

Transparency about autonomous military systems is critical to acceptance, research says

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When it comes to military use of autonomous systems, transparency about them, perceived usefulness and perception of ease of use all contribute to acceptance and adoption by personnel, according to new research at The University of Alabama in Huntsville (UAH), a part of the University of Alabama System.

"Of those three factors, transparency was regarded as the most critical to accepting and adopting an [autonomous system](#)," says Lisa Matsuyama, a second-year graduate research assistant in psychology who is the lead author of the research paper.

"It makes sense that transparency was most important because once operators understand the system and why they are using it, their perceptions of how useful and easy to use the system is can shift dramatically depending on what information they are given, or not given."

Autonomous systems perform tasks without external influence. Examples of autonomous systems include self-driving cars, learning thermostats and home assistants. These systems are becoming ever more prevalent in modern life.

"Understanding a system's capabilities is imperative to the acceptance and adoption of autonomous systems," Matsuyama says.

The project's principal investigator is Dr. Bryan Mesmer, an associate professor in the UAH Department of Industrial & Systems Engineering and Engineering Management (ISEEM). The work was supported by the Naval Postgraduate School (NPS) Consortium for Robotics and Unmanned Systems Education and Research (CRUSER), which funds novel research in robotics and autonomous systems through its Seed Research Program.

Dr. Mesmer teamed up in a UAH cross-campus collaboration with co-principal investigator Dr. Kristin Weger, an assistant professor in the Department of Psychology and Matsuyama's advisor.

"Dr. Mesmer and myself have collaborated on several other funded projects for NASA and the Army," says Dr. Weger. "What is interesting about these projects is that without the involvement of both disciplines, these research projects would not have come to fruition."

Dr. Weger says the Department of Psychology set up the interview questions, formulated a standardized procedure to interview the participants, and collected and analyzed the data. ISEEM applies the data to value modeling and game theory in order to generate and manage systems engineering requirements.

The project is a multi-university collaboration between UAH and NPS collaborators Dr. Douglas Van Bossuyt and Dr. Robert Semmens from the Systems Engineering Department.

"Autonomous systems are complex due to their underlying engineering and their uncertain interactions with human users," says Dr. Mesmer.

"It is only through a multi-university and multi-discipline examination, bringing in perspectives from multiple fields and backgrounds, that a real understanding of the acceptance of these systems can be made," he says. "That is what makes this collaborative team unique and appropriate for this project."

At UAH, Matsuyama's position and that of Raleigh Zimmerman, an undergraduate ISEEM major, are funded through CRUSER. Dr. Nathan Tenhundfeld, an assistant professor of psychology, is also supporting the effort.

Besides understanding an autonomous system's capabilities, Matsuyama says operators want to know why they are using the system and why it is needed.

"That intertwines with perceived usefulness, and users need to perceive a system as easy to use to be more likely to accept and adopt a system, as well," she says.

For example, Matsuyama says it is probably safe to say that a system with buttons on a controller that is similar to a Microsoft Xbox video game controller would be perceived as easy to use and be more readily accepted and adopted than an unknown controller with random buttons because users would already be familiar with the interface of the Xbox controller.

With the help of the NPS collaborators, the UAH researchers interviewed 47 active-duty military students in semi-structured interviews, mostly asking open-ended questions about their opinions of autonomous systems.

"Once we finished the interviews, we transcribed each interview and then coded each transcription,"

Matsuyama says. "Coding allowed us to group and analyze the data and transcriptions in a scientific way."

The scientists also reviewed pertinent literature of technological models, acceptance, adoption and autonomous systems to identify key determinants, including system effectiveness, system transparency, risk-based criticality and mental workload.

The study's conclusions apply across the branches of the military, the researchers found.

"We conducted a chi-square test of independence that found no significant differences between military branches and essential factors to accept and adopt autonomous systems," Matsuyama says. "Basically, that's statistical language to say that participants across all branches of the military agreed on what factors were most important regarding accepting and adopting autonomous systems."

Because enlisted warfighters encounter challenges regarding the acceptance and adoption of autonomous systems for operations, the findings are important to the military, she said.

"This research has the potential to help streamline the research and development phase of new systems, as well as give our warfighters/operators what they actually need and desire to work with in the future."

The next step is to administer a questionnaire to get additional perspectives on acceptance and adoption of autonomous systems to inform [systems engineering](#) and requirements management, Matsuyama says.

"Additionally, because a lot of companies can get overwhelmed with input from various sources, I think this research could really help to realign and bring the focus back on the operators and the people who will actually be using these systems."

Provided by University of Alabama in Huntsville

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