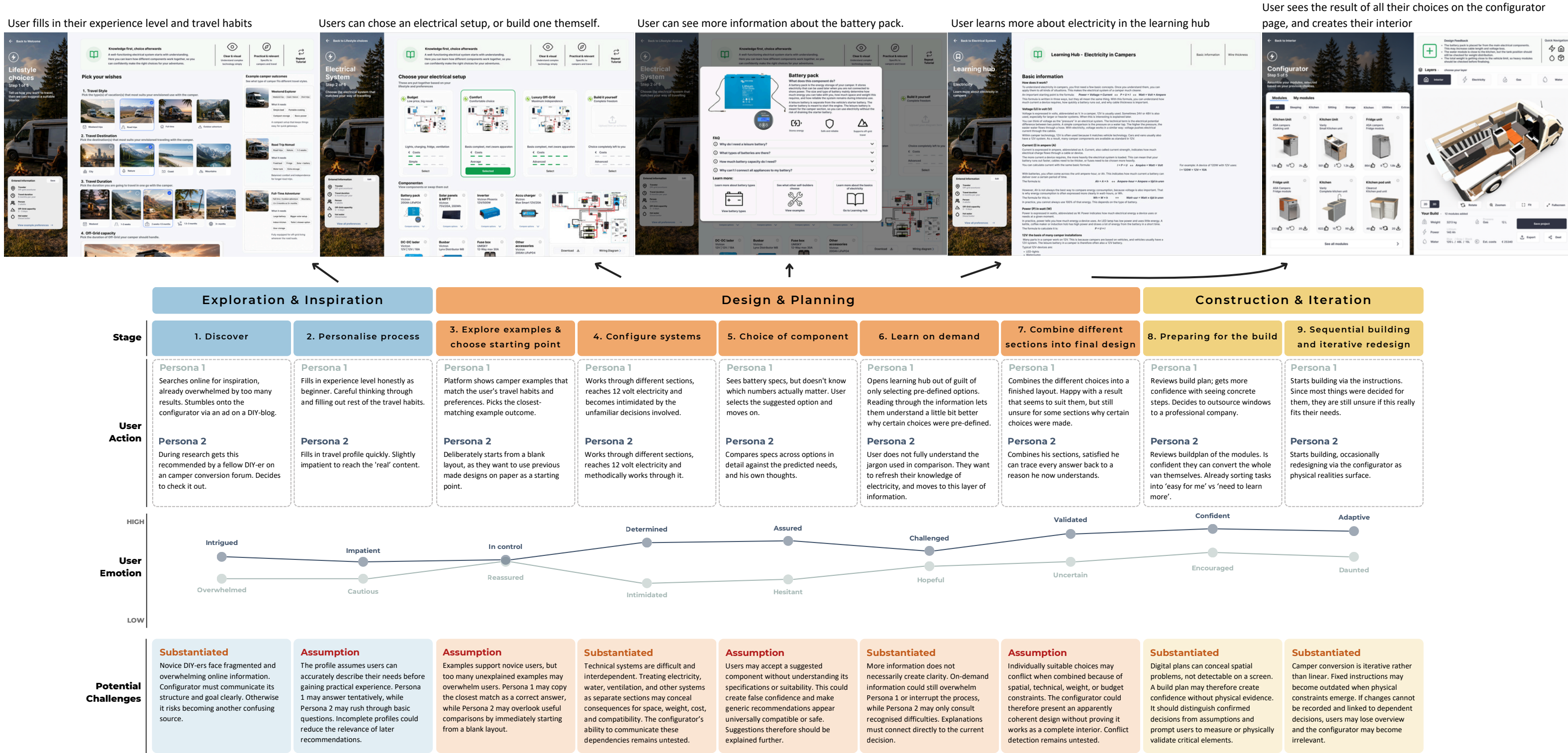


Figure 4.9 Visualisation of journey of user in the configurator

User Journey

To test this concept beyond its written description, a user journey was developed by stepping into the perspective of both personas defined in section 3.3.2 and working through how each would actually move through the Configurator. Rather than treating the concept description as finished, this was used as a way to think the concept through more concretely. The design challenges identified are further dissected in the next sections.

Figure 4.10 User Journey of the configurator



Viability

The concept creates opportunities for a scalable digital platform combining structured information, personalisation, and community knowledge. Because users move through a shared decision structure, information can be organised consistently and expanded over time. New products, technical insights, regulations, or examples can be added without redesigning the whole configurator. It also supports a broader ecosystem of shared modules, editable plans, and user-generated improvements; as with other maker platforms, its value grows with the collection of solutions and experience contributed by the community, potentially making it increasingly useful to novice DIY-ers over time.

Revenue could come from a low-cost subscription. Similar programs such as VanSpace3D sits at a yearly fee around €30. This is comfortably within the €200 cost ceiling (req. 5), though what novice DIY-ers would actually be willing to pay still needs benchmarking and testing. A freemium structure (free basic information, paid advanced features) is a plausible alternative. Additional revenue could come from standard build plans, editable templates, or flat-pack kits. Another revenue stream can come from clearly disclosed affiliate links to webshops, workshops, or suppliers. Provided that these affiliate links are still based on the needs of the user.

A possible market exists both domestically and internationally: 208,374 campervans were registered in the Netherlands as of 1 September 2025 (BOVAG, 2025). The European RV fleet is estimated at 2.5–3 million vehicles (European Caravan Federation, 2024), with comparable scale in the US. These figures don't distinguish factory-built, professionally converted, and DIY-converted vehicles, though, so they say nothing about how many novice DIY-ers actually exist or would use a configurator. The existence of similar platforms such as VanSpace3D suggests a market is already there; specialising in assisting and informing DIY-builders specifically would let this concept carve out its own niche within it.

Overall, the concept could start as a relatively simple decision-making tool and grow into a larger platform as information, modules, and contributions

accumulate. Its central risk is trust: novice DIY-ers would depend on it for complex, sometimes safety-critical decisions, so maintaining neutrality as it scales is essential, not optional.

Feasibility

The configurator can be built as a profile-based web platform without needing to generate a complete camper design automatically. It works by combining three types of information: a general knowledge database, a database of anonymised past user profiles and the choices they made, and the current user's own profile. Matching a new profile against similar past ones, using tags and weighted criteria such as van size, budget, travel duration, is assumed to be good enough for a first version. More advanced recommendation logic can follow as the case collection grows. This does assume users can already define their own travel habits and preferences accurately enough at the start to get fitting suggestions.

Two challenges matter more than the matching logic itself. First, data quality: user-generated choices are useful as inspiration but shouldn't automatically read as technical advice. Safety-critical information, regardless of how many users picked a given setup, still needs to be curated. Expert-reviewed information should be kept visibly separate from community examples and unvalidated recommendations. Second, and more fundamental: the sections that make the tool easy to navigate for a user don't reflect how the underlying systems actually relate to each other in a real van. Choosing a gas versus electric boiler has real consequences for both the gas and electrical sections; a different fridge changes battery needs; different insulation changes ventilation needs. These dependencies cut across the very sections the configurator uses to structure itself. This cross-system logic is unproven. If the configurator can't give compatible recommendations across sections, it risks community distrust and could undermine the whole concept.

Desirability

The concept reduces information overload by structuring choices into manageable, contextualised steps, helping translate personal needs into concrete spatial decisions (req. 2). It supports different expertise levels without gatekeeping anyone to a fixed level, since deeper content is always optional (req. 3), and profile-based comparison combined with the shared module system stimulates insight through comparison and feedback (req. 4) while enabling exchange of experience between DIY-ers (req. 7). Its subscription pricing comfortably meets the cost ceiling (req. 5).

It is assumed that the configurator also guides users through trade-offs and implications without taking the decision over, which should support confidence while preserving autonomy (req. 1). However, there is a real risk too: adding another source of information could simply add to the pile of already-fragmented online content DIY-ers have to sort through, rather than resolving it. Any further development should make very clear how the concept actually works and what a user gets from using it, so it doesn't become one more thing to filter.

Two requirements are less well served. The configurator's open-ended, revisitable nature works against constraining the process to a roughly one-day or six-hour session (req. 6). By design, it supports the opposite. This may be a reasonable trade-off but doesn't meet the requirement as written. Communicating the time, skills, and resources tied to specific choices (req. 8) is only implicit, folded into general trade-off explanations rather than a dedicated feature.

PMI with requirements

- 1 - Increase overview and confidence**
 - + Trade-offs explained and guidance to design
 - Whole process is digital, no physical evidence
- 2 - Translate personal needs into spatial decisions**
 - + Users work from their own submitted preferences
- 3 - Remain accessible across experience levels**
 - + Users get layered information when asked
 - + Users don't need to improve themselves
- 4 - Generate insight through experimentation**
 - + Profile-based comparison create new insights
 - Need a sufficient pool of qualitative previous profiles
- 5 - Costs no more than 200 euros per user**
 - + Current benchmark is well under 200 euros
- 6 - Complete within roughly a day or six hours**
 - + Configurator is deliberately open-ended, and is not completed in 1 session of 6 hours.
- 7 - Enable exchange between DIY-ers**
 - + Modules are shareable between DIY-ers
 - + Rely heavily on other choices of the DIY-ers
- 8 - Communicate time and skills per choice.**
 - Covered only implicitly through general trade-off explanations per topic

4.2.2 Concept 2: MaakPlaats

This concept builds upon ideas from Perdeck (2015), who developed the concept of the MaakPlaats: a shared environment where people with different skill levels can come together to learn, make, and experiment through DIY activities. This concept adapts these ideas to the context of DIY camper conversion. It responds to a recurring research finding: DIY self-builders mainly learn by doing and experiencing. This can be by visiting other vans, or building your own. Existing vans help users explore examples from others, but they rarely allow users to physically experience and iterate on their own ideas beforehand. When experience is gained by building, new insights are often costly or hard to implement. The MaakPlaats moves the experience gained by doing to the start of the process instead.

Concept definition

The concept combines a workshop, learning environment, community hub, and prototyping space built around a large collection of neutral, reusable interior modules. These modules include beds, kitchens, storage, tables, seating, and are available in different sizes and configurations. The modules follow the modular design philosophy from section 4.1.3. Rather than starting with permanent changes, users first assemble and test their own layout using these modules inside a mock-up space. This partially reverses the usual build order, so people experience the envisioned result before committing to the structural and technical layers that would normally come first. This is where the concept most directly supports translating personal needs, lifestyle, and priorities into concrete spatial decisions (req. 2).

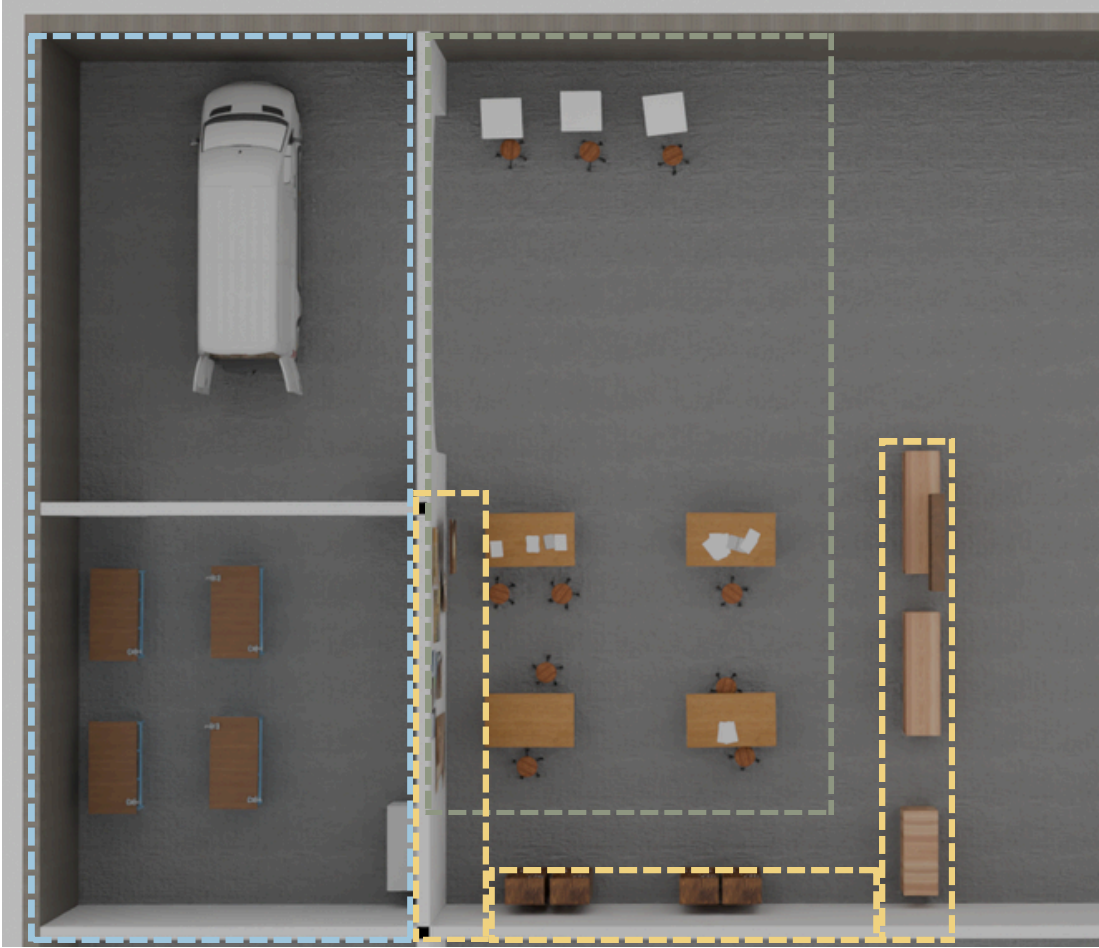
Figure 4.11 Render of proposed MaakPlaats concept, at the mock-up area



Concretely, users pick a van from the workshop matching their own vehicle's dimensions. Each van has a rail system onto which modules, using a library of around 100, in different sizes and functions can be attached, repositioned, and removed during the session. This reusable system allows most experimentation to take place through quick physical adjustments rather than by building each mock-up from scratch. If users require unique or unusual modules, they can improvise with cardboard or plywood. This is treated as the exception, not the default: Suzuki et al. (2023) found novice builders often struggle to imagine spatial possibilities from abstract cardboard mock-ups alone. This is also the reason a large library of complete modules is offered instead, helping less experienced or less certain users get inspired through physical exploration rather than having to invent and visualise everything themselves. This directly supports accessibility across competence levels (req. 3) and stimulating insight through hands-on experimentation and comparison (req. 4). Once satisfied with a configuration, users can purchase kits of the modules used, or build adapted versions themselves.

Figure 4.12 Proposed workshop flow of the Maakplaats Mock-Up workshop

PHASE	LEARNING OBJECTIVE	ACTIVITIES	OUTPUT	ADRESSES REQUIREMENT ...
Welcome	- Understand what the workshop does and does not cover - Recognize that uncertainty in this phase is normal	- Introduction to the workshop - Explain goal, scope, and day structure - Share expectations and starting point	- Shared starting point - Clear design question	Requirement 1, 2, 6
See	- Understand why certain layouts work - Learn to look beyond appearance and recognize underlying design choices	- Explore example layouts - Learn basic camper layout principles - See how layouts relate to different travel styles	- Inspiration and reference examples - First sense of possible design directions	Requirement 1, 3, 4, 8
Think	- Translate personal needs into spatial requirements - Reflect on priorities and preferences	- Map travel style and routines - Identify must-haves and nice-to-haves - Formulate design criteria	- Personal lifestyle profile - Brief list of design criteria	Requirement 1, 2, 3
Design & Experiment	- Combine functions into a spatial layout - Experience trade-offs physically - Understand design as an iterative process	- Create a first layout - Test it using mock-ups or full-scale modules - Act out everyday use scenarios - Iterate and improve the layout	- Tested and improved layout - Insight into issues, trade-offs, and opportunities	Requirement 1, 2, 3, 4, 6, 7, 8
Define	- Clearly communicate and justify design decisions - Understand the next steps in the process	- Finalize the design direction - Explain and justify key choices - Identify open technical questions - Present and receive feedback	- Well-founded interior concept - Overview of open points for further development	Requirement 1, 4, 6, 7, 8



-  Make area
-  See area
-  Think area

Figure 4.13 Render of the floorplan of the Maakplaats

As shown in figure 4.12, the workshop consists of five phases based on Perdeck’s (2015) concept.

During Welcome, the facilitator explains the workshop’s goal, scope, and structure, including what it does not cover. Participants share their expectations and starting points, creating a common understanding and a clear design question.

In See, participants explore example layouts and basic camper-layout principles. They look beyond appearance to understand why certain choices suit particular travel styles, providing reference points and possible design directions.

During Think, participants map their travel habits and routines and distinguish between must-haves and nice-to-haves. These are translated into a personal lifestyle profile and a short list of design criteria to guide the following phase.

In Design & Experiment, participants create a first full-scale layout and test it through everyday-use scenarios. By building, comparing alternatives, and making adjustments, they experience spatial trade-offs and gradually improve their design.

Finally, during Define, participants select their preferred design direction and explain the choices they made. They present their concept, receive feedback, and identify technical questions or other points that require further development.

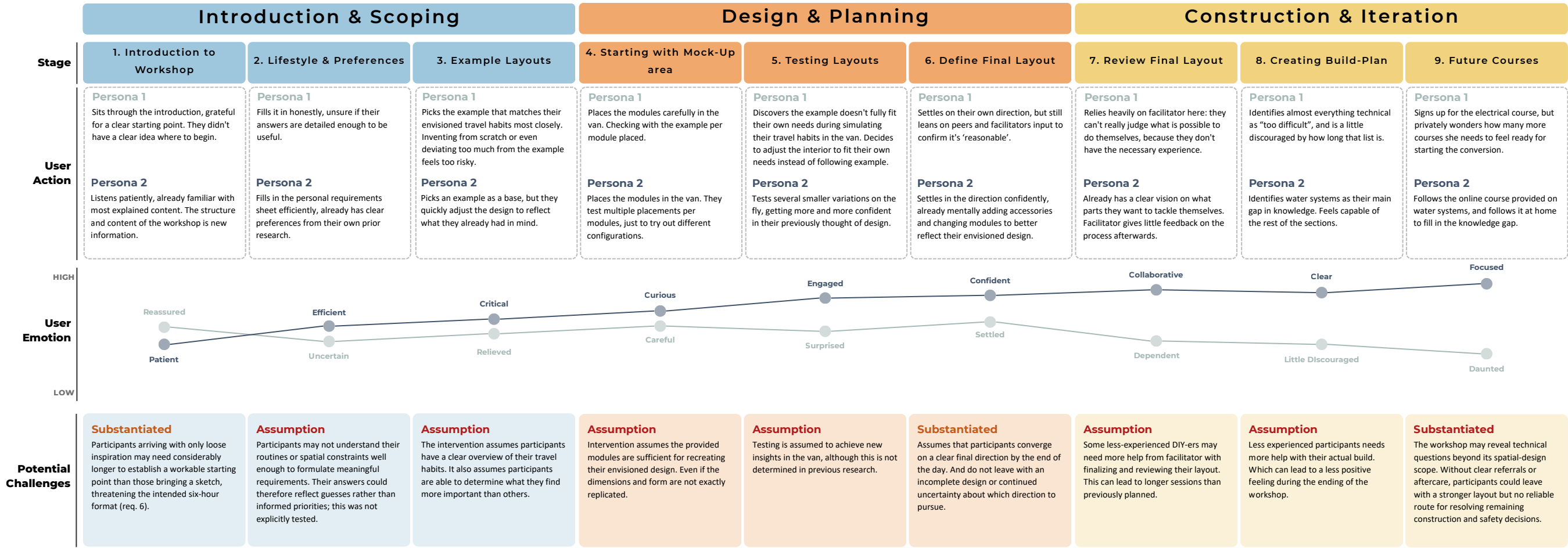
User Journey

Similar as to the Configurator concept, for the MaakPlaats concept another User Journey was developed by stepping into the perspective of both personas defined in section 3.3.2. The design challenges found, are carried directly into the viability, feasibility, and desirability assessment below.



Figure 4.14 Render of the proposed MaakPlaats concept

Figure 4.15 User Journey of the MaakPlaats



Viability

The concept's primary revenue source would most likely be workshop participation, potentially supplemented by workspace and tool rental, prefabricated module kits, building plans, community memberships, or partnerships with organisations active in camper conversion and DIY.

Operating the MaakPlaats would require both initial investment (developing and fabricating the modular system, technical and informational resources, tools and safety equipment, a suitable workspace) and recurring costs (rent, staffing, insurance, storage, cleaning, maintenance, consumables, administration, recruitment). No operator or implementation partner has yet been identified, and these costs have not been estimated. A possible first route would be a pilot within an existing makerspace or camper-conversion workshop (see section 2.4.2). They could supply an established workspace, storage, tools, safety procedures, staff, and access to participants. It will help reduce the initial investment compared to an independent facility. This remains a scenario, not an established partnership.

The modules themselves could create value after the session: if participants are satisfied with their layout, elements of the tested mock-up could become purchasable in the form of flat-pack kits or building plans. These modules can then be further adapted by the DIY-er individually to fully support their needs and wishes. This will help the DIY-er transition to building without taking autonomy over from the DIY-er. Whether the provided modules are actually sufficient to recreate a participant's envisioned interior is still unproven: some users may find pre-made modules too constricting for their own design. Because the modules are reusable across users and projects, the initial investment could be spread across repeated sessions. This depends on sufficient occupancy, manageable set-up/reset times, and module durability under repeated assembly; community sharing of layouts and adaptations could add further long-term value, but sustained participation shouldn't yet be assumed.

No research has established an acceptable participation fee. The final price depends on whether someone only uses the mock-up area or joins a fully

facilitated workshop, plus session duration, group size, staffing, and facility costs. A rough comparison with existing DIY-camper courses (see section 2.4.2) suggests a six-hour workshop could approach €200. This is close to the ceiling set by requirement 5, though this benchmark is not validated and needs further pricing and willingness-to-pay research before the concept's financial viability can be concluded.

Feasibility

At component level, the MaakPlaats appears technically feasible because it builds on existing makerspace infrastructures, workshop methods, and modular furniture principles. It does not require entirely new technologies, but rather a curated system of reusable modules, technical placeholders, information resources, and prototyping environments adapted specifically to camper conversion.

Most modules are made with standard woodworking methods and commonly available materials such as plywood. Existing vans or vehicle-sized mock-ups can serve as the prototyping environment; because the modules are intentionally neutral and generic in form, they could support varied layouts and users without a fully customised kit per project.

Operating the concept would require several connected resources:

- Physical environment

A safe workshop with vehicle access, sufficient space around each van, workbenches, lighting, electricity, ventilation, and areas for building, testing, and discussion.

- Module infrastructure

A sufficiently varied collection of modules, technical-component placeholders, connectors, tools, safety equipment, consumables, and organised storage.

- People and expertise

At least one facilitator who can guide the process without taking decisions away from participants, manage safe use of the workshop, and distinguish spatial guidance from specialist technical advice.

- Workshop preparation

Participant intake, preparation instructions, personal-requirement templates, reference examples, construction guidance, safety procedures, and a method for capturing the resulting layout.

- Operation and maintenance
- Booking and scheduling, set-up and reset between sessions, inspection and repair of modules, replacement of missing components, cleaning, storage, and participant support after the workshop.

Feasibility also depends on the participants themselves, in ways that are currently assumptions rather than confirmed. Less experienced participants (Persona 1) are assumed to get less out of the workshop, since they don't yet know the full range of possibilities and constraints for building an interior. This is why some prior thought about the van and its possibilities is treated as a precondition for attending. It's also assumed that physically recreating an envisioned design produces insight beyond what planning alone would (partially reflected in the literature, see section 2.2.3 or Suzuki et al. (2023)), and that insights gained during the workshop transfer usefully to a participant's actual build. Given how much rests on these assumptions, testing with the mock-up area itself is the logical next step.

Desirability

The concept responds to barriers identified during the research, such as uncertainty, limited experience, fragmented information, fear of irreversible mistakes. Though it shows that novice DIY-ers need support translating intentions into spatial decisions, not yet that the MaakPlaats specifically is the right form of that support.

Its main anticipated value is risk reduction before permanent construction: participants can physically compare layouts while decisions are still reversible, addressing whether there's enough space to move, cook, sleep, access storage, or convert furniture, whether technical components fit alongside living functions, and whether a layout that looks fine on paper actually supports daily routines. Catching such conflicts during the workshop, rather than during the build, could prevent wasted material, cost, and rework.

The concept is likely most valuable to users who already have inspiration or a rough sketch but remain unsure about committing to it. The MaakPlaats turns an imagined layout into embodied evidence inside a real van, and let the DIY-er gain experience from their

own design. At the same time, it preserves the autonomy and creativity that motivate DIY builders in the first place: participants stay the designers and makers of their own camper, gaining tools, examples, expertise, peer feedback, and experiential learning rather than being handed a finished decision. Its value lies in helping people see which choices work for them and what still needs investigating, not in guaranteeing every decision is correct.

Participation also introduces its own barriers, though: time, transport or bringing a van to the workshop, sufficient preparation beforehand, and a price that could sit close to the project's cost ceiling. Some DIY-ers may prefer an independent, simpler mock-up; participants with only loose inspiration may need more guidance and time than the workshop allows. The concept is therefore unlikely to offer equal value to every novice DIY-er.

PMI with requirements

- 1 - Increase overview and confidence**
 - + Full-scale testing gives concepts a new dimension
 - Resulting change is not proven yet
- 2 - Translate personal needs into spatial decisions**
 - + Participants work from their own requirements
- 3 - Remain accessible across experience levels**
 - + Premade modules and layered guidance helps
 - ± Use of outcome of design may differ between levels
- 4 - Generate insight through experimentation**
 - + Iterative building with external input for new insights
- 5 - Costs no more than 200 euros per user**
 - ± Current benchmark approaches ceiling, but is not validated yet
- 6 - Complete within roughly a day or six hours**
 - ± Intended to fit this window, but not validated yet
- 7 - Enable exchange between DIY-ers**
 - + Shared workshop experience
 - + Rely on experiences of previous participants
- 8 - Communicate time and skills per choice.**
 - A gentler transition between designing and building
 - Testing in mock-up doesn't show eventual difficulty

4.2.3 Concept selection

The two concepts were not evaluated using a scoring method such as weighted objectives. Instead, the selection was made through reasoned judgment, informed by the research findings and the design requirements.

A key insight in this process was that the concepts are not mutually exclusive. They can function in tandem along a coherent user journey. A DIY-er might first use the digital configurator to orient themselves, explore layout options, and build up a profile of their needs and preferences. They could then bring that emerging design to the MaakPlaats workshop to test it at full scale, experiencing the spatial consequences of their choices before committing to construction. Later, if they want to build confidence with a specific technical system before installing it themselves, a focused technical workshop provides that hands-on preparation.

In this way, the concepts complement each other. The configurator mainly helps to structure information and make support accessible from a distance. The MaakPlaats adds the possibility to physically test layouts and learn from others. The technical workshops focus more on developing the skills needed for complex or risky parts of the build. Together, these concepts support a larger part of the self-build process than one concept could do on its own.

However, within the scope of this project, the MaakPlaats workshop was selected as the primary concept for further development. This choice was made because it responds most directly to the central project goal: helping novice DIY camper builders make more confident and personal layout decisions before committing to construction. The research showed that novice DIY-ers do not only need more information, but also need support in translating that information into spatial decisions. The MaakPlaats addresses this by allowing users to physically experience, compare, and adjust layout ideas at full scale.

This selection also aligns strongly with the most important requirements. Requirement 1 focuses on increasing overview and confidence in layout

decisions. The MaakPlaats supports this by making the entire layout visible and experienceable inside a van or full-scale mock-up. Requirement 2 focuses on translating personal needs, lifestyle, and priorities into concrete spatial decisions. The workshop allows users to test whether their intended routines, such as cooking, sleeping, moving through the van, or accessing storage, actually fit within the layout. Requirement 4 focuses on generating new insights through experimentation, comparison, or feedback. This is where the MaakPlaats is especially strong, as users can physically test different layouts and immediately experience the consequences of their choices.

The concept is also well suited to the personas developed (see section 3.3.2). According to Dreyfus' scale of expertise, advanced beginners often rely on examples, rules, and external guidance. The MaakPlaats provides this support without taking over the design process. It gives users tangible starting points, such as mock-up modules, examples, prompts, and facilitation, while still leaving them responsible for their own decisions. More experienced users could also benefit from the workshop, but mainly as a way to validate or refine ideas. For novice users, the workshop has a more fundamental role: it helps them understand the space, discover trade-offs, and build confidence.

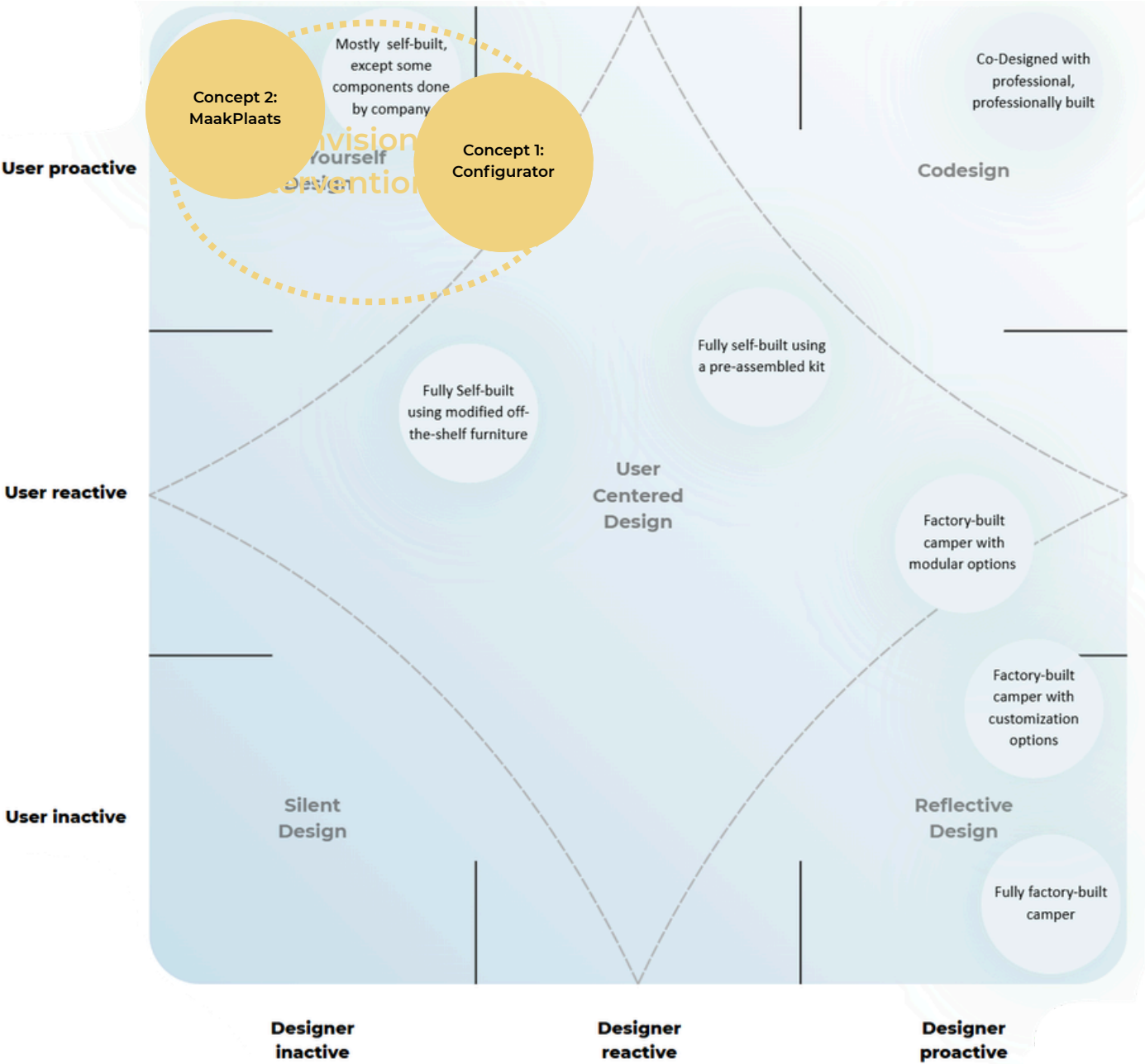
The configurator also addresses several requirements, especially those related to overview, accessibility, and information structure. However, online information sources, configurators, and tutorial platforms already exist in different forms within the DIY camper community. This configurator mainly extends this existing type of support.

The selection was however not based on novelty alone. Suzuki et al. (2023) found that novice builders often struggle to understand how a space will function when working only with abstract or digital representations. A full-scale layout provides direct insight into fit, movement, routines, and daily use. This type of embodied understanding is difficult to achieve through digital exploration alone.

