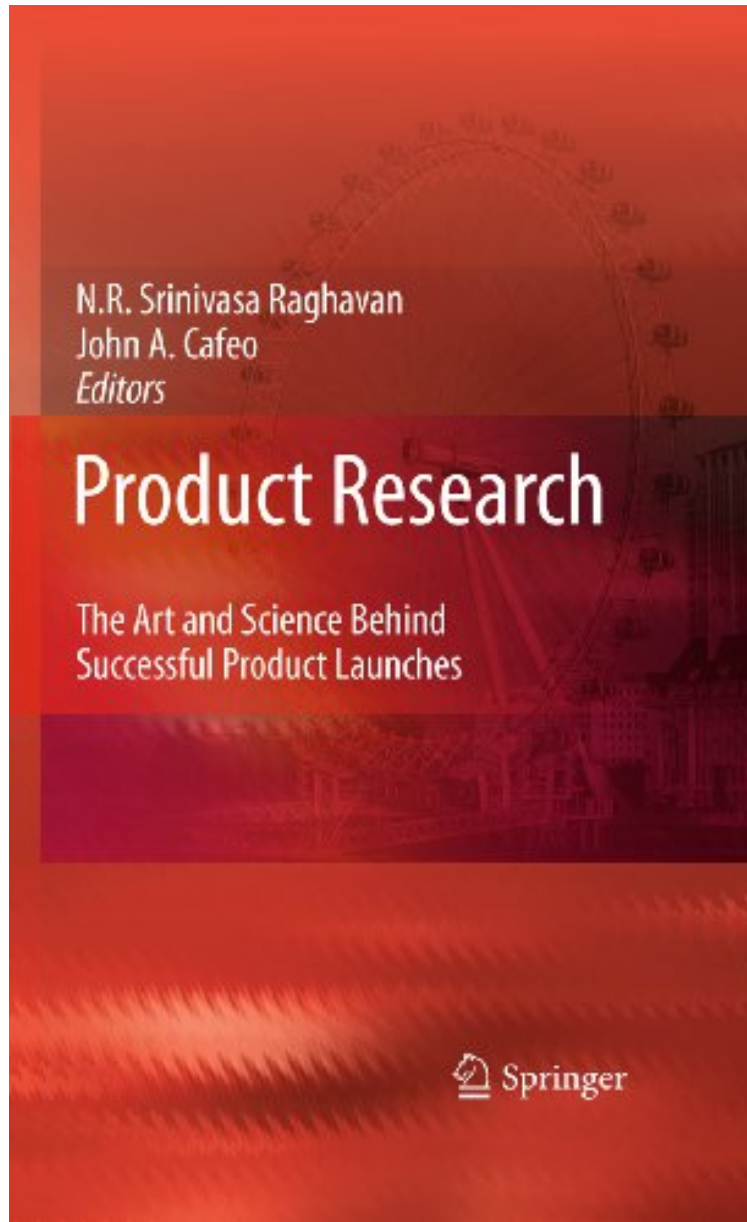


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7. 1. 1 Background Uncertainty can be considered as the lack of adequate information to make a decision. It is important to quantify uncertainties in mathematical models used for design and optimization of nondeterministic engineering systems. In general, uncertainty can be broadly classified into three types (Bae et al. 2004; Ha-Rok 2004; Klir and Wierman 1998; Oberkampf and Helton 2002; Sentz 2002). The first one is aleatory uncertainty (also referred to as stochastic uncertainty or inherent uncertainty); it results from the fact that a system can behave in random ways. For example, the failure of an engine can be modeled as an aleatory uncertainty because the failure can occur at a random time. One cannot predict exactly when the engine will fail even if a large quantity of failure data is gathered (available). The second one is epistemic uncertainty (also known as subjective uncertainty or reducible uncertainty); it is the uncertainty of the outcome of some random event due to lack of knowledge or information in any phase or activity of the modeling process. By gaining information about the system or environmental factors, one can reduce the epistemic uncertainty. For example, a lack of experimental data to characterize new materials and processes leads to epistemic uncertainty.

From the Back Cover New product development is a highly creative exercise, often involving an interdisciplinary decision making and execution process. This book is a compendium of research articles on various issues concerning product research, written by research scholars both from academia and industry. The papers have been divided into four main parts. The first part is on innovation and information sharing in product design. The second part deals with decision making in engineering design. The third part treats customer driven product definition, and the last part brings together articles on quantitative methods for product planning.