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The Impact of Technological Innovation on China's Construction Machinery Industry's International Competitiveness

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Abstract

This paper deals with the influence of technological innovation on international competitiveness of the construction machinery industry in China. It utilizes a qualitative approach to decode the nature of competition within the construction machinery industry. Results indicated that the technological innovation is one of the major components that raise the industry's international competitiveness. This study suggests that one of the investments of being a winner in the world market is having research and development, developing new technologies and customer satisfaction. This paper would then add to the literature regarding technological innovation and international competitiveness for the construction machinery industry and provide more insights and recommendations for further research.

Keywords: Impact of Technological, Innovation, Construction Machinery, International Competitiveness

Introduction

China's construction machinery industry has been growing rapidly and is now considered one of the most influential industry worldwide. Construction machinery is closely related to the development of infrastructures, urbanization and industrialization in China (Luo et al., 2020). Over the years, technology and innovation have emerged as enablers of competitiveness and growth for Chinese construction machinery manufacturers (Xu et al., 2022). ‟Technology has revolutionized the construction machinery industry sector, from advanced AI to robotics, digitalization and data analytics (Zhang et al., 2023). This has greatly enhanced the industry's efficiency and significantly improved the quality, efficiency and adaptability of construction machinery. As such, Chinese manufacturers are increasingly recognized as able to supply cost-effective, high-performance and reliable solutions to a wide range of challenges presented by the construction community.”

“Further, the high concern for sustainability and issues around the environment has raised the development of machinery focusing on efficiency and eco-friendliness (Luo et al.,

2020). Understanding the importance and implications of technology over innovation becomes critically important in the light of focusing development of the construction machinery sector within the region of China. The paper discusses the issues concerned with innovation and international competitiveness in the sector followed by the strategies, challenges, and the opportunities that the Chinese manufacturers face in the world market.

Background to the Study

"The last decades have seen a giant shift in growth and transformation in China's heavy construction machinery industry. China, the world giant in the market for construction machinery, has been the most sought-after destination for companies from all over the world. Massive investments in infrastructure, urbanization and industrialization in the country over the last decade have been taking place. "With technology development for high-value, high-quality yet cost-effective machine solutions, Chinese manufacturers increasingly fanned out to mark a significant presence in the local and global markets. One of the country's highest consumption markets of sophisticated construction machinery, it boasts a variety of active projects from super transportation networks to mega energy infrastructure, thereby further promoting the pivotal role of this industry in driving economic growth and development in China."

Problem Statement

China's construction machinery industry experienced a deep market adjustment from 2011 to 2015, and since 2016, benefited from the country's increased investment in infrastructure construction, the construction machinery industry for six consecutive years to show growth. Due to real estate, epidemics and other multiple factors, the overall sales volume of construction machinery declined in 2022, the 12 categories of construction machinery products sales totaled about 1,709,800 units, a year-on-year decline of -8.13%. The international market share of China's construction machinery industry continued to improve, and the export value increased substantially. 2022 annual export value reached a record again, reaching $44.302 billion, based on the record $34 billion in 2021.(China Construction Machinery Association,2022).

Although China's construction machinery industry has achieved promising result in the international market, construction machinery enterprises are facing the problems of fierce competition in overseas markets and basic saturation in the domestic market. In the next step of development, how to enhance the international competitiveness of China's construction machinery industry and improve the market share and profitability of enterprises is a problem worth studying.

"Even as the Chinese construction machinery industry has expanded over the years, it needs help with its international competitive positioning. Over the years, product quality, reliability and pricing parameters have affected buyers' decisions. This fact has placed many domestic firms at loggerheads with international benchmarks. "However, the changes in the industry dynamics in the last decade have been visible, and clear lines of changing industry competitive dynamics have been appearing. Technological innovation is one of the predominant changing agents, increasing the product's performance, reliability and efficiency. This shift has started to even out the playing field, making Chinese manufacturers

capable of outdoing the industry's global standards and in turn, beefing up their position in the fiercely competitive international marketplace."

Research Problems

"Due to the upsurge in growth of the Chinese construction machinery industry, its position in global competitiveness has emerged. Some issues, such as the quality of the products, reliability and pricing, have been elements impacting the buyers' choices. They have left domestic firms struggling to match up the international benchmarks. "However, the scenario has changed and a visible shift in the industry's competitive dynamics has occurred. Technological innovation has become a powerful driver of change, altering landscapes and adding value to products through enhanced performance, reliability and efficiency. This has helped neutralize the playing field, allowing the Chinese manufacturers not to catch up but to outdo the world's standards for the industry and thus substantiate their place in the highly aggressive international market."