Requirements 1, 2, and 4 all depend strongly on this form of understanding. They concern confidence and overview, the translation of personal needs into spatial decisions, and the generation of new insights through experimentation. For this reason, the MaakPlaats addresses these requirements more directly than the configurator.

- Short overview of the requirements**
- 1 - Increase overview and confidence
 - 2 - Translate personal needs into spatial decisions
 - 3 - Remain accessible across experience levels
 - 4 - Generate insight through experimentation
 - 5 - Costs no more than 200 euros per user
 - 6 - Complete within roughly a day or six hours
 - 7 - Enable exchange between DIY-ers
 - 8 - Communicate time and skills per choice.

Figure 4.16 Keinonen Design Contribution Square with envisioned interventions



4.3 Evaluating

4.3.1 Introduction

After selecting the MaakPlaats workshop as the primary concept, a test was conducted to verify my assumptions made in this concept, namely requirements 1, 2, 3, 4, & 6 (see figure 4.19). Also to test how a full-scale mock-up environment could support the campervan design process. The test focused on the early layout phase, where novice DIY builders often struggle to translate abstract ideas into a tangible, concrete layout.

4.3.2 Goal Test

The goal of this test is to evaluate whether a full-scale mock-up area helps DIY camper builders make better-informed layout decisions than designing on paper alone. The test does not aim to evaluate the quality of the final camper layout itself, but focuses on how the mock-up area supports the participant’s design process.

More specifically, the test evaluates three aspects:

- 1. Whether the mock-up area helps participants with their decision-making of designing a camper.
- 2. Whether physically placing and moving the modules leads to changes, new insights, or increased confidence compared to the initial paper layout.
- 3. Whether the available set of modules is usable for participants to represent and explore their intended camper interior.

In addition, the test explores whether participants with previous camper-building experience use the mock-up area differently from participants without such experience. This helps determine whether the method is especially useful for novice DIY-ers, or whether it also supports more experienced builders.

4.3.3 Test Setup

The main research question for this test is:

To what extent does a full-scale mock-up area support the decision-making and design process of creating a camper interior?

The subquestions are:

How does previous experience with camper building influence the way participants use the mock-up area?

To what extent does physically placing and moving the modules lead to changes, new insights or increased confidence compared to the initial paper layout?

To what extent are the available set of modules sufficient for participants to represent and explore their intended camper interior?

The test consists of an individual design session in which participants first create a camper layout on paper and then physically test and adapt this layout inside an empty van using full-scale modules. This before-and-after structure makes it possible to compare the initial abstract layout with the final physical mock-up layout. The main point of

comparison is whether the mock-up area leads to layout changes, new insights, clearer spatial understanding, or increased confidence in design decisions.

The test is performed outside in a parking lot with two vans: one fully converted campervan and one empty van. The fully converted campervan was used as a reference to help participants understand spatial proportions, existing camper solutions, and the feeling of occupying a completed interior. The empty van functioned as the mock-up area, where participants used the modules and made design decisions at full scale.

In 4 sessions, 5 participants have completed the test. 4 individuals and 1 couple, 4 male, 1 female, have participated. Each session took approximately 60 to 90 minutes. Because of time constraints of this thesis, fellow TU Delft students to participate in the study. The participants fit the two personas as they have

different levels of experience with building a campervan. All participants have some experience with DIY-ing, two participants were specifically selected because of previous or current experience with building a campervan themselves. The other two participants have no previous camper-building experience. This makes it possible to observe how prior knowledge influences the way participants approach the task, use the modules, and make layout decisions.

Figure 4.17 Overview of the test-setup



During the test, participants moved through a short design process (see figure 4.19). In the scoping phase, a few boundary conditions were predefined by the facilitator: the size of the van is fixed, as are the available furniture modules. Additionally, participants were also asked to comply with the campervan requirements set by the RDW and Belastingdienst, as described in section 1.1.3. These requirements were included because they introduce spatial and practical constraints that DIY-ers would also need to manage in a real camper design process. By including these components, the test became more realistic and required participants to consider trade-offs between space, comfort, technical systems, and personal needs.

The facilitator introduced the goal of the test, explained the available materials, and answered questions about the test procedure. However, the facilitator tried to refrain from giving opinions, suggestions, or design advice about the participant’s interior. This was important as to avoid influencing the participant’s layout decisions. The facilitator was allowed to ask neutral clarification questions, such as why a participant places a module in a certain position or what problem they are trying to solve. These questions were used to understand the participant’s reasoning, not to steer the design direction.

To visualize the added value of the mock-up area, participants were asked to first create an initial layout using a paper template. This layout represented their initial understanding of the spatial problem before physically testing the interior. Afterwards, participants moved into the empty van and use the available modules to recreate, test, and adapt their layout at full scale.

Data was collected through observation notes, video recording during the physical mock-up phase, photographs of the created layouts, completed templates, and a short reflection-interview after the session. During the physical mock-up phase, participants were asked to think aloud. Notes were taken on how participants used the modules, where they hesitated, which layout changes they made, and what insights or spatial conflicts emerged. Photographs were taken of important intermediate layouts and of the final mock-up arrangement.

After the final layout, participants were asked to reflect on whether the mock-up helped them understand the space, make decisions, or discover problems they had not considered before. Questions the facilitator had for the reflection interview are found in section 4.3.5.

The results were analysed by comparing each participant’s initial paper layout with their final physical mock-up layout. The analysis focused on the changes between these layouts, the reasons for those changes, the insights participants gained during the mock-up phase, and the extent to which the modules were sufficient to represent their ideas. The results were also compared between participants with and without camper-building experience to identify whether the mock-up area supports these groups differently.

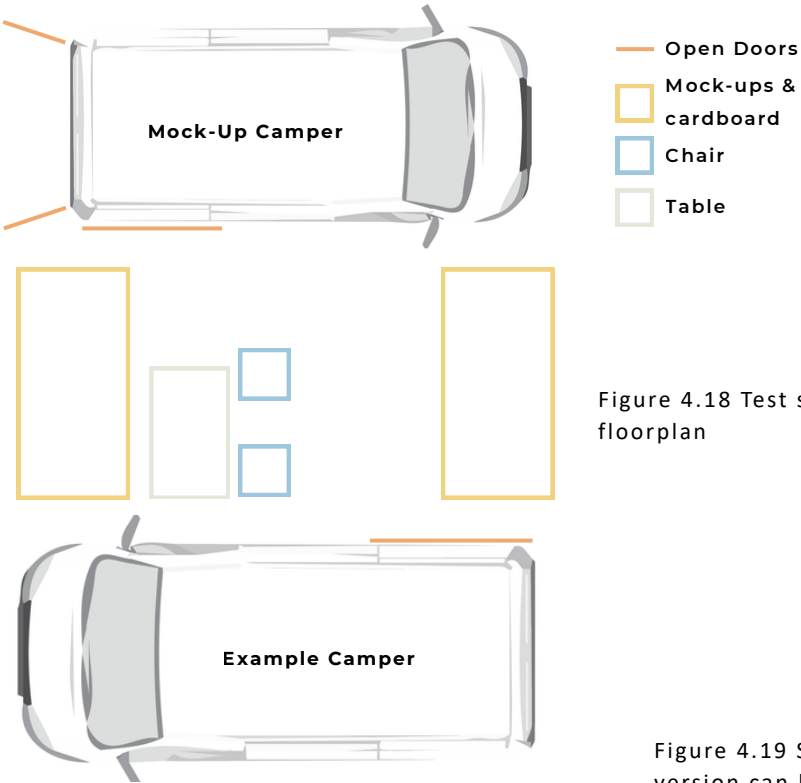


Figure 4.18 Test setup floorplan

Figure 4.19 Short overview of different phases of the test (extended version can be found in the appendix B)

PHASE	GOAL	ACTIVITIES	MEASURED RESULTS	REQUIREMENTS TESTED [short worded version of req.]
Introduction	Create shared understanding of the workshop and camper interior design challenge	• Introduction in campervan designing • Introduce goal of workshop • Show example campers / companies / results • Describe general flow of workshop & outcomes	• Goal of the workshop is clear • Know where to start	
Scoping	Translate personal travel habits into design criteria	• Define personal travel profile • Identify needs, wants and constraints • Define scope of the interior design • Explore available material	• Participant is able to note travel habits • Participant is able to differentiate needs and wants.	
First Interior Layout	Create a first spatial concept before testing it physically	• Design first camper layout (2D drawing) • Think of daily routines, and living habits • Recreate design in mock-up area • Simulate living habits and routines • Identify possible spatial conflicts	• Is able to translate needs & wants to a interior • Is able to translate examples to their own design.	2.The intervention must help users translate personal needs into concrete spatial decisions.
Mock-up testing	Experience the layout on fuil scale and discover issues / improvements	• Recreate design in mock-up area • Simulate living habits and routines • Observe what works and what feels difficult • Take photos / notes of test setup	• The tool is accessible in use. • Given modules are sufficient for designing an interior.	2.The intervention must help users translate personal needs into concrete spatial decisions. 4.The intervention must stimulate new insights through experimentation,
Itearte	Improve the design based on experience and trade-offs	• Adjust layout based on mock-up test • Try-out different layouts • Finalize design by drawing and filling in template	• New insights are obtained while using the tool. • Different layouts are compared, and outcome is used in final design.	3.The intervention must make the consequences of their decisions clear to the user. 4.The intervention should support iterative design.
Evaluate	Validate the design direction	• Present final concept • Explain design choices • Reflect on priorities and compromises • Fill in evaluation form about workshop	• User experience more confidence after using the mock-up tool. • User feels autonomous while using the design tool.	1.The intervention contributes to confidence of DIY-ers in their own layout 3.The intervention must be accessible and usable for novice DIY-ers.

4.3.4 Materials

For the test, several materials were provided.

Participants received paper templates for the scoping and design phases (see Appendix C). In addition, post-its, tape for marking or “drawing” inside the van, and drawing materials were available to support the layout exploration.

For the physical mock-up phase, a selection of interior modules was created. These modules were used as full-scale representations of common camper furniture elements, allowing participants to physically explore, combine, and adjust different layout options inside the van. The modules were not intended to function as finished camper furniture during the test. They were designed with the idea that similar modules could eventually be translated into prefab kits or adaptable building plans for DIY-ers who are satisfied with their workshop layout (see viability, section 4.2.2).

The modules were designed in CAD with relatively simple and adjustable dimensions, so that the same basic structure could potentially be adapted to different camper layouts in future iterations. The form language was kept neutral. This was done deliberately, so that the modules would function as spatial starting points rather than as finished style proposals. Moodboard for the form language is shown in figure 4.20. In this way, DIY-ers could imagine how the exterior, finish, or details could later be adapted to their own preferences.

The same height and depth were chosen for most modules because of the limited number of modules that could be produced within the available time and budget. This creates a limitation for users, as they have limited variability and therefore the modules have less chance to exactly support their envisioned layout. However, providing only a few modules with varying heights and depths would also introduce limitations, as such modules would not fit together well and would be less representative of how camper furniture is typically designed.

The following modules were made (see figure 4.21):

- 1 cabinet of 90 cm high, 60 cm wide, and 50 cm deep, including 3 drawers
- 1 cabinet of 90 × 40 × 50 cm, including 2 drawers
- 1 cabinet of 90 × 30 × 50 cm, including 3 drawers
- 1 cabinet of 90 × 20 × 50 cm, including 3 drawers
- 1 overhead cabinet of 30 × 40 × 40 cm
- 1 overhead cabinet of 40 × 40 × 40 cm
- 3 boxes of 50 × 50 × 50 cm, including 2 drawers
- 1 box of 100 × 50 × 50 cm
- 1 cabinet 90 x 60 x 50, which was not used as there were some problems during manufacturing.

The height of the modules was chosen because 90cm is commonly used as height of worktops. This height is also advised by ‘experienced’ DIY-ers (Bas, 2024). The depth of the cabinets are usually 60cm (Bas, 2024), and this is also used in my own van. However, because I wanted participants to have more space with the modules, I shortened it with 10cm. Participants could simulate deeper cabinets by leaving some space between the module and the wall of the vehicle. The width was varied between the modules. This way, the participants are able to create different resulting widths of cabinets by combining modules.

The rationale behind the chosen set of modules is that they provide a relatively simple yet coherent collection of building blocks. While the available sizes may not suit every user, I reasoned that, given the limited budget and time available, it was preferable to create a set of modules that fit together and enable users to design a coherent interior, rather than creating eight highly unique modules that are difficult to combine.



Figure 4.20 Moodboard for envisioned interior modules. Source: Pinterest. (n.d.). Pinterest. <https://nl.pinterest.com/>



Figure 4.21 Overview of all the modules made, numbers correspond with the cabinets described in the text



Figure 4.22 Author working together with Etienne assembling the overhead cabinet

Building the Modules

The modules were fabricated in the same workshop where I had previously converted my own campervan. Just as during my camper conversion, I was supported by Cyriel and Etienne, whose practical knowledge and willingness to help were highly valuable throughout the fabrication process. Their experience contributed not only to the speed of production, but also to the final quality of the modules.

During fabrication, several practical issues emerged that influenced the process and the final outcome. I initially intended to use plywood, as this is commonly used in campervan interiors. However, plywood was too expensive for this test setup, especially because the modules would only be used temporarily. Therefore, MDF was used instead. In a campervan context, MDF is generally discouraged because it absorbs moisture and can deform if not properly treated. Since the modules were only used for a short-term test in a controlled setting, this risk was considered acceptable. MDF also behaves relatively similarly to plywood during fabrication, making it useful for exploring whether the modules could later be produced with more suitable campervan materials.

The MDF panels were purchased at IDE and cut to size by the employees of PMB. The drawer walls were laser-cut at PMB, as these parts were less visible and laser cutting provided an efficient and accurate production method. For the front of the drawer, invisible connections were preferred because of aesthetic reasons. Most of these connections were made using biscuits, which are small wooden inserts placed between butt joints to increase the glue surface and improve resistance to shear forces. For the shelves, a router was used to create grooves in the side panels. The remaining connections were glued, and in some cases nails from a nail gun were added to keep parts in place while the glue was drying.

The main problems encountered during fabrication were related to the material properties of MDF. When routing grooves into larger panels, some panels started to bend. This likely happened because removing material from one side of the panel changed the balance of internal tension, reducing rigidity and making the panels less predictable to work with.

MDF also split more easily than expected, especially around edges, grooves, nails, and tight-fitting connections. Because MDF consists of fine wood fibres and resin pressed into panels (Brown, 2023), it is vulnerable to concentrated tensile or wedging forces. This was especially noticeable where little material remained around a joint. In several cases, split pieces had to be glued back together. Although this did not strongly influence the final result, it showed that MDF is less suitable for reusable mock-up modules.

Other issues were related to measurement accuracy and assembly. Although the modules looked relatively simple, small inaccuracies in cutting or routing affected the fit and movement of parts such as drawers. This showed that even basic mock-up modules require careful sequencing and accurate fabrication. For future versions, larger tolerances, simpler connections, and fewer precision-dependent parts would make the modules easier to produce and more reliable.

A final insight is that the modules should be prepared before the workshop takes place. Making them required material preparation, accurate cutting, routing, gluing, clamping, drying time, and problem-solving during assembly. If participants had to build these modules during the workshop itself, the session would become far too long and would no longer fit the requirement of developing and iterating on a layout within one day or approximately six hours. For that reason, the mock-up modules should be provided as prepared workshop material. This reduces the autonomy of the DIY-er during the workshop setup, but this is acceptable because the final camper interior can still be built, adapted, and finished according to the user's own preferences.

Overall, fabricating the modules produced three practical lessons:

- Material: MDF was heavy, insufficiently stiff in thin panels, and prone to splitting; plywood or a lightweight timber frame would be more suitable.
- Accuracy: Small cutting and assembly errors affected joints and drawers, requiring larger tolerances and simpler connections.
- Preparation: Modules should be manufactured and tested before the workshop, using robust construction that withstands transport, assembly, and repeated adjustment.



Figure 4.23 Glue on the lasercut blocks, later fixed together with the other wall of the drawer

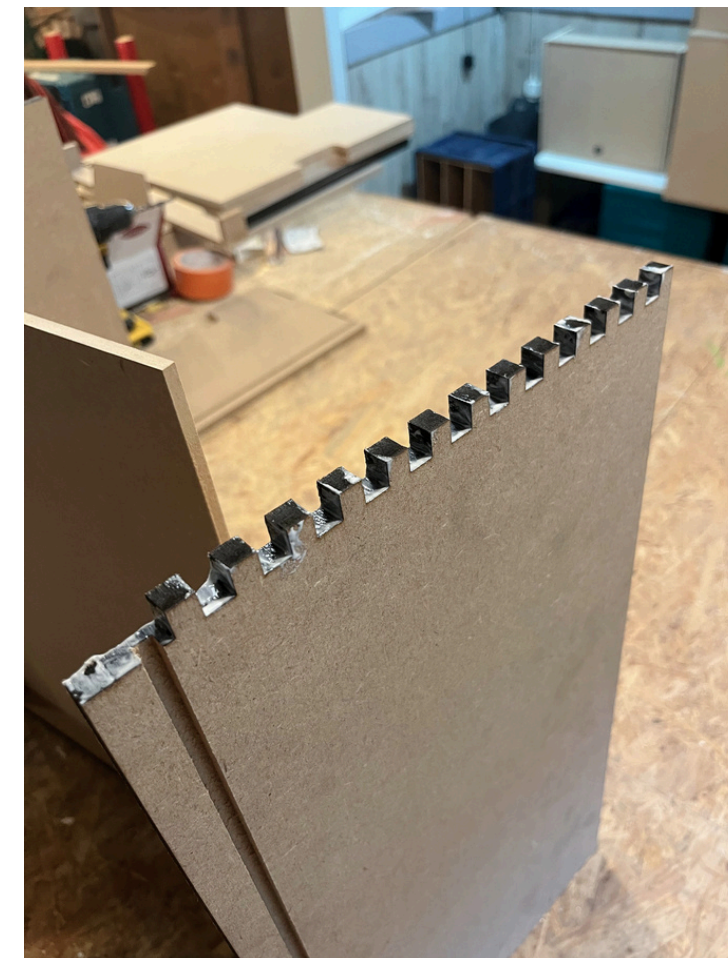


Figure 4.24 Usage of the biscuits by Cyriel, for invisible connection of the front of the drawer



Figure 4.25 Drawer fully assembled, left to dry with clamps

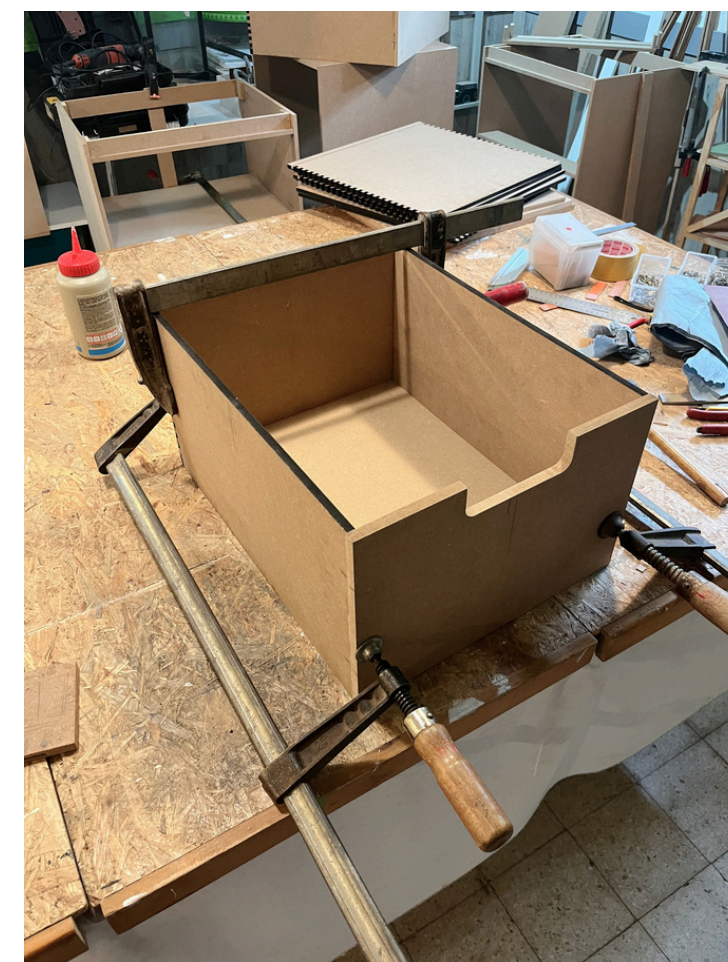


Figure 4.26 Placement of the front, fixed with biscuits and glue

4.3.5 Evaluation

For the evaluation phase, semi-structured interviews were conducted after each test session. The purpose of these interviews was to gain insight into how participants experienced the test, how the mock-up area influenced their design process, and whether it helped them reflect on their campervan layout decisions.

The interview questions were used as a guide rather than as a fixed script. This allowed the facilitator to ask follow-up questions when relevant, for example when an interesting observation emerged during the workshop. Some questions were also partly answered through observation during the test itself and therefore did not always need to be asked explicitly. The interview focused on the following guiding questions:

1. What is your experience with designing campervans?
2. What is your experience with campers or camping in general?
3. How did you experience working with the mock-up area and the test as a whole?
4. What stood out most to you during this test?
5. How would you describe your experience with the mock-up chamber?
6. In what way did the mock-up chamber influence the way you imagined your camper interior?
7. How was thinking about the layout on paper different from experiencing it in the mock-up chamber?
8. What became clearer by using the mock-up chamber?
9. What remained unclear after using the mock-up chamber?
10. Did your ideas for the camper layout change during or after using the mock-up chamber?
11. What new insights or questions did the mock-up chamber lead to?
12. How did the mock-up chamber affect your confidence in your layout decisions, if at all?
13. Which aspects of the mock-up chamber were useful, not useful, or difficult to use?
14. What would you change about the mock-up chamber for future participants?

Because of the nature of a semi-structured interview, these questions were not treated as fixed or mandatory. Instead, they provided a framework for reflection while leaving space to explore participant-specific experiences, unexpected comments, or observations made during the workshop.

Results from testing are analyzed by reviewing observation notes, think-aloud comments, and the semi-structured interview transcripts. Insights are grouped into recurring themes, organized around the the research questions. Each participant's initial paper layout was compared with their final mock-up layout to identify concrete changes, and the interviews were used to interpret the reasoning behind those changes.

Figure 4.27 Evaluation of mock-up area with participant 2



4.3.6 Results

All four participants were able to create a layout direction inside the empty van using the available modules. The mock-up area was generally experienced as enjoyable and engaging. Participants responded positively to physically placing modules in the van and indicated that this created a different design experience than working on paper alone. The full-scale setup made it possible to quickly visualise a possible camper interior and imagine how it could be used in practice.

Decision-making support

The mock-up area appeared to help participants make decisions in different ways depending on how far along their thinking already was, and on how directly that thinking applied to the test's own van. The owner of the van, participant 4, already has made an existing SolidWorks design of their planned build. He used the mock-up area to catch a specific, concrete conflict: while testing the layout physically they realised their swivel table could collide with the kitchen counter. This was not apparent in the digital model, and lead to him reconsidering the table's placement or mechanism in their actual project. He also experimented with two different layouts, to confirm his previous made assumptions. He experimented with two different beds: a self-made side-seating group (treinzit in Dutch), and a bench convertible in a bed.

Participant 2 has built a campervan before, but that vehicle is larger and has a different interior than the smaller test van used in this session, so P2 was designing a fresh layout for an unfamiliar vehicle rather than continuing their own project. Even so, physically standing in the space led them to remove swivel chairs from the plan and to decide the kitchen counter should run further along the wall than originally sketched.

For participant 1 and 3, who had not thought through a camper layout before, the mock-up phase surfaced a more fundamental decision-making gap: both needed to first decide what they would actually use the camper for and what legal or practical requirements they were already obligated to include (RDW / Belastingdienst requirements, referenced in 4.3.3).

Participant 1 proposed during the evaluation phase that a predefined list of standard options (e.g. gas vs. electric cooking, swivel seats vs. fixed benches) would have made this decision-making easier, since they found it hard to judge, in the moment, what was a fixed requirement versus a free design choice.

Changes & Insights

All four participants described the physical mock-up phase as producing insights that had not surfaced on paper. Participant 1 described feeling "lost" while working on paper, having no prior mental model to draw on. By walking through the empty van let them think through a concrete use case (arriving wet after swimming, wanting to enter from the back for a full overview of the space before showering) and directly test whether that sequence of actions made sense. They described the physical process as faster and more visual than sketching, and said ideas arose more naturally while physically moving modules around than while erasing and redrawing on paper.

Participant 4 reported that the van felt noticeably larger in person (1.4 x 2 m) than expected from the digital model, and that the kitchen module's height matched their plan well, while its depth differed slightly (slightly too deep). They noted being able to quickly move modules to test alternatives, and were able to be convinced on decisive bed placement as a result.

Participant 2 made two concrete changes as a result of the physical test: removing the swivel chairs from the design, and repositioning the kitchen counter to run further along than the vague placement sketched on paper. He became noticeably more precise about the exact distance required once physically confronted with the space. Their prior camper conversion experience appeared to inform how quickly and confidently they made these calls, rather than being carried over as a specific design.

Participant 3 did not report a specific layout change, but described the main value as an intuitive, full-body sense of whether the layout "felt" logical. If a space is cramped or comfortable was hard to judge from paper alone: a walking path felt tight only once physically walking it.

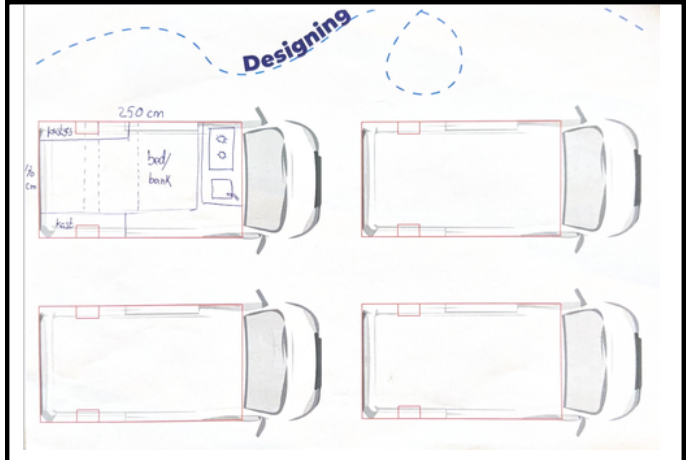
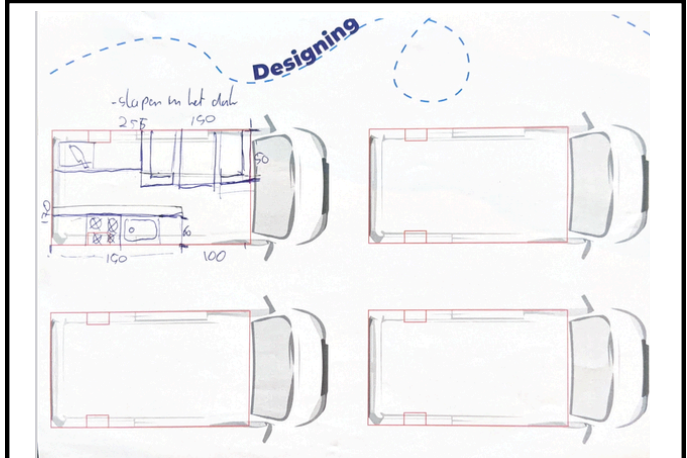
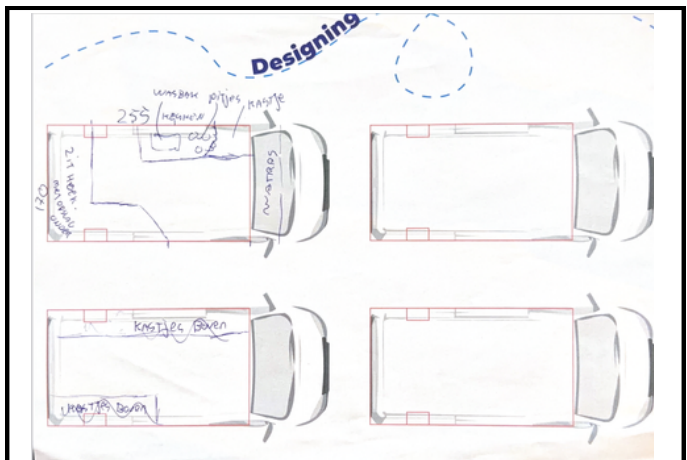
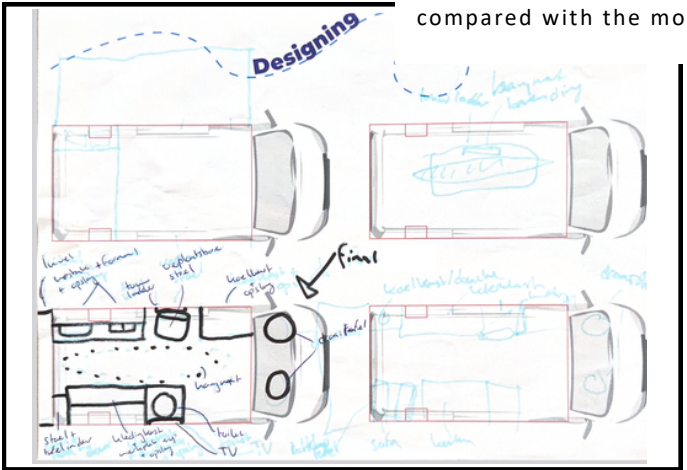


Figure 4.28 Sketched interiors compared with the mock-up interior

Participant 1
No previous experience with camper building

Participant 2
Previous experience with camper building (other camper)

Participant 3
No previous experience with camper building

Participant 4
Previous experience with camper building & owner of van used during test (during mock-up his girlfriend helped)

Figure 4.29
Modules sitting on
top of wheel
arches, supported
by a drawer



Figure 4.30 Participant 3 sliding in modules to recreate his 2D design



Sufficiency of Modules

Participants generally found the module set usable but repeatedly flagged its fixed dimensions as a constraint. Participant 1 wanted to create his mock-up interior by placing adjustable "walls", rather than being limited to the fixed footprint of the available modules. Participant 2 wanted smaller, finer modules for compact storage in addition to the larger modules. He also suggested adding accessories such as pans and cookware to support more precise mental visualisation of the kitchen area. Participant 3 identified the wheel arches as a specific, recurring obstacle that the current modules did not handle well. He suggested either modules shaped to fit around or on top of the wheel arch, or reframing the modules entirely as generic, labelled building blocks (e.g. a sticky note reading "this is the fridge") rather than furniture-shaped objects. He argued that the functional label mattered more to their reasoning than the module's literal shape.

Participant 4 found the modules largely sufficient. The 90 cm-high kitchen modules and the block modules used for the bed base were specifically mentioned as useful. He did note that gas, water, and electrical installations were not represented at all, and suggested standard-sized accessory modules (battery, water tank, gas bottle, sink, fridge) to be available. These could even be cardboard cut to the real dimensions of specific products, so that participants could plan around real fixtures found online. Accessories such as magnetic windows were also proposed to simulate permanent changes in a mock-up. Participant 4 also emphasised that small dimensional differences of around 5 cm meaningfully affect real usability. This could make a difference in whether one can lie fully stretched out in bed or not.

Participants 1 and 3 independently proposed scaling up the module set considerably (from roughly 10 to 50–100 variants). Another option they proposed was moving toward more generic building-block modules, to reduce the felt constraint of the current fixed set.

Difference in Experience Levels

The participants were split as described in the test setup (see section 4.3.3): Participant 1 and 3 had no prior camper-design or camping experience, while Participant 2 and 4 have some experience in DIY camper conversion.

The two novice participants (P1, P3) used the mock-up primarily to build a first sense of scale, sequence, and requirements. Both struggled initially why they would want a camper in the first place and what they would need it for. This was something they said they had never actively considered before.

The two experienced participants used the mock-up quite differently from each other. This appears to depend less on experience level itself and more on whether the test van related to their own project. Participant 4 used the session to validate and refine his existing design, made previously in SolidWorks. Participant 2 has also built a campervan before, but the van used during this test is smaller and has a different interior than his own vehicle. So despite his experience, was still effectively designing from scratch for this session in a van unrelated to his real build. Participant 2 still made confident, specific decisions (removing swivel chairs, repositioning the kitchen), and did so noticeably faster than the novice participants. This suggests their prior building experience transferred as general design fluency even though the specific layout produced did not carry over to their own project.

