Rethinking Hearing Aid Fitting:

A qualitative study of audiologists´perspective on a hearing health care app using ecological momentary assessment

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Presenter: Rosa-Linde Fischer

Principal Scientist, ORCA Labs Europe, Erlangen, Germany (Supervisor)

Josepha Birkl

BSc Student, Engineering Psychology, University of Applied Sciences, Landshut, Germany

Nadja Schinkel-Bielefeld

Principal Scientist, ORCA Labs Europe, Erlangen, Germany (Supervisor)

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HOCHSCHULE LANDSHUT

Agenda

1. Motivation
2. Ecological Momentary Assessment
3. Methods
   - Study conduction
   - Qualitative Content Analysis
4. Results
5. Discussion & Outlook

Motivation

Motivation

Hearing devices are the primary intervention for hearing loss[5,6], yet hearing aid (HA) adoption rates are still low[7]

Problem

- Lengthy HA fitting procedures[7]
- No standardized data collection[8,9]
- Subjective, retrospective, biased follow-up[5]

[5] K. E. Andersson, L. S. Andersen, J. H. Christensen, and T. Neher. 2021. Assessing real-life benefit from hearing-aid noise management: ssq12questionnaire versus ecological momentary assessment with acoustic data-logging. Am J Audiol, 30, 1, 93–104. doi: 10.1044/2020_AJA-20-00042.
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Introduction to EMA

Ecological Momentary Assessment (EMA)

- Collects real-time data captured in natural settings, reducing recall bias [19,20,21]

- Combines subjective reports (self- or context-triggered) and objective HA data (usage patterns, environment classifications)[22]

- Benefits include improved self-awareness, expedited troubleshooting, and more personalized HA adjustments[23,24]

[19] C. Wrzus and A. B. Neubauer. 2023. Ecological momentary assessment: a meta-analysis on designs, samples, and compliance across research fields.Assessment, 30, 3, 825–846. doi: 10.1177/10731911211067538.
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How should an EMA App be designed, so that it is useful in the hearing aid fitting process?

Methods

Study conduction

Participant Recruitment

<u>Eligibility criteria</u>

- 18+ years of age
- 2+ years of professional experience
- Consent to data protection protocols

<u>Demographic Data</u>

- 7 participants: f = 4; m = 3
- Mainly experienced (15+ years) master craftsman acousticians and business owners

Interview Approach

- Online
- 60-minute
- Semi-structured
- Late July & August 2024

Follow-up Approach

<u>Questionnaire</u>

- Online
- Covering demographics, technology affinity, and concept evaluation

<u>Data Analysis</u>

- Automatic transcription, verified manually
- Qualitative Content Analysis (MAXQDA 2018)

