

Interface usability evaluation of mobility apps aimed at inclusive design

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Summary

This study evaluated the interface usability of a range of mobility apps using a set of adapted heuristics aimed at inclusive design. Identified strengths and weaknesses informed interface design recommendations for a future MaaS app to enhance usability and support travel across all ages and genders of adults in the Southampton area.

KEYWORDS

Mobility as a Service, app, heuristic evaluation, interface, usability, inclusive design

Introduction

Personal mobility applications (apps) offer a range of services supporting travel by enabling planning, payment and real-time monitoring of journeys. Mobility as a Service (MaaS) apps integrate planning, payment and real-time information for multiple modes of transport to assist seamless travel. For high uptake of MaaS, interface design needs to be carefully considered to ensure usability across all ages and genders. Limitations of mobile devices (e.g., small size) present challenges, especially to older users (Calak, 2013, Watkins *et al.*, 2014). Age-related physical and cognitive declines in memory, attention, information processing, vision and fine motor control affect app use (Chirayus & Nanthaamornphong, 2019). There are gender differences in interface preferences and needs: compatibility, learnability and user guidance are particularly important for women (Lin & Hsieh, 2016). Using an adapted set of standard usability principles or ‘heuristics’ focussed on inclusivity (Richardson *et al.*, 2022), this study sought to identify strengths, weaknesses and common usability problems of a range of mobility apps to inform MaaS app design for all ages and genders of adults.

Method

Four Human Factors experts judged compliance with a set of adapted heuristics to evaluate the usability of 11 personal mobility apps available in Southampton: Google Maps (GM); National Rail Enquiries (NR); Uber (UB); Unilink (UL); Bluestar (BS); First Bus (FB); Trainline (TL); Voi (V); Cab My Ride (CR); Komoot (K); South Western Railway (SW). The number of evaluators was chosen to comply with guidance of Nielsen (1993). For each app, evaluators assigned compliance scores according to the criteria: 0 - not compliant; 1 - partially compliant; 2 - fully compliant for 37 sub-heuristics within ten main heuristics: H1 - Have Attractive and Simple Design; H2 - Use Plain Language; H3 - Make User’s In-App Journey Intuitive; H4 - Be Consistent; H5 - Provide Feedback; H6 - Allow User Control; H7 - Provide Shortcuts; H8 - Prevent Errors and Provide Clear Messages for Recovery; H9 - Provide Help and FAQs; H10 - Be Inclusive. Evaluators also assessed the severity of the impact of identified non-compliances on user experience using a five-point colour-coded severity scale: white - no identified problems; yellow - cosmetic; amber - minor; amber-red - major; red - catastrophic.

Results and Conclusions

Overall heuristic compliance scores as a percentage of full compliance ranged from 65% for NR to 87% for GM (Table 1). A common usability non-compliance, rated as major in six apps (SW, BS, CR, UL, K, NR) was associated with lack of or difficulty in finding Help and FAQs (H9). Non-compliances rated as major or catastrophic in eight apps (SW, FB, CR, TL, UB, UL, K, NR) were associated with lack of user control: inability to ‘undo’ actions and/or move between all stages of a journey during navigation (H6). Both lack of control and lack of or difficulty in finding Help (H9 and H6) are expected to present greater difficulties for older and female users than younger and male users. Identified priorities for inclusive MaaS app design include good control that allows users to undo actions and move between and view all stages of a selected journey; a functioning ‘back button’; main menu tabs that remain visible; clear and informative Help and FAQs that are easy to find; and avoidance of errors that require restarting the planning and payment process. The study findings will support optimisation of a future MaaS app to assist adult users of all ages and genders to plan and complete their journeys with ease and effectiveness.

Table 1: Usability scores as a percentage of full compliance and severity of non-compliances

Heuristic	Mobility app											Mean score %	Colour key Severity
	GM	SW	BS	FB	V	CR	TL	UB	UL	K	NR		
H1	84	90	76	91	88	94	72	73	80	72	68	73	
H2	100	100	100	93	100	58	100	77	93	91	93	82	None
H3	87	87	75	88	71	92	81	75	78	76	68	72	Cosmetic
H4	95	100	83	86	87	87	90	90	86	72	90	79	Minor
H5	87	56	68	56	70	50	50	56	68	75	50	54	Major
H6	93	50	93	50	83	66	70	41	93	66	70	62	Catastrophic
H7	93	87	67	87	62	62	95	84	67	83	82	71	
H8	100	83	100	83	100	100	91	100	100	83	50	81	
H9	66	79	13	83	83	50	79	70	9	55	0	47	
H10	81	81	71	65	73	83	73	73	71	60	73	66	
Overall score %	87	84	83	81	80	77	77	76	73	72	65		

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