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Hierarchical hybrid simulation optimization of the pharmaceutical supply chain

Altarazi, S.[a,*], **Shqair, M.**[a]

[a]Industrial Engineering Department, German Jordanian University, Amman, Jordan

ABSTRACT

In this paper, a global simulation optimization approach is developed to imitate and optimize the performance of the Pharmaceutical Supply Chain (PSC). Firstly, a hierarchical hybrid simulation model is developed in which aggregate and detailed data levels are addressed simultaneously. The model consists of two types of interdependent paradigms: the system dynamics paradigm, which depicts the echelons of pharmacies and wholesalers in the PSC, and the discrete event paradigm, which simulates the manufacturers with their detailed production operations, as well as the echelons of suppliers. Secondly, the "As is" scenario analysis and a screening process are performed to extract significant input parameters as well as sensitive outputs of the model. The final step optimizes the performance of PSC. The proposed approach validity is appraised by being applied to the PSC of a leading pharmaceutical company in Jordan. As a result, the opportunity loss cost has considerably decreased for both the manufacturer and wholesalers' echelons and the service level has improved throughout the PSC.

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Hybrid simulation;
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**Corresponding author:*
Safwan.altarazi@gju.edu.jo
(Altarazi, S.)

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Izvirni znanstveni članek

Optimizacija hierarhične hibridne simulacije farmacevtske dobavne verige

Altarazi, S.[a,*], **Shqair, M.**[a]

[a]Industrial Engineering Department, German Jordanian University, Amman, Jordan

POVZETEK

V tem članku je razvit pristop za globalno optimizacijo simulacije, ki posnema delovanje farmacevtske dobavne verige (PSC). Najprej je razvit hierarhični hibridni simulacijski model, v katerem se hkrati obravnavajo ravni zbranih in podrobnih podatkov. Model sestavljata dve vrsti medsebojno odvisnih paradigem: paradigma dinamike sistema, ki prikazuje ravni lekarn in veletrgovcev v PSC, ter paradigma diskretnih dogodkov, ki simulira proizvajalce z njihovimi podrobnimi proizvodnimi operacijami, pa tudi ravni dobaviteljev. V nadaljevanju se izvedeta analiza trenutnega stanja in postopek pregleda, da se pridobijo pomembni vhodni parametri in odkrijejo občutljivi rezultati modela. V zadnjem koraku se optimizira delovanje PSC. Učinkovitost predlaganega pristopa je ocenjena z uporabo na primeru dobavne verige vodilnega farmacevtskega podjetja v Jordaniji. Z uporabo pristopa se je strošek oportunitetne izgube znatno zmanjšal tako za proizvajalce kot za veletrgovce, raven storitev pa se je izboljšala v celotnem sistemu PSC.

PODATKI O ČLANKU

Ključne besede:
Dinamika sistema;
Diskretni dogodki;
Optimizacija simulacije;
Hibridna simulacija;
Iskanje po razpršitvi;
Iskanje s tabuji;
Umetne nevronske mreže (ANN);
Programska oprema za simulacijo AnyLogic;
Paket za optimizacijo OptQuest;
Farmacevtska dobavna veriga

**Kontaktna oseba:*
Safwan.altarazi@gju.edu.jo
(Altarazi, S.)

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