Qualitative Content Analysis

Transcription of the interviews

Development of transcription rules

Initial proof reading

Final proof reading

300 pages

175 pages

Developing a category system

Deductive category system

Definition of the main categories

Testing of the category systems

Inductive category systems

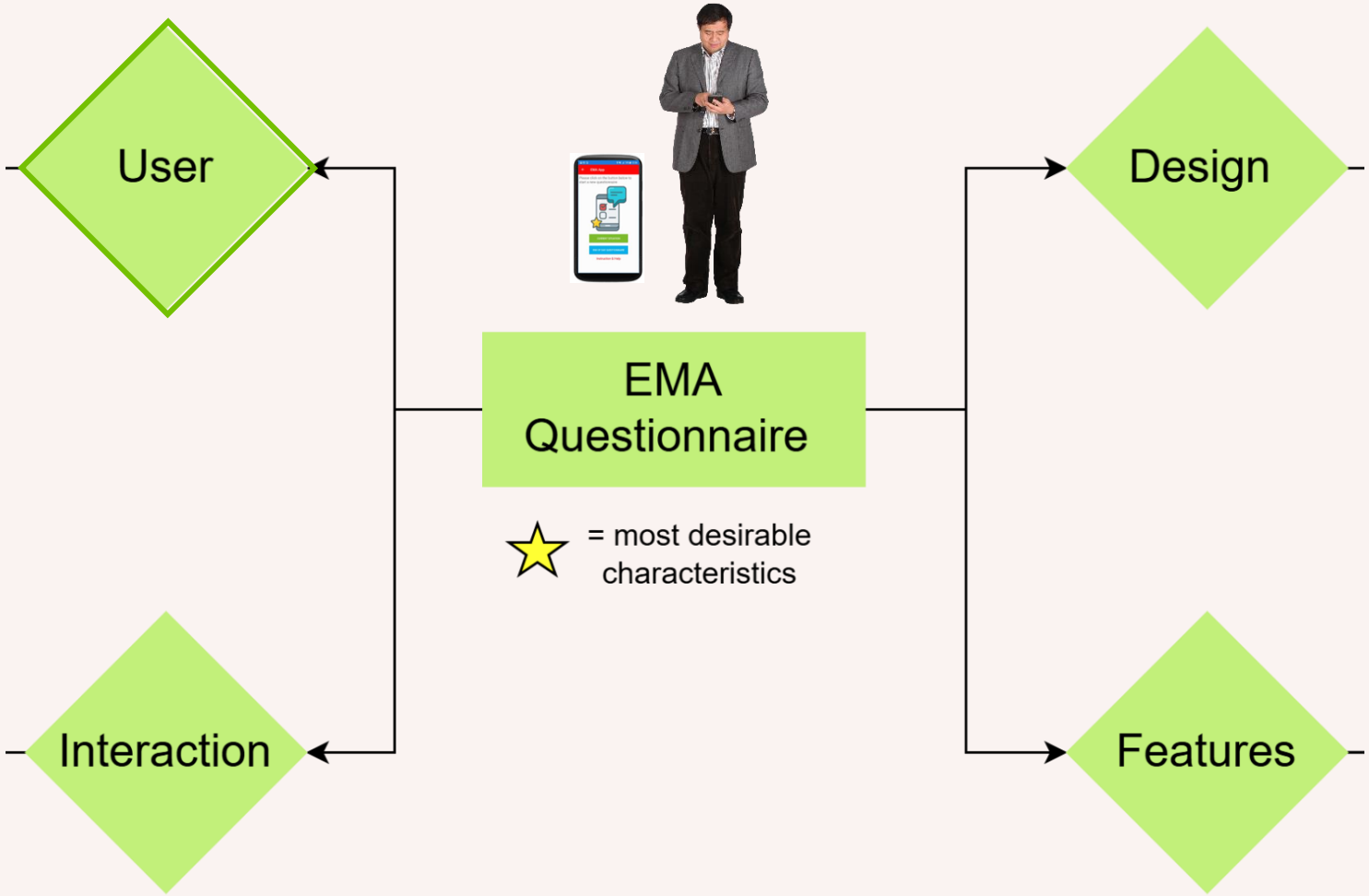
Analysis of the transkripts

Final coding

By Mayring (2015)

Results

How should an EMA app be designed for HA fitting process?

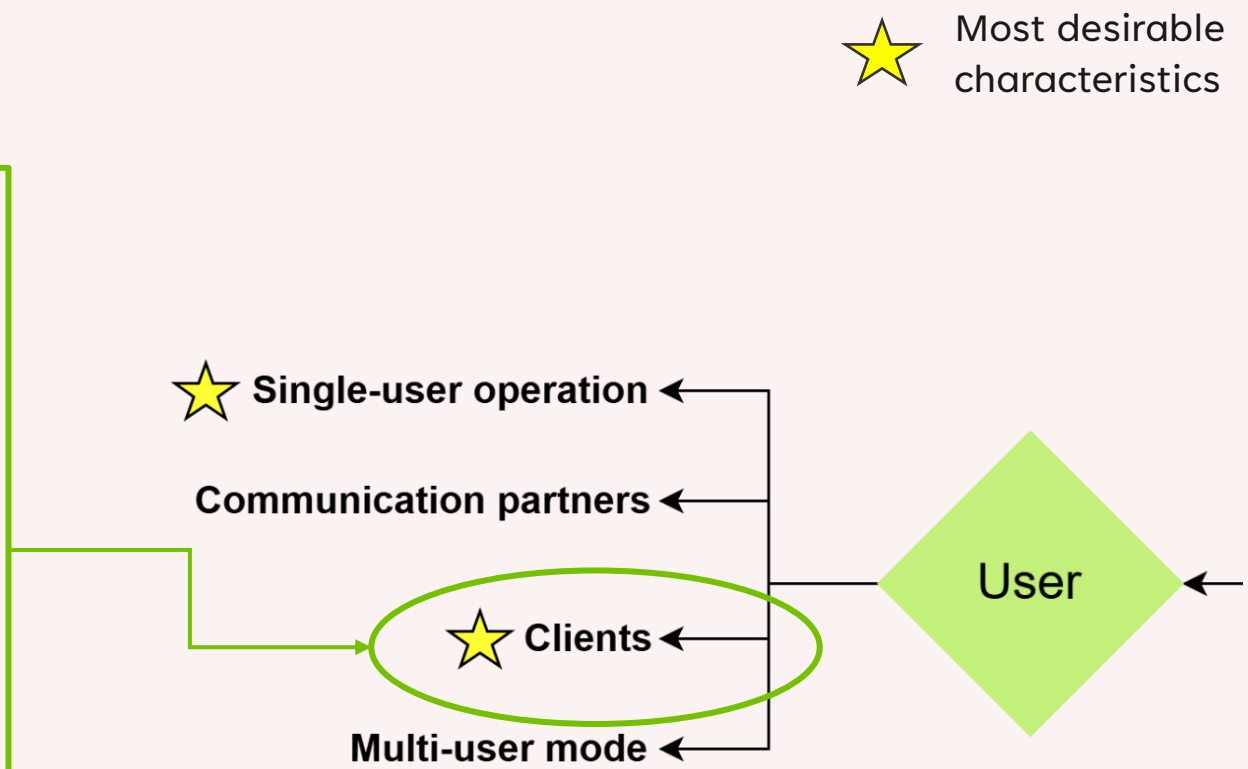


Who are potential users?

The EMA app should be designed primarily for client use

Recommended for clients who...

- ... are technology-affine
- ... are young and mentally fit
- ... are cautious and sensitive in their purchasing decisions
- ... with complex acoustic requirements, such as teachers



