Human Factors In Agile Automated Vehicle Development

Amna Pir Muhammad

Department of Computer Science and Engineering, University of Gothenburg
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The objective of this study is to understand and describe how AV design can account for human factors knowledge.
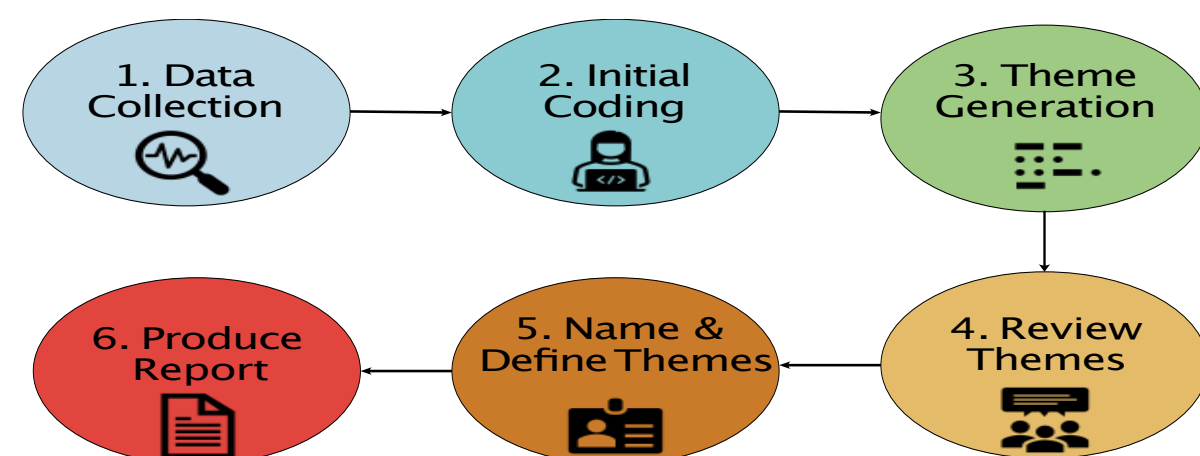
By identifying and integrating disparate requirements from AV human factors researchers and designers of AV, in order to improve road-user acceptance, AV transparency, and vehicle safety.
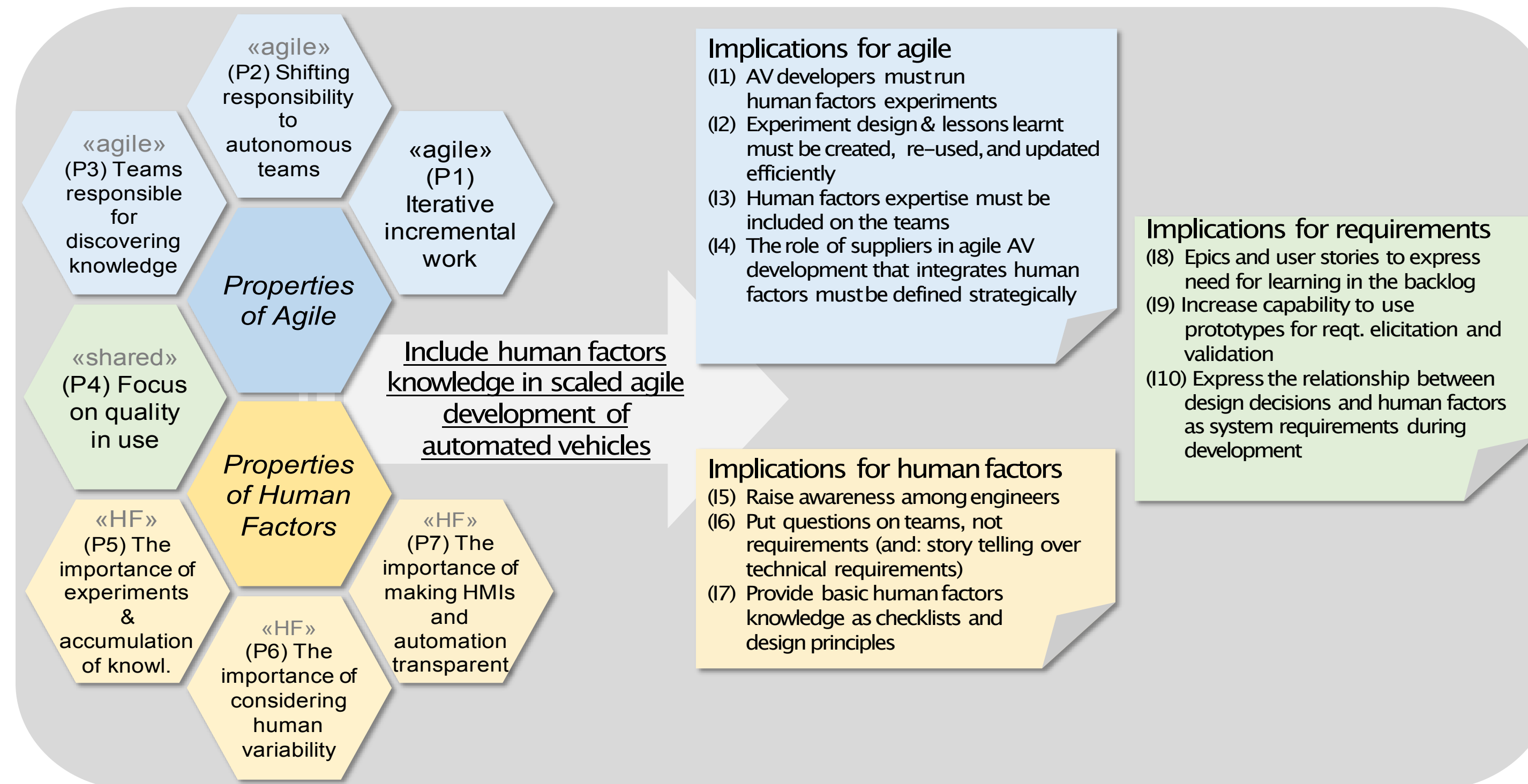
HF REQUIREMENTS FOR AV – STUDY I