Research Objectives

"This study's main research problem is the influence of technological innovation on the international competitiveness of China's construction machinery industry. The study specifically analyses how emerging trends and advancements in areas such as artificial intelligence (AI), robotics, digitalization and data analytics have redefined or changed the dynamics of the market and competitive strategies within the industry. "This is one fundamental question in light of the key role played by technological innovation in driving industrial growth and competitiveness. This paper seeks to understand the dynamics that led to the success of the Chinese construction machinery sector on the global stage by gaining insights into the factors that drive innovation and impact the global standing of the industry."

Literature Review

Historical Context of China's Construction Machinery Industry

"The development history of China's construction machinery industry is traced back to the early days of economic reform and opening-up policies in the 1970s (Zhou, 2014). "Initially, the industry was comparably small and domestically oriented, based mainly on the local markets. Only with the rapid economic growth and industrialization in China in the following decades did the demand for construction machinery soar. "A further spike in this trend came with increased demand for real estate, large-scale infrastructure projects, and urbanization (Liu et al., 2019). The construction machinery industry in China opened up the entry of foreign players, largely from the developed countries, who also brought advanced technologies and management practices in the 1990s (Huang et al., 2013). All of these led to considerable improvements in product quality, reliability and performance, raising the bar for what the manufacturer intended."

"Since the early 2000s, "the construction machinery industry in China has been growing rapidly and has now become the world's largest market for construction machinery products, valued at $40 billion (Vantage Market, 2022). It has attracted vast domestic and overseas investment and participation. China's construction machinery is powered by increased infrastructure spending, urbanization, and government focus on sustainable development (Wang et al., 2015). This resulted in the growth of Chinese manufacturers as a growing force in the global construction machinery market, riding on the back of their cost

advantage and tech knowledge (Wang et al., 2015)." "In recent years, it has been one of the major directions for innovation and technical advancement by the Chinese government. The 2015-launched "Made in China 2025" campaign aspires to create a global manufacturing giant from China through innovation, upgrading technology, and giving more muscle to the competitive landscape (Huimin et al., 2018). Such an endeavour has contributed to increasing investment in research and development and employing modern AI, robotics, digitalization and data analytics technologies in the construction machinery industry.

Overview of Technological Innovation in the Industry

Innovations in technology within the construction machinery business have been necessary to bring growth and improvement in the industry, thereby making the sector more competitive. Development in technology for construction machinery has been traditionally slow, as labour has been the primary approach towards construction (Ramadan et al., 2023). However, since the late 19th and early 20th centuries, the industry has witnessed significant leaps in innovation. Among those other notable breakthroughs, hydraulic systems applied to construction machinery were noted for their first appearance, pioneered by engineer John Froelich, with the introduction of the first gasoline-powered tractor in 1892. This innovation revolutionized machinery making, which allowed heavier duties to be performed with precision and efficiency (Xu & Yoon, 2016).

Some of the other major technological innovations of the construction industry post-World War II included the surfacing of the backhoe loader back in the 1950s. This machine is the most versatile because it carries out the combined role of a bulldozer and an excavator with hydraulic power, hence its versatility and flexibility in any construction area (Rustamov & Pardaboyev, 2023). Machinery rapidly developed in the late 20th and 21st centuries due to computer-aided design (CAD) and computer numerical control (CNC) machining. The need arose for high-tech machines such as 3D printers and robotic construction machines to produce parts as accurately as possible and quickly (Cabibihan et al., 2023).

International Competitiveness and Its Determinants

The construction machinery industry has always been characterized by a product quality, reliability and cost, where manufacturers always find a way to produce effective and reliable machinery at competitive prices (Pheng & Hou, 2019). Technological innovation in the last few years has become one of the important determinants of competitiveness today as it has changed the landscape and influenced the dynamics and market strategies (He, 2020).

