

Providing the Right Incentives for Systems Engineers: Why Requirements are Counter-Productive

Dr Chris Paredis (Georgia Institute of Technology) -

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Abstract. In current Systems Engineering practice, requirements engineering is the foundation on which most of our processes and methods are built. To most practicing systems engineers and even to systems engineering researchers, requirements engineering is therefore beyond question – it is simply how things are done. However, there is growing evidence and there are strong theoretical arguments that indicate that the use of requirements may actually be counterproductive. We all know of many large systems engineering projects that have failed entirely, were delayed by many years, or came in significantly over budget. Can these failures be explained simply as poor application of sound requirements engineering practices, or are the prescribed practices themselves flawed? In this presentation, I will explain some of the theoretical arguments against requirements engineering (RE) --- arguments based on decision theory, game theory, and behavioral economics. These arguments address the shortcomings of RE with respect to two distinct aspects of systems engineering: first, the expression of preference, and second the delegation of decision-making authority. As an alternative to RE, researchers have proposed capturing objectives and decomposing problems using value functions. In such value-driven systems engineering, the objectives are expressed directly and explicitly in a value function. In addition, communication between system and subsystem design teams occurs also using value functions instead of derived requirements. This provides for richer, more explicit communication of system-level objectives and for corresponding incentive structures that encourage behavior aligned with system objectives. Although these value-driven approaches still require further refinement, better support, and ultimately a shift in education and culture within the systems engineering community, their strong theoretical foundations justify a quest for further investigation, development and empirical justification.