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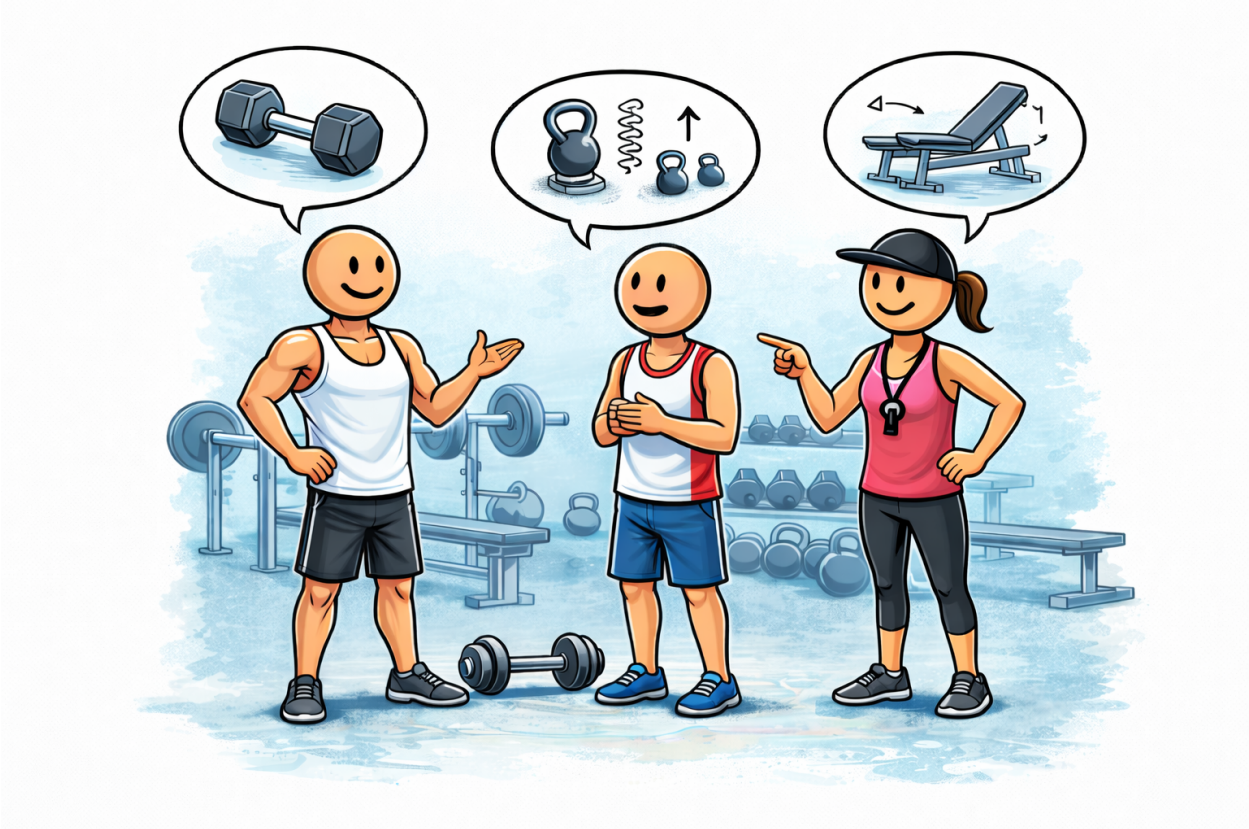

Identifying User Needs for Novel Strength-Training Equipment

A Needs Analysis Across Diverse User Groups

Master's thesis in Product Development

HANNA PALMÉR & ARVID SANDSTRÖM

DEPARTMENT OF PHYSICS
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HANNA PALMÉR & ARVID SANDSTRÖM

Supervisor: Magnus Karlsteen, Department of Physics & Björn Welde, Eleiko
Examiner: Magnus Karlsteen, Department of Physics

Master's Thesis 2025
Department of Physics
Chalmers University of Technology
SE-412 96 Gothenburg
Telephone +46 31 772 1000

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Abstract

As the fitness industry continues to evolve, there is an increasing demand for more variety in the offerings of strength-training equipment. Since commercial gyms are visited by people with vastly different goals and varying experience, new products must appeal to wide audiences. This thesis aims to identify customer needs for novel strength-training products and to evaluate the usefulness of feedback from different user groups. User insights were collected from recreational gym-goers, elite athletes and trainers/coaches, who all had varying experience in the field of strength training. Feedback was gathered through 38 semi-structured interviews and from observations.

The analysis revealed key functional and ergonomic needs and demonstrated that the relevance of the feedback differed between user groups. Elite athletes mostly expressed specific performance-related requirements, while inexperienced users more often emphasized guidance and intuitive interaction with a product. A commonality across all user groups was the need for adjustable equipment, in order to accommodate a wide range of body types. These findings supports a more effective and efficient processes in the development of future strength training equipment, and also became the foundation of a novel product concept that meets several of the discovered needs.

Keywords: strength-training, user-centered design, needs analysis, diverse user groups, product development, concept development, user studies, gym-equipment.

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Hanna Palmér & Arvid Sandström, Gothenburg, December 2025

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1
Introduction

In this chapter, background, aim, limitations, delimitations and specifications of the project are described. The purpose of this chapter is to give a clear definition of the project scope and motivate the future benefit of the project.

1.1 Background

Firstly, this thesis is conducted in collaboration with the company Eleiko AB, a globally recognized brand for their strength training equipment, especially barbells and weight plates for weightlifting and powerlifting [1]. Founded in Halmstad, Sweden, Eleiko has earned a strong reputation for manufacturing high-quality barbells, weight plates, rigs, and dumbbells used in professional competitions, commercial gyms and athletic training facilities around the world. Their products are known for their durability, precision, and adhesion to standards set by international sports federations, such as the International Powerlifting Federation (IPF) [2] and the International Weightlifting Federation (IWF) [3].

In the context of strength training, whether for performance improvement, injury prevention or aesthetic goals, the choice and quality of training equipment play a central role in user experience, training results and safety. Reliable and well-designed equipment therefore not only supports effective training, but also ensures the safety of the user during high-load exercises such as squats and bench presses. As the fitness industry grows, there is an increasing demand for equipment that supports varied training styles, adapts to limited space such as home gyms and also meets the needs of diverse user groups with varying goals.

Eleiko's current portfolio is primarily aimed at professional sporting equipment and high end commercial gym equipment, focusing on robustness, long-term durability and a premium look. However, the company is seeking to broaden its targeted market while maintaining these high standards and also offering modularity, flexibility and user-friendliness. This would includes the ability to customize or expand training setups in sports clubs, commercial training environments (gyms) and ambitious home gyms.

For this reason, the thesis project will contribute to the current strategic direction of Eleiko by focusing on the development of a new strength training product, or significantly modify an existing product if that is deemed more relevant. The project

will place particular emphasis on user-centered design, incorporating feedback from different types of users, including elite athletes, recreational gym-goers of varying experience and trainers/coaches as well. The goal is to develop a product concept that aligns with brand values, namely quality, functionality, and innovation, while also meeting customer needs in the strength training market.

Moreover, the current product offering of Eleiko will be taken into account when deciding how a new product would complement existing equipment. The new concept will therefore be designed with compatibility in mind, in order to integrate it with Eleiko's existing systems and components. Finally, through the combination of technical development and user feedback, the thesis aims to produce a functional prototype that not only demonstrates the feasibility of the a novel concept, but also serves as a foundation for future product development of strength training equipment.

1.2 Aim and Goals

The purpose of the thesis is to identify customer needs in the gym to develop a concept of a new strength training product or improve an existing strength training product, that can also be integrated with Eleiko's current product offering. Furthermore, the thesis aims to identify the value of feedback from different user groups within strength training and sports. Analyzing user feedback will subsequently create a deeper understanding of customer needs in future product development projects, especially in the sports sector, and allow information to be gathered more efficiently and effectively.

Goals:

- Identify customer needs and translate them into technical requirements through interviews and observations.
- Develop at least one functional prototype that can be practically tested to prove its functions.
- Include modular components from existing Eleiko products in the novel concept.
- Ensure that a new product could meet relevant ergonomic and safety standards.
- Provide documentation in the form of concept sketches, raw user data and a report evaluating the proposed solution.
- Evaluate customer needs and their influence on the resulting concept in order to draw conclusions about the value of feedback from different customer

segments.

