

A Systems Engineering Approach to Examining Policy and Ethics Considerations for IAS



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Mr. Mittu has authored one book, coedited five books, and written numerous book chapters and conference publications on the topics of autonomy and trust, computational context, Internet of Everything, and cyber defense as they relate to (distributed) artificial intelligence systems. He is actively involved with the national and international research communities through his leadership engagements with (1) The Technical Cooperation Program (TTCP), which promotes scientific exchange between New Zealand, UK, Australia, Canada and USA; (2) the NATO Information Systems Technology Panel; and (3) the DoD Reliance 21 C4I Community of Interest. Previously, Mr. Mittu has served as a Subject Matter Expert for the Joint IED Defeat Organization (2007-2008), participated as a member of the Netcentric Systems Test working group in collaboration with the U.S. Army Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI), and served on NRL's Invention Evaluation Board (IEB) to evaluate technologies and concepts for potential filing with the USPTO (2006-2008).

General description of opening 7-minutes of Panel

[Boy, 2019] discusses the progression of the field of Human Factors Engineering (HFE) since the 1950's, where the concern was on understanding the activities of users *after* a system had been developed. This was followed by related areas that emerged in the mid 1980's and mid 2010's called Human Computer Interaction (HCI) and Human Systems Integration (HSI), respectively. While HCI was primarily focused on understanding user tasks at design time, the field of HSI eventually focused on understanding complex human activity at design time through a Systems Engineering (SE) approach.

As advances are made in artificial intelligence and machine learning (AI/ML), a natural expectation would be to assume that the complexity and sophistication of these systems will become daunting in terms of their design complexity, managing their operations as well as total lifecycle costs. Additional challenges will include less technical aspects such as ethics and policy for operational deployment.

The field of HSI is evolving to dissect how humans should interact with advanced AI-based autonomous systems, and this evolution must take into consideration the interdependencies with the technical and non-technical considerations of deploying such autonomous systems. The SE discipline can serve as a

model to help understand this larger design space to ensure a path towards adoption and in this regard, several key questions need to be addressed:

- 1) What lessons have we learned about deploying complex software (non-AI or traditional AI) systems and benefits of a systems engineering (SE) perspective, and can an understanding of the SE discipline help us think about policies for the ethical deployment of advanced AI systems?
- 2) What are key elements of the SE design space or those that present the greatest challenges when considering policy and ethics of advanced AI systems?
- 3) How can an SE perspective aid in understanding the interdependencies/synergies between the human, automation, AI and other processes within the data-to-decisions pipeline and in the context of DevOps or DevSecOps, adversarial attacks, operational risk, T&E risk, etc.?

The relationships between AI and SE are also recently emerging as topics of discussion within the International Council on Systems Engineering, or INCOSE, located in San Diego, California (<https://www.incose.org/incose-member-resources/working-groups/transformational/agile-systems-se>) and the Association for the Advancement of Artificial Intelligence (AAAI) Spring Symposium Series (SSS) held annually on the campus of Stanford University, California (<https://aaai.org/Symposia/Spring/sss21.php>).