

Modeling Behavioral Considerations Related to Multifocal Security¹

Ignacio J Martinez-Moyano, Ph.D.
Argonne National Laboratory
The University of Chicago, Computation Institute

Security experts and system owners design and implement various types of security measures (e.g., physical, cyber, procedural) to protect systems from attack by adversaries and to mitigate other risks (e.g., natural disasters, power failures). A “multifocal” security approach considers how procedures, people, and processes interact in complex ways to create different foci in the context in which human judgment, decision criteria, outcome decomposition, and threshold setting evolve to improve (or degrade) security choices and systems. Because of the complex interaction of these elements, security choices are often plagued with cognitive biases, information limitations, and an overwhelming number of option combinations that compound the intrinsic difficulty of the protection enterprise. In addition, before security experts can effectively design and implement protective actions, they need to understand the details of selection-detection processes. These processes are used to identify threats, understand how these threats evolve over time, examine the conditions or pressures that allow adversaries to adapt, and identify the role that biases and limitations play in their understanding of the system and the adversaries. Thus, because the potential success of different threat vectors in complex dynamic systems is intrinsically tied to human judgment and decision-making processes (often aided by technology), an explicit understanding and a formal representation of such processes in decision models seems warranted. Further, because adversarial activity may have extremely low base rates, high potential consequences, and very low feedback availability, a multifocal approach is needed to develop security measures that are commensurate with the complexities that highly adaptive adversaries pose in complex socio-technical systems.

¹ This abstract has been cleared as an unclassified no restrictions document.