

Preface

The first ever trial on a simple body was performed by Archimedes. For complex bodies, it has been over hundred years, since any study was conducted on artifacts such as the 3M&I-body system in IE/OR (industrial engineering/operations research). Generally, “3M” means to human, material/machine, money, and “I” means the information/method in nature versus artifacts-based views.

The complex subject of 3M&I variety was first introduced and discussed in the book, “Manufacturing and service enterprise with risks,” by Springer (2008, 2014), and IE/OR is regarded and developed as an art (knowledge and “waza”/skill) of the 3M&I-body system in the book. F.W. Taylor introduced and developed the motion and time method and labor-related science in IE/OR, and the method (information) was further developed by N. Wiener.

For economic artifacts, “3M” represents human (labor), material/machine (manufacturing process), money (capital), and “I” represents information (wisdoms) on methods (combinatorics). This combination alone is not sufficient to deliver value (weight/profit), and it is born out of the changing state of activity and flow in the field (market/society), in contrast with nature.

This is the first book covering original knowledge on the mathematical science of the 3M&I-body system, and presents axioms and two major propositions on issues surrounding nature versus artifacts, and not on animal versus machine. This book is the product of industrial engineering as contrasted with Wiener’s cybernetics challenges for over a half-century.

For the 3M&I-body, there are two approaches to systemization and control: AI (artificial intelligence)/IoT (Internet of Things) and Matsui’s matrix/3D. The former is the analogical and visual approach to a real entity. The latter is the digital and logical approach to system decision, and is applied to the robotics of bodies.

The mathematical science of a body is constructed more effectively using algebra, geometry, analysis, and control, as in Matsui’s equation, toward the sandwich and balancing principles of bodies. The sandwich issues propose the squeeze or pinching theorem in mathematics for the 3M&I-body system, and

the balancing issues propose the principle of balancing and invisible collaboration of bodies, beginning from the work of Archimedes.

The book can contribute to the integration of knowledge and intelligence in nature versus artifacts science, and facilitate the realization of the cyber/real world, such as an enterprise robot, cloud-coordinated SCM (supply chain management) and smart cities in the near future. In addition, the book, together with the Appendix, will be useful to graduate students and researchers dealing with problems related to objects that occur in nature (Newton's) and to artifacts (Matsui's).

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