Mirce Science

"Everything that the human race has done and thought is concerned with the satisfaction of felt needs". A. Einstein

Human needs for transportation, education, ventilation, communication, refrigeration, information, computation and many other functions are continuously satisfied through human created and managed products or constructions, commonly called systems. Their functionality performance, measured by speed, capacity, frequency, power and similar physical quantities, can be accurately predicted during the design process and tested at the delivery, as they are functioning in accordance to linear chains of cause and effect, well understood by laws of natural sciences, such as: Newton's laws of motion, Maxwell's law of electrodynamics, Coulomb's law of solid friction, Hook's law of stress and strain Boltzmann's law of thermodynamics, to name a few. All of them are characterised by certainty, reversibility and independence of time, location and humans.

Experience teaches us that due to complex internal interactions within the system, external impacts from environment and human actions, variety of mechanical, electrical, chemical, thermal, radiant and other type of energy are generated, some of which cause the failure of systems to deliver a function. To maintain f**unctionability**[1] actions like servicing, repairs, inspections, replacements and similar, are undertaken by humans, which make them maintainable systems. Thus, the life of a system could be considered as a motion through positive and negative functionability states through time, which is physically manifested by occurrences of corresponding functionability events. Unlike accurate quantitative information regarding the design-in performance of systems that is available on the delivery day, the in-service performance is not. Instead, years later the statistics for various functionability measures become available. The reason for this is the fact that they are characterised by uncertainty, discontinuity, irreversibility, inseparability, and dependence of time, location and humans, and as such non predictable by existing laws of science.

To rationally address questions of the accurate predictions of functionability performance of maintainable systems, prior to entry into service Dr Knezevic has established the MIRCE Akademy at Woodbury Park, Exeter, UK, in 1999. Staff, Fellows, Members and students of the Akademy have endeavoured to subject in-service behaviour of systems to the laws of science and mathematics to:

- Determine the trajectory of the motion of a system through functionability states through time, which is uniquely defined by the sequence of occurrences of positive and negative events, together with the statistics of the work done by the systems and on the system[2]
- Understand mechanisms that lead to the occurrence of functionability events like fatigue, operator errors, corrosion, creep, foreign object damage, a faulty weld, carburettor icing, shelf life, perished rubber, maintenance induced failure, to name just a few, which are manifested within physical scale from the atom to the Solar System (10^{-10} to 10^{10} metre).
- Define a mathematical scheme for predicting expected functionability performance of systems for a given operational scenario, maintenance policies and support strategy, which is vital for the calculation of the work done by the systems and on the system.

While in classical mechanics a force is said to do work if, when acting on a body, there is a displacement of the point of application in the direction of the force, in Mirce Mechanics a given system is said to do work, if there is a provision of measurable functions in the direction of time.

In summary, the body of knowledge comprising of axioms, mathematical equations and methods that enable engineering, predicting and managing the functionability performance of maintainable systems, based on the scientific understanding of the mechanisms that cause occurrences of observable positive and negative functionability events through the life of maintainable systems constitutes Mirce Science.

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[1] Functionability, n. ability to function, Knezevic, J., Reliability, Maintainability and Supportability – A probabilistic Approach, Text and Software package, pp. 291, McGraw Hill, London 1993. ISBN 0-07-707691-5

[2] Boeing 747, registration number N747PA, been air born 80,000 flying hours, transported 4,000,000 passengers, burned 271,000,000 gallons of fuel while receiving 806,000 maintenance man-hours and consuming: 2,100 tyres, 350 brake systems, 125 engines, among other parts, during the 22 years of in-service life, at Pan Am airlines.