Organizing and prioritizing user needs for upper limb prostheses

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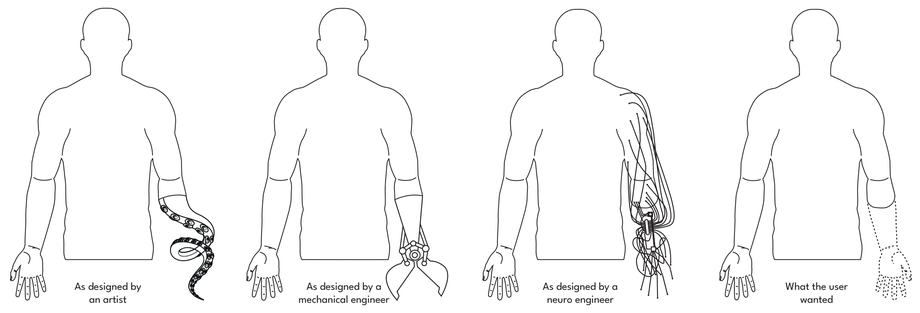
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Problem

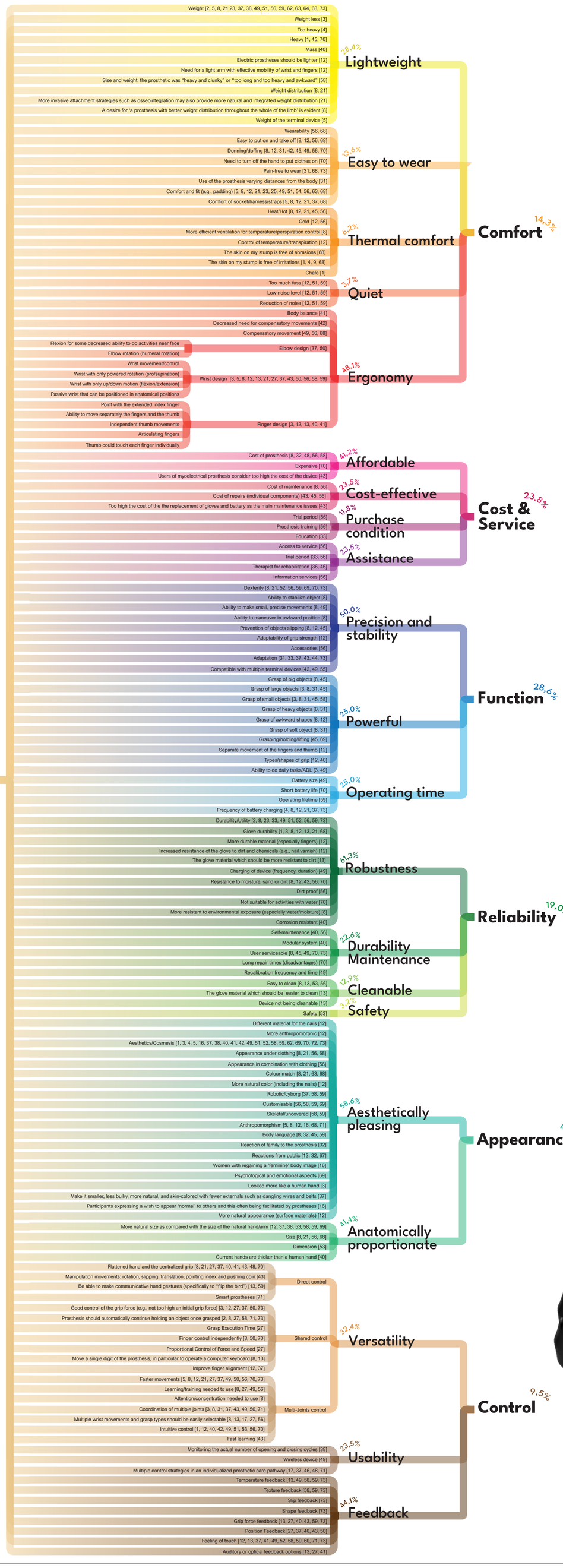
Upper limb amputation leads to severe restrictions in daily activities and psychosocial difficulties, which can dramatically reduce the quality of life of affected people.

Idea

To address this gap, we present an initial step in identifying, harmonizing, and prioritizing the needs of people with limb loss. Using the PRISMA methodology, we analysed 73 papers on the topic. Using a bottom-up approach, we clustered the needs identified in different surveys into categories and macro-categories based on a taxonomy derived from the terms identified in the literature. We then prioritized the needs after a normalization of the major surveys. We believe that this work is helping to guide the design of more user-friendly prostheses.



Organization & Prioritization of needs



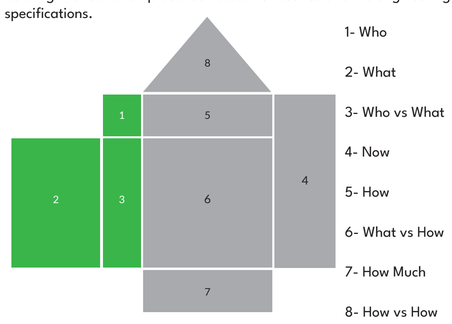
The references are here.

