

Industry-4.0-Enabled Business Strategies and Competitiveness of a Selected Retail Industry in Jiangxi Province, China



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ABSTRACT: The results of this study reveal the impact of Industry 4.0 practices on the business competitiveness of a retail company across several dimensions: technological adoption, supply chain management, human resource management, marketing capabilities, and financial strategies. Respondents indicated positive perceptions of the company's Industry 4.0 practices, particularly in business operations and environmental sustainability, with room for improvement in research and development (R&D) and scientific collaboration. There were no significant differences in the assessment of Industry 4.0 practices or business competitiveness based on demographic factors like sex, age, or position, except for societal impacts, where respondents aged 30-39 had a more favorable view. Significant positive correlations were found between Industry 4.0 practices and key areas of business competitiveness, particularly in technological adoption, human resource management, and financial strategies. The strongest correlations were observed in environmentally oriented practices, highlighting their influence on overall business performance. These findings underscore the importance of integrating advanced technologies and sustainability initiatives to enhance the company's competitive standing.

KEYWORDS: Industry-4.0, Business Strategies and Competitiveness, Retail Industry, China

I. INTRODUCTION

In business, many changes are borne from the incorporation of digital technology, automation, and real-time data in running companies, all colloquially termed the Fourth Industrial Revolution or Industry 4.0. This new industrial revolution is comprised of several advanced technologies, such as IoT, AI, robotics, and big data analytics, merged to improve operational efficiencies and stimulate more inventions (Khan et al., 2021). It is believed that the Industry 4.0 influences business models positively and promotes environmental sustainability, in turn helping industries to better service a market whose needs are continuously changing.

Major salient aspects of Industry 4.0 include its role in corporate competitiveness. A lead and enhanced effectiveness of corporate workings depend on these digital technologies operated in harmony together. For instance, the adoption of blockchain technology widely facilitates circular economy activities such as circular procurement, circular design, recycling, and remanufacturing, thus enhancing environmental and organizational performance (Tang et al., 2022). Similarly, Industry 4.0 created the need for ERP systems to transform how they operate so as to support firm agility through the technological, organizational, and environmental factors associated with it (Morawiec & Sołtysik-Piorunkowicz, 2023).

The Industry 4.0 also needs a shift in the educational environment to prepare the future workforce. Especially in courses of operations management, Challenge-Based Learning (CBL) conducted in higher institutions enables students to develop essential competencies such as collaboration, communication, and solving problems. Such an approach is not only informative but also pragmatic, providing realistic applications in life settings, thereby making the young generation ready to face the test of the digital world (Vilalta-Perdomo et al., 2022).

Changing paradigms in the company calls for opening the gates of Industry 4.0 technologies. Of increased importance is an open business model that takes advantage of digital change and open inventions. Developed tools, such as those based on the balanced scorecard, measure competitiveness and efficiency in the realization of these models and thereby empower companies to bargain through the barriers of the Industry 4.0 environment (Grabowska & Saniuk, 2022).

Industry 4.0, on the other hand, significantly promotes sustainability and the circular economy. To attain sustainable production and consumption patterns, companies are now increasingly realizing that they need to integrate circular economy ideas with Industry 4.0 technologies to achieve the United Nations Sustainable Development Goals (Toth-Peter et al., 2023).

Adoption of Industry 4.0 technologies presents difficulties even if the many advantages abound. Particularly in industrial clusters, companies—especially those in manufacturing clusters—face obstacles including ignorance of these technologies. By spreading knowledge and helping Industry 4.0 technologies (Dyba & De Marchi, 2022) to be adopted, business support organizations (BSOs) significantly help to overcome these obstacles.

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Empirical research conducted in several sectors depict even more the positive relationship among Industry 4.0 technologies, lean manufacturing techniques, and corporate performance. These research also show that there is a significant improvement in business performance when both lean methods and Industry 4.0 technology are used at the same time. Thus, empirical analysis demonstrates pragmatic benefits of this integration (Ooi et al., 2023; Nallaluthan et al., 2023).

Overall, industry 4.0 technologies carry tremendous transformation potential to enhance business competitiveness. Adopting the Five-Helix Model, this study aims to measure, based on Industry 4.0 innovations, the retail company competitiveness of a firm based in Jiangxi Province, China. By studying the relationship of business, society, government, science, and environment, it becomes easier for one to propose strategic recommendations as well as implementable ideas towards enhancing the competitiveness of the retail firm.

Research Questions:

1. What is the assessment of the respondents on the Industry 4.0 practices retail company in terms of:
 - 1.1. Business;
 - 1.2. Society;
 - 1.3. State;
 - 1.4. Science; and
 - 1.5. Environment?
2. What is the assessment of the respondents on the business competitiveness of the retail company in terms of:
 - 2.1. technological adoption;
 - 2.2. efficient supply chain management;
 - 2.3. human resource management;
 - 2.4. marketing capabilities; and
 - 2.5. sound financial strategies?
3. Is there a significant correlation between Industry 4.0 practices and business competitiveness of the retail company?

II. METHODOLOGY

Using a quantitative-correlational research design, his study examined industry 4.0 practices and business competitiveness in Jiangxi Province, China. While the correlational component looked at the relationship between Industry 4.0 practices and firm competitiveness, the quantitative method gave exact information on the relationships and variations among factors. Included in the study were 250 Jiangxi Retail Corporation (JRC) employees—management, administrative staff, and operational staff combined. The chosen study participants are departments at which they have served, based on their engagement in Industry 4.0 practice, and duration of stay at JRC. To identify the areas of competitive positioning where the present Industry 4.0 approach might enable the company to remain competitive. It applied a systematic questionnaire with two sections meant to target the relevant constructions for the research. Resulting conclusions Finally It shows the results on JRC's business competitiveness impact precisely according to Industry 4.0 standards.

