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Measuring the coordinated development of the advanced manufacturing cluster based on patent data: A composite system approach

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ABSTRACT

The advanced manufacturing industry serves as a key driver of high-quality economic development, with patent data widely used to assess regional technological innovation and synergy. Evaluating coordination within advanced industrial clusters offers practical insights into industrial upgrading. Focusing on the Beijing–Tianjin–Hebei advanced manufacturing cluster in China, the composite system is divided into four subsystems: quantity, quality, efficiency, and value. Using patent data from 2013 to 2023, a composite system synergy model was built to measure the degree of synergy. A coupling coordination degree model and an obstacle degree model were applied together to examine coordination states and limiting factors. The findings show a generally rising synergy degree in the cluster, indicating increased organizational coherence over time. Coupling coordination displayed short-term fluctuations but exhibited a positive long-term trend, achieving high-quality coupling by 2023. Collaborative development is dynamically influenced by multidimensional obstacles, calling for timely and tailored measures to improve synergy efficiency. This study offers an empirical basis for optimizing collaboration in the Beijing–Tianjin–Hebei cluster and provides a theoretical reference for understanding synergy mechanisms in similar industrial clusters.

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Keywords:
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Izvirni znanstveni članek

Merjenje usklajenosti razvoja grozda napredne proizvodnje na osnovi patentnih podatkov: pristop sestavljenega sistema

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POVZETEK

Napredna proizvodnja predstavlja ključni dejavnik visokokakovostnega gospodarskega razvoja, pri čemer se patentni podatki pogosto uporabljajo za ocenjevanje inovacij in strategij po regijah. Vrednotenje usklajenosti znotraj naprednih industrijskih grozdov ponuja pomembne vpoglede v razvojno dinamiko in procese industrijskega nadgrajevanja. Raziskava se osredotoča na grozd napredne proizvodnje v regiji Peking–Tjandžin–Hebej na Kitajskem, pri čemer je sestavljeni analitični sistem razdeljen na štiri podsisteme: količino, kakovost, učinkovitost in vrednost. Na podlagi patentnih podatkov za obdobje 2013–2023 je bil razvit model sinergije sestavljenega sistema za merjenje stopnje sinergije. Za analizo stanj usklajenosti in omejitvenih dejavnikov sta bila hkrati uporabljena model stopnje sklopljene usklajenosti ter model stopnje ovir. Rezultati kažejo splošen naraščajoč trend stopnje sinergije v grozdu, kar kaže na postopno krepitev organizacijske povezanosti skozi čas. Stopnja sklopljene usklajenosti sicer izkazuje kratkoročna nihanja, vendar dolgoročno kaže pozitiven trend in do leta 2023 doseže raven visokokakovostne sklopljenosti. Na sodelovalni razvoj dinamično vplivajo večrazsežnostne ovire, kar zahteva pravočasne in ciljno usmerjene ukrepe za izboljšanje učinkovitosti sinergije. Študija nudi empirično podlago za optimizacijo sodelovanja v grozdu Peking–Tjandžin–Hebej ter predstavlja teoretično izhodišče za razumevanje sinergijskih mehanizmov v primerljivih industrijskih grozdih.

PODATKI O ČLANKU

Ključne besede:
Grozd napredne proizvodnje;
Patentni podatki;
Sinergija sestavljenega sistema;
Stopnja sklopljene usklajenosti;
Stopnja ovir;
Regionalna industrijska usklajenost;
Inovacijska sinergija

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