One of the major determinants of international competitiveness in the construction machinery industry is product quality. Quality-sensitive buyers demand machinery that can perform its functions with reliability and promptness (Pheng & Hou, 2019). Manufacturers who provide quality without fail will normally be in a competitive advantage compared to their competitors internationally. Technological innovation is another factor that affects the competitive status of a company. Innovation and new technology can provide competitive leverage to manufacturers to serve the market in developing products that can adapt to the market's ever-changing needs (He, 2020). Innovations like artificial intelligence (AI), robotics, digitalization, and data analytics are disrupting industry practices and positioning manufacturers for new opportunities to increase productivity and efficiency (Zhang et al., 2023).

Cost is also an important determinant of international competitiveness. Costs impedes new layers into the manufacturer space (Wang et al., 2020). In addition, manufacturers would have to offer competitive prices with a decent profit margin in a global market. Competitive manufacturers will be the hallmarks of cost efficiency through technological innovation (Azeem et al., 2020). In addition, market position and brand name are important determinants of competitiveness. Manufacturers perceived as reliable, innovative and customer-oriented are bound to have a competitive edge (Ghanadiof, 2021). In addition, the strong brand name of a product may help the manufacturers break into new ground with the product and attract a large market among buyers (Ghanadiof, 2021).

Innovation Theory and the Construction Machinery Industry

Innovations in construction machinery often comply with principles articulated by Joseph Schumpeter's theory of "creative destruction." "The theory suggests that innovations advance economic growth by supplanting the existing technologies with newer and more efficient ones (Pfarrer & Smith, 2015). The cycle of innovation and obsolescence, therefore, propels development and the gain of economic growth. "The innovation theory of the construction machinery sector can be associated with several parts, from the design of the product to the manufacturing process and the market strategies (Kuklina et al., 2021). Similar types of innovation in manufacturing processes, such as 3D printing and modular construction, have resulted in cost savings and efficiency gains (Kuklina et al., 2021)."

"The theory of innovation is equally applicable in developing construction materials. For instance, the development of new, stronger and more durable materials, such as carbon nanotubes and graphene, is today possible with the power of research in nanotechnology (Utsev et al., 2023). This can revolutionize construction, making it lighter, more flexible and energy efficient. There are also changes in business model innovations that the companies in the construction machinery industry are also implementing in order to be able to keep them ahead in competitive business environment". Subscription-based models, where the customer pays a monthly fee for access to the machinery, are gaining traction (Schuh et al., 2020). This would allow companies the benefit of recurring revenue, with benefits to the customers who would gain access to the most cutting-edge equipment without the huge upfront costs (Schuh et al., 2020)."

Competitive Advantage Theories

The theories of competitive advantage, particularly Michael Porter's diamond model, allow for dissection of determinants around the competitive dynamics within the construction machinery industry. The Porter model refers to elements such as factor conditions, demand conditions, related and supporting industries, firm strategy, structure and rivalry as the key determinants of competitive advantage (Liu & Pan, 2012).

Factor Conditions

Factor conditions relate to inputs that firms can use, including natural resources, labor and infrastructure (Liu & Pan, 2012). They would prove a point of competition between countries in the construction machinery industry. For instance, if the country is resource-rich, has skilled labor, and the rest of the factors of production are highly developed, then that country will have a comparative advantage in the manufacture of construction machinery (Liu & Pan, 2012). However, the comparative advantage of a country with inadequate resources

and infrastructure may need to be stronger in manufacturing construction machinery on a global scale.

Demand Conditions

Demand conditions are based on the nature and sophistication of domestic demand concerning a product (Eickelpasch et al., 2010). The demand conditions for construction machinery are a function of the following parameters economic growth, urbanization, and government spending on infrastructure (Eickelpasch et al., 2010). For example, countries with strong local demand for construction machinery probably have a competitive advantage in the industry.

Related and Supporting Industries

Related and supporting industries are complementary industries that support and contribute to competitive advantage. The construction machinery industry has all the related and supporting industries, such as raw materials, components and technology suppliers (Pheng & Hou, 2019). A network of suppliers for the industry supports firms in lowering costs and improving the quality of products.

Firm Strategy, Structure and Rivalry

According to Porter, a firm's strategy, structure, and rivalry determine how a firm will compete within a given industry. In the construction machinery industry, competitive advantage emanates from innovative product design, efficient manufacturing processes and marketing (Yan et al., 2022).

Adoption and Diffusion of Technology Frameworks and Their Implications on the Construction Machinery Industry

The adoption and diffusion of technology frameworks shape the competitive landscape of the construction machinery industry. They could explain how new technologies are adopted and spread among users.

