
Lucallian

Cooperation Project between Interaction Design and Industrial Design at the ZHdK.

Lucallian

Z hdk

Zürcher Hochschule der Künste
Zurich University of the Arts

Introduction

Throughout history, the saddle has played a crucial role in equestrian sports and riding, offering riders a supportive seat while distributing the weight on the horse more effectively. Serving as a vital connection between two entities, the saddle significantly influences their safety and comfort. An appropriately fitted saddle guarantees a secure and comfortable riding experience for both the horse and the rider, while an improperly fitted one can result in pain, discomfort, and even injury. To achieve optimal saddle fit, it is imperative to customize the saddle according to the unique anatomies of both the rider and the horse, ensuring stability and safety during riding.

Obtaining a customized saddle is a luxurious undertaking reserved for a privileged few riders. The cost associated with personalized saddles often surpasses that of standard saddles, creating financial barriers for many equestrians.

Undoubtedly, contemporary technology with its remarkable attributes presents a valuable opportunity. It has the potential to transform the customizing process from a luxury into a viable option. In my thesis, I explore the possibility of integrating Augmented Reality (AR) technologies into traditional saddle design, aiming to develop a comprehensive measurement system for both the horse and the rider. This innovative approach seeks to enhance accessibility and affordability, enabling a wider range of users to acquire personalized and tailored saddles.

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Abstract

Lucallian is an equestrian innovation and collaborative project that introduces a technologically advanced and health-focused solution to the saddle fitting process and saddle design. This groundbreaking initiative utilizes a smartphone application that harnesses the power of AR scanning and measuring technology. It empowers riders to independently undertake the sophisticated fitting process and place orders for customized saddles, tailored precisely to the unique biomechanics of both the rider and the horse. By integrating individual measurements into the production of physical saddles, Lucallian revolutionizes the concept of saddle personalization. The result is an anatomically tailored saddle tree and padding system, ensuring an impeccable fit that promotes the well-being and safety of both the rider and the horse.

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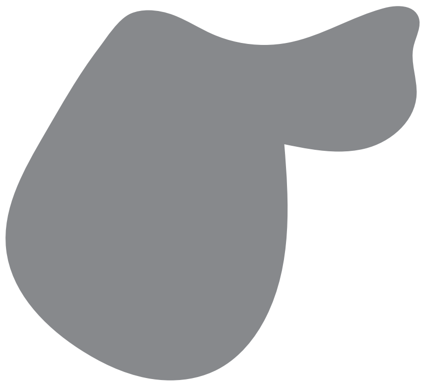
Vision

Our project envisions a product that embraces the principles of a circular economy and drives a repair revolution. We are committed to tackling the challenges associated with existing saddle fitting processes and exploring the potential of developing a measurement scanning application. This innovative solution aims to deliver a customized fit for both horses and riders by harnessing the scanning capabilities of smartphones. The following questions form the bedrock of our thesis, shaping our research and development endeavors.

Motivation & Intended Contribution

Our primary objective is to address an issue that significantly impacts the well-being of both humans and animals, specifically in the context of equestrian activities. We firmly believe that finding a solution to this problem can have a profound positive impact. Our personal riding experiences have served as a catalyst for our motivation, driving us to identify the problems and gaps within the field.

In terms of our intended contribution, our aim is to design a saddle fitting process that is more convenient, efficient, and accessible. We aspire to develop a user-friendly approach that challenges the prevailing norms of the traditional field. By doing so, we hope to foster greater interest in health-centered and research-based design, ultimately offering a product that prioritizes the well-being of both riders and horses on equal footing. Furthermore, our project endeavors to inspire further innovation within the equestrian domain, pushing the boundaries and surpassing the conventional expectations that currently exist.



Problems with Traditional Saddle Fitting

The conventional challenges associated with saddle fitting stem from a lack of comprehensive consideration for both the rider and the horse. Our interviews have brought to light that saddle makers often prioritize either the measurements of the rider or those of the horse, disregarding the crucial significance of both. This approach frequently results in ill-fitting saddles that bring about discomfort and harm to both parties involved. Moreover, existing saddle-fitting devices tend to be restricted to professional saddlemakers, adding financial and time burdens to the process. Furthermore, we have observed a dearth of measurement tools in the market that can provide precise and readily applicable measurements for saddle design. Consequently, saddlemakers often rely on trial and error rather than accurate measurements when crafting saddles. Another distressing aspect we have identified is the limited attention given to the biomechanics of female riders in saddle design, which can contribute to back pain and other health issues.

In light of these traditional problems, our overarching objective is to confront these issues by developing a more accessible, anatomically tailored, and health-centered approach to saddle fitting through our innovative concept product and service. By incorporating advanced measurement technology and considering the needs of both riders and horses, we aim to revolutionize the saddle fitting process and enhance the well-being of riders and horses alike.

Circular Economy

The core vision of our practical thesis is centered around the creation of a product that embodies the principles of the circular economy, with a strong emphasis on ecological sustainability and social relevance. Our objective is to challenge the prevailing disposable mindset by designing a product that is repairable and adaptable throughout its entire life-cycle. Rather than being discarded once its initial purpose is fulfilled, our product is intended to be durable, easily repairable, and equipped with replaceable components.

In pursuit of this vision, we place meticulous attention on the selection of materials that contribute to the long-term sustainability of the product. Our carefully chosen materials encompass durable hard-flexible plastic, 3D printed plastic soft resin, 5mm steel, 2mm flex-steel, polyester belts, and locally sourced second-hand leather. Furthermore, we provide a range of padding options, such as memory foam, hard foam, and gel pads, each offering unique benefits for a customized and enjoyable user experience. Through these thoughtful material choices, we aim to minimize waste and promote the reuse of valuable resources, aligning our efforts with the principles of the circular economy.

By integrating the principles of the circular economy and emphasizing ecological sustainability and social relevance, our vision is to create a product that not only satisfies the functional requirements of its users but also actively contributes to a more environmentally conscious and socially responsible future. Through our design choices, we strive to showcase the potential of embracing and supporting a circular economy, fostering a society that is more sustainable and equitable.

Research & Analysis

During the course of our project, we engaged in extensive research and analysis across various domains. This encompassed thorough product research, enabling us to comprehend the existing market landscape and identify potential gaps and opportunities. To gain a comprehensive understanding, we conducted interviews with industry experts and stakeholders, collecting valuable insights and perspectives on saddle fitting processes.

We actively sought out relevant events and workshops to stay abreast of the latest advancements and trends in the equestrian industry. Through our participation, we remained updated and connected with the current state of saddle fitting practices. Moreover, we actively engaged in saddle fitting processes ourselves, gaining practical knowledge and firsthand experience of the challenges involved.

Measurement was a pivotal aspect of our project, and we explored diverse techniques and technologies to develop a precise and reliable measurement system. This entailed evaluating existing measurement methods and considering innovative approaches that could enhance accuracy and efficiency.

Furthermore, our project involved extensive research on materials, specifically focusing on identifying sustainable and durable options suitable for our product. We delved into eco-friendly alternatives and meticulously examined their feasibility in terms of performance, cost, and environmental impact.

Through our comprehensive research and analysis in these areas, our objective was to gather robust data and insights that would inform the design and development of our innovative saddle fitting solution.

Historical Saddle Overview

A saddle serves as a crucial apparatus for both horse and rider, providing a secure and comfortable seat while ensuring even weight distribution across the horse's back.

Saddles have been utilized by humans for centuries as a means to ride various animals, including horses and camels. Over time, saddle design has undergone significant transformations influenced by technological advancements, shifts in riding styles, and a focus on enhancing comfort for both rider and animal.

In the early stages, saddles were likely rudimentary, consisting of blankets or pads placed on the animal's back to offer a more comfortable seating surface. As time progressed, these basic designs evolved into more structured forms, fastened to the animal's back through straps and other securing mechanisms. A monumental breakthrough in saddle design came with the introduction of the stirrup, providing riders with enhanced stability and the ability to exert greater control over the animal.

During the Middle Ages, the stirrup gained prominence, endowing riders with increased stability while mounted. In the 19th century, the saddle tree emerged as a pivotal innovation, serving as the internal framework of the saddle, providing support and structure. Furthermore, cushioning panels were incorporated into saddle designs to ensure the horse's back received adequate padding. Synthetic materials, such as rubber and plastic, also found their way into saddle construction during this period.

The latter half of the 20th century witnessed a growing concern for animal welfare, prompting a renewed focus on saddle design aimed at improving comfort and minimizing restrictions on the animal. Notably, the flexible tree revolutionized saddle construction by allowing the saddle to move harmoniously with the horse's back and distribute pressure more evenly.

Continuing into the 20th century, saddle design underwent further refinements, including the introduction of adjustable girths, which enabled precise fitting of the saddle to the horse. Additionally, the utilization of synthetic materials like nylon and Kevlar became prevalent in saddle manufacturing. Another notable advancement in saddle design was the introduction of the cutback saddle, specifically tailored to facilitate greater freedom of movement for the horse's shoulders. This innovation proved particularly significant in equestrian disciplines such as dressage and jumping, where increased range of motion is essential.

In the 21st century, advancements in technology, materials, and manufacturing processes have ushered in lighter and more durable saddles. This era has witnessed the integration of new technologies, leading to enhanced saddle performance. Overall, saddle design has undergone substantial evolution throughout history, characterized by numerous transformative innovations that have elevated comfort, safety, and performance for both horse and rider.

Fig 3 A Captain of the Northern Cavalry, American Civil War circa 1861.

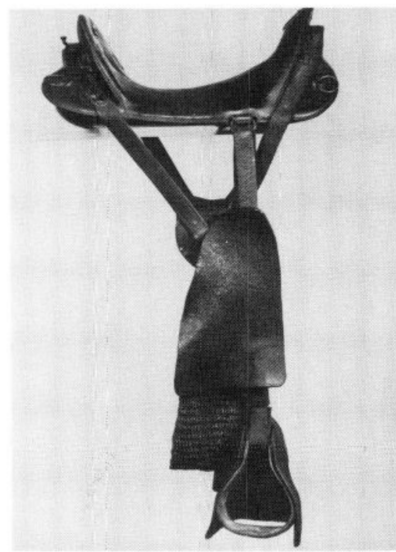


Fig 4 A McClellan saddle belonging to General George A. Custer, circa late 1860's early 1870's.

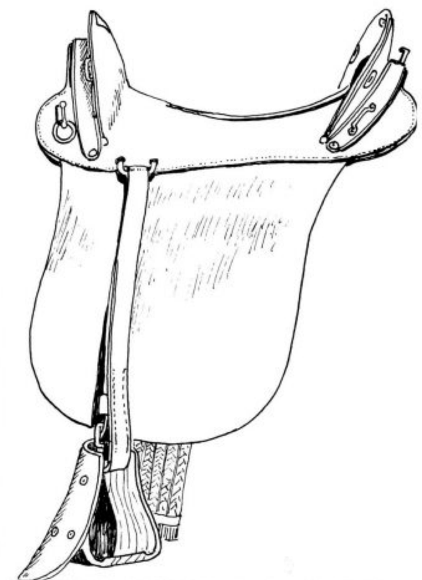


Fig 5 The 1928 Model American McClellan Saddle.

Saddle: Design & Fit

A saddle is a complex piece of equipment that serves critical functions for both the rider and the horse. Here is an overview of the various parts of a saddle and their functions:

Saddle Tree: The saddle tree is the supportive structure located inside the saddle. It provides shape and support, distributing the rider's weight evenly on the horse's back. The proper fit of the saddle tree is crucial for a well-fitted saddle.

Gullet: The gullet is a channel running down the center of the saddle, providing clearance for the horse's spine. It is positioned over the withers and should have an appropriate width to avoid pressure on the spine or lack of stability.

Pommel: The pommel is the front part of the saddle that rises above the seat. It helps secure the rider's position, especially during more challenging riding, by providing stability and support for the upper body.

Panels: The panels are located on either side of the saddle and act as cushioning for the horse's back. They are designed to match the shape of the horse's back and distribute the rider's weight evenly. Well-padded panels offer shock absorption and enhance comfort for the horse.

Twist: The twist is the narrowest part of the seat, situated between the pommel and the wider seat. It is the primary contact point between the rider's inner thigh and groin and the saddle. The twist plays a role in rider fit and can vary depending on the rider's anatomy.

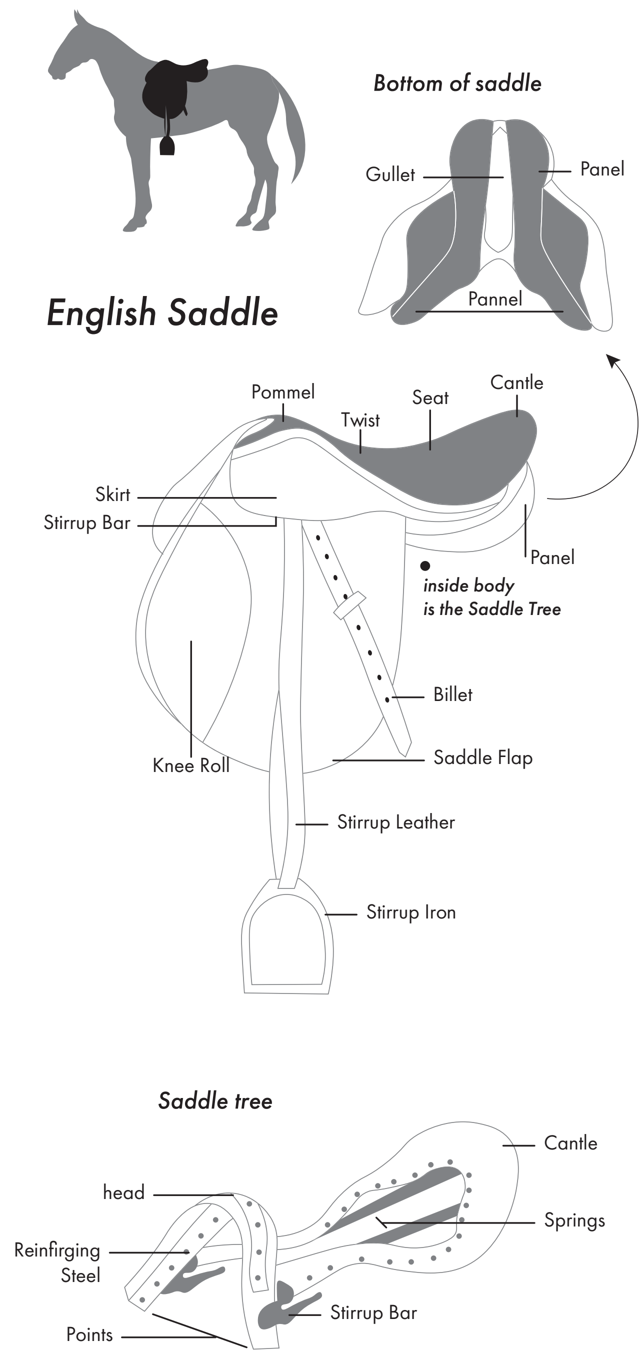
Seat: The seat is the area where the rider positions themselves. The level of cushioning and the depth of the seat can vary based on the intended use of the saddle.

Flaps: Flaps are large leather pieces that cover the billets and provide protection for the rider's legs against movements and friction. They can influence the rider's position and the saddle's interaction with the horse's body. Properly sized and shaped flaps are important for comfort and security.

Girth: The girth is a strap that secures the saddle in place on the horse's back. It passes under the horse's belly and attaches to the saddle on both sides. The girth's purpose is to evenly distribute the saddle's pressure across the horse's back, preventing slippage during riding.

Stirrups: Stirrups are loops hanging from the saddle's tree and connected to the stirrup leathers. They allow the rider to place their feet and provide support and balance during riding.

Each part of the saddle has a specific role in ensuring the comfort, balance, and well-being of both the rider and the horse. Proper fit and design of these components are essential for a successful riding experience.



Generic & Customised Saddles

Saddles can be categorized into two types based on their manufacturing method: generic saddles and customized saddles.

Generic saddles are pre-made and designed to fit a wide range of horses and riders. They are readily available in tack shops and online stores, often at a lower cost. While generic saddles can be suitable for some riders, they may not always provide the optimal fit for both the horse and rider. This can lead to discomfort and even injury. Finding the best-fitting saddle can be a challenge for riders, particularly if they are unable to test it on their own horse.

On the other hand, customized saddles are specifically designed and crafted to fit the unique anatomy and biomechanics of both the horse and the rider. These saddles are typically more expensive than generic ones. One of the main advantages of customized saddles is their precise fit, which helps prevent potential harm to both the horse and rider. A well-fitted custom saddle can enhance riding balance, stability, weight distribution, and reduce the risk of injuries. Furthermore, it can prevent body distortions caused by an ill-fitting saddle.

However, there are factors that may lead riders to choose a generic saddle over a customized one. The saddle fitting process for customized saddles can be time-consuming, as saddlers often need to make multiple visits to the horse's location for measurements. Additionally, the profession of saddle making is considered to be dwindling, which can contribute to the higher price of customized saddles.

Another concern is that each saddle maker may have their own fitting and production process. Some may prioritize rider measurements, while others focus on horse measurements or aesthetics. This lack of standardized procedures makes it difficult for riders to determine the level of customization they can expect from a saddle.

Typically, saddleries have a range of five to seven pre-made standard saddle tree models for customized saddles. These serve as the foundation for the eventual customized saddle. After assessing the horse or taking its measurements, the saddle maker selects the most appropriate saddle tree with the desired curvature and makes necessary adjustments to improve the fit.

If any readjustments are needed, the saddle is usually sent back to the saddle maker or manufacturing company. While saddleries can make certain adjustments, it is common for riders to opt for a new saddle instead, often at an additional cost. The only readjustments riders typically handle themselves involve adding or removing padding, but not all riders possess the knowledge to make these adjustments correctly. Therefore, readjustment processes also require additional financial and time resources.

Innovations in Equine Industry

The equestrian industry remains predominantly traditional and manual in nature, with various factors contributing to the preservation of its original form.

One of these factors is the notion of prestige associated with the industry, which stems from its historical significance rather than the methodology or the horse's perspective on the products. Additionally, saddle manufacturers often support riders who achieve success, recognition, and popularity. These manufacturers' opinions and views play a crucial role in driving innovations within the industry (Natural Horseman Saddles, 2021).

Horsetech, as a relatively young niche, falls under the category of equine-related technology, encompassing equipment for both riders and horses. It collaborates with a diverse range of sectors, including sports-human-computer interaction (HCI), leisure and training technology, and the Internet of Things (IoT) (Bergström, 2019).

Given the substantial number of practitioners in equestrian sports, there is a significant potential for the digitalization of services supporting the sport and for direct innovations. However, due to its highly traditional nature, the equestrian sports industry has been slow to adopt emerging technological developments (Berggren, 2018).

In general, most activities related to horses and the industry as a whole are considered low-tech, with the exception of the veterinarian field, which utilizes considerably more high-tech equipment. Services and products that support equestrian sports include stable construction or rental, saddle and bridle production, training classes, veterinary services, fodder production, and farrier services. Surprisingly, most of these services have not experienced significant innovations or digitalization processes (Berggren, 2018).

The implementation of new technologies in the equestrian industry is primarily driven by startups, lifestyle entrepreneurs or companies, and non-profit organizations. As innovations in equestrian sports often originate from young companies, there is a focus on Knowledge Intensive Entrepreneurship (Berggren, 2018).

Equine Anatomy Relative to Measurements & Saddle Fit

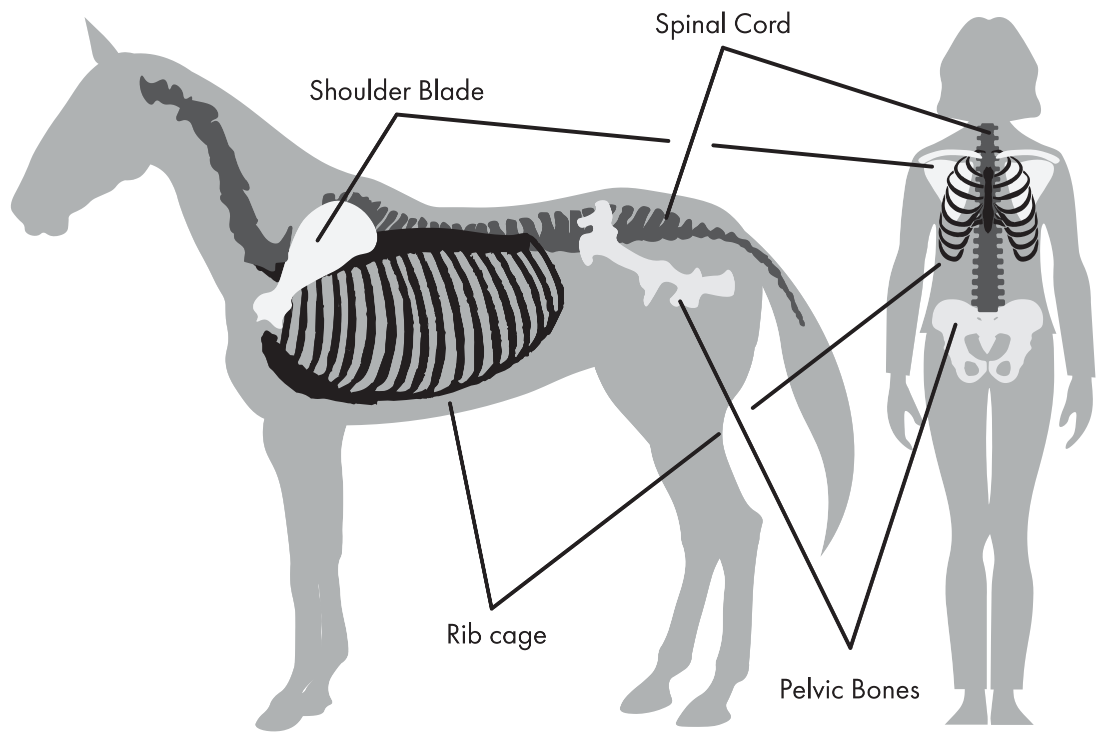
The fascia is a connective tissue that surrounds and supports the muscles, bones, and organs in the horse's body. In the saddle support area, the fascia helps distribute the weight of the rider and saddle over a larger surface area, thereby reducing the concentration of pressure points. This even distribution of weight is crucial for maintaining the horse's comfort and preventing discomfort or injury.

When the fascia in the saddle support area is healthy and functioning properly, it contributes to the stability and integrity of the area. It helps maintain the shape and structure of the saddle support area, allowing the horse to move freely and comfortably. A well-fitted saddle that considers the condition of the fascia can help optimize the horse's performance and overall well-being.

However, if the fascia in the saddle support area is compromised or unhealthy, it may lead to imbalances, restrictions, or discomfort for the horse. In such cases, it is important to address any underlying fascial issues through appropriate therapies, such as massage, stretching, or myofascial release techniques, to promote the horse's optimal musculoskeletal health.

Understanding the role of fascia in the saddle support area is essential for riders and saddle fitters to ensure the well-being and comfort of the horse during riding or other equestrian activities.

Anatomy



Fit-Related Differences in Female's & Male's Pelvis Biomechanics

Despite the increasing number of female riders, there is still a lack of equipment designed specifically for women. One of the main factors contributing to the need for gender-specific equipment is the significant biomechanical differences between males and females, particularly in the pelvis. The female pelvis is wider and shallower, accommodating the needs of childbirth, while the male pelvis is narrower and deeper, emphasizing stability and upper body support.

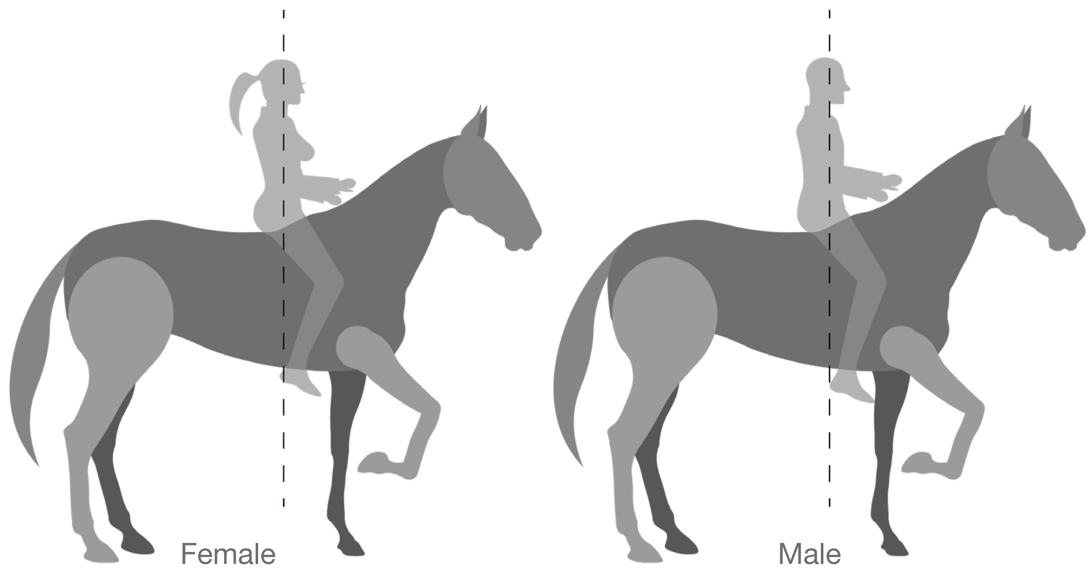
These anatomical differences have implications for saddle fit and rider balance. The wider and more anteriorly rotated female pelvis can make it challenging to maintain stability while riding, as the center of mass is shifted forward compared to males. On the other hand, the narrower and more posteriorly rotated male pelvis provides a natural advantage in maintaining balance.

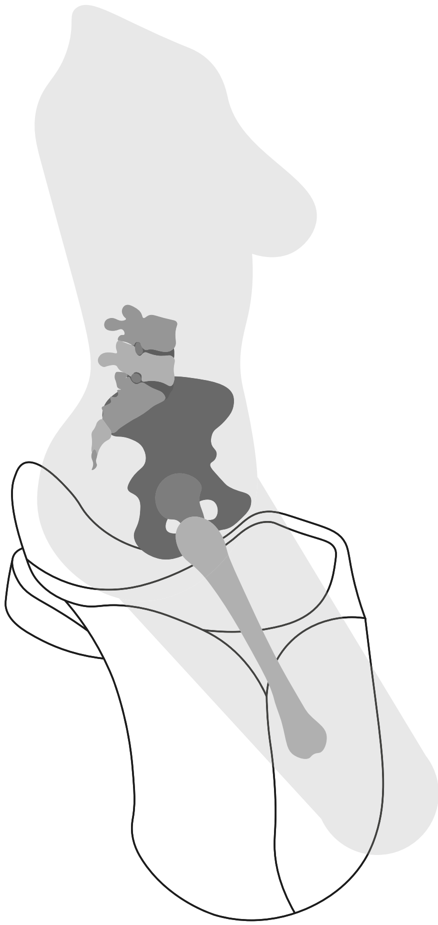
For female riders, the wider pelvis and forward tilt can affect weight distribution and balance. Consequently, saddle design should consider the curvature of the saddle tree to accommodate these differences. Additionally, female riders have three points of contact with the saddle, compared to males who have two, further influencing weight distribution and balance. The shape of the saddle twist and the support provided at the lower back should be tailored to address these differences.

The location of hip muscles also differs between males and females, impacting the space between the upper inner thighs. Male riders generally have more space, preferring wider fenders, while female riders have less space and would benefit from narrower fenders to accommodate the shape of their legs.