This suggests prior experience shaped how confidently and quickly participants worked, but only produced directly transferable outcomes (a validated real-world design decision) when the test van itself resembled the participant's own vehicle. Both participant 1 and 3 suggested that the value of the mock-up depends heavily on already having some idea of what one wants from a van in general. Participant 1 explicitly described feeling directionless on paper without such a starting point. Participant 3 wondered aloud whether a workshop like this adds more value than simply visiting a number of existing camper conversions, unless the user already has a fairly specific idea to test against.



Figure 4.31 Participant 4 filming his mock-up interior during testing to discuss with others

4.3.7 Discussion

This discussion interprets the test findings in relation to the research sub-questions and the further development of the MaakPlaats concept. The aim is not to validate the concept as a finished intervention, but to understand what the prototype revealed about full-scale spatial testing, the role of previous experience, and the limitations of the current module set. Since the test was exploratory and involved a small number of participants, the findings should be read as design insights rather than generalizable conclusions.

How does previous experience with camper building influence the way participants use the mock-up area? As shown in previous section, experience mattered less for whether participants engaged confidently with the task, and more for what kind of outcome the session produced. Both novice participants used the mock-up mainly to explore and to discover requirements and use cases they had not previously considered. While the more experienced participants had more general design fluency. They were more confident and had fast decision-making. This indicates that prior experience helps participants use the mock-up more efficiently, but that experience alone does not determine the value of the session. The transferability of the outcome also depends on whether the mock-up setup resembles the participant's own vehicle and project context. For the MaakPlaats concept, this means that the workshop should either offer multiple van setups or include a way to translate the tested layout back to the participant's own vehicle dimensions.

To what extent does physically placing and moving the modules lead to changes, new insights, or increased confidence compared to the initial paper layout? All four participants reported insights that emerged specifically from the physical phase and not from paper. Scale of the area could be better judged, collision issues from modules too close to each other were identified, and a better understanding of habits and needs could be defined. This is consistent with the intended value of full-scale physical prototyping: problems of proportion, sightline, and movement are easier to notice by inhabiting a space than by imagining or modelling it. However, the evidence for



Figure 4.32 Participant 1 creating his 2D design



Figure 4.33 Resulting mock-up of 2D design above

increased confidence is less direct. Participants were not asked to rate their confidence before and after the mock-up phase in a comparable way. Therefore, the test can support the claim that the mock-up produced concrete new insights and layout changes, but it cannot strongly demonstrate confidence increase as a separate measurable outcome.

To what extent are the available set of modules sufficient for participants to represent and explore their intended camper interior? The module set was usable for all four participants, but every participant mentioned at least one specific limitation tied the design (section 4.3.6). Participant 1 felt too constrained by the dimensions of the modules, and wanted more adjustability. Participant 2 wanted smaller, finer modules in addition to the larger modules. Participant 3 identified the wheel arches as a specific, recurring obstacle that the current modules did not handle well. Participant 4 noted that technical systems were not represented at all. These results suggests it is not an isolated preference but a structural constraint of the current set. At the same time, no participant reported being unable to represent their layout at all. The test indicates that realism is not only created by the size of the modules, but by how they can be used. All participants simulated their routines in the van with the modules, and reflected on how it helped during the designing. The cardboard boxes provided as alterable modules were not sufficient for this purpose. Therefore, future versions should focus on making flexible modules stable and physically believable enough for use scenarios, rather than only visually representative. Additionally, for the next iteration dedicated accessories for technical systems (battery, water tank, fridge) could be provided as a visual cue.

The findings show that the mock-up area has potential as a design support method, but that it should be developed as more than a collection of physical blocks. More emphasis has to be made on helping users creating and exploring different interiors, which also complies with rules from the Belastingdienst and RDW. In this form, the concept could support both exploration and verification: beginners can use it to discover possibilities and understand space, while more experienced DIY-ers can use it to test and refine specific layout decisions.

4.3.8 Conclusion

The test aimed to answer the following research question: *To what extent does a full-scale mock-up area support the decision-making and design process of creating a camper interior?*

Based on the four test sessions, the full-scale mock-up area appears to support the camper layout design process mainly by making spatial decisions experienceable. Compared to the initial paper layouts, the physical setup helped participants notice issues related to scale, movement, reachability, proximity, and the sequence of use. These insights did not emerge in the same way during the sketching phase.

The test therefore supports the value of the mock-up as an in-session design aid. It helps users move from abstract layout thinking toward an embodied design: instead of only looking at a layout, participants could walk through it, sit in it, reach across it, and imagine everyday routines. This is especially relevant in campervan interiors, where small spatial differences can strongly affect comfort, movement, and usability.

However, the test also shows that the mock-up area supports different users in different ways. Participants without previous camper-design experience used the setup mainly to explore, discover requirements, and develop a first understanding of how they might use a camper. For these users, the mock-up was valuable, but not sufficient on its own. They still needed support in defining their needs, understanding which choices were fixed requirements, and judging which options were relevant. Participants with more experience used the mock-up more efficiently, but the transferability of the outcome depended strongly on whether the test van resembled their own project. Participant 4, who is currently converting that specific van, could directly feed the insight back into their real design.

Reviewed against the design requirements, the mock-up area partially supports the translation of personal needs into spatial decisions. It clearly helped participants translate needs into layout choices once those needs were identified, but for novice users the discovery of their needs need more structure. The requirement to stimulate new insights through experimentation was supported, as all participants

reported at least one insight from the physical phase. The mock-up also helped make consequences of design decisions clearer, especially around scale, proximity, collisions, and movement. Iteration was only partially supported: the setup made iteration possible, but most participants did not systematically compare multiple alternatives unless they had a strong personal reason to do so. Finally, confidence was not measured directly before and after the session, so the test cannot conclusively show an increase in confidence, even though participants generally engaged positively with the mock-up.

The available module set can be considered a workable first iteration, but it also revealed clear limitations. Participants were able to explore a layout, yet the fixed dimensions and limited variety of the modules reduced precision, especially around wheel arches, small storage needs, and technical systems. Future versions should therefore include a larger or more generic module library, adjustable or labelled building blocks, and dedicated modules for technical components such as batteries, water tanks, gas bottles, and sinks.

Overall, the test does not demonstrate that the MaakPlaats leads to better final camper layouts, nor does it fully validate the concept as a finished intervention. Instead, it shows that full-scale spatial testing has clear potential as part of a broader design support method. The next iteration of the MaakPlaats should therefore keep the physical mock-up phase, but strengthen it with clearer scaffolding for novice users. This way, the MaakPlaats could better support DIY-ers in moving from abstract ideas toward more informed, personal, and spatially tested layout decisions.



Figure 4.34 Participant 3 simulating cooking in mock-up area



Figure 4.35 Author sitting in mock-up area

4.3.9 Limitations

Several limitations should be considered when interpreting the results of this test.

The test involved four sessions with five participants in total, recruited from within TU Delft. The primary participants were split as intended between two novice and two experienced participants. Participant 4's session was the couple session: their partner took part in the design phase and provided feedback, but was not present during the sketching phase or the reflection interview, which was conducted with Participant 4 alone. This means that the couple's joint experience of using the mock-up area was not fully captured. Combined with the small sample size, the gender balance, and the single-university recruitment pool, the findings are not generalizable to the wider DIY camper-building population.

All participants completed the paper layout phase before the mock-up phase, in a fixed order. Participant 4 formed a partial exception, as they arrived with a pre-existing design rather than starting purely from paper during the session. This means that changes observed after the mock-up phase cannot be fully separated from the effect of spending more time with the design task. No control condition, such as a second paper-only iteration, was used to isolate the added value of physical prototyping.

The sessions were facilitated by the researcher, who was also the designer of the MaakPlaats concept and the modules being tested. While the facilitator protocol was designed to avoid steering participants, several transcripts show that the facilitator explained parts of the underlying design rationale, such as the interior-out build logic, in response to participant questions. Although this was a reasonable response to genuine confusion, it means that participants' later reflections were not entirely independent from the facilitator's own framing of the concept.

As described in Section 4.3.4 and repeatedly confirmed in the interviews, the modules had uniform and limited dimensions. This influenced what participants could represent during the test. Where participants improvised around these constraints, their final

mock-up layouts may reflect the available modules as much as their actual design intentions. This should be kept in mind when treating the final mock-up layouts as representations of participants' true preferences.

Confidence and insight were captured only through post-session reflection interviews and think-aloud comments. No standardized measurement was taken before and after the paper and mock-up phases. As a result, the test can support that concrete changes and insights occurred, but it cannot demonstrate a measured increase in confidence. It only shows participants' retrospectively reported experience of the mock-up phase.

Each session lasted approximately 60–90 minutes and covered only the early layout phase. Technical systems, such as electricity, water, and gas, were explicitly mentioned by Participant 4 as elements that were not represented by the current modules. This means that the test does not evaluate how well the method supports later and more technical stages of camper design. The limited duration of the sessions also restricted how far the camper interior could be developed.

Figure 4.36
Participant 2
simulating how a
bench is going to
function as
storage



4.4 Iterating

4.4.1 Introduction

This iteration focuses on improving the chosen concept based on the outcomes of the test. Within this project, one major iteration was made. However, throughout the ideation and concept refinement phases, several smaller iterations naturally took place.

The changes described in this section relate only to the mock-up area, since the other parts of the MaakPlaats workshop were not included in the test. The test showed that full-scale prototyping supported spatial understanding and led to concrete new insights for every participant. It also revealed limitations in the workshop structure, the adaptability of the modules, and the transferability of the resulting layouts to a user's own van (see section 4.3.6). Given the small and TU Delft-recruited sample, these findings are treated as directional input for this iteration rather than as generalizable conclusions (see 4.3.9).

4.4.2 Changes after testing

The first major change concerns where the mock-up process takes place. The original concept proposed workshop vans fitted with a rail system onto which modules could be attached. However, the results of the test (section 4.3.6) showed that the relevance of the outcome depends partly on how closely the mock-up environment resembles the user's own vehicle. For this reason, DIY-ers should be able to bring their own empty or partly converted van and create the mock-up directly inside it (req. 8). The modules should therefore no longer depend on a permanently installed rail system, but freestanding or secured through temporary and non-damaging connections. For users who do not yet own a van, several standard vehicle sizes could still be provided for initial exploration. These could be based on the three different panel van sizes described in section 1.1.

The second major change concerns the function of the modules. In the original concept, the modules could potentially be translated into prefabricated kits for the final camper interior. After testing, the focus shifts more clearly toward their role as temporary

prototyping tools. Their main purpose is to help users explore dimensions, relationships, movement, and possible routines before committing to a final construction. The modules should therefore become more adaptable: adjustable widths, heights, depths, worktops, and wall elements (req 7). This way, layouts can be represented in a more accurate way, without needing a separate module for every possible dimension. This added adaptability should not come at the cost of physical usability. The test showed that part of the modules' value came specifically from being able to physically interact with them, and this remains an important requirement going forward (req 6).

The third major change concerns the range of options represented within the mock-up area. Participants indicated that they did not always know what is possible in a camper interior. The workshop should therefore include a 'library' of common layout and furniture solutions. In the case of beds, it could include lengthwise beds, convertible dinettes, fixed beds, etc.. These examples should not prescribe a preferred solution. Instead, they should help users understand the available possibilities and how they could be represented using the mock-up modules (req. 9).

The same library should include simplified representations of technical systems and accessories. Participant 4 noted that gas, water, and electrical installations were not represented in the tested module set. Future versions should therefore include realistically sized modules for components such as batteries, water tanks, gas bottles, sinks, refrigerators, and electrical equipment. One working example of a system could be displayed alongside several lightweight placeholders representing different product sizes (req. 12).

Finally, the fourth major change concerns the structure of the workshop itself. The mock-up area should more actively encourage comparison and iteration. Although the modules could be moved during the test, participants did not always explore several alternatives systematically. Future iterations of the workshop should therefore more actively prompt comparison and iteration. This can be done by giving users specific scenarios and asking them to build and compare at least two layouts against each other within their chosen van or mock-up interior.

4.4.3 Requirements

All these changes are reflected in the requirements. They've been updated to fit the new envisioned concept. New requirements are underscored, and old ones can be rephrased to fit this specific concept better.

Must haves:

1. The intervention must contribute to DIY-ers experiencing more overview and confidence in their own layout decisions after use than they would without the intervention. (Theme 3, 4)
2. The intervention must help users translate personal needs, lifestyle, and priorities into concrete spatial decisions. (Theme 1, 2, 5)
3. The intervention must be accessible and usable for advanced beginner DIY camper builders according to Dreyfus' scale of competence. (Theme 1, 3, 4, 8)
4. The intervention must stimulate new insights through experimentation, comparison, or feedback. (Theme 5, 6 & 7)
5. The cost of the intervention must not exceed 200 euros per DIY-er. (Theme 1, 8)
6. The mock-up modules must allow users to safely simulate relevant use scenarios within their intended interior (cooking, sleeping, showering, and accessing storage).
7. The dimensions of the mock-up modules must be adjustable and representable with an accuracy of 1 cm.
8. The intervention must be usable in any medium or large sized panel van, without making permanent changes to the van.
9. The intervention should let users see what the options are in the van, and how to accurately represent them (interior modules for sleeping, seating, eating or working, food preparation, storage).

Should haves:

10. The intervention should enable users to develop and iterate on a complete layout concept within approximately one day (or a workshop of up to six hours), assuming the user's requirements are already known. (Theme 8)
11. The intervention should enable useful exchange of experiences and feedback between DIY-ers. (Theme 4, 6)
12. The intervention should include simplified, realistically sized representations of technical components. These are batteries, water tanks, gas bottles, refrigerators, and sinks. These modules should help users understand their spatial implications before installation.

Could haves:

13. The intervention could communicate required time, skills, and resources connected to design choices. (Theme 6, 8)
14. The intervention could encourage users to create, test, and compare at least two alternative layouts before selecting a preferred design direction.

4.4.4 Module Exploration

Following the requirement for more adaptable modules (req. 7), I first explored how the mock-up material itself could be made more transformable, starting from sketches of possible construction approaches.

First, materials were selected to resemble what the final interior of most DIY-ers were going to look, as this is most helpful to them. Plastics are heavy, with the lightest suitable plates weighing about twice as much as multiplex (Plastics, 2026). Lighter materials, such as cardboard, XPS, or styrofoam plates weren't suitable as they were not structurally sound enough to simulate real use. At last, sandwich panels are often used in camper interiors, but this is too expensive to be making temporary modules with (HCU-BV, 2025): most alternatives are not cheap, not structurally sound enough to simulate real use (sitting, leaning, repeated handling), and not easily adjustable. Since most final camper interiors are themselves built largely from plywood (Jansen, 2025), prototyping in the same material also keeps the mock-up experience realistic, giving users a genuine sense of the weight, rigidity, and feel of their eventual build.

An early direction explored an adjustable frame, onto which panels or surfaces could be attached at different positions to represent different dimensions. This direction was rejected, because an adjustable frame would get in the way of inserting components from more technical systems. Components such as fridges would be harder to insert because the frame itself occupies the space those components would need to slide into. This conflicts directly with the requirement to represent technical and accessory systems within the mock-up area (req. 12).

Based on these considerations, two distinct directions were developed further:

- Fully adjustable cabinets: single modules whose internal dimensions (such as width, height, or shelf position) can be adjusted directly, allowing one module to represent several possible variants of the same function.
- Mounted-rail panel system: rather than resizing a complete cabinet, this concept creates temporary furniture volumes from separate vertical panels. The panels attach to a rail mounted within the mock-up area, which stabilises them without requiring a surrounding frame. The distance between two panels determines the width of the volume, while interchangeable panel heights allow different heights to be represented. Shelves, worktops, or technical components can subsequently be positioned between the panels. Panels can be moved, added, or removed without rebuilding the complete unit. This offers greater dimensional freedom and keeps the internal space accessible, but makes the system dependent on the mounted rail.

These two concepts were deliberately chosen to be distinct from one another, rather than variations on a single approach. Each addresses the adaptability requirement (req. 7) through a different mechanism. This means, once developed and tested further, their individual strengths could potentially be combined into a single, stronger final concept rather than committing early to one direction.

With both designs, the height and depth is changed by using different sized panels. The envisioned designs have a selection of different sized panels with intervals of around 10 cm, with finer adjustments being done by using add-on feet.

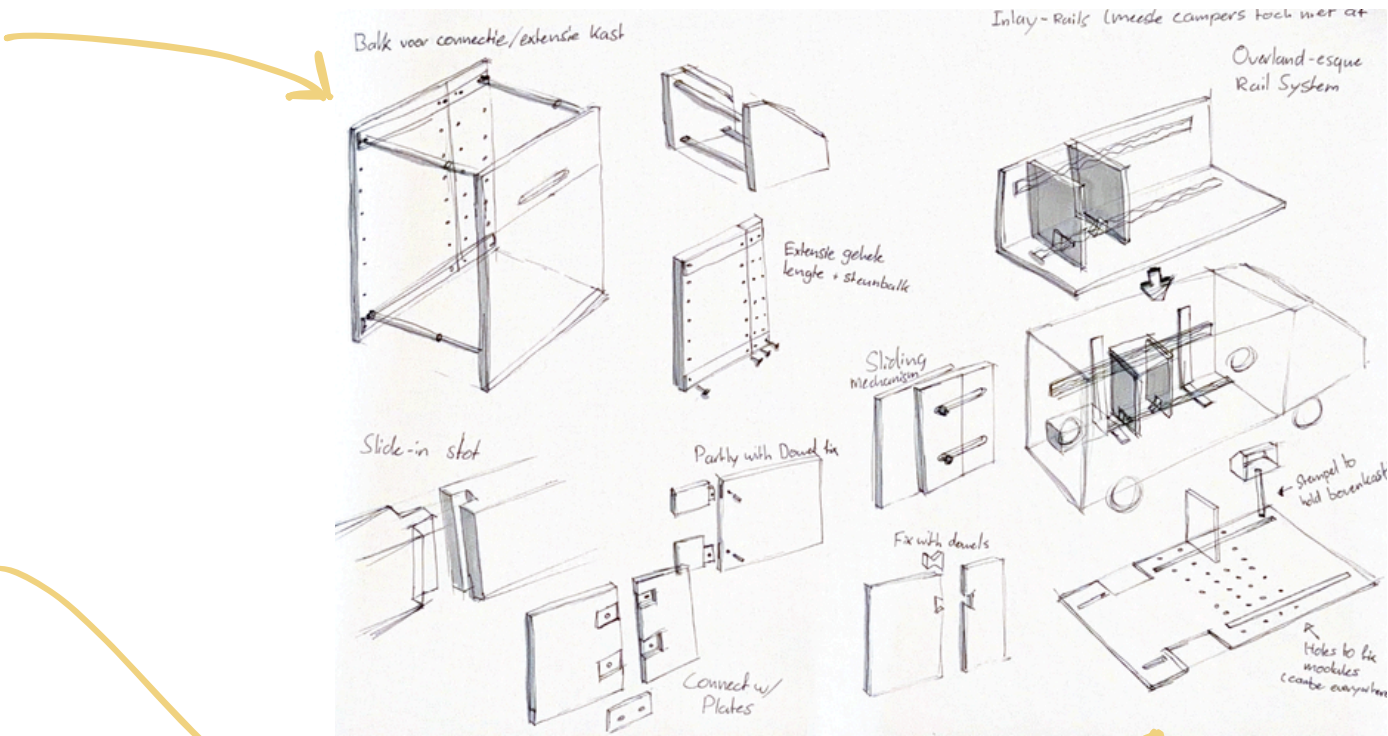
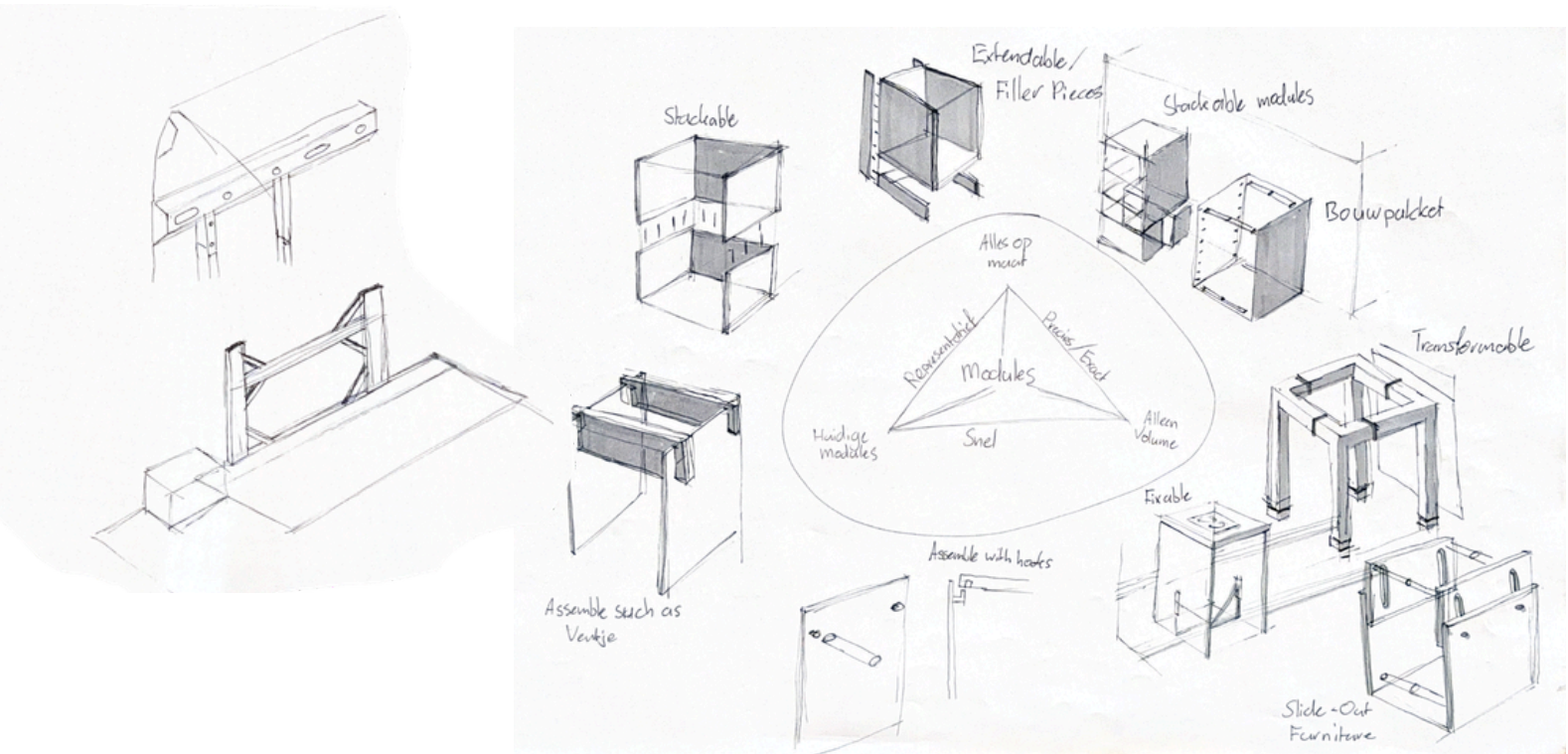


Figure 4.37 Sketches made during module exploration



4.4.5 Module Selection

To get a better overview of the three directions explored in 4.4.4, I recreated them as scaled 3D-printed models. Translating each idea from a sketch into a physical object forced a more concrete evaluation than sketching alone allowed: it surfaced practical questions that hadn't been visible on paper, such as how connection points would actually behave under load, and how many discrete pieces would be needed to represent a reasonable range of camper dimensions (req. 7). Each direction was evaluated on the same three criteria: how easily it could be adjusted to different dimensions, how structurally robust the resulting connections were, and how many distinct layout possibilities a limited set of physical pieces could realistically cover.

The rail-based system was rejected at this stage. In this direction, wall panels were mounted onto a shared rail, with each panel cantilevered outward from its connection point. Scaled testing showed that this created significant torsion at the point where each panel connected to the rail. The further a panel extended from the wall, the more force was placed on that single connection, making the joint prone to flexing or failing. When scaled up, this torsion problem gets worse as the bending moment gets increased by the bigger size of the panels. This could, in principle, be solved by adding extra connecting pieces between panels to distribute the load. However, doing so would mean each panel could increasingly stand and stabilize on its own, which would make the rail itself largely redundant. At that point, the design would effectively converge into the fully adjustable cabinets direction rather than remaining a distinct concept.

Based on this, the fully adjustable cabinets direction was carried forward. Because each module is self-contained and free-standing rather than dependent on a shared rail, it avoids the torsion problem entirely while still meeting the adjustability requirement (req. 7) and the earlier requirement that modules remain freestanding rather than dependent on permanent fixtures (req. 8).

Figure 4.39 3D-printed module of adjustable cabinet with sink on top

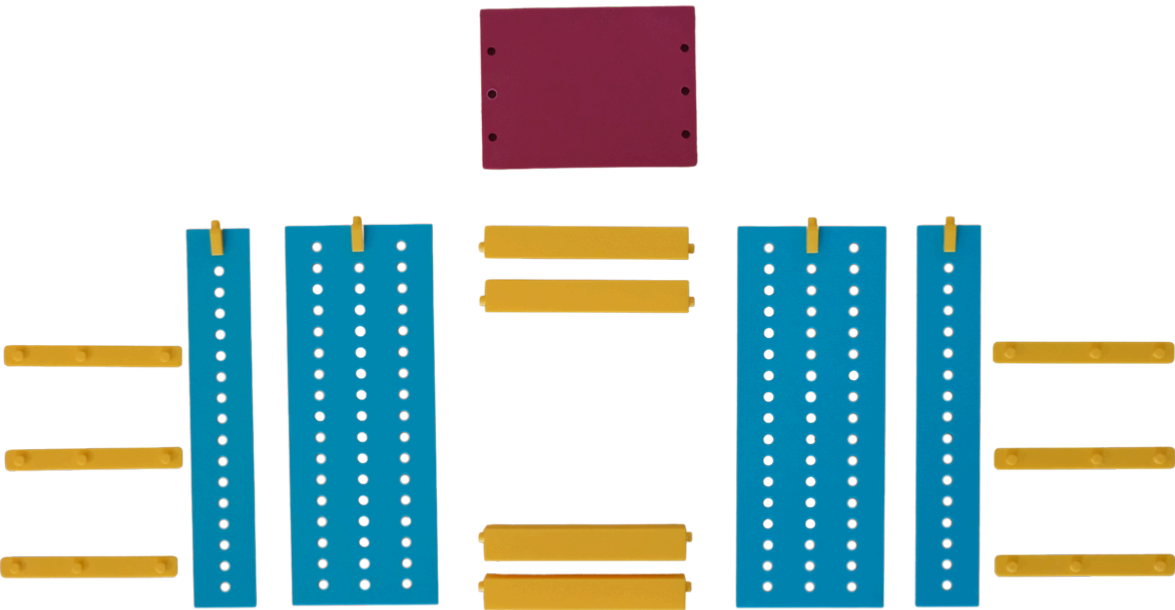


Figure 4.38 3D-printed module of rail-based system



Figure 4.40 Constructed 3D-printed module of adjustable cabinet

Figure 4.41 Overview of parts of 3D-printed module of adjustable cabinet



4.4.6 Module Testing

To determine whether the proposed module system would function as intended, a full-scale prototype was developed and tested. Before construction, further ideation was carried out to define the module's dimensions, adjustability, and structural requirements.

Telescopic tubes were selected to determine the width of the modules. These allow the width to be adjusted precisely to the needs of each DIY-er while providing sufficient structural stability to simulate activities and travel routines. Curtain rods were modified to be used as telescopic tubes. The rods were shortened, and custom end caps were 3D-printed so they could be bolted to the plywood walls. Threaded inserts were installed in the end caps to create secure bolted connections (see figure 4.43). The approximate height and depth of each module are created by combining plywood panels of different dimensions. More precise height adjustments can be made by attaching feet of different sizes underneath the module.

The prototype was constructed from 12 mm plywood. Each side wall consisted of three separate panels measuring 500 × 350 mm, 300 × 350 mm, and 200 × 350 mm. The panels contained 10 mm holes arranged at 50 mm intervals, with the outer holes positioned at least 50 mm from the edges. Threaded inserts were installed where bolted connections were required. M6 bolts, nuts, and washers were used as the standard hardware throughout. At 12 mm thickness, M6 keeps the hole small enough to leave sufficient material around each connection while still providing adequate clamping force, and is quick to align and tighten by hand (req. 10). Washers were added to spread the clamping force across a wider area of the panel face, reducing local crushing of the plywood so the same holes would remain usable after repeated cycles.

For horizontal panels intended for sitting or lying, additional support was required when the unsupported span reached 400 mm or more (see figure 4.44). This conservative design rule accounts for the panel perforations, material variation, repeated assembly, and movement during use (see appendix D for calculations).

The panel dimensions were partly determined by the

manufacturing method. Laser cutting was selected to produce an accurate and evenly spaced hole pattern. The available laser cutter had a maximum working area of 1,200 × 700 mm. The depth was set to 500 mm to retain a clearly rectangular cabinet proportion while allowing two elements to fit within one cutting layout. Larger panels would have required additional sections and cutting operations, increasing material and production costs.

The original design proposed aluminium connection plates because these were expected to keep the panel connections rigid. However, I could not obtain suitable aluminium plates within the available time. Acrylic plates with the same shape were therefore used in the prototype. This allowed the connection principle and assembly process to be tested.

The 50 mm hole spacing represented a compromise between adjustability and stiffness. A smaller interval would remove more material and potentially weaken the 12 mm plywood, whereas a larger interval would restrict adjustments to relatively coarse steps. Maintaining at least 50 mm between the holes and panel edges was intended to reduce the risk of splitting.

Dividing each side wall into three panels limited the size of the individual elements while allowing the module to be configured around fixed vehicle features. Based on the vans and reference examples examined during development, wheel arches were estimated to be approximately 300–350 mm high. The shared 350 mm panel dimension was selected to accommodate the upper end of this range. One of two lower panels could be removed around obstacles while the remaining panels continued to support the module.

Two different sizes of feet were 3D-printed to test the height-adjustment principle. Additional adjustable holders were printed to support optional horizontal shelves or surfaces (see figure 4.43). Because these holders can slide along the telescopic tubes, the inserted board does not need to match the exact width of the module. Although this may result in a small gap between the board and the side walls, it was assumed that this level of precision would be sufficient for simulating the spatial dimensions and intended use of the furniture.