Methodology

Application of House of Quality to the Design of Prosthetic Hands

House of Quality

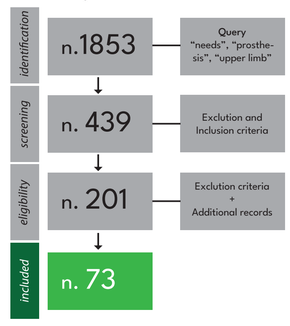
Each room in the diagram represents a step in the methodology for building the relationship between customer desires and the engineering specifications.



Identification and screening of the needs

PRISMA

Preferred Reporting Items for Systematic reviews and Meta-Analyses
≥2000 - English



Assess the relative importance of each customer requirements

RRF MacroCategories

$$RRF = \sum \frac{1}{r(d)} : \frac{Rank_i}{All} \times 100$$

1- Function
2- Cost & Service
3- Reliability
4- Comfort
5- Control
6- Appearance

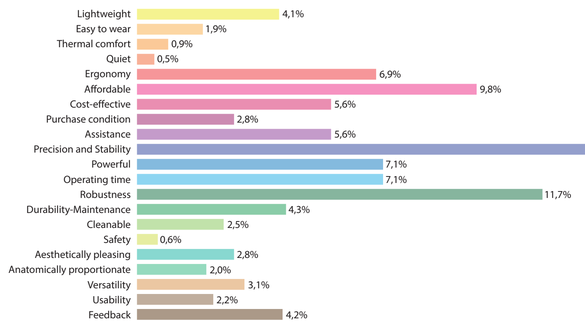
Occurrences Categories

$$\frac{f_i}{\sum f_i} \times 100$$

1- Precision and Stability
2- Robustness
3- Affordable
4- Powerful - Operating time
5- Ergonomy
6- Cost-effective - Assistance
7- Durability-Maintenance
8- Feedback
9- Lightweight
10- Versatility
11- Purchase condition - Aesthetically pleasing
12- Cleanable
13- Usability
14- Anatomically proportionate
15- Easy to wear
16- Thermal comfort
17- Safety
18- Quiet

Discussion

Needs that represent the global population



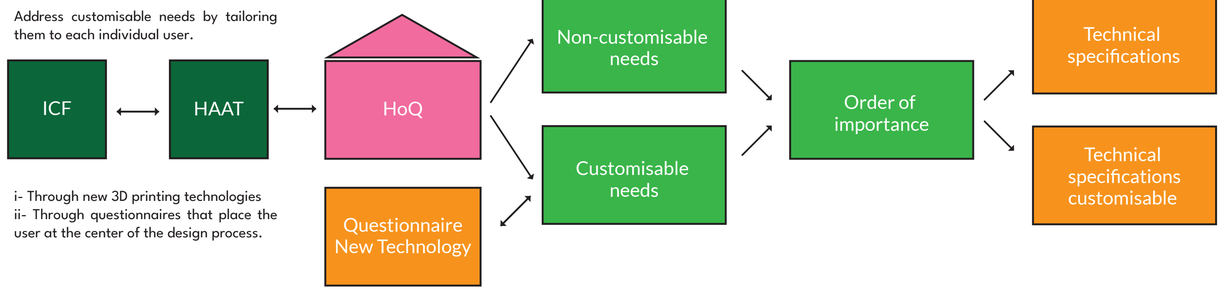


Function was identified as the most critical need, particularly for grasping precision and stability. **Cost & Service** was another major concern, with affordability and assistance being key issues. **Comfort** was driven by ergonomics and weight, as users often experience discomfort from heavy prostheses and limited mobility.

Appearance is considered less important than functionality. We belive it as a latent need, although acknowledged, that will gain more significance once the issues related to functionality are resolved and it becomes more accessible. In this way, appearance can help reduce the amputee's shame and embarrassment, as well as encourage the adoption of the prosthesis, reducing the risk of abandonment.

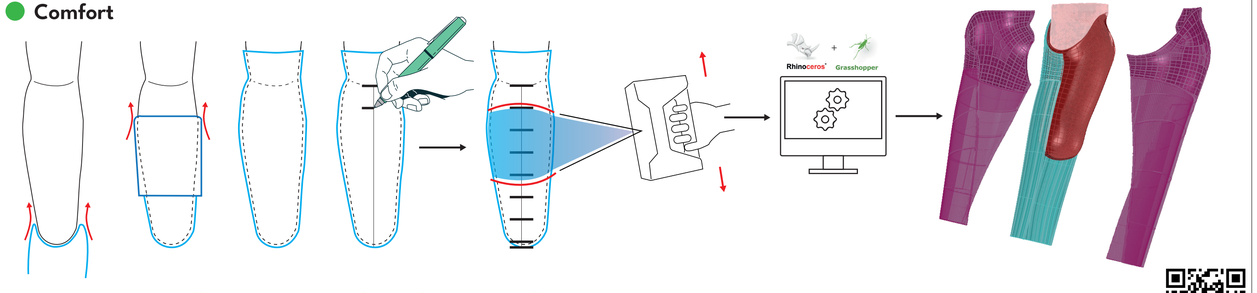
Future Works

Address customisable needs by tailoring them to each individual user.