1.3 Limitations and Delimitations

The project will primarily focus on developing a new strength training concept, that could be added to Eleiko's product offering. In addition to adhering to customer needs, technical requirements from Eleiko will be incorporated, as well as general guidelines for safety. The project will also include an analysis of customer needs and their impact on the final result. However, full-scale production of a finished product prototype will not be included in the project since time is a restricting factor. In addition, a detailed cost analysis will not be performed and no thorough logistic and manufacturing calculations will be included due to the time frame available. In other words, the main focus of this project lies in designing a concept prototype and analyzing customer feedback.

1.4 Specification of the Issue Being Investigated

In this section, research questions that will be answered throughout the project are presented. They will be revisited in the *Conclusions* chapter with the findings.

RQ 1: *Which customer segments is the product aimed at?*

RQ 2: *What are the needs of the customer segments?*

RQ 3: *How can modular components from Eleiko be incorporated in the design?*

RQ 4: *How can the product meet the needs of a broad customer base?*

RQ 5: *How did the quality of customer feedback/opinions vary among the different user groups?*

RQ 6: *What conclusions about user feedback can be applied to the strength training equipment sector?*

2

Defining Methods and Presenting Relevant Theory

The following chapter defines the methods used during the project. In addition to this, the chapter contains explanations of vocabulary relating to training exercises, machines and movements that are mentioned throughout the report.

2.1 Definition of Specific Methods Used During the Project

When gathering information about the needs in different user groups, several methods were used. The following section gives a description of the methods used.

2.1.1 Interviews

When determining the number of interviews to conduct, general methodological guidelines were considered. For many product-related studies, conducting between 10 and 50 interviews is considered a reasonable benchmark to adequate data saturation [4]. This range informed the planning of the data collection process and ensured that the sample size would be sufficient to draw valid conclusions [4]. Semi-structured interviews were used, since they give interviewees the opportunity to answer specific questions, but do not restrict them from sharing other interesting information that can also be useful [5].

2.1.2 Observations

Participant observation is an approach for examining social practices within real world settings [6]. Through full participation, researchers are able to access experiences and social dynamics from within the field itself, providing first-hand insight into behaviors, interactions, and contextual factors that shape the phenomena under study.

2.1.3 SWOT-Analysis

A SWOT-analysis is a theoretical framework used to structure the assessment of internal and external factors [7]. Within this framework, strengths and weaknesses

represent internal conditions of an organization, while opportunities and threats instead reflect external influences.

2.1.4 Patent Search

Searching for patents is an effective way of identifying concepts that are protected and must be avoided [8]. Furthermore, a patent search can identify patents without global coverage or that are expired, which can be a great source of inspiration for generating new ideas during a product development process.

2.1.5 Brainstorming

Brainstorming is a creative technique where a group generates ideas together, based on the information and experience that the participants already have [9]. When participating in brainstorming there should be no judgment and the goal is to generate as many ideas as possible, which can then be improved later on.

2.1.6 Reverse Engineering

Reverse engineering was applied to systematically analyze existing solutions relevant to the study. This method involves deconstructing selected products and interfaces to understand their underlying structure, functionality, and design decisions [10]. The insights gained from this process can be used to identify common patterns, strengths, and limitations within current solutions, thereby informing the development of ones own design concepts, especially by ensuring no major functions are overlooked.

2.2 Defining Exercises, Machines and Strength Training Vocabulary

This section defines vocabulary that is used throughout the report and mentioned in interviews, since many of the terms may not be generally known to the public, unless one is experienced in strength training.

Bench press: The bench press is a weight training exercise that is performed lying on a flat bench, where a barbell or dumbbells is pressed upwards from the chest, primarily working the chest and triceps.

Squat: A squat is a foundational strength exercise where the body is lowered from a standing position by bending at the hips and knees, then returning to the start by extending the legs. The exercise strengthens quadriceps, hamstrings, and gluteus, improves overall balance and posture, and supports bone health. It is often performed with barbells and weights.

Deadlift: A deadlift is a strength-training exercise where a loaded barbell is lifted from the floor to a standing position, keeping the back straight and core engaged, then lowered with control.

(Strict) Press: The (standing) strict press, or standing overhead press, is a compound strength-training exercise that works the shoulders (deltoids), triceps, and core muscles. To perform it, a barbell is gripped with a wide overhand grip, while the core is braced, and the weight is pressed from shoulder height directly overhead until the arms are straight. Then, the bar is lowered with control back to the starting position.

Barbell row: A barbell row is a compound exercise that targets the upper back, erector muscles and arms. A barbell is pulled from a bent-over position towards the torso while keeping the back neutral.

Chins/Pullups: A chin-up or pullup is an upper-body strength exercise performed by hanging from a bar and pulling the body upward until the chin clears the bar. This exercise primarily targets the back muscles (lats) and the biceps, while also engaging the forearms, core, and shoulders. The difference between chin-ups and pullups are the grip on the bar, where chin-ups have the palms facing towards the athlete and pullups have the palms facing away from the athlete.

Seal row: A seal row is a back-focused exercise where one lies prone (face down) on an elevated bench to isolate the upper back, mid-back and lats by eliminating the use of momentum and the lower back. To perform a seal row, one positions a high bench so the head hangs off one en, while gripping a barbell or dumbbells with an overhand grip, and pulling the weight towards the torso, focusing on squeezing the shoulder blades together before slowly lowering the weight back down.

Landmine: Landmine is the term used for a barbell connected to the ground via a cardan shaft. The landmine can be used for a variety of exercises, mostly for core stability, back and shoulder training.

3
Methodology

In this chapter, the methodology used throughout the project is presented in chronological order. The tools and methods used in each step are mentioned as well.

3.1 Define Project Scope, Goals and Formulate a Problem Statement

The project began with initial discussions and meetings with representatives from Eleiko AB. These discussions aimed to define the scope of the project, identify available resources and also ensure that expectations regarding goals, technical constraints and practical applications were aligned. The collaborative planning phase resulted in a structured project timeline, which included concrete deadlines and milestones. These ensured that progress could be effectively monitored throughout the project.

3.2 Data Gathering Through Interviews and Observations in a User Study

After defining goal and scope, the project entered a research and data collection phase. This phase included a combination of observations on potential customers in action and interviews with the goal of collecting as much information as possible about their training habits and needs.

3.2.1 Interviews to Gather User Data

Semi-structured interviews were conducted as part of the user study to gain in-depth insights into participants' experiences and perspectives. The interviews were carried out in an online one-to-one format, which provided flexibility for participants while ensuring a controlled and consistent interview environment. Each interview was planned to last approximately 20–30 minutes, allowing sufficient time to explore key themes while maintaining participant engagement. The interviews contained mostly open-ended questions, in addition to demographic questions.

A semi-structured interview guide was used to ensure that all relevant topics were covered, while still allowing follow-up questions and spontaneous additions. This balance of structure and openness supported the collection of rich qualitative data.

Furthermore, a broad variety of interview subjects, ranging from casual gym-goers to world champions and Olympic medalists in their respective fields, were interviewed according to the questions found in Appendix A. The goal was to identify user problems and opinions about strength training equipment available in commercial gyms, and how each group experienced the equipment at their disposal. In total, 38 interviews were conducted.

3.2.2 Observations to Gather User Data

To verify real-world relevance to the problems and wishes found in the interviews, observations were used to support the findings of the interviews. Also, observations enabled a gathering of information about latent needs that subjects may not be able to articulate themselves. The observations were therefore carried out by observing regular gym-goers and high-level athletes while they trained, taking notes about the problems they faced and how they solved them.

The observations continued until all behaviors described in the interviews were observed at least two times, either in a confirming or contradicting way. Notes were taken throughout the observation period to document recurring patterns and significant deviations. The observations served a dual purpose; first, to confirm or challenge the interview findings by comparing reported experiences with those observed in practice and second, to find latent needs that were not expressed in interviews.