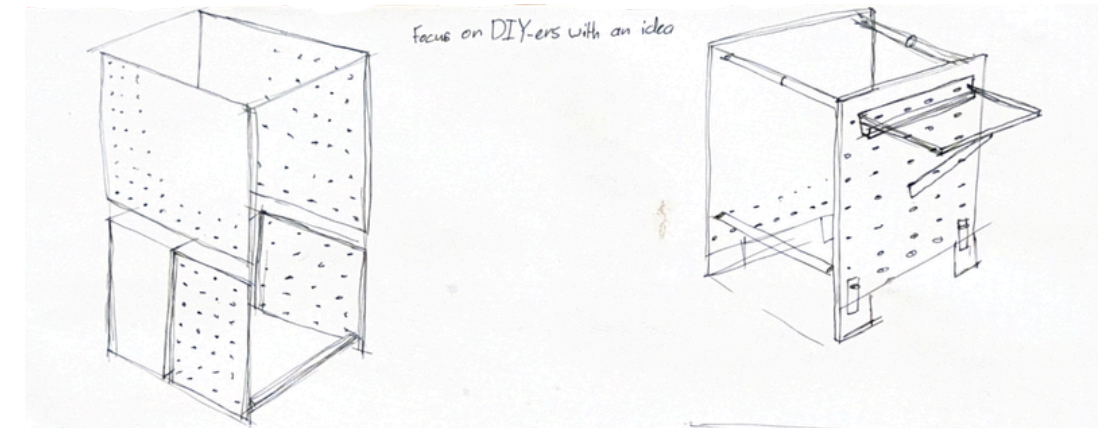


Figure 4.42 Further development sketch of adjustable cabinet

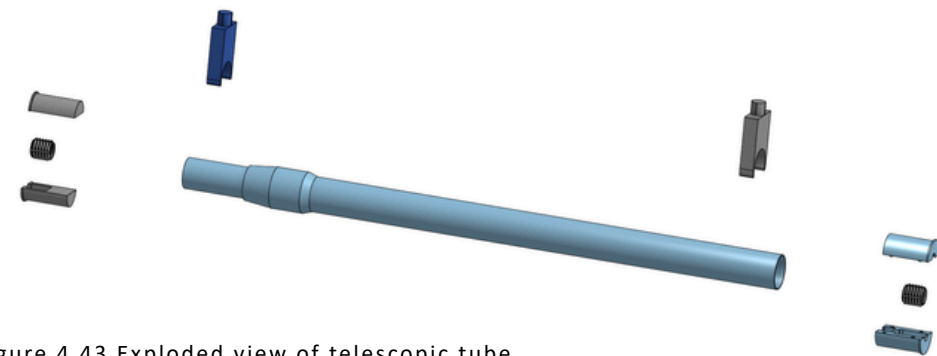


Figure 4.43 Exploded view of telescopic tube

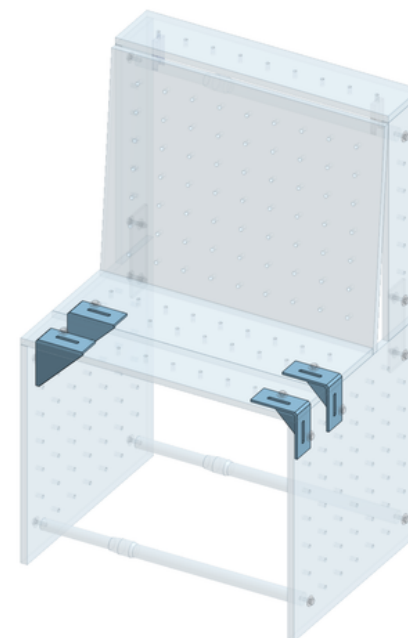


Figure 4.44 Supporting brackets for seating

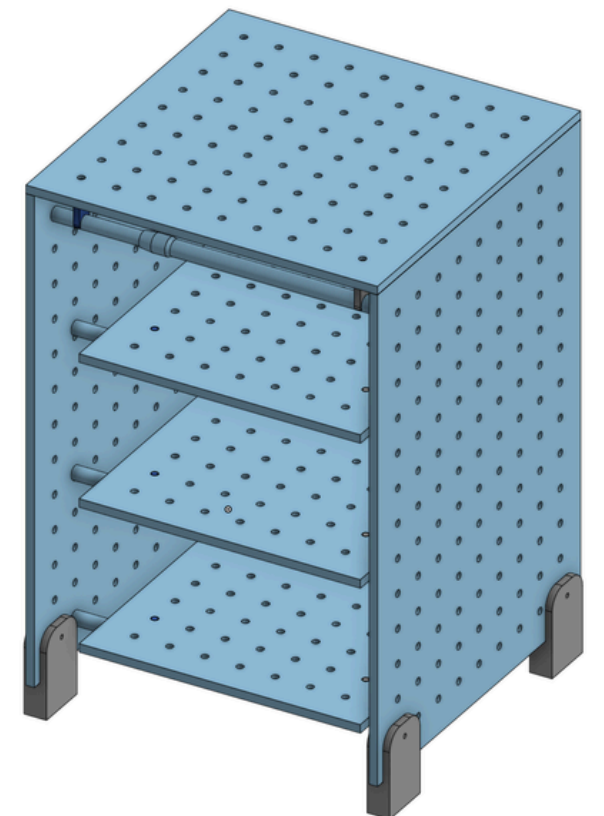


Figure 4.45 1:1 CAD model of adjustable cabinet

To assess whether the module structure was suitable for use in the mock-up area, an informal test was conducted with three participants: a 24-year-old woman, a 24-year-old man, and a man aged over 65. The test examined whether the module-related requirements established earlier were met.

For this exploratory test, the module structure was considered provisionally suitable when:

- Assembly and adaptability: each participant could assemble the reference configuration and adjust at least one principal dimension individually (req. 3 and 7).
- Structural robustness: the module remained stable during assembly, repositioning, and the simulation of routines, without connection failure, permanent damage, or deformation that interfered with its use (req. 4).
- Configuration range: the same limited set of pieces could form at least two functionally distinct furniture configurations without requiring additional fabricated components (req. 6 and 9).

Each participant was asked to assemble the available materials into the configuration shown in figure 4.47. Insights were gathered through observation and short reflections with the participants during and after assembly.

The outcomes were largely consistent across the three participants. The threaded inserts proved difficult to use, as they were hard to position straight inside the drilled holes. When the telescopic tubes were attached, misaligned inserts caused the bolts and tubes to sit at an angle. Although the tubes could be pushed into a straighter position, this created undesirable leverage on the connections.

A second issue concerned the adjustment of the telescopic tubes. The width of the tubes is changed by rotating them. However, when a bolt connects both the threaded insert in the plywood panel and the insert in the tube end-cap, this rotation is locked. As a result, the bolt must first be removed before the width can be adjusted, making the process less efficient than intended.

During testing, the acrylic connection plates were not stiff enough, causing the plywood walls to flex.

In figure 4.46, the left wall can be seen bending slightly. This showed that acrylic was not suitable for this application. However, it did not demonstrate that aluminium plates would solve the problem, as these were not tested. A future prototype with aluminium plates is therefore needed to determine whether they provide sufficient stability.

Despite these issues, the module was sufficiently sturdy to support the simulation of activities such as cooking or working on a laptop. Participants were also able to create different furniture shapes relatively easily, and the 3D-printed components remained intact throughout the tests.

Evaluated against the predefined criteria, the prototype was partially suitable. The configuration-range criterion was met because participants could create at least two functionally distinct shapes using the same pieces. Structural robustness was partly achieved: the module remained usable and no components broke, but the acrylic plates allowed visible flexing. Assembly and adaptability were also only partly achieved because the inserts were difficult to align and bolts had to be removed before dimensions could be adjusted. The modular principle therefore functioned, but the connection and stabilisation mechanisms required redesign before the structure could be considered suitable for repeated workshop use.

Based on these findings, one correction to the prototype and two design changes were proposed. The prototype should first be rebuilt using aluminium plates, as intended in the original design. This is a correction of the material used in the prototype rather than a new design change. The first design change is to extend the plates to the second hole from the panel edge. This reduces the unsupported distance and the leverage acting on the connection.

The second design change is to remove the threaded inserts. Instead, the panels should use 6 mm through-holes with separate bolts and nuts. This creates a simpler connection and reduces the risk of misalignment. Both the aluminium plates and the revised connections must be tested in a future prototype before their performance can be concluded.



Figure 4.46 Front view of cabinet, built by 24-year old woman



Figure 4.47 Side view of cabinet, built by 24-year old woman

4.4.7 Workshop Exploration

The modules developed in the preceding sections require an implementation model through which DIY-ers can access and use them. Possible models include selling a complete kit, renting modules for use at home, operating a lending library through a makerspace, bringing a mobile set to users' vans, or incorporating the modules into a facilitated workshop.

Direct sale was not selected because a useful kit would need to contain modules in multiple sizes, technical-system placeholders, and supporting tools. Such a kit would be large, costly, difficult to store, and only needed during a limited phase of a camper conversion. Independent rental or lending remains promising because the same materials could be reused by multiple DIY-ers. However, observations during testing showed that participants often required external guidance to interpret spatial consequences, overcome uncertainty, and continue developing their layouts. Access to the modules alone would not necessarily provide this support.

For these reasons, the proposed solution retains the workshop format. Within a shared workspace, the same collection can be reused, a facilitator can provide guidance when required, and participants can compare decisions and exchange experiences. This more directly supports the requirement to enable meaningful exchange between DIY-ers.

The final workshop was developed from the earlier MaakPlaats concept and the findings from the user test. The MaakPlaats provided the basic structure of exploring, designing, and making, while the test clarified what additional guidance novice DIY-ers needed. I therefore explored how the workspace itself could support experimentation, comparison, and independent decision-making.

Several requirements could be translated directly into the workshop. These included stimulating insights through experimentation and feedback (requirements 4 and 11), showing the available possibilities and technical components within a camper (requirements 9 and 12), communicating the required time, skills, and resources (requirement 13), and requiring participants to compare at least two layouts within the available

workshop time (requirements 10 and 14).

Different workshop layouts were sketched to explore how the space could support peer learning. The final layout places participants in adjacent work areas with low partitions. This allows them to see each other's solutions, walk past other mock-ups, and exchange informal feedback while retaining control over their own design. Comparison therefore becomes part of the environment rather than only a formal workshop activity.

Inspiration for the information area came from camper stores such as De Wit Schijndel, where products, tools, materials, and technical systems are displayed together. One interviewee mentioned such exhibitions as an important source of inspiration, while the research also showed that DIY-ers browse online store pages to discover possible solutions. VanPlan translates this behaviour into a physical environment where components can be seen, touched, and positioned inside a layout.

Full-scale representations of batteries, water tanks, heaters, and other accessories make their spatial consequences visible. Additional information communicates approximate cost, installation time, tools, skills, and professional support required. This helps participants evaluate choices in relation to both space and practical feasibility.

Finally, the workshop explicitly requires participants to develop and test at least two layouts. The user test showed that adjustable modules alone did not automatically lead to iteration, as participants often refined their first promising solution. By making comparison a required step, experimentation becomes a deliberate part of the process.

Overall, the final workshop combines the MaakPlaats structure with the needs identified during testing. The workspace itself provides guidance by making possibilities visible, encouraging informal exchange, and supporting participants in comparing and evaluating their own solutions.

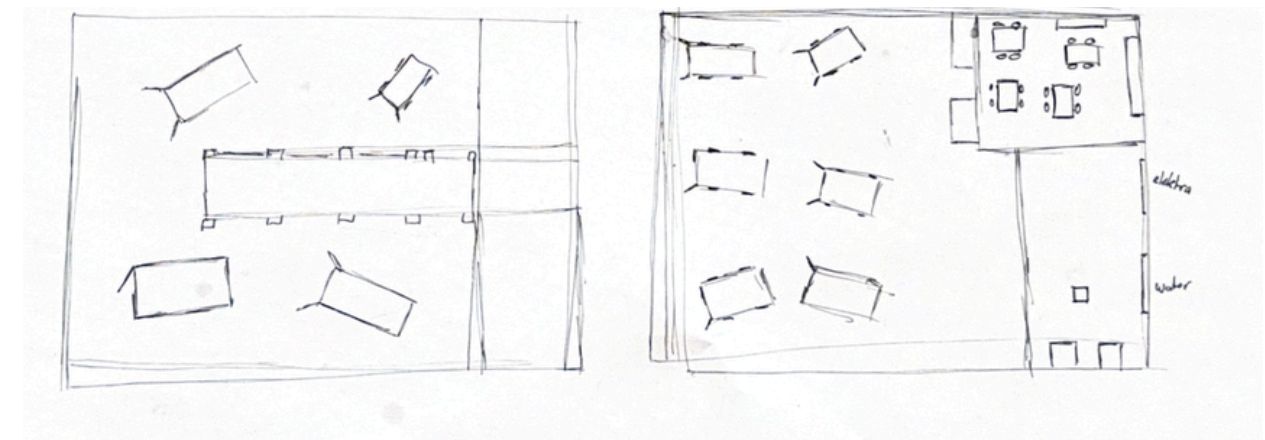
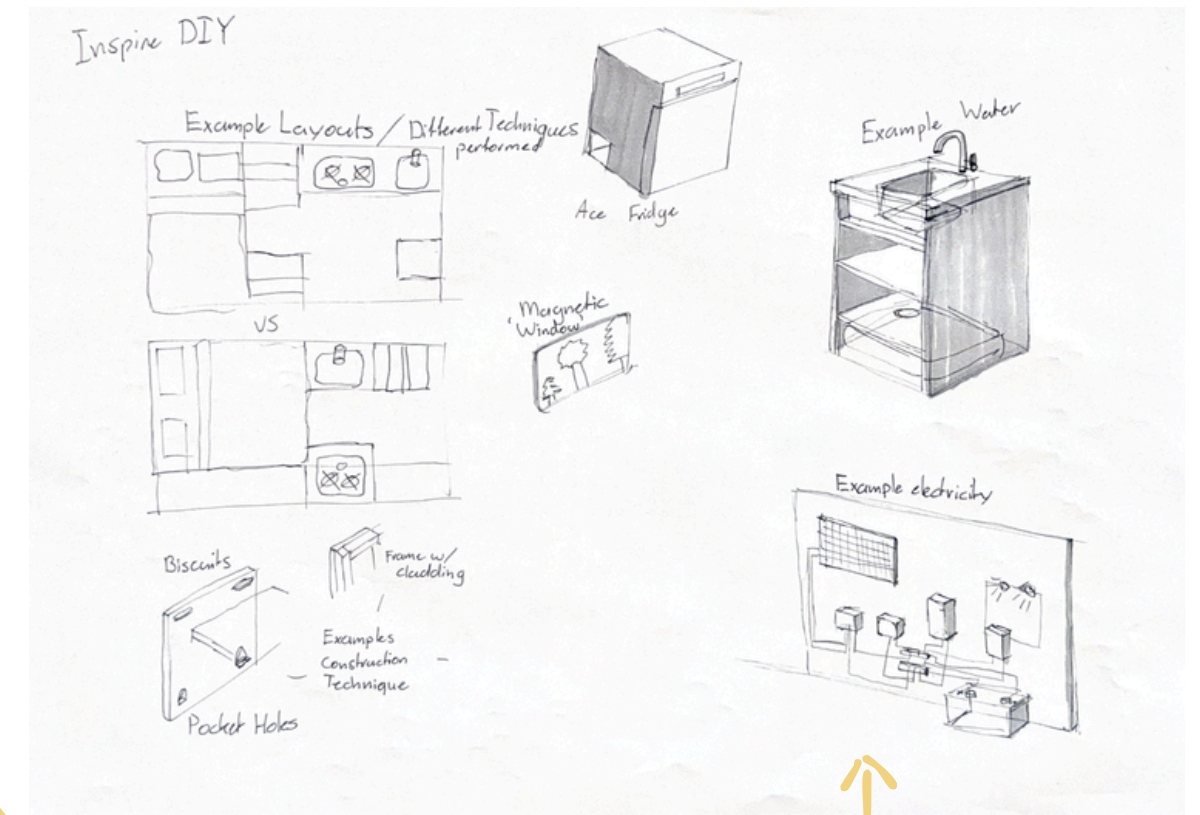


Figure 4.48 Sketches of iteration on workshop design.

5. DELIVER

5.1 VanPlan

5.2 Validation

5.3 Final Statement



5.1 VanPlan

Throughout this thesis, a recurring tension emerged between guidance and autonomy. Beginner DIY-ers need structure and support to translate fragmented information into confident spatial decisions. However, existing forms of support often reduce uncertainty by making or prescribing decisions for the user. This conflicts with the autonomy, ownership, and creativity that motivate people to undertake a DIY camper conversion in the first place (see sections 1.2 and 2.3.3).

VanPlan addresses this tension through a reusable, full-scale modular mock-up system that enables DIY-ers to construct and experience a proposed camper interior inside their own van. The adjustable modules form the central intervention. The workshop environment, technical examples, information resources, and facilitator support are secondary elements that help participants use the system effectively without taking control of the design process away from them.



Figure 5.1 Render of possible interior created with VanPlan modules



Placeholder item for gas stove

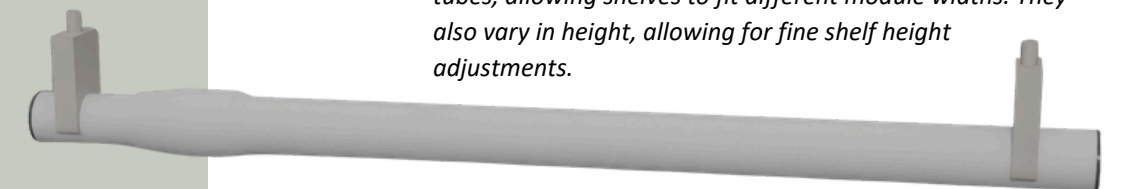
A non-functional, full-scale placeholder represents the spatial envelope of a gas stove. It allows participants to simulate cooking activities and consider the space and routing required for the gas supply.

Optional shelf for more customization

An optional shelf can be attached to explore additional storage and personalise the proposed interior.

Telescopic tube for width adjustment

The telescopic tubes allow the module width to be adjusted continuously. The 3D-printed shelf supports slide along the tubes, allowing shelves to fit different module widths. They also vary in height, allowing for fine shelf height adjustments.



Removable and repositionable shelves

Shelves can be added, removed, or installed at different heights to represent different furniture configurations. M6 bolts, nuts, and washers secure the telescopic tubes to the side panels.

Adjustable feet for height adjustment

These feet provide fine height adjustment. Larger height changes are achieved by selecting a different side-panel height.



Figure 5.2 Render of a module used in figure 5.1



Figure 5.3 Render possible VanPlan interior in the van

Instead of relying solely on drawings, CAD models, online examples, or verbal advice, participants can translate abstract ideas into physical volumes. These volumes can be assembled, inhabited, compared, and altered before permanent construction begins. VanPlan does not determine what the ideal camper interior should be. It enables participants to investigate whether their own ideas work spatially and how those ideas might need to change.

Full-scale testing is designed to give DIY-ers a concrete, embodied sense of what their interior will actually become, before they commit to a permanent build. This matters for two connected reasons established earlier in this thesis:

Firstly, advanced beginners DIY-ers struggle to translate abstract representation into spatial understanding. Suzuki et al. (2023) found that novice builders in particular struggle to imagine spatial possibilities from abstract or digital representations alone. This finding directly informed the selection of VanPlan over other concepts as the primary direction for further development (see section 4.2.3). The work of Desjardins et al.(2016) and Brischetto (2018) reinforce this: understanding a space is something built through inhabiting it, not just viewing it. Own research on the camper conversion process with DIY-ers confirmed these findings from the literature: the most important source for converting a van is experience (see section 2.2.2). Therefore, having seen and experienced the end goal before committing to the entire process gives the DIY-er a boost in confidence that the envisioned interior they're working towards actually suits them.

Secondly, seeing the end result early reveals what needs to change at different layers of the campervan. By experiencing a close-to-final layout before construction begins, DIY-ers discover how different layers of the conversion need to be planned for from the very start of the build. Components such as insulation thickness, wiring routes, holes in the van, can still be adjusted after seeing conflicting parts during testing, rather than being discovered only once construction is already underway and changes become costly or difficult to reverse (see section 4.3).

5.1.2 Target group

VanPlan primarily targets DIY camper builders who already have general confidence in completing practical tasks and are comfortable using basic tools. Within the Dreyfus model, this thesis positions them between advanced beginner and competent specifically in relation to campervan conversion, while assuming at least advanced-beginner competence in general DIY activities (see Section 2.3.2).

Participants do not need to arrive with one fully resolved design. Their starting points may range from loosely collected inspiration to a hand-drawn or digital layout, already purchased components, an existing piece of furniture, or a specific spatial problem (see process tree). However, they should have enough understanding of camper interiors and their own intended use to engage meaningfully with the physical mock-up. VanPlan is not intended as a basic tool-use course or as a service that creates a complete camper design on behalf of someone starting without any personal direction.

Within this target group, VanPlan focuses specifically on DIY-ers who already own a van and whose interior layout is still open to change. Testing conducted in Section 4.3.6 showed that participants could evaluate spatial decisions more concretely when working inside their own vehicle than when using an unrelated test van. The vehicle itself contains relevant dimensions, wheel arches, doors, windows, existing components, and other constraints. The mock-up process should therefore take place inside the participant’s own van wherever possible (requirement 8).

The intended outcome is not necessarily a final, construction-ready camper design. Participants leave with embodied insight into how a proposed layout supports their routines, which compromises it creates, and what still requires investigation. This provides information that cannot be obtained from a paper or CAD layout alone while preserving the autonomy and ownership that motivate DIY-ers to build their own interior, addressing requirements 1, 2, and 4.

5.1.3 How it works

VanPlan consists of three connected elements:

- 1. Adjustable modules
- 2. Technical and accessory modules
- 3. A supporting workshop structure

These elements are not equally weighted. The adjustable modules form the core of VanPlan. They make it possible to translate a proposed interior into a full-scale, usable mock-up. The technical and accessory modules introduce realistic spatial constraints, while the workshop structure provides the resources and support needed to build, experience, compare, and document different arrangements.

Adjustable modules

The adjustable modules consist of plywood panels available in a range of standard sizes. In figure 5.4, the envisioned set of panel sizes is shown. This collection of panels lets the user be able to build multiple cabinets of the same size, and not be limited by the amount of panels. This is a preliminary set, and further testing is needed to confirm whether this many are needed. This set will need approx. 1,5m³ of storage. It gives participants a wide but finite library of panel sizes to build from. Plywood was deliberately chosen over alternative materials (see section 4.4.4): most alternatives are not cheap, weigh too much, or are not structurally sound enough to simulate real use (sitting, leaning, repeated handling). Since most final camper interiors are themselves built largely from plywood, prototyping in the same material also keeps the mock-up experience realistic, giving users a genuine sense of the weight, rigidity, and feel of their eventual build.

Every panel contains a common connection grid consisting of 6.5 mm (to fit M6 bolts) through-holes spaced 50 mm apart, with a 50 mm margin around the edges. Panels and accessories are connected using M6 bolts, separate nuts, and washers (see section 4.4.6). This common interface allows the same panel to become part of a bed, cabinet, seat, table, worktop, step, or another structure depending on how it is combined.

Figure 5.4 Envisioned amount of plywood panels available per DIY-er, per combination of height and depth

		Height (cm)												
		180	150	100	90	80	70	60	50	40	30	20	15	10
D e p t h (cm)	80	6	6	X	X	X	X	X	X	X	X	6	6	X
	70	6	6	X	X	X	X	X	X	X	X	6	6	X
	50	X	X	10	10	10	10	10	10	10	10	10	10	10
	40	X	X	10	10	10	10	10	X	10	10	10	10	10
	30	X	X	10	10	10	10	10	X	X	10	10	10	10
	20	6	6	10	10	10	10	10	X	X	X	10	10	10
	15	6	6	10	10	10	10	10	X	X	X	X	10	10
	10	X	X	10	10	10	10	10	X	X	X	X	X	10

Figure 5.5 Overview of work area of participant at VanPlan workshop



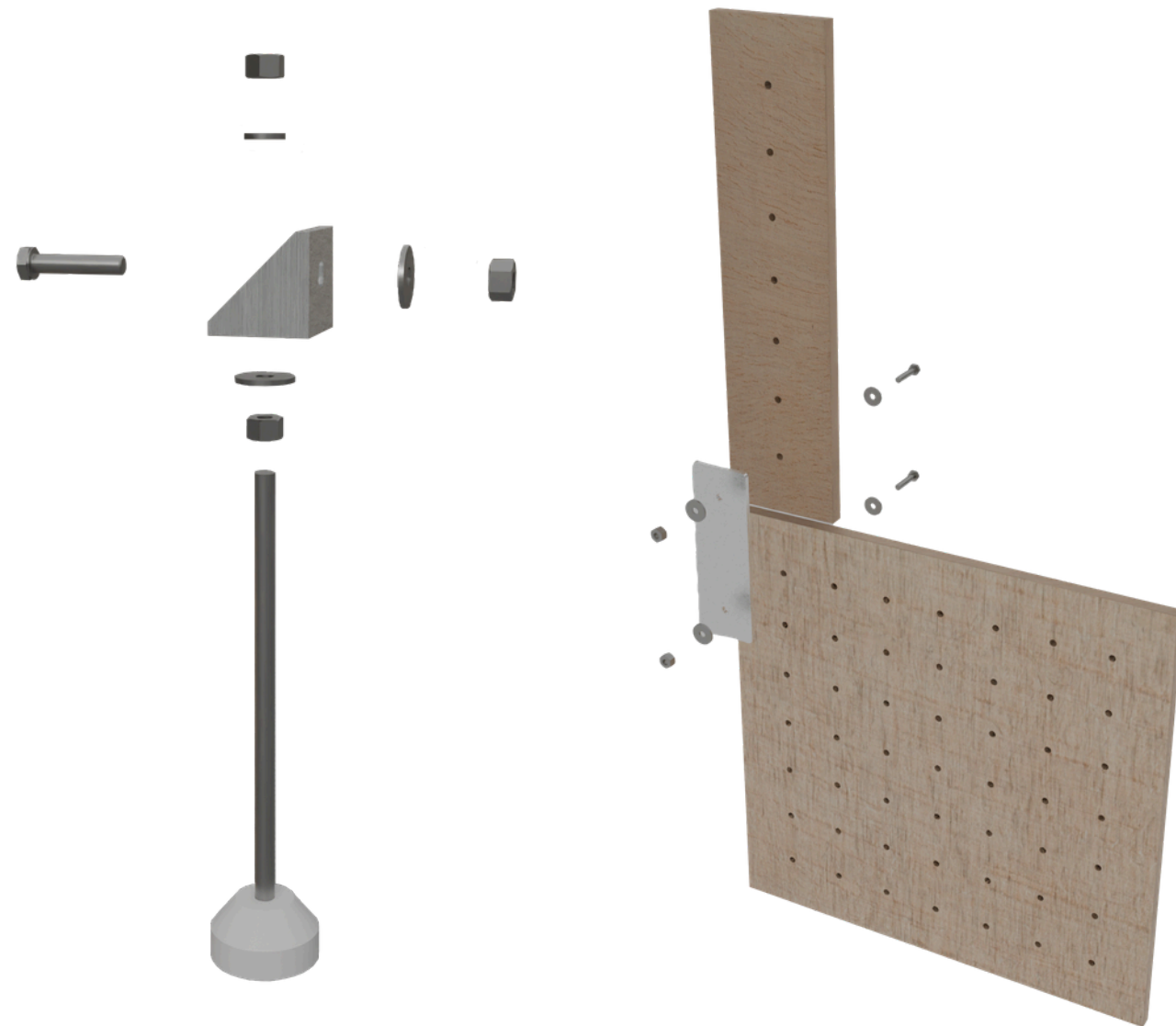


Figure 5.6 Exploded view of telescopic feet used in the mock-up modules.

Figure 5.7 Exploded view of panels fixed together. Here for creating a chair.

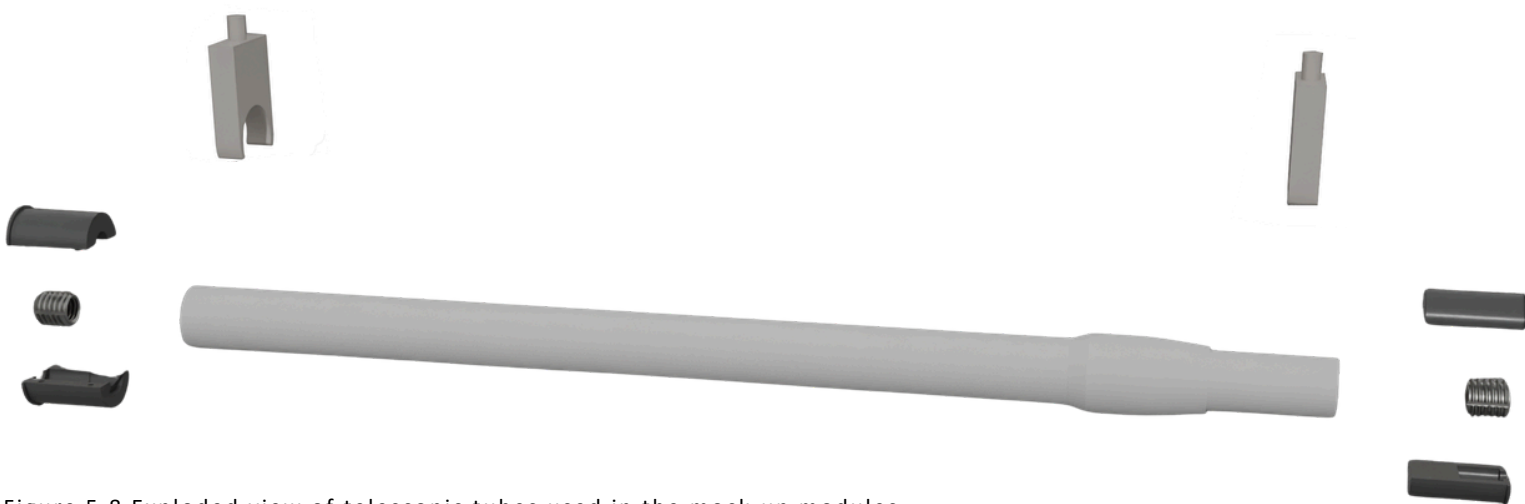


Figure 5.8 Exploded view of telescopic tubes used in the mock-up modules.

The test module in section 4.4.6 showed that threaded inserts made assembly unnecessarily difficult. It was hard to insert them straight, and even small misalignments caused connected bolts or telescopic tubes to sit at an angle. The final proposal therefore replaces threaded inserts with 6.5 mm through-holes and separate bolts and nuts. This produces a simpler connection that is easier to align, inspect, replace, and reuse.

Aluminium connection plates are proposed where panels must be joined or supported. During prototype testing, acrylic plates flexed too much under load. Aluminium provides greater stiffness and can extend to the second row of holes from the panel edge. This reduces leverage at the joint and limits visible movement between connected panels.

Height, width, and depth are adjusted in different ways. Height is primarily established by selecting an appropriate panel size and can be fine-tuned using adjustable telescoping feet. Width is adjusted continuously using horizontal telescoping tubes. Their internal fastening hardware is retained by 3D-printed end caps, as shown in figure 5.8. Depth is changed by selecting or combining side panels of different sizes.

Smaller panels can be connected to create larger or irregular surfaces. For example, a 300 mm and a 200 mm panel can be combined to represent a depth of 500 mm. Although this is not intended as the default construction method, it enables participants to work around wheel arches, existing installations, or other irregular features. The same openness allows the system to represent less conventional elements such as steps, chairs, convertible beds, and multifunctional furniture (see figure 5.7).

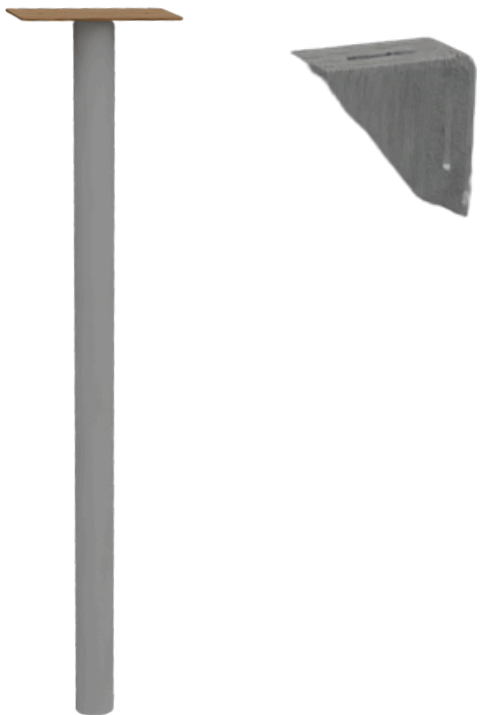
To support participants during assembly, VanPlan includes a concise manual showing how common furniture configurations can be created with the modules. It also provides ergonomic starting points that participants can test and adjust to their own bodies and routines. The complete manual is included in Appendix E.

Because the modules are used physically, their provisional load-bearing limits should be

communicated before a surface is loaded, not discovered by sitting on it. Based on a strength assessment of 12 mm poplar plywood (Appendix D), horizontal panels intended for repeated seating or lying should receive additional support once their unsupported span reaches approximately 400 mm. It should be communicated directly on the modules and in the accompanying manuals so participants encounter the limitation before testing begins (see figure 5.9). Further physical load testing is required before this can be treated as a validated safety limit.

Together, the panel collection and connection grid create a coarse dimensional structure, while the telescoping mechanisms allow finer adjustments. The modules are therefore standardised enough to remain reusable and manageable while being open enough to represent personalised interiors. This addresses the need for both robustness and adjustability (requirements 6 and 7) without introducing a predefined camper layout.

Figure 5.9 Support used in VanPlan (left a telescopic leg for tables or beds, right a cornerpiece for fixing two panels to each other)



Technical / Accessory modules

In line with req. 12 and the test findings about gas, water and electrical systems (section 4.3.6), the VanPlan mock-up system includes standard-sized placeholder or working modules for accessories. Accessories included are: electrical devices (battery, solar charger, inverter, etc.), water systems (heater, pump, tank), gas bottles, sinks, fridges, heater, toilets, showers, as is shown in figure 5.11. At least 1 ‘real’ version of the component is displayed in the proposed workshop area. Furthermore, there are placeholders sized to real products (see figure 5.10). This way, participants can plan around fixtures they might actually purchase and also place them in their mock-up area.

The system also includes a library where example technical systems are showcased. This serves as a reminder of what a complete system typically consists of, and lets users see the construction methods and resources such a system requires. By seeing this laid out concretely, participants can better account for these requirements and apply the necessary resources in their own interior, even without having built a technical system themselves before (see figure 5.11).

The area also contains furniture examples that help participants translate their temporary mock-up into a buildable interior. After creating a layout with the generic modules, participants can link individual modules to comparable furniture examples. This way, they record the intended function and construction principle of each element. Following the workshop, the corresponding build plans can be adapted using measurements taken from the mock-up. These plans provide a practical starting point for constructing the final interior elements or developing them further to suit the participant’s specific design.



