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### The Case for Employing MBSE in Early-Stage R&D Projects using Agile Development Approaches

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#### ABSTRACT

The case for using Model-Based Systems Engineering (MBSE) in large, complex projects is now well established and many sources are available from which a system engineer can make a case to project stakeholders for its inclusion. In contrast, there is much less available material to justify the use of MBSE in Early-Stage Research and Development (ESR&D) projects that are intending to use agile development methodologies. This paper addresses this deficiency by reviewing information from standards, handbooks, and research papers and tempering this with experience to assemble a compelling case targeted at audiences unfamiliar with contemporary industry systems engineering practices, such as those in small start-up companies, research laboratories, and universities. The review is followed by a discussion on the relevant nuances from contemporary thinking on systems engineering, digital engineering, and agile approaches for product development that further reinforces the business case developed from the review material.

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