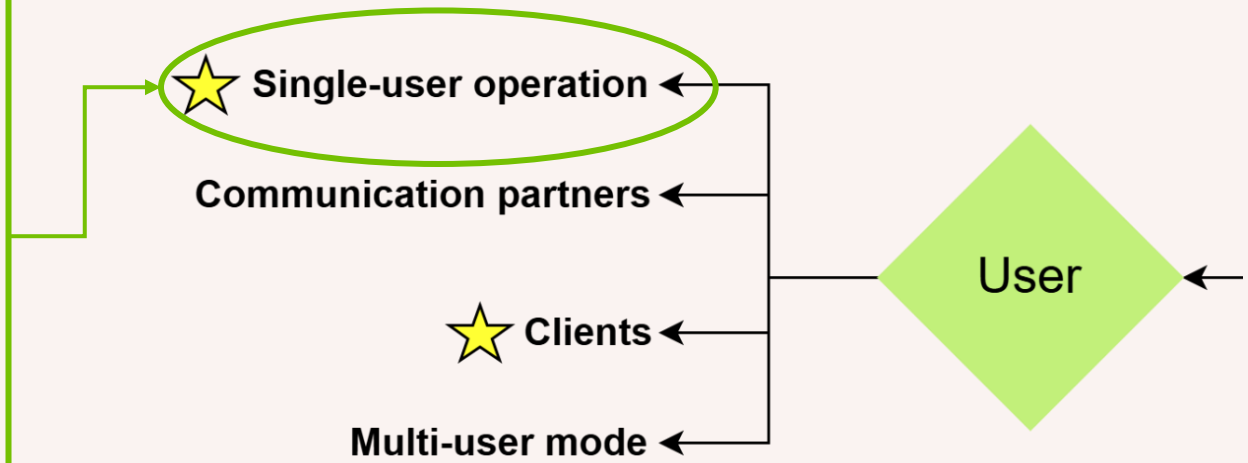
User-centred requirements

Most desirable characteristics

The app should allow for single-user operation as acousticians fear that their clients may otherwise feel patronized and ignored.

Aligns with study similar context related to general well-being:

Older adults fear losing control over assistive technologies, which could lead to feelings of disempowerment[10].



[10] Sebastiaan T.M. Peek, Eveline J.M. Wouters, Joost van Hoof, Katrien G. Luijkx, Hennie R. Boeije, and Hubertus J.M. Vrijhoef. 2014. Factorsinfluencing acceptance of technology for aging in place: a systematic review. International Journal of Medical Informatics, 83, (Apr. 2014), 235–248. https://doi.org/10.1016/j.ijmedinf.2014.01.004.

User-centred requirements

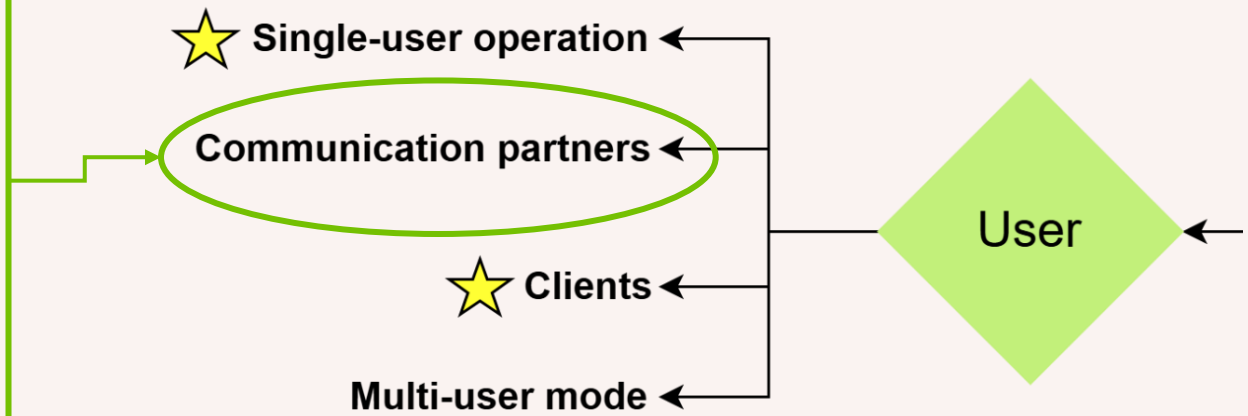
Most desirable characteristics

The EMA app should be used by the communication partners of clients

→ In cases of cognitive or physical impairments

→ Allowing them to support the client's adaptation process

VP3: "I also have a lot of dementia patients or something along those lines and here I need the environment[.]"



