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Hybrid fuzzy multi-attribute decision making model for evaluation of advanced digital technologies in manufacturing: Industry 4.0 perspective

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ABSTRACT

Manufacturing is currently at a turning point from mass production to customized production. The implementation of the Industry 4.0 concept, leading to automation and digitalization of manufacturing processes, is therefore considered vital for companies that aim to follow emerging trends in production. Research in this field is primarily focused on companies from developed countries, while companies from transition countries have difficulties to adapt to new business environment. The aim of this paper is to evaluate the use of advanced digital technologies in manufacturing companies from transition countries (i.e. Serbia) in the context of Industry 4.0. To address this problem, an evaluation method based on Fuzzy Analytic Hierarchy Process (FAHP) and Preference Ranking Organization Method for Enrichment Evaluations (PROMETHEE) is proposed. FAHP was used to determine criteria weights as an input for PROMETHEE method which was then used to evaluate advanced digital technologies. For this purpose, the dataset from the European Manufacturing Survey gathered in 2018 from Serbian manufacturing companies is used. The results of this empirical research revealed that production planning and scheduling, digital exchange of data with suppliers/customers, and production control systems play vital role for manufacturers in the context of industry 4.0. These results could serve to manufacturers for their strategic orientation and decision making.

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Izvirni znanstveni članek

Hibridni mehki model odločanja z več atributi za ocenjevanje naprednih digitalnih tehnologij v proizvodnji: Perspektiva Industrije 4.0

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POVZETEK

Proizvodnja je trenutno na prelomnici od množične proizvodnje do prilagojene proizvodnje. Uvajanje koncepta Industrije 4.0, ki vodi do avtomatizacije in digitalizacije proizvodnih procesov, je nujno za podjetja, ki želijo slediti nastajajočim trendom v proizvodnji. Raziskave na tem področju so usmerjene predvsem v podjetja iz razvitih držav, medtem ko se podjetja iz tranzicijskih držav težko prilagajajo novemu poslovnemu okolju. Namen tega prispevka je oceniti uporabo naprednih digitalnih tehnologij v proizvodnih podjetjih iz tranzicijskih držav (t.j. Srbije) v kontekstu Industrije 4.0. Za reševanje te težave je predlagana metoda ocenjevanja, ki temelji na postopku mehkega analitičnega hierarhičnega proces (FAHP) in metodi PROMETHEE. FAHP je bil uporabljen za določitev uteži meril za metodo PROMETHEE, ki je bila nato uporabljena za oceno naprednih digitalnih tehnologij. V ta namen se uporablja nabor podatkov iz evropske raziskave o proizvodnji, ki so jo v letu 2018 zbrala srbska proizvodna podjetja. Rezultati te empirične raziskave so pokazali, da načrtovanje in razporejanje proizvodnje, digitalna izmenjava podatkov z dobavitelji/kupci in sistemi za nadzor proizvodnje igrajo ključno vlogo za proizvajalce v okviru Industrije 4.0. Ti rezultati bi lahko služili proizvajalcem za njihovo strateško usmeritev in odločanje.

PODATKI O ČLANKU

Ključne besede:
Industrija 4.0;
Proizvodnja;
Digitalizacija;
Napredne tehnologije;
Odločanje z več atributi (MADM);
Mehki analitični hierarhični proces (FAHP);
Metoda PROMETHEE

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