Impact of cooperation uncertainty on the robustness of manufacturing service system

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ABSTRACT

The cooperation between enterprises is actually at a certain risk of interruption, which has a significant impact on the robustness of manufacturing service system (MSS). Evaluating MSS' robustness is integral to production and service provisioning, and thus the influence mechanism should be clearly revealed for assisting professionals in the company in improving the robust performance. In this paper, we present an effective methodology for explicating the impact of cooperation uncertainty on the robustness of MSS from a complex system standpoint. This methodology characterizes MSS as a topological network consisting of serval service subsystems, and constructs the measure metrics system of which the validity and applicability are proved theoretically from the dimension of structure and performance. Furthermore, it simulates the cooperation interruption from four different scenarios with algorithms, and finally takes an elevator manufacturing service network as the case to illustrate this novel methodology. The simulation findings suggest that identifying the critical paths in MSS and standardizing the cooperation mechanism within and among core manufacturing service principals outperform the other measures in improving the robustness of MSS.

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Vpliv negotovosti sodelovanja na robustnost sistema proizvodnih storitev

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POVZETEK

Pri sodelovanju med podjetji predstavlja prekinitev sodelovanja tveganje, ki pomembno vpliva na robustnost sistema proizvodnih storitev (MSS). Ocenjevanje robustnosti MSS-jev je sestavni del proizvodnje in zagotavljanja storitev, zato je treba za pomoč strokovnjakom v podjetjih jasno razkriti mehanizme vpliva za izboljšanje robustne zmogljivosti. V tem prispevku predstavljamo učinkovito metodologijo za izražanje vpliva negotovosti sodelovanja na robustnost MSS s kompleksnega sistemskega stališča. Ta metodologija označuje MSS kot topološko omrežje, sestavljeno iz številnih storitvenih podsistemov in vzpostavi sistem vrednotenja, katerega veljavnost in uporabnost sta teoretično potrjeni z dimenzijo strukture in zmogljivostjo. Za ponazoritev delovanja nove metodologije se z algoritmom simulira prekinitev sodelovanja na štirih različnih študijskih primerih ter na primeru mreže za proizvodnjo dvigal. Simulacije kažejo, da prepoznavanje kritičnih poti v MSS in standardizacija mehanizma sodelovanja znotraj in med glavnimi proizvodnimi storitvami presegajo druge ukrepe za izboljšanje robustnosti MSS.