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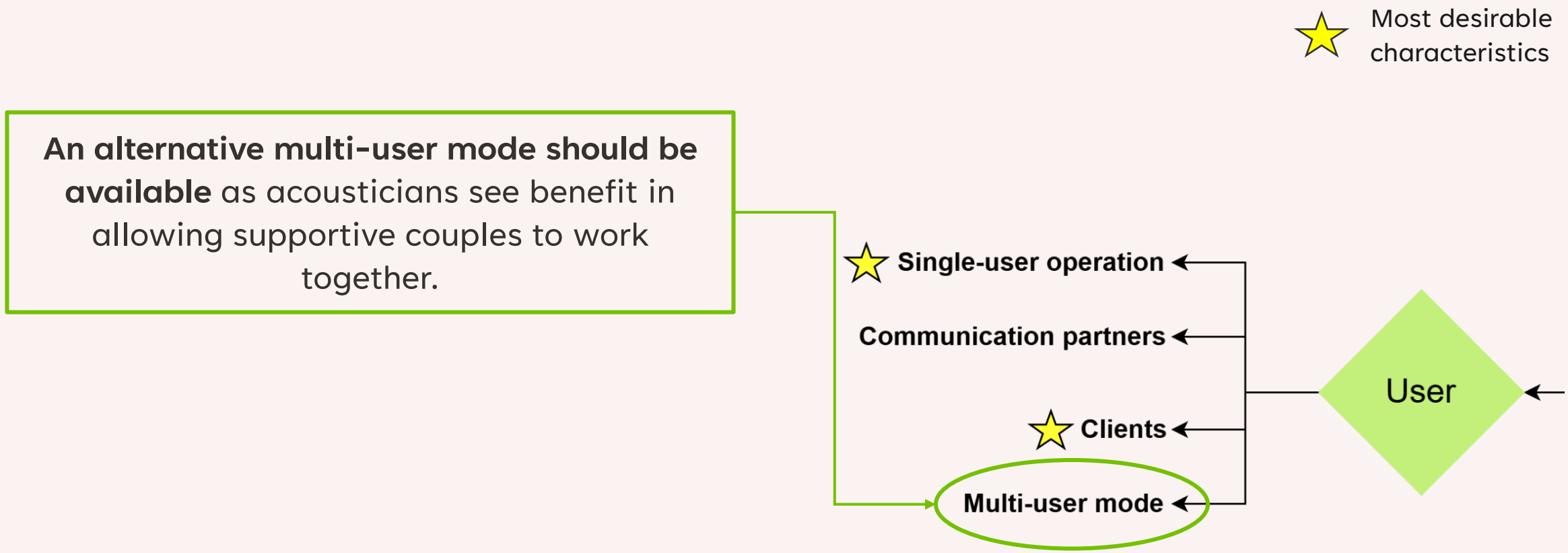
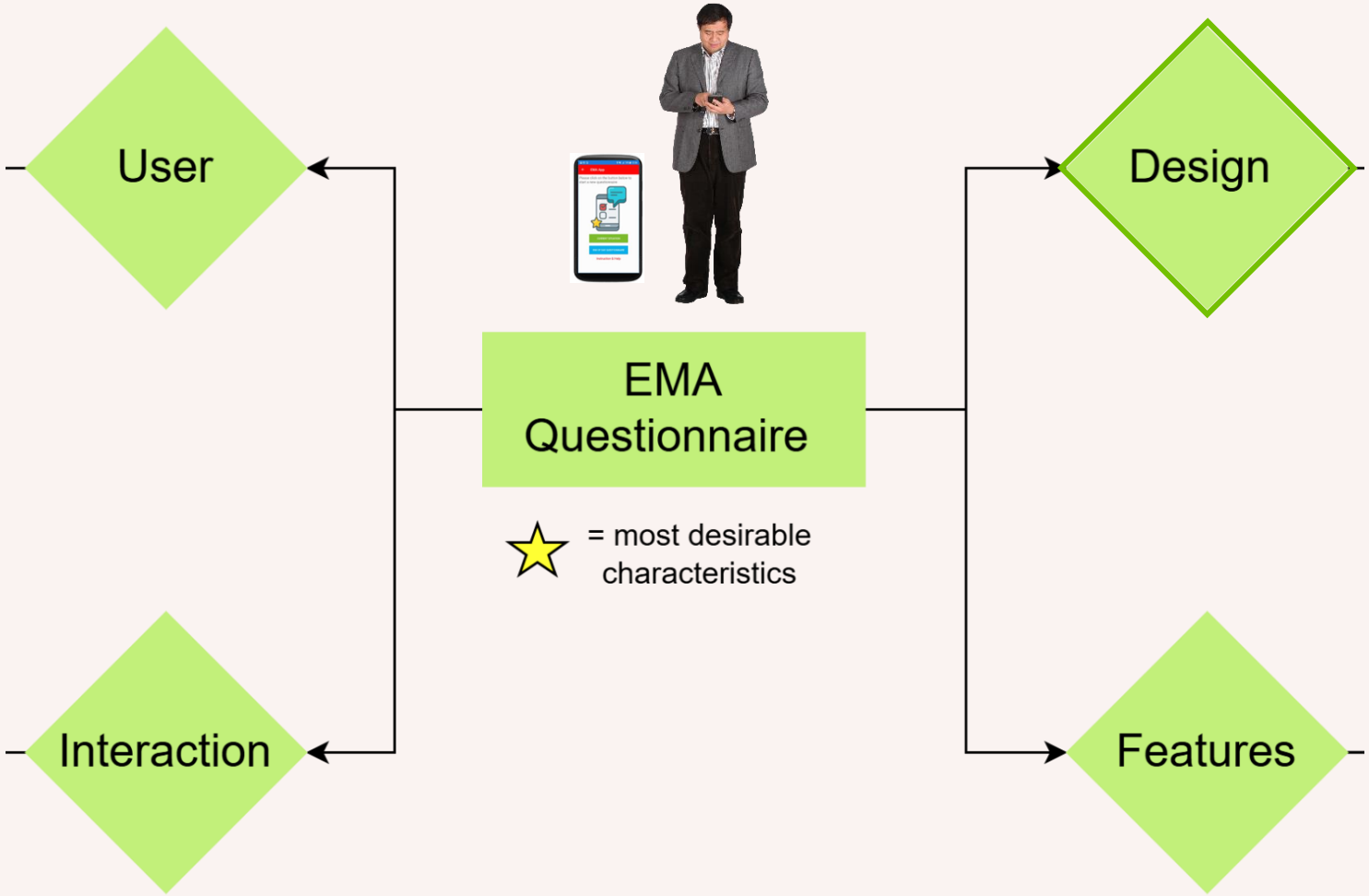


How should user feedback be requested?



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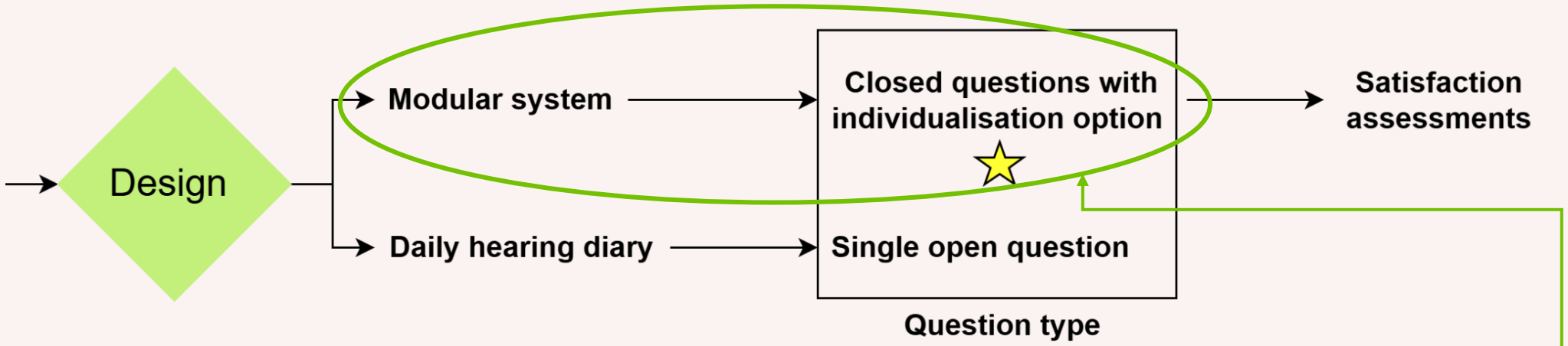