Rogers' Diffusion of Innovations Theory

Rogers' diffusion of innovations theory can be applied to the construction machinery industry, categorizing adopters as innovators, early adopters, early majority, late majority and laggards (Kale & Arditi, 2010). This industry is typically left to the innovators and early adopters, the big companies with all the required resources and capacities for experimenting with new technologies (Kale & Arditi, 2010). For the construction machinery industry, this will imply that the companies in that industry will increasingly need to prove the advantages of adopting the new machinery to the early and late majority. The introduction of cutting-edge construction machinery could be both self-driving vehicles and 3D printing technology, which can promise both more effective and ending with improved safety on the construction sites. The early companies adopting these technologies will have an early competitive gain relative to their competitors (Kale & Arditi, 2010). Further, the diffusion of technology frameworks can result in industry-wide changes in the manufacturing process, supply chains and business models.

Methodology

This paper adopted a literature review method to examine how technological innovation works and its effects on the international competitiveness of the Chinese construction machinery industry. The approach allowed for analysis of the available data, research and scholarly literature to create insights into the research topic and to summarize the data sourced from various government and industry publications (Snyder, 2019).

Research Design

"The research design employed in the current study is exploratory research. An exploratory study helps gain insight into the research question (Hallingberg et al., 2018). As such, this design helped investigate how technological innovation affects the competitiveness of the Chinese construction machinery industry internationally" through the existing literature, among other things.

Data Collection

"The data collection involved a comprehensive review of academic journals, reports and any other related literature on the subject. The researcher located and reviewed relevant articles and publications from diverse sources, such as academic databases from sites such as JSTOR and ScienceDirect and government publications. In addition, the research involved scanning for key phrases that match the best study for the process."

Data Analysis

The data analysis process encompassed a synthesis and summarization of key findings and trends developed from the literature review. This involved identifying common themes, trends and patterns in the reviewed literature. The objective focus was defined for analysis: specifying the influence of technological innovation on the international competitiveness in the construction machinery industry of China and the factors that exert influence.

Results

"Technological innovations in the industry have greatly affected product design and development in construction machinery. These developments resulted in more efficiency and effectiveness in machinery, furthering productivity and quality of work in the construction sector (Xu & Yoon, 2016). The use of advanced materials in the production of construction machinery is among the major innovations that have impinged product design and development in a great way. These materials are lighter, stronger and more durable than the traditional, enabling the manufacturers to build more efficient, cost-effective machinery (Utsev et al., 2023). Another innovation worth noting is the application of automation and robotics in construction machinery. This has seen the development of machines that have better output in terms of accuracy and speed in doing tasks, and this has translated into more productivity for companies within the construction industry and reduced costs within the processS (Zhang et al., 2023). The technologies have helped manufacturers collect data from their machinery and help analyse them in order to understand areas that need improvements and optimization in their processes."

"Advanced technologies have brought major changes in the manufacturing process of this construction machinery industry. Robotics, artificial intelligence (AI), and digitalization are widely used along the production lines in many companies (He, 2020). Robotics has

revolutionized the assembly line in such a way that many repetitive tasks have become automated and precision has gone up. This has, in turn, translated to reduced downtime and reduced associated costs for unexpected breakdowns (Zhang et al., 2023). Generally, digitalization has streamlined the manufacturing process to a huge degree". From digital design and simulation through the level of supply chain and logistics optimization, digital tools are more effective and reduce waste. Additive manufacturing (3D printing) is also practiced at companies for prototyping and manufacturing complicated parts and helps decrease lead times and improve efficiency (Kuklina et al., 2021).

Therefore, adopting technological innovations has generated impetus for the competitiveness of China's construction machinery industry. Such companies, in turn, as investment in sophisticated technology is accompanied by an enhancement of quality and operational efficiency, let the firm become better positioned on the market. This has seen them capture market share in both local and international market segments. Besides, it has allowed companies based on innovation to provide more differential products with many features and benefits to those competitors. It has enabled them to make a leadership position for them in niche markets or segments. Companies that have taken to sustainability by using eco-friendly technologies in their machinery have been able to win a competitive advantage.

Discussion

The findings are in close conformance with the literature review on technological innovation and international competitiveness within the construction machinery industry. Research indicates that those companies that are focused on new technologies and research and development (R & D) are the ones that can maintain their competitive edge in the global market (Yan et al., 2022, Kale & Arditi, 2010). "Furthermore, the literature further identifies a customer focus as a means to acquire and maintain international competitiveness. Firms that are deeply involved in understanding their customers' needs and preferences are likely to design and deliver products that cater to the needs of their clients (Pheng & Hou, 2019)."

