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Editorial

Competitive and Sustainable Manufacturing in the Age of Globalization

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Abstract: Competitiveness is the ability and performance of a firm, subsector or country to sell or supply goods or services in a given market. The competitiveness and sustainability of an enterprise are closely related. Competitiveness has received ever-growing attention in the era of globalization. This Special Issue provides a forum for researchers and practitioners to review and disseminate quality research work on competitive and sustainable manufacturing in the era of globalization and their applications, and to identify critical issues for further developments.

Keywords: competitiveness; sustainability; manufacturing; globalization

1. Introduction

With the trend of globalization, the competition within some industries is becoming increasingly fierce. To survive in the industry, every firm must strive to continually improve its competence in one way or another [1]. For example, some firms do not have their own factories, so they can focus on activities that are more profitable [2], while others continue expanding their manufacturing capacity to further drive down costs [3]. Other common strategies include: outsourcing [4], the blue ocean strategy [5], better scheduling [6,7], factory simulation [8,9], green and lean technologies [10–12], applying the competitiveness diamond model [13], cyber-physical systems and cloud manufacturing [14–16], developing next-generation technologies [17,18], forming alliances [19,20], etc.

In contrast, some studies have shown that even with considerable research and development (R&D) capabilities, manufacturers cannot guarantee long-term competitiveness (i.e., sustainability) [1,21]. In addition, in the past, support from the government enabled the continued growth of manufacturers in some regions. After such support disappears, maintaining competitiveness and sustainability becomes a big problem [22]. Further, the rise of the Chinese market and of its manufacturers has brought opportunities and threats to existing firms [22,23].

This Special Issue is intended to provide details regarding sustainable development and competitive strategies, and their applications to manufacturing.

2. Competitive and Sustainable Manufacturing Approaches

Sophisticated models for assisting the design processes of complex mechanical products are essential for managers or designers to manage design processes and further improve design efficiency. Zheng et al. [24] put forth a supernetwork-based model for designing complex mechanical products. They first identified the key elements in the design processes of complex mechanical products. Then, based on these, they analyzed the sub-elements of the key elements and the relationships between the sub-elements. Finally, sub-networks with sub-elements were built as nodes and their relationships as edges, forming the supernetwork model for assisting the design processes of complex mechanical products based on the sub-networks and their relationships.

The conventional failure modes and effects analysis (FMEA) approaches fail to explain the aggregate effects of a failure from different perspectives such as technical severity, economic severity, and production capacity in some practical applications. To fulfill this gap, Nguyen et al. [25] proposed an extension by considering the associated quality costs and the capability of a failure detection system as additional determinants to signify the priority level for each failure mode. Analytical results indicated that the proposed approach remarkably reduced the percentage of defective fabrics, thus significantly reducing wastes and increasing the operational efficiency.

Joining global production networks is critical to fostering local supplier upgrading. However, heterogeneous buyer-supplier relationships have rarely been configured and even incorporated into such networks empirically. To address this issue, Cho and Lim [26] proposed a framework based on which the features of buyer-supplier relationships can be related to the aspects of local supplier upgrading. In addition, the results of a latent class analysis showed that the ways value chains are governed have different effects on various types of technological upgrading.

Woo and Cho [27] discussed the mechanism under which the cost of wage rigidity is transferred from contractors to subcontracting firms, which in turn aggravates the inequality among the wages of workers in contracting and subcontracting firms. In addition, after studying a Korean case, the intensity of this transferring mechanism was shown to differ from industry to industry. Lu et al. [28] examined consumers' moral reactions to a product-harm crisis. After conducting a national-wide survey with 801 respondents in China, they found that consumers will react to a product-harm crisis through controlled cognitive processing and emotional intuition. In addition, the survey results also showed that consumers view a product-harm crisis as an ethical issue, and will make an ethical judgment according to the perceived severity and relevance of the crisis.

The Japanese automobile industry has been suffering a huge economic downturn in the recent decade. The rise in costs and the decline in sales led to serious problems in this industry, such as the waste of time in replacing assembly boards for manufacturing lines. To tackle this issue, Wang et al. [29] applied the Teoriya Resheniya Izobreatatelskih Zadatch (TRIZ) approach to provide efficient solutions for the automobile industry. They first analyzed the technical problems using the function and attribute analysis (FAA) model. Then, a contradiction matrix and the inventive principle were applied to find possible solutions to these problems.

Equal channel angular pressing (ECAP) is the most popular and simple process to produce nano-titanium. However, ECAP is time-consuming, power-wasting, and far from sufficient to produce the required ultrafine-grain structure. To address this issue, Wang et al. [30] applied the Teoriya Resheniya Izobreatatelskih Zadatch (TRIZ) approach to improve the performance of ECAP, especially in reducing the production costs.

Because of the dynamic and complex characteristics of foods and their production, environment and sustainability issues are critical to the food industry. Pipatprapa et al. [31] applied the hybrid structural equation modeling (SEM) and the fuzzy analytic hierarchy process (FAHP) approach to find out factors that are influential on the environmental performance of Thailand's food industry. The results showed that quality management, market orientation, and innovation capability have significantly positive effects on the environmental performance.

Aggregate production planning (APP) is an important task in production planning and control. However, the existing models, either static or dynamic, have several shortcomings. To overcome these, Davizón et al. [32] formulated a mathematical model to achieve optimal control. The mathematical model integrates a second-order dynamical system with a first-order system by considering the production rate, inventory level, capacity, and costs of the work force.

Galal and Moneim [33] formulated a mixed integer nonlinear programming model to determine the product mix in a manufacturing facility to maximize the sustainability index (SI) which is the weighted sum of the economic, environmental, and social measures of sustainability. The weights of these measures were determined using the analytic hierarchy process (AHP) approach.

Electronic paper (e-paper) has a lot of important applications. Huang et al. [34] estimated the future market size of Taiwan's e-paper industry using a hybrid grey model. They incorporated Fourier series and a Markov chain into discrete Grey model (DGM) (2, 1) and the Verhulst model, respectively, and proposed two new models—Fourier Markov (FM)-Verhulst and FMDGM (2, 1). According to the experimental results, the two models outperformed the existing grey models in improving the estimation accuracy.

Lu et al. [35] investigated the effects of the internal technological innovation capability (ITIC) and external linkages (ELs) on the upgrading of the Chinese automotive manufacturing industry (CAMI) in the global value chain. The results showed that compared to ELs, ITIC was more critical to the upgrading of CAMI. In addition, in some regions, such as Shanghai and Chongqing, the effects of EL are far from significant. In contrast, in other regions, more benefits can be gained through suitable clustering.

3. Conclusions

In the era of globalization, many world-class companies have migrated to certain countries or regions for competitive manufacturing, which highlights the importance of competitive manufacturing for any global company's sustainable development. This Special Issue features a balance between state-of-the-art research on competitive and sustainable manufacturing in the era of globalization. All methods proposed in this Special Issue have been applied to practical examples. Several valuable results were obtained, which support these methods to be viable strategies in planning-related activities.

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