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Design and operations framework for the Twin Transition of manufacturing systems

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ABSTRACT

Manufacturing companies are facing what recently has been called the Twin Transition. They must conduct a digital transition as well as a transition from mere linear toward more circular value creation. The research presents an integrated Design and Operations Framework for digital and circular manufacturing systems. Defined process phases of the framework are described which address: the maturity assessment, Objectives and Key Results, the design (Des) and operations (Ops) of the manufacturing system, and a training concept. The authors follow a qualitative research approach for developing the integrated DesOps Framework for Circular and Digital Manufacturing Systems. The framework is conceptualized by combining state-of-the-art procedures and methods in the field of maturity and readiness assessment, Objectives and Key Results, Systems Engineering, and DesOps. Eventually, a case study is utilized for verifying the principal efficacy of the conceptualized framework. The research intends to scientifically contribute to the field of manufacturing systems design by proposing a novel design framework. From industrial application perspective, the research intends to contribute to improving decision-making in manufacturing companies by providing them with a practical-oriented guideline for transforming their manufacturing systems in the sense of the Twin Transition.

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Izvirni znanstveni članek

Okvir načrtovanja in delovanja proizvodnih sistemov pri prehodu na digitalne dvojčke

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POVZETEK

Proizvodna podjetja se soočajo s pojavom, ki smo ga pred kratkim poimenovali digitalni prehod. Izvajati morajo digitalni prehod in prehod od linearnega k bolj krožnemu ustvarjanju vrednosti. V raziskavi je predstavljen celovit okvir načrtovanja in delovanja, ki opredeljuje digitalne in krožne proizvodne sisteme. Opisane so procesne faze okvirja, ki obravnavajo: oceno zrelosti, cilje in ključne rezultate, načrtovanje (Des) in delovanje (Ops) proizvodnega sistema ter načrt usposabljanja. Avtorji pri razvoju celovitega okvirja DesOps za krožne in digitalne proizvodne sisteme uporabljajo kvalitativni raziskovalni pristop. Okvir je zasnovan z združevanjem najsodobnejših postopkov in metod na področju ocenjevanja zrelosti in pripravljenosti, ciljev in ključnih rezultatov, sistemskega inženirstva in DesOps. Nazadnje je za preverjanje učinkovitosti predlaganega okvirja uporabljena študija primera. Namen raziskave je znanstveno prispevati k področju načrtovanja proizvodnih sistemov s predlogom novega okvirja načrtovanja. Z vidika industrijske uporabe raziskava prispeva k izboljšanju odločanja v proizvodnih podjetjih, saj zagotavlja praktične smernice za preoblikovanje proizvodnih sistemov v smislu digitalnega prehoda.

PODATKI O ČLANKU

Ključne besede:
Načrtovanje proizvodnih sistemov;
Krožno gospodarstvo;
Trajnost;
Digitalni dvojček;
Prehod na digitalnega dvojčka;
Digitalni prehod;
Načrtovanje in delovanje (DesOps)

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