The app must employ closed-ended questions in a modular format for efficiency and consistency

- Aligns with existing standardized questionnaires[11,12,13]
- Customization based on individual client needs
- Greater flexibility while maintaining process efficiency

[11] R. M. Cox and G. C. Alexander. 1995. The abbreviated profile of hearing aid benefit. Ear Hear, 16, 176–186. Har. doi: 10.1097/00003446-199504000-00005.
[12] Robyn M. Cox and Genevieve C. Alexander. 2002. The international outcome inventory for hearing aids (ioi-ha): psychometric properties of theenglish version: el inventario international de resultados para auxiliares auditivos (ioi-ha): propiedades psicometricas de la version en ingles.International Journal of Audiology, 41, 1, 30–35. doi: 10.3109/14992020209101309.
[13] Ira M. Ventry and Barbara E Weinstein. 1982. The hearing handicap inventory for the elderly: a new tool. Ear and Hearing, 3, (May 1982), 128–134.doi: 10.1097/00003446-199504000-00005.

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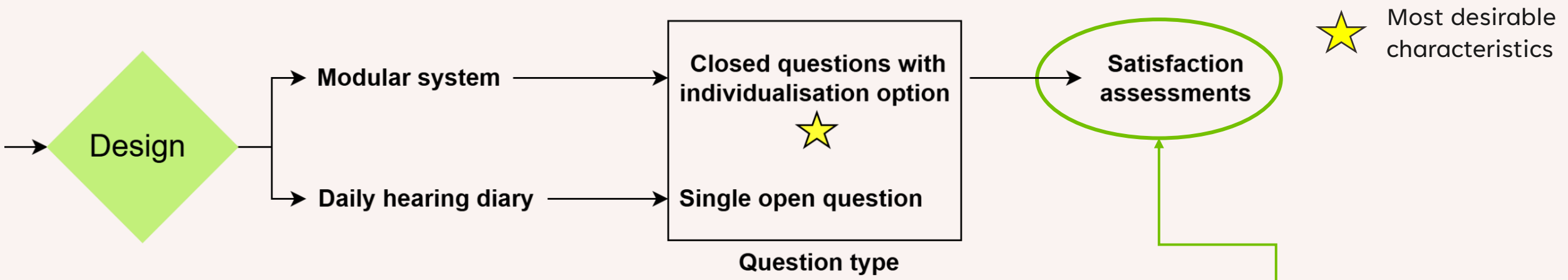

The app should include client satisfaction assessments

- Satisfaction presents as the variable needed to assess the adequate adjustment and adaption of HAs[14,15,16]

