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Independent vs. collaborative blockchain Research and Development: Operational decisions in food supply chains

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ABSTRACT

As blockchain increasingly demonstrates advantages in enhancing consumer trust and reducing collaborative production costs in food supply chains, more food companies are developing blockchain-based supply chain management platforms. However, in a complex and competitive supply chain environment, food companies face critical operational management challenges in selecting appropriate blockchain R&D approaches and determining optimal R&D levels. This study examines two competing food companies deciding on their optimal food production and blockchain R&D levels. We first established a benchmark model without blockchain adoption. Then, we constructed supply chain operation models for both independent and collaborative blockchain R&D scenarios. By comparing equilibrium decisions across different models, we derived the optimal blockchain R&D model and operational strategies in food supply chains. Furthermore, we extended our analysis to consider asymmetric food substitution scenarios. Our findings revealed that independent blockchain R&D tends to increase equilibrium food production and is more suitable for premium food supply chains. Conversely, collaborative blockchain R&D significantly enhanced overall supply chain profitability. As spillover effects increase, food companies are likely to favor independent blockchain R&D to achieve higher R&D levels and stronger market competitiveness. Additionally, we demonstrated that blockchain R&D levels are influenced by food substitutability and quality credibility.

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Primerjava samostojnega in sodelovalnega razvoja tehnologije veriženja blokov: operativne odločitve v prehranskih dobavnih verigah

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POVZETEK

Podjetja v prehranskih dobavnih verigah vse pogosteje uvajajo rešitve, ki temeljijo na tehnologiji veriženja blokov, saj ta vse bolj izkazuje svoje prednosti pri spodbujanju zaupanja potrošnikov in zniževanju stroškov sodelovalne proizvodnje. Vendar pa se morajo podjetja v zapletenem in konkurenčnem okolju dobavnih verig soočati s ključnimi izzivi operativnega upravljanja pri izbiri ustreznega pristopa k razvoju tehnologije veriženja blokov (R&R) in določanju optimalne ravni vlaganj v razvoj. Študija obravnava dve konkurenčni podjetji, ki določata optimalno raven proizvodnje hrane in razvojnih aktivnosti na področju tehnologije veriženja blokov. Najprej je bil vzpostavljen izhodiščni model brez uporabe tehnologije veriženja blokov. Nato sta bila oblikovana modela delovanja dobavne verige za scenarija samostojnega in sodelovalnega razvoja te tehnologije. S primerjavo ravnotežnih odločitev med različnimi modeli so bile določene optimalne strategije razvoja tehnologije veriženja blokov in operativnega odločanja v prehranskih dobavnih verigah. Poleg tega je bila analiza razširjena še na primere z asimetrično nadomestljivimi živili. Rezultati kažejo, da samostojni razvoj tehnologije veriženja blokov običajno poveča ravnotežno raven proizvodnje hrane in je primernejši za dobavne verige z živili višje kakovosti. Nasprotno pa sodelovalni razvoj pomembno poveča skupno dobičkonosnost dobavne verige. Z naraščajočimi učinki prenosa znanja (angl. spillover effects) podjetja pogosteje izbirajo samostojni razvoj, saj ta omogoča višjo raven raziskav in razvoja ter večjo konkurenčnost na trgu. Poleg tega je bilo ugotovljeno, da na raven raziskav in razvoja tehnologije veriženja blokov vplivata tudi nadomestljivost živil in verodostojnost njihove kakovosti.

PODATKI O ČLANKU

Ključne besede:
Sprejetje tehnologije veriženja blokov;
Prehranske dobavne verige;
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