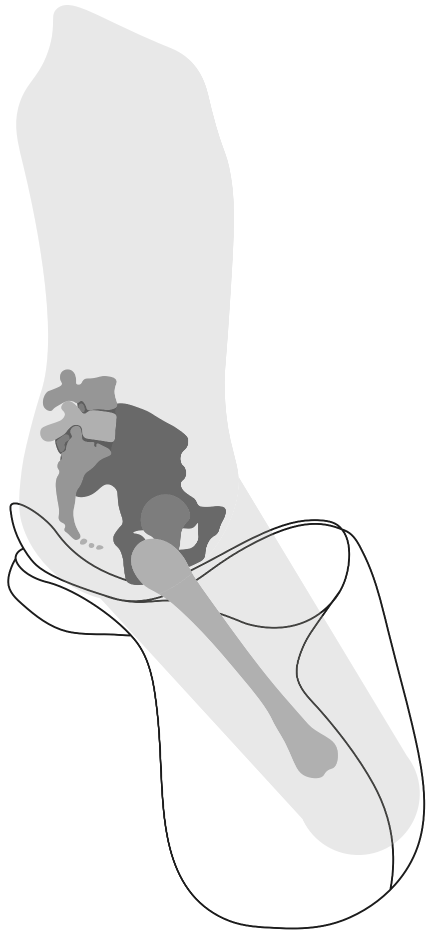
Furthermore, the leg skeleton varies between males and females, with males often having longer lower legs relative to their upper legs. As a result, male riders may find it more comfortable when the stirrup bars are positioned more forward, while females may benefit from stirrups located closer to the middle of the saddle for improved ergonomics.

It is important to address these gender-specific considerations in saddle fit, as an ill-fitting saddle can not only lead to discomfort and body deformation for female riders but also result in poor weight distribution on the horse's back.





Female



Male

Female

Male

Gender-Specific Saddle Design

The design of a saddle should take into account the differences in anatomy and biomechanics between male and female riders. One important aspect to consider is the width of the twist, which is the area between the upper inner thighs. Women typically have wider hips, so the twist should be wider in women's saddles to accommodate their anatomy and provide proper support. In contrast, men have narrower hips, so the twist in their saddles can be narrower.

The position of the stirrup bars, which hold the stirrups, also needs to be adjusted for the differences in leg length and alignment between male and female riders. Women often have longer upper legs, so placing the stirrup bars in the usual position can cause the legs to be pushed too far forward. Adjusting the position of the stirrup bars can help align the legs with the body's center of gravity and improve balance.

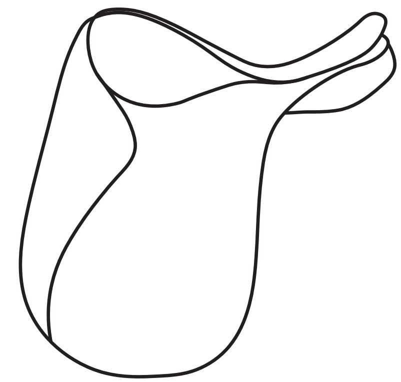
The flaps and thigh rolls of a saddle should also be designed to account for the differences in hip bone location and leg angles between men and women. Men's hip sockets are further forward, allowing their legs to hang straight down. Women's hip sockets are located more laterally, causing their legs to angle out. The shape and positioning of the flaps and thigh rolls should accommodate these differences to provide optimal comfort and support.

The seat of a saddle is another important consideration. The female pelvis usually has a lower pubic symphysis, which can cause friction with the seat if not properly accommodated. The seat should be designed to provide clearance for the female anatomy and prevent discomfort. Women also tend to have a wider pelvic arch, so the seat may need to be wider to provide proper support and weight distribution.

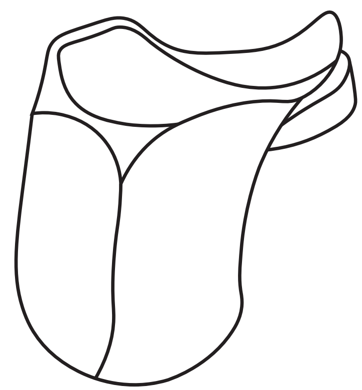
The pommel (front) and cantle (rear) of the saddle should be shaped and positioned differently for male and female riders. Women typically have a wider and shallower pubic symphysis, requiring a wider and more open pommel for comfort and stability. The cantle should be positioned further back to avoid excessive pressure on the wider part of the female pelvis. Men, on the other hand, have a narrower and deeper pubic symphysis, so the pommel should be narrower and more closed to avoid interference. The cantle may be positioned slightly further forward for optimal support.

The panels and gullet of the saddle should also be designed to accommodate the differences in hip socket location and structure between men and women. Women's hip sockets are more laterally located, and the angle of their femur bone is wider. This requires more rounded panels and a wider gullet to provide clearance for the wider hip area. Men's hip sockets are more medially located, and the angle of their femur bone is narrower. Straighter panels and a narrower gullet are more suitable for their anatomy.

It is important to recognize that the lack of implementation of research on gender biomechanics in saddle design can lead to discomfort, pain, and health issues for female riders. The majority of saddles are still made with male hip bone biomechanics in mind, which can cause problems for female riders. It is crucial to consider the unique anatomical and biomechanical differences between male and female riders and develop saddles that cater to their specific needs.

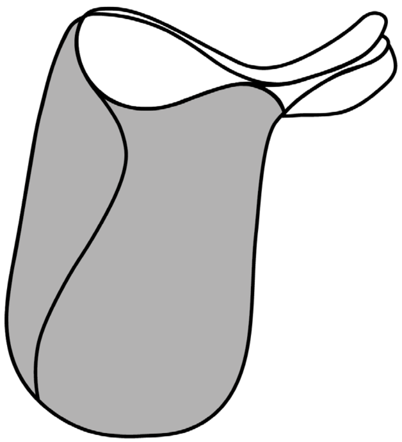


Male saddle

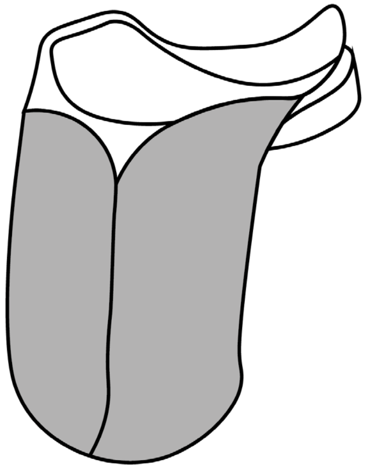


Female saddle

Saddle Flat + Panel length changes:

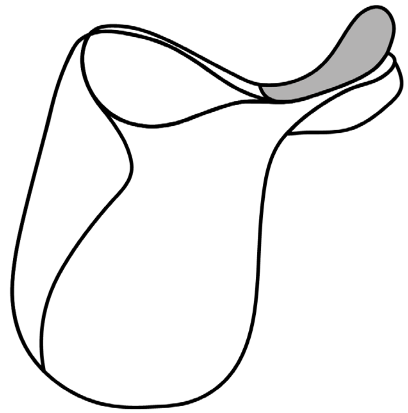


Male saddle

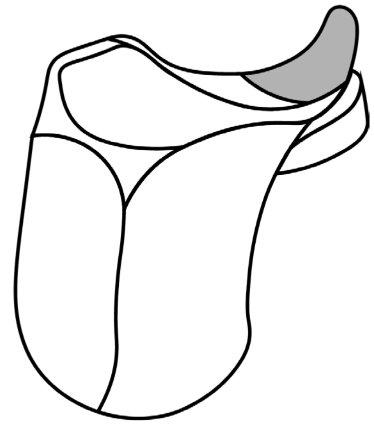


Female saddle

Cantle + Seat hight changes:

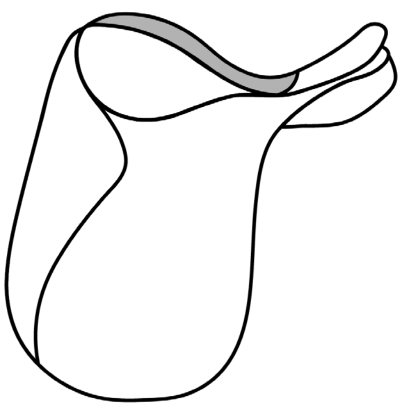


Male saddle

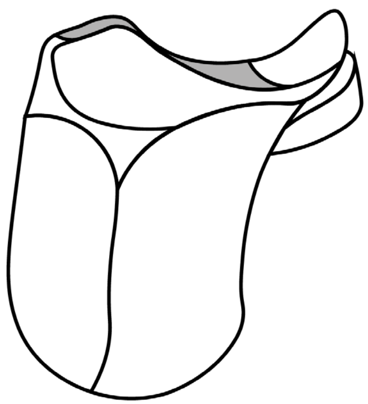


Female saddle

Pommel + Twist hight changes:

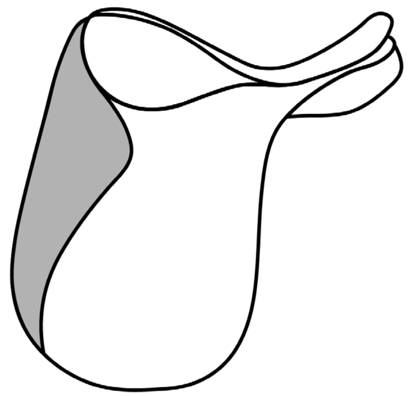


Male saddle

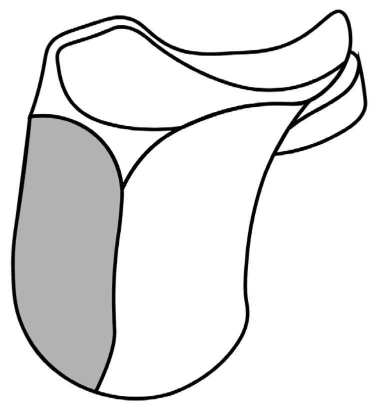


Female saddle

Knee Roll form changes:



Male saddle



Female saddle

Research Question & Hypothesisbiomechanics

In the current thesis, our aim is to explore the concept of health-centered anatomically tailored saddle fit that can be carried out independently by riders. Additionally, we have conducted research on the implementation of gender-specific health-centered saddle design. Based on this, we have formulated the following research questions:

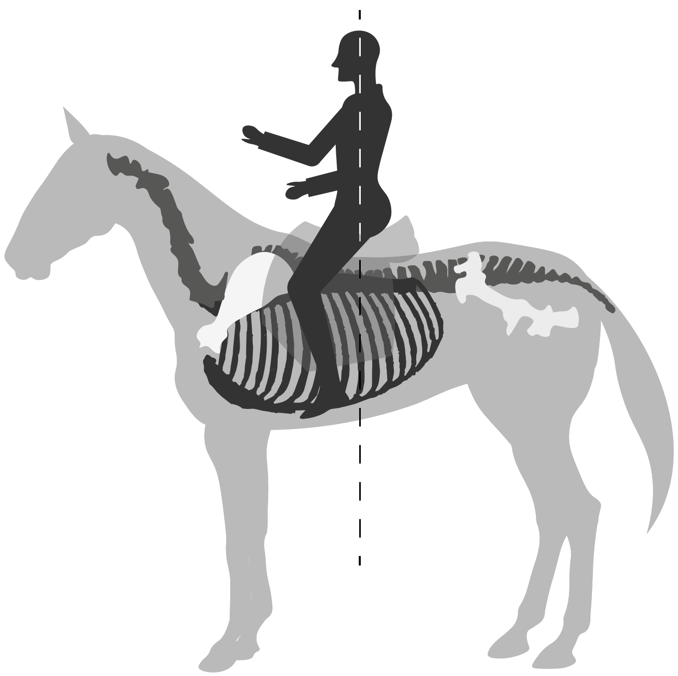
How can we develop a user-friendly and comprehensive mobile application for saddle fitting that empowers riders to perform the process autonomously and obtain a customized saddle?

How can we design a holistic measurement system that captures and records all the necessary measurements and parameters of both the rider and the horse, enabling the generation of ready-to-implement results for saddle design?

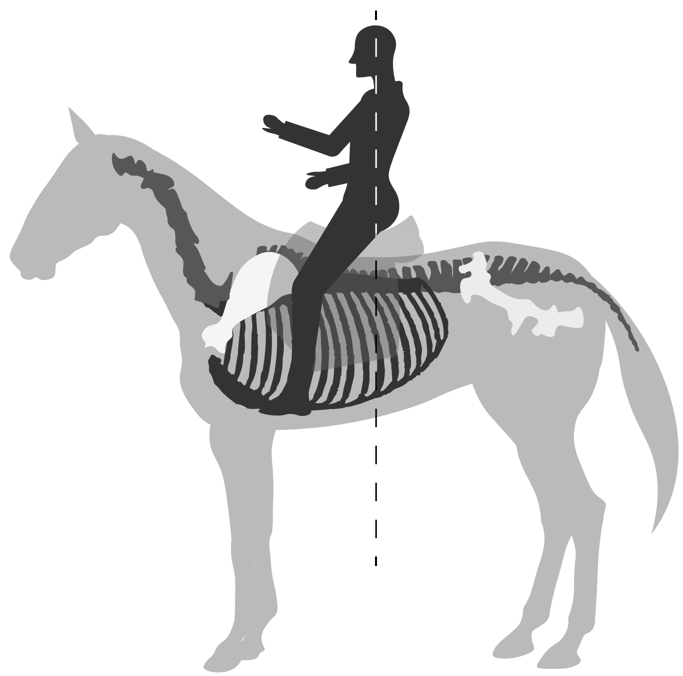
What innovations are required in saddle design to create a gender-specific and health-centered saddle system that promotes rider comfort and ensures the well-being of the horse?

Our hypothesis is that through the utilization of advanced technologies, the intricate process of saddle fitting can be simplified, resulting in more accurate outcomes. We believe that riders would embrace the use of a user-friendly tool once they understand the benefits it offers in achieving a highly personalized saddle fit.

In conclusion, we assert that innovative advancements in saddle design are essential to enhance the comfort and safety of both riders and horses, providing a riding experience that is both enjoyable and free from harm.



Balanced Riding Position



Conventional Riding Position

Exploring the Cultural Relevance of the Saddle

In our quest to delve into the cultural significance of the saddle, we embarked on a comprehensive field research journey. Our research approach encompassed a range of activities aimed at gaining valuable insights. We attended various events related to equestrianism, engaging with riders and enthusiasts to understand their perspectives on saddle usage and its cultural relevance. Additionally, we conducted in-depth interviews with individuals from diverse backgrounds to gather a broad spectrum of opinions and experiences.

To expand our knowledge base, we paid a visit to Equinomic, a renowned saddler known for their expertise in crafting high-quality saddles. This interaction allowed us to gain insights into the intricate craftsmanship and traditional techniques associated with saddle making. Furthermore, we delved into extensive research on similar products in the market, analyzing their design, functionality, and cultural implications.

Material research and application played a crucial role in our investigation. We explored various materials used in saddle construction, studying their properties, durability, and cultural connotations. By understanding the materials and their application in saddle design, we aimed to uncover the cultural nuances associated with specific choices.

Additionally, we embarked on scanning research, employing advanced scanning techniques to capture detailed information about saddles. This allowed us to analyze the intricate details of saddle design and understand how it relates to cultural context.

Through this comprehensive field research approach, including event attendance, interviews, saddler visits, product research, material exploration, and scanning analysis, we sought to gain a holistic understanding of the cultural relevance of the saddle. Our findings and insights from these research endeavors will inform our subsequent design process, ensuring that our final product resonates with the rich cultural heritage and diverse perspectives surrounding saddle usage.

The White Turf Races

We recognized the White Turf races as a valuable opportunity to engage with professional riders and gain insights into their experiences with saddle fit. By attending this prestigious event held in St. Moritz, Switzerland, which showcases horse racing on a frozen lake, we were able to connect with a diverse range of skilled riders.

During our time at the event, we had the privilege of conversing with these professionals, discussing their perspectives on saddle fit, and seeking their feedback on our innovative idea. We were particularly interested in understanding their level of trust in technology and exploring any suggestions they may have had.

Attending the White Turf races provided us with firsthand interactions with riders in a unique setting, allowing us to gather valuable information and insights to further refine our project.

Outtakes

The White Turf races provided us with thought-provoking insights into various aspects of the equestrian industry. One significant realization was the need for improved regulations and guidelines surrounding the retirement process and racing careers of professional horses. This highlighted the importance of ensuring the well-being and welfare of these animals throughout their lives.

Additionally, the event exposed us to a previously overlooked target group: riding schools. We were pleasantly surprised to receive interest in our product idea from a riding school owner, prompting us to reconsider our target persona and explore the potential benefits our solution could offer to this specific audience.

Furthermore, we discovered that many professional riders experience back pain due to the rigorous demands of competition and training. This insight emphasized the significance of designing a saddle that provides optimal comfort and support to alleviate such issues. Additionally, the frequency at which professional riders replace their saddles every two to four years, and their horses every four to five years, revealed the need for durable and high-quality saddle solutions to accommodate their demanding schedules and prevent overexertion.

Overall, the White Turf races provided us with a deeper understanding of industry challenges and opportunities, prompting us to refine our approach and address the specific needs of professional riders and their horses.

SPOGA 2023 EXPO - Cologne

The SPOGA Horse 2023 Expo serves as a platform to highlight the most recent advancements, emerging trends, and innovative products within the equestrian industry. By emphasizing the values of animal welfare, sustainability, and technology, the expo strives to foster a greater awareness and adoption of ethical and responsible practices throughout the industry.

At the expo, industry professionals, enthusiasts, and stakeholders have the opportunity to explore a wide range of exhibits, demonstrations, and presentations. These offerings showcase cutting-edge technologies, sustainable materials, and innovative approaches that prioritize the well-being and care of horses.

By featuring the latest innovations, the expo encourages dialogue and collaboration among industry players to further improve the standards and practices within the equestrian world. The focus on technology also underscores the potential for advancements to enhance the overall experience for both horses and riders, while simultaneously promoting environmentally conscious solutions.

Overall, the SPOGA Horse 2023 Expo plays a crucial role in facilitating the exchange of ideas, promoting responsible practices, and shaping the future of the equestrian industry towards a more sustainable and animal-friendly direction.

Interview with EQUIscan

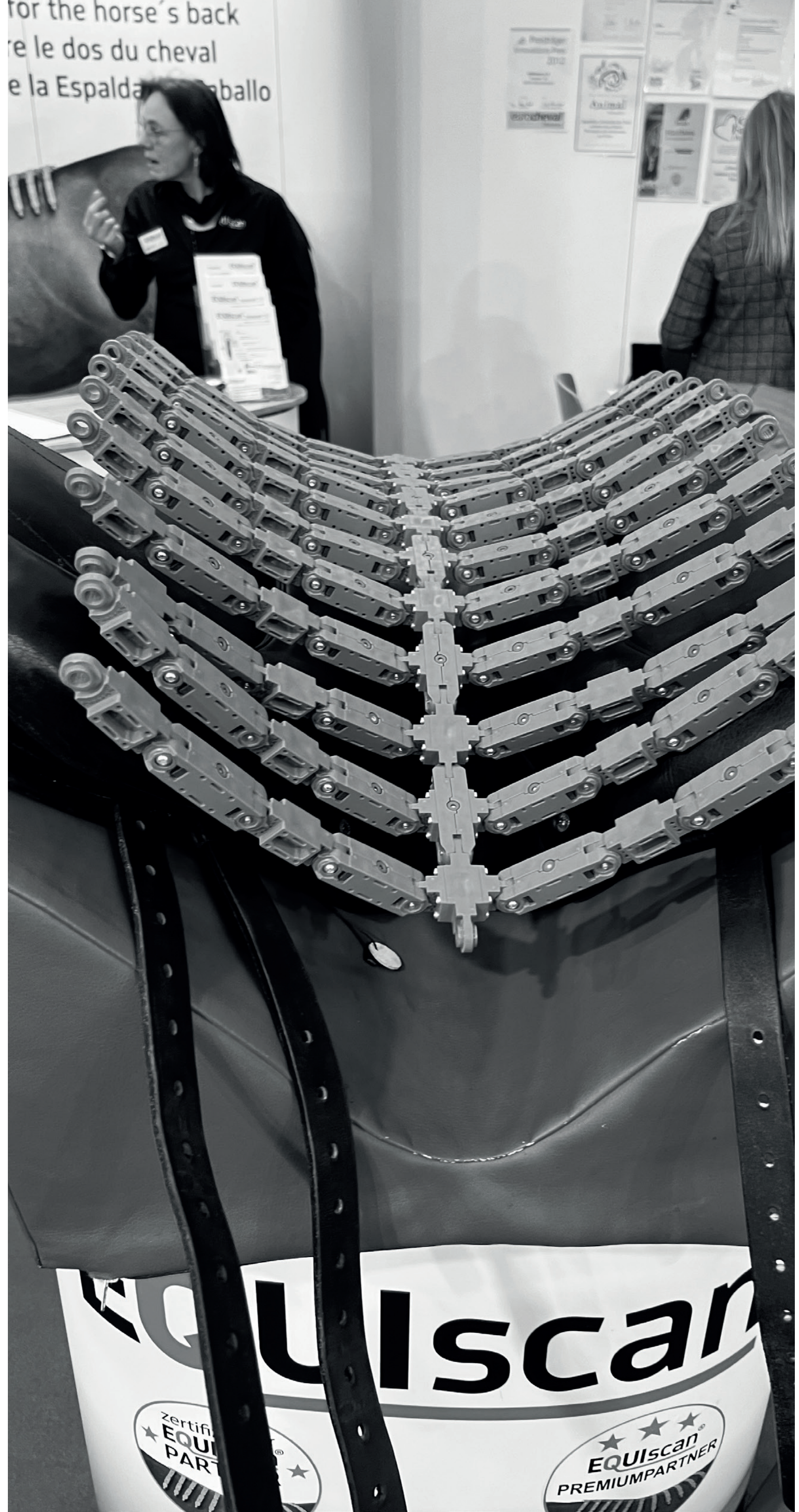
During our visit to the SPOGA 2023 Expo, we had the privilege of interviewing the team from EQUIscan, a prominent company specializing in saddle fitting systems. Our interaction with them allowed us to gain in-depth knowledge about their product and understand their methodology.

We conducted a thorough examination of the EQUIscan system and engaged in insightful discussions with the team. The EQUIscan system is designed to provide accurate measurements and analysis of a horse's back shape and curvature. It incorporates the EquiScan Topographer, which consists of independently movable sectioned arms equipped with mechanical numbers to represent angle data at different points on the horse's back. The team emphasized that the Topographer is primarily intended for use by professional saddle makers or doctors due to its intricate nature and technical requirements.

During the interview, we delved into the step-by-step process of using the EQUIscan system. The device is initially placed loosely on the horse's back, and each of the eighty-eight screws is tightened to ensure a secure fit. The user then records the corresponding angle measurements and inputs them into a form on the EQUIscan website. Finally, a comprehensive PDF report is generated, providing a detailed 3D model of the horse's back, an overlay of the device, and a “heat map” illustrating pressure distribution. It is important to note that the measurements are taken with the horse in a stationary position to minimize any potential movement that could affect accuracy.

While the EQUIscan system yields commendable outcomes, it is worth considering that the process can be time-consuming. In practice, many saddle makers utilize the device by placing it above the saddle to assess the fit more conveniently. Additionally, users have the option to store their data on the EQUIscan website, facilitating the comparison of measurements from previous years and tracking changes over time.

Our interview with the EQUIscan team was invaluable, providing us with deep insights into their saddle fitting system and its underlying methodology. This knowledge will significantly contribute to our research and aid us in developing a comprehensive and effective saddle fit solution.



Discovery of Schleese

During our visit to the SPOGA 2023 expo, we had the opportunity to explore various companies and products in the equestrian industry. One company that stood out to us was Schleese Saddles, renowned for their expertise in saddle fit and design. Schleese Saddles became a significant source of inspiration and knowledge for our thesis.

Schleese Saddles has established a strong reputation for their comprehensive understanding of both horse and rider anatomy and biomechanics. They have developed the “Saddlefit 4 Life” philosophy program, which takes into account various parameters such as the horse’s conformation, musculature, and movement, as well as the rider’s position and individual measurements and requirements. Through their program, Schleese Saddles aims to provide the best-fitting saddle for each individual or offer customized options when necessary.

What particularly caught our attention was Schleese Saddles’ pioneering work in gender-specific saddle design. They have been at the forefront of developing anatomically tailored saddle designs specifically for females, addressing the unique biomechanical needs of women riders. This aligns with our own goal of creating a gender-specific and health-centered saddle system.

Encountering Schleese Saddles at the SPOGA 2023 expo left a profound impact on us. Their attention to detail, holistic approach to saddle fitting, and commitment to gender-specific design inspired us to strive for excellence in our own project.

We aim to implement a similar level of customization and precision in our saddle fitting process, while also considering the specific biomechanics and needs of different genders.

We extend our sincere gratitude to Schleese Saddles for being a major source of inspiration and knowledge for our thesis. Their expertise and achievements in the field of saddle fit have significantly influenced our approach and motivated us to pursue innovation and excellence in our own endeavors.

Outtakes

During our research, we came across a diverse range of innovative projects within the equestrian industry, totaling around ten fascinating discoveries. However, we observed a notable lack of substantial innovation in the realm of traditional saddles.

This realization served as a strong motivator for us to pursue our own ideas and push the boundaries of saddle design and fitting. We recognized the immense potential to introduce new technologies and approaches that can revolutionize the riding experience.

Inspired by the pioneering spirit of other companies in the field, we are dedicated to developing a comprehensive and technologically advanced saddle-fitting system. Our aim is to create a solution that goes beyond mere comfort and aesthetics, prioritizing the well-being, performance, and harmony of both rider and horse.

Through our efforts, we hope to contribute to the evolution of the equestrian industry by bringing fresh perspectives and innovative solutions to the traditional art of saddle design. By embracing cutting-edge technologies and reimagining established practices, we are determined to create a new standard of excellence in the field.

Visiting Casty Ranch

Conducting fieldwork was identified as the crucial next step in our project to test and validate our concept and ideas. Fortunately, during an interview with professional rider Sabrina Casty, she graciously extended an invitation for us to visit her family ranch and engage with her horses.

This opportunity proved to be immensely valuable, providing us with practical insights and hands-on experience in the field. Interacting with the horses and witnessing firsthand the intricacies of their behavior and movement allowed us to deepen our understanding of the challenges and intricacies of saddle fit and design.

The fieldwork not only enriched our knowledge but also allowed us to gather real-world data and feedback from the horses and rider. It served as a vital stepping stone towards refining our concept and ensuring its practicality and effectiveness.

We are deeply grateful to Sabrina Casty and her family for their generous hospitality and willingness to contribute to our project. Their collaboration has significantly propelled our research forward, enabling us to develop a more robust and informed approach to saddle innovation.

Measurements

In our initial attempt to implement our idea in the field, we chose to utilize a “3D scanner” app to capture scans of each horse and gain insight into the process. The app employed Lidar technology and required us to slowly move the phone underneath and above the horse to create a comprehensive 3D model while ensuring the scanned object remained still.

We conducted scans on a total of four horses, beginning with Flur, a sleek and athletic racing horse. During this process, we quickly realized the importance of providing clear instructions within the service to avoid any potential issues. For example, scanning a horse within the confines of a stable proved to be inconvenient, prompting us to determine that a minimum area of 5x5 meters was necessary for accurate scanning. Additionally, we encountered challenges related to the movement of the horses themselves. It was difficult for them to remain completely still, requiring the assistance of a second person to calm Flur and prevent any inadvertent movements by standing near its head.

To capture the movement of the horse’s back, we experimented with asking the user to lunge the horse while recording from both sides. This allowed us to observe the dynamics of the horse’s gait and analyze any asymmetries present.

In another approach, we recorded a video from the back of a bareback horse, which proved informative in assessing shoulder movement and identifying any potential asymmetries.

Upon reflection, we recognized that obtaining at least two samples using the chosen method would be necessary to ensure a more complete and accurate representation.