[14] N. A. Hawes, R. M. Durand, and S. R. Clark. 1985. Understanding desired benefits of a hearing aid: a consumer behavior perspective. Journal of theAcademy of Rehabilitative Audiology, 18, 112–122. https://psycnet.apa.org/record/1987-13698-001.
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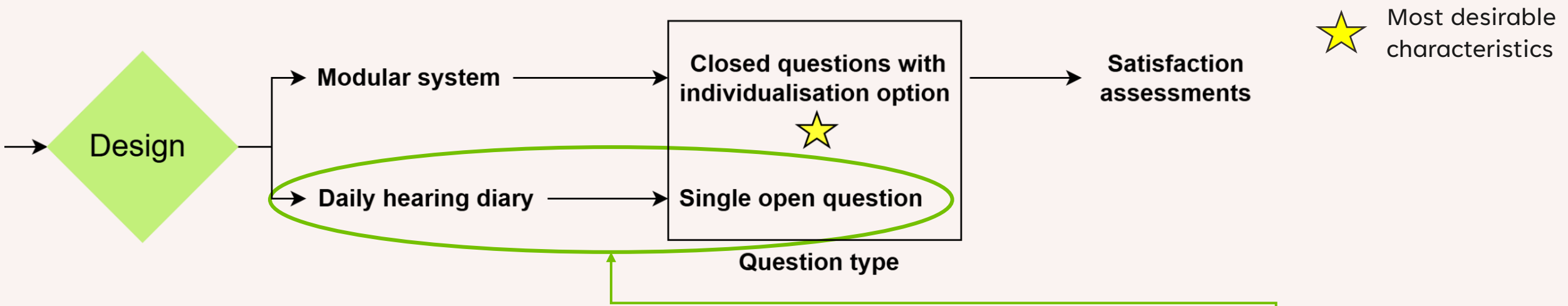
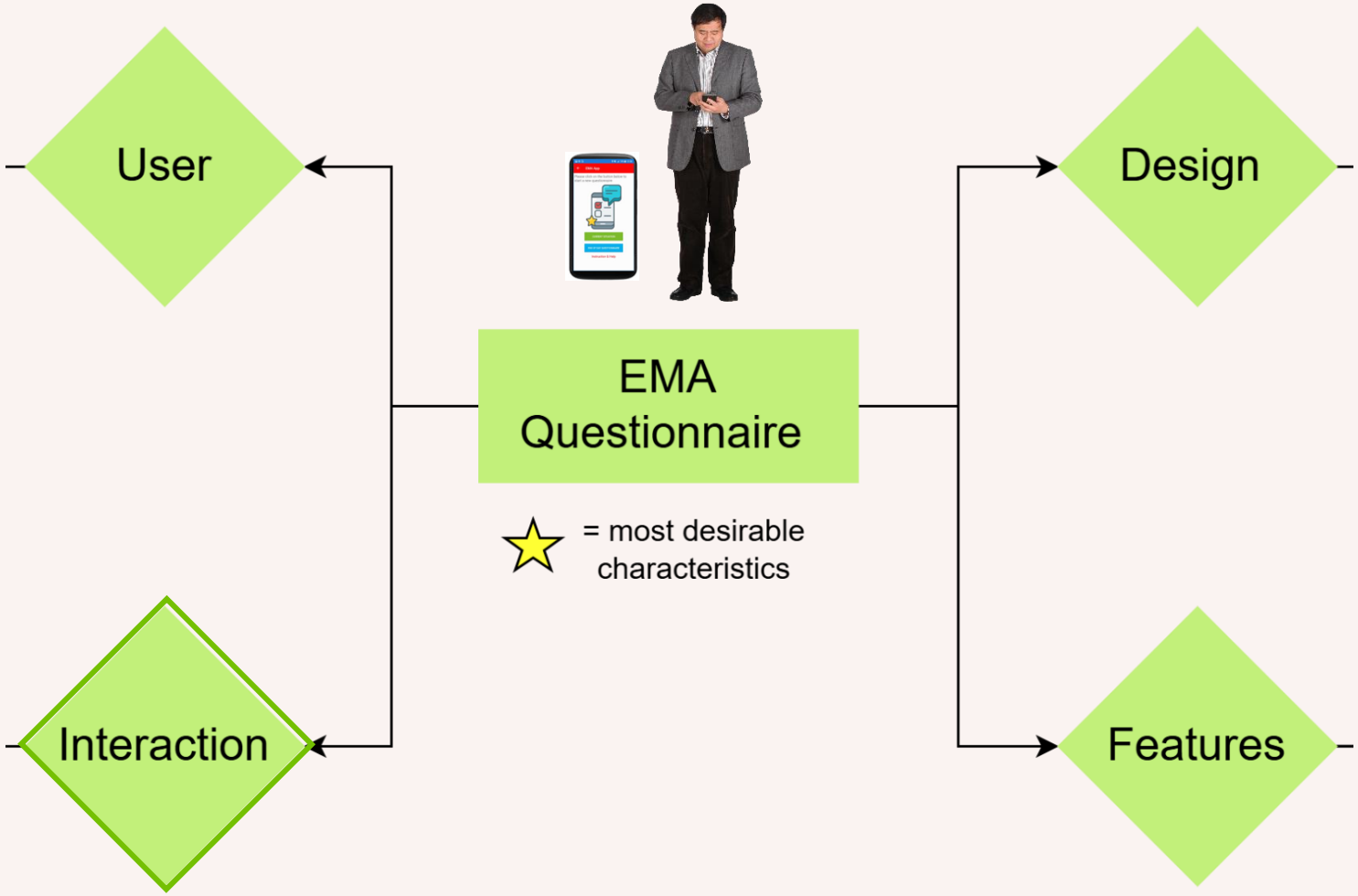


The app should include non-momentary assessments

- Enabling clients to provide reflective information at days end
- Focusing exclusively on positive aspects

How should the interaction be designed?

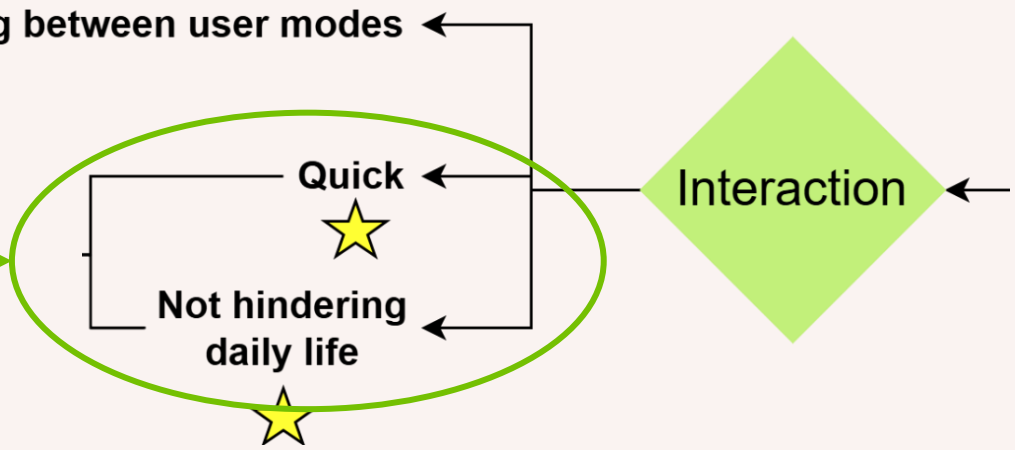


How should the interaction be designed?

Most desirable characteristics

- Implementation of short questionnaires as they are quicker to answer.
- Literature: Processing should not exceed 2-3 min[17]; Shortened questionnaires increase the likelihood of participation[18]

