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Kenneth J. Arrow

Kenneth J. Arrow (born August 23, 1921) earned a Bachelor's degree from City College of New York in 1940, and a Master's degree in 1941 and Ph.D. in 1951 from Columbia University. He has had academic positions at University of Chicago, Stanford, and Harvard, and numerous visiting positions at such institutions as University of California at Berkeley, M.I.T., Churchill College (Cambridge, UK), Institute for Advanced Studies (Vienna), University of Siena (Italy), and All Souls College (Oxford, UK). He is currently Joan Kenney Professor of Economics Emeritus and Professor of Operations Research Emeritus at Stanford University. He has made fundamental contributions to social choice theory, notably "Arrow's impossibility theorem," and to general equilibrium analysis. He has done foundational work in several areas of economics including endogenous growth theory and the economics of information.

Closer to home for Production and Operations Management Society, Arrow has made seminal contributions in inventory theory, risk-aversion measures (notably the Arrow-Pratt measure of risk-aversion), concepts of moral hazard and adverse selection, mathematical programming, game theory, and optimal control theory. His classic 1951 *Econometrica* paper titled "Optimal Inventory Policy" (with T. Harris and J. Marschak) studies several important aspects of inventory theory including the newsvendor model and general dynamic inventory models. In the presence of fixed cost, they introduced the concept of the (s, S) policy, which was proved to be optimal by H. Scarf in 1960. Arrow's 1958 book *Studies in the Mathematical Theory of Inventory and Production* (Stanford University Press with S. Karlin and H. Scarf) is considered to be the bible in production inventory literature.

In 1961, Arrow produced (with L. Hurwicz and H. Uzawa) a now well-known weak constraint qualification for obtaining the saddle-point characterization of a local solution to a nonlinear programming problem, and several famous results (with A. C. Enthoven) in characterizing optimization problems when both the maxim and and constraint functions are quasiconcave. He has used optimal control theory as a guide to resource allocation, inventory policy, public investment, etc. In a series of articles (with M. Kurz 1969, 1970), culminating in their 1970 book, Arrow presented numerous applications of the use of Hamiltonians and sufficiency optimality conditions. For works in these areas, he was awarded the 1986 John von Neumann Theory Prize.

A part of the citation for the John von Neumann Theory Prize reads,

> The 1986 von Neumann Theory Prize for contributions to the theory of operations research and management science is awarded by the Operations Research Society of America and The Institute of Management Sciences to Kenneth J. Arrow for landmark contributions to the theory of social choice and economic equilibria, and for fundamental and prodigious contributions to an astonishing array of fields in the decision sciences. These include decision theory, the theory of risk-bearing, the economics of information and organization, dynamic programming, inventory and production theory, linear and nonlinear programming, advertising policy, economics of medical care, theory of job discrimination, economic growth theory, finance, price theory, maintenance policy, economics of education, natural resource policy, and technological innovation. His work exhibits extraordinary theoretical power and often provides stunning insights on the fundamental issues of the day.

He has generously answered calls to provide leadership of many professional societies including serving as President of The Institute of Management Science, the American Economic Association, the Econometric Society and the International Society for Inventory Research, and Advisory Editor of *Mathematics of Operations Research*.

Arrow is a winner of the 1972 Nobel Memorial Prize in Economics for his pioneering contributions to general economic equilibrium theory and welfare theory, and he received the National Medal of Science, the nation's highest scientific honor, in 2004 for his contributions to research on the problem of making decisions using imperfect information and his research on bearing risk. He is a recipient of the American Economic Association's John Bates Clark Medal, a member of the National Academy of Sciences and the Institute of Medicine, and he holds many honorary degrees.

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