

Research on Operation Management and Investment Financing Strategies of Water Utilities under New Circumstances

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Abstract

This paper integrates the current political and economic landscape to analyze cases of large-scale water utilities both domestically and internationally. It concludes that their success is primarily attributed to lean management, cost reduction and expenditure control, and the provision of services with higher cost-effectiveness to customers; related diversification, market expansion, and the exertion of synergistic effects; emphasis on research and development (R&D) with hierarchical management of R&D activities; and the importance of investment and financing management, including mergers and acquisitions as well as continuous innovation in investment and financing instruments. Based on these findings, the paper proposes three major suggestions: leveraging technological innovation and big data to enhance service levels; adopting a holistic perspective to implement lean management and improve water quality; and seizing policy opportunities to innovate investment and financing models. It is hoped that these suggestions will serve as a catalyst for further discussion and provide a certain degree of reference for the industry.

Keywords

Water Utilities, Operational Management, Investment and Financing

1. Introduction

In China, the water utility sector is not only crucial for ensuring the quality of daily life for millions of people but also a pivotal component of the country's public infrastructure. Over the years, the entire water supply industry has progressively matured, providing stable and safe drinking water resources for hundreds of millions of citizens. Meanwhile, with the acceleration of urbanization and the

increasing awareness of environmental protection among the people, the wastewater treatment industry has also come into prominence and gradually become a significant part of the national environmental protection strategy.

In recent years, driven by a series of robust national environmental protection policies, the wastewater treatment industry has ushered in unprecedented development opportunities. The government has not only increased investment in wastewater treatment facilities but also issued a series of policies and regulations aimed at improving the efficiency and quality of wastewater treatment, effectively promoting the rapid development of the entire industry. Against this backdrop, numerous wastewater treatment enterprises have emerged, introducing advanced treatment technologies and management models to continuously enhance their service quality and market competitiveness.

Looking ahead, during the 14th Five-Year Plan period, China will continue to deepen reforms and development in the environmental protection sector and plans to further unlock the enormous potential of the rural wastewater treatment market through the introduction of a series of government policies and regulations. This will not only effectively improve the ecological environment quality in rural areas but also bring new development opportunities for wastewater treatment enterprises. In this process, wastewater treatment enterprises need to pay attention not only to the effective treatment of wastewater but also strengthen the treatment and disposal of sludge, as well as actively participate in the ecological restoration of polluted water bodies. These initiatives can not only enhance the social responsibility and brand image of enterprises but also bring more economic and social benefits.

Therefore, in future development, China's wastewater treatment enterprises are expected to gradually transform from single wastewater treatment service providers into comprehensive water environment management enterprises. They will continuously improve their overall competitiveness and sustainable development capabilities by integrating upstream and downstream resources, optimizing technologies and service models, etc., thereby making greater contributions to China's environmental protection efforts and ecological civilization construction.

2. Company Overview

2.1. Beijing Capital Eco-Environmental Protection Group Co., Ltd.

Beijing Capital Eco-Environmental Protection Group Co., Ltd. (BCG), stock code 600008.BCG is a leading enterprise dedicated to environmental protection technological innovation and solution provision, BCG has emerged as a pioneer in China's environmental protection sector, relying on its exceptional technical prowess and forward-thinking development philosophy. BCG focuses on the research and application of environmental protection technologies, continuously launching environmental protection products and solutions with independent intellectual property rights. These innovative technologies have not only effectively

enhanced the efficiency of environmental governance but also significantly reduced the costs of environmental treatment, infusing China's environmental protection cause with immense momentum. Additionally, BCG actively participates in various environmental protection projects, spanning water treatment, solid waste disposal, atmospheric pollution control, and other fields. Through professional and efficient services, BCG has made outstanding contributions to China's environmental protection cause, earning widespread praise and recognition.

