

Napoved tehnoloških sprememb v Industriji 4.0

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Povzetek

Raziskovalno vprašanje (RV): Kakšne so napovedi za tehnološki razvoj Industrije 4.0?

Namen: Članek se osredotoča na predstavitev konca Moorjevega zakona in vpliva tega na tehnološki razvoj Industrije 4.0.

Metoda: Za namene raziskave smo pregledali znanstveno literaturo na temo trendov v razvoju programske in strojne opreme v Industriji 4.0 (kibernetsko fizični sistemi, internet stvari, umetna inteligenca itd.), kot tudi predvideli datuma konca Moorjevega zakona. Pregledali smo alternativne tehnologije, ki imajo potencial, da zamenjajo trenutno tehnologijo ali pa povečajo njeno učinkovitost.

Rezultati: Pregled literature je pokazal, da je Moorjev zakon blizu konca, vsaj do tolikšne mere, ko je predviden dobiček uporabe te manjši od vsote, ki bi bila potrebna za raziskave in razvoj potrebne za nadaljevanja Moorjevega zakona. Poleg tega naj bi Moorjev zakon prišel do točke, ko ne bi bilo več fizično mogoče proizvesti manjše strojne komponente kot je že sedaj proizvedena. Kljub temu imata kvantno računanje in neuromorfična strojna oprema potencial, da zamenjata trenutno tehnologijo ali pa povečata učinkovitost trenutne tehnologije.

Organizacija: Če se kvantno računanje in neuromorfična strojna oprema pokažeta kot neizvedljiva, bo to pomenilo, da je napredek v razvoju naših tehnologij omejen, vsaj do trenutka, ko se bodo odkrile nove tehnologije, ki so izvedljive.

Družba: Po drugi strani pa je neizvedljivost kvantnega računanja in neuromorfične strojne opreme slaba za Industrijo 4.0, saj je trenutna vrednost Industrije 4.0 je 71.7\$ milijard dolarjev in se pričakuje, da se bo ta vrednost povečala na 156.6\$ milijard dolarjev do leta 2024. Kljub temu vse nakazuje na to, da se razvoj kvantnih računalnikov in neuromorfičnih komponent razvija skoraj istočasno z koncem Moorjevega zakona, kot tudi to, da bodo omenjena tehnologija tehnologija izvedljiva za uporabo.

Originalnost: Na to temo še ni bil narejen pregled literature v povezavi z Industrijo 4.0.

Omejitev/nadaljnje raziskovanje: Omejitve, ki se pojavi pri raziskavi je ta, da se okolje stalno spreminja in lahko da bodo v naslednjih letih naše napovedi zastarele ali pa posodobljene, kot tudi to, da je tema zelo kompleksna in je iz tega razloga težko napovedati prihodnost.

Ključne besede: tehnologije Industrije 4.0, kvantno računanje, neuromorfična strojna oprema, Moorjev zakon

Tine Bertoncel je doktor znanosti na področju managementa. Dela kot raziskovalec na Fakulteti za organizacijske študije v Novem mestu, kjer raziskuje področja Industrije 4.0, menedžmenta, sistemov zgodnjega obveščanja in rudarjenja besedil. Je avtor in soavtor večih znanstvenih in strokovnih člankov.

Dr. Maja Meško je redna profesorica managementa na Fakulteti za management Univerze na Primorskem. Doktorirala je na področju kineziologije, naslov njene doktorske disertacije je Definiranje nekaterih gibalnih sposobnosti in psiholoških značilnosti slovenskih vojaških pilotov. Njeni raziskovalni interesi obsegajo področja managementa, psihologije v managementu, zdravja na delovnem mestu ter vodenja. Sodelovala je in še sodeluje tudi pri različnih projektih. Je avtorica in soavtorica številnih znanstvenih in strokovnih člankov.

Prediction of technological developments in Industry 4.0

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Abstract

Research Question (RQ): What are the predicted trends in technological development in regards to Industry 4.0?

Purpose: This article tries to find out how the end of Moore's law limits development in Industry 4.0.

Method: For the purpose of the study we studied trends in the scientific literature. We studied the current hardware and software requirements of technology used in smart manufacturing (Cyber-physical systems, Internet of Things, Artificial Intelligence etc.), as well as predictions of when Moore's law is expected to end. Finally, we looked at the literature on alternative technologies, which could replace current hardware or increase its efficiency in ways that are not related to Moore's law directly.

Results: We found that Moore's law has reached the point at which the amount of money needed for research and development exceeds the potential profit, in addition to components getting so small on a nano degree that it will soon not be physically possible to make the components smaller. However, quantum computing and neuromorphic hardware show promise in making current hardware more efficient, along with the possibility of eventually fully replacing current hardware.

Organization: If quantum computing or neuromorphic hardware do not end up being viable additions to or alternatives to current technology, Industry 4.0 reaches a dead end, which means that there is a limit to how advanced software and hardware in smart manufacturing can become.

Society: For those that are afraid of technological development, smart manufacturing technologies reaching their limit might be seen as a positive outcome, however for an industry that is currently valued at approximately 71.7\$ billion dollars and is expected to grow to 156.6\$ billion dollars by 2024, this is not a great thing to hear. However, it seems that new technologies are emerging at just the right time for Industrial managers to not worry.

Originality: To the best of our knowledge, this kind of literature review has not yet been conducted within the context of Industry 4.0.

Limitations / further research: The limitation that arises is that the environment in which technology arises is constantly changing, within a few years these predictions might be outdated or updated, as well as the topic, is very complex and hard to predict.

Keywords: Industry 4.0 technology, Quantum computing, Neuromorphic hardware, Moore's law

Tine Bertonce received his PhD in management. He is a research assistant at the Faculty of organization studies, where he is doing research on Industry 4.0, management, early management systems and text mining. He authored or co-authored various scientific papers published in professional and academic journals.

Maja Meško is a full professor of management at the Faculty of Management, University of Primorska. She received PhD in kinesiology, the title of her doctoral dissertation is Defining certain motor abilities and psychological characteristics of the Slovenian military pilots. Her research interests include the areas of management, psychology in management, occupational health and management. She has also participated in various projects. She authored or co-authored various scientific papers published in professional and academic journals.
