ABSTRACT

Systems engineering is an interdisciplinary and holistic discipline with methods and techniques to address complex problems. Systems engineering treats the whole system generally and even its elements in details. The thesis defines systems engineering, its purpose, usage in life and its ability to solve problems even the small or complex ones. Systems engineering standards are discussed and their evolution throughout the ages. Also these standards are compared to each other, and one of them is chosen as it is broader and more comprehensive (ISO/IEC 15288). Systems engineering management is accomplished by three activities; development phasing, systems engineering process, and lifecycle integration. Systems Engineering uses models and tools to understand, communicate, debate, and facilitate decisions about complex problems and potential solutions.

This research presents how the system lifecycle processes, phases, and tools frameworks can be integrated and the benefits of that integration, especially how it can be used to develop and execute system as a whole. It also introduces an initial proposal of Systems Engineering Lifecycl-Tools-Model Framework (SELTMF). Finally it gives a presentation of some ideas concerning systems engineering tools support, those tools are gathered in a template can be applied to any system, for example; V-model, Use Case Diagram, VisSim, and system modeling and architecture.

The thesis addresses some issues of real cases like faced in industries; in any business the main goal is achieving customer needs, but when this is not achieved we don’t have the prober tools to analyze and investigate the root causes of this problem or even how to treat them. These problems as some think superficially glance they are only caused by product defects or labor faults, they don’t look deeply and analyze situation to recognize that the whole system is integrated and maybe any unexpected problem anywhere into the system causes a fatal problem consequently affects achieving goals. It is applied for one of the largest
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industries serving big assembly industries for vehicles and other fields. It is applied to this company and some results have been got that the company has problems not only at the level of workers, products or the production process but also at the level of the administration as a whole. So it has to build systems engineering framework not just documentary but also indeed on the floor to get the benefits they experimented, some of them when this study has started to apply.

The application of this proposed model led to a significant increase of the firm total and (labors and materials) partial productivity, quality-productivity index, profit, and value added almost by (28%, 39%, 17%, 28%, 67%, and 54%) respectively, noticeable positive decrease of defective products percentage, rework, and lead time almost by (+100%, +100%, and +100%) respectively, also acquiring new customers and new products, subsequently developing training programs, and solving customer claims.