Within the general aim of determining how human factors (HF) aspects of automated vehicles (AV) development can be communicated to AV engineers, first study specially aims to investigate how HF knowledge can be systematically captured as requirements for agile AV development.

METHODOLOGY

We used qualitative research methodology. Analysis was done by following six steps.

1. Data Collection
2. Initial Coding
3. Theme Generation
4. Review Themes
5. Name & Define Themes
6. Produce Report

FINDINGS - STUDY I

Properties of Agile

«agile» (P2) Shifting responsibility to autonomous teams

«agile» (P3) Teams responsible for discovering knowledge

«agile» (P1) Iterative incremental work

«shared» (P4) Focus on quality in use

Properties of Human Factors

«HF» (P5) The importance of experiments & accumulation of knowl.

«HF» (P6) The importance of considering human variability

«HF» (P7) The importance of making HMIs and automation transparent

Include human factors knowledge in scaled agile development of automated vehicles

Implications for agile
(I1) AV developers must run human factors experiments
(I2) Experiment design & lessons learnt must be created, re–used, and updated efficiently
(I3) Human factors expertise must be included on the teams
(I4) The role of suppliers in agile AV development that integrates human factors must be defined strategically

Implications for requirements
(I8) Epics and user stories to express need for learning in the backlog
(I9) Increase capability to use prototypes for reqt. elicitation and validation
(I10) Express the relationship between design decisions and human factors as system requirements during development

Implications for human factors
(I5) Raise awareness among engineers
(I6) Put questions on teams, not requirements (and: story telling over technical requirements)
(I7) Provide basic human factors knowledge as checklists and design principles

CONTINUOUS EXPERIMENTATION – STUDY II

The results from the interview study showed that the HF expert play an important role in testing and experimentation of the system. Nevertheless, it is challenging in agile development, where fast, iterative increments do not typically allow time for the rigorous experiments that HF experts may need in order to ensure user-centered quality.

Therefore, our next new study aims to investigate to what extent **human factors experiments** can be integrated in agile development (of systems, services, or products). In particular, we are interested in practices associated with managing iterative work/continuous experimentation environment suitable for iterative HF experiments.

LATEST RESEARCH OUTPUT

Muhammad, A. P. (2021). Methods and Guidelines for Incorporating Human Factors Requirements in Automated Vehicles Development. In *REFSQ Workshops*.

Muhammad, A. P., Knauss, E. & Bärgman J. (2021). Human Factors in Developing Automated Vehicles: A Requirements Engineering Perspective.

SUPERVISION AND CONTACT DETAILS

Supervised by: Eric Kanuss
Jonas Bärgman

Contact Details:

amnap@chalmers.se

https://www.shape-it.eu/esr/esr-8-human-factors-in-ai-based-automation-design/

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