Editorial: Social Manufacturing on Industrial Internet

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The fast development of the industrial internet is boosting the evolution of the manufacturing industry to a new stage of socialization, servitization, universal interaction and connection, and platformization. Under such a background, social manufacturing has emerged as a new kind of manufacturing paradigm characterized by self-driven, self-organization, self-adaptive, and cyber–physical–social interaction among huge numbers of socialized manufacturing resource providers. The most prominent advantage of social manufacturing is its capability of completing production/service orders with the limited internal manufacturing resource of an enterprise by utilizing socialized manufacturing resources from the outside, and this can be applied in both large and small enterprises and trigger value co-creation for both resource providers and demanders. In this regard, this Special Issue is established to explore how exactly the newly emerged social manufacturing paradigm influences the trends of mass customization and the configuration/operation patterns during order delivering, and how advanced information technologies such as industrial internet, cloud computing, blockchain, etc., can boost the development and application of social manufacturing. In total, 14 papers, including 2 review articles, have been collected in this Special Issue, and the key topics explored in these papers are briefly introduced below.

The paper in [1] introduced the issue of product customization under the context of social manufacturing. It introduced a framework that utilizes advanced deep learning models and cloud computing technologies to transfer the text/image data generated during manufacturing process into customized 3D contents that can be directly used for 3D printing. Supported by the framework, more effective product customization and more efficient social manufacturing operation and optimization can be realized.

The papers in [2–5] provided insights from the perspective of production configuration under the context of social manufacturing. Specifically, a graph convolutional network-based method for socialized designer team configuration was proposed in [2]. By utilizing the graph convolution network embedded with the graph matching algorithm, it can identify the socialized designers with the suitable design resources for a certain socialized design project, and thus provide decision making support for designer team configuration. In [3], a fast manufacturing system configuration model was established under the context of industrial 4.0 and social manufacturing, and the model could be particularly useful for small enterprises to improve their existing manufacturing system to meet the new requirements of wider customized product varieties, a shorter response time to new orders, a faster manufacturing system configuration process, etc., from the new market environment. Aiming at the situation that one large 3D printing order could be collaboratively carried out by multiple factories under the context of social manufacturing, a multi-part production planning system particularly for 3D printing orders was established

in [4]. The system utilizes multiple types of intelligent algorithms to support printing order separation, printing part orientation, and nesting during order collaboration. A novel method for configuring the data acquisition network for socialized intelligent factory was proposed in [5]. The data acquisition network can realize real-time data collection and pre-processing for energy consumption analysis, and thus support further intelligent optimization on energy consumption.

The papers in [6–9] provided ideas from the perspective of supporting production operations with advanced techniques such as industrial internet, cloud-edge collaboration technologies, etc., which are fundamental for enabling the social manufacturing paradigm. For example, production data management and application during cloud manufacturing is considered in [6]. In this paper, a kind of cloud manufacturing system enhanced with an industrial internet of things and cloud-edge collaboration was established. The system can describe the characteristics of heterogeneous manufacturing resources, the operational data of the resources, and their relations with the service-oriented manufacturing system. In addition, a middleware and AI edge gate way model was established, and it utilizes real-time sensor data to realize the remote monitoring and controlling of cloud manufacturing resources. Supported by the system, companies can better utilize the distributed cloud manufacturing resources and improve their response speed to personalized orders. In [7], a kind of equipment asset management model was established based on industrial internet platform techniques and a fuzzy DEMATEL-TOPSIS algorithm under the general framework of system engineering. By collecting the required data for asset management from the industrial internet platform established for the target industrial, the fuzzy DEMATEL-TOPSIS algorithm is then applied to identify the relations among the requirements from customers and the characteristics of the assets registered in the platform. In this way, the model helps to establish the solutions for asset management for the entire product lifecycle. The one review article in [8] reviewed the related research on utilizing advanced information technologies (e.g., edge/cloud/fog computing, big data collecting and processing, artificial intelligence, digital twin, etc.) for equipment or production line maintenance. The other review paper in [9] established a blockchain-based method to support a trustworthy operation environment for manufacturing activities under the context of industrial 5.0 and social manufacturing. By applying an industrial Internet of Things network enhanced with blockchain networks, the method can protect the confidential and private data of stakeholders, and thus support the realization of resilient and trustworthy manufacturing operation.

The papers in [10–13] provided technical road maps from the perspective of a few fundamental information and data techniques that can support social and intelligent manufacturing realization. For example, a kind of high precision synchronous control method for a fieldbus control system is established in [10], and it can improve the control accuracy of multi-axis collaborative machining tasks. A novel method for liquid crystal display module alignment and particle detection in anisotropic conductive film bonding was established in [11]. By applying only one camera instead of multiple to obtain images of multiple locations, the method can realize the transformation from image space to world coordinates. Compared with the traditional methods which apply multiple cameras, the method can accurately identify the rotation center, the position, and angle deviation of the target object with a relatively lower economic and time cost. A kind of deep learning-driven defect image generation method was established in [12]. The method was for solving data enhancement problems in industrial defect detection. By applying a masked defect image generation adversarial network, the method can solve the problems of a loss of background information, an insufficient consideration of complex defects, and a lack of accurate annotation image data which usually occurred during data-driven defect detection. A kind of online dimensional error prediction method to predict the errors occurred during grinding process was proposed in [13]. The method was driven by principal component analysis, extreme learning machine, genetic algorithm, and ensemble strategy (bagging algorithm). By applying the method, grinding errors can be detected in a real-time manner with our extra devices and space occupation.

Finally, a case study of social manufacturing from the entry point of the value chain was proposed in [14]. First, a kind of value chain model under the context of the social manufacturing paradigm was established; it then utilized the cases from the crane industry to demonstrate the advantages of the established model.

All the papers above provide a reference for academic research and the industrial application of social manufacturing. However, as a newly emerged research topic, there are still unexplored issues for more optimal interaction/configuration/operation under the context of social manufacturing such as the implementation of collective and social 3D printing factories, realizing collective intelligence during social manufacturing operation, applying advanced cross-modal data processing techniques for extracting and utilizing production data for social manufacturing optimization, etc.

Conflicts of Interest: The authors declare no conflict of interest.

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