WM992-15 Human Technology Interaction

24/25

Department
WMG
Level
Taught Postgraduate Level
Module leader
Roger Woodman
Credit value
15
Module duration
2 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The module introduces and explores the requirements of Human Technology Interaction (HTI) from different stakeholder perspectives. Design features to satisfy and optimise stakeholder requirements of HTI will be discussed. Human factors research provides a way to empirically understand and predict how driver behaviour may change, adjust, or be impacted by new technologies.
Key disciplines of human factors, psychology, human machine interface (HMI) design, business, and ethics will underpin the module with relevant methods introduced.
Key topics include: Fundamentals of HTI for SCAV, Human Machine Interface (HMI) design and evaluation, the supply chain in the automotive industry, human sensing within a car, occupant wellbeing, motion sickness, trust in-vehicle technology. As well as more traditional measures this module also explores future trends of mobility as service and vehicle personalization/customization.
Key topics are introduced from both theoretical and practical viewpoints, supported by case-studies to encourage independent critical evaluation of the subject matter.

Module aims

This module aims to provide students with comprehensive knowledge of Human Technology Interaction (HTI) relevant to Smart Connected and Autonomous Vehicles (SCAV). This is an opportunity to explore a human factors approach to SCAV design and gain an understanding of the many factors at play (inclusive of trust, motion sickness, driver state monitoring, distraction and interaction, wellbeing, and sensing of the human). This module aims to comprehensively explore and analyse the design process within HTI to derive truly innovative technological solutions to improve the safety, efficiency, and enjoyment of SCAVs.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Introduction to Human Technology Interaction (HTI). Key concepts from human factors, design and psychology described along with theoretical underpinning.

- Application of concepts and principles relevant to HTI from across different sectors introduced.
- HTI design for SCAV outlined, introduced and practical demonstrations given.
- Methods for designing HTI relevant to different stakeholder groups.
- Consumers, technology, population, emerging markets, and how they will affect the design of
  tolerant human machine interfaces.
- Distraction and interaction with HTI explored through theory and demonstrations.
- Wellbeing and human sensing outline and application of use given.
- Importance of the concept of trust and implications on the design
- Social, ethical, and business implications of SCAV defined and explored.
- Introduction to stakeholder identification for SCAV
- Definitions and examples of design requirements for different stakeholder groups SCAV
- Validation of methodologies for optimising the design of HTI for SCAV including theory, demonstrations, and tasks. Methods for measuring key concepts defined with examples.
- Latest trends of HTI for SCAV underpinned by state of the art research, future trends and directions identified.

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate an in-depth knowledge of key principles underpinning human interaction and apply it to compare/criticise the design.[AHEP:4,M4,M17]
- Critically evaluate the appropriateness of current technology solutions for different stakeholders.[AHEP:4,M2,M4,M7]
- Comprehensively understand and apply advanced usability testing, to refine the design of human machine interfaces.[AHEP:4,M1,M4]
- Demonstrate the application of concepts like trust, distraction, interaction, wellbeing, and sensing the human in designing of human machine interfaces.[AHEP:4,M3,M5]
- Demonstrate a critical high-level understanding of challenges associated with the supply

chain and mobility as a service.[AHEP:4,M4]

Indicative reading list

Amanatidis, T., Langdon, P., & Clarkson, P. J. (2017, July). Toward an “Equal-Footing” Human-Robot Interaction for
Fully Autonomous Vehicles. In International Conference on Applied Human Factors and Ergonomics (pp. 313-319).
Springer, Cham.

Akamatsu, M. (Ed.). (2019). Handbook of Automotive Human Factors. Boca Raton: CRC Press.

Birrell, S. A., & Fowkes, M. (2014). Glance behaviours when using an in-vehicle smart driving aid: A real-world, on-
road driving study. Transportation research part F: traffic psychology and behaviour, 22, 113-125.

Birrell, S. A., Fowkes, M., & Jennings, P. A. (2014). Effect of using an in-vehicle smart driving aid on real-world driver
performance. IEEE Transactions on Intelligent Transportation Systems, 15(4), 1801-1810.

Birrell, S., Young, M., Stanton, N., & Jennings, P. (2017). Using adaptive interfaces to encourage smart driving and
their effect on driver workload. In Advances in Human Aspects of Transportation (pp. 31-43). Springer International
Publishing.

Bonnefon, J. F., Shariff, A., & Rahwan, I. (2016). The social dilemma of autonomous vehicles. Science, 352(6293),
1573-1576.

