Technik & Architektur
HSLU Lucerne University of Applied Sciences and Arts

Project Context 1

Review 3

$\text{My}_{\text{celium}}\text{Tent}$

The biodegradable tent

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Horw, 14th October 2024

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1 Introduction

The $\text{My}_{\text{celium}}$Tent addresses the need for sustainable alternatives in the festival market, offering a biodegradable and affordable solution to reduce plastic waste from abandoned tents. Made from mycelium-based materials, it minimizes the environmental footprint while maintaining functionality for short-term camping. This project explores the feasibility of biodegradable tents, evaluates design options, and aims to develop a sustainable product that provides a comfortable camping experience. It includes morphological analyses, a value-benefit assessment, and a rough description of the mock-up to ensure the most effective design.

FILE NOTE TEAM 31

REVIEW 2

Date:	11.10.2024
Place:	T&A, room E404
Time:	15:15 – 15:45
Meeting leader:	Benjamin McCarthy
Minute taker:	Simon Althaus
Attendees:	Christen Anna, Rohrer Julia, Team 32, Team 31

PLANNED AGENDA ITEMS:

1. Detailed user scenario
2. Feedback from potential customers
3. Requirements catalogue
4. Annotated research
5. Discussion, feedback and questions

DISCUSSED, FEEDBACK, QUESTIONS:

1. Detailed user scenario
    a. My$_{celium}$Tent" is a solution for a part of the big amounts of waste produced at festivals. It is a product, made from mushroom powder, used by festival goers and campers seeking a cheap and sustainable place to sleep.

2. Feedback from potential customers
    a. Two friends of Narandavaa expressed interest in purchasing the product, considering it promising. They suggested a price range of CHF 80-100 and emphasized the importance of fire resistance.
    b. Further investigation on the material is required to assess the feasibility of the product.
    c. Event providers: OA-Frauenfeld provided information about collaboration with a start-up.

3. Requirements catalogue
    a. The table of requirements was reviewed and discussed.

4. Annotated research: This section was devided into the following topics:
    a. Mycelium: Material research (properties, potential, usecase, recycleability, environmental impact)
    b. Marketing (global, european and swiss market analysis)
    c. Structure and Setup of the tent
    d. Safety

e. Environmental Conciderations

5. Questions:

How long does it take to degrade mycelium?

Estimated to take around two months, depending on the composite.
Input: Consider using bamboo poles for the structure, as they are biodegradable.

6. Feedback:

Julia:

- Compliment, likes the Idea.
- Noted that customer feedback was unclear; details about the source and nature of the feedback should be specified.
- Suggested improvements to the requirements catalogue, particularly refining the definition of "light storm" and specifying the degree of biodegradability.
- Mentioned the need to address aluminum recycling in the morphological box:
- It remains unclear whether the tent is intended for single or multiple uses.

Anna:

- No additional feedback all points are covered in the review paper.
- Requested a resubmission of the Interview section by 16th of October 12:00

AGENDA ITEMS FOR NEXT MEETING:

1. File note Review 2
2. Morphological box
3. Decision matrix
4. Justified choice final solution
5. Rough description of mock-up dimensions (LxWxH)

Written by: Simon Althaus

Date, Place: 12.10.2024, Buchrain

Signature: 

3 Morphological Analysis

The goal of this chapter is to produce three solution variants for a biodegradable festival tent. Using the morphological box method, key design parameters were explored to generate a range of possible solutions. From these, three promising variants were selected for further evaluation based on their feasibility, sustainability, and alignment with the project's goals.

3.1 Initial Morphological Box

Table 1 presents the initial morphological box, which compiles the results of the brainstorming session. Each row in the table represents a key design factor related to the development of a biodegradable festival tent. For each factor, 3 to 4 possible solutions were generated, reflecting a diverse range of materials, structural designs, and manufacturing techniques. This systematic approach provided a comprehensive set of solution combinations, which served as the foundation for selecting the most promising design variants for further evaluation

Table 1: Initial Morphological Box

Sub-Functions / Problems	**Solution 1**	**Solution 2**	**Solution 3**	**Solution 4**
Shape	Right triangular prism	Dome	Tunnel	Instant-tent (Decathlon-Style)
Size (People)	Max. 1 p.	Max. 2 p.	Max. 3 p.	Max. 4 p.
Design	Single color	Multiple colors		
Structure support	Mycelium poles	Aluminum	Bamboo	Plastic
Lifespan	Single use	5 months	1 - 3 years	
Quality	Low	Medium	High	
Processing Method	Mycelium-based Leather (MBL)	Unprocessed (MBC)	Kombucha leather	
Duration of Biodegradation	1 - 2 months	3 - 12 months	1 - 3 years	

3.2 Elimination of subtopics

This chapter focuses on the elimination of specific subfunctions, problems, and solutions to streamline the design process. These eliminations were made to provide a clearer overview of the most promising solution variants and to discard any illogical or impractical options. As a result, Table 2 presents the slimmed-down version of the morphological box, highlighting the refined set of feasible solutions for further consideration.