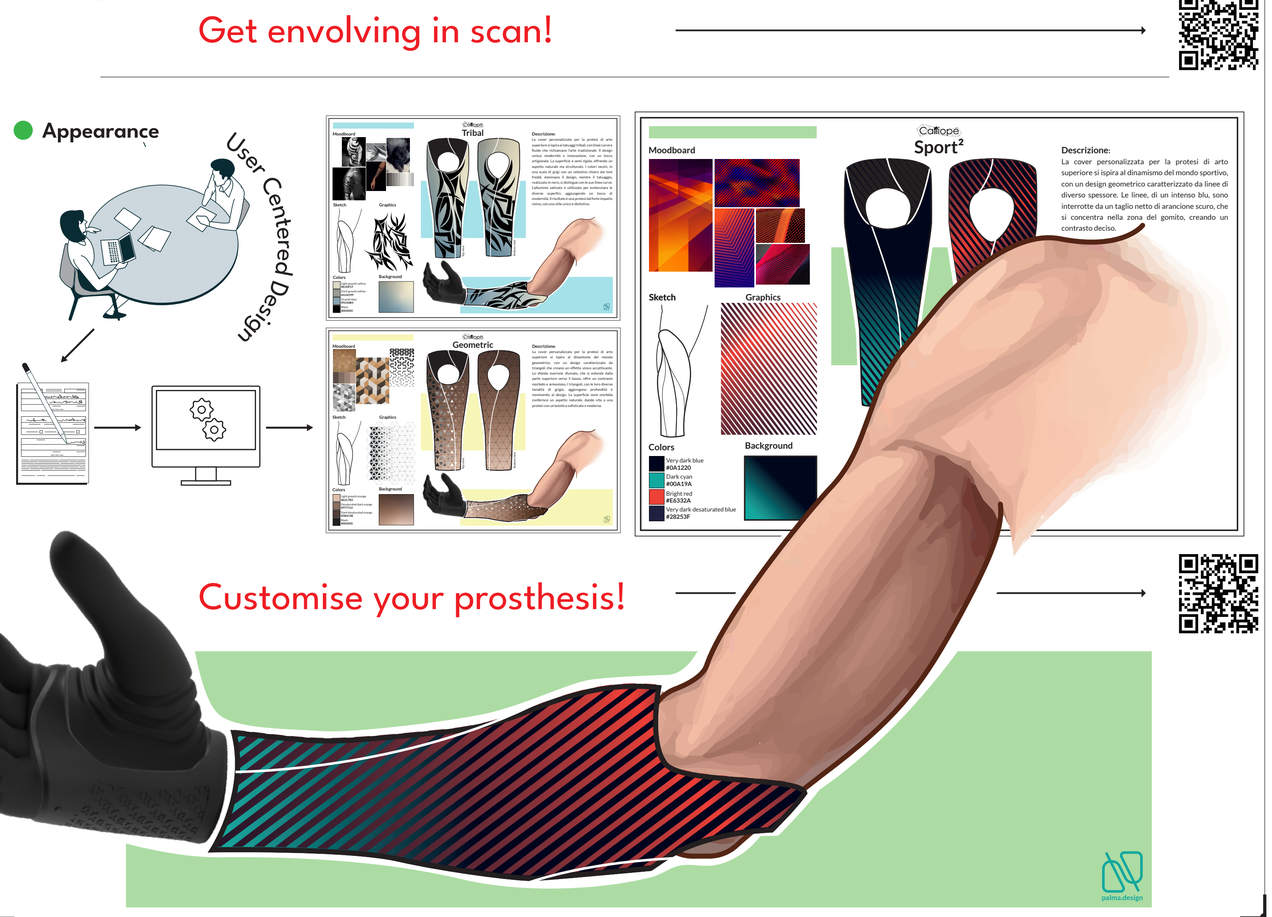
i- Through new 3D printing technologies
ii- Through questionnaires that place the user at the center of the design process.

Comfort



Get envolving in scan!

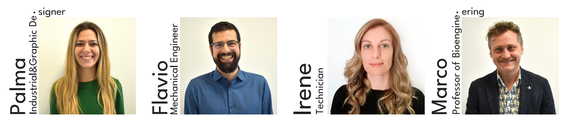
Appearance



Customise your prosthesis!

palma.design

Collab with us



Artificial Hands Area