3.3 Analysis of User Feedback

The evaluation of user feedback was carried out by grouping the interview participants into groups and then drawing conclusions about their contribution for product development in the strength training market. The primary objective of this phase was to identify user needs, preferences and pain points related to strength training equipment. Special attention was given to finding varying needs among user groups, which included athletes, general gym-goers and coaches to ensure relevant and profitable products that appeal to most gym visitors.

The participants of the study were divided into three categories based on their experience in strength training (recreational gym-goers, elite athletes and coaches/-trainers). This division was mainly based on the experience that participants have in the gym/sports environment, as well as their strength.

Participants that had competed at an international level in a strength-related sport, earned medals at the Swedish national championships in a strength related sport

or had lifted within 10% of the qualifying weight for the Swedish national championships in applicable lifts (powerlifting or weightlifting) were classified as elite. The participants were not asked about their body weights, so the qualifying totals were taken from weight classes that corresponds closest to the average male and female weights in Sweden (male: 84 and women: 68) [11]. If participants did not meet the criteria, they were placed in the recreational group. Coaches/trainers included everyone that trains others on any level, and could by definition include personal trainers or a coach of some sort. Furthermore, the participants were also divided into male/female categories to see if there were any possible differences between the needs they expressed.

The analysis was completed manually by sorting the feedback from interviews and comparing it to observed behaviors in a validation process. Later, LLMs (ChatGPT and Gemini) were used to identify any other potential differences that may have been overlooked during manual analysis.

Thereafter, the project could progress by deciding which user problems to solve, based on issues identified during the interviews and observations. The focus of the project therefore became the experienced difficulty in training the lower back in a simple, easy-to-understand and effective way, that also makes heavy loading possible.

3.4 Identifying Needs, Setting Requirements and Ideating Solutions

After the data gathering had been completed, brainstorming and rapid sketching were tools used to generate ideas. The insights gained from the user research were then analyzed and translated into a set of clear technical and functional requirements. These requirements were the basis for the idea generation phase, where multiple concepts were developed and iterated upon.

3.5 Patent Search Analysis

Using Espacenet, a patent search was conducted in order to gather inspiration from expired patents as well as to not infringe upon existing patents.

The following content has been omitted due to a non-disclosure agreement (NDA).

3.6 Market Study Through Competitor Benchmarking

In order to understand current market offerings, a competitor benchmarking was completed with a focus on hyper-extension machines with adjustable resistance. In order to gain a comprehensive view of the market, a thorough search was conducted by researching many sports-equipment brands and their product catalogs.

Furthermore, a SWOT-analysis was conducted. The SWOT-analysis supported the identification of key patterns in the market and contributed to the overall understanding of how capabilities, strengths and opportunities could be utilized. In order to successfully develop a novel concept, internal and external conditions should be taken into account.

3.7 Protyping and Testing

Through collaborative evaluation and gradual refinement through iterations, testing and prototyping, final solutions were selected based on feasibility, innovation potential and alignment with both user needs and the capabilities of Eleiko. Reverse engineering was applied to existing Eleiko products to identify existing functions. The prototyping then was executed in iterations. The first tests were conducted in a way that could isolate one function, and the process therefore started with simple prototypes that could test one function/aspect of the product at a time. Once a concept had been evaluated, it was labeled as a success or failure and the process restarted for the next function.

After all functions were tested individually, later iterations tested a couple functions together to ensure compatibility. The promising concepts were further developed into functional prototypes using available equipment such as a 45 degree back extension machine, a pulley-station, ratchet straps and wood pallets. The basic designs are first physically tested to ensure mechanical safety, ergonomic usability and ease of understanding.

Lastly, the sub-solutions to the main functions were put together to ensure compatibility as a complete system and that there was alignment with existing Eleiko product systems. This solution was then created using CAD-software.

4

User Study Results and Results from Analysis of User Feedback

In this chapter, the results from the user study are presented, in addition to the results from the user feedback analysis. The results from the user study are divided into results from interviews and results from observations.

4.1 User Study Results from Interviews

The interviews illustrated several needs and wishes, some of which are expressed by the following statements in the list bellow. The entire collection of needs and wishes (raw data) are presented in Appendix B.

- A solution for elevating one leg (Bulgarian split squat)
- I want to be able to track my own progress via technology
- The neck is hard to train safely and effectively
- Balance exercises are percieved as silly
- Deadlifts are hard, solution?
- Easy to understand
- Easy and logical to prepare
- Adjustable within a wide range
- Easy to adjust machines and change resistance/weights
- One should know what the weight shown on the machine means

4.2 User Study Results from Observations

The observations confirmed most of the needs and problems found in the interviews, but also contradicted some of them. Also, a few "hidden" problems were identified. This section focuses on the main findings from the observations and explains the ones that contradicted answers from the interviews. Needs that are specific to a single piece of equipment (or brand specific) are not described further.

- Seal row is an exercise that is mentioned many times during the interviews. This seems to be a problem connected to the offering of equipment at specific gyms rather than the equipment not existing.

- Very few beginners, young men excluded, are doing deadlifts and deep squats without supervision of a personal trainer. Many beginners look to the side to see how their back looks in a mirror, which creates an undesirable twisting of the spine.
- The possibility of loading compound leg exercises heavy without putting to much stress on the back is difficult for many athletes. In gyms with belt-squats this seems to be possible, but many seem to struggle anyways.
- Safety-racks seem to be widely miss-used (i.e. not used in a way that catches the barbell if the user fails a lift) by gym-goers on all levels. This includes use of benchpress, squats and variations thereof.
- Training of the abdominal muscles seem to be done almost exclusively with body weight or free weights, even though interviews shows high interest in machines for this. Many of the machines available seem hard to understand.
- The need for easy and intuitive adjustment of equipment to personal needs are expressed in the interviews and can also be observed in many cases. Both the way equipment is adjusted and the range in which it can be adjusted seem to be limiting factors.
- There is confusion about the difference in how a weight feels in machine handles compared to the weight of the resistance plates in cable machines etc.
- The deltoid muscles seem hard to to train in general and even more the parts in isolation. This seem to be partly due to a lack of sufficient equipment. The complexity of the joint itself also seems to play a part in this.

4.3 Results from User Feedback Analysis

In order to analyze the data from user studies, the participants in the interviews were first grouped by training experience. The groups were defined as regular gym-goers (max lift in applicable compound lifts below 90% of the Swedish nationals qualifying weight in that lift for their respective gender), elite athletes (competing on international or highest national level in any sport or stronger than 90% of the Swedish nationals qualifications in any applicable compound max lift) or trainers (experience as a personal trainer, coach or in any other way training other athletes)

4.3.1 Recreational Gym-Goers

The recreational users in the study expressed a wide range of needs but the underlying theme was clear: they want equipment that feels safe, simple, and easy to understand. For many of them, strength training is not their primary passion but something they do for health, appearance, or general fitness. As a result, any equipment that feels intimidating, confusing, or physically uncomfortable becomes a barrier to use. A large proportion of recreational users expressed some degree of insecurity around free-weight exercises, especially when lifting heavier loads or performing technically demanding movements such as squats, deadlifts, or overhead presses. Many reported that they avoided certain movements or exercises entirely,

unless machines offer a safer or more controlled alternative. Smith machines, guided paths and clearly defined movement patterns were appreciated because they reduce the fear of failing a lift or "doing something wrong". This highlights that perceived safety, rather than maximal loading capacity, is a key factor in adopting new equipment for this group.

Another dominant theme was the importance of a clear and intuitive design. Recreational users often decide whether or not to try a machine within a few seconds of first seeing it. If the setup looks complicated, if the adjustment levers are not obvious or if the purpose of the machine is unclear, they will typically default to whatever they already know. Several users expressed a desire for instructions, visual guides or demonstrations, either on the machine itself or through digital solutions in order to gain confidence before trying new exercises. This also ties into a wide concern about gym etiquette and not wanting to "look awkward" while trying out new equipment.

Furthermore, comfort and adjustability were also recurring points. Recreational users come in a wide range of heights, limb proportions and experience levels, and many machines are designed around an assumed "average" body. Several interview participants noted that certain machines did not fit them properly or caused discomfort, especially in areas like the shins, hips, shoulders and abdomen. Equipment that allows quick and meaningful adjustments and that clearly communicates how to personalize the setup was therefore seen as particularly valuable.