Figure 5.10 Overview of example reference furniture

Figure 5.11 Overview of see area with the technical modules at VanPlan workshop



Figure 5.12 Overview possible placeholder items (sinks and stoves)



Workshop Structure

The proposed workshop structure builds on the framework developed in section 4.2.3 and incorporates lessons from the earlier research and prototype tests presented in section 4.4. However, during testing only parts of the workshop were tested, and not the workshop as a whole. The structure should therefore be regarded as informed by evidence, but still a provisional framework.

It is organised around two core principles. First, information is layered and available through self-service resources instead of being delivered mainly through lectures (section 2.3). The only moment participants are addressed as a group is the opening introduction itself. Second, most of the session is devoted to building, testing, and rebuilding layouts (section 4.4.2). Together, these principles create a setting in which the modular system supports participants without prescribing one fixed design process or preferred solution.

This approach aims to preserve DIY-ers’ autonomy over both designing and learning, consistent with the autonomy-supportive approach described in self-determination theory (section 2.3.3). Information, examples, and facilitation are available when relevant, while participants decide what to investigate and how to develop their layouts. Facilitators respond to requests rather than directing every step. Participants can therefore consult information when it becomes meaningful and devote most of their time to physical experimentation.

Because the complete workshop has not yet been piloted, participants’ precise behaviour cannot be predicted. They may follow different orders, skip activities, use modules unexpectedly, or arrive having already completed parts of the process. The framework therefore identifies important process functions and available forms of support while allowing flexible movement between them.

PHASE	LEARNING OBJECTIVE	ACTIVITIES	OUTPUT	ADRESSES REQUIREMENT ...
Introduction & Orientation	- Understand how to use the workshop independently - Establish a rough personal design direction	- Introduce the purpose, scope, and structure of the workshop - Complete a short personal preference sheet - Walk through the workspace, tools, modules, and information resources	- Initial preferences, must-haves, and doubts - Clear understanding of the workshop process and available resources	Requirement 1, 2, 3, 10
Define Personal Requirements	- Translate travel habits, lifestyle, and priorities into concrete spatial requirements - Recognise which decisions are constrained and which remain open	- Define personal needs, priorities, and constraints - Distinguish fixed legal or practical requirements from free design choices - Create criteria against which later layouts can be evaluated	- Prioritised personal requirements - Clear evaluation criteria for testing layouts	Requirement 1, 2, 3, 13
Build, Test & Compare	- Understand how modules, dimensions, and functions interact in the available space - Discover spatial consequences through making and physical use - Learn by comparing alternatives rather than committing immediately	- Assemble a first full-scale layout - Build selected self-build-kit components - Simulate relevant daily-use scenarios - Create and test a second alternative layout - Compare both layouts against the personal requirements	- At least two complete, tested layout alternatives - Observations about usability, spatial conflicts, and trade-offs - A preferred base layout	Requirement 1, 2, 3, 4, 6, 7, 8, 9, 10, 12, 14
Refine the Preferred Layout	- Improve the preferred layout based on evidence from testing - Balance personal priorities, spatial limitations, and practical consequences	- Adjust dimensions and module positions - Add accessories and additional functions - Apply lessons learned from the alternative layouts - Retest relevant routines and use scenarios	- Refined and personalised layout concept - Explicit design choices and accepted compromises	Requirement 1, 2, 4, 6, 7, 9, 10, 12
Capture the Outcome	Document the layout accurately enough to continue developing or recreating it after the workshop	- Photograph the final layout - Create sketches with measurements - Record the modules and accessories used - Link workshop components to plans available online	- Photographs and measured sketches - Referenced module and component list - Accessible plans for rebuilding selected modules at home	Requirement 1, 7, 9, 10, 12, 13
Present & Exchange Feedback	- Explain and justify personal layout decisions - Gain new insights through feedback and other participants’ concepts	- Briefly present travel style, chosen layout, reasoning, and open questions - Receive feedback from other DIY-ers - Compare different solutions and approaches	- Peer feedback - Additional inspiration and final points for reconsideration - Better-supported design decisions	Requirement 1, 4, 11
Aftercare & Next Steps	- Understand what is required to turn the layout concept into a finished camper interior - Recognise personal limitations in time, skills, and resources	- Discuss remaining technical questions with the host - Identify suitable follow-up workshops, professional support, or independent next steps - Consider which parts can be self-built and which may require external help	- Concrete next-step plan - List of open technical questions - Relevant referrals, workshops, or support options	Requirement 1, 3, 12, 13

- Think area
- See area
- Make area

Figure 5.14
Floorplan of
envisioned
Workshop area of
VanPlan

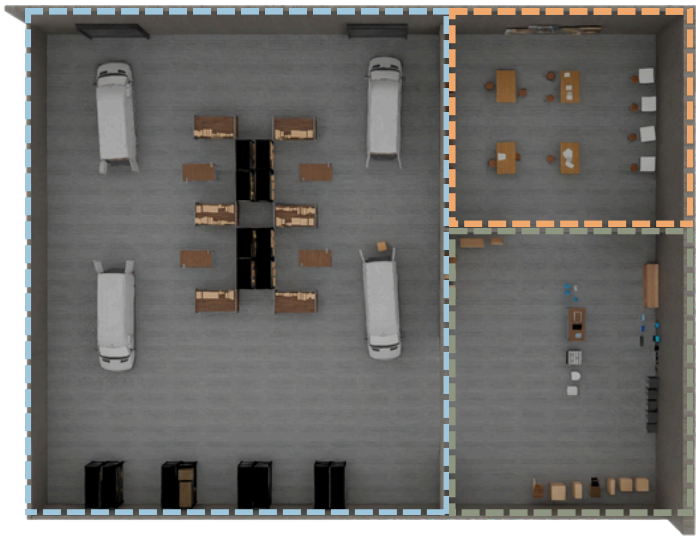


Figure 5.13 Proposed
workshop structure for
VanPlan

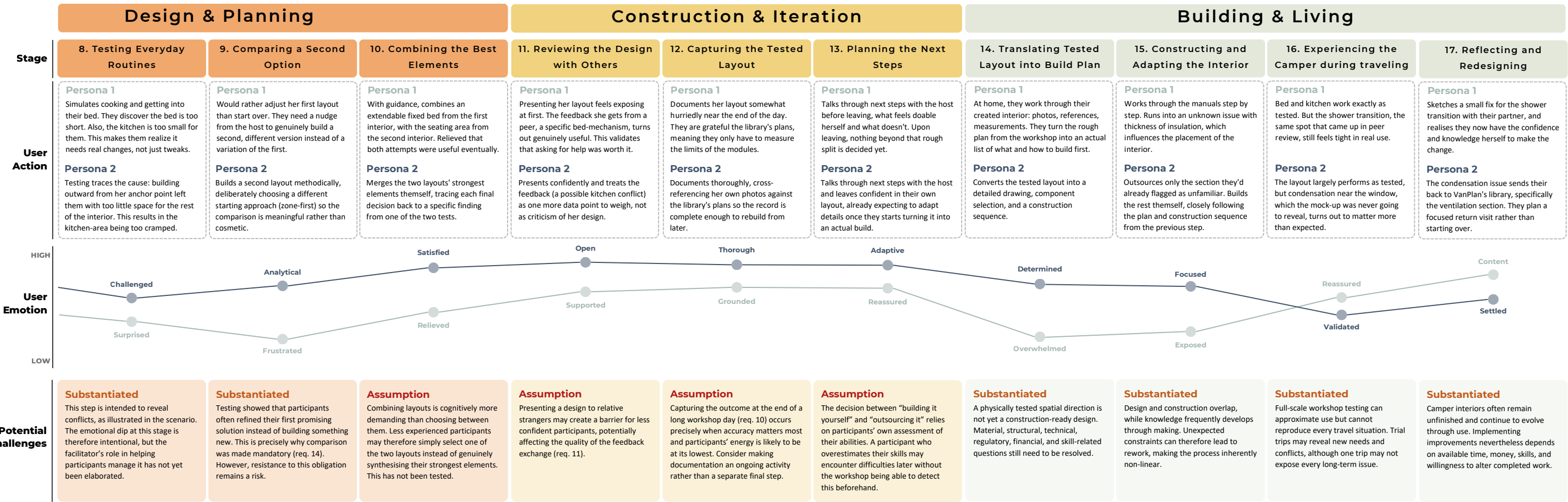
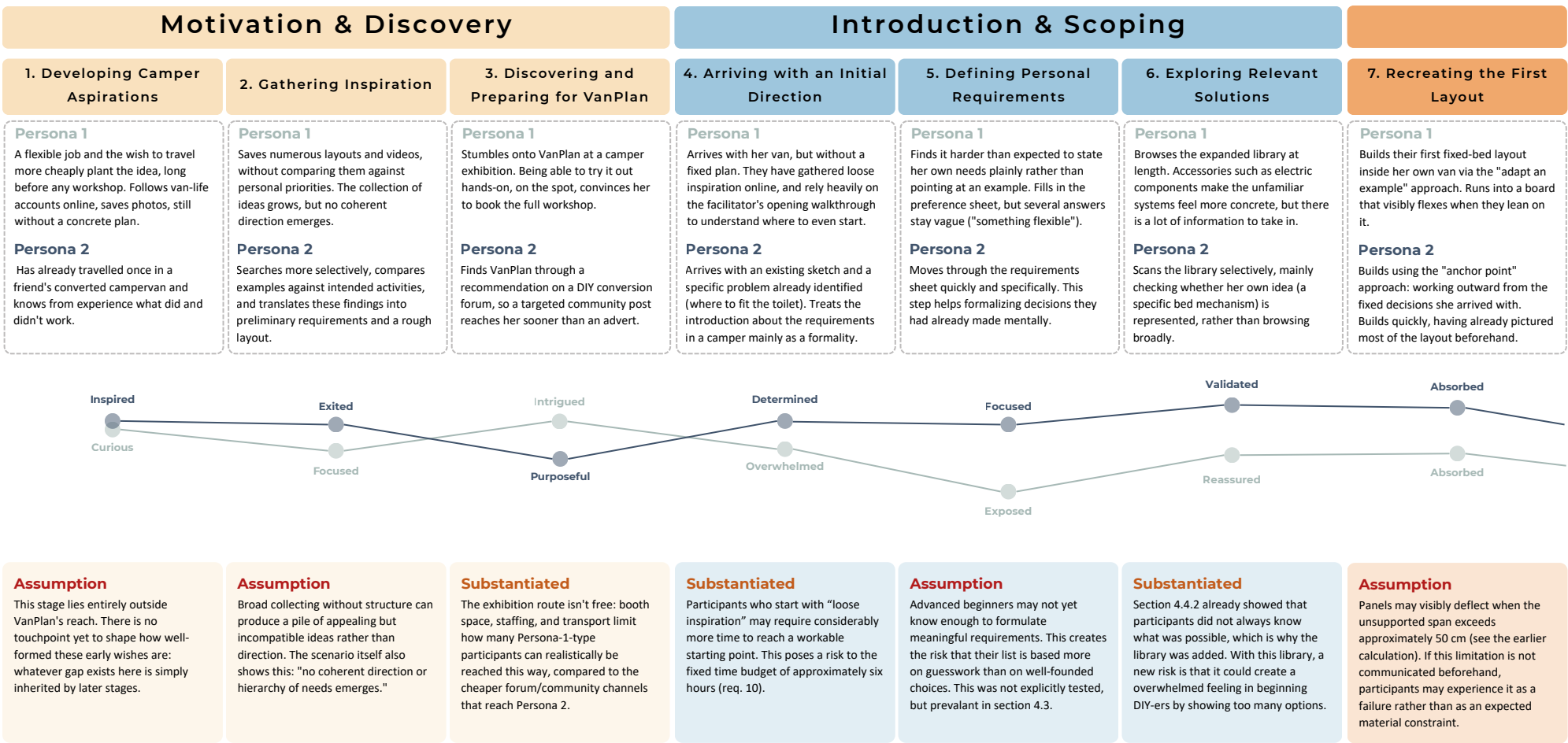
- Extra notes for table:**
1. *Define Personal Requirements* distinguishes underlying needs from proposed solutions. For instance, "being able to sleep without rearranging the interior" (a requirement) versus "installing a fixed lengthwise bed" (one possible response). This distinction lets participants reconsider a solution without losing the need behind it.
 2. *Refine the Preferred Layout* weighs layouts against factors such as movement, comfort, storage, openness, accessibility, privacy, maintenance and technical feasibility, alongside cost, weight, complexity, skills, tools and time where known.
 3. *Aftercare & Next Steps* covers more than "self-build vs. outsource". Namely, building a module independently, attend another workshop, using a makerspace, buying a standard component, outsourcing fabrication only, outsourcing installation only, having self-built work inspected, or returning to VanPlan with a new question.

This process tree maps the possible decisions and pathways within the VanPlan workshop. The tree was developed by combining observations from the test with scenario-based reasoning from the perspectives of the two personas. It shows how participant may make different choices, or return to an earlier step. The steps of the tree represent the designer's expectations rather than observed or validated behaviour. The process tree should therefore not be interpreted as a prescribed sequence or an exhaustive overview of every possible action. Instead, it visualises the current assumptions underlying the workshop structure and identifies pathways that should be evaluated during a complete workshop pilot.



User Journey

These assumptions are further explored through two contrasting persona-based user journeys. These are based on the personas defined in section (3.3.2): persona 1 is a less experienced DIY-er, and arrives with loosely collected inspiration. They develop a workable direction through broad exploration and experimentation. Persona 2 is more experienced in DIY-ing, and arrives with an existing sketch and a specific problem. They use the workshop resources selectively to test and improve the proposal. The journeys illustrate how VanPlan could accommodate different starting points and support needs rather than predict how participants will actually behave. Their steps, emotions, and challenges were anticipated by considering the workshop from each personas perspective and drawing on earlier research and test observations. They consequently combine evidence-informed expectations with assumptions that still require evaluation through a complete workshop pilot.



5.1.4 Marketing

Provisional market position

VanPlan has not yet been tested as a complete service. A final price, workshop format, operating model, and marketing strategy can therefore not yet be defined. However, the intended target group, the value offered to them, and VanPlan's position relative to existing forms of support can already be described.

As discussed in Section 2.4, existing support for DIY camper builders covers a broad range. Online information, forums, and digital planning tools leave most design control with the DIY-er, but require users to translate abstract information into their own vehicle. Courses and technical workshops help users gain knowledge or complete specific parts of the conversion, but generally do not focus on physically testing a personal layout. Furniture kits and modular interiors offer a more concrete starting point, but they also limit the user to an existing product or layout system. Professional design and conversion services provide more guidance and certainty, but transfer a larger part of the design process to a professional.

VanPlan is positioned between self-guided planning and these more predefined or professionally guided solutions. It combines a high level of user control with full-scale, physical experimentation. Participants remain responsible for their requirements, layout, and final decisions, while the modules and workshop structure help them experience the spatial consequences of those decisions before construction begins.

VanPlan is therefore not primarily a course, furniture system, or professional design service. Unlike a general course, its main outcome is not knowledge about camper building. Unlike a furniture kit, it does not sell a predetermined layout. Unlike professional design support, it does not create the solution on behalf of the participant. Instead, it helps DIY-ers test and improve their own solution.

Its central marketing proposition is:

Test your own camper layout at full scale, inside your own van, before you permanently build it!

The intended outcome should be communicated honestly. VanPlan does not guarantee that participants leave with a technically complete or final design. Instead, they leave with an experienced and tested layout direction, a clearer understanding of its compromises, and an overview of questions that still need to be resolved. This distinguishes VanPlan from services that promise a finished plan or interior.

VanPlan can also complement existing services rather than directly compete with them. After testing their layout, participants may continue building independently, use a makerspace, attend a technical course, purchase standard components, or outsource selected parts of the conversion. VanPlan is positioned earlier in this process, at the point where the layout is still flexible and changes are relatively easy to make.

Initial route into the market

The complete workshop environment shown in figure 5.15 should be understood as a possible long-term form of VanPlan, rather than the only way in which the concept can be introduced. Creating a separate workshop with a complete module collection, tools, storage, technical examples, and permanent staff would require a large initial investment before participant demand has been established.

A more realistic first step would be a small-scale pilot within an existing makerspace, camper-conversion workshop, or educational organisation. Such a pilot could begin with one vehicle workspace and a reduced collection of commonly applicable modules and technical placeholders. The core value of VanPlan—building and testing a personal layout at full scale—would remain the same, while the exact form could range from a bookable mock-up session to a small facilitated workshop.

Existing partners could provide space, tools, storage, safety procedures, and access to people who are already preparing a camper conversion. In return, VanPlan could help their users arrive at later courses, purchases, or building activities with a better-defined layout. Any partnership should still allow VanPlan to present different solutions and products, rather than becoming a demonstration platform for one supplier. Early marketing should therefore also function as pilot

recruitment. The first participants should preferably already own a van, have basic DIY confidence, and bring inspiration, a sketch, or a specific layout question. These sessions can then provide information about which modules are used, how much guidance is required, which session format is most useful, and what participants consider valuable enough to pay for. The module collection and service format can be expanded after these patterns become clearer.

Reaching and communicating with users

VanPlan should reach DIY-ers while their layout is still open to change. Relevant channels include camper-building courses, makerspaces, conversion suppliers, camper events, online communities, forums, bloggers, and social-media creators. A small hands-on demonstration at an exhibition could make the concept immediately understandable, but exhibitions should initially be treated as a way to test interest and recruit participants rather than as the main delivery or marketing channel.

Marketing material should show the process rather than only a polished final layout. Relevant images include participants assembling modules, comparing

two arrangements, moving through the mock-up, discovering a conflict, and documenting the result. These activities communicate the value of VanPlan more clearly than a render of one finished interior. Participants may later share their layouts and lessons within DIY communities, supporting word-of-mouth communication and the existing DIY practice of sharing experiences and outcomes (Kuznetsov & Paulos, 2010).

In the longer term, the Configurator described in Section 4.2.1 could provide an online starting point. Users could first organise their ideas digitally and move towards VanPlan when they are ready to test them physically.

No fixed participant price is proposed at this stage. The eventual price depends on the chosen format, level of facilitation, partner structure, workspace costs, and scale of the module collection. VanPlan should require substantially less commitment than professional design, a furniture package, or an outsourced conversion, while offering more direct and personal feedback than self-guided planning. Pilot sessions are needed before this relative position can be translated into an exact price.

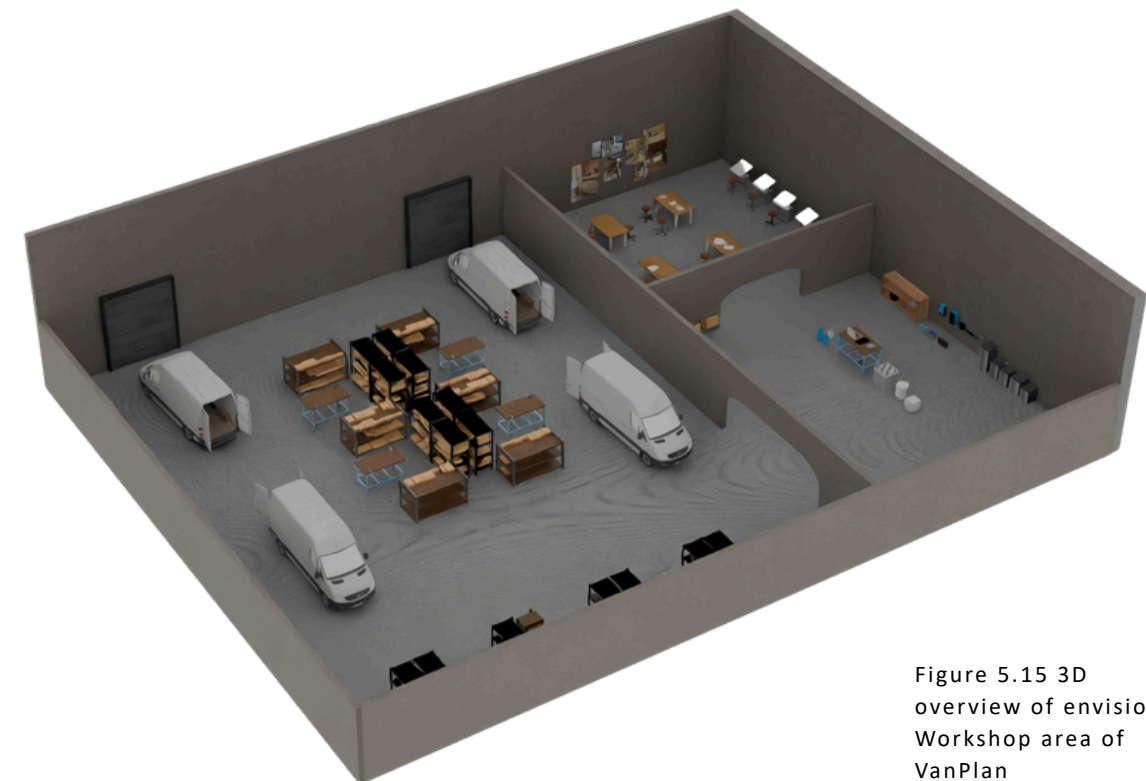


Figure 5.15 3D overview of envisioned Workshop area of VanPlan

5.2 Validation

5.2.1 Introduction

The final VanPlan concept was assessed against the fourteen requirements using evidence from the exploratory layout sessions and the module test. Several requirements were introduced or revised after these tests. This assessment therefore partly maps earlier findings onto the final concept retrospectively; it does not constitute a complete validation of VanPlan as a finished service.

The requirements are therefore assessed using three levels:

- Supported at prototype level: the tests provide direct exploratory evidence that the requirement can be achieved.
- Partly supported: part of the requirement was observed, but the evidence or prototype was incomplete.
- Not yet demonstrated: the final concept includes the requirement, but it has not been tested.

A requirement that is not yet demonstrated has not necessarily failed; it means that insufficient evidence is currently available.

5.2.2 Validation

Req 1 (*Sections 4.3.7 and 4.3.9*): Physical testing helped participants recognise spatial consequences and make more informed layout decisions. However, confidence was not measured before and after the session, and no control condition was used. An increase in confidence can therefore not yet be established.

Req. 2 (*Sections 4.3.6–4.3.8*): Once participants had articulated their needs, all were able to translate these into concrete choices concerning spatial decisions.

Req. 3 (*Sections 4.3.6, 4.3.9, and 4.4.6*): Participants with different levels of experience were able to use the mock-up and engage with the design task.

Validation with Requirements

1. The intervention must contribute to DIY-ers experiencing more overview and confidence in their own layout decisions after use than they would without the intervention.	●
2. The intervention must help users translate personal needs, lifestyle, and priorities into concrete spatial decisions.	●
3. The intervention must be accessible and usable for advanced beginner DIY camper builders according to Dreyfus’ scale of competence.	●
4. The intervention must stimulate new insights through experimentation, comparison, or feedback.	●
5. The cost of the intervention must not exceed 200 euros per DIY-er.	●
6. The mock-up modules must allow users to safely simulate relevant use scenarios within their intended interior. For instance: cooking, sleeping, showering, and accessing storage.	●
7. The dimensions of the mock-up modules must be adjustable and representable with an accuracy of 1 cm.	●
8. The intervention must be usable in any medium or large sized panel van, without making permanent changes to the van.	●
9. The intervention should let users see what the options are in the van, and how to accurately represent them (interior modules for sleeping, seating, eating or working, food preparation, storage).	●
10. The intervention should enable users to develop and iterate on a complete layout concept within approximately one day (or a workshop of up to six hours), assuming the user's requirements are already known.	●
11. The intervention should enable useful exchange of experiences and feedback between DIY-ers.	●
12. The intervention should include simplified, realistically sized representations of technical components. These are batteries, water tanks, gas bottles, refrigerators, and sinks. These modules should help users understand their spatial implications before installation.	●
13. The intervention could communicate required time, skills, and resources connected to design choices.	●
14. The intervention could encourage users to create, test, and compare at least two alternative layouts before selecting a preferred design direction.	●

Req. 4 (*Sections 4.3.6–4.3.8*): Every participant discovered spatial issues during the full-scale phase that had not emerged from their drawings.

Req. 5 (*Section 5.1.4*): The intended price remains an accessibility target rather than a validated price. Facilitator time, workspace costs, transport, module maintenance, workshop capacity, demand, and willingness to pay have not yet been established.

Req. 6 (*Sections 4.3.6–4.3.8 and 4.4.6*): Participants could walk through layouts and simulate activities such as cooking, reaching, and accessing storage. Safe sitting, lying, sleeping, and other load-bearing activities were not tested with the final module design.

Req. 7 (*Section 4.4.6*): The module prototype demonstrated that different dimensions and furniture configurations could be created. However, the required accuracy was not measured, and the

intended aluminium connections were not included in the test.

Req. 8 (*Sections 4.4.2 and 5.1.3*): Earlier mock-up modules were used inside one van, but the final freestanding system has not been tested across different medium and large panel vans. Requirement is accounted for in theory, but not yet demonstrated.

Req. 9 (*Sections 4.4.2, 4.4.7, and 5.1.3*): The final concept includes examples of sleeping, seating, cooking, storage, sanitation, and technical configurations. This example library was developed after testing, so its completeness and its ability to help users represent these options have not yet been evaluated.

Req. 10 (*Sections 4.3.9, 4.4.7, and 5.1.3*): The exploratory sessions lasted approximately 60–90 minutes and addressed only part of the layout process.

The complete workshop, including requirements definition, multiple layouts, refinement, and documentation, has not yet been conducted.

Req. 11 (*Sections 4.4.7 and 5.1.3*): Most sessions were completed individually. The proposed workshop structure creates opportunities for observation, discussion, and peer feedback, but these interactions have not yet been tested with multiple DIY-ers working simultaneously.

Req. 12 (*Sections 4.3.6, 4.3.9, and 5.1.3*): Technical components were absent from the exploratory test and were specifically requested by a participant. The proposed placeholders have not yet been produced or evaluated for completeness, recognisability, or spatial accuracy.

Req. 13 (*Sections 4.4.7 and 5.1.3*): VanPlan proposes communicating the time, tools, skills, costs, and professional support associated with design decisions. The information and its influence on participant decisions have not yet been tested.

Req. 14 (*Sections 4.3.8, 4.4.7, and 5.1.3*): The modules allowed layouts to be changed, but most participants gradually refined one arrangement instead of systematically comparing alternatives. The compulsory comparison step was therefore added after testing and still requires validation.

The findings provide exploratory support for VanPlan’s central principle: constructing and experiencing a layout at full scale can help DIY-ers translate previously identified needs into spatial decisions and reveal issues that remain unnoticed in drawings. They do not yet validate the complete workshop, final module system, operational feasibility, or market proposition.

The next pilot should therefore test the complete workshop with intended users in their own vans. It should use the final module connections and technical placeholders, require participants to compare two layouts, and measure overview and confidence before and after participation. Setup time, usability, dimensional accuracy, module wear, participant costs, and the usefulness of the resulting documentation should also be recorded.

5.2.3 Further Development

The requirements provide a logical sequence for further development:

Phase 1: Validate the physical system

The first step should focus on requirements 6, 7, 8, and 12. One improved module should be constructed using the proposed through-holes, aluminium connection plates, telescopic elements, and adjustable feet. The testing should determine whether target users can assemble and adjust a full mock-up interior. Including accurate dimensions, simulating relevant use scenarios, and including technical placeholders.

The initial technical set should remain limited to the five components named in requirement 12: a battery, water tank, gas bottle, refrigerator, and sink. Additional placeholders should only be added when pilot sessions show that they frequently influence the layout and cannot be represented sufficiently with generic labelled volumes.

Phase 2: Validate the core VanPlan session

After the physical system functions reliably, a reduced pilot can evaluate requirements 1, 2, 3, 4, 6, 9, and 14. This pilot should involve one participant or couple, one facilitator, their own van, and a reduced panel collection intended for one layout at a time.

Here, participants should be able to record their initial requirements and confidence, compare alternatives against their personal requirements, and document their preferred direction and remaining questions.

The pilot should record which modules were used or missing, what assistance was required, which new insights emerged, whether the second layout was genuinely different, and whether overview and confidence changed. The duration should be observed instead of prescribing a six-hour format beforehand.

Phase 3: Validate the complete service

Only after the core session has been evaluated should the complete workshop be tested against requirements 5, 10, 11, and 13. This includes recruitment, preparation, multiple participants, peer feedback, the information area, documentation, follow-up, facilitator capacity, and operational costs.

A follow-up during construction should examine whether participants can translate the workshop output into drawings, component choices, and a construction sequence. This would also provide stronger evidence for requirement 1 by showing whether confidence and overview remain useful after the session.



Figure 5.16 Render of possible interior made with modules of VanPlan

5.3 Final Statement

5.3.1 Introduction

This closing chapter reflects on the project as a whole. Section 5.3.2 discusses the findings that emerged across the Discover, Define, Develop, and Deliver phases. Rather than separating the findings from their interpretation, the discussion focuses on the findings that most strongly shaped the project, what I learned from them, and what surprised me during the process. It then describes the theoretical, practical, and DIY-specific contributions of the project and discusses its main limitations.

Section 5.3.3 answers the project goal introduced in section 3.3.1 in light of the VanPlan concept and its evaluation. The chapter then closes with a personal reflection on the graduation process in section 5.3.4 and an acknowledgement of the use of AI tools in section 5.3.5.

5.3.2 Discussion

Key Findings

The finding that most strongly drove this project was that novice DIY-ers do not primarily lack information. Tutorials, examples, forums, courses, and professional services are widely available. The main difficulty is deciding which information matters for their own situation and translating it into a coherent design that fits their vehicle, budget, travel habits, and personal priorities. This shifted the project away from creating another source of information. Instead, the focus became creating a process in which users can apply information, compare choices, and understand their consequences.

Another important lesson was that campervan conversion is not a linear process in which a complete design is first created and then built. Designing, researching, building, testing, and revising continuously influence one another. Decisions concerning one part of the camper often affect several other parts, while new requirements appear during construction and use. A DIY camper is therefore rarely experienced as completely finished. This showed me

that support should not assume that users already know all their requirements at the beginning. It should allow them to discover, revise, and prioritise requirements throughout the process.

I also learned that structure and autonomy are not opposites. Novice DIY-ers need guidance because they do not yet have enough camper-specific experience to recognise which issues are important. However, guidance becomes less useful when it determines the outcome for them. Dreyfus’ scale of expertise helped explain why novice users benefit from examples, rules, and clear starting points. Self-Determination Theory helped explain why this support should still leave the final decisions with the user. Together, these theories showed that structure can strengthen autonomy when it helps users make their own decisions instead of making those decisions for them.

This became an important principle within VanPlan. The workshop provides adjustable modules, ergonomic information, technical placeholders, examples, and facilitation, but it does not determine the position of the bed, kitchen, or storage. Users still decide which compromises are acceptable in their own situation. The goal of the structure is therefore not to lead every participant towards the same solution, but to make their own decision process more manageable.

The most convincing result for me came from the full-scale mock-up test. Compared with their paper layouts, all participants noticed additional issues concerning scale, movement, reachability, proximity, and everyday routines when they physically built and used their layouts. These insights had not emerged during the paper exercise. This showed that the mock-up does more than visualise or confirm an existing design. It also helps users develop requirements, question assumptions, and recognise consequences that are difficult to imagine beforehand.

The mock-up therefore moves part of the learning that normally happens during permanent construction to an earlier and more reversible stage. Users still learn by making and trying things, but changes can be made before materials, money, and time have been committed to the final build. For me, this was the clearest indication that physical prototyping could provide something that existing information sources

and paper planning alone could not.

The tests also showed how strongly the value of a mock-up depends on the environment in which it is created. Participants working inside their own vehicle could relate findings directly to their intended conversion. Participants working in another van mainly explored more general layout principles. Small differences in vehicle dimensions, doors, walls, and wheel arches can determine whether a layout is possible. This led to the decision that the user’s own van should be treated as part of the prototype rather than as a neutral space in which the workshop happens.

The result that surprised me most was that flexibility alone did not automatically lead to iteration. I expected movable modules to encourage participants to create and compare several layouts. Instead, most participants gradually worked towards one arrangement and adjusted it until they were satisfied. This showed that making comparison possible is not the same as encouraging users to compare. The final workshop therefore requires participants to create and evaluate at least two layouts against their personal requirements. This was an important design lesson: if a certain activity is essential to the intended learning process, the workshop must actively support that activity rather than assume it will happen by itself.

Taken together, these findings changed how I understood the purpose of VanPlan. Its main value is not that every participant leaves with a perfect or final layout. Its value lies in helping users understand why a layout does or does not work for them, which compromises they are making, and what still needs to be investigated. The tests provide support for claims about new insights and layout changes. They do not yet demonstrate that the complete workshop increases confidence, since confidence was not measured before and after participation.