Table 2: Slimmed down Morphological Box

Sub-Functions / Problems	**Solution 1**	**Solution 2**	**Solution 3**	**Solution 4**
Shape	Right triangular prism	Dome	Tunnel	Instant-tent (Decathlon-Style)
Size (People)	Max. 1 p.	Max. 2 p.	Max. 3 p.	Max. 4 p.
~~Design~~	~~Single color~~	~~Multiple colors~~		
Structure support	Mycelium poles	Aluminum	Bamboo	~~Plastic~~
Lifespan	Single use	5 months	1 - 3 years	
Quality	Low	Medium	High	
Processing Method	Mycelium-based Leather (MBL)	~~Unprocessed (MBC)~~	Kombucha leather	
~~Duration of Biodegradation~~	~~1 - 2 months~~	~~3 - 12 months~~	~~1 - 3 years~~	

The subfunction ”Design” was removed, as the tent’s color is not critical to the current development phase and could be explored later as an additional feature. Similarly, the duration of biodegradation was excluded, as this aspect will be evaluated separately in the value-benefit analysis rather than during the solution-generation phase. Furthermore, certain materials, such as unprocessed Mycelium-Based Composites (MBCs) and plastic, were deemed illogical for this project. Unprocessed MBCs pose significant disadvantages compared to processed materials like Mycelium-Based Leather (MBL), complicating the tent’s structural integrity. The use of plastic contradicts the project’s primary goal of reducing plastic waste, making it unsuitable for consideration.

3.2.1 Reduced Morphological Box

Table 3 shows the reduced morphological box, after elimination of all the illogical solutions and less important sub-functions or problems. After consideration of the remaining solutions, three solution-variants were selected and inserted into the table.

Table 3: Reduced Morphological Box

Sub-Functions / Problems	**Solution 1**	**Solution 2**	**Solution 3**	**Solution 4**
Shape	Right triangular prism	Dome	Tunnel	Instant-tent (Decathlon-Style)
Size (People)	Max. 1 p.	Max. 2 p.	Max. 3 p.	Max. 4 p.
Structure support	Mycelium poles	Aluminum	Bamboo	
Lifespan	Single use	5 months	1 - 3 years	
Quality	Low	Medium	High	
Processing Method	Mycelium-based Leather (MBL)		Kombucha leather	

3.3 Description of the three Solution Variants

Variant 1: Dome Tent (Single-Use, Fully Biodegradable)
The first variant is a dome-shaped tent, constructed entirely from biodegradable materials, including mycelium poles and Mycelium-Based Leather (MBL). This variant is designed for single-use and aims to provide the highest possible grade of biodegradability. It is produced with a focus on low-cost and low-quality materials, suitable for short-term use at festivals.

Variant 2: Tunnel Tent (Four-Person, Long-Lasting)
The second variant is a tunnel tent, chosen for its optimal space-to-weight ratio, making it suitable for accommodating four people—the largest capacity in this selection. It is designed with higher-quality materials for a lifespan of one to three years, supported by an aluminum structure for enhanced durability and stability.

Variant 3: Triangular Prism Tent (Two-Person, Medium-Lasting)
The third variant is a right triangular prism-shaped tent, designed for two people. This option combines features from both the high-quality tunnel tent and the single-use dome tent. It uses bamboo poles, which provide greater longevity than mycelium but are less durable than aluminum, while still maintaining biodegradability.

The final selection between these three variants will be made in the following chapter.

4 Value-Benefit Analysis

Table 4 presents the Value-Benefit analysis of the three previously described tent variants. In alignment with our primary objective of addressing plastic waste at festivals, biodegradability is assigned the highest priority. The affordability of each variant is also crucial, as it must remain competitive with existing products that contribute to the plastic waste problem. Given that the target market is festival-goers seeking short-term, disposable solutions, the overall quality and lifespan of the tents are less critical, as we do not aim to compete in the high-quality tent market.

The analysis includes a row for "Weather Resistance," which evaluates the tent's ability to endure adverse weather conditions, such as heavy winds. This aspect is particularly relevant as different shapes provide varying levels of structural resilience.

Table 4: Value-Benefit Analysis

Criteria	**Weighting**	**Dome**		**Tunnel**		**Prism**	
		Score	**Weighted score**	**Score**	**Weighted score**	**Score**	**Weighted score**
Price	25	8	200	2	50	6	150
Biodegradability	25	9	225	5	125	7	175
Handling	15	6	90	5	75	6	90
Lifespan	10	3	30	3	30	6	60
Quality	10	3	30	8	80	6	60
Weather resistance	15	7	105	7	105	5	75
TOTAL Score			**680**		**515**		**610**

4.1 Justified Choise

Based on the weighted ratings derived from the Value-Benefit analysis (Table 4), the Dome Tent variant emerges as the most suitable option, achieving a total score of 680 points, which is by far the highest among the variants. Its strong alignment with our values of biodegradability and affordability positions it effectively within the festival market. As such, it represents the best solution to achieve our goal of mitigating plastic waste in festival environments.