Recreational users also expressed wanting to prioritize time efficiency. Many want to complete a full workout in a relatively short session, often 30–45 minutes, and appreciate solutions that minimize setup time and allow quick changes of weight/resistance. Machines that combine too many functions or require excessive reconfiguration were viewed as counterproductive. At the same time, the user groups values robust, reliable equipment; wobbling benches, uneven surfaces or worn-out mechanisms were frequently mentioned as sources of distrust and negative experience.

Finally, recreational users cared more about the environment and atmosphere of the gym than other groups. A friendly culture, good maintenance, tidy weight areas and clear organization of accessories as well as attachments were frequently mentioned as important. Psychological comfort, feeling welcome, not judged and being able to train without fear of embarrassment played a substantial role in how they interacted with equipment.

Overall, recreational users prioritize simplicity, safety, comfort and clarity. Their needs revolve around minimizing cognitive and emotional barriers to training, ensuring that equipment feels approachable and reliable and enables them to train effectively without advanced knowledge or technical skill.

4.3.2 Elite Athletes

It became obvious that elite athletes had a very clear picture of what they wanted. The main goal of their strength training was to become stronger and therefore their most important need was to be able to lift maximal weight, often in explosive manners. Equipment that many expressed was most commonly used by them included barbells, dumbbells, weightplates, boxes, kettlebells and other common free weights and racks. Many also expressed a desire for a variety of sport specific equipment that is only applicable to their specific sport. No sports had any overlap regarding that equipment (many exercises overlapped, but not any specialized equipment).

In addition to free weights and sport-specific tools, elite athletes also demanded equipment with extremely predictable resistance curves, very high mechanical stability and industrial-level durability. They frequently requested heavy plate-loaded lower-body machines (such as hack squat and belt squat), tools for explosive or isometric training as well as equipment enabling full ROM (range of motion) without unnecessary spinal load. They also stressed the need for fast adjustments, high-quality safety racks and specialized tools for hard-to-train areas such as the neck, hips, and postural chain.

4.3.3 Coaches and Trainers

The group of trainers and coaches expressed needs that seem to be shaped by their dual role: they want to be able to train effectively themselves, but even more importantly, they need equipment that allows them to instruct, cue and supervise a wide range of clients with different body types, skill levels and training goals. As a result, their priorities were less about maximal load and more about usability, adjustability and the ability to teach correct movement patterns safely.

A recurring theme was the requirement for equipment that is straightforward to understand and quick to adjust. Coaches often move between several clients within the same session, so machines that take too long to set up or have unclear adjustment points end up disrupting the training. Many trainers expressed the value of equipment with clear, minimal and intuitive adjustment mechanisms, ideally with visible markers or standardized settings that can easily be communicated to clients.

Another recurring need within the group was the ability to perform full range of motion and unilateral variations. Trainers noted that many existing machines restrict movement or overly fix the body, making it difficult to work on joint-specific strength, address asymmetries or perform variations suited for rehab and prehab. Equipment that supports full joint excursion, adjustable loading angles and unilateral capabilities was considered essential for helping clients who struggle with imbalances or limited mobility.

Additionally, trainers also emphasized the importance of accurate and predictable resistance profiles, not primarily for maximal strength but because a consistent loading curve makes it easier to teach proper technique and to progress clients safely.

Many preferred plate-loaded machines for this reason, as they more closely mimic free-weight movement patterns and make load increments more transparent for the user.

Furthermore, a notable share of coaches expressed a desire for tools that allow them to measure performance, especially in isometric tests or controlled strength assessments. This reflects an emphasis on data-driven coaching, where measurable outputs (force, power, ROM) help guide training decisions and track client development. Similarly, equipment that enables safe practice of explosive movements was considered valuable, provided such equipment can be used despite varying ability levels and for different body types.

Finally, trainers highlighted a need for equipment with a clear purpose and minimal unnecessary complexity. Machines with too many moving parts, overly broad functionality or ambiguous movement paths were seen as counterproductive both for learning and for coaching. Instead, trainers preferred robust, clearly defined tools where the targeted muscle or movement pattern is immediately obvious to the client. Durability and ease of maintenance were emphasized, as equipment in a coaching environment must withstand frequent use and significant wear.
Overall, the trainers' needs center around clarity, adjustability, pedagogical value and functional versatility. These factors support their role in guiding diverse clients safely and effectively.

4.3.4 Comparison of the Three User Groups

Elite athletes, coaches/trainers and recreational gym-goers share some basic needs, but their priorities clearly differ. Elite athletes focus primarily on performance; they want equipment that allows maximal loading, precise mechanics and explosive or sport-specific movements. The equipment should have minimal setup and maximal stability. Trainers and coaches, however, prioritize equipment that is easy to adjust, pedagogical, and versatile enough to suit many different clients. Also, they value clear movement paths, full range of motion and predictable resistance curves that make teaching and progression straightforward. Recreational gym-goers emphasize safety, simplicity and comfort. They want equipment that feels intuitive, non-intimidating as well as easy to understand, often choosing stable machines over complex free-weight setups. Furthermore, they value features that help them train confidently without fear of mistakes or injury.

4.3.5 Gender Differences

Although men and women expressed many similar needs, such as wanting robust equipment and a positive training environment, their priorities and concerns diverged in several ways. Women tended to emphasize psychological safety, clarity and ergonomic comfort. Many expressed uncertainty around free-weight exercises, especially movements like deadlifts, squats, cleans and bench presses, often choosing machines because they felt safer and more controlled. Women also highlighted

the importance of intuitive design and clear guidance: if a machine looks confusing or requires guesswork, they are less likely to try it. Comfort-related aspects, such as seat adjustments, handle size, and accommodating shorter limb lengths, were raised much more frequently by women than men. This suggests a stronger sensitivity to whether the equipment "fits" their body and whether it feels comfortable, non-intimidating and easy to use. An alternative possible conclusion is that most equipment may be designed to fit the average male, rather than the average female.

Men, by contrast, focused more on mechanical performance and training specificity. Their comments frequently revolved around resistance curves, the ability to load very heavy weights, stability under high load and access to specialized strength equipment such as hack squats, belt squats, landmines and various bar types. Men were also more likely to critique construction quality, moving parts and the durability of joints, screws and surfaces. Where women asked for clarity and confidence, men asked for "realism," "smoothness," and "precision." Their concerns generally revolved around how the equipment behaves when used at/near maximum capacity.

There were also subtle differences in what each gender found frustrating or discouraging. Women mentioned social discomfort, such as feeling unsure, not wanting to look awkward or avoiding "intimidating" equipment areas. Men rarely voiced these concerns; instead, they were frustrated by unstable benches, inconsistent equipment behavior or inefficient adjustability options. In general, the complaints of men were mechanical; those of women were more often experiential or confidence-related.

In terms of which muscle groups or training needs were prioritized, women more frequently talked about hips, glutes and core stability. Men discussed back, chest, legs, heavy pulls and high-output strength work, reflecting a more performance-oriented mindset. Women valued equipment that helps them maintain good form and avoid discomfort or injury, whereas men valued equipment that enables progression, overload and variation. In general, the emerging pattern is that women's needs center on accessibility, clarity, and a sense of safety, while the needs expressed focus on performance, load and mechanical quality.

4.4 Customer Needs Selected for Further Development

This section presents the needs identified and selected for further development. The entire list of sorted customer statements can be found in Appendix C.

The following content has been omitted due to a non-disclosure agreement (NDA).

4.5 Direction of Product Development Based on the Results from Analyzing User Feedback

The following content has been omitted due to a non-disclosure agreement (NDA).

4.6 Requirement Specification

Based on data from the user study and analysis, a requirement specification was created for the product in development. In order to move forward with the development of the ideas generated during brainstorming and rapid sketching, possible solutions had to adhere to functional requirements. The requirement specification is presented in Appendix D. The requirements are mainly guidelines for any future development of an actual product based on the concept and therefore there is room to specify them further. Many of the necessary requirements for the product do not differ from other Eleiko products and are therefore not discussed in detail as they are a part of already established practices and routines.