Contributions

This thesis makes contributions on three levels:

- Theoretically

It applies Dreyfus’ scale of expertise and Self-Determination Theory to spatial decision-making in DIY camper conversion. Together, these frameworks explain why novice DIY-ers require structure and why this structure should support rather than replace personal judgement. The thesis also adds exploratory evidence to existing research on camper-design media by showing how a reusable, full-scale modular mock-up can support the discovery of spatial consequences and the development of requirements.

- Practically

The thesis delivers the VanPlan concept: a structured workshop format combining personal requirements, full-scale adjustable modules, technical placeholders, example solutions, multiple layout iterations, peer feedback, and documentation. It also provides a set of design requirements and a persona-based evaluation framework that can be used to develop and assess future interventions for novice DIY camper builders.

- DIY Domain

The thesis identifies a gap between the abundance of DIY knowledge and users’ ability to apply that knowledge to their own situation. It demonstrates that the next step in supporting DIY may not be to create more instructions, but to create environments in which people can compare, experiment, and build their own judgement. The user journey and thematic analysis also provide a standalone synthesis of the DIY camper conversion process that may support future research and practice.

Limitations

Several limitations should be weighed when interpreting these results.

The usability test was small and exploratory: four sessions, five participants, all recruited from within TU Delft, an uneven experience and gender split, no control condition (e.g., a second paper-only iteration) to isolate the effect of physical prototyping from simply spending more time on the task, and a facilitator who was also the concept's designer, which the transcripts show occasionally shaped how the concept was explained to confused participants (section 4.3.9). Confidence was assessed only through retrospective interviews rather than a measured before/after comparison, so claims about *insight* and *layout change* are better supported than claims about *increased confidence*.

The final workshop structure, peer-feedback activities, documentation method, aftercare, and six-hour duration have also not yet been tested as one complete experience. A subsequent study should evaluate the full workshop with participants who own vans and are actively preparing a conversion. It should examine whether participants can create and compare multiple layouts within one day, whether the final documentation can be used during construction, and whether insights remain useful over time. A longitudinal evaluation could follow participants into the actual build and assess which workshop decisions were retained, revised, or abandoned.

Finally, the feasibility of the concept as a service remains uncertain. The estimated price of approximately €200 is based on comparable courses rather than validated willingness to pay. The costs of the workspace, staffing, insurance, storage, transport, maintenance, and replacement of the modules still require investigation. These questions are relevant because accessibility is central to the concept: a workshop intended to lower the threshold to DIY conversion should not introduce a new financial barrier.

5.3.3 Conclusion

The research question introduced in section 1.2 asked how DIY-ers currently design and build their campervans and what support they have. The findings show that DIY camper conversion is an iterative and highly personal process. DIY-ers use online information, communities, examples, courses, companies, and their own growing experience to progress through the project. However, existing support is strongest in providing inspiration, technical information, execution assistance, or predefined solutions. Less support is available for the early stage in which novice DIY-ers must translate personal requirements and fragmented information into a coherent spatial design.

This led to the project goal: How can a system support novice DIY camper converters in designing their camper interior, while also enabling them to share insights from their own design outcome with other DIY-ers in a structured and meaningful way?

This project answers the question through VanPlan. VanPlan is a structured, full-scale mock-up workshop in which DIY-ers use adjustable modules and realistically sized technical components to build, inhabit, compare, and refine layout alternatives inside their own van. Personal requirements guide the process, while examples, ergonomic information, peer feedback, and facilitator support are available without determining the final design. Participants leave with a tested layout direction, documented dimensions, an understanding of the compromises they made, and a clearer set of next steps.

The second half of the original question, enabling DIY-ers to share the reasoning behind their design outcomes with each other in a structured way, is answered more lightly, through the workshop's presentation-and-feedback phase and published module plans rather than through a dedicated structured platform. This part of the project goal remains an open direction rather than a fully developed solution.

The project has most clearly shown the value of physical comparison and experimentation before permanent construction. It has not yet demonstrated that the complete workshop can be delivered within six hours, that it increases confidence, or that it is financially viable as a service. VanPlan should therefore be understood as an evidence-informed and partly tested design direction rather than a fully validated service.

Taken together, the project supports my personal ambition stated in Section 1.3.2: to approach DIY campervan conversion through complexity, coherence, and trade-offs, and to give beginning DIY-ers more overview and agency in their own design process without removing the autonomy that motivates DIY-ing in the first place.

5.3.4 Personal Reflection

This project suited me well, in part because it let me return to a journey I had already lived through myself. It was never entirely an abstract design brief; it was a chance to examine what I would have wanted available to me at the start of that process.

During and after my own conversion, I found myself wondering how I would have approached it differently if I had looked at it through the lens of a designer rather than just a DIY-er: it was my first big project, with a lot of stakes. This made it that I was mostly focused on making it work than choosing the most optimal solution. Interviews, questionnaires, tests, and feedback were needed to find out if my experience was shared by other DIY-ers, or whether it was simply specific to my own situation.

Alongside that shift in perspective, I think I grew as a designer in more concrete ways too. I picked up new skills such as rendering, improved my 3D-modelling, and got noticeably better at expanding on my own ideas and putting them down clearly on paper rather than leaving most of the reasoning in my head. I also learned a great deal about woodworking itself, and about working with machines such as the domino machine and the router table. Testing reinforced all of this from a different angle: it reminded me, again, how important it is to plan tests early enough that their outcome can still actually be used.

My most persistent misjudgement came from the same place as most of that growth: my own vision as a fairly technically minded designer, and my instinct to assume that process would be just as legible to another DIY-er as it was to me. Subjects that felt self-explanatory to me turned out to be considerably harder for others, and being surrounded by like-minded, technically fluent students at IDE only reinforced that blind spot rather than correcting it. Testing showed this assumption to be wrong in a very concrete way: participants consistently refined whatever they had built first, rather than constructing something genuinely different to compare it against. The possibility alone does not function as instruction. I had implicitly treated an available behaviour as an expected one. Recognising this shaped one of the more consequential decisions in the final concept.

On the other side of that, I genuinely enjoyed working on a subject I could let my own inspiration loose on, and have been doing so for well over a year now. It has been interesting to see how others have tackled this same problem, what solutions already exist to help DIY-ers, and where VanPlan ends up sitting alongside them. This project gave real room to both my creativity and my need to work with my hands, and I am grateful it did.

There were moments, particularly toward the end of the project, where I wished I could return to the kick-off meeting with everything I now understand about what other users would want, need, and actually do. With that knowledge in hand from the start, I could have spent my time perfecting the execution rather than searching so long for the right answer. I do not think that wish is evidence the project fell short. If anything, it is closer to the opposite: It reflects how much was learned along the way, learning that could only have come from doing the project in the order it actually happened. Restarting would not resolve this; it would simply introduce a different set of misjudgements, made with just as much confidence as the first set.

What I am ultimately satisfied with is not that VanPlan is complete, but that it is a concept I (and, I believe, others) would genuinely want to use during a first conversion. Looking back on the project as a whole, I am proud of what it became: if VanPlan had existed while I was designing my own van, I think the campervan I have now would have turned out better than it did.



Figure 5.17 Author with his campervan

5.3.5 AI Acknowledgement

ChatGPT 5.5 played a supporting role throughout the development of this thesis. Initially, it served as a brainstorming tool to generate ideas and identify potential research gaps. Additionally, AI was utilized to create search queries for Google Scholar. It generated a series of comprehensive and mutually exclusive, collectively exhaustive (MECE) search queries, incorporating strategic wildcards as instructed.

AI also assisted in restructuring the text within the literature review. After manually extracting relevant information from the sources, ChatGPT 5.5 helped organize and present the collected insights into a coherent results section. I then carefully reviewed and rewrote the results to ensure they accurately reflected my perspective.

Throughout the research and design process, ChatGPT also functioned as a sparring partner. It was used to explore alternative perspectives, challenge assumptions, identify gaps in reasoning, and help elaborate ideas. These suggestions were treated as input for reflection rather than as research evidence or final design decisions.

Finally, AI was employed for proofreading and providing suggestions for enhancing the manually written text. Sections of the text were submitted to ChatGPT 5.5, which offered concrete suggestions for improvement. Once the suggestions were accepted, the sections were adjusted and refined by the author to ensure they truly represented their viewpoint.

All visuals without a source reference were created by the author, except for the supporting visuals illustrating the themes in Section 3.1.3, which were generated using AI.

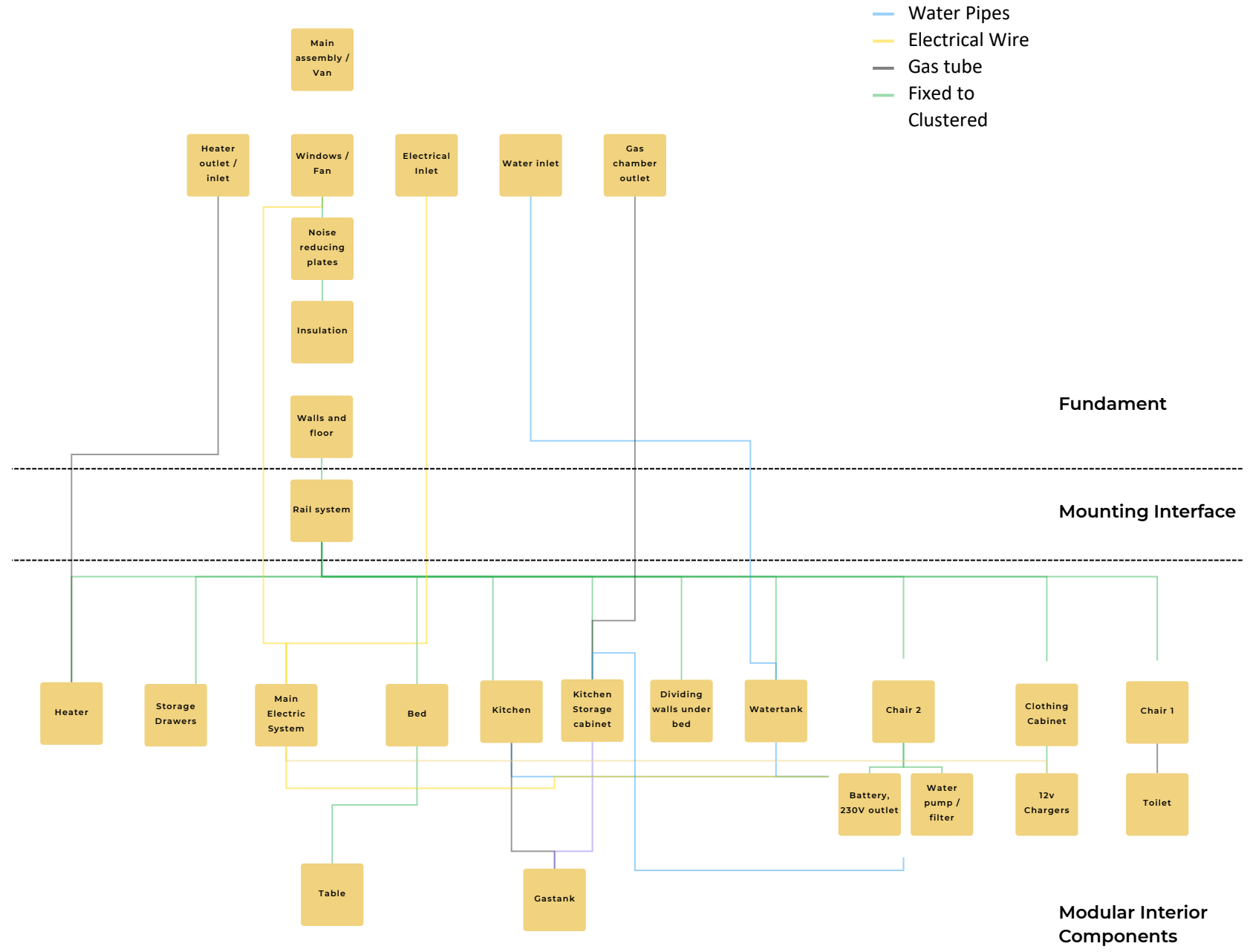
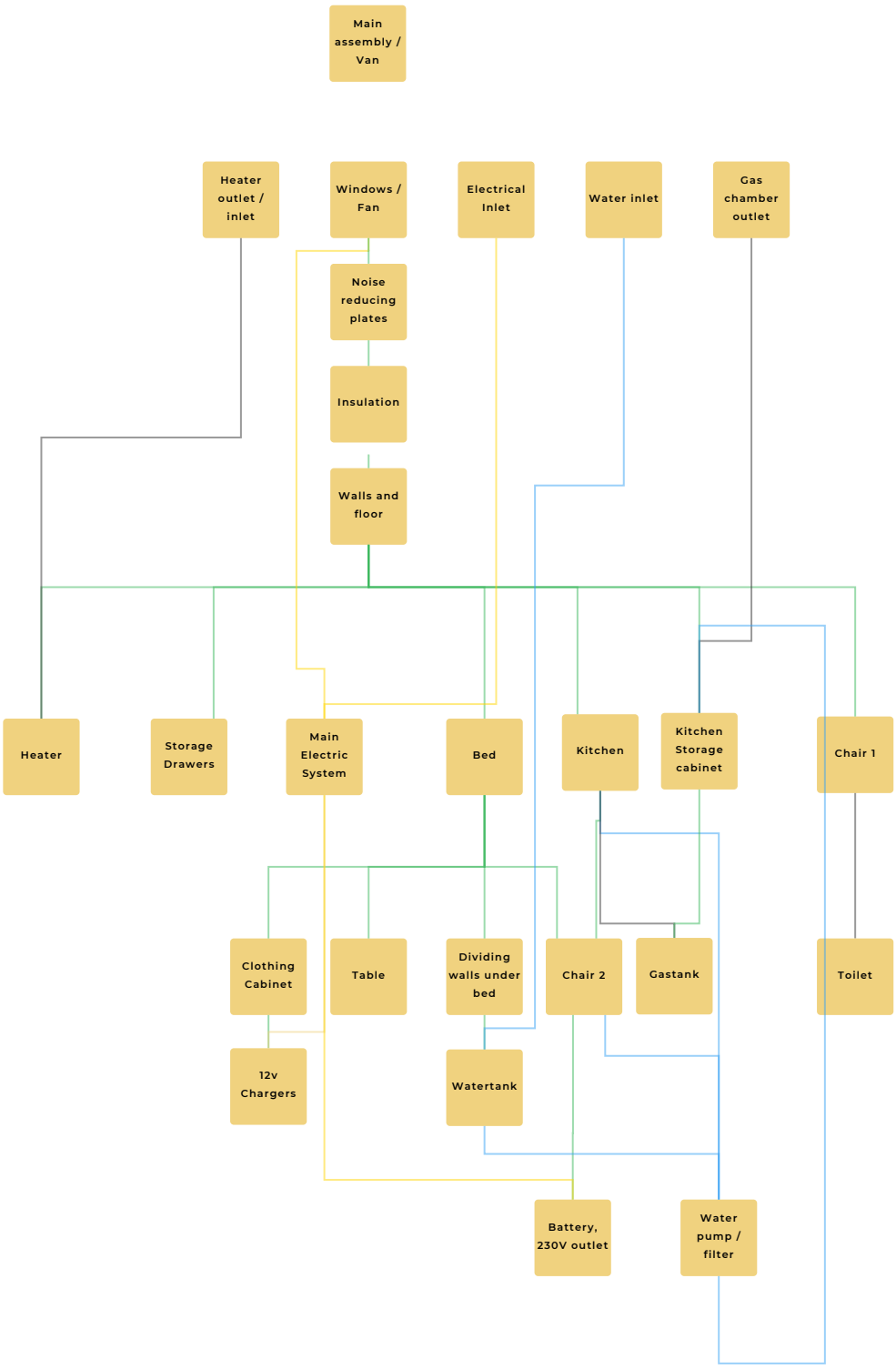
AI-generated output was not treated as a source of evidence. The author remained responsible for the research process, source verification, analysis, design decisions, and final content of this thesis.

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APPENDIX A



- Water Pipes
- Electrical Wire
- Gas tube
- Fixed to Clustered

Fundament

Mounting Interface

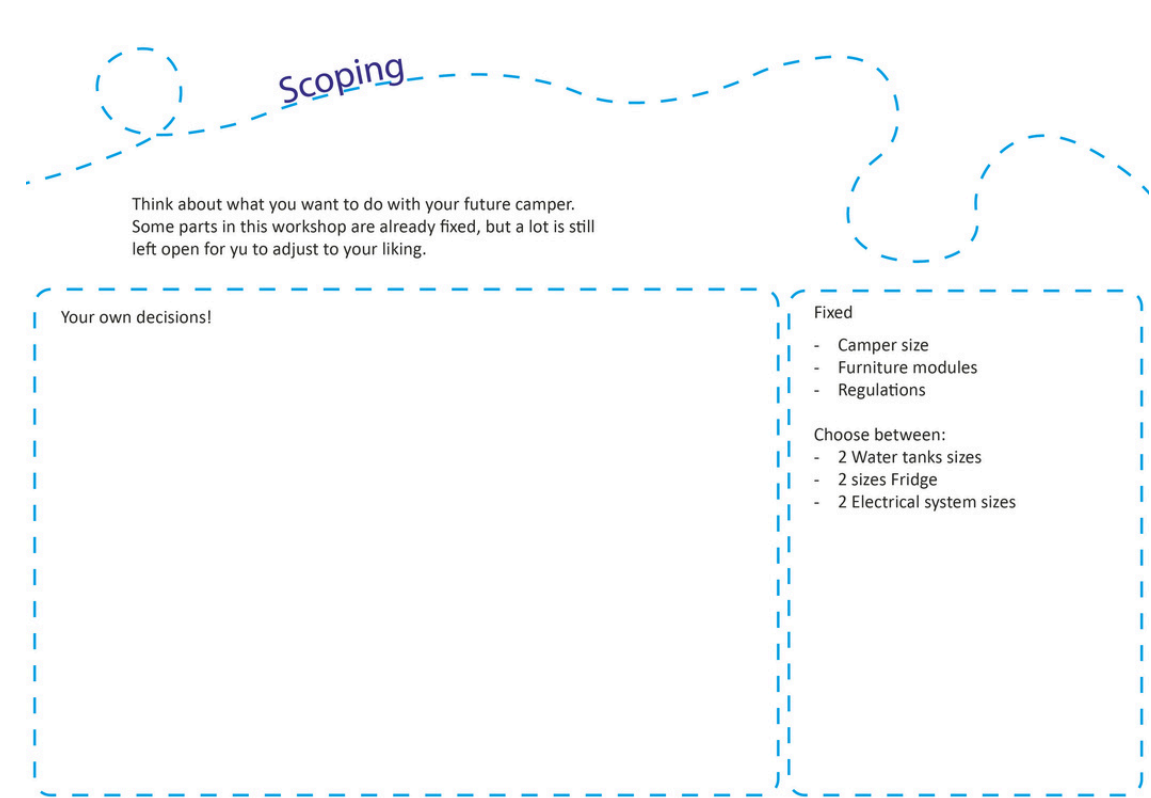
Modular Interior Components

APPENDIX B

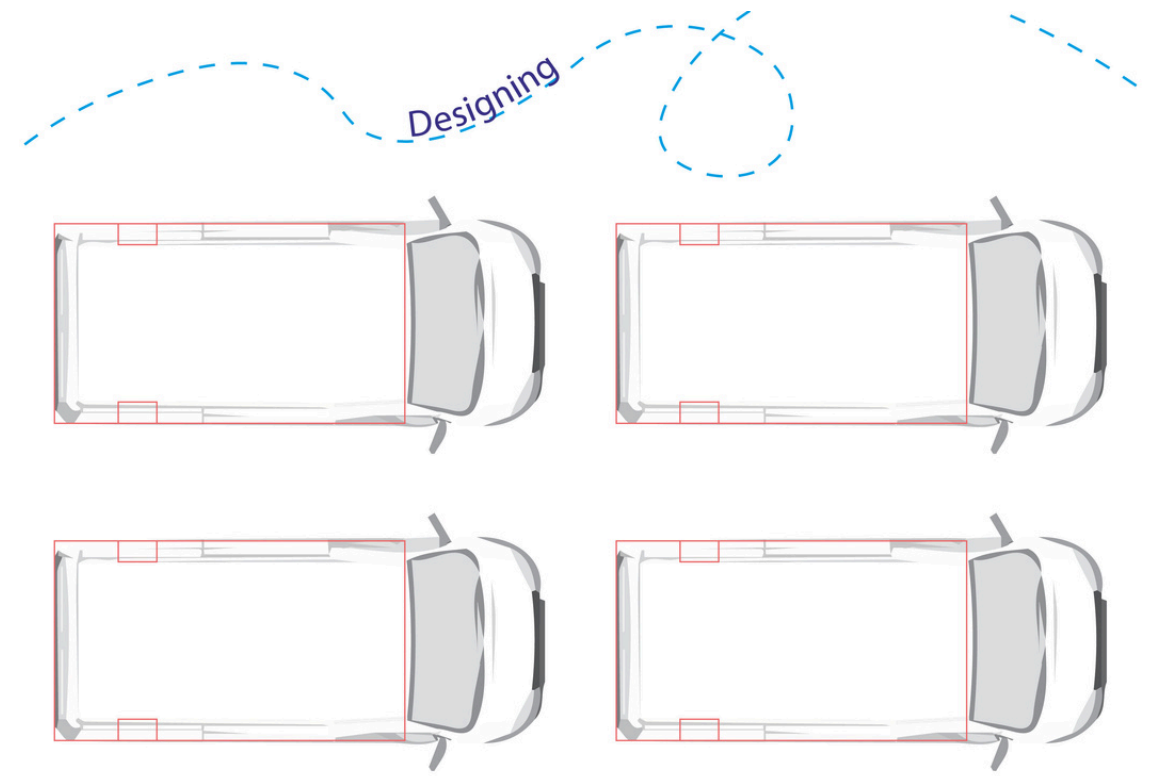
TIME	PHASE	GOAL	ACTIVITIES	QUESTIONS	METHOD	OUTCOMES USER	TOOLS NEEDED	MEASURED RESULTS	REQUIREMENTS TESTED
5 min	Introduction	Create shared understanding of the workshop and camper interior design challenge	• Introduction in campervan designing • Introduce goal of workshop • Show example campers / companies / results • Describe general flow of workshop & outcomes	• What do you need to think about during campervan interior designing? • What is a 'successful' camper interior? • What is your experience with campervan interior designing? • What are my travel habits / What is the goal of my interior?	• Short presentation • Visual examples	• Create a shared understanding of the interior • Participants understand design challenge	• Presentation slides • Example camper layouts	• Goal of the workshop is clear • Know where to start	
10 min	Scoping	Translate personal travel habits into design criteria	• Define personal travel profile • Identify needs, wants and constraints • Define scope of the interior design • Explore available material	• How do you want to travel with your camper • What is in the scope of this design assignment? • What is needed of the camper to suit my travel needs?	• Individual preference sheet • Short reflection • Prioritising with post-its	• Personal lifestyle profile • Design criteria list	• Preference sheet • Post-its & Pens • Example layouts including preference sheets?	• Participant is able to note travel habits • Participant is able to differentiate needs and wants.	
15 min	First Interior Layout	Create a first spatial concept before testing it physically	• Design first camper layout (2D or 3D drawing) • Think of daily routines, and living habits • Recreate design in mock-up area • Simulate living habits and routines • Identify possible spatial conflicts	• Which functions are conflicting with each other? • What should be explored further? • How does this suit my travel profile	• Layout sketching • Individual design work with short guidance	• A test personalized layout concept • Better understanding of spatial trade-offs • Increased confidence in design decisions	• Layout template. • Module cards / templates • Pens	• Is able to translate needs & wants to a interior • Is able to translate examples to their own design.	4.The intervention must help users translate personal needs into concrete spatial decisions.
15 min	Mock-up testing	Experience the layout on full scale and discover issues / improvements	• Recreate design in mock-up area • Simulate living habits and routines • Observe what works and what feels difficult • Take photos / notes of test setup	• Can I logically move through the camper • Does this space feel open or full • What did I discover by testing full-scale?	• Full-Scale mock-up • Scenario testing • Observation through use	• Full-scale mock-up setup • Better understanding of spatial trade-offs • Observed problems in the layout • Photos / notes of tested layout	• Interior Modules • Mock-up area • Mock-up / prototype materials • Photos / Drawings of final design	• The tool is accessible in use. • Given modules are sufficient for designing an interior.	4.The intervention must help users translate personal needs into concrete spatial decisions. 6.The intervention must stimulate new insights through experimentation,
20 min	Iterate	Improve the design based on experience and trade-offs	• Adjust layout based on mock-up test • Try-out different layouts • Finalize design by drawing and filling in template	• What problem am I trying to solve with this change? • Which function is more important for my use? • Does this still fit my original preferences, or need they to be altered?	• Move-test-reflect cycle • Peer feedback	• Improved personalized layout concept • Revised drawing / template • Understood design compromise • Increased confidence in design decisions	• Interior Modules • Mock-up area • Mock-up / prototype materials • Photos / Drawings of final design	• New insights are obtained while using the tool. • Different layouts are compared, and outcome is used in final design.	3.The intervention must make the consequences of their decisions clear to the user. 8.The intervention should support iterative design.
10 min	Evaluate	Validate the design direction	• Present final concept • Explain design choices • Reflect on priorities and compromises • Fill in evaluation form about workshop	• How does this layout support your needs? • Which design choices are most important • What is uncertain / should be explored further? • How did the mock-up influence your design?	• Short presentation / exchange • Evaluation checklist • Method evaluation	• Validated interior design (direction) • Finalized layout concept • List of uncertainties	• Evaluation checklist • Feedback form	• User experience more confidence after using the mock-up tool. • User feels autonomous while using the design tool.	1.The intervention must preserve the autonomy of the DIY-er. 2.The intervention contributes to confidence of DIY-ers in their own layout 5.The intervention must be accessible and usable for novice DIY-ers.

Complete overview of test phases

APPENDIX C



Paper during Scoping phase



Paper during Designing Phase

APPENDIX D

For this preliminary calculation, the declared properties of a comparable 11–20 mm poplar plywood product were used as representative values (Declaration of Performance, 2026). These values do not certify the strength of the specific plywood used in the prototype.

Assumptions

- 12 mm plywood
- User weighing 100 kg:
 - $F=100 \cdot 9.81=981$ N

Safety factor for dynamic situations:

- $P \approx 2 \cdot 981 \approx 2,000$ N

The calculation assumes that a 400 mm-wide section of plywood helps carry the load. Seven Ø6.5 mm holes cross the most unfavourable section:

$$\text{Width}(\text{net}) = 400 - (7 \cdot 6.5\text{mm}) = 354.5\text{mm}$$

Point load at midspan

Support on two opposite sides

- Modulus of elasticity: $E=4,051$ N/mm²
- Characteristic bending strength: 24.6 N/mm²

Calculating the resistance and stiffness

For a 12 mm-thick rectangular section:

- $W = \text{width} \cdot h^2 / 6 = 354.5 \cdot 12^2 / 6 = 8,508\text{mm}^3$
- $I = \text{width} \cdot h^3 / 12 = 354.5 \cdot 12^3 / 12 = 51,048\text{mm}^4$

The section modulus W describes how well the panel resists bending stress. The second moment of area I describes how resistant the panel is to deflection.

The maximum bending moment caused by a central load is:

- $M(\text{max}) = PL / 4 = 2000 \cdot 400 / 4 = 200000\text{Nmm}$

Resulting bending stress is:

- $\sigma = M(\text{max}) / W = 200000 / 8,508 = 23,5\text{N/mm}^2$

Datasheet gave a characteristic bending strength of 24.6 N/mm². The calculated stress at 400 mm is therefore already very close to this value.

Predicted deflection would be:

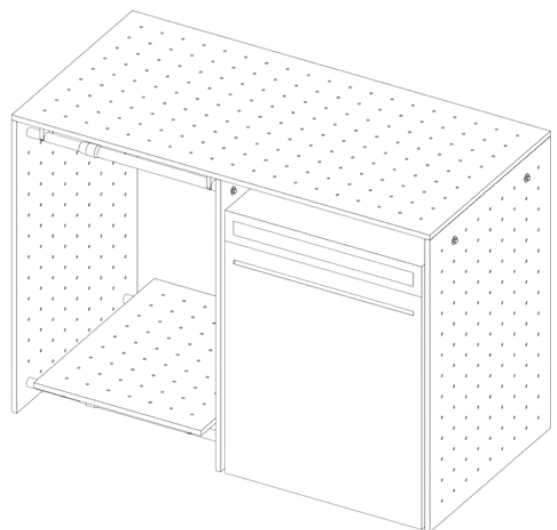
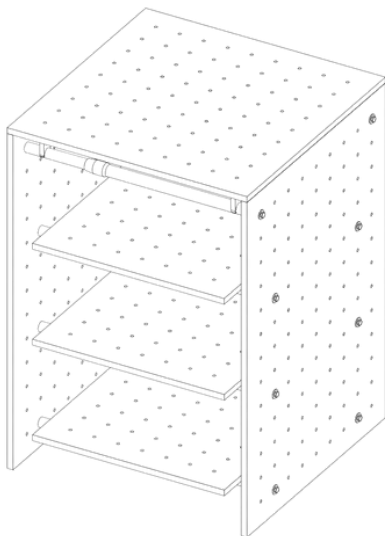
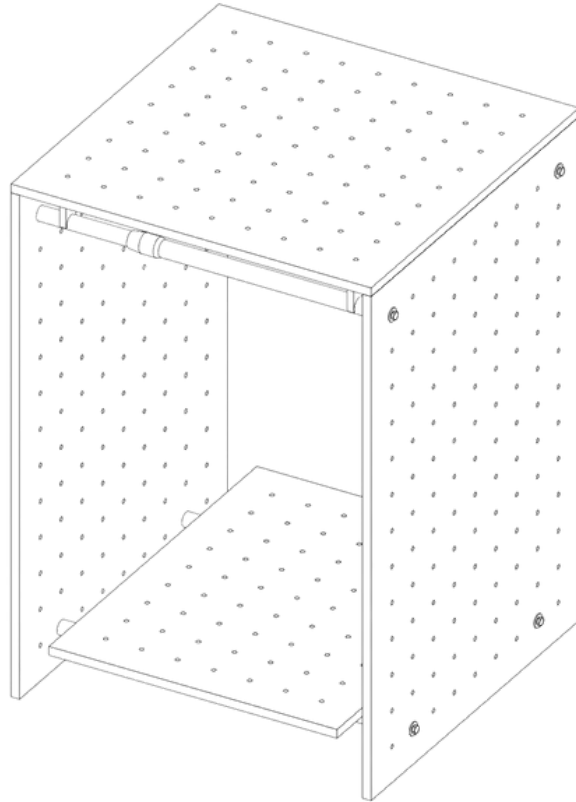
- $\delta = (PL^3) / (48EI) = (2000 \cdot 400^3) / (48 \cdot 4,051 \cdot 51,048) = 12.9$ mm

The characteristic bending strength would be reached at approximately:

- $L(\text{limit}) = (4fW) / P = (4 \cdot 24.6 \cdot 8,508) / 2,000 \approx 419$ mm

APPENDIX E

Kitchen module manual



Ergonomic Starting Points

This page provides quick ergonomic starting points for configuring the modules. These values support the mock-up and should not be interpreted as final construction requirements.

WARNING: *Always follow the appliance manual and applicable gas, electrical and ventilation regulations.*

Before building

- Measure from the expected finished floor while wearing normal footwear.
- Round the starting height to the nearest 50 mm grid position.
- Test at least a position higher and lower with all intended users.

Worktop and cooking (Maguire et al., 2014)

- Food preparation: start 100–150 mm below standing elbow height.
- Include the height of cutting boards, appliances and pans.
- Check that users can see, stir and lift without raised shoulders or continuous bending.

Drawers and storage (CCOHS, 2018)

- Store frequently used items between knuckle and elbow height.
- Store heavy items close to waist height.
- Use lower and upper compartments for light or infrequently used items.
- Check that open drawers remain accessible without blocking the aisle.

Refrigerator (Thetford, 2025)

- Position the handle and frequently used shelves between waist and shoulder height.
- Keep heavy bottles and containers in the lower or middle section.
- Test the door swing, aisle clearance and maintenance access.
- Include the ventilation and installation clearances specified for the selected model.