An intriguing observation we made pertained to the interdependence of rider and horse behaviors and habits. Sabrina aptly explained this relationship by stating that “rider and horse take each other’s weaknesses.” For instance, if a rider is right-handed, it may lead to the horse becoming stiff or blocked on the right side during riding. Notably, most riders are right-handed while most horses exhibit left-handed tendencies. Considering this dynamic, we have decided to incorporate this factor into our saddle design to address and accommodate these inherent rider-horse interactions.

Outtakes

During our observations, we noticed a significant size difference between the warm-blood horse, Tomara, and the cold-blood racing horse, Fo. Tomara was approximately one and a half times larger than Fo, which is a common characteristic among show-jumping horses who require more musculature. Additionally, their backs exhibited distinct curvatures and gullets, indicating that they would not be able to fit into the same saddle.

Sabrina shared with us that she currently uses a single saddle for all four of her horses due to financial constraints, except for Fo who has a custom saddle tailored to his unique back anatomy.

To optimize the scanning process and ensure users can capture accurate data, we identified several key factors that needed to be considered. Clear and comprehensive instructions for users were paramount, providing guidance on how to position their phones, select appropriate lighting conditions, and minimize distractions during the scanning process. Additionally, having a second person present to assist in keeping the horse calm and still proved to be beneficial in achieving accurate scans.

Visiting Saddlery: Equinomic

During our visit to Equinomic, a Swiss custom saddle production firm, we gained valuable insights into their customer base and manufacturing process. We learned that their main clientele consists of hobby riders who seek customized saddles for their horses.

Equinomic follows a unique approach in their production by outsourcing the manufacturing of saddle trees. This allows them to have a base product that can be further customized to meet individual requirements. They explained that most saddleries typically have a limited number of variations for saddle trees, typically around five options. When an order is placed, the saddlery selects the best-fitting tree for the horse.

In their pursuit of innovation, Equinomic has explored alternative materials for saddle construction, including plastic. However, they ultimately decided to maintain the traditional wooden structure, as it proved to be the most suitable choice for their specific needs and customer preferences.

Overall, our discussions with Equinomic provided us with valuable insights into their unique process and the importance of customization in saddle production.

Measurements

Equinomic adopts a comprehensive approach in their saddle production process, beginning with an on-site visit to the horse and rider. They gather various measurements from the rider, including height, weight, trouser size, and the length of their upper thigh from the hip joint to the knee. The measurement of the upper thigh length helps determine the appropriate saddle panel length, which may vary based on the rider’s height.

To assess the horse’s requirements, Equinomic utilizes a moldable rod tool that maintains its shape to measure the horse’s height and body. They focus on key areas such as the withers, spine curvature, mid-back structure, and the location of the last rib on the back. Additionally, the saddler requests the rider to lunge the horse at different gaits and use a sample saddle to observe the horse’s performance with the rider on top. This allows them to assess how the horse’s shoulders stretch and move during movement.

Equinomic acknowledges that modern breeding trends have led to horses with more extreme movements, posing challenges in saddle fitting. To accommodate these movements, the saddle tree gullet is designed higher to avoid hindering the horse’s range of motion. Moreover, they emphasize that modern horses tend to be more sensitive, underscoring the significance of a proper saddle fit in ensuring their comfort and well-being.

While Equinomic finds the EQUIscan system useful for Western saddle types, they may employ alternative methods for other saddle styles, suggesting that different types of saddles may require tailored approaches in the fitting process.

Injuries Impacting Saddle Design

Equinomic provided us with insightful information regarding saddle design-related injuries that can impact both riders and horses. When it comes to riders, they highlighted several key considerations. For individuals with hip joint problems, a saddle with a narrow seat can be beneficial as it helps reduce pressure on the hips, providing greater comfort during riding. Riders who experience back issues may require a wider seat in their saddle, as this design provides more space and support, alleviating discomfort and strain on the back. For those with tailbone injuries, a saddle with a specially designed seat featuring a hole or relief can help reduce pressure on the tailbone area, enhancing overall comfort.

In terms of horses, Equinomic emphasized the importance of addressing kissing spines, a condition where the vertebrae in a horse’s back come into contact with each other, causing pain and discomfort. They explained that saddles can be designed to alleviate pressure from the affected area, promoting the horse’s well-being and preventing further complications.

By considering these specific injuries and conditions, saddle designs can be tailored to meet the unique needs of riders and horses alike. This customization aims to enhance comfort, performance, and overall welfare, ensuring a more enjoyable and harmonious riding experience for both the rider and the horse.

Rider preferences

Equinomic also emphasized the importance of considering riders' preferences when it comes to various aspects of saddle design. They highlighted that individual riders may have specific preferences when it comes to the cantle, seat size, depth of the seat, flatness of the seat, and the shape of the saddle flaps.

The cantle, which is the raised portion at the back of the saddle, can vary in height and shape. Some riders may prefer a higher cantle for added security and support, while others may prefer a lower cantle for increased freedom of movement. Similarly, the size of the seat, including its width and length, can be customized to accommodate the rider's comfort and riding style.

The depth of the seat refers to how deep or shallow the saddle's seat is. Riders may have different preferences in this regard, with some preferring a deeper seat for a more secure and centered position, while others may prefer a shallower seat for greater flexibility and freedom.

The flatness of the seat, or the angle at which it is positioned, can also vary. Some riders may prefer a flatter seat for a more neutral position, while others may prefer a slightly tilted seat for a specific riding discipline or personal preference.

Additionally, the shape of the saddle flaps, which are the extensions on the sides of the saddle, can be tailored to accommodate the rider's leg position and provide optimal support and contact.

Taking into account these various preferences ensures that riders have a saddle that aligns with their specific needs, promoting comfort, balance, and optimal performance during their rides.

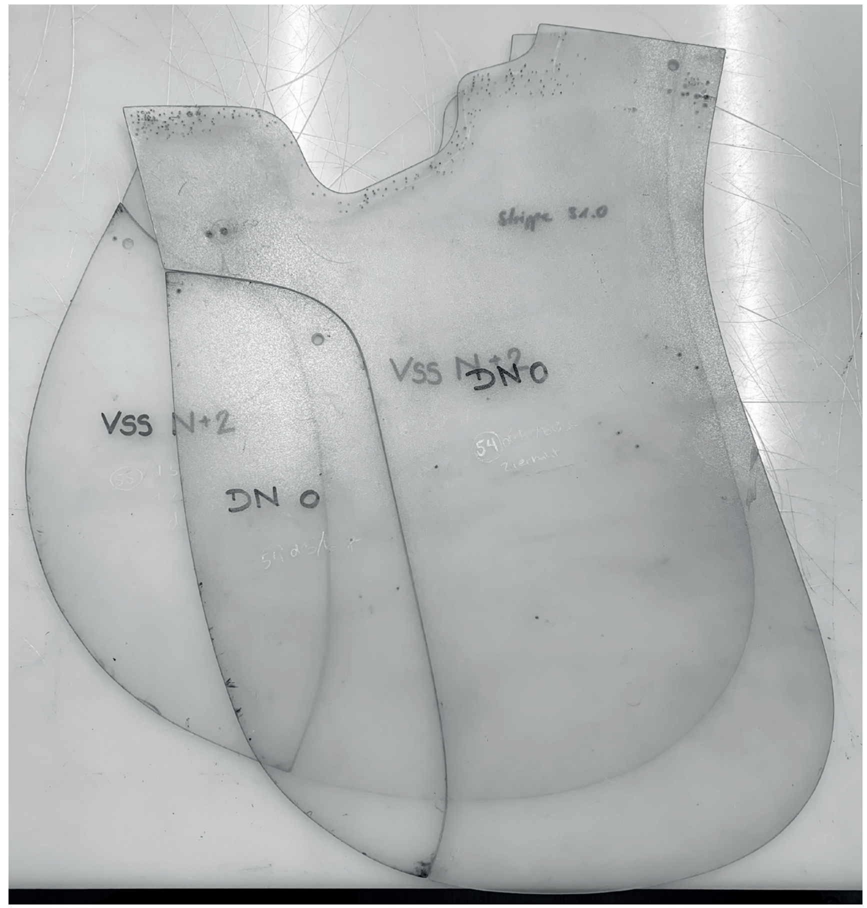
Production process

Once Equinomic has obtained the necessary measurements, they proceed to partially modify the saddle tree based on the horse's body measurements. This modification involves carefully cutting away parts of the tree to ensure a better fit for the horse. By customizing the saddle tree in this manner, Equinomic can create a saddle that accommodates the unique shape and contours of the horse's back.

For the rider's comfort and stability, Equinomic utilizes strong woven polyester straps as part of the saddle's structure. These straps play a crucial role in holding the rider securely in place during their ride. Depending on the user's gender, the placement of these straps varies. In a woman's saddle tree, the vertically placed straps are wider compared to a man's saddle tree. This differentiation takes into account the anatomical structure of the hip bones and aims to provide optimal support and comfort for the rider.

Once the saddle tree and straps are in place, Equinomic adds padding to further enhance the rider's comfort and to ensure a snug fit. The padding materials used may vary depending on the specific requirements and preferences of the rider. The proper distribution and thickness of the padding are crucial to provide adequate support, cushioning, and stability during the ride.

By meticulously modifying the saddle tree, incorporating gender-specific strap placement, and adding appropriate padding, Equinomic aims to create saddles that not only fit the horse's anatomy but also prioritize the comfort and well-being of the rider. These considerations contribute to an optimal riding experience and can help prevent discomfort, pain, or potential injuries for both horse and rider.



Outtakes

Equinomic's insights and experiences have been invaluable in shaping our project, and we express our gratitude for their contribution. To enhance our measurement system, we have decided to adopt some of their methods based on their recommendations:

Firstly, we will request a video of a lunging horse without a saddle. This will enable us to gain a better understanding of the horse's back shape and movement, allowing us to capture more accurate data for saddle fitting.

Secondly, we will request a video of a lunging saddled horse with a rider. This video will help us analyze the balance and symmetry during riding, providing valuable insights into the interaction between the horse and rider and ensuring a more precise saddle fit.

To accommodate individual horse and rider needs more effectively, we will introduce a new section in our application specifically dedicated to "Injuries & Anatomical Irregularities." This will allow users to provide information about any existing injuries or anatomical irregularities, enabling us to tailor the saddle fit accordingly.

Additionally, we will implement a "Fit Preferences" page in the application, giving users greater flexibility in expressing their preferences for saddle fit. This will ensure that the saddle not only meets the anatomical requirements but also aligns with the rider's personal preferences and comfort.

Equinomic emphasized the significance of saddle curvature in achieving a proper saddle fit. Based on their input, we will pay increased attention to this parameter in our measurement and scanning system. By focusing on saddle curvature, we aim to provide a more accurate and tailored fit for each individual horse.

During our visit, we also encountered the challenge of custom saddles not always fitting a horse's anatomy properly. We acknowledge this issue and are committed to addressing it. Our goal is to develop a saddle fit system that can effectively accommodate the unique anatomical characteristics of each horse, ensuring the best possible fit and comfort.

By incorporating Equinomic's recommendations and addressing the challenges identified during our visit, we are confident that we can refine our measurement system and deliver a saddle fit solution that meets the diverse needs of both horse and rider.recommendations and addressing the challenges identified during our visit, we are confident that we can refine our measurement system and deliver a saddle fit solution that meets the diverse needs of both horse and rider.knee. The measurement of the upper thigh length helps determine the appropriate saddle panel length, which may vary based on the rider's height.

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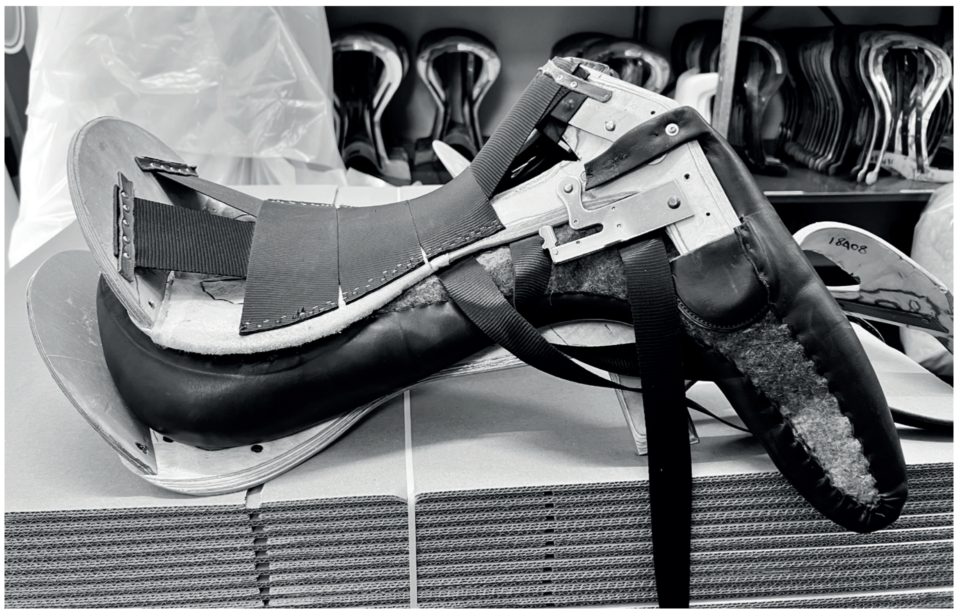

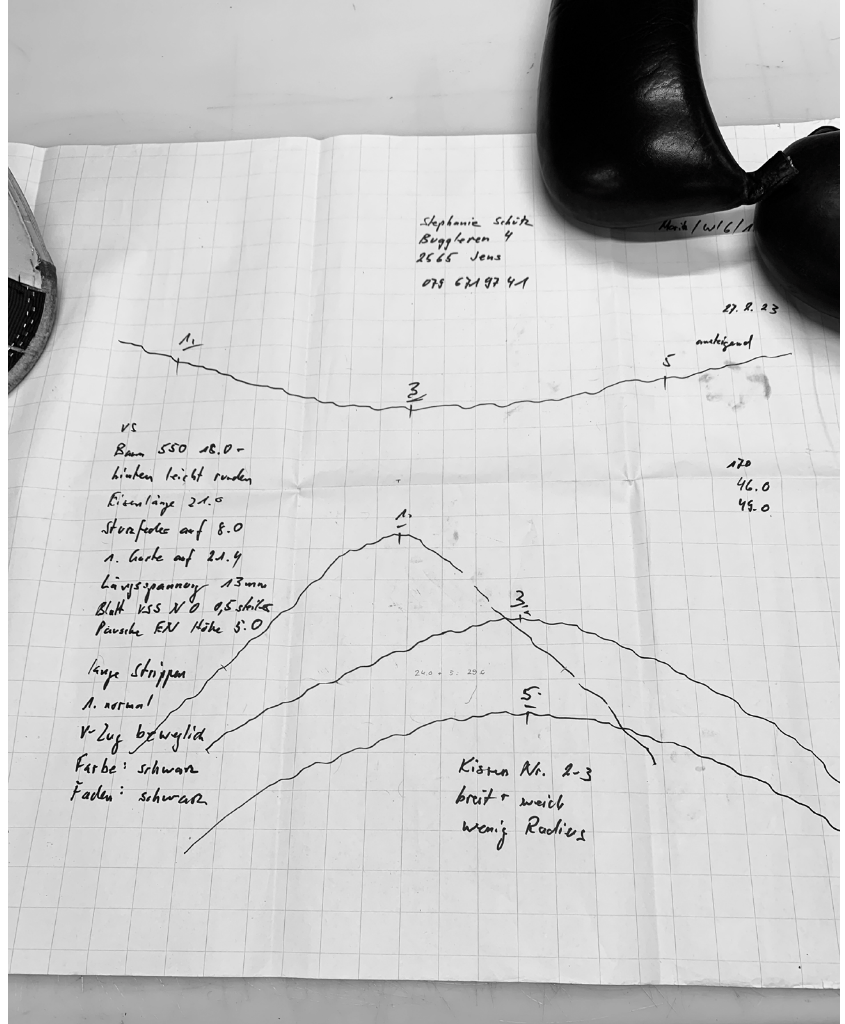
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Interviews

We extend our heartfelt appreciation to all the individuals who participated in the interviews, graciously sharing their extensive knowledge, experience, and insights. Their contributions have played a pivotal role in shaping and enriching our project.

The information obtained from each interview was meticulously analyzed and organized according to its relevance and significance. In this document, we aim to highlight the most significant and enlightening findings that emerged from these interviews. These findings have served as a guiding light, influencing our project's direction and outcomes.

Name: Jessica Wohlwend
Interview Role: Saddler

Jessica, an experienced saddle maker who primarily worked on English saddles for Equinomic Saddlery. One notable insight Jessica shared is that Switzerland has a significantly higher percentage of customized saddles, around 50%, compared to other countries. The following key points emerged from our conversation:

Measurement

When taking measurements for riders, Jessica would consider factors such as trousers size, hip width, and femur bone length.
For horse measurements, they would capture images of the horse's back at its deepest point and estimate the swing line using photos in the opposite direction. They also measure the horse's back line separately.
It is important to measure the horse both when stationary and during movement, as well as assess its neck height and range of motion.
The horse should feel and behave naturally during measurements to ensure accurate assessment of its back shape.
Checking the rider's balance and determining which side they tend to sit more on is crucial.
Horses' body shapes can change significantly as certain body parts may take longer to develop.

Service

It is essential to provide comprehensive information to riders after purchasing a saddle, including details about the specific horse and rider for whom the saddle was made, as well as the saddle's parameters and materials used. This information can be valuable for future readjustments or resale purposes.

Name: Sabrina Casti
Interview Role: Ranch Owner & Hobby Rider

Sabrina, a former professional rider with a family history in horse ownership and training, provided valuable insights during our interview. Here are the key points from our conversation:

Ordering a customized saddle

Sabrina ordered a customized saddle for her horse Fo, who has a specific back shape that is angled and narrow.
The customization process focused solely on fitting the horse, and multiple appointments were required, which consumed time and money.
Saddlemakers did not consider the rider on the horse during the customization process. They primarily asked about the rider's height, weight, and leg length. They also observed the horse's movement without a rider to assess the performance of the old saddle.

Current saddle

Sabrina currently uses a single saddle for all her horses and relies on extensive padding to accommodate each horse's needs.
She finds it expensive to have a customized saddle for each horse and believes it is more practical to use padding instead.

Health problems

Sabrina and her horses have experienced back problems, which she believes can be addressed through the use of customized saddles.

Saddle adjustments

Sabrina expressed interest in a DIY padding system that would allow riders to make adjustments themselves. However, she noted that riders may not always know how these adjustments would affect the fit.

Application

Sabrina suggested that saddle makers should be involved in the initial stages of launching new technologies to build trust among users.
She also mentioned that having multiple profiles for each horse in the application would be beneficial.

Name: Jordane Vernet
Interview Role: Hobby Rider

Jordane, our Accenture mentor and a lifelong horse rider with 25 years of experience, provided valuable insights during our discussion. Here are the key points from our conversation:

Ordering a customized saddle

Jordane had a customized saddle, but she could no longer use it after changing horses. She noted that saddlemakers often prioritize the aesthetics of a saddle rather than considering the horse's parameters. She advised us to prioritize functionality over appearance.
Measurements taken from Jordane included the length from knee to seat bone and hip width. However, no measurements were taken from her horse. The saddlemakers only assessed the fit of the saddle on her horse at the end of the process.
Jordane highlighted the importance of measuring the horse's girth and the size of its back.

Health problems

Jordane experienced back problems specifically in her lower back. Changing the saddle resolved the issue.

Saddle adjustments

Jordane never adjusted her customized saddle. She found the concept of cushion adaptability and a DIY perfect fit to be useful.

Saddle feedback data

Jordane suggested that having feedback on the fit of a saddle would be beneficial. She also mentioned that measuring the horse's temperature could provide valuable insights that are often overlooked.

Name: Stella Trümpi,
Interview Role: Horse Owner & Professional Rider

Stella, a professional show-jumper with multiple horses, provided us with insightful perspectives during our discussion. Here are the key points from our conversation:

About Saddles

Stella believes that saddles are not harmful to horses and primarily serve the rider's needs based on their discipline. However, she emphasizes the importance of fitting the saddle to the horse. Due to the frequent wear and tear in show-jumping, Stella changes saddles every two to four years. She typically owns two saddles, each tailored to fit smaller or larger horses based on their shoulder size.

Health problems

Stella recognizes that riders, including herself, often face back problems, but she is unsure if they always result from an ill-fitting saddle. Seeking advice from a veterinarian, she obtained a recommended saddle to ensure a suitable fit for her own well-being.
In dressage, horses frequently experience back problems, even if riders feel comfortable in the saddle. To address this, riders commonly adjust pads to alleviate discomfort. Stella attributes these problems primarily to muscular rather than skeletal issues.

Customized Saddles

Stella had a mixed experience with customized saddles. She encountered a situation where a saddle was specifically made for her but did not provide the necessary comfort and connection with her horse. This highlights the potential risk of ordering customized saddles that may not suit the rider's preferences.

Horses

Stella mentioned that she changes horses every four to five years, and she has observed significant changes in their bodies during this period due to continued growth.

Name: Pietro Zullo
Interview Role: Cofounder AlterEgo
AR Tech Specialist

Pietro, a software engineer involved in developing the AlterEgo application, provided valuable insights on creating 3D models and measuring riders and horses. Here are the key points from our discussion:

Rider measurements & scan

To obtain measurements of a rider, two options were suggested:

- Using an AlterEgo model, where users provide one or multiple photos along with their height as a reference point.
- Employing Lidar scan for more detailed measurements. Users would need to rotate in the same place with a margin of error between 2-5%.

Pietro recommended providing users with a clear visual reference of a “good model” through a video or picture showcasing the expected result.

Horse measurements

Pietro believed that Lidar scan is the most precise technology for measuring horses. However, he lacked knowledge about NeRF technologies and couldn’t evaluate their impact on our project.

Target Group & Technologies

The choice of technologies has implications for the accessibility of our service, depending on the user’s platform preference (iOS or Android). Lidar technology is limited to the latest iPhone versions, while NeRF would work on previous iPhone versions as well as Android devices.

These insights shed light on the options available for measuring riders and horses and highlighted the influence of technology choices on the accessibility of our service for the target group.

Name: Verena Ziegler
Interview Role: CEO of Open Dress
AR Tech Specialist

Verena Ziegler, the founder and CEO of Open Dress, provided valuable insights regarding horse and rider measurements using different technologies. Here are the key points from our discussion:

Horse measurements

Verena suggested that Lidar technology is not suitable for scanning bodies, as it is more effective for smaller objects with straight surfaces. She recommended utilizing NeRF technology for horse measurements. By using photos from different angles or a video, NeRF can create a point cloud-based model of the horse, capturing all necessary measurements. Users would need to provide a “ground truth” measurement, such as the horse’s height, and ensure camera stability during the scanning process.

Rider measurements

Verena mentioned that the same NeRF approach could be applied to perform a scan for a rider as well.

Additionally, Verena offered us the opportunity to try the NeRF technologies her company works with. We provided her team with materials from Sabrina Casti’s horses, and they created an example of a NeRF model of Tomara for us. Further details and the results can be found in the provided documentation.

Situating Our Work

We draw inspiration from Alogo, a well-designed mobile application in the equestrian industry, for its high standards in user experience and functionality. Our project aims to match their implementation quality and clear feedback.

In terms of saddle fit, we are inspired by Schleese and their holistic approach. Similar to Schleese, we prioritize the well-being and comfort of both the horse and rider in our saddle design. Our goal is to create saddles that promote proper biomechanics and provide an optimal fit, enhancing the performance and fostering a harmonious connection between horse and rider.

In summary, our project takes inspiration from Alogo for implementation quality and feedback, while Schleese influences our approach to saddle fit by emphasizing the holistic well-being of the horse and rider.

BVFR

The BVFR (Back Vertical Free Rotation) is a standard tool used to measure a horse's topline. However, its application can be challenging as it requires the use of another tool to measure the precise shape of the saddle-support region. This additional step adds complexity and may make the process less user-friendly.

Schleese, in 2017, pointed out the limitations of the BVFR and highlighted the need for improved methods in saddle fitting. Their observation underscores the importance of developing innovative approaches that provide more accurate and comprehensive measurements without the need for multiple tools.

In our project, we are committed to addressing these challenges by exploring advanced technologies and methodologies. Our goal is to create a more streamlined and user-friendly system for saddle fitting. By leveraging cutting-edge sensor technology and data analysis, we aim to provide a more comprehensive assessment of the horse's back and saddle-support region, ultimately improving the accuracy and efficiency of the fitting process.

The Topographer by EQUIScan

During our interview with the EQUIscan team at SPOGA-2023, we discovered their innovative process and technology for capturing a horse's back shape and curvature. The EquiScan Topographer is the key component, consisting of movable sectioned arms placed across the horse's back.

To use the EquiScan Topographer, the user secures it on the horse's back by tightening individual screws. The corresponding numbers are then entered into an online form on the EQUIscan website. A comprehensive PDF report is generated, including a 3D model of the horse's back, a representation of the device, and a pressure distribution "heat map."

While EQUIscan provides valuable outcomes for saddle fitting, the process can be time-consuming, typically used by professional saddlemakers. Data is stored on the website for future comparisons and analysis.

Overall, EQUIscan offers a detailed approach to saddle fitting, providing valuable insights for professionals in the equestrian industry.

Horseshape Laser

The use of lasers in saddle customization and fitting is a notable technology that captures a complete 3D image of the horse's back shape. This enables precise customization or fitting of the saddle before it is sent to the customer. The laser device quickly reads the three-dimensional contour of the horse's back and transmits the information for analysis on a computer.

This technology is particularly effective for constructing fully customized saddles that perfectly fit a specific horse's back. Additionally, horse owners can obtain a "cutout" form of the shape, allowing them to compare the horse's changing conformation over time. Some companies even offer scans to riders, providing them with a 3D image of their horse's back for their own records.

It is important to note that the ownership and handling of the captured data is typically in the hands of the saddle manufacturer or fitting experts. The process requires the involvement of knowledgeable professionals to ensure accurate measurements and analysis.

The EASY-CHANGE Fit Solution

The EASY-CHANGE Fit Solution is a set of tools designed to assist users in custom-fitting their saddles. One of these tools is the Gullet Gauge, which helps users select the correct size gullet to fit their horse. Additionally, the Gullet Gauge can be used periodically, every three to six months, to monitor any changes in the horse's muscle and determine if any adjustments to the saddle are necessary. To use the Gullet Gauge, it is placed loosely on the horse's withers, and the user adjusts it to align with the angle of the withers. The user then takes measurements and compares them to the current saddle to determine if any modifications are needed (EASY CHANGE, n.d.-b).

It should be noted that during the interview, one of the participants mentioned that the EASY-CHANGE Fit Solution does not provide any data on the curvature of a horse's back. This implies that the tools in the EASY-CHANGE system primarily focus on gullet sizing and adjustments rather than capturing detailed information about the horse's back curvature (EASY CHANGE, n.d.-b).

Alogo Analysis

Alogo Analysis, a Swiss tech company, has made significant advancements in modernizing the equestrian industry through their innovative analytics tools. Their flagship products, the "Alogo" mobile app and equine sensor "Move PRO," revolutionize performance measurement and tracking in equine athletes.

The Move PRO sensor, developed by Alogo Analysis, attaches to the horse's girth and captures precise data on movement during training and competition. This sensor collects information on gait, stride, speed, and other performance metrics, which is then analyzed in the Alogo mobile app. The app provides comprehensive insights into balance, straightness, and other key parameters, allowing riders and trainers to monitor and track progress over time.

A notable aspect of Alogo's technology is its ability to monitor and assess horse health. The app's monitoring features can identify potential issues like lameness, behavioral anomalies, and weight fluctuations, enabling early detection and intervention.