5
Market Study Results

In this chapter, the results from a patent search analysis and competitor benchmarking are presented. These results offer an overview of the current market landscape for the concept product in question.

5.1 Patent Search Analysis

The patent search resulted in a variety of patents that offer inspiration of how to solve certain functions, as well as the identification of already existing solutions that serve the same or a similar purpose. This section will therefore present some of the sources of inspiration used to develop a final concept, as well as show examples of already existing solutions that have similar functions.

5.2 Competitor Benchmarking

The following section presents the results from the market study and competitor benchmarking. In addition, examples of direct competitors that offer similar products are presented.

The following content has been omitted due to a non-disclosure agreement (NDA).

5.3 SWOT Analysis

Based on current market offerings found during the benchmarking process, a SWOT analysis was conducted to illustrate *Strengths*, *Weaknesses*, *Opportunities* and *Threats* that Eleiko must take into account to launch a successful product with similar functions. Figure 5.1 shows the SWOT-analysis.

Strengths refers to internal capabilities that Eleiko can benefit from when developing a new product. These include, as seen in Figure 5.1, the innovative culture at Eleiko only has a few other manufacturers to compete with. Furthermore, Eleiko has a strong brand recognition and a reputation for producing high-quality products. When it comes to *Weaknesses*, this refers to internal structures, cultures or capabilities that hinder development. Since Eleiko has rigorous testing before releasing any product, R&D costs will inevitably be high. Also, as part of their high-quality

strategy, tight tolerances raise the cost of manufacturing compared to many other brands. However, by having a modular approach to product development, few new parts would have to be developed in order to create a new product offering and thereby manufacturing and R&D costs can be kept lower.

Opportunities refer to the external market and how Eleiko can benefit from it. Opportunities include a large demand for innovative fitness equipment, having millions of customers accessible through online marketing and having few direct competitors. Of course, some direct competitors is not as desirable as no competitors. In contrast, *Threats* refer to the environment of the external market that hinders development. This includes competitors who want to copy the designs of Eleiko but sacrifice quality for lower costs. Additionally, gyms and users may be reluctant to invest in new equipment if it is not considered a standard piece of equipment that every gym "should" have. The global economy also affects the purchasing power of consumers and may affect how widely the product is initially received, which could have long-term affects on the success of the product.

Strengths (Internal, Positive) • With only few current manufacturers, Eleiko can differentiate themselves with innovation and improved design. • Quality reputation and credibility is high. • Eleiko has a strong brand recognition.	**W**eaknesses (Internal, Negative) • Testing and R&D costs are often high for new products. • Eleiko has tight tolerances that need to be taken into account when producing equipment.
Opportunities (External, Positive) • Global demand for innovative training equipment is rising. IoT-enabled machines can connect with fitness apps, VR, or competitive training platforms so there is great opporotunity for innovation. • Post-pandemic demand for home gym solutions is still strong, which Eleiko successfully caters to currently. • Social media enables collaborations with gyms, influencers, or sports institutions to popularize the machine. • Only few existing manufacturers mean Eleiko can capture a large market share. • If marketed well, the equipment could drive community engagement (competitions, classes, challenges).	**T**hreats (External, Negative) • Existing manufacturers could cut prices, improve products, or dominate distribution channels. • Eleiko-products have a reputation for high quality but also high price. • Consumers and gyms may hesitate to invest in an unfamiliar piece of equipment. • Bigger fitness equipment companies could copy a new product and develop it cheaper. • Fitness equipment is a discretionary purchase and vulnerable to reduced consumer spending. • New quipmentemust pass strict safety standards and there are liability risks if injuries occur. • Popularity of new sports/tools can fade quickly if not adopted widely.

Figure 5.1: SWOT-analysis.

6

Prototyping Results

The results from prototyping and testing are presented in this chapter. Firstly, the results from initial brainstorming are discussed, followed by the results from several iterations of testing.

6.1 Reverse Engineering of an Existing Product

A reverse engineering analysis revealed a set of core functions that collectively enable safe and controlled back-extension exercise. Rather than emphasizing physical components, the following functional breakdown highlights how the system operates to support the user's movement, stability, and safety.

6.2 Generating Ideas and Brainstorming Before Prototyping

In this section, the results of brainstorming sessions and rapid sketching are described in short, and further illustrated with sketches in Appendix E. Several key questions were discovered during brainstorming, which were answered during prototyping and testing. A summary of the questions and results are therefore presented in this section, but will be motivated in greater depth in section 6.3.

6.3 Testing Subsolutions to Optimize Performance and Eliminate Inferior Alternatives

When testing functions to include in the final prototype, several iterations were necessary. The main functions were given the most attention, since a concept was the end goal of the project. Furthermore, it was of great importance to design a concept that would seamlessly fit into the current Eleiko offering, both in terms of design, manufacturing and modularity. This was taken into account when making any design decision.

6.3.1 Functions Tested in the First Iteration of Prototyping

Several solutions were tested in the first iteration, which led to several conclusions that would be incorporated into the final design. The concepts that were tested in the first iteration are listed and briefly explained in the list below.

The following content has been omitted due to a non-disclosure agreement (NDA).

6.3.2 Functions Tested in the Second Iteration of Prototyping

The following content has been omitted due to a non-disclosure agreement (NDA).

6.3.3 Functions Tested in the Third Iteration of Prototyping

The following content has been omitted due to a non-disclosure agreement (NDA).

7

Final Concept for a Novel Modular Product

The final concept is presented in this chapter, with descriptions and pictures. The majority of components that would be part of a final product assembly do not require new development, since suitable parts from existing Eleiko products are available. These parts will be shown and motivated in this chapter as well in order to describe the product as a whole.

7.1 Final Concept Sketches of New Equipment

The following content has been omitted due to a non-disclosure agreement (NDA).

7.2 Facilitating the Integration of a New Product Into the Eleiko Catalogue by Utilizing Pre-existing Parts and Modularity

When developing a concept for the novel product offering, it was not a priority to lock in minor details of the design. Instead, major functions were prioritized. However, a few suggestions of ways to incorporate existing products are presented in this section. By including parts from existing products and utilizing modularity, the threshold to embrace the novel concept can hopefully be lowered. The details presented here are therefore merely suggestions, since it otherwise would be too early in the design process to lock in these details and many other possible solutions could be chosen instead,if deemed more appropriate.

In order to keep R&D cost, manufacturing cost as well as production time low, it was early on decided to facilitate the inclusion of pre-existing parts from Eleiko products. By leaning into their modular strategy, only one new major part would have to be designed to fulfill all the desired functions.

8

Discussion

The results of this project reflect the distribution of participants across the three user categories. With a larger share of recreational users compared to elite athletes and trainers, many responses naturally emphasized accessibility, perceived safety, and ease of use. These needs are likely representative of the broader gym population, where confidence and usability are significant determinants of participation and long-term adherence. In contrast, the smaller group of elite athletes provided highly specific and performance-driven feedback focused on stability, load capacity and movement precision, which aligns with the demands of training for competitive endeavors. Trainers and coaches, positioned between these groups, focused on adjustability and clarity, that stem directly from working with versatile client populations.

Furthermore, the gender distribution of the interviews was slightly skewed toward men, which may have amplified the prominence of feedback related to load, mechanical behavior and specialized equipment. The women who participated offered a different perspective, often highlighting comfort, confidence and concerns about fit of equipment. These qualitative contrasts suggest that gender plays a role in how users assess and interact with gym equipment.

Given the sample size as well as the uneven sample ratios (more men than women and more recreational users than elite athletes and trainers) the results uncovered are credible but should be interpreted with awareness of representation. Expanding the sample could either reinforce these trends or reveal additional needs that are currently less visible due to sample limitations, event though clear patters did arise as more interviews were conducted.

9
Conclusion

In this chapter the conclusions from the results are presented by answering the research questioned stated in section 1.4.

RQ 1: *Which customer segments is the product aimed at?*

The following content has been omitted due to a non-disclosure agreement (NDA).
RQ 2: *What are the needs of the customer segments?*

In short, the most important needs expressed in the user study can be summarized as adjustability and accessibility, range of motion, load capacity, perceived safety, clear instructions and intuitive use.

RQ 3: *How can modular components from Eleiko be incorporated in the design?*

The following content has been omitted due to a non-disclosure agreement (NDA).