➢ **Possible realization with Micro-EMA (µEMA)**



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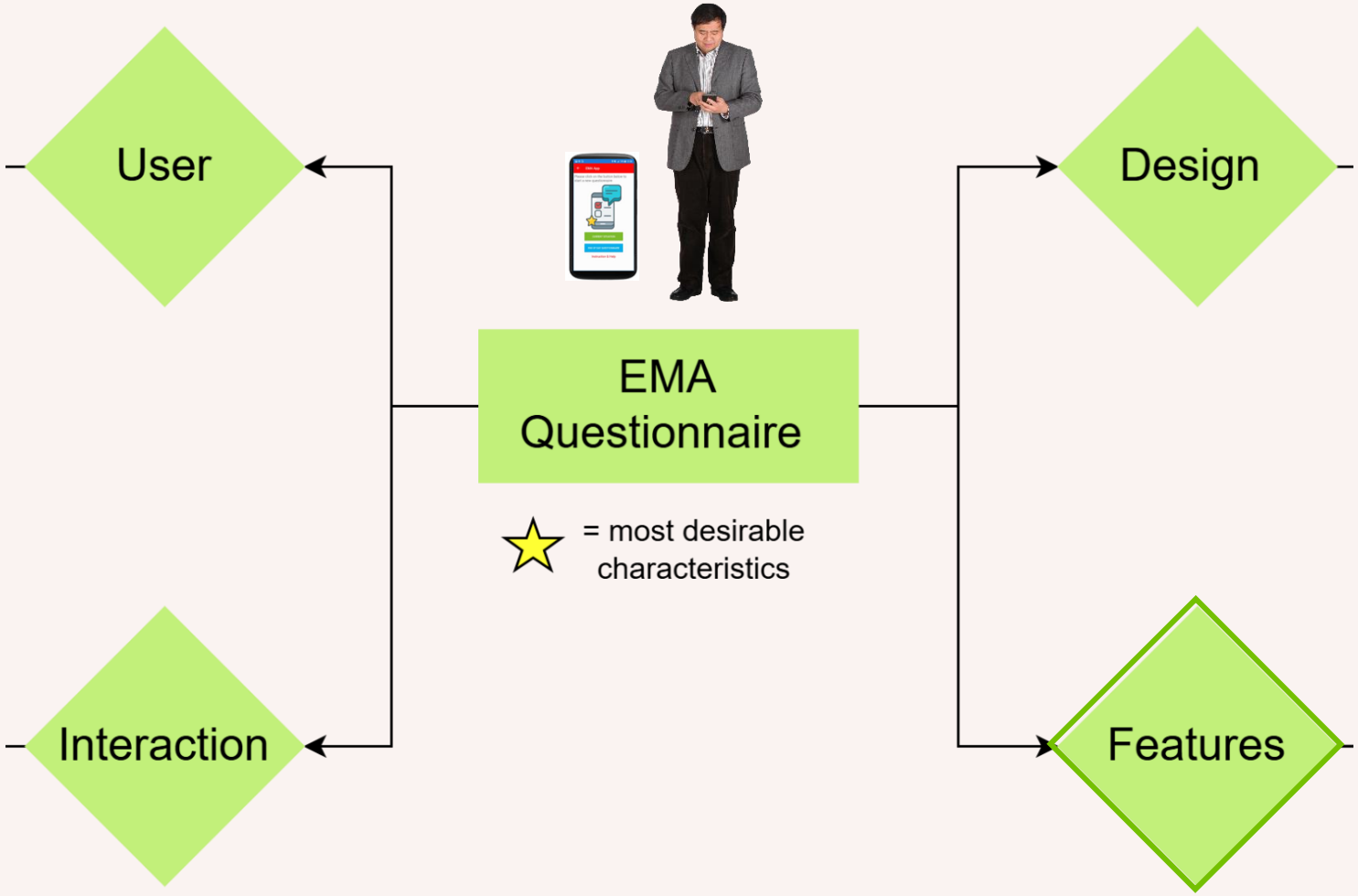
What features should be implemented?



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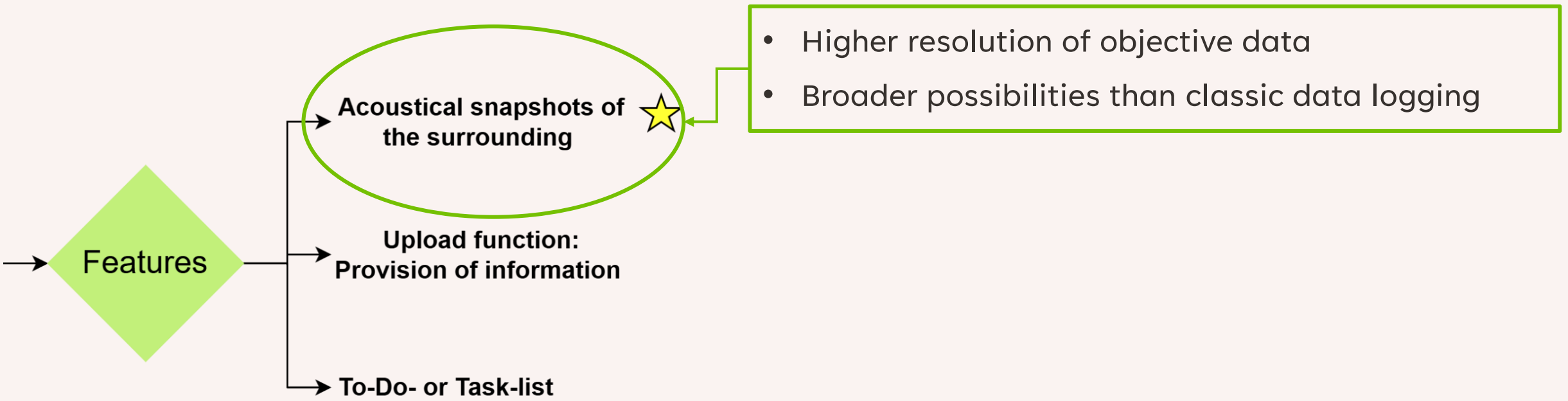
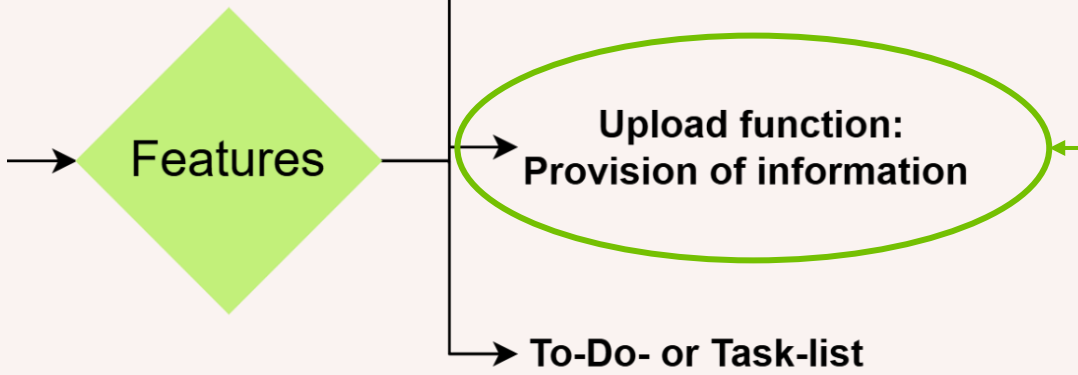


