

AuRa – Autonomes Rad

Flexibler Einsatz autonomer Fahrradsysteme für Logistik- und Beförderungsaufgaben

Testing the usability of a mobile application prototype for an autonomous cargo bike call system

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Background

Sharing systems for cargo bikes have become a global mega-trend. However, autonomous cargo bikes are still being developed, even though it seems it is only a matter of time before they will enter the emerging on-demand market for alternative means of transport [1][2][3].

AuRa (Autonomes Rad, autonomous bike) is such an autonomous cargo bike call system. Users can order a bike to a desired location via a mobile application. After use, the bike can be released to return autonomously to the depot.

Early consideration of user needs and intuitive interfaces can significantly influence both product acceptance and commercial success [4][5][6][7]. Therefore, high usability (How easy and pleasant is the interface to use?) is crucial and may affect perceived utility.

Goals

- 1) Testing the usability of the AuRa app prototype
- 2) Exploring perceived utility and
- 3) Age-related differences

Methods

Sample

In total, $N = 147$ participants completed the test (67 women, 2 divers; $M_{age} = 36.24$ years, $SD_{age} = 14.62$, Range = 16–74 years).

Usability → objective measures

- 7 realistic tasks (see Table 1) were drawn up and success and click rates were measured [8][7],
- additional feedback could be given after each task.

Usability → subjective measures

- Single Ease Question (SEQ) [9]
- System Usability Scale (SUS) [10]

Utility

- Five items were developed to measure utility

Finally, sociodemographic data (age, gender, etc.) were collected.

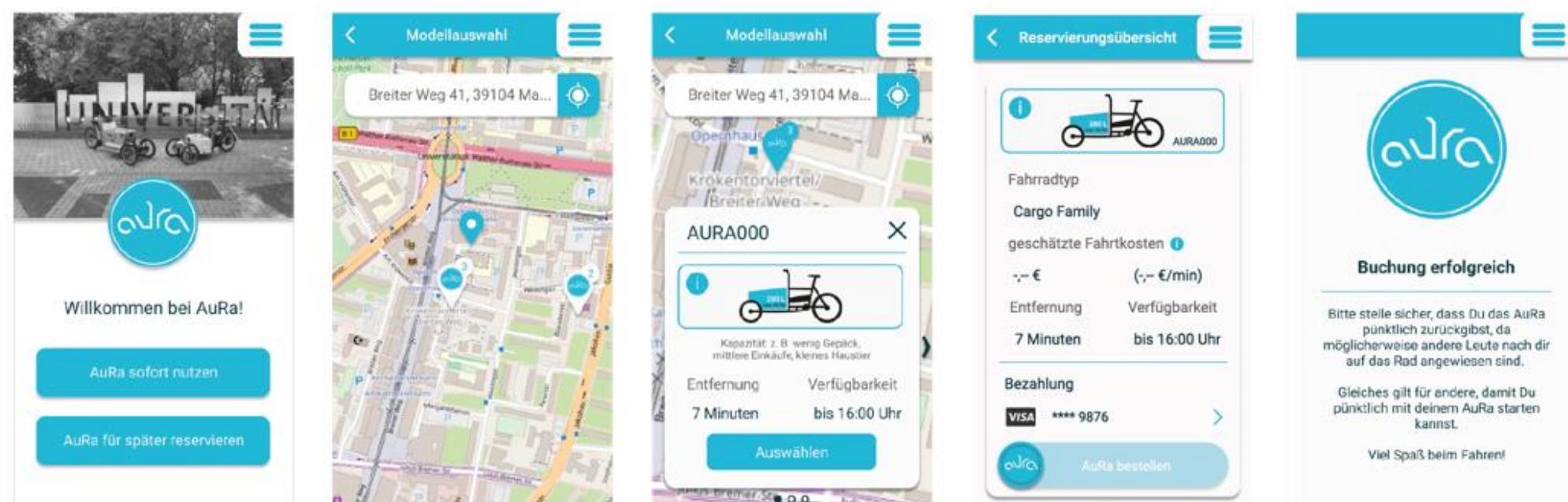


Figure 1 - Booking flow.

Results

1) Usability

Objective measures

- Overall, the majority of participants successfully completed the individual tasks. Success rates and average click rates, along with the number of clicks required to successfully complete a task, can be found in Table 1.

Subjective Measures

- User satisfaction, measured with the SEQ, was above average ($M = 5.54$, $SD = 1.89$, Range = 1–7).
- SUS reliability was indicated with Cronbach's alpha = .87. With a SUS score of 80, the overall usability could be classified as good to nearly excellent [11].

Tab. 1 - Success Rates (Absolute Values/Percentages), Average Click Rates (Required Clicks)

Task	Success Rates	Average Click Rates (Required Clicks)
Booking AuRa	114 (78%)	19.60 (8)
Unlocking AuRa	134 (91%)	4.92 (3)
Pausing the ride	124 (84%)	6.61 (3)
Extending the rental period	137 (93%)	4.14 (2)
Reporting damage	62 (42%)	14.41 (4)
Cancelling the ride	111 (76%)	9.27 (4)
Searching for information	105 (71%)	6.80 (2)

2) Utility

- The majority of respondents rated the general utility of the app as high.
- The integration of the timetables with other means of public transport was mainly considered desirable.
- Booking via a browser was usually not preferred.
- Most participants viewed accessibility as a very important feature.
- Approval for climate feedback was high, but noticeably lower.

3) Age-related differences

- Overall, no age-related differences could be found.
- Analyses included bivariate correlations between age and (1) success rate ($\chi^2(48) = 55.47$, $p = .214$, Cramer's $V = .62$), (2) satisfaction with the app (SEQ; $r = -.14$, $p = .086$), and (3) a preference for booking with the browser (rather than the app; $r = .05$, $p = .540$).

Conclusion

Overall, usability as well as utility were found to be good to nearly excellent. However, further usability testing is recommended before the call system can be put into operation and initial test drives will allow for evaluations of actual use.

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