RQ 4: *How does the product meet the needs of a broad customer base?*

The following content has been omitted due to a non-disclosure agreement (NDA).

RQ 5: *How did the quality of customer feedback/opinions vary among the different user groups?*

Feedback patterns varied notably between both experience levels and gender groups. Elite athletes focused primarily on performance-related requirements, such as high load capacity, mechanical precision, and the ability to train explosively with stable, durable equipment. Trainers emphasized adjustability, predictable resistance curves, and equipment that supports instruction and accommodates diverse users efficiently. Recreational users prioritized safety, simplicity, and comfort, preferring intuitive machines that build confidence and reduce the fear of performing exercises incorrectly.

Gender differences also emerged. Women more often expressed concerns about usability, ergonomic fit, and psychological safety, including anxiety around free weights and a stronger desire for guidance and intuitive interfaces. Men, on the other hand, focused more on mechanical quality, load, and training variety, frequently discussing stability, resistance behavior, and access to specialized strength equipment.

Overall, the feedback demonstrates that different user groups have distinct priorities, which gave insights about what product concepts and functions are most likely to success in the current market.

RQ 6: *What conclusions about user feedback can be applied to the gym sector?*

User feedback collected from different categories of gym-goers indicates that future gym equipment should be designed with both usability and high performance in focus. Recreational users often perceive traditional strength training equipment as complex or intimidating, which highlights the need for intuitive interfaces, straightforward adjustment mechanisms and a strong perception of safety to increase adoption. In contrast, advanced users and elite athletes place higher demands on mechanical precision, load capacity and stability, requiring equipment that can support heavy, explosive and technically demanding movements. Trainers emphasize efficiency in setup and clear movement guidance to facilitate coaching and exercise instruction. Additionally, consistent maintenance, good ergonomics and a supportive training environment play significant roles in long-term engagement. Together, these insights underscore the importance of knowing which population is the target user when researching needs to develop strength training equipment.

Finally, it can be concluded that in future product development efforts within the strength training equipment sector, it may be beneficial to target a niche part of the market instead of trying to develop equipment that appeals to all gym visitors. Different groups clearly have different needs, and it may therefore be more effective to focus on the customer segments separately.

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A

Interview guide

Date:
Person's name:
Group division: Coaches & Gym Owners, Athletes (elite & recreational), Non-training individuals (control group type)

Demographic questions
Age:
Gender:
Sport:
Athlete/Coach/etc.:

Open ended questions
Personal bests in various main lifts (squat, bench press, deadlift, clean...):
How long/much/often have you trained?
What is the highest level you have competed at / coached someone to? (competitions and records (
Which exercises do you/your athletes usually perform?
Rank them based on how important they are: Why?
What makes you choose to do an exercise (e.g., results, injury prevention, enjoyment, variation)?
Which exercises would you have liked to use (more)? Why and how important is it?
Which equipment must/should really be available at the gym? Rank by importance. Why?
Which muscle group(s) are the hardest/most troublesome for you to train? Why?
When you use equipment at the gym, what is important to you?
What determines whether you try a new exercise/piece of equipment, and what determines whether you continue using it?
Is there anything else you want to add?

B

Needs (Raw Data) Identified During the Interviews and Observations

rec	E	Get as much strength and muscle as possible in as little time as possible.
	E	Ab machines that exist are a bit strange. I avoid them. Awkward and odd.
	E	Want to be able to do a full workout in one and the same setup.
	E	Machines where leg curls are separate.
	E	Calves are hard to train usually require supersets. Machines are needed so it's not only bodyweight.
	E	Leg machines can hurt against the shins.
	E	Too much equipment needs to be moved across many machines.
	E	Narrower handles are comfortable.
	E	Machines should feel real, not too much plastic, etc. Straightforward.
	E	Comparable leverage. Total volume should correspond to or be comparable with alternatives.
	E	You shouldn't feel embarrassed performing an exercise.
elite,coach	Q	Squats without spinal loading are desired.
	Q	An exercise for quads in a fully extended position is desired.
	Q	A squat-like machine is desired.
	Q	The equipment should be comfortable to use, plate-loaded so you can use very heavy weights.
	Q	Loadable back extension machines.
	Q	Easy to perform, easy to manage.
rec	I	A substitute for deadlifts.
	I	Not a big fan of racks where everything is done in the same rack, one for each application is better.
	I	Small wrists make it hard to find suitable exercises. Forearms in general are difficult.
	I	The back can be hard to connect with properly so the wrong muscles aren't used.
	I	Good hand grip is important.
	I	Durability and ease of maintenance are important.
	I	It's important to get good muscle contact.
rec	K	Machines should be easy to adjust to fit different people.
	K	I like having safety in both bench press and squats if I don't have experienced spotters.
	K	For machines, it's important they can be adjusted to fit my long arms and legs.
	K	Eleiko has partially failed in some designs.
	K	Adjustment options are important, plus safety.
	K	Machines are a big advantage for beginners since it's harder to do things wrong.
	K	It should be possible to add chains and resistance bands to certain exercises.

	K	Machines are time-efficient.
	K	Simple machines are preferred rather than combined ones.
rec	F	Deadlifts feel complicated and scary.
	F	I want video material that shows exercises.
	F	I want to be able to track my own progress via technology.
rec	M	Ab machines are often unergonomic or bad.
	M	High quality and easy-to-repair machines are important.
	M	It can be hard to take dumbbells down from racks.
rec	G	Seal row benches could have simpler adjustments.
	G	A solution for elevating one leg (Bulgarian split squat).
	G	Hips hurt in some hip thrust machines.
	G	Exercises must be quick and smooth to set up.
	G	Machines should be adjustable to the user.
	G	It should be easy to understand how a machine works.
rec	H	It should be quick to choose weight and start training.
	H	Machines for forearms could be developed.
	H	Lower-back machines exist but have room for improvement.
	H	Isolation for the lower back.
	H	Ab machines have improvement potential.
	H	Shoulders are complicated and often require several machines.
	H	Machines must be easy to understand or they won't be used.
	H	Eleiko's preacher bench has room for improvement.
elite,coach	O	Good belt squat and hack squat machines are desired.
	O	Open bars are hard for beginners to understand.
	O	A high-quality safety squat bar is desired.
	O	The selection of shoulder machines is poor.
	O	It's hard to activate the lower back properly
	O	Limit moving parts to what is necessary for the machine's purpose.
	O	Heavier exercises should be done at the gym due to safety.
rec	L	Abs and back training at home feels unsafe and messy.
	L	It should feel comfortable and natural to sit in machines.

	L	Fast weight changes are important.
	L	Plate-loaded leg press feels scary to train heavy alone.
rec	X	It should be easy to understand how to use machines.
	X	I want more information before trying new machines.
	X	Eleiko has nice colorful kettlebells, but the 8 kg is too large.
	X	Bench press and deadlift often need an extra set of eyes for safety.
rec	C	Rear delts are hard to train correctly.
	C	There should be more glute machines.
	C	People don't put equipment back after use.
	C	Balance exercises are perceived as silly and are avoided.
rec	P	The neck is hard to train safely and effectively.
	P	Equipment should always be intact.
	P	Good hand grip quality is required.
	P	Cable machine pins sometimes get stuck.
	P	It's important that broken parts are easy to replace.
	P	You need to understand how and why to use a machine before trying it.
	P	Weights lying on the floor are extremely annoying.
	P	Handle storage systems are poorly designed and confusing.
	P	People use mats incorrectly and destroy them.
	P	I prefer plate-loaded machines over weight stacks.
coach	Y	I don't like overcomplicating things, basics work best.
	Y	Resistance curves should be smooth and resemble real lifts.
	Y	Lower back pain is extremely common.
	Y	I want to be efficient and not spend three hours at the gym.
	Y	I want to be able to choose the correct squat rack height.
elite	N	Seal rows are skipped if no proper setup exists.
	N	Wobbly or rotating barbells feel unsafe.
	N	Eleiko's Smith machine is too narrow and poorly designed.
	N	Machines are easier when you lack free-weight knowledge.
	N	Triceps can be difficult to train when starting out.