- Higher resolution of objective data
- Broader possibilities than classic data logging

Most desirable characteristics

What features should be implemented?

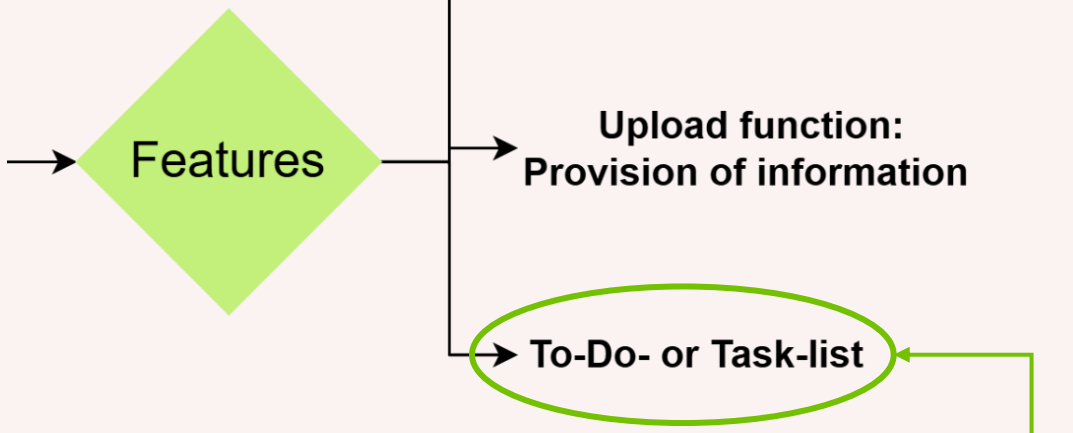


- Higher resolution of objective data
- Broader possibilities than classic data logging

- Education of the client on things such as hearing loss & how hearing aids work
- Information about Acousticians' company

Most desirable characteristics

What features should be implemented?



- Higher resolution of objective data
- Broader possibilities than classic data logging

- Education of the client on things such as hearing loss & how hearing aids work
- Information about Acousticians´ company

- Optimize their HA adaptation

Most desirable characteristics

Discussion & Outlook

Discussion & Outlook

EMA App Potential

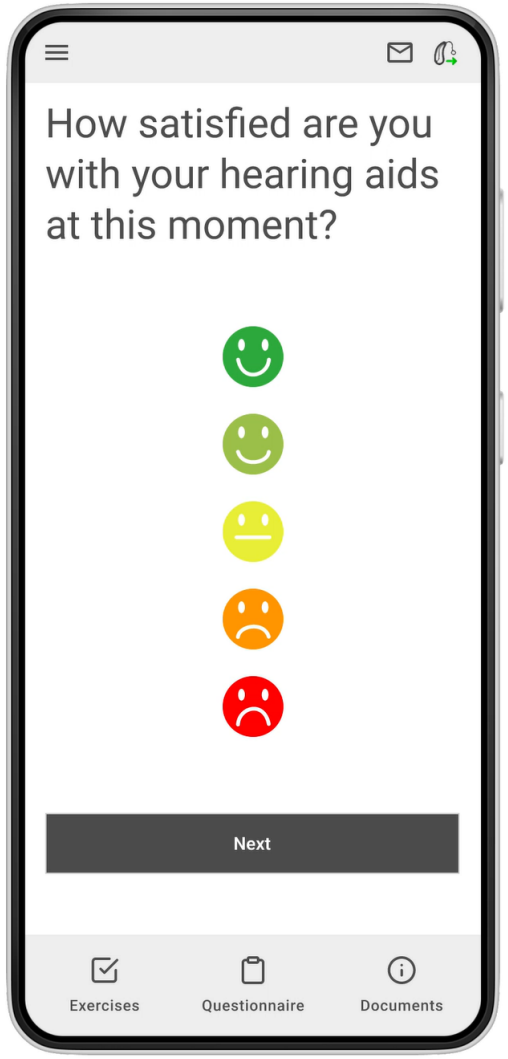
- → Findings indicate potential use case
- → Further research with prototype to confirm acceptance among HA stores
- → Minimizing interference with essential communication and relationships between clients and acousticians
- → Exploring potential in diverse settings (e.g., Teleaudiology, OTC)

User-Centric Design & Workflow Integration

- → EMA requires a user-friendly design, considering age-related usability and potential data overload
- → Strategies are needed for seamless integration into clinical workflows
- → Next phase: Evaluating effectiveness in real-world applications

Questions?

- On the right side: Draft prototype implementation according to the extracted requirements
- For your information: Short paper will be published in conference proceedings “Mensch und Computer”, Chemnitz, Germany, Sept 2025



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Corresponding author:
rosa-linde.fischer@wsa.com

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