"The literature emphasizes the importance of strategic collaboration in strengthening innovation through gaining newer technologies. Strategic collaboration with research institutions, governmental agencies and other firms grants an organization access to resources and expertise that it needs to have within itself (Huimin et al., 2018). In addition, the results have indicated that a regulatory environment is very important in determining firms' innovative capability and international competitiveness. Regulatory barriers may disrupt the process of innovations in case the adoption of certain technologies or materials is limited. Conversely, only a good regulatory environment can support innovation by offering incentives and facilitating the reason for resources. Especially so in matters of sustainability and environmental friendliness, when government regulation and incentives are an important driver for the market to adopt eco-friendly technologies.

Evidently, technological innovation over the years has been a major driving factor that shaped the construction machinery industry in product design and development with impacts involved in producing more efficient and effective products. It has drastically impacted design by using advanced materials such as lightweight, high-strength, and durable to design efficient and cost-effective machinery (Utsev et al., 2023; Xu & Yoon, 2016). In addition, the use of automation and robotics resulted in more accurate and faster machines, consequently

increasing productivity and reducing costs for companies in the construction industry (Zhang et al., 2023).

Additionally, the ways the manufacturing has been conducted have experienced some technological changes in the industry, and most of the repeatable activities have been highly automated to improve precision and minimize downtimes (Zhang et al., 2023). Digitalization streamlines manufacturing processes from design and simulation to supply chain management and logistics optimization (He, 2020). On the other hand, additive manufacturing, such as 3D printing, allows a company to prototype and economically produce complex parts more effectively (Kuklina et al., 2021).

As such, with the advent of innovative technology, there has been a significant improvement in international competitiveness in China's construction machinery industry. Adopting innovative technologies allows a company to manufacture more efficient and higher quality machinery, enabling the company to always be in a better market competitive position. Furthermore, it leads to more market share in domestic and international markets for the innovating companies. Another advantage of eco-friendly technologies is that companies using them can differentiate their products and thus gain a competitive advantage.

Implications for Theory and Practice

The practical implications of the findings obtained in this work relate to theoretical research and practical implications in the construction machinery industry. The results of this study will add to the body of existing literature regarding the technological innovation and international competitiveness of the construction machinery industry. The paper especially expounds on technological innovation, strategic partnership, and customer focus, which align with the drivers of international competitiveness identified in previous research. The insight is further extended to how regulatory environments influence the adoption of innovation, which, in turn, impacts competitiveness. The results, therefore, bring a certain nuance to the determinants of a company's ability to innovate and compete internationally within this industry.

The results are, therefore, useful to industry practitioners in gaining insights into the right strategies that can enhance the company's international competitiveness. Companies must invest in R&D to develop new technologies that meet the customer's needs and increase the firm's efficient performance. Forming strategic alliances will help access the resources and expertise important to innovation and new markets. Further, while deciding about the strategy to be adopted by the company, critical attention should be given to the regulatory environment as regulation critically influences innovation and competitiveness.

Future Research Recommendations

This study has set a background for the construction machinery industry for the future as some of the areas are quite promising for the future and require further investigation.

Comparison with Other Manufacturing Sectors: Future research shall compare the innovation strategy and competitiveness of the construction machinery industry with other manufacturing sectors. In the same case, further researchers can dig deeper into the level of

competitiveness and innovation in the construction machinery industry when they compare and understand similarities and differences with other industries.

***Longitudinal Study*:** This study may follow the innovation trajectories of companies in the long run, to witness how this innovation evolution affects companies and how the whole phenomenon affects competitiveness. The approach would help look at innovation dynamics over time and show how companies would adjust to changes.

Regional Analysis: Research focusing on regions may inquire into regional factors in government policies, industry clusters and economic conditions affecting innovation and competitiveness within the construction machinery industry. This would allow a view of regional dynamics and context that define innovations and competitiveness.

Technology: Future studies will likely consider an inspection of the role of emerging technologies, such as artificial intelligence, the Internet of Things (IoT), and blockchain, in the competitiveness of building and construction machinery. Such an emerging technology might serve the industry's crucial role, which will be a further research base for this field.