rec	J	Equipment should be intuitive or clearly instructed.
	J	User-friendliness is important.
	J	As long as equipment is fresh and well-kept, it's acceptable.
	J	I avoid jerky CrossFit-style movements due to injury risk.
	J	Overhead triceps exercises are uncomfortable.
rec	D	Flashy machines that can't train the whole body are not appealing.
	D	Glute isolation exercises are awkward to set up.
	D	It's hard to progress biceps and lats over time.
	D	Equipment should be intuitive and quick to adjust.
	D	Equipment should be intact and clean.
	D	Unnecessary complexity should be avoided.
	D	I try equipment only if it clearly solves a problem.
	D	A quick-adjust rack height system would be useful.
	D	Machines for gluteus medius are desired.
	D	Machines for heavy rehabilitation are desired.
	D	A simple and effective hack squat or belt squat is desired.
coach	R	Something that simplifies hip thrusts is needed.
	R	Explosive training should be possible in machines.
	R	Good flooring is important.
	R	It's hard to train the neck safely.
elite	AE	Light, movable squat stands are important.
	AE	Portable gym flooring for sports clubs is desired.
	AE	Machines must allow full range of motion.
	AE	Unilateral functions in machines are important.
coach	AD	Cable rows should be height-adjustable.
coach	T	Rotating handles for pec fly machines are needed.
	T	Many machines need better resistance curves.
	T	Machines must allow very heavy loading, especially for legs.
	T	A deadlift machine is desired.
	T	Plate-loaded machines often have better resistance curves.
	T	A lying leg extension machine is desired.

	T	Machines must have a clear training purpose.
	T	Muscles should be trained effectively in the stretched position.
	T	A machine that mimics slingshot resistance curves is desired.
	T	Machines for concentric-only training are desired.
	T	Machines for eccentric-only training are desired.
elite	AB	It's easy to forget or miss certain muscles.
	AB	Heavy loading in lat pulldown machines is important.
	AB	Stable bench press blocks for competition are needed.
	AB	Safety racks for squats are important.
	AB	Lower legs hurt during leg extensions and curls.
	AB	Machines must be built for the loads they handle.
	AB	Medicine ball throw-like movements without throwing objects would be useful.
	AB	Explosive movement capability is important.
	AB	Seated barbell shoulder press is awkward to get into position.
elite	AC	Isometric exercises are hard to set up for strong people.
	AC	Machines must adjust easily to different body shapes.
	AC	A smoother solution for adjustable dumbbells is desired.
	AC	Seated calf raise machines are often bulky.
	AC	It should be easy to understand how exercises are performed.
	AC	Deep pullovers are awkward due to setup height.
	AC	Good grip with the floor is important.
	AC	It should be possible to safely drop weights.
	AC	Measuring performance in machines using sensors is desirable.
	AC	Single-joint exercise machines are desired.
	AC	Simplicity is important so everyone understands the machine.
coach	S	Heavy and stable leg exercises are essential.
	S	Equipment for measuring isometric load is needed.
	S	Machines should have a clearly defined purpose.
	S	Being able to vary resistance curves would be helpful.
	S	Exercises should be joint-friendly and not jerky.
	S	A good pull-up bar with multiple grip options is important.

	S	Equipment should be standardized.
	S	Training for ankles and rehab/prehab should be more engaging.
elite	AK	Some exercises are difficult to understand.
	AK	A rope-climbing treadmill concept would be useful.
	AK	Compound exercises are preferred to save time.
	AK	A Smith machine is important for safety.
rec	AL	Shoulders are difficult to train and need better machines.
	AL	Machines should feel smooth and not worn.
elite	AM	Some dumbbell handles are too thick and uncomfortable.
rec	AA	Shoulders are often neglected but should be trained carefully.
	AA	External and internal shoulder rotation is the hardest to train.
	AA	Machines must accommodate very tall users.
	AA	Screws and locking mechanisms often fail on complex machines.
	AA	Sumo deadlift setups could be simplified.
rec	AF	Compound lifts are avoided due to insecurity.
	AF	Ab training is boring and often skipped.
	AF	Lower legs are difficult to train effectively.
	AF	Adjustability is especially important for shorter users.
	AF	Instructions should be clear and immediate.
rec	AI	People stick to familiar machines because others look confusing.
	AI	Knurled handles are hard to clean
	AI	Smith machines allow safer heavy loading.
	AI	Upper leg training is difficult because people quit too early.
	AI	Reliability is absolutely critical for safety.
	AI	Cardio and strength machines are often poorly maintained.
	AI	Gym culture and values matter.
rec	AJ	Bodyweight strength is missed compared to youth.
	AJ	Movement-based training is preferred over muscle isolation.
	AJ	The long-term goal is to leave machines behind.
	AJ	Equipment should feel solid and not rattle.
	AJ	Adjustable barbell racks are important.

	AJ	More color in gym equipment would be fun.
coach	AT	Unfriendly gym staff are a major issue.
	AT	High-quality technique bars are important.
	AT	Technique plates break too easily.
	AT	Full-size 5 kg plates are too loud when dropped.
	AT	Rubber is preferred over plastic for plates.
	AT	Joint-friendly posterior chain exercises are needed.
elite,coach	AO	Weightlifting block height selection should be simpler.
	AO	A shoulder-friendly bench-press alternative is desired.
	AO	A solid landmine attachment is important.
	AO	Stable step-up boxes with variable height are needed.
	AO	Heavy adductor training with full ROM is difficult.
elite	AP	Good rubber coating on plates is important.
	AP	Technically simple exercises that feel like free weights are desired.
elite,coach	AQ	Good resistance band attachments on racks are needed.
	AQ	An easy way to do Anderson squats is desired.
	AQ	Machines for rotational training are desired.
	AQ	Dip handles with adjustable width are needed.
	AQ	Robust machines and tools are essential.
	AQ	Bra/smidiga fästen för gummiband på racks efterfrågas
coach	AR	Enkelt sätt att göra anderson-squats önskas
	AR	Maskiner/redskap för rotationsträning (olika muskler) önskas
rec	AS	Dipshandtag som kan varieras i bredd önskas
	AS	Robusta maskiner/redskap är viktigt

C

Sorted Customer Needs Found During the User Study

Category	Color
Leg-related wishes	
Ab-related wishes	
Rack-related wishes	
Efficiency	
Shoulder-related wishes	
Calfes, forearms, neck	
Ergonomics/usability	
Ease of understanding	
People	
Deadlift/lower back	
Other	

Person X	Wish/problem/need/solution		Needs
E	Get as much strength and muscle as possible in as little time as possible.		Simple to set up and change weight
K	Machines are time-efficient.		Simple design
G	Exercises must be quick and smooth to set up.		
H	It should be quick to choose weight and start training.		
L	Plate-loaded leg press feels scary to train heavy alone.		
N	Seal rows are skipped if no proper setup exists.		
D	Machines for gluteus medius are desired.		
AA	Shoulders are often neglected but should be trained carefully.		
AP	Good rubber coating on plates is important.		
AQ	An easy way to do Anderson squats is desired.		
E	Too much equipment needs to be moved across many machines.		Minimized number of moving parts
E	Narrower handles are comfortable.		Adjustable to fit a wide audience
E	Machines should feel real, not too much plastic, etc. Straightforward.		Good handles/grips
E	You shouldn't feel embarrassed performing an exercise.		Different height settings for cable rows
Q	Easy to perform, easy to manage.		
I	Good hand grip is important.		
K	Machines should be easy to adjust to fit different people.		
K	For machines, it's important they can be adjusted to fit my long arms and legs.		
K	Adjustment options are important, plus safety.		
K	Machines are a big advantage for beginners since it's harder to do things wrong.		
G	Machines should be adjustable to the user.		

P	Cable machine pins sometimes get stuck.	
T	Machines must allow very heavy loading, especially for legs.	
AC	It should be easy to understand how exercises are performed.	
AF	Lower legs are difficult to train effectively.	
AI	Upper leg training is difficult because people quit too early.	
AS	Dipshandtag som kan varieras i bredd önskas	
K	Simple machines are preferred rather than combined ones.	
N	Wobbly or rotating barbells feel unsafe.	
AT	Full-size 5 kg plates are too loud when dropped.	