The Alogo mobile app stands out as one of the most advanced and user-friendly applications in the equine industry. Its ability to provide concise and easily understandable feedback to users is commendable.

Inspired by Alogo's concept, we aim to explore the integration of similar sensors directly into saddles. This integration would eliminate the need for separate devices, enhancing convenience for riders while seamlessly collecting valuable data on horse health and performance (Alogo, n.d.).

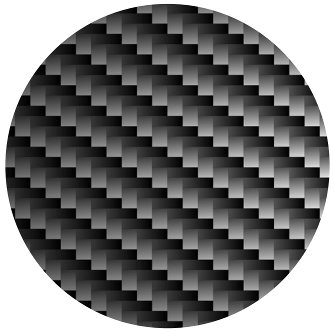
Schleese

Schleese's renowned "Saddlefit 4 Life" program highlights their profound understanding of equine and rider anatomy and biomechanics. Through the use of advanced devices and skilled saddle fitters, Schleese takes into account various factors such as the horse's conformation, musculature, and movement, as well as the rider's position and measurements. This comprehensive approach ensures the best possible fit for both horse and rider, offering a well-fitting saddle from their range or the option to customize a saddle to their specific needs.

Schleese's dedication to optimal saddle fit extends to their pioneering work in developing gender-specific saddles. They were among the first to introduce saddles designed specifically for the anatomical requirements of female riders. This attention to detail and consideration of gender-specific biomechanics serves as a source of inspiration for our own project. We aim to incorporate a similar level of precision, detail, and gender-specific design principles into our saddle customization and fitting process.

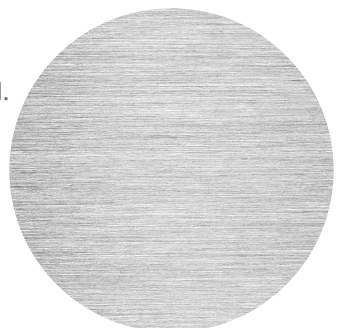
Carbon Fiber

Advantages: Lightweight, strong, and durable material with excellent stiffness.
Disadvantages: Expensive, difficult to repair, and limited flexibility.
Usage: Carbon fiber can be used in the saddle tree and other structural components for enhanced strength and weight reduction.
Manufacturing Technique: Carbon fiber sheets or fabric are layered and bonded together using epoxy resin and then molded into the desired shape using heat and pressure.



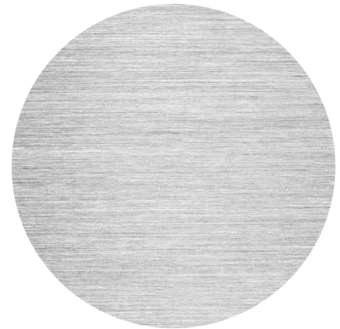
5mm Thick Steel

Advantages: Strong and durable material that provides stability and support.
Disadvantages: Heavy, may require additional padding for comfort, and susceptible to rust if not properly protected.
Usage: Steel can be used for the gullet and other load-bearing components in the saddle structure.
Manufacturing Technique: Steel sheets are laser-cut into the desired shape and then welded or riveted together to form the saddle components.



2mm Thick Flex-Steel

Advantages: Combines flexibility and strength, allowing for some degree of movement and customization.
Disadvantages: Requires precision manufacturing for proper flexibility, may require periodic adjustment, and not as durable as thicker steel.
Usage: Flex-steel can be used for the twist strut and back width strut to provide flexibility and adjustability in the saddle.
Manufacturing Technique: Similar to 5mm thick steel, flex-steel sheets are laser-cut and assembled using welding or riveting techniques.

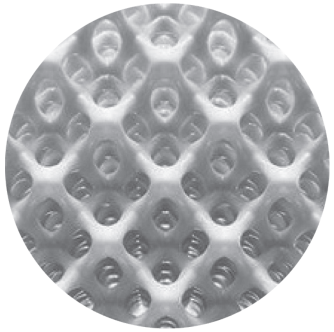


Wood

Advantages: Natural and traditional material with good shock absorption properties and aesthetic appeal.
Disadvantages: Susceptible to moisture damage, warping, and requires regular maintenance.
Usage: Wood can be used for the saddle tree and other components where a combination of strength and flexibility is desired.
Manufacturing Technique: Wood is carefully shaped and carved to form the desired saddle structure, with different types of wood and construction methods utilized.

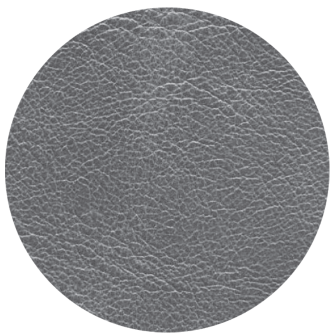
3D Resin Printed Lattice Structures

Advantages: Customizable, lightweight, and allows for intricate designs.
Disadvantages: Limited material options, may require additional support structures, and less traditional appearance.
Usage: Lattice structures can be used in non-load-bearing parts of the saddle for added comfort and weight reduction.
Manufacturing Technique: 3D resin printing is used to create lattice structures layer by layer, using resin and ultraviolet light for solidification.



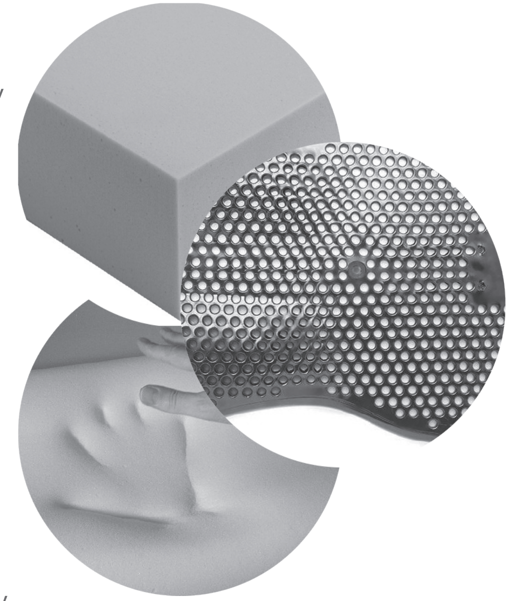
Locally Sourced Second-Hand Leather Cuttings

Advantages: Sustainable option, cost-effective, and reduces waste.
Disadvantages: Limited availability and may require careful selection to ensure quality.
Usage: Second-hand leather cuttings can be used for the saddle cover, providing comfort and aesthetics.
Manufacturing Technique: Leather cuttings are sourced locally, carefully selected, and stitched together to create the saddle cover.



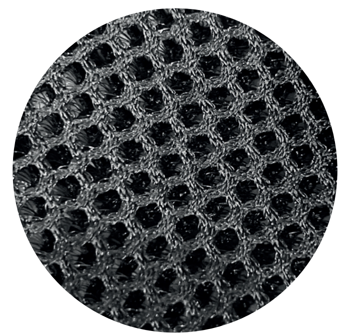
Selection of Paddings (e.g., Gel Pads, Soft and Hard Foams, Memory Foam)

Advantages: Provides cushioning, shock absorption, and customized comfort.
Disadvantages: Varying durability and may require replacement over time.
Usage: Paddings can be incorporated in the saddle design to enhance rider and horse comfort.
Manufacturing Technique: Paddings are cut into the desired shape and placed strategically within the saddle structure or cover for optimal support and comfort.



3D Air Effect

Advantages: Provides excellent breathability and airflow, reducing heat buildup and moisture accumulation.
Disadvantages: May have limited durability and require proper maintenance.
Usage: The 3D Air Effect material can be utilized in the saddle's padding or as a component in the saddle cover for enhanced ventilation and moisture-wicking properties.
Manufacturing Technique: The 3D Air Effect material is typically constructed using a three-dimensional mesh or perforated fabric that allows air circulation. It can be cut and shaped to fit the specific areas of the saddle where breathability is desired.
By incorporating the 3D Air Effect material, the saddle can offer improved ventilation, preventing discomfort caused by heat and sweat buildup during extended riding sessions. The material's breathability helps maintain a cooler and drier environment, promoting better overall comfort for both the rider and the horse.



Plastic Molds

Advantages: Plastic molds offer versatility, as they can be easily shaped and customized according to specific design requirements. They are lightweight, durable, and resistant to moisture and corrosion.
Disadvantages: Depending on the type of plastic used, there may be limitations in terms of temperature resistance and long-term durability.
Usage: Plastic molds are commonly used in saddle production for creating various components. They provide structural support and contribute to the overall stability of the saddle.
Manufacturing Technique: Plastic molds are typically created through injection molding or 3D printing processes. Injection molding involves injecting molten plastic into a mold cavity and allowing it to cool and solidify, while 3D printing builds the molds layer by layer using a computer-controlled additive manufacturing technique.

Polyester Belts

Advantages: Polyester belts are strong, flexible, and resistant to stretching. They offer reliable load-bearing capabilities and are resistant to moisture and UV damage.
Disadvantages: Polyester belts may have limitations in terms of adjustability and precise customization compared to other materials like leather.
Usage: Polyester belts are commonly used in saddle construction to provide support and reinforcement. They contribute to the overall stability and strength of the saddle.
Manufacturing Technique: Polyester belts are typically manufactured through weaving or braiding processes using high-strength polyester fibers. They can be cut and adjusted to the desired length and securely fastened within the saddle structure.

Best Use Case Materials for Saddle

The choice of materials is crucial in saddle production as they each offer distinct advantages and characteristics that contribute to the comfort, stability, and durability of the saddle design.

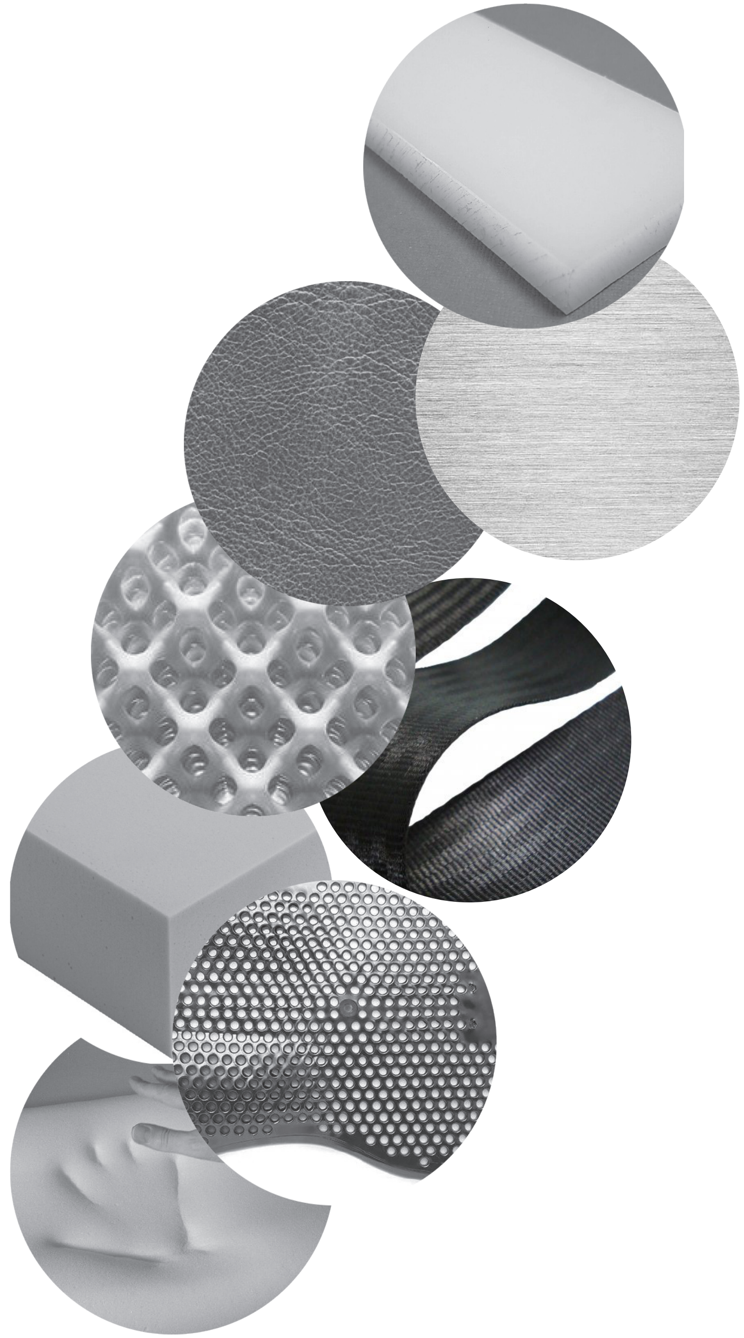
Polyester belts and plastic molds are valuable materials in saddle production. Polyester belts provide reliable load-bearing support, ensuring even weight distribution and overall saddle stability. They are strong, flexible, and resistant to stretching, making them ideal for enduring the demands of horseback riding. On the other hand, plastic molds are versatile and durable, allowing for the creation of various saddle components. They can be precisely shaped and customized, contributing to the saddle's design, functionality, and rider comfort.

Using locally sourced second-hand leather cuttings adds sustainability and aesthetic appeal to the saddle. Repurposing leather materials reduces waste and promotes environmental conservation. Skilled craftsmen shape and stitch the leather cuttings, offering durability, comfort, and a traditional touch to the saddle.

The selection of paddings, such as gel pads, soft and hard foams, and memory foam, enables customized comfort and support. Gel pads absorb shocks, reducing impact on the horse's back and the rider's seat. Soft and hard foams provide varying levels of cushioning, catering to individual preferences. Memory foam molds to the rider's body, ensuring optimal weight distribution and pressure relief. These paddings allow the saddle to be tailored to the specific needs and preferences of both horse and rider.

Flex-steel (2mm thick) and thick steel (5mm thick) components add strength and stability to the saddle structure. Flex-steel offers flexibility and adaptability, allowing the saddle to conform to the horse's back while maintaining its shape. The thicker steel components provide robustness and support, ensuring the saddle can withstand the rigors of horseback riding. These materials contribute to the overall durability and longevity of the saddle.

By carefully selecting and integrating these materials into the saddle production process, a well-designed saddle can be created, prioritizing comfort, stability, durability, and customization. Each material brings specific advantages, enhancing the riding experience for both horse and rider.



Research Findings

In this chapter, we present our conclusions based on the research findings, incorporating valuable insights from our target audience, particularly equestrians. Through in-depth analysis of the collected data, we have identified the specific needs and preferences of equestrians in relation to saddle design. These findings have shaped our design criteria, which prioritize usability, functionality, aesthetics, sustainability, cultural relevance, and equestrian requirements. By considering the unique needs of equestrians, we aim to create a saddle that not only meets their expectations but also enhances their riding experience and promotes the well-being of both the rider and the horse.

Saddle Fitting Proccess

During the saddle fitting process for English horse saddles, various measurements are taken to ensure a proper fit and optimal design. These measurements are crucial in creating a saddle that accommodates both the rider's comfort and the horse's anatomy.

For the rider, measurements such as height, weight, trouser size, and the length of the upper thigh from the hip joint to the knee are taken. These measurements help determine the appropriate saddle panel length and ensure that the rider's position is well-aligned during riding.

To assess the horse's requirements, measurements are taken using tools such as a moldable rod. Key areas of focus include the withers, spine curvature, mid-back structure, and the location of the last rib on the back. By evaluating these areas, saddle fitters can tailor the saddle design to accommodate the horse's unique shape and provide proper clearance and support.

During the fitting process, the saddler may request the rider to lunge the horse at different gaits while using a sample saddle. This allows them to observe the horse's movement and assess how the horse's shoulders stretch and move during different activities. By evaluating the horse's motion, the saddle fitter can ensure that the saddle design allows for adequate freedom of movement and avoids any discomfort or restrictions.

In addition to the measurements, consideration is given to specific injuries and anatomical irregularities that may impact both the rider and the horse. For riders, factors such as hip joint problems, back issues, or tailbone injuries are taken into account when designing the saddle. Customizations, such as a narrow seat for hip joint problems or a specially designed seat for tailbone injuries, can enhance rider comfort and prevent discomfort during riding.

Moreover, riders' preferences for various aspects of saddle design, such as the cantle, seat size, depth of the seat, flatness of the seat, and the shape of the saddle flaps, are considered. These preferences are taken into account to create a saddle that aligns with the rider's individual needs and riding style, providing comfort and balance.

Once the measurements are obtained, the saddle may be modified to better fit the horse's anatomy. This modification may involve adjusting the saddle tree or making specific cuts to ensure a snug fit and proper alignment with the horse's back. Additionally, appropriate padding materials are added to the saddle to enhance rider comfort and provide support and stability during the ride.

By incorporating precise measurements, considering specific injuries and anatomical irregularities, and addressing rider preferences, saddle fitters can create a saddle that fits the horse's anatomy and provides optimal comfort and performance for both horse and rider. The aim is to ensure a harmonious riding experience and minimize any discomfort or potential injuries.

During the testing and experimenting stage, three different prototype directions were developed:

Application prototype

The saddle application prototype simplifies the customization process by allowing users to input their own measurements and take scans for a custom saddle tree design. Riders can enter personal measurements like seat size and leg length, while horse measurements include back length and withers height. Scanning capabilities capture detailed data on the horse's back shape, ensuring an accurate and tailored saddle fit. This streamlined approach prioritizes comfort and considers both rider and horse anatomy.

Measurements method prototype

The measurements method prototype focused on testing technologies for precise scanning of a horse's body to extract necessary measurements. The goal was to improve accuracy and consistency in designing a saddle tree that fits the horse's body precisely. The prototypes aimed to eliminate guesswork and subjectivity by relying on objective data from 3D scans. This approach ensured an ergonomically designed saddle tree with appropriate clearance and support in the relevant areas, resulting in a more reliable and accurate saddle fit.

Prototype of a system delivering and implementing of individual measurements into a saddle tree design

The implementation of individual measurements into a saddle tree design involved taking the data from the measurements method prototype and integrating it into a custom saddle tree design. The goal was to ensure that the saddle tree was ergonomically designed to fit the horse's back, with adequate clearance and support in the appropriate areas. By using the precise measurements collected from the 3D scan, the saddle tree could be designed to fit the specific dimensions and contours of the horse's back, resulting in a more comfortable and performance-enhancing saddle.

Prototype of a system delivering and implementing of individual measurements into a saddle tree design

The integration of individual measurements into a saddle tree design consisted of incorporating data from the measurements method prototype into a customized saddle tree. The objective was to create an ergonomically designed saddle tree that perfectly fit the horse's back, providing sufficient clearance and support where needed. By utilizing precise measurements obtained from the 3D scan, the saddle tree could be tailored to match the specific dimensions and contours of the horse's back. This resulted in a saddle that was not only more comfortable for the horse but also improved overall performance during riding.

Materials to work with

We reached out to Sabrina Casty at the Casty Farm, a dedicated horse facility located in Engadin, Switzerland. During our visit, the focus was on scanning Sabrina's four warmblooded horses, which consisted of two horses for racing, one for steeplechase, and one for show jumping. The scanning methodology involved gathering data on their body volumes, shapes, breeds, and activities.

Although NeRF technologies were not utilized at that time, we were able to capture photos of each horse and record videos of them lunging and their backs while riding. These visuals provided valuable insights into the horses' movement patterns and helped identify areas where the saddle required additional support or clearance.

Although the current technology did not include NeRF scanning, the collected scans and videos served as valuable data for future refinement of the custom saddle tree design process. As technology advances, we anticipate the development of more sophisticated scanning and measurement techniques, which will further enhance the accuracy and efficiency of custom saddle tree design.

Overall, the scans and videos obtained during our visit to the Casty Farm played a vital role in the optimization of the custom saddle tree design process, ensuring it meets the unique needs and preferences of each horse.

3D model of a Horse: Lidar Technology

In our initial measurement method prototype, we experimented with Lidar scanning technology using various scanning apps on the iPhone 13 Max Pro. After testing apps like Polycam and 3D Scanner App, we found that the latter produced the best results for scanning large objects. Using the 3D Scanner App, we recorded a video and took around 400 pictures of a racing horse named Flur in his stable. This meticulous process resulted in a highly detailed and accurate 3D model.

We also explored different approaches to capturing the horse's body and anatomy, including videos, pictures, and 3D scanning from different angles. To capture the movement of the horse's back, we recorded lunging sessions from both sides. It was crucial to provide clear instructions and ensure a stable environment to keep the horse calm during the process.

Although the scanning process was time-consuming and required focused attention, we were able to extract measurements from the generated models. We proceeded with the horse named Fou for our saddle tree design due to his unique back angles. While the application allowed us to obtain measurements for the customized saddle tree design, we encountered challenges in capturing the angles of the withers.

In summary, our team utilized Lidar scanning technology and the 3D Scanner App to capture detailed 3D models of a racing horse's body. The process involved careful scanning, video recording, and capturing multiple images. Despite challenges related to horse movement and object size, we obtained useful measurements. The selected horse, Fou, presented specific anatomical requirements that necessitated a customized saddle tree design.

3D model of a Horse: Nerf Technology

NeRF (Neural Radiance Fields) is a cutting-edge technology used in 3D computer graphics to create photo realistic renderings of complex scenes. Instead of approximating object surfaces with polygons, NeRF represents objects as a continuous function mapping 3D space to RGB values. To utilize NeRF effectively, objects should be stationary and well-lit. A reference dimension is required for accurate measurements, such as the height of a horse from the ground to the withers. Despite limitations in capturing ideal video input, the resulting NeRF model was highly detailed. The challenge lies in extracting measurements from the point cloud model and converting it into polygons.

3D model of a Person: Lidar Technology

NeRF (Neural Radiance Fields) is an advanced technology used in 3D computer graphics to generate realistic renderings of complex scenes. Unlike traditional methods that use polygons to approximate object surfaces, NeRF represents objects as a continuous function mapping 3D space to RGB values. For optimal results with NeRF, objects should be stationary and well-illuminated. Accurate measurements require a reference dimension, such as the height of a horse from the ground to the withers. Although capturing ideal video input presents challenges, the resulting NeRF model offers high levels of detail. The main difficulty lies in extracting measurements from the point cloud model and converting them into polygons. appeared distorted. This highlighted the challenges and limitations of using certain 3D scanning applications, emphasizing the need to understand the constraints of technology when creating 3D models of complex objects like humans.

3D model of a Person: AlterEgo Software

AlterEgo, an ETH-affiliated start-up, specializes in creating 3D models using only a single frontal picture, height, and weight of a person. Their software is primarily designed for online shopping platforms, enabling users to virtually try on clothes before buying them.

In our conversation with AlterEgo's engineers, we explored the potential for incorporating the user's back perspective into their model. They confirmed that integrating the back perspective was indeed possible, expanding the capabilities of their software.

The Flexfit System

The following chapter details the development process of the physical FlexFit prototype concept system.

Concept for Project Lucallian

After conducting field research and brainstorming ideas, our team has developed a user-centered and technologically advanced solution for saddle fitting. Our phone-based application utilizes AR scanning and measuring technology to create an anatomically custom-built saddle that prioritizes the health and comfort of both the rider and the horse.

Our product focuses on three key aspects to achieve an optimized fit and weight distribution: (1) gender-based saddle design, (2) personalized measurements for both the rider and the horse, and (3) the future implementation of a balance system and health data feedback.

In the application, users are prompted to provide information about rider parameters, rider measurements, horse parameters, and horse measurements. They also perform a scanning process, which involves capturing a video or photo of the horse and rider.

Using AR scanning technology, the application generates precise 3D models of the rider and horse based on the provided data. These scan-derived measurements are then incorporated into the saddle tree design, ensuring that the overall size and shape of the saddle body perfectly suit the individual characteristics of the rider and horse.

To enhance the riding experience and promote a balanced position, we have integrated pressure sensors into the saddle pads. This allows for live feedback on the rider's balance through the application. The sensor data is displayed in real-time, providing visible feedback on the saddle's fit and enabling users to make adjustments for an optimal fit and comfort for the horse when necessary.

Next Steps

During the research phase, it became apparent that the scope of our Bachelor's Thesis needed to be narrowed down. As a result, our current work will primarily concentrate on the following aspects:

Firstly, we will focus on developing a comprehensive saddle fitting measurement system. This system will involve capturing precise measurements to ensure an optimal fit between the rider and the horse.

Secondly, we will design an application that serves as both a measurement system tool and a platform for ordering a customized saddle. The application will provide an intuitive interface for users to input their measurements and preferences.

Additionally, we will conduct experiments with various available technologies to determine their effectiveness in the saddle fitting process. This will allow us to identify the most suitable technologies to incorporate into our solution.

Furthermore, we will prioritize the design of a harm-free and health-centered saddle tree. This involves creating a saddle tree that considers the anatomical needs of both the horse and the rider, ensuring maximum comfort and support.

Lastly, we will develop a gender-based saddle design. Recognizing the anatomical differences between male and female riders, our goal is to design saddles that accommodate the specific biomechanical requirements of each gender.

By focusing on these aspects, we aim to create a comprehensive and technologically advanced solution for saddle fitting that prioritizes comfort, performance, and the well-being of both the rider and the horse.

Rider Measurements: Scanning Method

Based on the data and knowledge gathered from desk and field research, you developed a measurement system to achieve an anatomically tailored fit for the saddle design. The table below explains the measurements that need to be taken and how they should inform the saddle design:

Measurement	Influence on Saddle Design	Saddle Design Adjustments
Pelvis width	Seat width should be adjusted to accommodate different widths. Pelvis volume impacts the space occupied by the pelvis in the saddle.	Narrower or wider seat. A larger pelvis volume may require a longer saddle tree for sufficient room and support. A larger seat size requires a flatter curve, while a smaller seat size requires a more pronounced curve
Pelvic tilt	The saddle should compensate for pelvic tilt and support the lower back.	Adjust the angle of the saddle tilt to compensate for the rider's tilt and provide lower back support. A more forward-tilting pelvis requires a flatter curve, while a more backward-tilting pelvis requires a more pronounced curve.
Balancing axes	The saddle should align with the balancing axes in the middle of the hip socket.	Ensure the seat is centered over the balancing axes.
Seat bones width	Seat bone width should be considered to adjust the seat width.	Narrower or wider seat.
Ratio of femur bone length to lower leg	Stirrup location should be adjusted to accommodate different ratios and maintain a balanced position. Longer femur bones also impact saddle length.	Adjust the location and length of the stirrup bars. The length of a rider's femur bone affects the angle of their thigh bone and can impact the required saddle tree length.
Lower leg	The angle and position of the stirrup bars should be adjusted to accommodate different leg lengths.	Adjust the angle and position of the stirrup bars for shorter or longer legs.
Upper inner thig	The form of the panels should be adjusted to accommodate the shape and location of the upper inner thigh muscles.	Adjust the form of the panels to fit the shape of the upper inner thigh and consider saddle panel length.
Inseam length	Stirrups should be adjusted to fit the rider's inseam length.	Adjust the length of the stirrups to match the rider's inseam length.
Balance & Tilt while seating	In case of tilt, padding should compensate for the tilt.	In case of tilt, padding should compensate for the tilt.

By considering these measurements and corresponding saddle design adjustments, you ensure that the saddle provides a customized fit based on individual anatomical characteristics and promotes proper alignment, comfort, and balance for the rider.

How to Measure the Rider

Obtaining accurate measurements for each rider is crucial in developing a saddle that fits them comfortably. After determining the necessary measurements, the challenge was to find effective ways to gather this data from scans or photos of the rider. The identified methods were grouped into several categories.

Firstly, for obtaining measurements from a photo of a user standing straight with their feet at a normal distance, the pelvic width was measured by determining the circumference of the pelvis at its widest point while keeping the measuring line parallel to the floor. Additionally, the distance between the ankles was measured to confirm the pelvic width. The length of the femur bone and lower leg, as well as the ratio between them, was also determined from this photo.