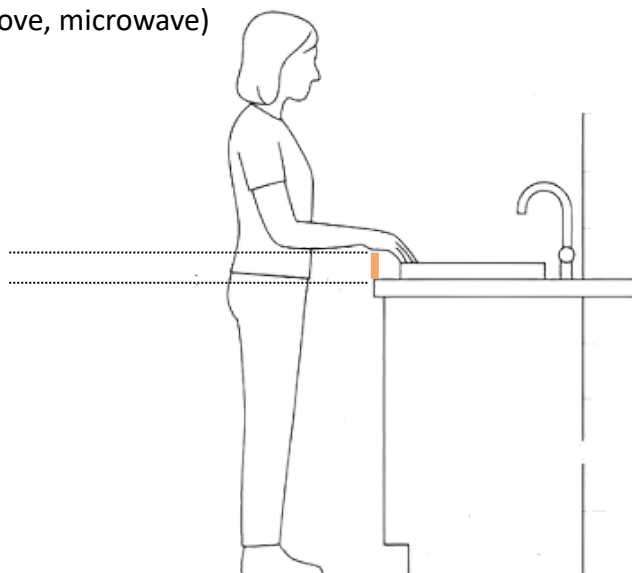
Legal Requirements (for tax reduction in the Netherlands)

These requirements are mandated by the RDW and Belastingdienst to be eligible for tax reduction.

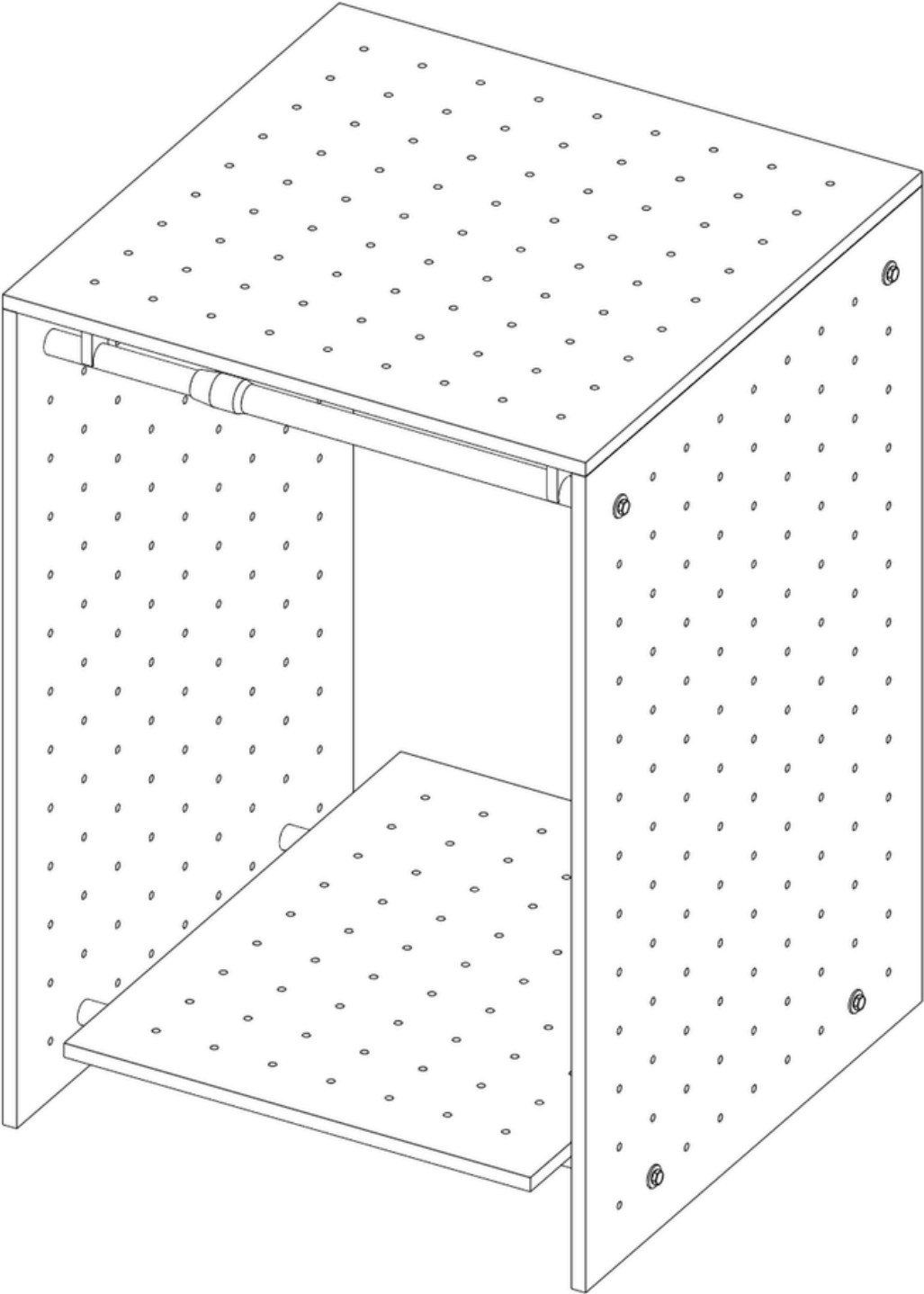
- A fixed kitchen unit with water supply and drainage
- A fixed cooking facility (gas stove, induction stove, microwave)

Starting point

100-150 mm



BASIC CABINET



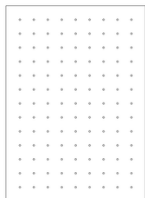
8x M6 20mm

8x M6

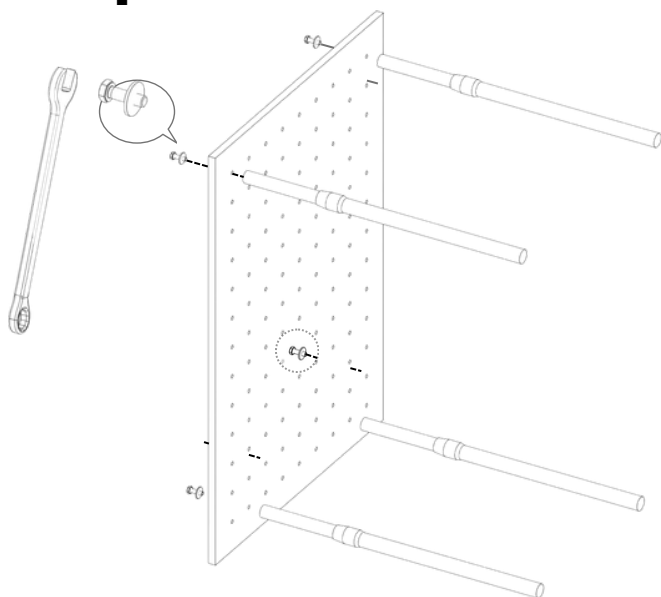
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4x

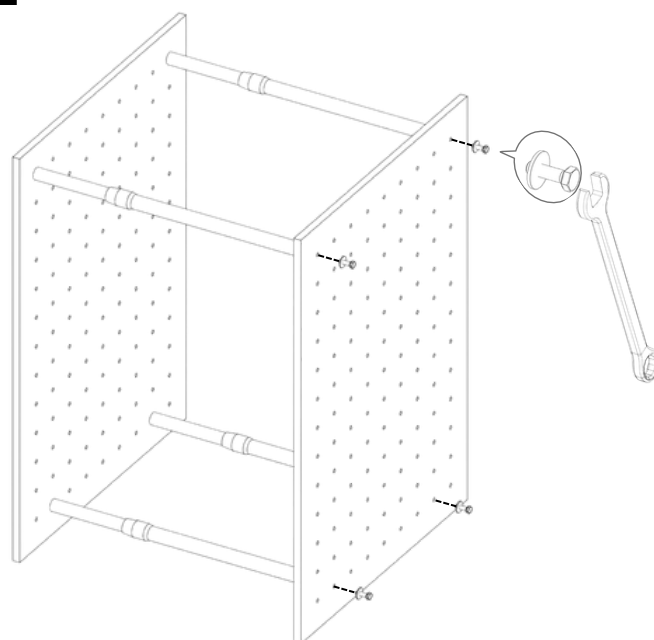
8x 35mm



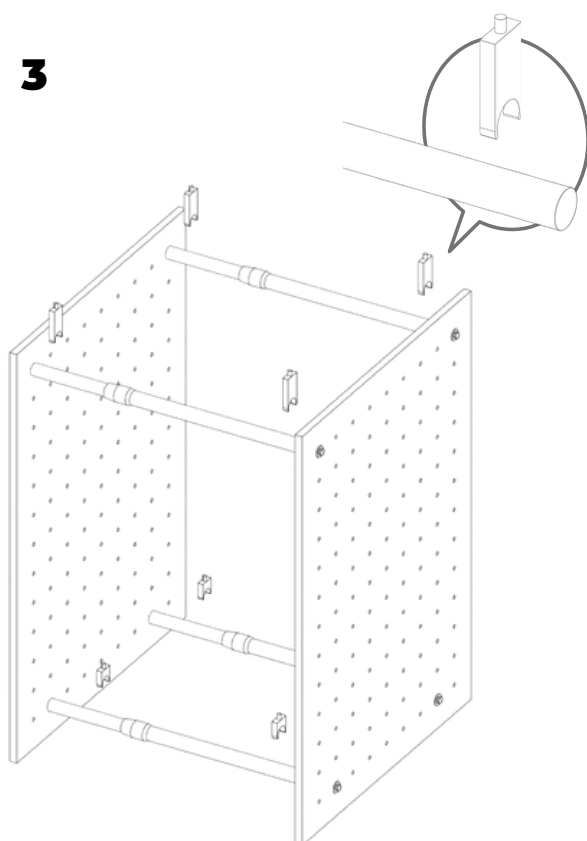
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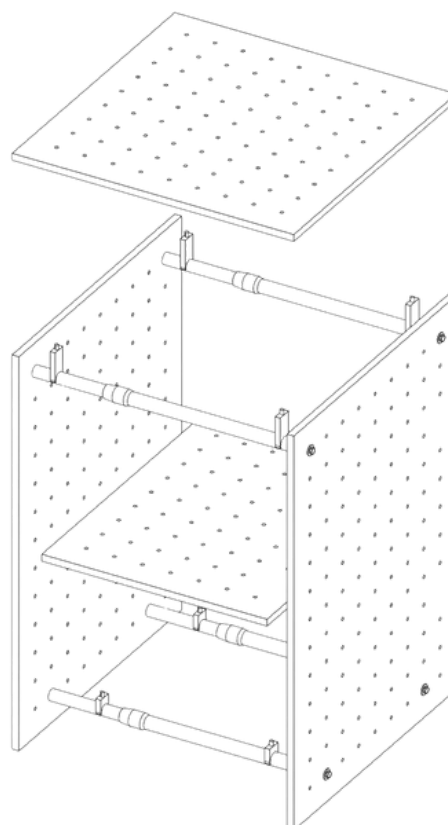
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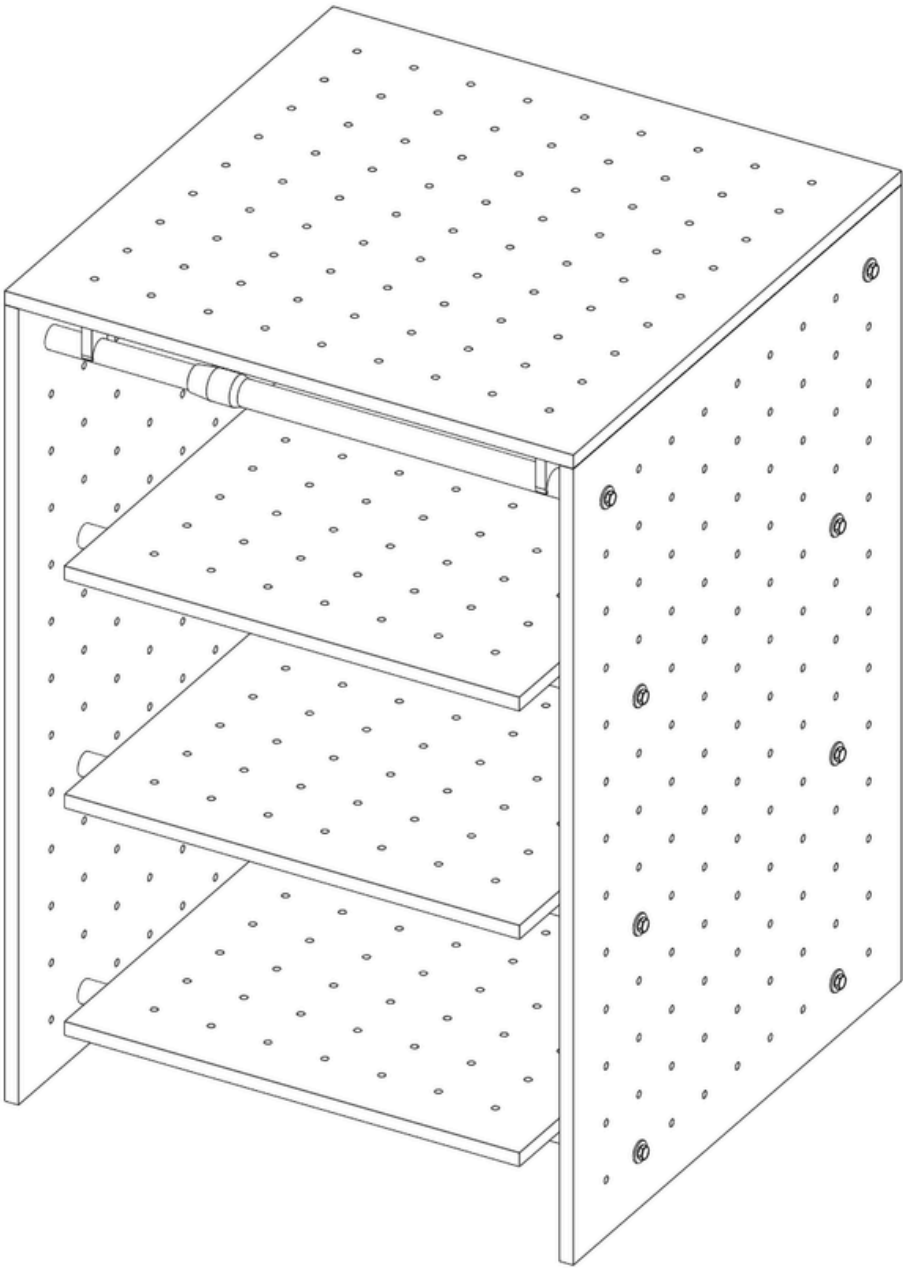
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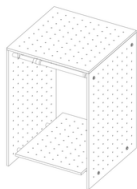
4



CABINET WITH 3 SHELVES



1x



8x M6 20mm



8x M6



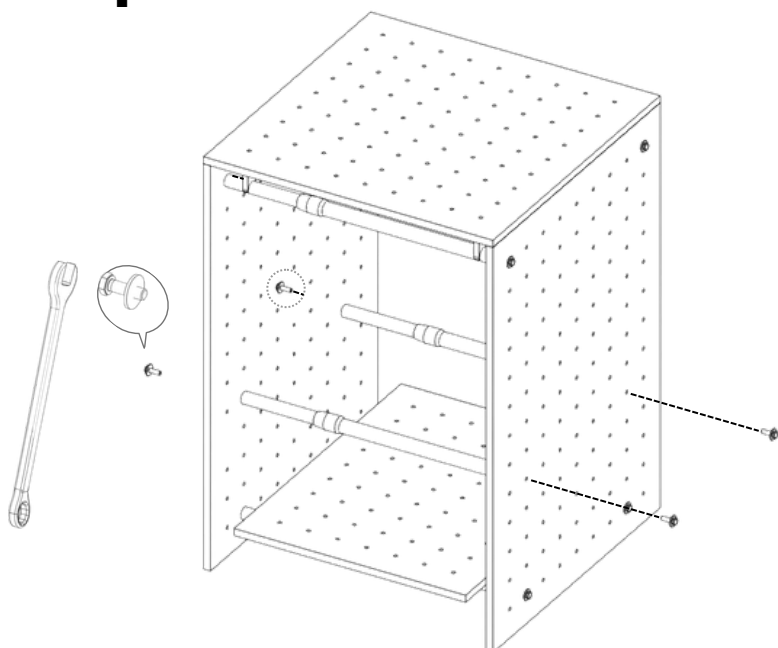
4x



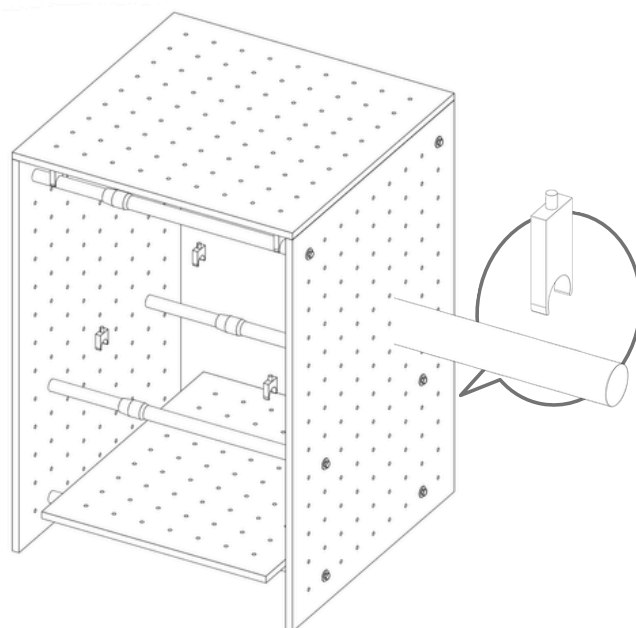
8x 15mm



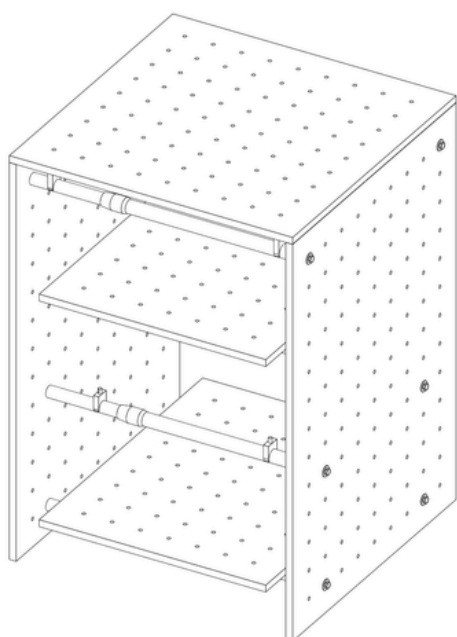
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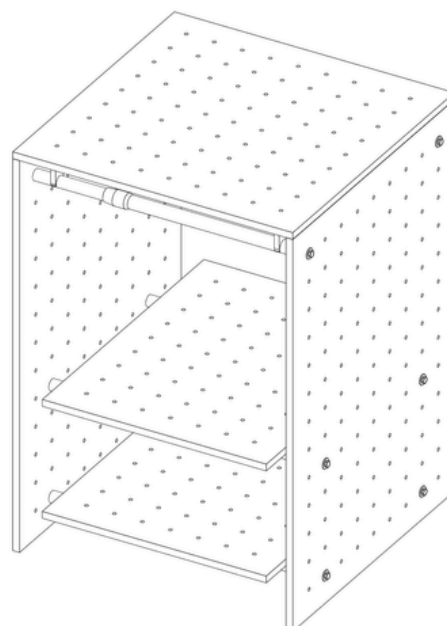
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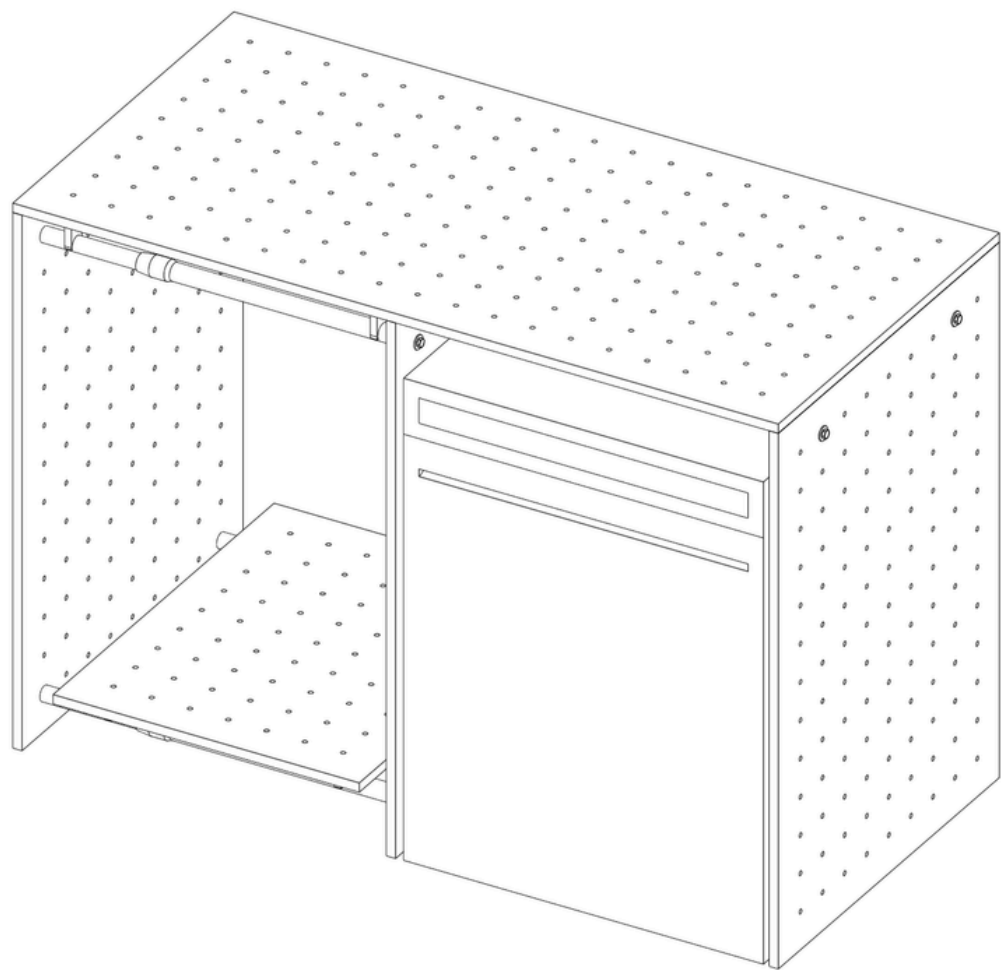
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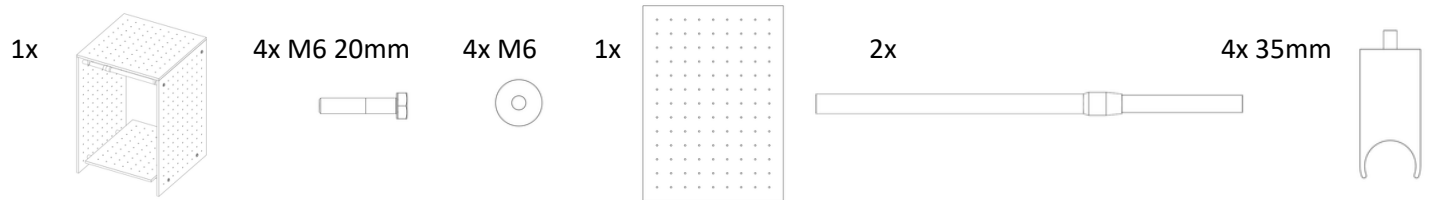


4 Repeat step 1-3, a few holes higher

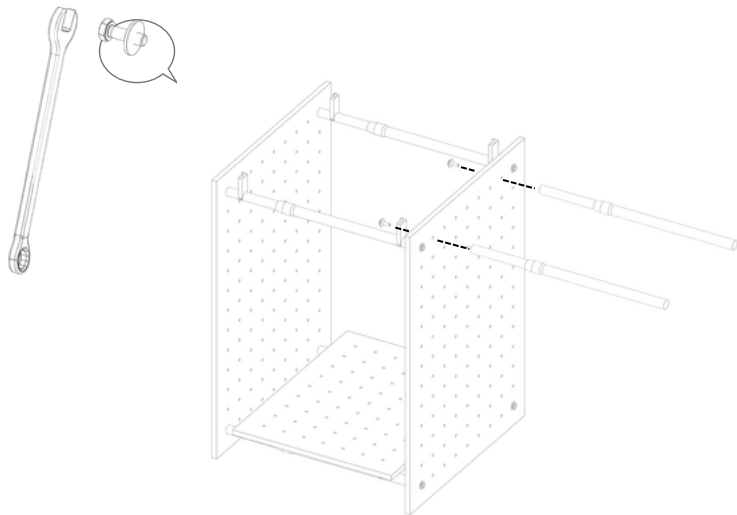


CABINET WITH FRIDGE

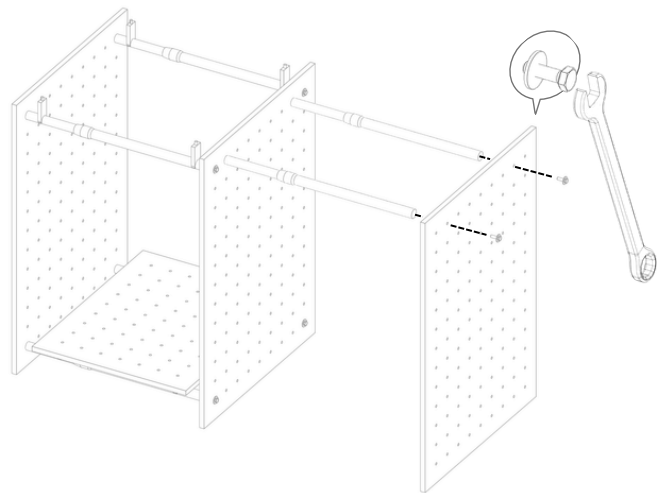




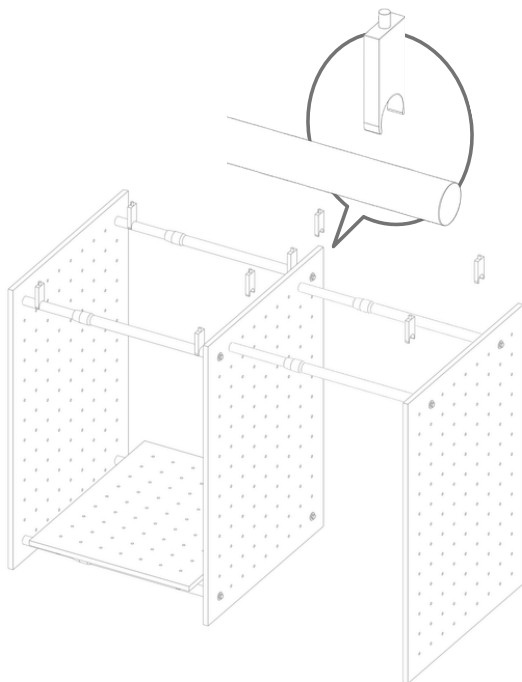
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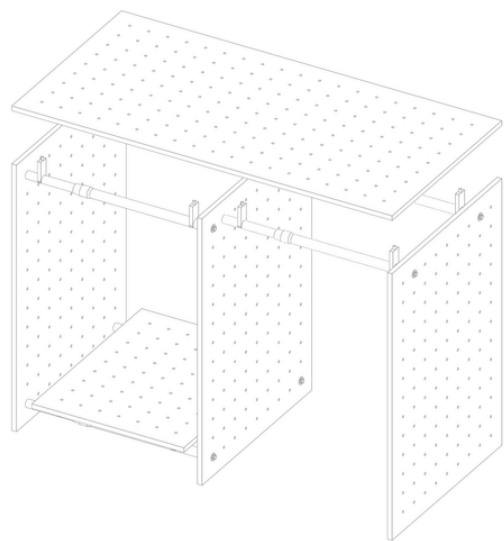
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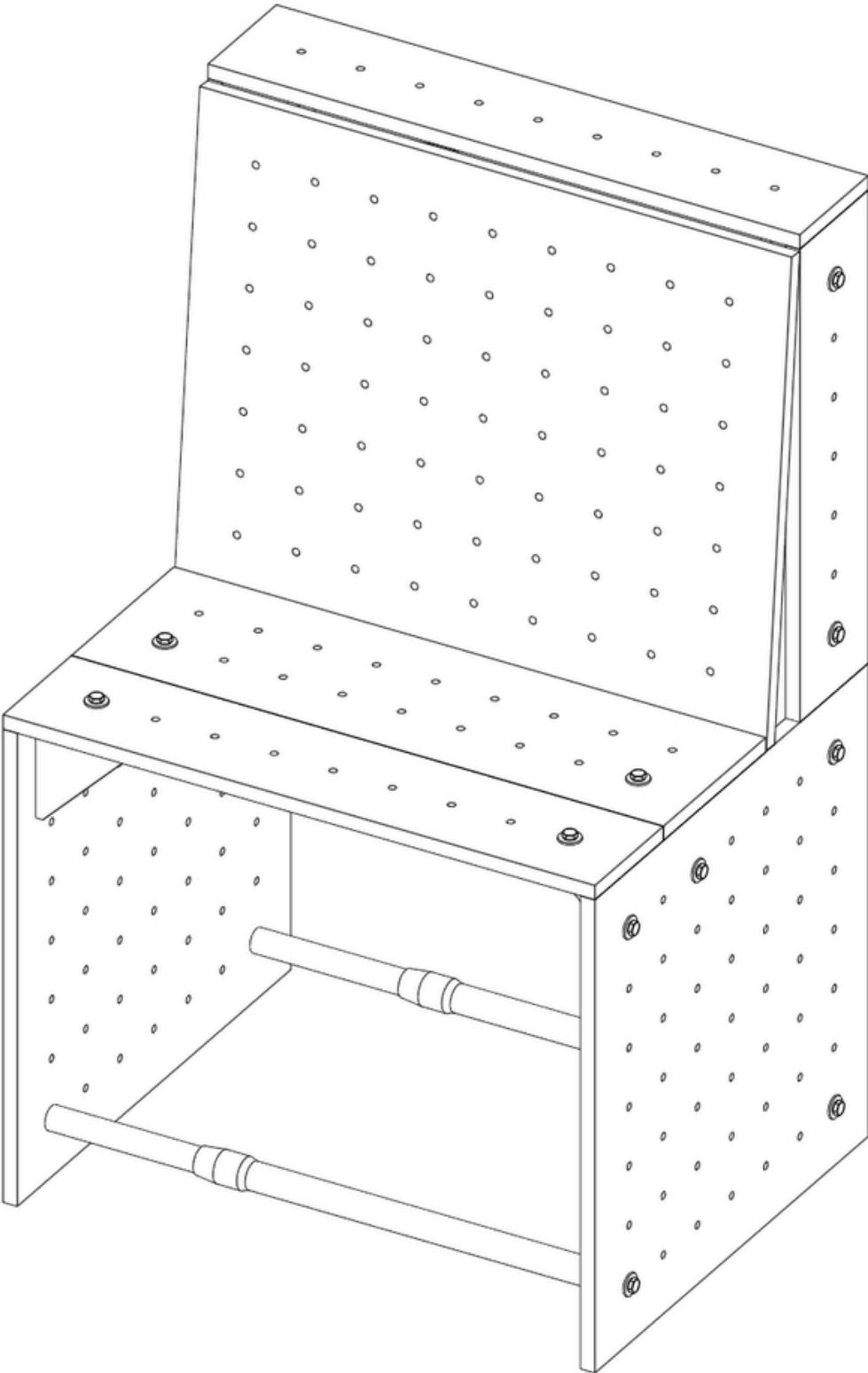
3



4



BASIC CHAIR



Ergonomic Starting Points

Here is a quick ergonomic cheatsheet for finding a comfortable starting point for seating. These values are starting points for the mock-up, not final construction requirements.

Seat dimensions (Sydor & Hitka, 2023)

- Start with a seat height of 40–45 cm above the finished floor.
- Start with approximately 40 cm usable seat depth, measured to the front of the backrest.
- Allow at least approximately 45 cm clear width per adult.
- Leave approximately 30–50 mm, or three fingers, between the seat edge and the back of the knees.

