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ЦИФРОВЫЕ ДВОЙНИКИ В ПРОМЫШЛЕННОСТИ: ГЕНЕЗИС, СОСТАВ, ТЕРМИНОЛОГИЯ, ТЕХНОЛОГИИ, ПЛАТФОРМЫ, ПЕРСПЕКТИВЫ. ЧАСТЬ 3. ПРИКЛАДНЫЕ ПЛАТФОРМЫ, ПРАКТИЧЕСКИЕ ПРИМЕРЫ, ПРОГНОЗЫ РАЗВИТИЯ, ВЫЗОВЫ.

Рассматриваются практические аспекты создания цифровых двойников (ЦД), прежде всего, применяемых в промышленности. Описываются прикладные платформы, реализующие ключевые элементы киберфизических систем: промышленный Internet вещей, анализ больших данных, коммуникационную и вычислительную инфраструктуру, собственно ЦД. Приводятся многочисленные примеры практического внедрения ЦД в промышленности. Характеризуются текущее состояние и тренды рынка ЦД в мире и в России. Обсуждаются социально-технические вызовы ширящегося распространения ЦД и задачи участников этого революционного этапа трансформации экономики: промышленности, науки, правительственных и финансовых институтов, общества.

Ключевые слова: цифровые двойники, киберфизические системы, прикладные платформы, большие данные, анализ данных, машинное обучение, искусственный интеллект, промышленный Internet вещей, рынок цифровых двойников.

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The third part of the paper addresses the practical aspects digital twin (DT) development for industrial applications. It describes applied platforms implementing the key elements of cyber-physical systems: Industrial Internet of Things, big data analysis, *communication and computational infrastructure, as well as the DT themselves. Numerous application cases from various industries are included, the current state and trends of the global and Russian DT markets are outlined. Finally, the paper discusses the socio-technical challenges of the increasing DT dissemination and the roles of the participants of the current revolutionary phase of economy transformation: industry, science, governmental and financial institutions, society.*

Keywords: digital twins, cyber-physical systems, applied platforms, big data, data analysis, machine learning, artificial intelligence, Industrial Internet of Things (IIoT), digital twin market.

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