III. DISCUSSION

1. Respondents' Assessment of Industry 4.0 Practices:

Business: In general, Industry 4.0 practices in business were positive with a mean of 2.99; the respondents were in agreement that the company does indeed use technology effectively to improve its operations and enhance customer service.

Society: The respondents believe that Industry 4.0 practices have a moderate impact on societal factors with a mean value of 2.98. This is specifically in areas like employee satisfaction and community engagement.

State: Respondents agreed that the company adheres to state regulations, with some benefits from public-private partnerships and government policies, with a mean of 2.94.

Science: Overall, scientific practices scored a little below average at 2.89. This means that since there is already collaboration with research institutions, investment in research and development remains a relatively weak link.

Environment: Environmental practices were rated positively (mean = 2.89), with a particular focus on resource efficiency and sustainability, although there were some perceived gaps in reducing the company's environmental footprint.

2. Respondents' Assessment of Business Competitiveness:

Technological Adoption: The company was rated competitive in technological adoption (mean = 2.94), with a particular emphasis on the adoption of cutting-edge technologies and employee proficiency.

Efficient Supply Chain Management: The supply chain management practices were also rated as competitive (mean = 2.94), especially in areas like cost reduction through automation and real-time data management.

Human Resource Management: HR management was viewed as competitive (mean = 2.96), with strong technology-driven workforce management and continuous employee development programs.

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Marketing Capabilities: The marketing capabilities were rated as moderately competitive (mean = 2.93), with the use of digital tools for market reach and customer engagement, though there was room for improvement in leveraging the latest technologies.

Sound Financial Strategies: Respondents rated the company's financial strategies as competitive (mean = 2.89), with technology improving financial decision-making and forecasting.

3. The study determined the correlation between Industry 4.0 practices and the business competitiveness of the retail company across five key dimensions: technological adoption, supply chain management, human resource management, marketing capabilities, and financial strategies. The Pearson correlation values, significance levels (Sig.), and decisions regarding the null hypothesis (Ho) are provided for each dimension, with significant correlations highlighted.

For the Business dimension, there is a significant positive correlation between Industry 4.0 practices and technological adoption (Pearson correlation = 0.165, p-value = 0.009), human resource management (0.128, p-value = 0.043), and financial strategies (0.128, p-value = 0.042). This means that improved Industry 4.0 practices are associated with higher competitiveness in these areas. However, the correlations for supply chain management and marketing capabilities are not significant (p-values of 0.327 and 0.544, respectively), suggesting no strong relationship between Industry 4.0 practices and these aspects of competitiveness.

For the Society dimension, there is only one significant correlation, found with financial strategies (0.280, p-value = 0.000), indicating that societal aspects of Industry 4.0 positively influence financial competitiveness. No significant correlations are observed with technological adoption, supply chain management, human resource management, or marketing capabilities.

In the State dimension, a significant correlation is observed with technological adoption (0.133, p-value = 0.035), suggesting that state-related Industry 4.0 practices positively influence technological competitiveness. However, the correlations with other areas, including supply chain management, human resource management, marketing, and financial strategies, are not significant.

For the Science dimension, no significant correlations are observed across all indicators, with p-values ranging from 0.075 to 0.628. This indicates that scientific aspects of Industry 4.0 practices do not have a meaningful impact on the company's business competitiveness in these areas.

The Environment dimension shows the strongest and most widespread correlations. There are significant positive correlations with technological adoption (0.164, p-value = 0.010), human resource management (0.355, p-value = 0.000), marketing capabilities (0.265, p-value = 0.000), and financial strategies (negative correlation of -0.137, p-value = 0.031). Interestingly, a negative correlation is found with supply chain management (-0.126, p-value = 0.047), suggesting that while environmental practices enhance other areas, they might challenge supply chain efficiency.

Lastly, the overall correlation between Industry 4.0 practices and business competitiveness is significant, with a Pearson correlation of 0.264 and a p-value of 0.000. This indicates that, in general, better implementation of Industry 4.0 practices is positively associated with the company's overall business competitiveness.

In summary, Table 18 highlights that Industry 4.0 practices are significantly related to business competitiveness, particularly in areas such as technological adoption, human resource management, and financial strategies. The environmental aspect of Industry 4.0 plays a particularly strong role across multiple areas, while societal and state-related practices show more limited impact. Scientific practices have no significant influence on competitiveness. The overall correlation between Industry 4.0 practices and business competitiveness reinforces the importance of embracing these technologies to maintain a competitive edge.

IV. CONCLUSION

Industry 4.0 practices, based on this research, are pivotal to the competencies of business enterprises along diverse dimensions. Indeed, most of the firms appropriately deploy technology in an attempt to improve operations; however, strong relationships were noticed between technology adoption, human capital management, and financial strategy. Environmental practice is also an important influencer for various business operations. However, it must be emphasized that their effects on supply chain effectiveness are rather ambiguous. The Industry 4.0 practices were societal and state-related, hence limiting their impact; scientific practices didn't play an important role in competitiveness. Significant correlation of industry 4.0 practices to business competitiveness reflects the importance of continued investment in digital transformation toward enhancing technological capabilities, workforce management, and financial decision-making. Companies should focus on strengthening weaker areas, such as research and development and marketing innovations, while optimizing the benefits of environmental sustainability and regulatory compliance to sustain a competitive edge.

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