Backrest and comfort (Sydor & Hitka, 2023)

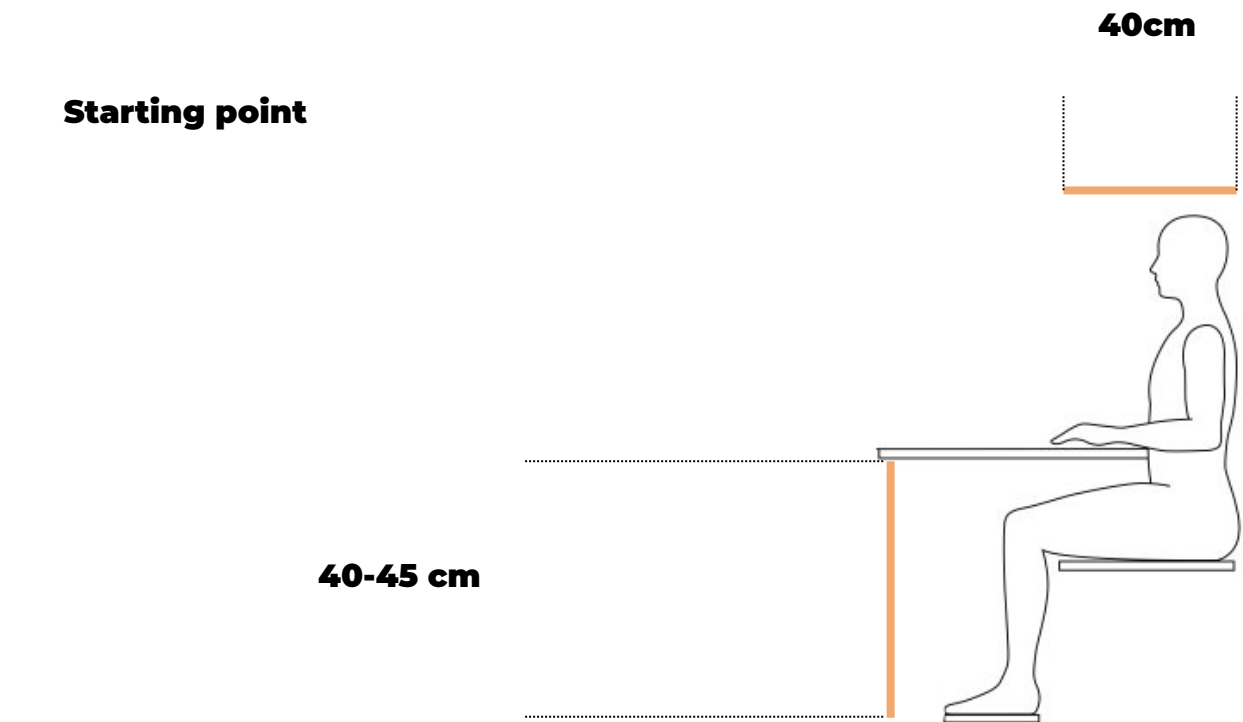
- Start with a slightly reclined backrest rather than a strict 90° corner.
- Use a rounded or cushioned front edge to prevent pressure behind the legs.
- Check that the cushion and backrest cannot slide during use.
- Test different activities; each activity may require a different posture.

Stability (Appendix D)

- Add additional support when the unsupported panel span is 40 cm or more.
- Check all connections, feet and supporting panels before sitting.
- Sit down carefully during testing; do not jump, rock or stand on the modules.

Important

- Seats, swivel bases, seatbelts and anchor points used while driving must meet applicable European and RDW requirements.
- Belastingdienst requires at least two fixed seats in a camper.



12x M6 20mm

20x M6

8x M6

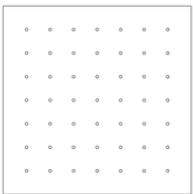
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2x

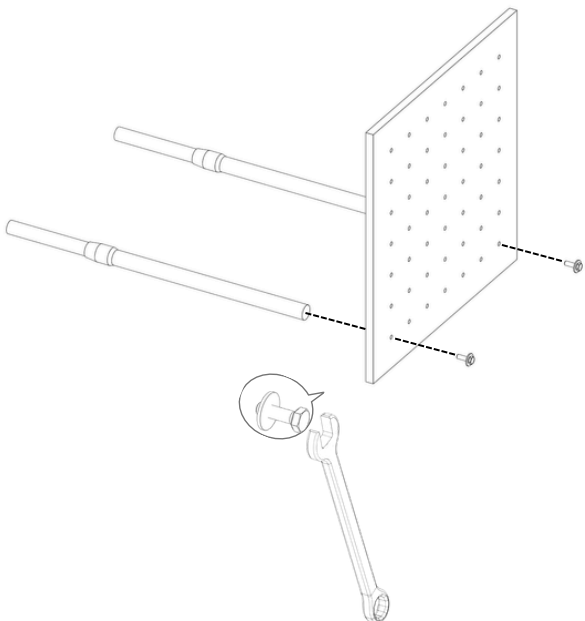
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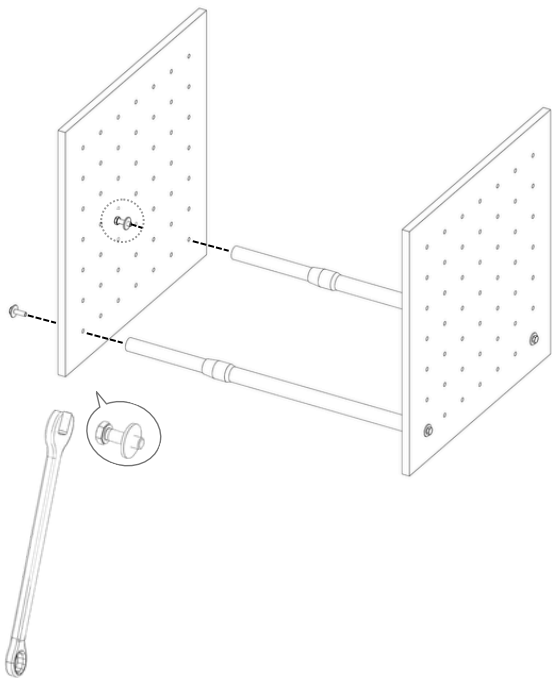
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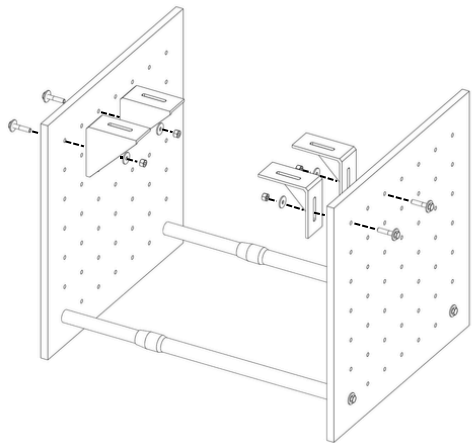
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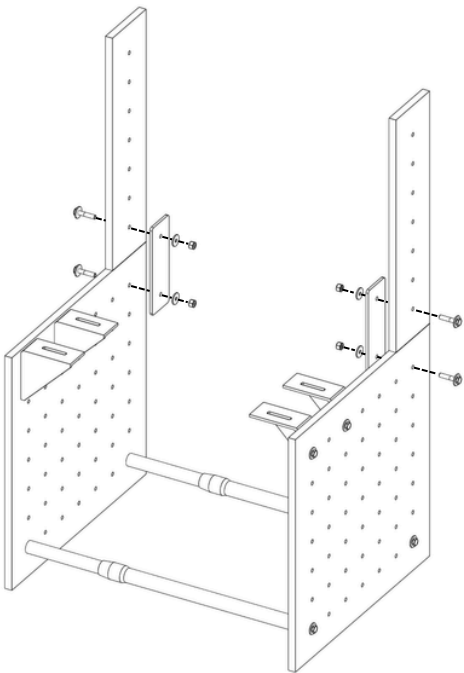
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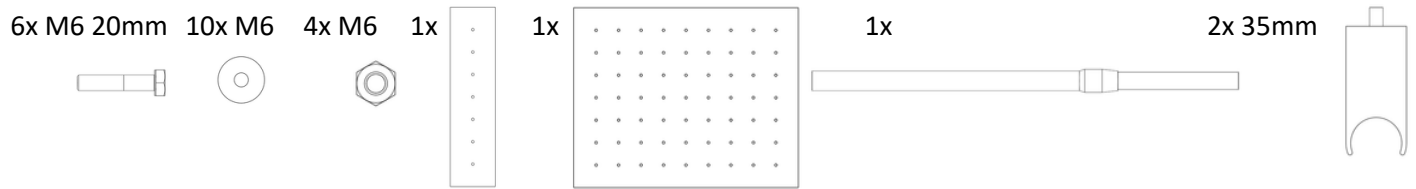


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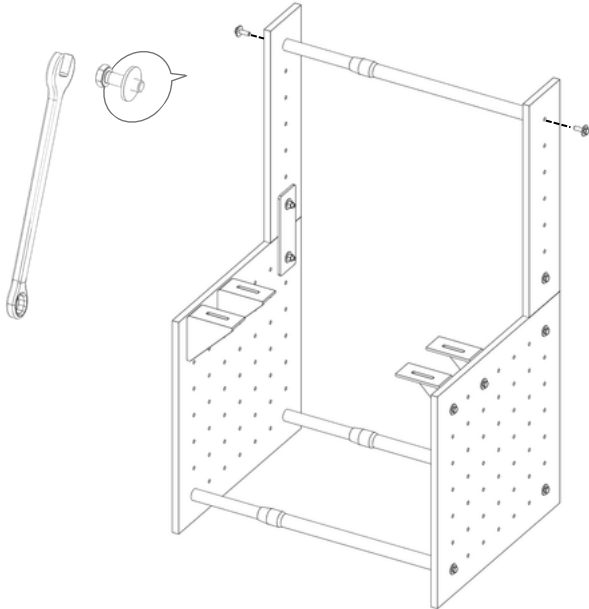


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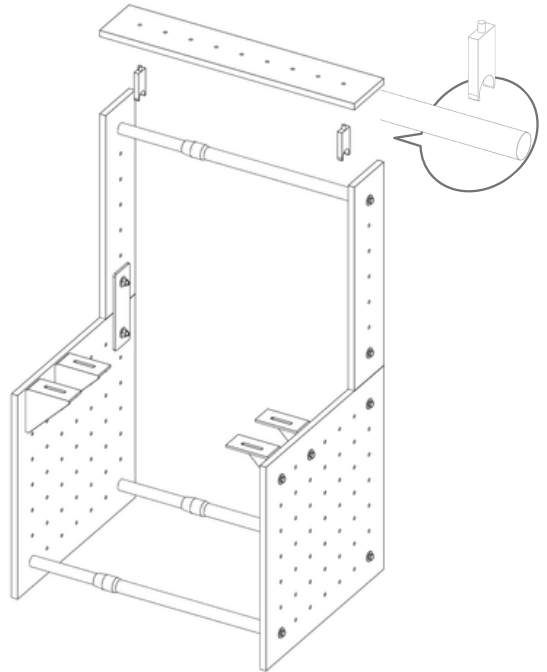




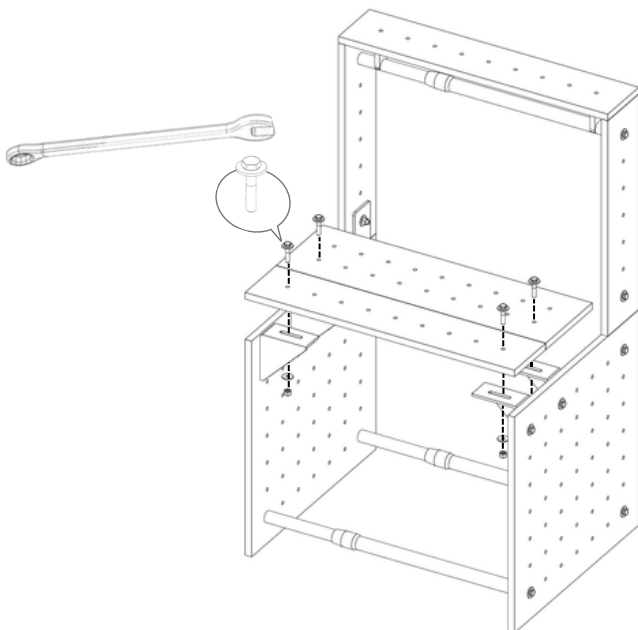
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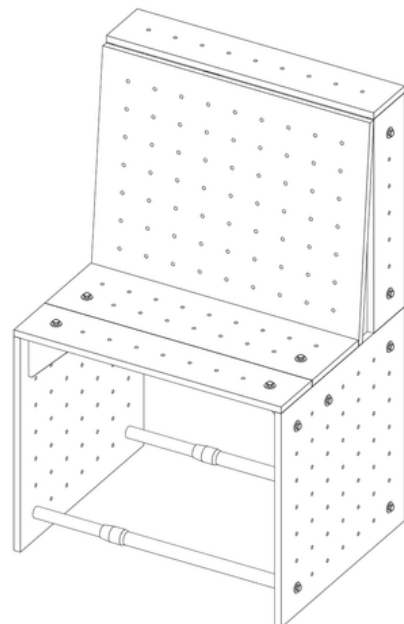
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7



8



APPENDIX F



Figure 1: Example of a Do-It-Yourself camper conversion.

DO-IT-YOURSELF CAMPER CONVERSION

Literature Review into Research-Backed Do-It-Yourself Camper Conversions

Kamiel

Abstract:

The increasing popularity of Do-It-Yourself (DIY) campervan conversions has brought renewed attention to compact living strategies and their relevance for self-built mobile interiors. This study examines to what extent the interior outcomes of DIY campervan conversions reflect theoretical principles from compact living, and how DIY makers approach the design and development of these interiors. A literature review on compact living, multifunctional furniture, prototyping, and DIY practices was combined with questionnaire data collected from DIY campervan builders. The results indicate that many campervan interiors align with compact living principles such as multifunctionality, spatial efficiency, and the prioritization of essential activities. However, these principles are seldom applied explicitly during the design process. Instead, DIY makers predominantly rely on iterative, experience-driven, and highly personalized design practices, often supported by informal tools and knowledge shared within DIY communities. This research contributes to the field by distinguishing between compact living principles as analytical frameworks for evaluating design outcomes and the experiential processes through which these outcomes are realized. By bridging compact living theory with empirical observations of DIY practices, the study highlights the importance of personalization and iteration in small-space design and points toward

opportunities for developing supportive, non-prescriptive design tools for DIY makers.

Keywords

Ergonomics, Human-Centered Design, Campervan Conversion, DIY Design, Compact Living

1. Introduction

The growing popularity of Do-It-Yourself (DIY) campervan conversions has renewed interest in compact living as a design domain in which everyday activities must be accommodated within extremely limited spatial boundaries. Campervan interiors typically require users to sleep, cook, eat, work, and relax within spaces that are often smaller than 8 m². As a result, the interior layout must accommodate diverse functional demands while remaining safe, comfortable, and intuitive.

Human-centred design and ergonomics offer a strong theoretical framework for understanding how people interact with small environments. Literature on the interior of small living spaces (tiny houses, micro-apartments) highlights the importance of multifunctional systems, visual ergonomics, and user-centred decision-making. Together, these studies offer a rich body of theoretical knowledge on how compact spaces can be designed to support daily life.

Despite the availability of ergonomic principles and design strategies for compact living, there is no clear evidence-based way to design campervan interiors. Most camper manufacturers promote with infinite interior options, which is a double edged sword. It gives the user a lot of freedom, but wrong choices can lead to regret or wasted opportunities. Existing interior research typically focuses on isolated aspects such as multifunctional furniture, storage optimisation, or clean aesthetic. They seldom combine these into a holistic, practical interior concept.

In addition, it remains unclear to what extent DIY campervan builders apply ergonomic and human-

centred design principles, and whether this occurs consciously or intuitively. User reports frequently describe dissatisfaction after building a campervan, often related to limited freedom of movement, inefficient layouts, or uncomfortable sleeping arrangements. Notably, many DIY converters continue to modify or rethink their interiors even shortly after completion, suggesting that current design practices struggle to anticipate real-world use and long-term user needs.

This highlights the need for research that investigates how DIY converters consider and apply established practices from small living interiors. This paper tries this by synthesizing literature on compact living and DIY design, and by contextualizing these insights using questionnaire data from DIY campervan builders. The focus of the study is not to evaluate individual campervans, but to use empirical observations to support and reflect upon patterns identified in the literature. The central research question guiding this review is:

To what extent do DIY campervan interiors reflect principles from compact living, and how do DIY makers approach the design and development of these interiors?

2. Method

This study follows a structured literature review methodology, supplemented by questionnaire data to contextualize and reflect upon findings from the literature. The method consists of three main phases: (1) literature search and selection, (2) thematic analysis of the literature, and (3) the use of questionnaire data as supporting empirical input.

2.1 Literature Search and Selection

A systematic literature search was conducted to identify publications related to compact living, multifunctional and transformable furniture, mobile interiors, prototyping, and DIY design practices. Google Scholar was used as the primary database due to its broad coverage of academic literature across design, architecture, ergonomics, and human-centred design. Search strings were generated using ChatGPT 5.2 and refined iteratively (see Appendix A). For each search string, the first 30 results were screened. To capture up-to-date information a search date range was set from 2010 to present day. Only English and Dutch sources were considered as these could be understood in its context by the author. An initial filtering was conducted based on titles and abstracts (n = 65), followed by forward and backward citation chaining using ResearchRabbit to identify additional relevant publications (n = 79). All these publications combined were subsequently screened based on their conclusions (n = 32). After reviewing the full papers, an additional papers were excluded due to their limited relevance to the final scope of the review (n=14).

2.2 Literature Analysis and Categorization

The selected literature was analyzed thematically to identify recurring principles and conceptual frameworks relevant to compact living and campervan interiors. These were used as themes to structure the Results section.

Each of the 14 papers was carefully reviewed using the Strip method developed by Stuckler (2021) to identify the central concepts. The review process started with an examination of the general structure, including headings, figures, and conclusions. This was followed by a focus on the key sections such as

the introduction, methodology, and results, and concluded with a thorough reading of the remaining parts of the papers (Stuckler, 2022).

2.3 Questionnaire Creation and Analysis

To complement the literature review and provide contextual insight into DIY campervan practices, a questionnaire was developed based on the themes identified in the literature. The questionnaire explored design approaches, use of tools, levels of planning and iteration, and the presence of compact living strategies in completed campervan interiors.

The questionnaire was distributed via two Dutch online platforms: camperforum.nl, a forum dedicated to campervan use and DIY conversions, and the Facebook group Zelfbouwcampers, a large community focused on self-built campervans. A total of 50 responses were collected. The questionnaire data were used to illustrate tendencies, validate patterns identified in the literature, and ground theoretical insights in real-world practice.

3. Results

This section presents an overview of the theoretical design principles of compact living, and the design principles and outcomes of DIY-ers converting their camper. The results are divided into two sections. First the design principles of compact living, and second the DIY camper conversion.

3.1.1 Compact Living Principles

Literature on compact living consistently emphasizes the optimization of limited space through ergonomic prioritization, functional overlap, and visual

openness (Hu, 2019; Shabanova, 2025; Gronostajska & Szczegielniak, 2021; Brischetto et al., 2019). Functional stacking and using the entire height of the space is also prevalent in the literature (Hu, 2019; Shabanova, 2025; Gronostajska & Szczegielniak, 2021). Minimizing visual clutter by creating extensive storage solutions and minimalistic design with few small details is also widely accepted (Hu, 2019; Shabanova, 2025; Gronostajska & Szczegielniak, 2021; Brischetto et al., 2019). Light colours and lots of natural daylight are also important in small spaces to perceive them as larger (Gronostajska & Szczegielniak, 2021; Shabanova, 2025; Hu, 2019, Mouamani et al., 2025).

3.1.2 Zoning

As in normal-sized living spaces, zoning is also needed in smaller living spaces. (Shabanova, 2025; Mouamani et al., 2025; Brischetto et al., 2019). Shabanova (2025) showcases zoning by creating small elevation changes. This supports the need for using the full height of the room. Brischetto et al. (2019) uses zoning in their camper design by clustering furniture that perform similar tasks. For example a 'wet zone' which includes the bathroom and the kitchen. Questionnaire results show that approximately half of the participants created some form of zoning in their campervan conversion, most commonly through physical elements such as partial walls separating the sleeping area or enclosing a bathroom. There is a small increase in van volume size when zoning is used, and even more when physical walls are used.

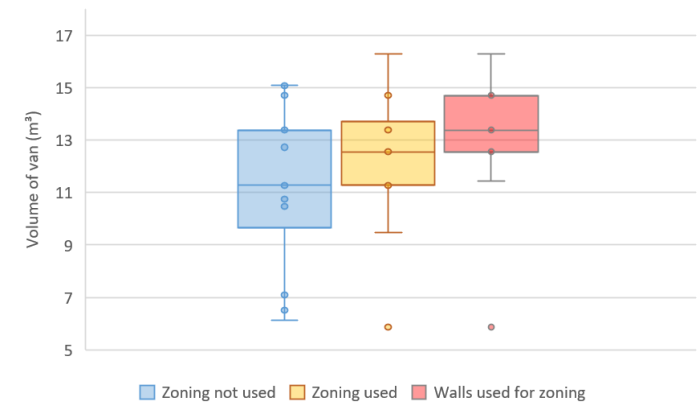


Figure 2: Volume of Van plotted against usage of zoning

3.1.3 Transforming Living Space

Very compact living spaces should be able to transform during the day depending on the time and activities taking place. In every case, the transformation of the compact living space is paired with transforming furniture (Hu, 2019; Mouamani et al., 2025; Shabanova, 2025; Brischetto et al., 2019; Akyalçin et al., 2015). In the final design of the camper, Brischetto et al. (2019) is able to transform the different zones to transform from daytime to nighttime.



Figure 3: Camper Design from Brischetto et al. (2019) in daytime and nighttime configuration.

3.1.4 Individual Preferences

Hu (2019) identifies the need to prioritize and optimize the interior for vital activities of the occupants. Gronostajska and Szczegielniak (2021) and Saied et al. (2024) note the importance of the user in this process. They both note that users have highly individual requirements for their home, and emphasize the need for understanding the occupants' activities. Based on the outcome, new uncommon interiors can be designed according to their specific preferences, to support productivity, personal expression, and satisfaction.

3.1.5 Transformable Furniture

Multifunctional and transformable furniture are widely identified in the literature as key strategies for compact living (Akyalçin et al., 2015; Shabanova, 2025; Rizvi et al., 2021; Moumani et al., 2025; Mungase & Bangad, 2024; Saied et al., 2024). There are multiple strategies for transformable furniture identified. Akyalçin et al. (2015), in a case study of yachts, categorizes them into modular systems, movable systems, and foldable systems. The study reports that smaller living environments tend to use more flexible solutions, with foldable systems being most common. Moumani et al. (2025) categorizes multifunctional furniture into convertible, space-saving, and combination furniture, defining convertible furniture as adaptable in shape, function, or style; combination furniture as serving multiple purposes through separable or movable parts; and space-saving furniture as being efficiently storable to increase free space. Rizvi et al. (2021) reports that vanlifers consider multifunctionality essential due to the extreme spatial constraints of campervans.

Questionnaire findings show that 68% of participants reported having some form of transformable furniture, with movable furniture being most prevalent. Transformability was most commonly applied to sleeping arrangements, with beds frequently converting into couches or vice versa. Some participants reported that such transformations were primarily intended for emergency situations rather than everyday use.



Figure 4: Modular systems, moveable systems, & foldable systems, examples by Akyalçin et al. (2015).

3.2.1 DIY Design Process, Prototyping, and Tools

Multifunctional and transformable furniture are widely identified in several studies highlighting the importance of iteration, anticipation, and lived experience in mobile and compact living design. Suzuki et al. (2023) compare different prototyping techniques for campervan design, including physical prototyping with cardboard, CAD drawing (Vanspace3D), and AR-based tools. They report that participants with clear and pre-defined interior concepts preferred physical prototyping, as it left more room for imagination. Those with less-defined ideas benefited from digital tools that already had built-in furniture to give them inspiration. Differences in spatial perception were also observed, with digital environments making spaces appear smaller than physical prototypes.

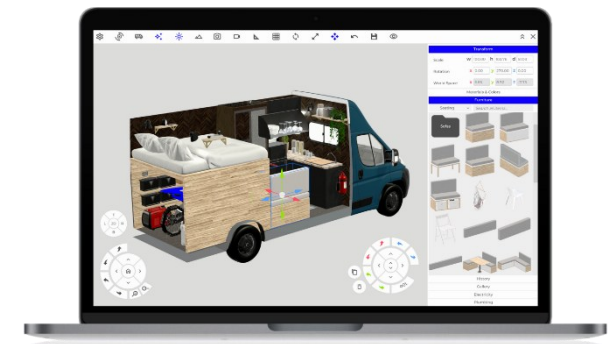


Figure 5: Screenshot from VanSpace3D.

In the questionnaire, results indicate that sketching was the most commonly used design method (74%), followed by mock-ups (36%) and CAD programs (33%). A majority of participants (61%) reported starting their conversion with only a general idea or no complete plan, adjusting their designs during construction. Participants who used design methods rated their importance to the final design at an

average of 7.09 out of 10. Participants rated their own practical skills prior to conversion at 7.32 out of 10, despite more than 60% reporting no prior campervan conversion experience.

Akyalçın et al. (2015) and Suzuki et al. (2023) emphasizes the need to consider future scenarios that have not yet been encountered, as changes in mobile interiors are difficult to predict. Furthermore, Suzuki et al. (2023) indicates because of the space constraints in a van, every design decision has ramifications for the others. It can be difficult for beginners to imagine every way they are going to use the van eventually beforehand. It is also difficult for professionals to anticipate the specific and personal needs and contexts the user is going to experience (Suzuki et al., 2023). Rizvi et al. (2021) finds that vanlifers frequently think about future iterations of their interiors while living in them, but lack effective tools to conceptualize these changes. Desjardins and Wakkary (2016) reports that living in the campervan before completion altered users' understanding of what was needed in a campervan.

3.2.2 Personalization & User Experience

DIY campervan building is closely associated with personalization and emotional attachment. Gibas et al. (2025) describe how DIY builders develop emotional connections to quasi-permanent caravans through material engagement, with ongoing modifications continuously redefining the meaning of home. Desjardins and Wakkary (2016) similarly reports that extended, phased conversion processes combined with travel lead to renewed novelty and intimate knowledge of the vehicle, including both its strengths and limitations.

Rizvi et al. (2021) reports that most full-time vanlifers express strong pride in their vans. Despite this pride, participants consistently think about future iterations of their space. Brischetto et al. (2019) report that more experienced caravan users are more accommodating toward potentially critical situations, while less experienced users are more critical, possibly due to comparisons with conventional housing.

Questionnaire results indicate that participants experienced relatively little discomfort or frustration during campervan use, most commonly citing lack of space or compromises resulting from spatial constraints. Approximately half of participants frequently thought about the next build, while the other half rarely did so, with similar dissatisfaction levels reported.

3.2.3 Community Influence

Community engagement emerged as a significant influence on DIY campervan design. Desjardins et al. (2017) reports that well-documented design decisions are highly valued by DIY builders, as they enable others to apply similar approaches. Kuznetsov & Paulos (2010) characterizes DIY communities as creative, learning-oriented environments where validation functions similarly to peer review, leading to the notion of DIY practitioners as “expert amateurs.” Participants reported that their campervan designs were most influenced by personal experience, followed by DIY communities and camper forums, online sources, physical visits to other campervans, professional knowledge, advice from others, and prototyping or testing within the camper. Participants rated their willingness to share knowledge at 6 out of 10 and primarily shared

knowledge with friends and family (48%) and on camper or DIY forums (40%).

4. Discussion

This literature review examined theoretical principles from compact living in relation to the interior outcomes and design practices of DIY campervan builders. The results indicate that many interior solutions found in DIY campervan conversions closely resemble principles described in compact living literature, particularly with regard to ergonomics, multifunctionality, and spatial efficiency. At the same time, the design processes through which these interiors are realized differ from the structured, principle-driven approaches commonly described in academic studies. Instead, DIY campervan design emerges as an iterative, experience-based, and highly personal practice.

Across the literature, compact living is characterized by the prioritization of essential activities, functional overlap, spatial zoning, and visual openness. These principles are visible in the reported outcomes of campervan interiors, particularly in the widespread use of transformable furniture, the prioritization of sleeping and cooking functions, and the use of minimalistic layouts. The frequent presence of multifunctional beds, foldable tables, and movable storage aligns closely with classifications of flexible furniture described by Akyalçın et al. (2015) and Moumani et al. (2025). Similarly, the emphasis on reducing visual clutter and using light or minimal finishes echoes recommendations by Hu (2019) and Shabanova (2025).

However, the results also show that some compact living strategies are only partially adopted. While zoning is frequently emphasized in the literature as a key strategy, just over half of the participants reported creating no explicit zones in their campervan. The relatively small differences in reported living volume between zoned and non-zoned campervans further suggest that zoning decisions are not solely driven by spatial optimization but may also relate to personal preferences or use patterns.

Similarly, while compact living theory promotes the idea of transforming spaces throughout the day (Hu, 2019; Moumani et al., 2025), the extent to which DIY campervan interiors reflect this principle appears to be context-dependent. Many participants did incorporate transformable furniture, such as beds that convert into couches, but these transformations were often seen as emergency solutions rather than regular, functional features of daily life. This finding indicates that while the flexibility and multifunctionality inherent in compact living are important, they may not always align with the day-to-day realities of campervan use.

The design process itself appears to operate largely independently of compact living theory. Literature on DIY and prototyping emphasizes iteration, lived experience, and adaptation over predefined planning, which is reflected in the questionnaire data. Most participants reported starting their conversion with only a general idea and adjusting their design during construction and use. DIY campervan interiors appear to develop through continuous testing, temporary solutions, and gradual refinement,

supporting observations by Desjardins and Wakkary (2016) that living in a prototype fundamentally shapes design decisions.

Design tools play a supporting rather than directive role in this process. While sketching, mock-ups, and CAD tools are widely used, they are not necessarily employed to fully define the final design in advance. Participants who used design methods rated them as important, yet the frequent divergence between initial plans and final outcomes suggests that these tools primarily facilitate exploration and adjustment rather than strict adherence to predefined principles. This aligns with Rizvi's (2021) observation that existing planning tools often fail to accommodate personal expression or evolving needs in mobile living contexts. This is also supported by the compact living literature, that interior should be adjusted to the individual living in it. Prototyping tools don't accommodate specific personal needs or wants in the campervan design, and then people divert to general concepts and ideas and a as we go mentality.

Personalization and emotional attachment emerge as central aspects of DIY campervan design that are less prominently addressed in compact living literature. While compact living theory tends to focus on efficiency and optimization, DIY builders emphasize ownership, identity, and emotional connection to their space. The reported low levels of dissatisfaction, despite spatial constraints, suggest that personalization plays a significant role in perceived comfort and usability. The fact that many participants frequently think about a next build, without reporting higher dissatisfaction, further

reinforces the idea of campervans as evolving, unfinished projects rather than finalized designs. Community engagement appears to mediate the relationship between theory and practice. Rather than drawing directly from academic sources, DIY builders rely heavily on peer knowledge, online platforms, and documented examples from other builders. These communities function as informal knowledge networks in which compact living principles may be implicitly transferred, adapted, or reinterpreted. This supports Kuznetsov & Paulos (2010) characterization of DIY practitioners as expert amateurs whose work is collectively validated and refined through sharing and feedback.

4.2 Limitations

This study has several limitations that should be considered when interpreting the findings. First, the questionnaire has a limited amount of participants (n=50), which restricts the generalizability of the results. Secondly, the participants were recruited through camper forum and a camper-focused Facebook group. The lack of diverse ways to recruit from the DIY conversion community. Thirdly, the questionnaire did not include in-depth qualitative interviews. As a result, insights into participants' motivations, decision-making processes, and design reflections are limited. Lastly, the study relied partly on self-reported data, which may introduce bias in reported skill levels, satisfaction, or design effectiveness.

The findings of the questionnaire provide insight into tendencies among DIY campervan builders but cannot be assumed to represent the broader campervan or vanlife population.

Access to academic literature was limited, including restricted access to certain relevant publications, which may have constrained the theoretical scope of the review. Finally, the limited timeframe of the study prevented longitudinal investigation, making it impossible to observe how campervan interiors evolve over extended periods of use.

4.3 Future Research

Future research could address these limitations by expanding participant recruitment to include a wider range of channels, such as offline communities, campervan events, or professional builders. Increasing sample size and diversity would allow for more robust comparisons across different campervan types and usage contexts.

In-depth qualitative interviews and longitudinal studies could provide deeper insight into how design decisions evolve over time and how temporary solutions become permanent. Incorporating observational methods, such as photo documentation or in-situ evaluations, could further improve understanding of spatial organization and actual use patterns. Future work could also explore how compact living theory might be translated into accessible tools that support DIY campervan builders without constraining their iterative and personal design processes.

5. Conclusion

This study examined the extent to which DIY campervan conversions reflect principles of compact living and the design processes employed by DIY builders. The results reveal that many compact living principles are reflected in DIY campervans. However, the application of these principles is often adapted to fit the practical realities of campervan life, with personalization and emotional attachment playing a central role in the design process. The iterative, experience-driven nature of DIY design diverges from the more rigid, principle-based approaches common in compact living theory. While design tools like CAD and sketching support the process, they are primarily used for exploration rather than strict adherence to predetermined principles. This study contributes to the understanding of compact living by highlighting the unique challenges and opportunities presented by the DIY campervan context, where design is shaped by both functional constraints and personal expression. As DIY campervan conversion continues to evolve, further research is needed to explore how compact living principles can be better integrated into the design process. Giving users more tools for their conversion, while preserving the builder's pride and creative freedom.