Secondly, a photo of a user in profile provided valuable measurements. Pelvic tilt, which is commonly visible when a person stands straight, was assessed. The length of the femur bone, lower leg, and the ratio between them were also obtained from this photo. The shape of the upper inner thigh and the inseam length were determined by analyzing a front picture of the user with legs shoulder-distance apart.

Next, a photo of a rider sitting on a saddled horse from the back was used to gather important data. This included information on pelvic tilt, balance, and tilt while seating. Seat bone width, which is challenging to measure, was approached by using the Fit Right System developed by WTB. However, due to time constraints, a photo from the back perspective was used as an alternative method.

Another photo of a rider sitting on a saddled horse, this time from the profile, was utilized to determine the balancing axes. This photo also provided data on the femur bone length, lower leg length, and the ratio between them, giving insights into the hip-socket location and knee joint.

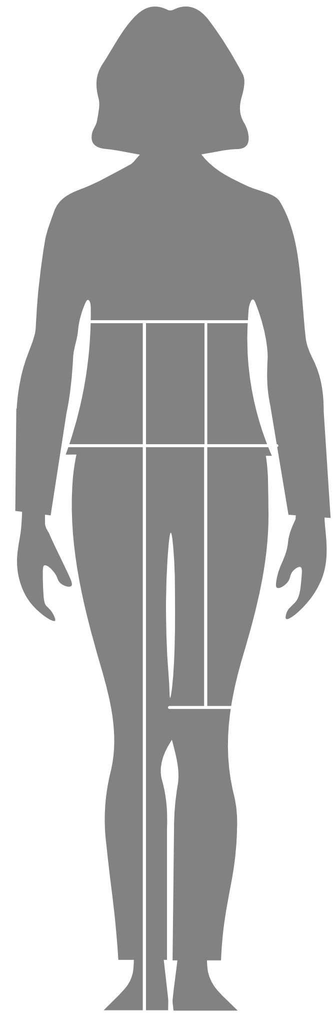
It is essential to highlight that each of these methods plays a crucial role in gathering data for the development of a customized saddle that fits the rider comfortably. By utilizing these methods, accurate measurements can be obtained, allowing for the creation of a saddle that is tailored to the unique physique of each individual rider.

Rider Parameters: Manual Input

In addition to the data collected through scans and measurements, there are additional parameters in saddle design that require direct input from the rider. These parameters include:

Hip-bone structure: Understanding the rider's hip-bone structure helps determine whether a saddle should be designed specifically for males or females.
Trouser size: The rider's trouser size serves as a reference point to verify the accuracy of the collected data and estimate the volume of the rider's pelvis, which influences saddle size and shape.
Height: Rider height affects how they sit on the saddle and distribute their weight. Taller riders may require a longer and wider seat area, as well as a higher pommel and cantle for balance in certain disciplines.
Weight: The rider's weight impacts the saddle's steel thickness, and weight distribution affects the placement of stirrup bars and the shape of panels.
Other factors to consider in saddle design are injuries, anatomical irregularities, preferred activity/discipline, and preferred riding position. Injuries and irregularities require adjustments for comfort and support, while different activities and disciplines have specific requirements for seat shape, flap length, and stirrup bar position. Preferred riding position may also necessitate a design with added support, such as a deeper seat or larger knee roll.

By incorporating these rider-specific parameters along with the gathered data, a saddle can be designed that is tailored to the rider's unique needs, ensuring comfort, performance, and support.



We have compiled a table that includes essential horse measurements necessary for achieving a customized and harm-free saddle fit. These measurements are crucial for each specific part of the saddle tree, ensuring that it fits securely and comfortably on the horse's back.

Saddle Tree Length:

Measurement	Implementing in Saddle Tree
Back Length	The length of the saddle tree cannot exceed the back length measurement. The tree should end 5-7.5 cm down from the spine.
Shoulder Blade Position	The saddle tree should start behind the horse's shoulder blade to allow free movement.
Shoulder Angle	A horse's shoulder angle affects the required tree length. A more upright angle may necessitate a shorter tree.

Gullet Plate Width & Shape (Front of the gullet):

Measurement	Implementing in Saddle Tree
Withers	The shape of the gullet should follow the shape of the withers with additional clearance for movement.

Saddle Tree Points:

Measurement	Implementing in Saddle Tree
Withers	Points should be positioned based on the height of the withers and the horse's conformation.
Position and rotation of scapula (shoulder blade)	The points should be placed behind the shoulder blade for freedom of movement.
The angle of the scapula	The angle of the tree points should align with the angle of the shoulder blade.

Additional Measurements:

Measurement	Implementing in Saddle Tree
The angle of the larger shoulder	Adjustments should be made to accommodate the larger shoulder, ensuring it is not compressed.
Gullet width	The gullet should be wide enough to avoid pressure on the horse's spine.
Shape of the back (spinal curve)	The shape of the back influences the required gullet width. A flatter back may require more clearance, while a curved back may need width.
Nuchal ligament	The presence and development of the nuchal ligament affect the required gullet width.

Curvature of the Tree:

Measurement	Implementing in Saddle Tree
Back shape & Back line	The saddle tree's curvature should align with the shape and profile of the horse's back.
Back length	The length of the back influences the required curvature of the saddle tree.
Withers	The front part of the saddle should mimic the shape of the withers and allow for clearance.

How to Measure the Horse

To obtain the necessary measurements for fitting a saddle to a horse, we categorized the measurements based on the method used to collect them. Firstly, a 3D model of the horse can provide us with measurements such as the back length, withers' angle and slope length, the angle of the scapula, the angle of the larger shoulder or shoulder asymmetry, the nuchal ligament, and the back shape and swing line.

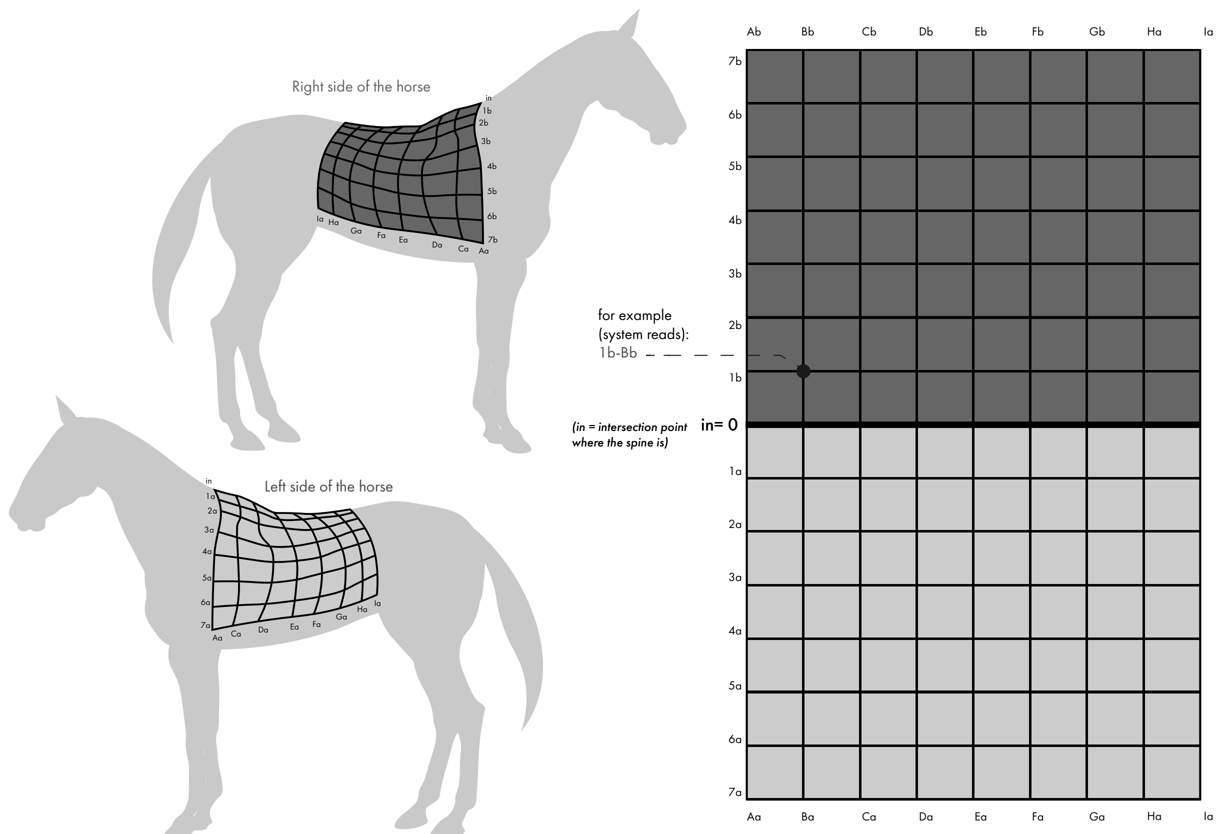
Secondly, a video of the horse lunging allows us to capture measurements related to the shoulder blade position, the shoulder angle during movement, and the back shape and swing line.

Thirdly, a video of a rider on a saddled horse can help identify any interference of the shoulder blade with the current saddle, providing insights into potential issues with the fit.

Lastly, a video of the horse's back in motion from a top view offers valuable information on shoulder movement and asymmetry.

These various methods of data collection enable us to understand the natural movement and shape of the horse's back and shoulders, allowing for a customized and comfortable saddle fit. By considering the width and shape of the horse's rib cage and obtaining measurements of the withers' vertical height, the depth of the drop from the top of the wither to the top edge of the rib cage, and the length of the withers' slope, we can ensure a proper fit that minimizes the risk of injury and discomfort.

In summary, by utilizing 3D models, videos of lunging and riding, and top-view motion videos, we can gather the necessary measurements to design a saddle that fits securely and comfortably on the horse's back. Taking into account factors such as the rib cage width and shape, as well as the withers' height, drop depth, and slope length, we can create a customized fit that promotes the horse's well-being and performance.



Emma Meir

“

Bio

Emma used to perform and do a professional Show Jumping. Horse-riding is her hobby now. She has 4 family horses and cares about 4 horses of other owners. She loves to take a proper care for her horses and provide them with best equipment.

Age: 37

Sex: Female

Discipline: Show Jumping

Activity: Hobby

Horses: 3 race horses, 1 ex-race horse, 1 show jumper

Not Techy — Techy

Conservative-thinking — Modern-thinking

Riding 1h/day — Riding 6h/day

Helpers

Phillip

Sara

Saddle choice & Financial situation

- Emma once had a customised saddle for Fu because of his specific back-shape
- Now she has a generic saddle one for her 4 horses
- Cannot afford a saddle for every horse: “Person who does it for hobby person cannot afford it”

1000 CHF — 10 000 CHF

Core needs

- I would like to have one saddle customised for me and my horses
- Durable saddle: 10-20 years
- Light saddle
- “It would be beneficial to have a saddle customised for a rider”
- “I don't want to change a saddle a lot”

Motivation

- Reduce sore points for a horse and have a smooth riding experience

Pain Points

- No customisation for a rider
- For a customised saddle a rider needs 2-3 appointments. Its a lot of time.

- Emma's back problems caused by horse riding
- Her horse's back problems

- Price and process of ordering a customised saddle
- No customisation for a rider: “They judge only by a fit by a horse”

Barn

Terry

Fu

Francis

Phill

Tomara

Bio

Tamara is one of the first horses of Emma. She used to be a show jumper. She has a big and wide body and bigger than her barn-neighbours. Tamara is not performing anymore and now is a retired horse but still spend a lot of time with Emma riding outside for Tamara's health.

Age: 19

Breed: Dutch Warmblood

Activity: Show Jumping

Hight: 19 hands

Width: 100 cm

Girth: 230 cm

Attributes

calm | strong | wise | gentle

Concept for Project Lucallian

In the "Define Stage" of the design thinking process, user personas played a crucial role in understanding the needs, pain points, expectations, and goals of our identified user group, consisting of professional riders and hobby riders. Personas guided the ideation process and helped design an optimal user experience for the target audience.

The user personas included general user information and a representative quote reflecting their motivation. We considered qualities such as technological familiarity, readiness for new services, and time spent riding per day. These qualities were measured on scales like "Techy-Not Techy" and "Conservative thinking-Modern thinking" to gauge familiarity with technology and openness to new services.

The second part of the personas focused on saddle choice, financial situation, core needs, motivation, and pain points. We examined saddle history and financial resources to understand preferences and limitations. Core needs focused on the well-being of both the rider and horse. Understanding motivation and pain points helped tailor the service to user preferences and address concerns.

To comprehensively understand user needs, we included a third part representing the "Barn" and horse profile. This considered the rider-horse relationship and interconnected needs. Differentiating needs of different horses was as important as understanding rider needs.

The developed personas are as follows:

Professional Rider Persona: Mia
Mia is a professional show-jumping rider with seven years of experience. Her motivation is a well-tailored and health-centered saddle fit due to frequent horse changes. Mia values familiarity with a specific saddle type and seeks durability and ease of cleaning. Her horse, Fu, requires a customized saddle to accommodate anatomical irregularities.

Hobby Rider Persona: Emma
Emma is a hobby rider experiencing back pain. She wants an anatomically tailored saddle to improve posture and alleviate discomfort. Emma cares about her horse's health and desires an ergonomically designed saddle for her Dutch warmblood horse, Tomara. She is open to new opportunities and has used the same saddle for ten years.

The personas helped define the main functions of the service and application, shaping the final product. Certain ideas, like "performance feedback," were unnecessary for identified user types, while functions like "balance feedback" enhanced the goal of achieving a harm-free riding experience.

Including the "Barn" category highlighted the need for riders to create multiple horse profiles, enabling customized saddle orders.

Considering the personas' familiarity with technology, the aim was to create an easy-to-use tool for riders less experienced with scanning technologies.

The personas also aided in positioning the service and developing a marketing plan. Insights shaped assumptions, such as targeting hobby riders above thirty-five years old due to their impact on long-term health conditions and desire for health-centered equipment.

Insights to creating user journey

Once the value proposition and user personas were established, the next step in our process was to create a User Journey that outlines the customer's experience and interactions with our service. This User Journey was specifically tailored for professional riders and encompassed all stages of their engagement, starting from the initial awareness of our product to their post-purchase behavior. Through this exercise, we gained valuable insights into our users' needs, behaviors, and challenges.

During the User Journey mapping process, we discovered that health issues were the primary motivator for users to order a Lucallian saddle. Additionally, we identified that users faced challenges related to their unfamiliarity with the technology and a lack of trust in the traditional equestrian industry. It became clear that users would require support throughout the entire process, with a user-friendly interface and clear instructions being essential in building trust.

To address these challenges and provide a seamless user experience, we incorporated the FlexFit Tree system into our saddle offerings. The physical saddle tree, consisting of the 3D CellPad, FlexBody, and FlexTree, plays a crucial role in delivering optimal fit and comfort for riders and horses.

Starting with the 3D CellPad, the user journey begins by capturing precise measurements of the rider's anatomy through advanced 3D printing technology. This custom-fit cushioning is created to prevent sore spots and ensure optimal comfort during riding. The manufacturing process for the 3D CellPad utilizes a Heterogeneous Lattice structure that aids in shock absorption and weight distribution, enhancing the rider's experience.

Moving on to the FlexBody, the user journey continues with the construction of the saddle's structure, spring, and adaptability. The lightweight punctured flex-steel material is carefully shaped and assembled using injection mold plastic parts. The FlexBody's design caters to the specific hip bone structure of male and female riders, optimizing weight distribution, promoting proper sitting positions, and enhancing overall comfort.

Next, the user journey intersects with the FlexTree, which serves as the backbone of the saddle. The manufacturing process for the FlexTree involves precision engineering and custom fabrication. The gullet, made of 5mm thick aluminum, takes its measurements and form from the horse's withers width, ensuring necessary support and weight-bearing capacity. The puzzle-like plastic injection mold pieces, combined with the laser-printed Flex-Steel Struts, create a strong and adaptable foundation. This meticulous manufacturing process guarantees stability, alignment, and proper weight distribution for the rider's comfort.

Throughout the user journey, from initial awareness to the final purchase decision, the value proposition of the FlexFit Tree system is highlighted. The user-friendly interface and clear instructions provided with the saddle help address users' concerns about the unfamiliar technology and lack of trust in the equestrian industry. By incorporating the FlexFit Tree system into our saddle offerings, we alleviate users' fears of the unknown, simplify the scanning process, and assure them of the product's quality.

By mapping out user actions and touchpoints, we were able to identify the necessary functions and features that our application should offer. Furthermore, we pinpointed specific frustrations experienced by users and transformed them into opportunities for improvement. This comprehensive understanding of our users' needs, behaviors, pain points, and opportunities guides us in tailoring our service to better meet their requirements and provide an exceptional user experience.

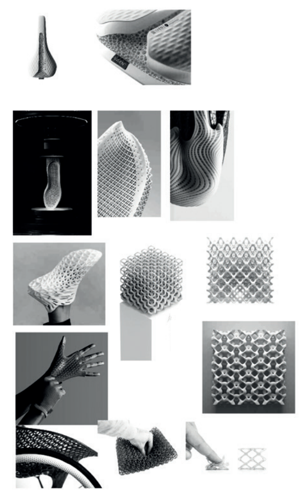
In summary, the FlexFit Tree system, consisting of the 3D CellPad, FlexBody, and FlexTree, is a fundamental part of our user journey. By incorporating advanced technology, precision engineering, and user-centric design principles, we address the challenges faced by riders and provide a saddle solution that delivers optimal fit, comfort, and trust. Through the User Journey analysis, we gained valuable insights that shape our service and ensure the satisfaction of our users, reinforcing Lucallian's

Branding

Photography

Product Form Board

3D Cellular Padding



Question Catalogue

We developed the questions catalogue to base our design on.

Check Parts	Catalogue of Requirements for Designing the Saddle Tree:
Secure and Comfortable Fit:	The saddle tree should fit securely and comfortably on the horse's back, ensuring a proper weight distribution and preventing discomfort or injury.
Horse Measurements:	The design of the saddle tree should consider essential horse measurements, including:
	Back Length: The distance from the withers to the T-18 rib, dictating the maximum length of the saddle tree.
	Shoulder Blade Position: The saddle tree should start behind the horse's shoulder blade to avoid interference with its movement.
	Shoulder Angle: The angle of the horse's shoulder blade, influencing the length of the tree for proper shoulder movement.
	Gullet Plate Width & Shape: The width and shape of the front of the gullet should align with the horse's withers, providing adequate clearance for movement.
	Saddle Tree Points: The positioning and rotation of the scapula (shoulder blade) should be considered to allow freedom of movement.
	Larger Shoulder/Shoulder Asymmetry: Adjustments should accommodate any asymmetry in the horse's shoulders to avoid compression or pressure points.
Gullet Width:	The gullet should be wide enough to avoid any pressure on the horse's spine, considering the shape of the back and the development of the nuchal ligament.
Curvature of the Tree:	The curvature of the saddle tree should align with the curvature of the horse's back, considering factors such as back shape, back length, and withers.
Saddle Panels:	The saddle panels should make even contact with the horse's back along its entire length, ensuring proper weight distribution and providing sufficient cushioning.
Adjustability:	The saddle tree design should allow for adjustability to accommodate different horse shapes, sizes, and asymmetries, as well as the rider's preferences and needs.
Material and Construction:	The saddle tree should be constructed from high-quality materials that provide strength, durability, and flexibility, such as Flex-Steel, aluminum, or other suitable materials.
Customization:	The design should allow for customization based on specific rider requirements, sport type, and inseam length, ensuring a personalized fit and optimal performance.
Ergonomics:	The saddle tree should be ergonomically designed to provide support and stability to the rider, promoting proper alignment and comfort during riding.
Weight Distribution:	The saddle tree design should aim to evenly distribute the rider's weight over a suitable area of the horse's back, reducing pressure points and ensuring balance.
Durability and Longevity:	The saddle tree should be designed to withstand regular use, providing long-lasting performance and reliability.
Manufacturability:	The design should consider the feasibility and practicality of manufacturing the saddle tree, taking into account cost-effectiveness, production processes, and scalability.
Adaptability	The saddle tree should be adaptable to accommodate changes in the horse's and rider's shape and condition over time.
Horse & Rider Measurements:	The saddle tree should consider sustainable materials, manufacturing processes, and end-of-life options to promote a more environmentally friendly approach.

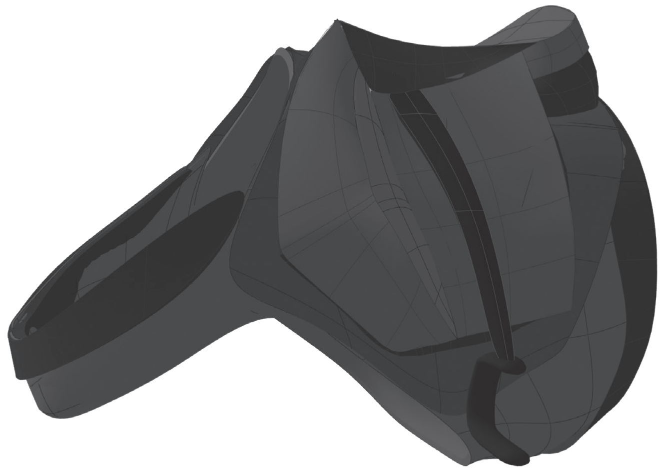
Exploring Horse Body Proportions: Unveiling the Size of the Horse's Back through Masking

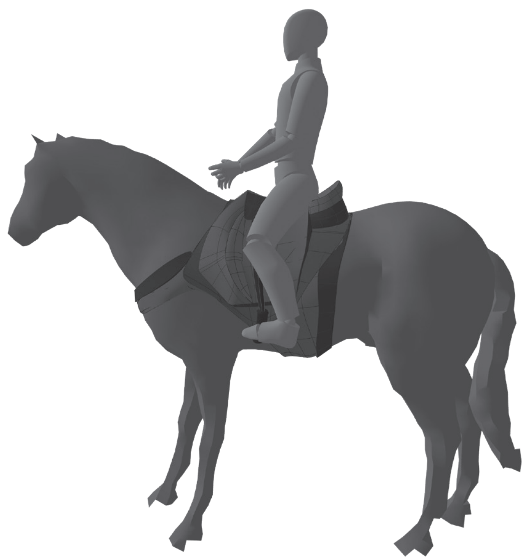
In the provided images, you can see the mask obtained from the horse named Eragon. This mask served as a reference to create a 1:1 body surface for developing the physical model in the off-site atelier. By utilizing the mask, we achieved an accurate representation of the horse's back and chest size and volume. To streamline the process, we introduced an inflated plastic body into the atelier, enabling us to inflate the mask to its full 1:1 dimensions.

VR Headset in Gravity Sketch

The integration of Oculus VR headset with Gravity Sketch has significantly improved the design process by allowing designers to enter a virtual world and interact with their 3D models in real-time. This integration enhances spatial awareness, depth perception, and the ability to manipulate designs using natural hand movements and gestures. The combination of Oculus VR technology and Gravity Sketch's advanced design tools enables more accurate representations of designs, informed decision-making, and rapid iteration, leading to increased efficiency and impactful design outcomes. Gravity Sketch proved to be particularly beneficial in quickly visualizing and designing complex system sketches, saving time compared to traditional hand-drawn sketches, and providing a more detailed and realistic representation of the components in a 1:1 virtual environment.

The explanation of the pieces is on the fallowing page.





Saddle Body

1.Pommel

Different on the male and female pelvic floor and provides balance so the rider doesn't fall too far forward or too far back. The padding on the Twist needs to be softer and wider for the female version of the saddle. The padding on the Twist needs to be firmer, higher and narrower on the male version of the saddle.
Mylo
Secondhand Leather

2.Twist

Different on the male and female pelvic floor and provides balance so the rider doesn't fall too far forward or too far back. The padding on the Twist needs to be softer and wider for the female version of the saddle. The padding on the Twist needs to be firmer, higher and narrower on the male version of the saddle.
Mylo
Secondhand Leather

5.Buckel

This 4 Buckels connects the saddle to the the halter-pad.
Metal
Elastic

8.Gullet

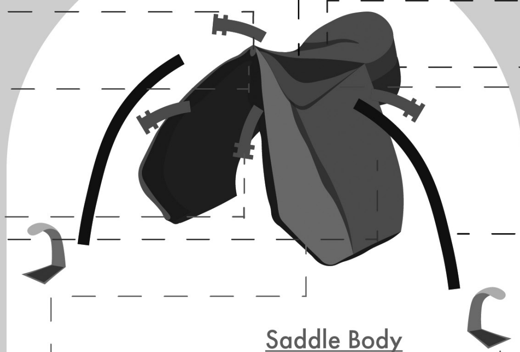
Should have no contact with the horse's spine. Should be minim 10cm wide as to not pinch or rub the horse's spine.
Mylo
Secondhand Leather

9.Knee Pad

Supports the rider's knee and has padding to prevent sore spots on the horse's rib cage.
Cover: Mylo
Cover: 3D Air Effect, Secondhand
Interior: Memory foam,3D mes, Gel paddin, Foam padding

10.Saddle Flap

Protects the horse from the rider's leg. Prevents friction between horse and rider. Touches horse and rider.
Mylo
Secondhand Leather



Saddle Body

3.Seat

Is where your lower pelvic bones sit; Women have 3 points of contact and men have two points of contact. The seat does not touch the horses back. Only the riders have seat contact. Therefore, the seat needs to be fitted with padding on top of the saddle tree. The seat needs comfortable and hold the rider's position as to not cause back pain.
Cover: Mylo, Secondhand Leather
Interior: Padding made from a 3D mesh

4.Cantle

The Cantle provides back support and positions the pelvic floor for correct posture giving lower lumber support. Located on the back of the saddle and has not contact with the horse.
Mylo
Secondhand Leather

6.Skirt

Skirt is connected to the main body (Pommel, Seat, Cantel). Main function to protect the inner thighs and hides the Dee Ring and Strip bar connection. This part has minimal padding.
Cover: Mylo, Secondhand Leather
Interior: Padding made from a 3D mesh

7.Panel

The Cantle provides back support and positions the pelvic floor for correct posture giving lower lumber support. Located on the back of the saddle and has not contact with the horse.
Mylo
Secondhand Leather

11.Stirrup

A leather strap that holds the Stirrup bar to the Dee Ring that bares the weight of the rider. Has little contact with the horse.
Mylo
Secondhand Leather

12.Stirrup Bar

Bares the weight of the rider aiding in proper weight distribution.
Steal
Aluminum
Plastic

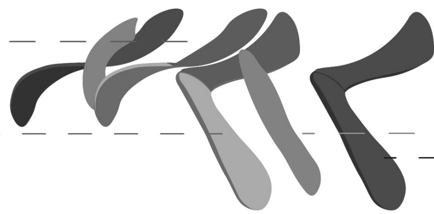
Panel Padding System

2.Thigh Pad

This padding helps distribute weight of the rider and prevents the rider's knee and calf from causing friction or pain on the horse's rib cage. The Thigh padding adds calf support for the rider. This will be attached by a zipper so that the rider can change the forms.
3D mesh, Gel padding, Foam padding, Memory foam
Zipper

1.Horse Back Pad

Distributes the weight from the rider evenly. It has several types of paddings depending on the horse's needs. These paddings are color coordinated depending on which one you need, this will provide comfort the horses spine. The Back Pad doesn't lay on the horse's spine. The app will advise you on which on which are advised by the app. This will be attached by a zipper so that the rider can change the forms.
3D mesh, Gel padding, Foam padding, Memory foam
Zipper



3.3D Cellular Print

Extra: This helps support the rider's thigh. This will be 3D printed because it will weigh less than traditional foams.
3D printed soft material

