

# **A System-Dynamics based Model for Implementing Theory of Constraints on Healthcare Systems**

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## **Abstract**

The management of the costly and limited healthcare resources such as operating rooms, doctors, nurses, and beds is challenged by the uncertainty of the arrival patients and the service rate for each type of them depending on the available resources. Therefore, healthcare units encounter unbalanced utilization of such resources and unnecessary long patient's waiting time before admission and operating rooms. A system dynamics model simulating a typical medium-sized hospital, where different types of patients are served using the same limited resources, is developed to implement the theory of constraints philosophy. The model is used to identify the system bottleneck resource, then to exploit and to subordinate the system around this resource. The number of served patients (throughput) is increased by 6% without any resource elevation. Furthermore, the model is used to determine the proper capacity needed to elevate the bottleneck resource.

## **Keywords**

System Dynamics; sharing resources; operating room planning; theory of constraints; admission policy.

## **Biographies**

**Mohamed Grida** is an assistant professor of Industrial Engineering at Zagazig University. He holds a MSc. degree in industrial engineering from the American University in Cairo and a PhD from the Zagazig University. He worked as a visiting researcher in Hong Kong University of Science and Technology. His research interests include modeling and optimization of supply chain systems, containers logistics systems, and retail systems.

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