Ekman, F., Johansson, M., & Sochor, J. (2017). Creating Appropriate Trust in Automated Vehicle Systems: A Framework for HMI Design. IEEE Transactions on Human-Machine Systems.

Fagnant, D. J., & Kockelman, K. (2015). Preparing a nation for autonomous vehicles: opportunities, barriers and policy recommendations. Transportation Research Part A: Policy and Practice, 77, 167-181.

Kroemer-Elbert, K.E., Kroemer, H.B., Kroemer,-Hoffman, A.D. (2018). Ergonomics: How to design for ease and
efficiency. Elsevier Science.

Khastgir, S., Birrell, S., Dhadyalla, G., & Jennings, P. (2015, May). Development of a Drive-in Driver-in-the-Loop Fully Immersive Driving Simulator for Virtual Validation of Automotive Systems. In Vehicular Technology Conference (VTC Spring), 2015 IEEE 81st (pp. 1-4). IEEE.

Khastgir, S., Birrell, S., Dhadyalla, G., & Jennings, P. (2017). Calibrating trust to increase the use of automated systems in a vehicle. In Advances in Human Aspects of Transportation (pp. 535-546). Springer International Publishing.

Langdon, P., Politis, I., Bradley, M., Skrypchuk, L., Mouzakitis, A., & Clarkson, J. (2017, July). Obtaining design requirements from the public understanding of driverless technology. In

International Conference on Applied Human Factors and Ergonomics (pp. 749-759). Springer, Cham.

Maurer, M., Gerdes, J. C., Lenz, B., & Winner, H. (Eds.). (2016). Autonomous driving: technical, legal and social aspects. Springer.

Morgan, P. L., Voinescu, A., Williams, C., Caleb-Solly, P., Alford, C., Shergold, I., ... & Pipe, A. (2017, July). An Emerging Framework to Inform Effective Design of Human-Machine Interfaces for Older Adults Using Connected Autonomous Vehicles. In International Conference on Applied Human Factors and Ergonomics (pp. 325-334). Springer, Cham.

Sharp, H., Rogers, Y., & Preece, J. (2007). Interaction design: beyond human-computer interaction.

Skrypchuk, L., Mouzakitis, A., & Clarkson, P. J. (2017, July). Designing Autonomy in Cars: A Survey and Two Focus Groups on Driving Habits of an Inclusive User Group, and Group Attitudes Towards Autonomous Cars. In Advances in Design for Inclusion: Proceedings of the AHFE 2017 Conference on Design for Inclusion, July 17-21, 2017, Los Angeles, California, USA (Vol. 587, p. 161). Springer.

Smyth, J., Jennings, P., & Birrell, S. (2019). Are You Sitting Comfortably? How Current Self-driving Car Concepts Overlook Motion Sickness, and the Impact It Has on Comfort and Productivity. In N. Stanton (Ed.), Advances in Human Factors of Transportation (pp. 387-339). Washington D.C., USA: Springer.
Wilson, J. R., & Sharples, S. (Eds.). (2015). Evaluation of human work. CRC press.

Waytz, A., Heafner, J., & Epley, N. (2014). The mind in the machine: Anthropomorphism increases trust in an autonomous vehicle. Journal of Experimental Social Psychology, 52, 113-117.

View reading list on Talis Aspire

Subject specific skills

The student will gain many skills related to human factors in SCAV. They will understand the importance of human factors and how they inform design; knowledge of supply chain in the automotive industry and business model of mobility as services. Understand and evaluate the development cycle of HMI and the importance of HMI quality. Understand the importance of trust, human sensing and their wellbeing, while using the SCAV.

Transferable skills

Teamwork - Work effectively in a group or team to achieve goals, personal motivation, organisation, and time management skills. Research and analytical skills. Project and program management skills. The ability to gather industry knowledge and interpret the information delivered by a guest lecturer.

Study

Study time

Type	Required
Lectures	24 sessions of 1 hour (16%)
Practical classes	6 sessions of 1 hour (4%)
Online learning (independent)	24 sessions of 1 hour (16%)
Private study	36 hours (24%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

36 Hours of student self-guided study to prepare for the PMAs. Guidance on topics to be studied is provided during lectures (with some extra content on moodle) and PMA instructions.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A3

	Weighting	Study time
Post Module assignment: Human Technology Interaction	100%	60 hours

Post Module assignment based on the intended learning outcomes of the module.

Feedback on assessment

PMA : The written feedback will be provided based on WMG feedback template and it will address each of the questions submitted, including feedback comments on presentation, structure and grammar.

Availability

Courses

This module is Core for:

- Year 1 of TESS-SP Short Programme