

What is Engineering? What is a System and what is Systems Engineering?

No one can deny that engineering has always been the fuel powering the engine of human progress. From the earliest tools to modern technologies, engineers shaped the lives of people in their eras. However, what is engineering? It is the practical application of science, imagination, and innovation, the art of designing, improving and delivering processes, structures, and technologies. What makes it an art is the elegant symbiosis of theory and practice, technical excellence and innovation, critical thinking, and the core understanding of the problems to be solved. Engineers are the ones who turn abstract ideas into feasible outcomes, revolutionizing, reshaping, and rethinking the world we live in.

What is a system? A system is a set of components serving to deliver the same objective. Like the gears in a watch, every minute detail serves a distinct purpose, and the system as a whole relies on the tiny details forming it. However, systems are not constrained to being physical or human-engineered; they surround us everywhere and may not be perceived as systems due to their commonness. The ecosystem we are part of is an example of a natural system, where animals, plants, bacteria, climate, and other factors form and contribute to the continuation of life. Teams are an example of a human-designed social system, where their members operate separately, while contributing to the same goal. Systems are about interdependence and cooperation; they function when all other parts work together.

The union of these ideas leads to systems engineering, which is the discipline of delivering complex systems as full-cycle solutions. In comparison to the traditional perception of engineering, it does not focus on individual subsystems but on the subsystems as a whole, the ways they interact with one another, and the complete architecture of the delivered design. Systems engineers are responsible for the harmony between the technical performance, cost, reliability, and sustainability of the final products. Additionally, they serve as the intermediary between different engineering disciplines, consumers, product owners, technologies, and business needs. An example of a systems engineer in software development is the DevOps engineer. DevOps practices are meant to bridge the gap between operations, development, and business needs. Meanwhile, delivering resilient, cost-efficient, and simple systems to end users, overseeing system bottlenecks, operational issues, compatibility issues, and much more.

By way of conclusion, engineering is the application of science and creativity, the objective of which is to resolve problems. A system can be defined as a set of functional parts sharing the same purpose. The orchestration of the two above leads to the discipline of systems engineering, which is about delivering a functional, efficient, and persistent whole. It is about translating ideas into results and making the world a better place.