
Editorial

Mahdi Bastan

Department of Industrial Engineering,
University of Eyvanekey,
Eyvanekey, Garmsar, Iran
E-mail: mbastan@eyc.ac.ir

Biographical notes: Mahdi Bastan received his PhD in Industrial Engineering from University of Tehran, Iran. He holds MSc in the field of Healthcare System Engineering from Amirkabir University of Technology, Iran. He is currently working as Faculty member of Department of Industrial Engineering at the University of Eyvanekey, Iran. His research interests include banking and economic dynamics, strategic business management, data analytics and health economics. He has received several international awards in field of system dynamics and simulation. He is the member of System Dynamics Society, Editorial Board and Reviewer of several international journals and also Chair of System Dynamics Track in Industrial Engineering and Operation Management (IEOM) conferences.

The application of system dynamics (SD) to solve complex problems is increasing. These problems have dynamic complexity and change over time. Some of the organisational problems such as supply chain management, product and service development, risk management, business and customer management, performance evaluation, and key competencies development have dynamic complexity, with delay and also non-linear interactions. In these cases, suggested solutions have to take into account their side effects. Problems will be exacerbated if solutions have been developed by applying a non-holistic view in the decision-making process.

Using system thinking and for the analysis of complex problems gives us a deeper understanding of their causal reasons. Applying SD as one of the best and practical tools for executing system thinking to understand, perception and resolving complex problems, can lead to achieving efficient and also sustainable policies and solutions for them. Also by improving the mental model of policymakers, the high-quality decision-making process will be implemented in organisations. Thus this special issue is focusing on applying SD to provide management decision support for decision-makers to choose an efficient solution for their complex problems.

This special issue (System Dynamics Applications for Solving Complex Problems) is a collection of the six papers are written by eminent professors and researchers from different countries.

Paper 1: Dynamic strategies for measuring the performance of inventory system in closed loop supply chain

This paper focuses on performance evaluation of a food supply chain. A single product inventory in the multi-echelon closed-loop supply chain as a dynamic complex system has been investigated as the case study of this research. To achieve goals in this system,

dynamic strategies are needed. This study applied system dynamics approach to examine the relationships and significant effect of the factors within a supply chain on its performance. Using a simulation model and analysing the policies, the optimal transferring time of products from a central warehouse to distribution centres and the best coefficient time for warehouse inventory were identified. The model of this paper can be applied in other industries as useful tools to reach the best possible performance of their supply chain.

Paper 2: The most common issues in development of causal-loop diagrams and stock-and-flow diagrams

Building a system dynamics model is a professional work. Achieving a perfect simulation model with adequate ability of representation behaviour of the given system needs high skills of modelling. During the modelling process, which starts with problem formulation and system boundary definition and ends with policy and scenario propositions and evaluation, various mistakes occur. This paper presents the most common mistakes identified by four-group model-based single-blind experiment that modellers make during a specific stage of the overall modelling process. Identification of the most common mistakes in modelling process can help to minimisation or even elimination of this mistakes on modelling.

Paper 3: Performance evaluation of telecommunication services provision with combined approach of balanced scorecard and system dynamics (case study: telecommunications infrastructure company)

Balanced Scorecard (BSC) is widely used as an appropriate tool in strategic evaluation phase of strategic management of a company or organisation. Despite the popularity of this approach, there are some limitations on classic BSC. Lack of a system perspective and not considering the dynamic relationships between indicators and delays are some of its weakness. The third paper of this issue present a SD model along a BSC as a comprehensive and empowering tool which would be able to overcome its limitations. A Telecommunications Infrastructure Company (TIC) has been considered as case study of this research and by introducing a simulation model for a dynamic BSC evaluation system, the efficient policies have identified. This study provides a dynamic BSC framework for performance evaluation of a company and by eliminating the major limitation of the classic BSC approach on proposed framework; it can apply for performance evaluation of organisations.

Paper 4: Development of a risk assessment model for the customer performance perspective in power plants applying a system dynamics approach

Risk management is a key management process that allows identifying, understanding and assessing risks to mitigate failures and disruptions and to protect equipment and humans against risks. Customer risks are also relevant to the organisation's long-term strategy and they should also be considered to integrate a robust risk management system. These key risks are not isolated and causal interrelationships should be established among those risks to assess their impact on organisational performance. The fourth paper of this issue develops a system dynamics model to assess the impact of customer risks on three key strategic performance measures in the power plants. The SD model provides a decision support for managers, practitioners, analysts, and policymakers to assess risks and helps policymakers in improving their understanding of the behaviour of a complex

system over time. Also the model improves the understanding of risk interdependencies and long-term risk behaviour that may affect the performance of the organisation. This modelling approach of this paper could be extended to other industries.

Paper 5: A system dynamics model to analyse economic challenges of apparel industry: the case study of Iran

The apparel industry in Iran faces with a lot of challenges which lead to losing their domestic market share. To identifying key reasons, a system dynamics model by economic perspective was developed in this paper. This study investigates the effect of economic variables on apparel production and import level in Iran. Also effect of some controversial issues such as tariff barriers, exchange rate, structural changes, wage, and inflation rates were discussed. The results show, linking up with global leaders is an efficient strategy to ameliorate domestic production. Of course, this strategy can't compensate for the negative effects of high inflation rates in Iran. The tariff rate and exchange rate can't be considered as long-time industry improvement strategies since they don't remove the deteriorating effects of economic instability and high inflation rates.

Paper 6: Exploring the linkages between the patent applications and energy transitions: a system dynamics perspective

Renewable energy plays an essential role for the challenges that bring climate change. Enhancing clean technology innovation performance, supported by patent applications, is a fundamental way to contribute to the emission reduction. Exploring the patent applications contribute to reveal opportunities and challenges in the energy sector. The last paper of this issue discusses the impact of the patent application delays on the incentives for innovation which contribute to the clean energy transition. To understand the impacts on the long-term, a simulation model based on system dynamics approach has applied. Results show that the delays of patent applications could have a significant impact on the clean energy transition in Latin America.

This issue published high-quality innovative researches and case studies as the latest advances in system dynamics and its application in solving complex problems. This issue will be valuable to both scholars, system dynamics researchers, and also organisation's managers interested in management interdisciplinary researches. I hope that it will make a great reference material for them. I would like to thank all who kindly contributed their papers for this issue. I am also indebted to Prof. Ahmad Taher Azar for his supports and also Inderscience Publishers for their assistance in the preparation and publication of this issue.