4.Outer Panel Cover

The Horse Back Pad and Thigh Pad System is within the Outer Panel Cover holding the system together; making sure that it stays clean. The user can make changes or adaptations to the system via the zipper.
Mylo
Secondhand Leather
Zipper

Saddle Tree

2.Riders Saddle Tree

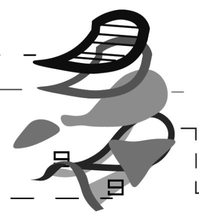
This holds the form of the flex body and has flexible areas, which can form to the horse and the riders weight distribution and lower lumber.
Gullet and Cantle: Carbon Fiber
Rail: Spring Steel
Body Cover: Polyurethane

1.Flex Body

Flex Body: Adds buoyancy to the rider. Flexes to support the weight.
PLA Plastic

5.Dee Ring

The bar that is connected to the saddle tree which holds the stirrups
Stainless Steel, Aluminum



3. 3D Cellular Print

This is an innovation to suppress the blunt force of the rider's weight onto the horses back, creating shock absorption.
3D printed soft material

4.Horse Saddle Tree

Form to the horse and the riders weight distribution and lower lumber. Holds the form of the horse's withers making proper weight distribution and adding flexibility.
Gullet and Cantle: Carbon Fiber
Rail: Spring Steel
Body Cover: Polyurethane

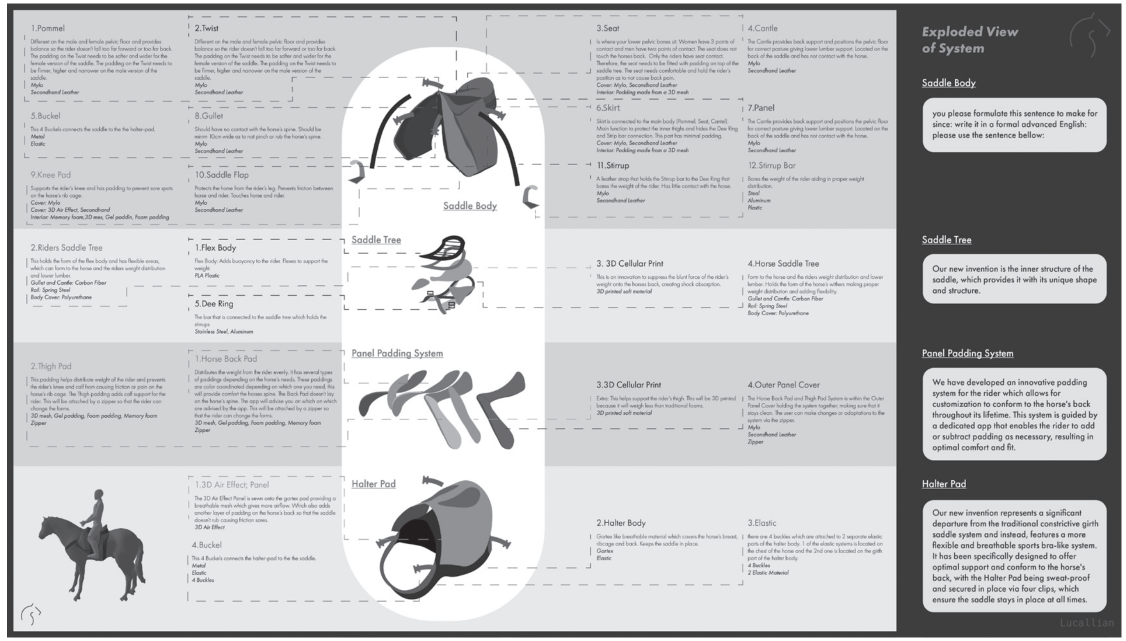
Focus on Panel Padding System and Saddle Tree

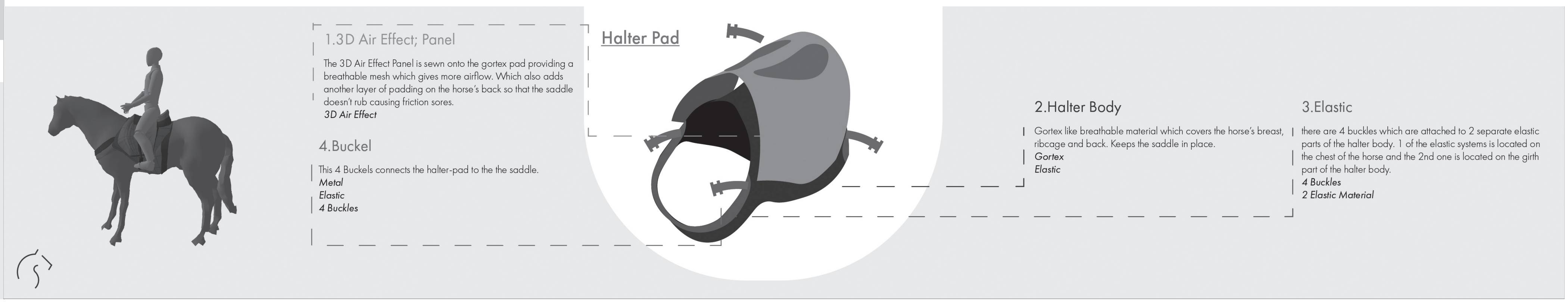
During the design process, we conducted a thorough analysis of the saddle components to identify areas where improvements could be made. As a result, we decided to narrow our focus to two specific parts: the panel padding system and the saddle tree.

The panel padding system plays a crucial role in providing comfort and support to both the rider and the horse. We recognized the need to enhance this component to ensure optimal weight distribution and pressure relief. Through extensive research and testing, we aimed to develop a padding system that would minimize sore spots and promote a harmonious riding experience.

The saddle tree, as the backbone of the saddle, determines its overall structure and stability. We aimed to design a tree that would offer adaptability and flexibility while maintaining durability and strength. By focusing on this component, we could address the core foundation of the saddle and optimize its performance.

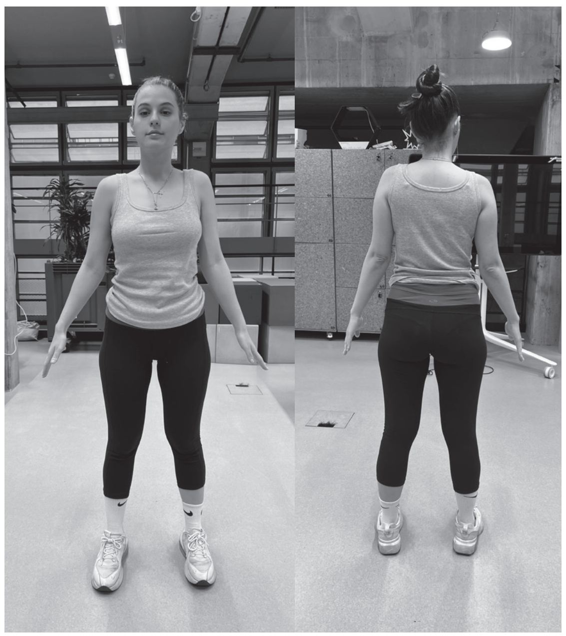
By concentrating our efforts on the panel padding system and the saddle tree, we aimed to make significant advancements in these specific areas of the saddle design. Our intention was to create a saddle that prioritizes comfort, functionality, and the well-being of both the rider and the horse.

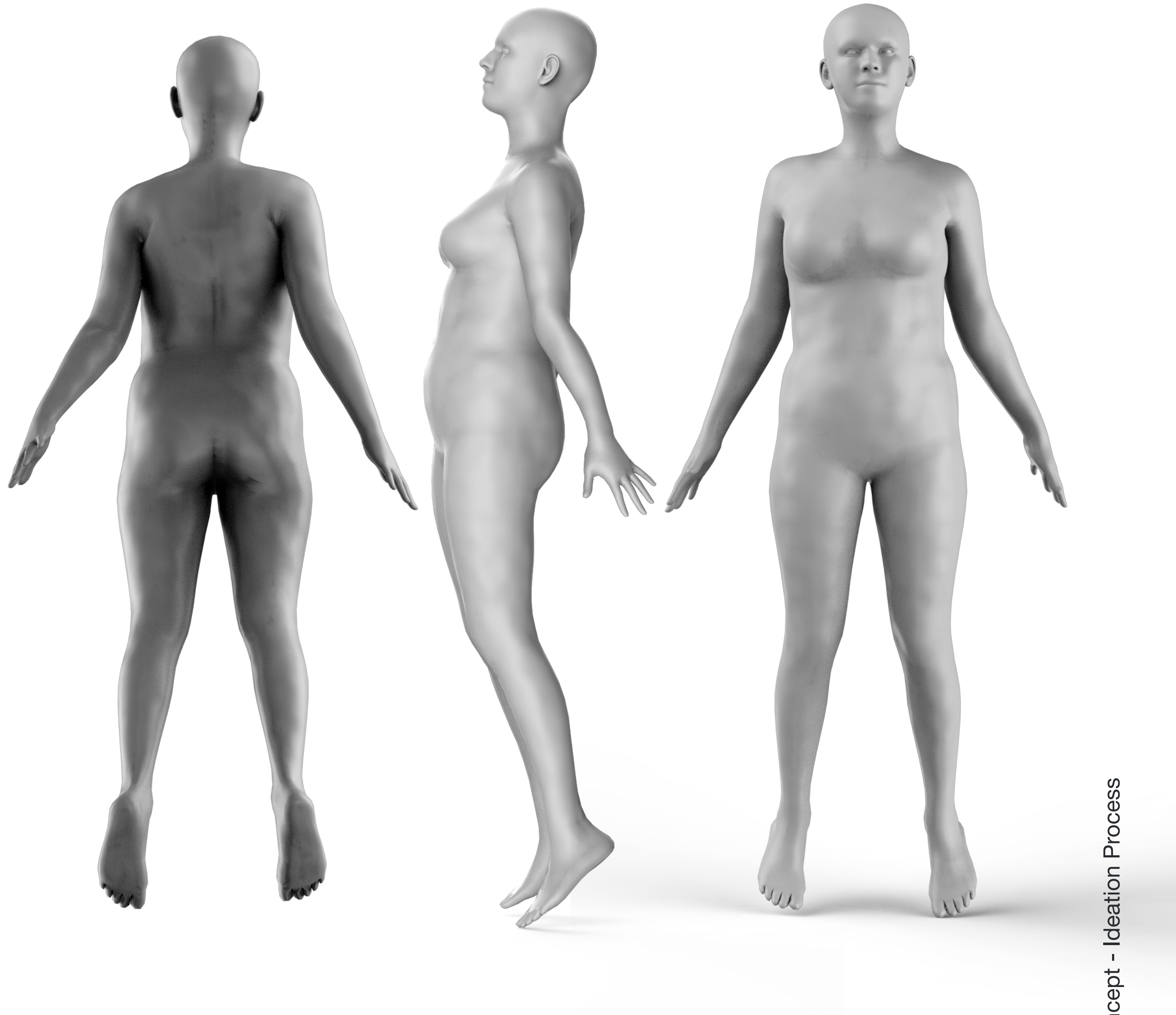




Dzhulliia 3D Model created by AlterEgo's Software

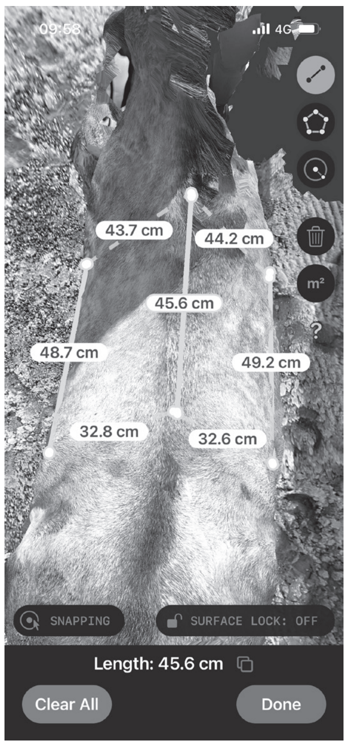
We had the opportunity to collaborate with the AlterEgo Company, which allowed us to obtain precise measurements for our project. To ensure accuracy, we extracted key measurements from the 3D model provided by AlterEgo. These measurements included pelvic tilt, balancing axes, inseams, upper leg, lower leg, hip bone width, and the distance between the upper inner thigh. By utilizing these detailed measurements, we were able to design and develop our project with a focus on customizing the saddle fit for optimal comfort and functionality. Working closely with AlterEgo and leveraging their advanced technology enabled us to create a tailored solution that meets the specific needs of our users.

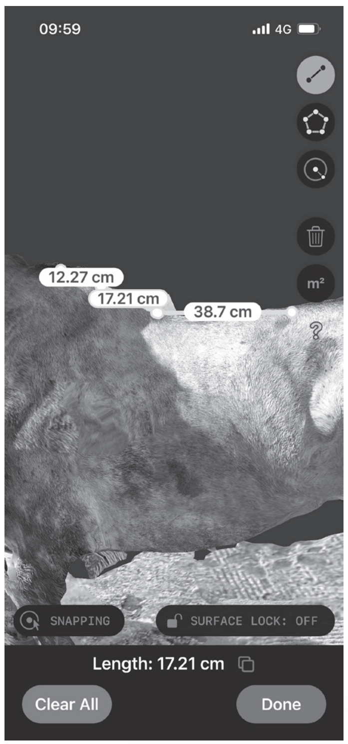




Fou de Reve 3D Model created with 3D Scanner App

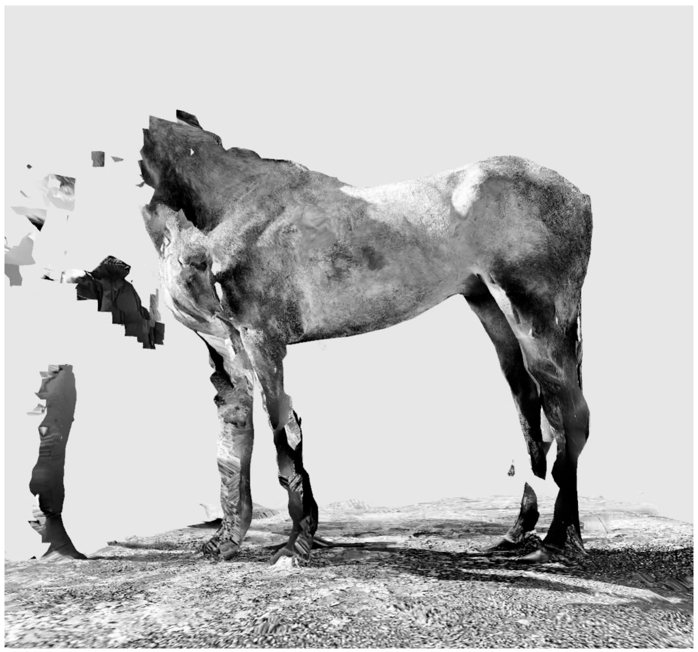
To obtain an accurate 3D scan of a horse, we utilized the 3D Scanner App to scan Fou de reve. This allowed us to generate a precise digital model of the horse, which served as a valuable reference for our project. From this model, we extracted various measurements to inform our design process. These measurements included the length of the saddle support area (SSA), the width of the spine, the symmetry and size of the shoulders, the width and size of the withers, the musculature, the shoulder blade angle and width, the width and curvature of the back, as well as the back (swing) line of the horse. By accurately capturing these measurements from the 3D model, we were able to design and develop our project with a deep understanding of the horse's anatomy, ensuring a proper fit and optimal comfort for both the horse and rider.





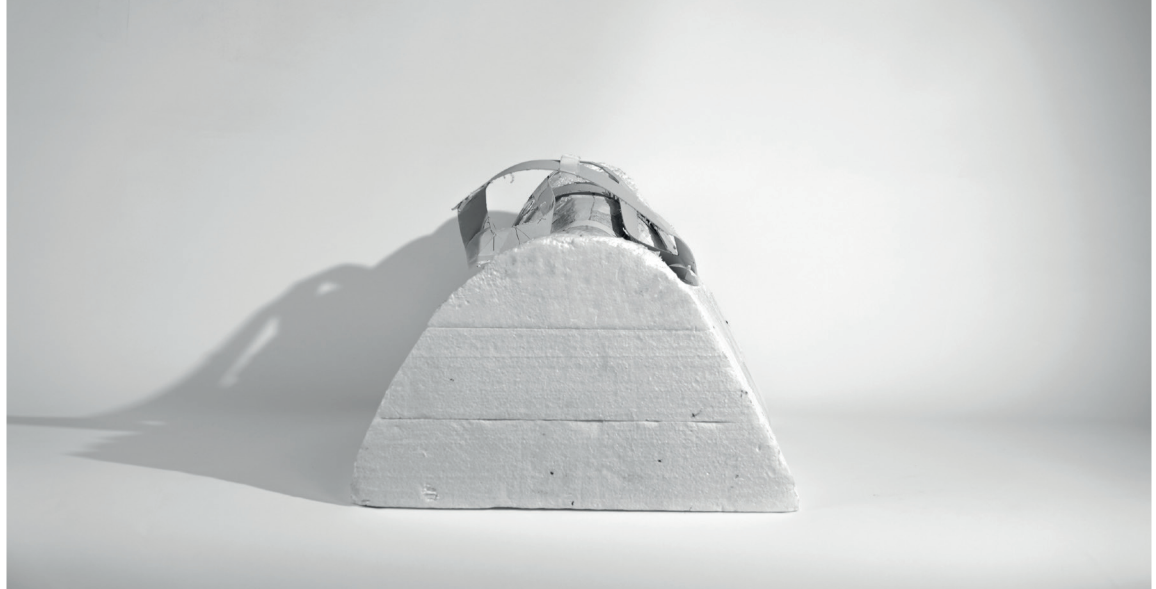
Crafting a 1:1 Foam Back Exemplar: Replicating the Horse Model "Fou de Reve"

Using advanced technology, specifically the Lidar scanning application called 3D Scanner App, we captured a detailed 3D model of Fou de Reve at the Casty ranch. This allowed us to obtain accurate virtual measurements of his physique. Based on these measurements, we sculpted a physical replica of his back using polystyrene material. Additionally, we recreated the design in a digital format using Fusion 360, providing a digital 1:1 mockup as a reference for the final product. This foam back exemplar served as the foundation for the design process, enabling us to create a tailored end product.



Cardboard Saddle Tree Model

Creating a cardboard model proved to be beneficial in obtaining a 1:1 representation of the saddle tree shape. By constructing the model out of cardboard, we were able to visually assess its size and form, gaining a better understanding of its dimensions and overall appearance. This rough model provided valuable insights into the potential design and allowed us to make initial observations and adjustments before proceeding with more detailed iterations. The cardboard model served as a practical tool for visualizing and conceptualizing the saddle tree, aiding in the development and visualization of the final product.

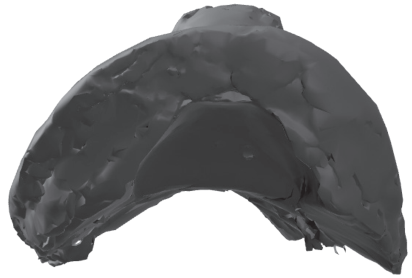


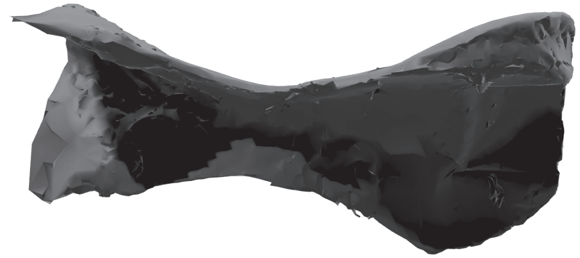
Scupting a Clay Model from Dzhuliia and Fou de Reve

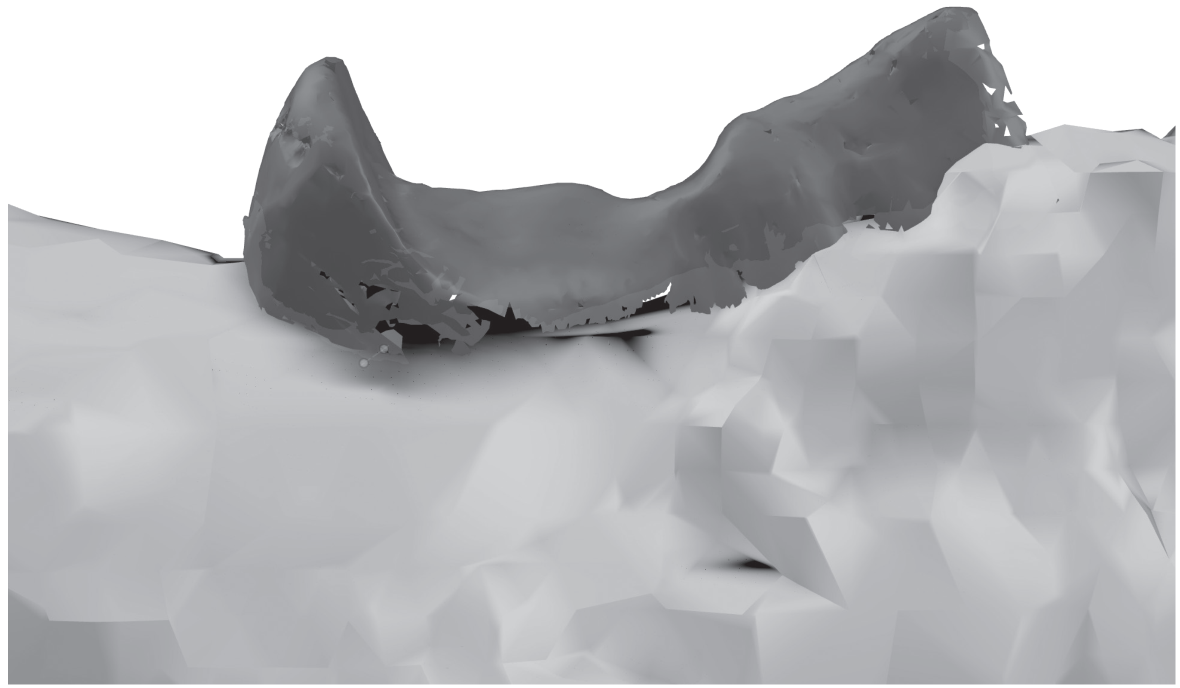
To achieve an accurate 1:1 clay model of the saddle tree, it was essential to have precise measurements of the horse's back. Our horse model, named "Fou" and owned by Sabrina Casty, served as the source for extracting these measurements. We used polystyrene foam to sculpt the horse's back body, employing a hot-rod and sanding machine to carefully remove materials and create the desired shape. In the case of the saddle tree body, we used Dzhuliia as the model and obtained a warm clay negative form of her sitting on top of the horse's back. Once the clay was taken out of the oven, it had to be swiftly molded into the desired shape, ensuring enough material was added for the subsequent sculpting process that occurs as the clay dries, which typically takes around 12 hours. Throughout the sculpting process, sculpting tools and knives were utilized to achieve the desired shape and form for the body. Occasionally, if too much material was removed, additional clay had to be applied, resulting in additional waiting time. It took approximately 5-6 hours to sculpt the clay module representing the volume of the saddle tree.

Clay model scanned wising the EinScan Pro 2x into CAD

To attain an accurate 1:1 design in CAD, the clay model was scanned using the EinScan Pro 2x.

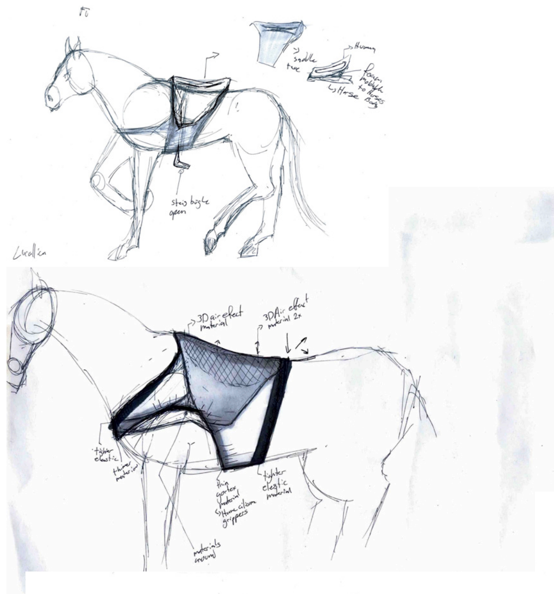


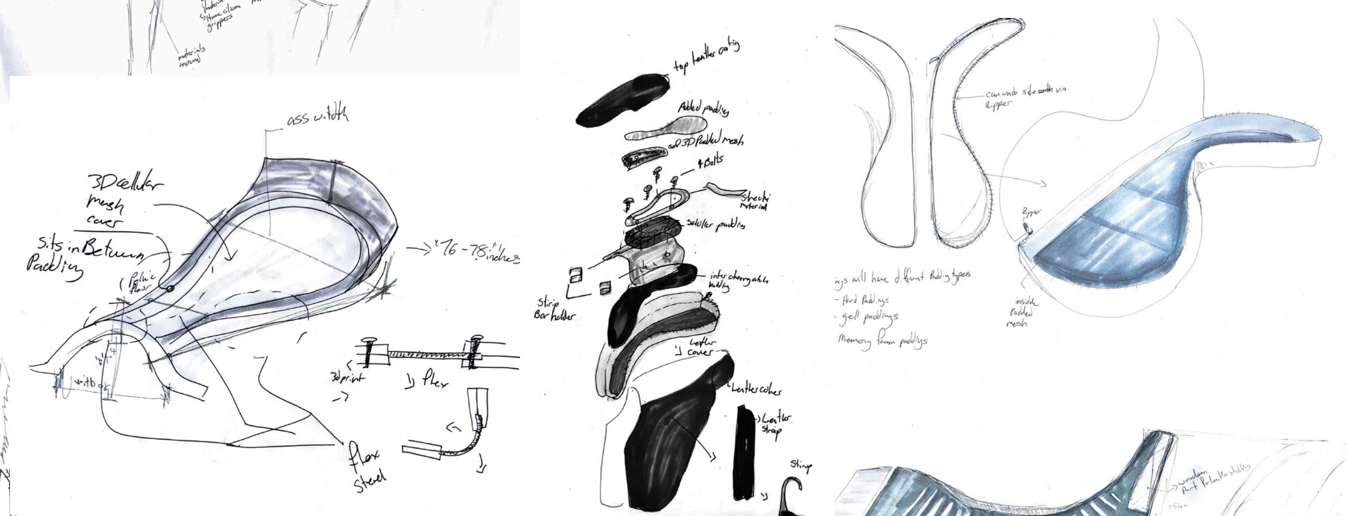


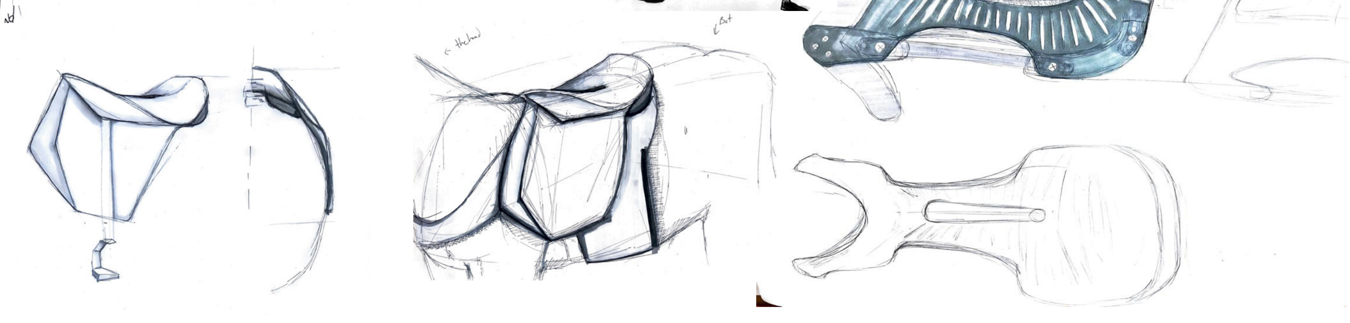


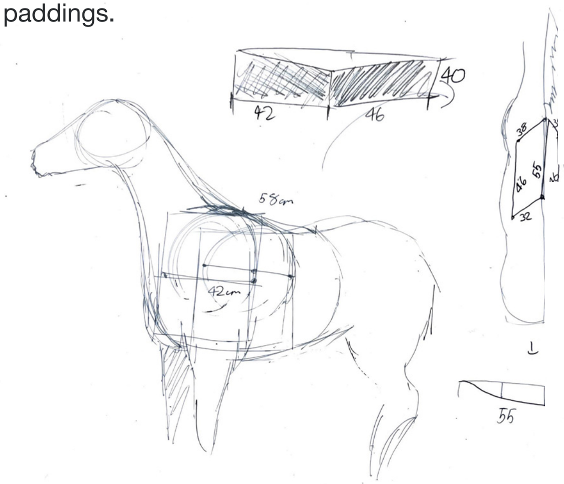
Defining Parts for ideate structure for the Saddle Tree

The FlexFit Tree and AdaptPad systems are integral components that provide structure and support to the saddle, ensuring its shape is maintained. The FlexFit Tree system is designed for an adjustable fit between the horse and rider, comprising three main parts: the 3D CellPad, FlexBody, and EquiFlex. The 3D CellPad utilizes 3D printing technology to create a customized anatomical cushioning, preventing discomfort for the rider. It incorporates a Heterogeneous Lattice structure for shock absorption and weight distribution on the horse’s back. The FlexBody, made of lightweight punctured plastic, adds structural spring and form to the saddle, while the EquiFlex system, consisting of eleven pieces, including custom Flex-Steel Struts, ensures proper weight distribution and flexibility. The AdaptPad, on the other hand, features a customizable design with a sustainably sourced leather cover and two zipper compartments for different types of cushioning materials such as gel pads, memory foam, and harder foam paddings.