Sustainability: With the increasing focus on sustainability and environmentally friendly practices, future research would tackle the impacts of eco-friendly technologies on the competitiveness of the construction machinery industry. It might be a field of analysis to check how the practices and policies towards sustainability affect the innovation strategies and the competitiveness of firms.

Global Supply Chains: Research can be done about how global supply chains provide the base for facilitating innovations to enhance competitiveness in the construction machinery industry. It will include how companies work with suppliers and other partners to innovate and improve their products.

Cultural Factors: Future research will be about how cultural factors are important for innovation and competitiveness in the construction machinery industry. Cultural norms, values and beliefs influence companies' innovation strategies and competitiveness worldwide. This could give an understanding of such cultural dynamics to enable a firm to enhance innovation and competitiveness.

Conclusion

This research addressed the influence of technological innovation on the international competitiveness of the construction machinery industry in China. The research applied the qualitative approach as the key methodology for the study. The results indicate that technological innovation is fundamental for the industry's upturn in international competitiveness. Companies that invest in R&D and other new technologies focusing on customer satisfaction could have a good prospect of succeeding in the international markets. The availability of strategic partners in different parts of the world and a regulatory and policy environment supportive of innovation are also boosting competitiveness and innovation.

References

Azeem, M., Ullah, F., Thaheem, M. J., & Qayyum, S. (2020). Competitiveness in the construction industry: A contractor's perspective on barriers to improving the construction industry performance. *Journal of Construction Engineering, Management & Innovation*, *3*(3), 193–219. https://doi.org/10.31462/jcemi.2020.03193219

Cabibihan, J.-J., Gaballa, A., Fadli, F., Irshidat, M., Mahdi, E., Nimish Biloria, Mansour, Z., & Houssam Abdulrazak. (2023). *A guided approach for utilizing concrete robotic 3D printing for the architecture, engineering, and construction industry*. https://doi.org/10.1007/s41693-023-00103-9

Eickelpasch, A., Lejpras, A., & Stephan, A. (2010). *Locational and Internal Sources of Firm Competitive Advantage: Applying Porter's Diamond Model at the Firm Level*. https://www.diva-portal.org/smash/get/diva2:552194/FULLTEXT01.pdf

Ghanadiof, O. (2021). Customer Loyalty and Powerful Brand in Heavy Machinery Industry. *European Journal of Business and Management Research*, *6*(3), 195–199. https://doi.org/10.24018/ejbmr.2021.6.3.903

Hallingberg, B., Turley, R., Segrott, J., Wight, D., Craig, P., Moore, L., Murphy, S., Robling, M., Simpson, S. A., & Moore, G. (2018). Exploratory studies to decide whether and how to proceed with full-scale evaluations of public health interventions: a systematic review of guidance. *Pilot and Feasibility Studies*, *4*(1), 1–12. NCBI. https://doi.org/10.1186/s40814-018-0290-8

He, Y. (2020). Application of Information Technology in Construction Machinery Management. *Journal of Physics: Conference Series*, *1486*, 022039. https://doi.org/10.1088/1742-6596/1486/2/022039

Huang, Y., Lan, Y., & Bai, Y. (2013). *Development of the Chinese Construction Industry after the Cultural Revolution: Administration Framework, Economic Growth, and Market Structure*. https://epublications.marquette.edu/cgi/viewcontent.cgi?article=1328&context=civengin_fac

Huimin, M., Wu, X., Yan, L., Huang, H., Wu, H., Xiong, J., & Zhang, J. (2018). Strategic Plan of "Made in China 2025" and Its Implementation. *Advances in Business Information Systems and Analytics*, 1–23. https://doi.org/10.4018/978-1-5225-3468-6.ch001

Kale, S., & Arditi, D. (2010). Innovation Diffusion Modeling in the Construction Industry. *Journal of Construction Engineering and Management*, *136*(3), 329–340. https://doi.org/10.1061/(asce)co.1943-7862.0000134

Kuklina, M. V., Rogov, V. Y., Erdinieva, S. N., & Urazov, I. S. (2021). Innovation in the construction industry. *IOP Conference Series: Earth and Environmental Science*, *751*(1), 012101. Researchgate. https://doi.org/10.1088/1755-1315/751/1/012101

Liu, M., Chen, F., & Guo, K. (2019). Research on the Relevance of China's Construction Industry, Real Estate Industry and Fixed Assets Investment. *IOP Conference Series: Materials Science and Engineering*, *688*, 055071. https://doi.org/10.1088/1757-899x/688/5/055071