5 Rough Mock-up description

The mock-up section presents a preliminary analysis of the purpose and essential details of the tent. The goal is both to physically have a model of the tent and to serve as an effective communication tool to convey the features and benefits of the tent to the target audience, such as festival goers and outdoor enthusiasts.

5.1 Purpose

This mock-up of the My_{celium}Tent provides customers with an initial impression of an attractive, affordable, biodegradable, and sustainable solution to convetional tents.

5.2 Target audience

The target audience consist of individuals interested in festival and outdoor events.

5.3 Key Features / Sections

The key features of the My_{celium}Tent include a dome-style structure with space for two people, one main door, three small mesh windows for airflow, and lightweight poles for structural support.

5.4 Size

5.4.1 Tent size

The My_{celium}Tent measures approximately 225 cm in length, 130 cm in width, and 100 cm in height, providing sufficient space for two people.

5.4.2 Mock-up size

The mock-up is designed at a 1:10 scale to offer a clear understanding of the dimensions and proportions of the final product.

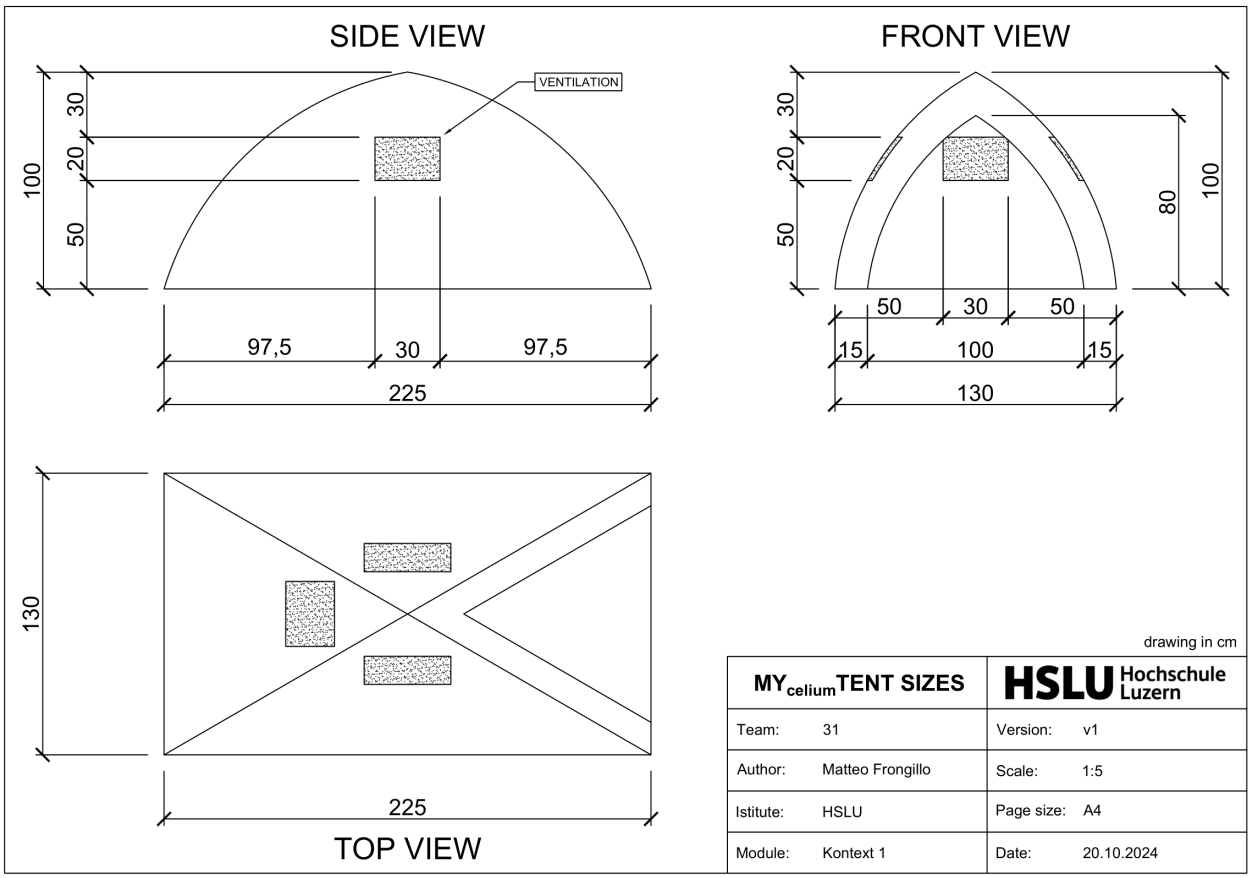

Figure 1: My_{celium}Tent dimensions and structure

5.5 Rendering

The 3D rendering of the MyCelium tent illustrates its dome configuration and context, depicting the tent in a festival setting, showing its adaptability and integration in these environments.

Figure 2: 3D visualization of the Tent in the environment.

6 Declarations on the use of AI tools

- *DeepL* and *ChatGPT 4o* have been used as a spell-checker;
  https://www.deepl.com/
  https://www.chatgpt.com/

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