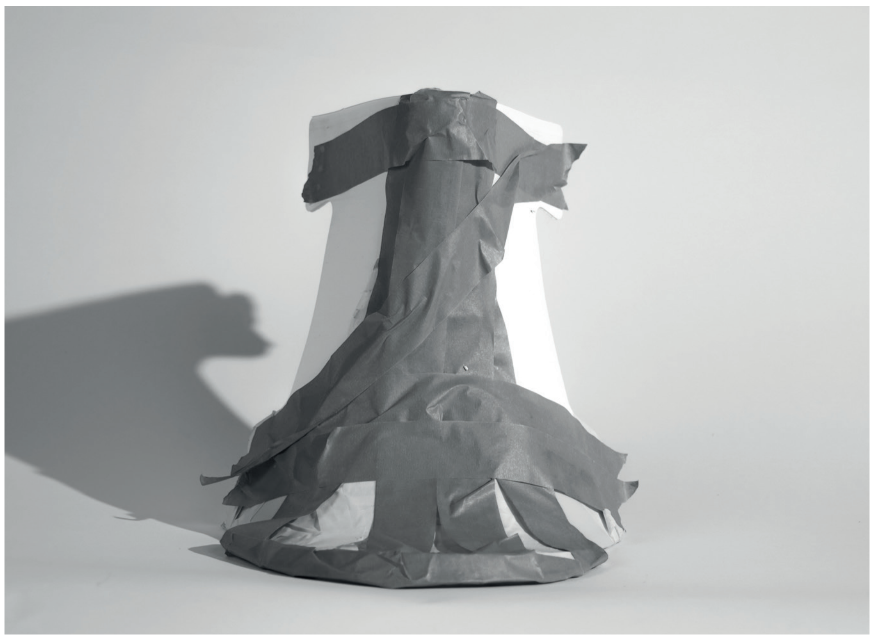


Defining Parts for ideate structure for the Saddle Tree

During our ideation process, we initially planned to design a thin, flexible plastic molded piece for the rider's part of the tree. The intention was to provide the rider with some spring and flexibility. However, we encountered challenges in manufacturing this component as it required individual customization for each saddle. Recognizing this limitation, we pivoted to a new concept that involved using polyester belts.

In the revised concept, polyester belts would be strung from the FlexTree, serving as the primary support for the rider's part of the saddle tree. This approach offered greater flexibility in terms of customization and manufacturing. The use of polyester belts allowed for easier adjustment and adaptation to different saddle designs and rider preferences.

By implementing this new concept, we aimed to maintain the desired spring and flexibility for the rider while simplifying the manufacturing process. This innovative approach presented a more practical solution that could be effectively applied to a variety of saddle designs, enhancing the overall functionality and comfort for riders.



The Flexfit System Breakdown

The FlexFit Tree and AdaptPad systems are designed to provide structure and support to the saddle, ensuring a customized fit and comfort for both the rider and the horse. The FlexFit Tree consists of the 3D CellPad, FlexBody, and FlexTree, which adapt to the rider's anatomy and distribute weight effectively. The AdaptPad offers customizable padding options based on the sport type and rider's inseam length. These systems aim to improve rider comfort and promote the well-being of the horse during different riding activities.

FlexFit System on the Horse Body Scan “Fou de Reve”

3D CellPad

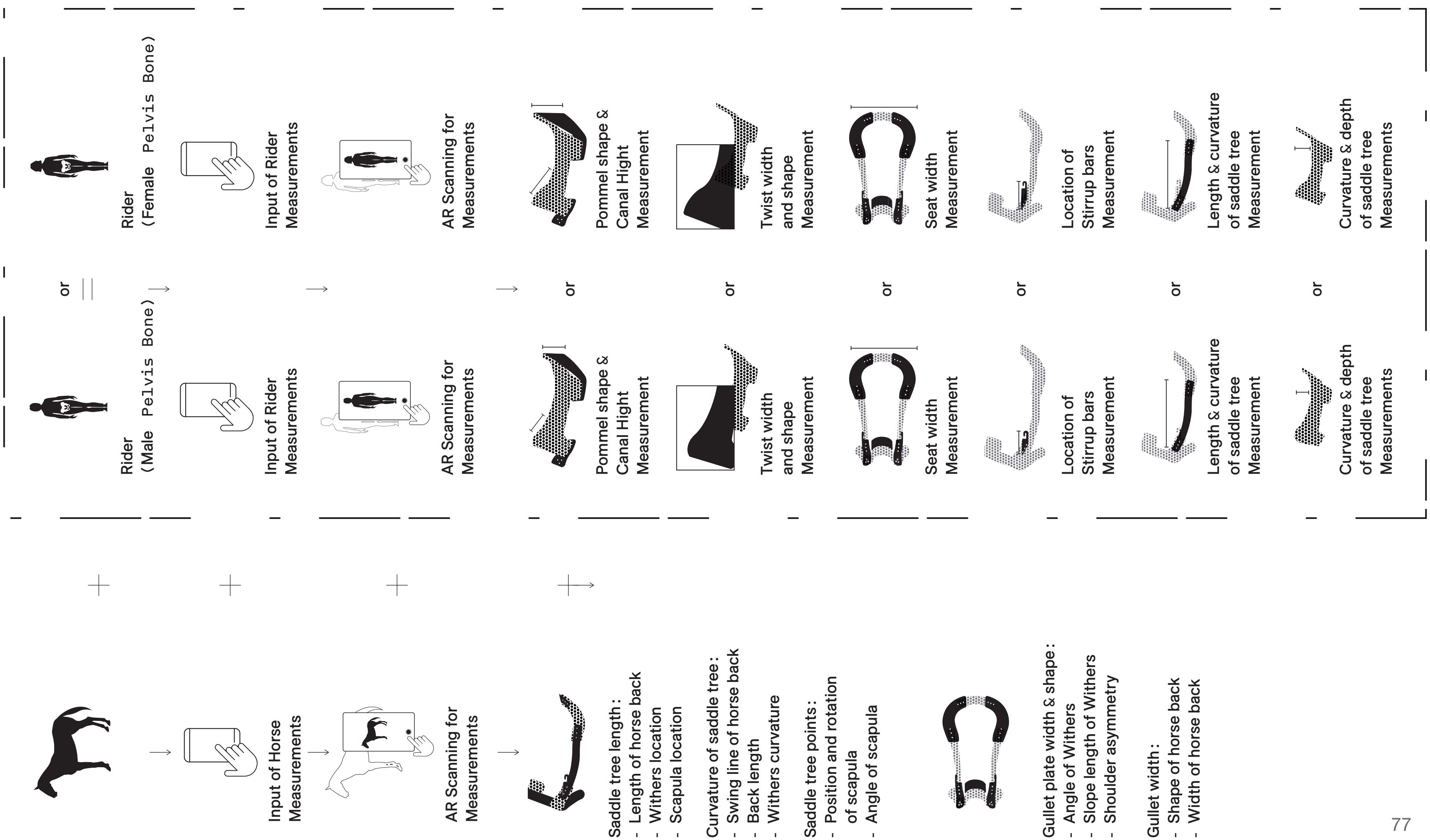
FlexBody

FlexTree

AdaptPad

Adaptive system

Bellow you can see the Flexfit system and how it alters in shape depending on the measurement given by the application's 3D Model.



3D CellPad
- Adaptable Padding for Rider

FlexBody
- Adaptable, Spring Support & Weight distribution for Rider

Fletree
- Adaptable & Weight distribution for Horse's back

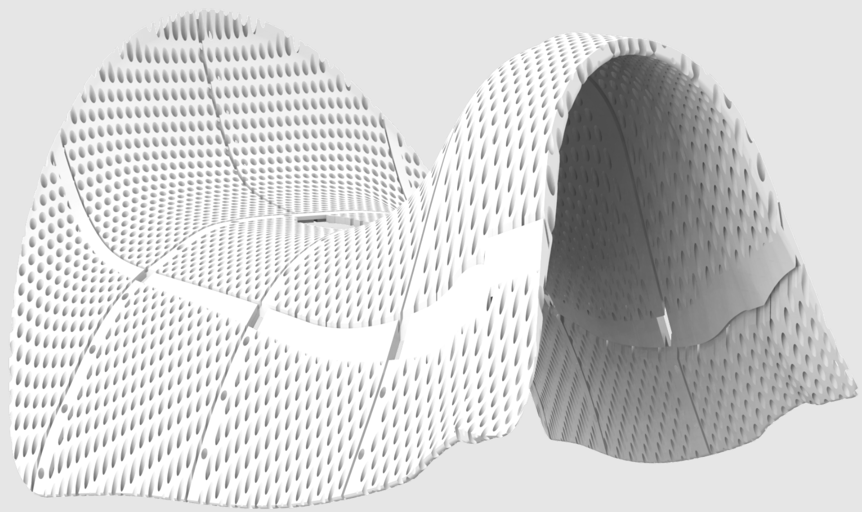
AdaptPad
- Adaptable Padding for Horse

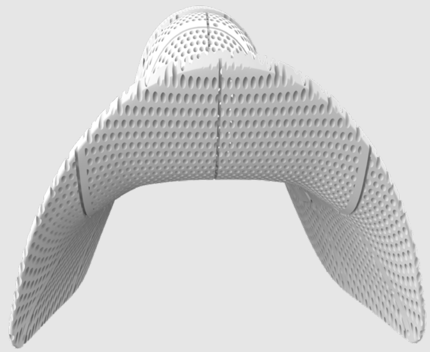
Lucallian's System Breakdown

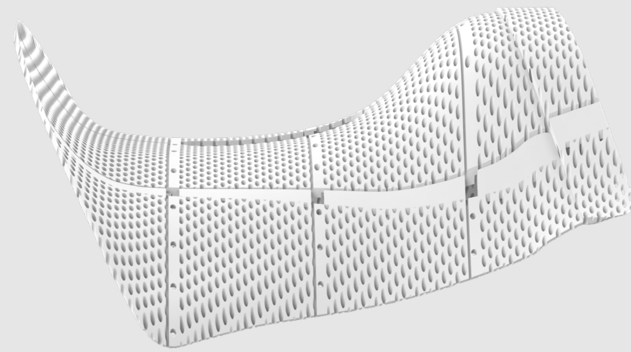
The FlexFit Tree and AdaptPad systems play a crucial role in providing structural integrity, support, and tailored solutions for saddles, prioritizing the comfort and fit of both riders and horses. The FlexFit Tree system, consisting of the 3D CellPad, FlexBody, and FlexTree, offers adaptability and precise weight distribution to ensure optimal performance. Complementing this, the AdaptPad introduces customizable padding options, further enhancing rider and horse comfort. These innovative saddle components work in harmony to promote adaptive and comfortable riding experiences while prioritizing the well-being of the horse. Let's explore the functional intricacies and design principles of these cutting-edge saddle systems in more detail.

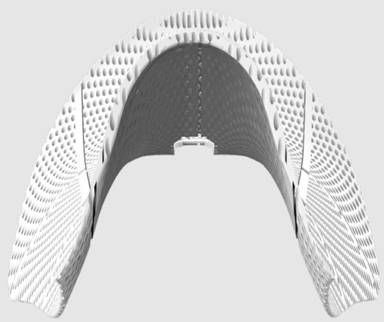
The 3D CellPad

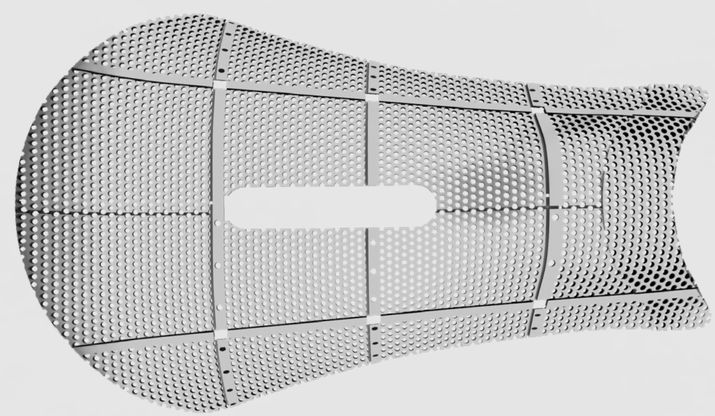
The 3D CellPad plays a crucial role in the FlexFit Tree system, providing optimal cushioning and preventing discomfort for the rider. It is designed individually to match the unique shape of the rider's seat-bones. The manufacturing process of the 3D CellPad involves advanced 3D printing technology. Precise measurements of the rider's anatomy are collected to create a custom-fit cushioning. Using 3D printing, the CellPad is meticulously constructed with a seat-bone point heat-map and a Heterogeneous Lattice structure, ensuring effective shock absorption and weight distribution. This process results in a perfect anatomical cushioning that prevents sore spots and enhances comfort during horseback riding. The size of the padding is determined by the dimensions of the FlexBody and FlexTree, offering different sizes ranging from XS to XL. The length and width of the CellPad are digitally adapted based on the measurements of the rider's hipbone, hip width, and seat-bone length.









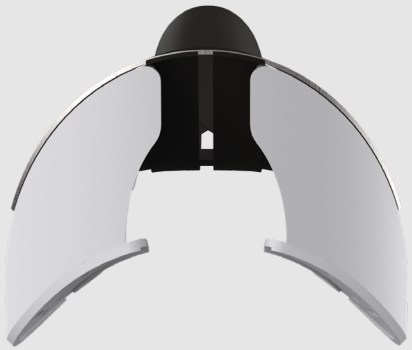


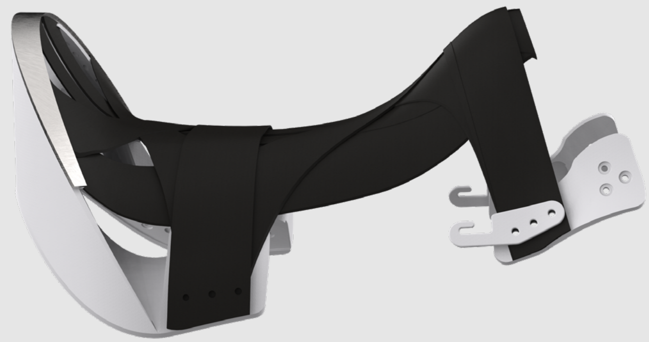
Concept - Saddle Parts Breakdown

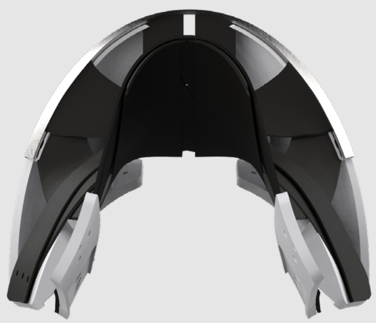
The FlexBody

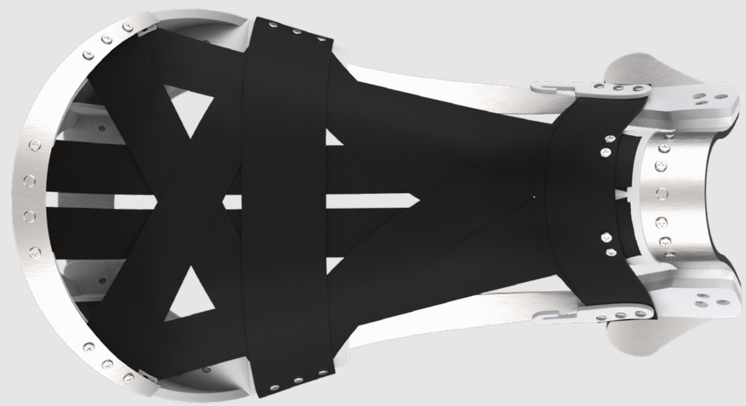
The FlexBody is a crucial component of the FlexFit Tree system, providing the saddle with essential structure, spring, and adaptability. The manufacturing process for the FlexBody involves utilizing a custom lightweight woven polyester belt material. This material is carefully shaped and formed to ensure the saddle's stability, flexibility, and spring-like qualities. To assemble the FlexBody, four standard injection mold plastic parts are used, securely holding the components together. This manufacturing process guarantees durability and adaptability in the saddle, accommodating the specific hip bone structure of both male and female riders.

The measurements taken by the 3D models from the application have a significant influence on certain parts of the system. The top flexsteel part is influenced by the width of the hips, while the polyester belts are adjusted to match the location of the rider's seat bones. The system allows for customization by incorporating multiple built-in holes that enable the adjustment of the polyester belts. Proper assembly of the belts is crucial, with the longest belts initially strung from the gullet straight to the cantle. Subsequently, the other straps can be threaded over them, providing additional support and securing this part of the saddle.







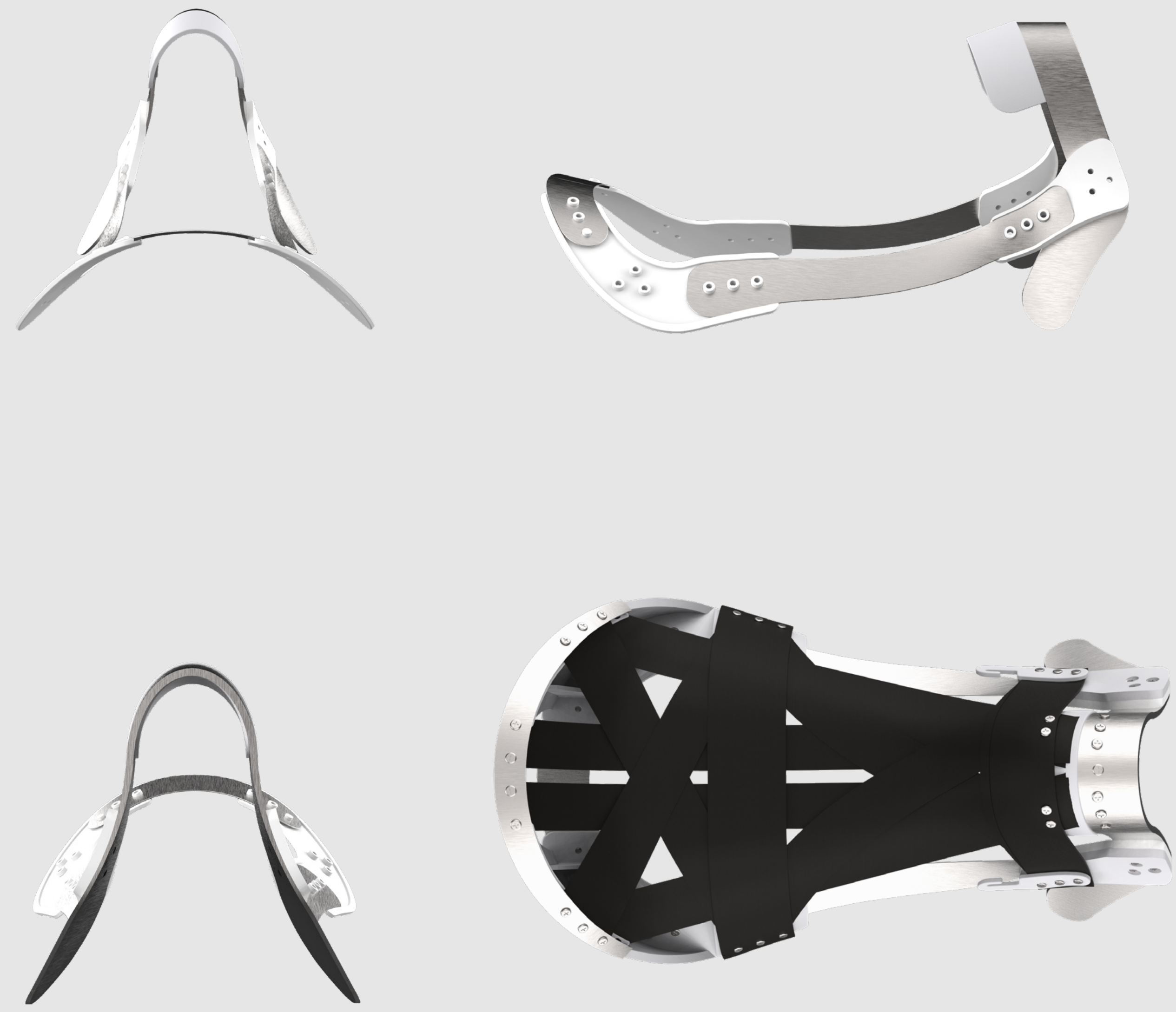


Concept - Saddle Parts Breakdown

The FlexTree

The FlexTree system consists of eleven individual pieces, excluding screws, and plays a crucial role as the backbone of the saddle. The manufacturing process for the FlexTree involves precision engineering and custom fabrication. The gullet, which is made of 5mm thick aluminum, derives its measurements and shape from the width of the horse’s withers, providing essential support and weight-bearing capacity. The puzzle-like plastic injection mold pieces are manufactured with precision to ensure seamless fitting, resulting in stability and alignment. The custom laser-printed Flex-Steel Struts are meticulously crafted to ensure proper weight distribution and flexibility. These components are then assembled, joined, and secured using screws, creating a robust, adaptable, and supportive foundation for the saddle.

The measurements taken by the application significantly influence the FlexTree’s components, particularly the 5mm Steel gullet, 2mm side struts, and back strut. The Steel gullet’s measurements are based on the width and height of the horse’s withers, with an additional 5.5 cm added to ensure proper clearance between the saddle and the horse’s back. The height coverage may vary depending on the horse. The length of the 2mm side struts varies based on the length of the horse’s back, and additional struts can be added on top of one another depending on the rider’s weight. Similarly, the length of the 2mm back strut is determined by the rider’s hip bone length. These customizations ensure a tailored fit and optimal functionality for both horse and rider.

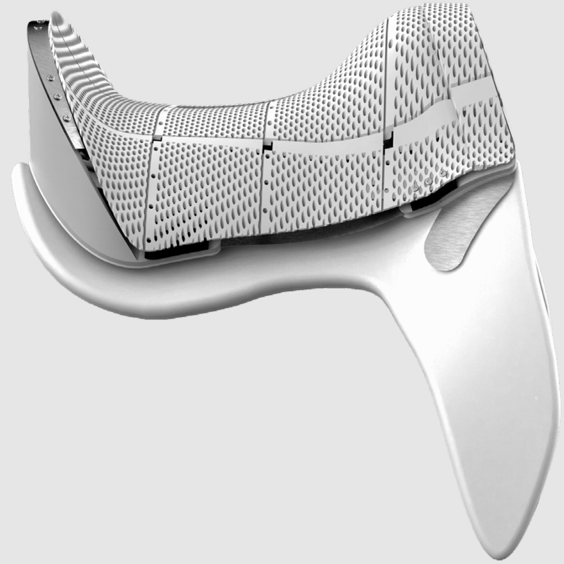


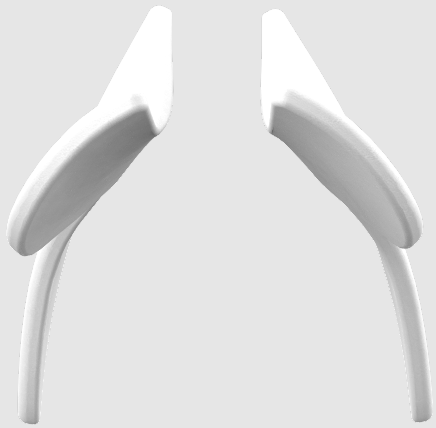
Concept - Saddle Parts Breakdown

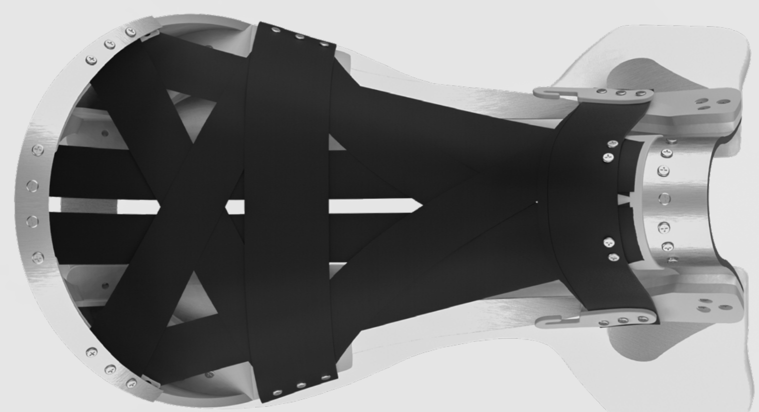
The AdaptPad

The AdaptPad is a customizable system specifically designed to enhance comfort and support in the saddle. The manufacturing process for the AdaptPad begins by sourcing sustainable second-hand leather for the pad cover. The leather is carefully chosen and precisely cut to meet the required specifications. The pad cover incorporates two zipper compartments, providing space for the padding. Different types and grades of cushioning materials, such as gel pads, memory foam, and harder foam paddings, are manufactured separately. These cushioning materials are then inserted into the designated compartments of the pad cover, allowing riders to personalize their saddle's padding according to their specific needs and preferences. The manufacturing process for the AdaptPad ensures high quality, comfort, and versatility in saddle padding.