Liu, S.-K., & Pan, N.-H. (2012). Integrating the diamond theory and the 3C model: The construction companies in Taiwan. *Journal of Statistics and Management Systems*, *15*(6), 601–625. https://doi.org/10.1080/09720510.2012.10701644

Luo, Y., Xiang, P., & Wang, Y. (2020). Investigate the Relationship between Urbanization and Industrialization using a Coordination Model: A Case Study of China. *Sustainability*, *12*(3), 916. https://doi.org/10.3390/su12030916

Pfarrer, M. D., & Smith, K. G. (2015). Creative Destruction. *Wiley Encyclopedia of Management*, 1–3. https://doi.org/10.1002/9781118785317.weom030020

Pheng, L. S., & Hou, L. S. (2019). The Economy and the Construction Industry. *Construction Quality and the Economy*, 21–54. Ncbi. https://doi.org/10.1007/978-981-13-5847-0_2

Ramadan, B., Nassereddine, H., Taylor, T. R. B., & Goodrum, P. (2023). Impact of technology use on workforce performance and information access in the construction industry. *Frontiers in Built Environment*, *9*. https://doi.org/10.3389/fbuil.2023.1079203

Rustamov, K., & Pardaboyev, Z. (2023). *THE HISTORY OF THE CREATION OF THE BACKHOE LOADER*. https://www.conferenceseries.info/index.php/natural/article/download/1255/1132

Schuh, G., Wenger, L., Stich, V., Hicking, J., & Gailus, J. (2020). Outcome Economy: Subscription Business Models in Machinery and Plant Engineering. *Procedia CIRP*, *93*, 599–604. https://doi.org/10.1016/j.procir.2020.04.146

Snyder, H. (2019). Literature Review as a Research methodology: an Overview and Guidelines. *Journal of Business Research*, *104*(1), 333–339. ScienceDirect. https://doi.org/10.1016/j.jbusres.2019.07.039

Utsev, T., Tiza, M. T., Ogunleye, E., Sesugh, T., Jiya, V., & Onuzulike, C. (2023). Nanotechnology and the Construction Industry. *NanoEra*, *3*(1), 1–7. https://doi.org/10.5152/nanoera.2023.1189977

Vantage Market. (2022). *Construction Equipment Market Size USD 252.59 Billion by 2030*. Vantage Market Research. https://www.vantagemarketresearch.com/industry-report/construction-equipment-market-1897#:~:text=China%20is%20the%20world

Wang, G., Xia, C., & Cao, D. (2020). State and determinants of inter-regional market entry practices in the Chinese construction industry: evidence from national quality award projects. *Engineering, Construction and Architectural Management*, *27*(7), 1461–1477. https://doi.org/10.1108/ecam-06-2019-0336

Wang, Y., Li, Z., & Shi, F. (2015). Factors Influencing Mechanism of Construction Development Transformation in China Based on SEM. *Discrete Dynamics in Nature and Society*, *2015*, 1–10. https://doi.org/10.1155/2015/219865

Xu, J., & Yoon, H.-S. (2016). A Review on Mechanical and Hydraulic System Modeling of Excavator Manipulator System. *Journal of Construction Engineering*, *2016*, 1–11. https://doi.org/10.1155/2016/9409370

Xu, Z., Wang, X., & Wu, G. (2022). Exploring the coupling relationship of industrial agglomeration and low-carbon economy considering spatiotemporal differentiation: An empirical study in China's construction machinery industry. *Frontiers of Engineering Management*, *10*(2), 285–299. https://doi.org/10.1007/s42524-022-0197-1

Yan, X., Zhou, Y., Li, T., & Zhu, F. (2022). What Drives the Intelligent Construction Development in China? *Buildings*, *12*(8), 1250. https://doi.org/10.3390/buildings12081250

Zhang, N., Ye, J., Zhong, Y., & Chen, Z. (2023). Digital Transformation in the Chinese Construction Industry: Status, Barriers, and Impact. *Buildings*, *13*(4), 1092. https://doi.org/10.3390/buildings13041092

Zhou, X. (2014). The Chinese construction Industry in the remaking since 1978. In the context of the important Reforms. *Revue Francaise d'Histoire Economique*, *1*(1), 128–145. https://www.cairn.info/revue-francaise-d-histoire-economique-2014-1-page-128.htm