E	Machines where leg curls are separate.	Possibility to load heavy on leg exercises
E	Leg machines can hurt against the shins.	Compound movements without load on the back
Q	Squats without spinal loading are desired.	Unilatheral leg exercises
Q	An exercise for quads in a fully extended position is desired.	Squat-mimiking machine
Q	A squat-like machine is desired.	Quadricepstraining with straight hips
G	A solution for elevating one leg (Bulgarian split squat).	Something to raise back leg in split-squats
G	Hips hurt in some hip thrust machines.	Better "pillow" for legcurls/leg extensions
O	Good belt squat and hack squat machines are desired.	More comfortable hip-thrust machines
O	A high-quality safety squat bar is desired.	Specialized barbells (safety squat bar)
X	It should be easy to understand how to use machines.	Glute machines (more options)
C	People don't put equipment back after use.	Gulteus medius-machines(heavy rehab options)
D	Equipment should be intact and clean.	Safetyracks for squats
R	Something that simplifies hip thrusts is needed.	
R	Good flooring is important.	
R	It's hard to train the neck safely.	
T	A lying leg extension machine is desired.	
T	A machine that mimics slingshot resistance curves is desired.	
AB	Medicine ball throw-like movements without throwing objects would be useful.	
AB	Explosive movement capability is important.	
S	Exercises should be joint-friendly and not jerky.	
AF	Instructions should be clear and immediate.	
AJ	Movement-based training is preferred over muscle isolation.	
AR	Enkelt sätt att göra anderson-squats önskas	

E	Calves are hard to train usually require supersets. Machines are needed so it's not only bodyweight.	Machines for forearms and neck
I	Small wrists make it hard to find suitable exercises. Forearms in general are difficult.	Calf-machines
H	Machines for forearms could be developed.	

P	Equipment should always be intact.
AE	Machines must allow full range of motion.
AC	Good grip with the floor is important.
AK	A rope-climbing treadmill concept would be useful.
AI	Smith machines allow safer heavy loading.

H	Shoulders are complicated and often require several machines.
O	The selection of shoulder machines is poor.
C	There should be more glute machines.
AC	A smoother solution for adjustable dumbbells is desired.
AA	Machines must accommodate very tall users.
AF	Compound lifts are avoided due to insecurity.
AF	Ab training is boring and often skipped.
AP	Technically simple exercises that feel like free weights are desired.

E	Ab machines that exist are a bit strange. I avoid them. Awkward and odd.
M	Ab machines are often unergonomic or bad.
H	Ab machines have improvement potential.
L	It should feel comfortable and natural to sit in machines.
AI	Knurled handles are hard to clean

C	Balance exercises are perceived as silly and are avoided.
P	Handle storage systems are poorly designed and confusing.
P	People use mats incorrectly and destroy them.
Y	I want to be efficient and not spend three hours at the gym.
AJ	Adjustable barbell racks are important.
AT	Joint-friendly posterior chain exercises are needed.

F	I want video material that shows exercises.
G	It should be easy to understand how a machine works.
H	Machines must be easy to understand or they won't be used.
O	Open bars are hard for beginners to understand.
O	Limit moving parts to what is necessary for the machine's purpose.
L	Fast weight changes are important.
X	I want more information before trying new machines.
X	Eleiko has nice colorful kettlebells, but the 8 kg is too large.

More options regarding shoulder machines
Machine for the whole shoulder
Simpler machines for rotation-training of the shoulders

Intuitive ab-machines
Ergonomics?

Easy and intuitive to set up

Easy to understand
Clear instructions
Easy access to information

P	Weights lying on the floor are extremely annoying.	
J	Equipment should be intuitive or clearly instructed.	
J	As long as equipment is fresh and well-kept, it's acceptable.	
J	I avoid jerky CrossFit-style movements due to injury risk.	
D	I try equipment only if it clearly solves a problem.	
D	Machines for heavy rehabilitation are desired.	
AC	It should be possible to safely drop weights.	
S	Being able to vary resistance curves would be helpful.	
AL	Machines should feel smooth and not worn.	
AI	Reliability is absolutely critical for safety.	
AI	Cardio and strength machines are often poorly maintained.	
AQ	Robust machines and tools are essential.	
E	Want to be able to do a full workout in one and the same setup.	Racks with multiple functions
I	Not a big fan of racks where everything is done in the same rack, one for each application is better.	Racks with one function
K	I like having safety in both bench press and squats if I don't have experienced spotters.	Safetyracks for all exercises in racks
K	Eleiko has partially failed in some designs.	Better rubber feet and U-pipes on the competition rack
D	A simple and effective hack squat or belt squat is desired.	Easy to move racks
AE	Unilateral functions in machines are important.	Continous height options on racks
AB	Machines must be built for the loads they handle.	
AQ	Good resistance band attachments on racks are needed.	
AQ	Simple options for add ons like rubber bands on racks	
AS	Robustness is important	
I	A substitute for deadlifts.	Deadlift-mimiking machine
F	Deadlifts feel complicated and scary.	Back extensions that can le loaded easily
H	Lower-back machines exist but have room for improvement.	Isolation of the lower back
H	Isolation for the lower back.	Deadlifts feels hard, can it be made easier?
O	It's hard to activate the lower back properly	
C	Rear delts are hard to train correctly.	
Y	I want to be able to choose the correct squat rack height.	
N	Machines are easier when you lack free-weight knowledge.	
T	Machines must have a clear training purpose.	
AO	Heavy adductor training with full ROM is difficult.	
Q	Loadable back extension machines.	
E	Comparable leverage. Total volume should correspond to or be comparable with alternatives.	It's important to know the exact weight is being lifted

Q	The equipment should be comfortable to use, plate-loaded so you can use very heavy weights.	Possibility to change resistance curves
I	The back can be hard to connect with properly so the wrong muscles aren't used.	Possibility to track progress
I	Durability and ease of maintenance are important.	Easy to maintain and repair
I	It's important to get good muscle contact.	Simple seal-row benches
K	It should be possible to add chains and resistance bands to certain exercises.	Preacherbenches are not ergonomic
F	I want to be able to track my own progress via technology.	Look at resistance curves
M	High quality and easy-to-repair machines are important.	Plateloaded machines are highly requested
M	It can be hard to take dumbbells down from racks.	Machines for "heavy rehab"
G	Seal row benches could have simpler adjustments.	Ability to train explosive movements in machines
H	Eleiko's preacher bench has room for improvement.	Better flooring
O	Heavier exercises should be done at the gym due to safety.	Consentric/eccentric machines
L	Abs and back training at home feels unsafe and messy.	Simplify isometric training
X	Bench press and deadlift often need an extra set of eyes for safety.	Threadmill for rope climbing
P	The neck is hard to train safely and effectively.	Variable weight in dumbells
P	Good hand grip quality is required.	Measurements on force production embedded in machines
P	It's important that broken parts are easy to replace.	
P	You need to understand how and why to use a machine before trying it.	
P	I prefer plate-loaded machines over weight stacks.	
Y	I don't like overcomplicating things, basics work best.	
Y	Resistance curves should be smooth and resemble real lifts.	
Y	Lower back pain is extremely common.	
N	Eleiko's Smith machine is too narrow and poorly designed.	
N	Triceps can be difficult to train when starting out.	
J	User-friendliness is important.	
J	Overhead triceps exercises are uncomfortable.	
D	Flashy machines that can't train the whole body are not appealing.	
D	Glute isolation exercises are awkward to set up.	
D	It's hard to progress biceps and lats over time.	
D	Equipment should be intuitive and quick to adjust.	
D	Unnecessary complexity should be avoided.	
D	A quick-adjust rack height system would be useful.	
R	Explosive training should be possible in machines.	
AE	Light, movable squat stands are important.	
AE	Portable gym flooring for sports clubs is desired.	
AD	Cable rows should be height-adjustable.	
T	Rotating handles for pec fly machines are needed.	
T	Many machines need better resistance curves.	

D

Requirement Specification

The following content has been omitted due to a non-disclosure agreement (NDA).

E

Results from Brainstorming and Rapid Sketching

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DEPARTMENT OF SOME SUBJECT OR TECHNOLOGY
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden
www.chalmers.se

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