The size and design of the AdaptPad are verified based on the rider's sport preferences. The measurements taken into consideration include the length of the horse's back and the muscle build-up on the horse's back, which can be customized to suit the horse's individual needs. Additionally, the exact size of the AdaptPad is determined by the size of the saddle tree, ensuring a perfect fit and optimal performance



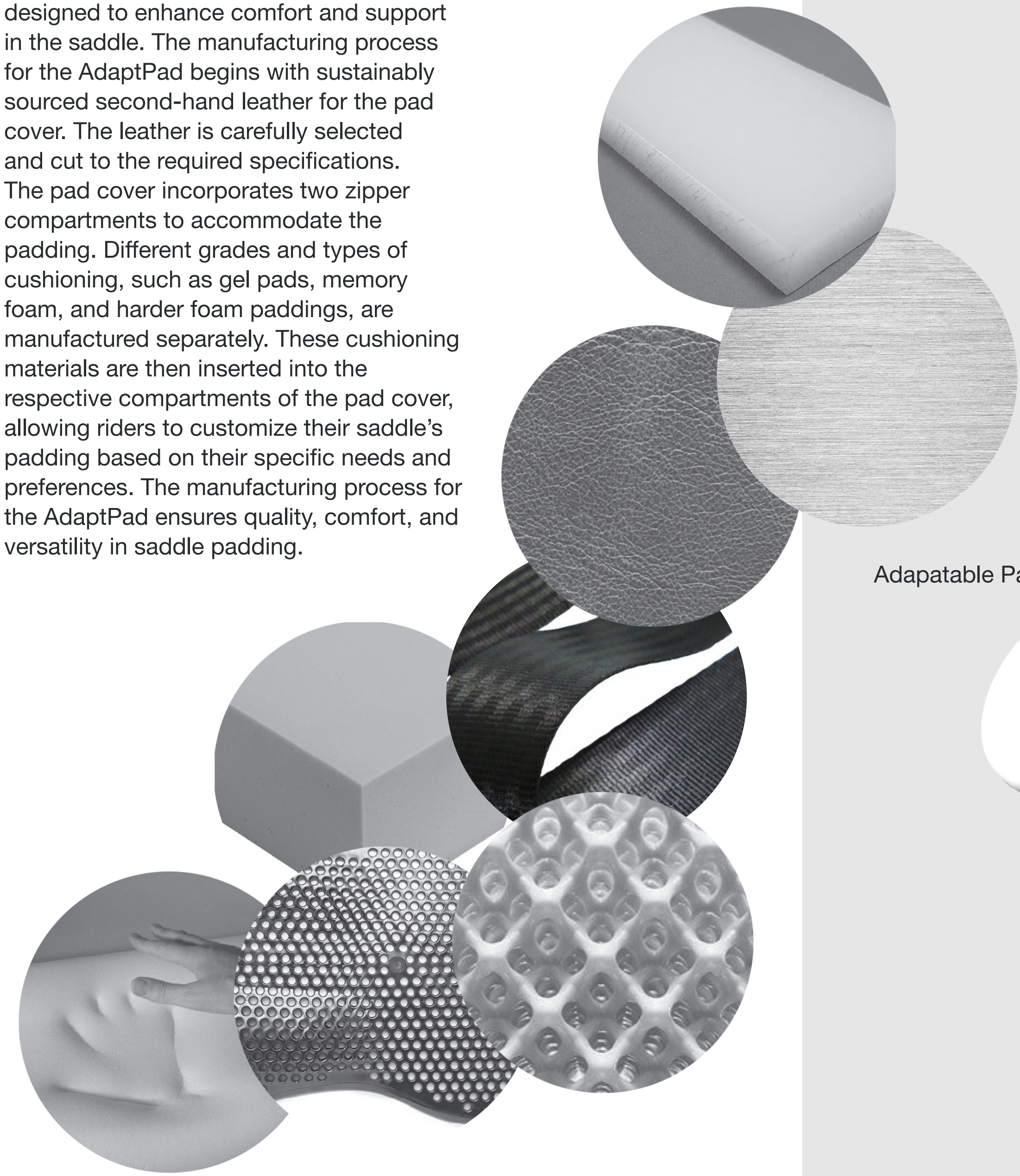




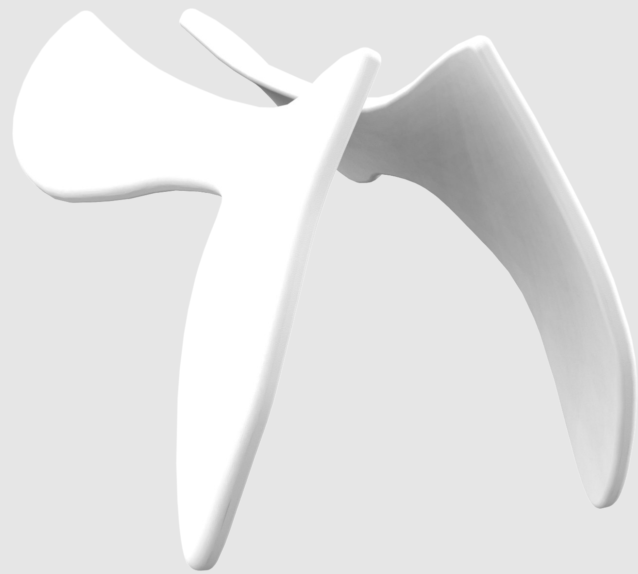
Concept - Saddle Parts Breakdown

Materials Used

The AdaptPad is a customizable system designed to enhance comfort and support in the saddle. The manufacturing process for the AdaptPad begins with sustainably sourced second-hand leather for the pad cover. The leather is carefully selected and cut to the required specifications. The pad cover incorporates two zipper compartments to accommodate the padding. Different grades and types of cushioning, such as gel pads, memory foam, and harder foam paddings, are manufactured separately. These cushioning materials are then inserted into the respective compartments of the pad cover, allowing riders to customize their saddle's padding based on their specific needs and preferences. The manufacturing process for the AdaptPad ensures quality, comfort, and versatility in saddle padding.



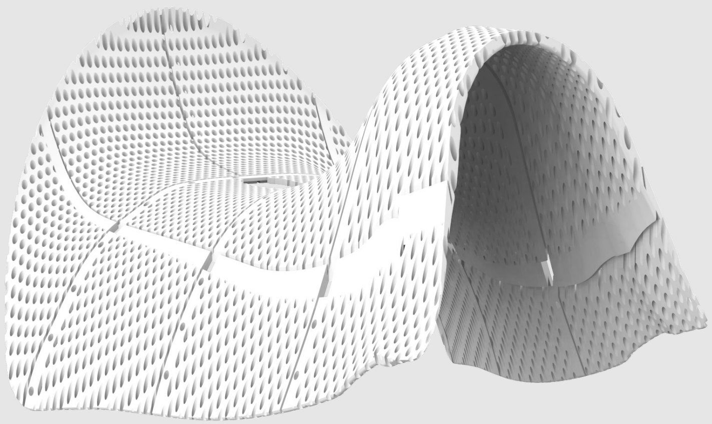
Adapatable Padding Second-Hand Leather



Adapatable in length Steel & Flex Steel

Cantle + Seat hight changes: Plastic Mold

Adapatable 3D Printed Resin



Adapatable Polyester Belts

In summary, the FlexFit Tree and AdaptPad systems provide customized solutions for saddle fit and comfort. The 3D CellPad, FlexBody, and FlexTree components of the FlexFit Tree system offer adaptability, precise weight distribution, and structural support. The AdaptPad's manufacturing process enables riders to customize their saddle's padding, promoting enhanced comfort and support. These innovative components and manufacturing processes aim to enhance rider comfort, promote optimal weight distribution, and prioritize the well-being of the horse during various riding activities.

Through the implementation of diverse methodologies, we have sought to enhance our comprehension of saddle design and fitting, ensuring we acquire the essential expertise in this domain. Recognizing the importance of specialized knowledge, we have undertaken a comprehensive exploration of the subject. Moreover, to better serve our end users, we have conducted in-depth research to discern their distinct requirements and anticipated outcomes.

Interviews

To acquire comprehensive insights into the perspectives of end users and industry experts, we employed the interview methodology. Through conducting interviews with saddle makers, riders, and individuals well-versed in scanning technologies, we aimed to gather their valuable insights and experiences concerning the current landscape of saddle fit and design.

To optimize our learning outcomes from each participant, we tailored distinct sets of questions for the different groups. This approach enabled us to delve into the specific domains of expertise and experiences relevant to each group, facilitating a deeper exploration of their insights.

Visiting Events

To enhance our comprehension of the latest advancements in the equestrian industry, we actively participated in prominent events within the field. By engaging in discussions with professionals, examining various projects and products, and immersing ourselves in the atmosphere of these events, we developed a well-informed perspective on the direction we aspire to pursue. These experiences provided us with invaluable insights into the cutting-edge trends and innovations specifically related to saddle design and fit.

Field tour, examination & learning

By immersing ourselves in a saddlery environment, we had the opportunity to gain hands-on experience and deepen our understanding of the saddle fitting and production process. This visit proved to be invaluable in verifying the accuracy of our existing knowledge and hypotheses, as well as identifying any misconceptions or gaps in our understanding. Collaborating with a skilled saddle maker allowed us to gain practical insights and expertise that greatly influenced our project’s approach. The visit served as a crucial stepping stone in shaping our product’s innovative and practical design, ensuring that it aligns with the realities of saddle production and meets the needs of end users effectively.

Experiments & Prototypes

Our research approach involved a combination of experimentation and prototyping to explore and validate various concepts and technologies. This iterative process allowed us to make both rapid advancements and more detailed refinements in our project.

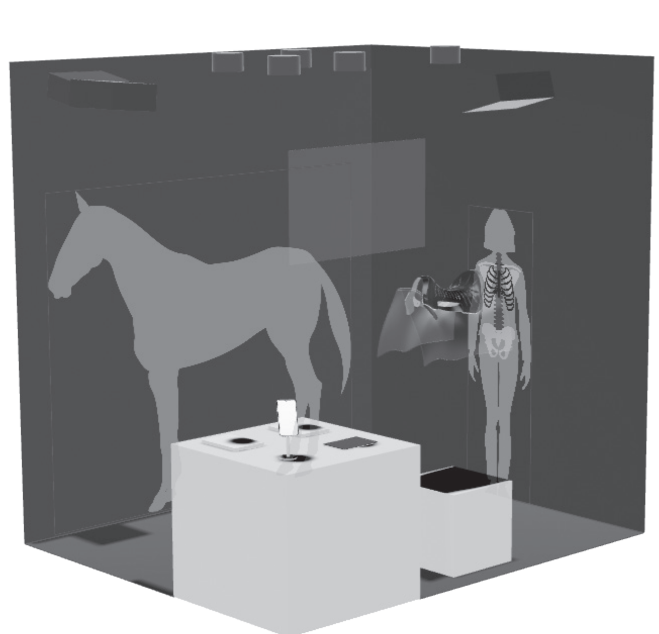
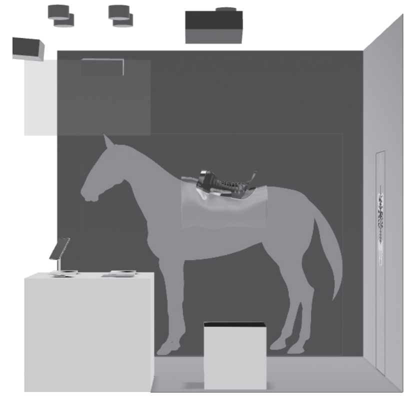
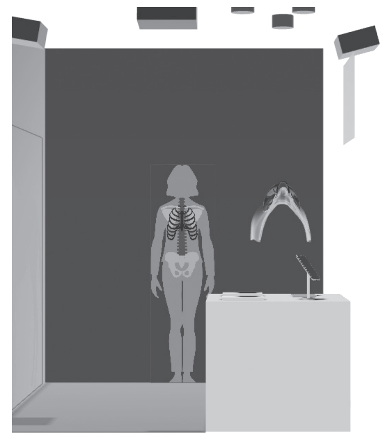
Working directly with horses in real-world settings provided us with invaluable insights into the practical aspects of the scanning procedure. This hands-on experience helped us understand the intricacies and challenges involved in capturing accurate data. The results obtained from these experiments served as a primary source of inspiration, informing our subsequent prototype development.

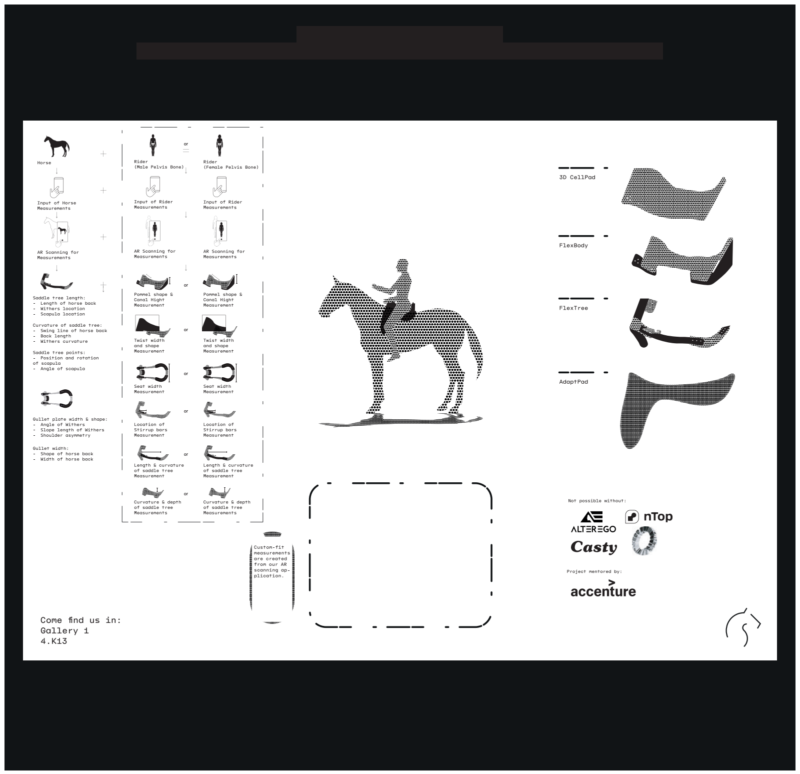
Furthermore, our exploration of gender-specific saddle design involved the use of clay molding. This allowed us to create physical representations of our ideas and test their feasibility. By validating our gender-specific strategy through this tactile approach, we gained confidence in its potential effectiveness and impact on rider comfort and horse well-being.

Through these experiments and prototypes, we were able to refine our concepts, address technical considerations, and further validate our approach to developing a health-centered and gender-specific saddle fit solution.

Two Exhibitions

We had the opportunity to participate in both the industrial design and interaction design exhibitions, showcasing our concepts in each respective field. In the industrial design exhibition, our display consisted of a table adorned with graphics, a diploma, and an external screen. However, we did not include a physical model at this exhibition, as we intended to showcase it in its entirety at the interaction design exhibition.

For the interaction design exhibition, we were allocated a space of 5 square meters, which allowed us to fully construct our exhibit. We had the opportunity to create a scaled-down version of our concept, including our model, along with material samples that complemented our design. Our plan was to have our phone prototype and an informational website displayed on the large front table. Additionally, we arranged for two projections—one featuring a 1:1 scale horse and another displaying a 1:1 scale human. Lastly, a television screen was set up, playing our promotional video to engage and inform visitors about our project.

Programs

Figma:	A collaborative design tool used for creating user interfaces, prototypes, and interactive designs.
Miro:	A digital whiteboard and collaboration platform for brainstorming, visualizing ideas, and remote collaboration.
Ntop:	A network traffic monitoring tool used for analyzing and managing network traffic.
Best Dressed:	A fashion styling and outfit planning app that helps users curate and organize their wardrobe.
Alterego:	An application that allows users to create personalized avatars and virtual characters.
Photoshop:	A popular image editing software by Adobe, used for manipulating and enhancing digital images.
Illustrator:	Another Adobe software used for creating vector graphics, illustrations, and artwork.
InDesign:	A desktop publishing software used for creating layouts, brochures, magazines, and other printed materials.
Lightroom:	An image editing and organization software primarily used by photographers to edit and enhance their photos.
After Effects:	A motion graphics and visual effects software used in video editing and animation.
Premiere Pro:	A video editing software by Adobe, used for professional video editing and post-production.
DaVinci Resolve:	A professional video editing and color grading software known for its advanced features.
Fusion 360:	A 3D CAD, CAM, and CAE software used for product design, engineering, and manufacturing.
Keyshot:	A rendering and animation software used for creating high-quality visuals and product renderings.
Blender:	An open-source 3D creation suite used for modeling, animation, rendering, and simulation.
Cinema 4D:	A professional 3D modeling, animation, and rendering software widely used in motion graphics and visual effects.
3DScanner App:	An application that allows users to scan real-world objects and environments to create 3D models.
Luma:	A mobile app for video editing and visual effects, offering a range of creative tools and filters.
Framer:	A prototyping and design tool focused on creating interactive and animated user interfaces.

Conclusion

In this chapter, we aim to conclude our final project by highlighting key development points and insights gained over the past few months. Our intention is to emphasize the ways in which our project can contribute to the fields of equestrian equipment, health-centered design, and customization. Additionally, we will present potential future directions for this project.

Our journey began with extensive research into customization and health-centered design, which formed the core of our design philosophy. As we delved into the topic of health-centered saddle fit for horses, we also recognized the interconnectedness between the balance of riders and its impact on horses. Moreover, we discovered the potential harm that saddles can cause to riders' health. This led us to approach the saddle fitting process from the rider's perspective and address the lack of female-specific equipment in the industry.

Initially, our target group was identified as professional and hobby equestrians. However, we soon realized that these two categories have distinct motivations and goals. Consequently, we shifted our focus to hobby riders who have a strong connection with their horses and may experience health issues related to horse riding.

Our research process encompassed multiple aspects simultaneously, including examining the current state of saddle fitting processes at saddleries, identifying the essential measurements for horses and riders, understanding the rider's decision-making process in choosing a saddle, exploring suitable technologies for our concept, innovating the saddle tree design, and selecting appropriate components for manufacturing.

During our research, we debated whether to develop a mobile application or a website as the user interface for our service. Considering the potential for additional innovations and the riders' ability to interact with our product during every ride, we opted for a mobile application format.

The development of the application, along with the initial sketches of the saddle tree, started early in the research phase. We continuously iterated on our concept based on the insights and learnings gathered through fieldwork and interviews. One critical consideration was ensuring that the scanning process would be accessible for our non-tech target audience.

Our research findings also incorporated aspects such as gender-specific and health-centered design into a physical product, while taking into account manufacturing constraints. We had to refine our ideas, considering realistic production costs and material choices in the design and manufacturing process.

As we developed the application, we realized the need for a reliable and fact-based measurement system to ensure the accurate design of our product based on anatomical specifications. Consequently, we extensively researched supporting technologies to find the most suitable solution for our service's needs.

The collaborative nature of our process allowed us to approach our research questions from different angles, considering both practicality and innovativeness. We believe that we have developed a promising concept that advances the saddle fitting process and design, with the health and well-being of the rider and horse at its core.

Designing a medium that facilitates the interaction between two living beings, the horse and rider, presented a genuine challenge and significant responsibility for us as designers. However, it also provided us with an advantage as we approached the field of saddle design with fresh perspectives, unburdened by traditional industry constraints. In this context, design has the potential to enhance the relationship and experience between riders and horses or contribute to the creation of harmful equipment. Hence, we adopted a holistic approach to our research, gaining insights from various perspectives and personas involved in the saddle fitting and production process, including riders, saddlers, and individuals in the technology sector. We emphasized a fact-based design approach and maintained honest self-assessment throughout the process, with the goal of creating a genuinely useful and health-centered product.

In conclusion, our project has resulted in the creation of a unique service that brings the equestrian equipment industry into the era of digitalization and health-centered products. This encompasses interaction design, the development of suitable user experience and user interface, and the exploration of production methods

Ethical Question

In our project, we recognized the importance of addressing the needs of both riders and horses. As animals cannot directly communicate their needs and feelings, we felt a great responsibility to advocate for their well-being through our design decisions. We ensured that our project development process considered the welfare of horses as a priority.

During our research, we encountered ethical dilemmas related to professional horse riding. Events such as the White Turf Races raised important questions regarding the treatment and care of professional horses. We strongly believe that legal involvement is necessary to protect animals and establish regulations concerning their care, performing age, and retirement. We advocate for changes that prioritize the welfare of horses in professional equestrian sports.

To minimize potential harm to horses, we conducted thorough research on horse anatomy and identified possible ways in which saddles could cause discomfort or injury. We implemented measures to decrease these risks. However, we acknowledge that there is still significant room for improvement in the design of saddles to ensure the utmost comfort and safety for horses.

Throughout the design process, we recognized the importance of involving medical professionals and veterinarians. Their expertise and insights are crucial in making informed decisions and avoiding any potentially harmful outcomes. Collaborating with these experts ensures that our design choices are aligned with the well-being and safety of animals. We value their input and actively seek their guidance to enhance the health-centered aspect of our project.

In conclusion, we are committed to considering the ethical implications of our design decisions, particularly in relation to the well-being of horses. We believe that involving medical professionals, veterinarians, and legal regulations can contribute to creating a design solution that prioritizes the welfare of both riders and horses.

Reflecting on Our Process

We concluded our project with a sense of satisfaction, considering the wide range of aspects we investigated and addressed. Dzhuliia recognized the significance of interaction design in defining the core essence of the fitting process and exploring potential innovations to bring the riding saddle industry closer to health-centered design. Kaitlynn learned the importance of designing a saddle tree system based on material limitations and cost-effectiveness. We both recognized that designing a perfect system within the given time was not always feasible, and we needed to focus on the core part of the system, which is the saddle tree, while keeping a drive for future innovations.

Throughout our journey, one of the main challenges we faced was gaining a comprehensive understanding of all the aspects involved in achieving our final goal. Some aspects emerged during the research, prompting us to realize the need for deeper exploration. We believe that proactive planning and execution would have allowed us to better structure our research and development stages, providing more time for ideation on the core design and functionality.

Fieldwork proved to be immensely insightful for our project. However, we realized that increasing the frequency of visits to horses and saddleries would have greatly benefited the development of our prototypes. Unfortunately, organizing such visits was challenging, particularly because our model horse, Fou, frequently traveled for competitions. Contacting horse ranches and equestrian places for questioning and learning also proved difficult due to high-season or related occasions limiting their availability.

Maintaining focus on one aspect at a time was another challenge, as we had to constantly switch our attention between highly interconnected aspects. Both physical and digital product development required ideation and finding solutions simultaneously. The lines of who did what were blurred, as we influenced and helped each other throughout the project. Additionally, different delivery deadlines and requirements occasionally blurred our focus as we strived to ensure timely completion of both aspects.

While we had numerous ideas for further improvements, such as implementing balance and health sensors, developing a DIY Padding System and Adjustment Guide, and introducing a 3D CellPad, time limitations prevented us from exploring these aspects extensively within our Bachelor project. We decided to focus on the FlexFit saddle tree system, the development of the measuring tool, and the user experience of the application. We plan to pursue these additional ideas after our Bachelor's degree when we launch our startup or continue our research project.

We had hoped to interview veterinarians and chiropractors to deepen our knowledge of existing problems, but some of the interviews did not happen due to time constraints. In particular, we were keen to interview veterinarian/anatomist Ivana Ruddock-Lange, whose online materials provided valuable insights. We concluded that we would conduct these interviews and further research for Lucallian's product development after completing our Bachelor's degree.

Lastly, the lack of time prevented us from conducting more user tests of the application with riders. We strongly believe that conducting additional user tests would have provided us with even more valuable feedback. We plan to incorporate user trials of our system in a later design phase after completing our Bachelor's degree.

Contribution

In an industry often considered low-tech and traditional, we firmly believe that there is room for technological innovation to enhance various aspects of horse riding and equipment. Our thesis introduces the Lucallian service as a compelling example for equestrians, innovators, and designers to explore the potential for innovation within the field. We challenge the perception that only the rider's comfort is important, emphasizing the well-being of both the horse and rider in a symbiotic relationship.

We hope to inspire the industry to think beyond traditional approaches and consider how advancements in technology, design, and user experience can positively impact the equestrian industry. Our research brings attention to overlooked changes in modern horses' back sensitivity and shoulder flexibility, bridging the gap between traditional practices and modern equine anatomy. By promoting evidence-based approaches for the welfare of horses, we emphasize the importance of a health-centered approach in equestrian equipment design and raise awareness among riders about the significance of proper fitting for both their own comfort and their horses' well-being.

During our visits to ranches and the White TURF races, we had motivating exchanges with horse owners, riders, and riding school owners. After presenting our service concept, we received positive feedback and multiple requests to test and purchase our product. We promised to reach out to them when the project turns into a startup.

One of our key contributions is the implementation of an anatomy-based design approach, aiming to revolutionize the industry's standards by making female-built saddles as readily available as male-based ones. We aim to prevent female riders from experiencing posture distortion caused by ill-fitting saddles and offer a wide range of customization possibilities for both men and women.

Overall, our design serves as a framework for creating products that prioritize the welfare of both animals and humans. By focusing on the symbiotic relationship between the horse and rider and emphasizing evidence-based practices, we hope to encourage the industry to adopt a health-centered approach and consider the potential of technology in enhancing equestrian experiences.

Learnings

W rking on Lucallian was a joy and a source of excitement for our interdisciplinary project. Our sincere interest and passion for horses and the equestrian field drove us to achieve the results we envisioned from the beginning. This internal motivation allowed us to approach the thesis with a high level of dedication.

Through our work on Lucallian, we gained practical experience and knowledge that significantly enhanced our skills and confidence as interaction and industrial designers. The collaboration between us, with our different backgrounds, provided a unique and exciting working dynamic.

The project provided us with valuable insights into user experience design and the implementation of design methods in practice. Working with representatives from our target group and conducting fieldwork proved to be particularly insightful. Simple tests and interviews with participants yielded raw and creative ideas that enriched our design process.

Our Bachelor project allowed us to apply various approaches and tools that we learned at the Zurich University of the Arts, further developing our confidence in our knowledge and skills.

In addition, we gained extensive knowledge in devising solutions for product design, especially in relation to the development of a customizable saddle tree that combines standardized and customized components. This approach aims to strike a balance between reducing manufacturing costs and providing tailored solutions for riders.

During the manufacturing process of the FlexFit concept design system for the thesis exhibition, we faced challenges. We were unable to manufacture the parts we originally intended, but we successfully created a volume material exemplar that accurately represented the design concept and its intended materials.

Overall, working on Lucallian allowed us to grow both professionally and personally. We deepened our knowledge, expanded our skills, and gained confidence in our abilities as designers. The project was a rewarding experience that further fueled our passion for innovative design solutions in the equestrian industry.

Future Steps

It's exciting to hear that you have plans to transform your thesis into a startup. Your project has already garnered interest from companies like Accenture Song and Seaver, which indicates the potential impact and value of your ideas within the equestrian industry.

Integrating balance sensors into the saddle to monitor riders' posture and balance is a promising idea. By providing real-time feedback and suggestions for adjustments through the Lucallian mobile application, you can enhance the riding experience and promote harm-free riding.

The inclusion of health data sensors in the saddle design, focusing on key indicators such as heart rate, respiratory rate, blood pressure, and temperature, is another innovative concept. While you need to test the feasibility of directly implementing sensors in the saddle due to potential pressure during riding, this feature can provide valuable insights into the well-being of both the horse and the rider.

The DIY Adjustment padding system, with color coding on the pads and a mobile adjustment guide in the Lucallian application, offers a practical solution for accommodating changes in horses' bodies over time. This user-friendly approach can help riders make necessary adjustments and ensure the comfort and well-being of their horses.

Your plan to manufacture the saddle using locally sourced second-hand leather is commendable, as it promotes sustainability and reduces waste. Designing the saddle as a part-based system that utilizes offcuts from the leather industry aligns with eco-friendly practices.

To further refine your product, it is essential to conduct additional user testing of the application with riders on the ranch and with the saddle model with padding. Gathering more precise feedback will enable you to make necessary improvements and ensure that the final product meets the needs and expectations of your target users.

Overall, your future steps involve incorporating advanced sensors into the saddle design, exploring the DIY Adjustment padding system, conducting thorough user testing, and designing a complete saddle model. By pursuing these avenues, you can continue to innovate and bring your vision of a health-centered design system for horses and riders to fruition.

Thank you

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