2.2. Chengdu Xingrong Environmental Co., Ltd.

Chengdu Xingrong Environmental Co., Ltd (Xingrong Environment), stock code 000598. Xingrong Environment focuses on the research and application of water treatment technologies, dedicated to providing efficient and reliable water treatment solutions. Through advanced technological means, Xingrong Environment can effectively enhance the utilization efficiency of water resources and reduce water wastage. Furthermore, Xingrong Environment actively participates in various water treatment projects, encompassing urban water supply, sewage treatment, industrial wastewater treatment, and other aspects. The successful implementation of these projects has not only earned Xingrong Environment a good reputation but also made significant contributions to China's water resource protection and utilization endeavors.

2.3. Veolia

Veolia stands as a leader focuses on the research and innovation of environmental protection technologies, continuously launching groundbreaking environmental products and solutions. Veolia's business scope spans water treatment, solid waste management, energy management, and other fields, providing comprehensive, one-stop environmental services to clients worldwide. Through professional services and efficient solutions.

On August 30, 2020, Veolia made an offer to acquire a 29.9% stake in Suez Group. The acquisition was completed on October 5, 2020. On March 21, 2022, Suez's environmental professionals officially joined Veolia. With the acquisition of Suez, Veolia now boasts a more comprehensive business coverage in Asia, enabling it to better support the green development and ecological transformation of the region. Veolia believes that this merger will create a more powerful team, which will explore and develop more efficient environmental solutions. The combined expertise of both companies will enable Veolia to offer complementary solutions and new business models that are more suitable for local conditions in Asia.

3. Key Findings and Explorations Worth Learning From

By examining prominent water utilities both domestically and internationally, this paper highlights several areas for learning:

3.1. Brand and Service

Water utilities should focus on brand building, cost reduction, and providing higher cost-effectiveness in their services to customers. The case companies achieve this by employing lean management techniques, utilizing big data, and establishing a systematic and standardized group operation management system. While specific benefits of these initiatives may not be explicitly available in public information, the significance of these efforts is clear. In terms of brand development, these companies mainly gain recognition and social honors through effective stock price management, operational oversight, and fulfilling social responsibilities. Veolia's construction of a numerical control center stands out for its ability to reduce costs, enhance service quality, and broaden market reach while mitigating operational risks.

3.2. Diversification

The development trajectory of water utilities, both domestically and abroad, indicates a trend toward related diversification. For instance, BCG is accelerating growth in emerging environmental protection sectors, including sludge disposal, reclaimed water, industrial wastewater treatment, and seawater desalination, thereby strengthening its environmental protection industry chain (Song, 2018). Diversification can be categorized into related and unrelated. Currently, most water utilities are pursuing related diversification while also exploring unrelated avenues. Related diversification involves expanding into business areas closely related to water technology, such as solid waste treatment, based on core water business operations—as exemplified by BCG and Xingrong Environment. Conversely, some companies are scaling down their water-related activities and delving into unrelated sectors. For instance, Le He Share derives only a small fraction of its main revenue from the water industry, with the majority sourced from electronic equipment and devices, indicating that its core competitiveness lies outside the water sector.

3.3. Research and Development (R&D)

Innovation is the lifeblood of a nation, driving progress and sustaining enterprise growth. None of the case companies overlook their investments and outputs in this area. Suez's website indicates that in 2012, the company invested 74 million euros in R&D, employing over 400 researchers and initiating more than 20 R&D projects. Suez places great importance on building its global technology network. With its headquarters in France, the company established a dedicated water research center in Shanghai in 2006, 15 years after its entry into the Chinese market. Suez manages its R&D through a hierarchical system, significantly enhancing its creative capacity by categorizing research into exploratory, applied, and technological development. Exploratory research primarily focuses on academic partnerships and investigations into new areas within the company's operations, while applied research is linked to business segments and technological development is

executed by operational units. To encourage innovation, Suez promotes open collaboration and has established management bodies—special innovation teams—by sector to review projects, provide funding, and ensure proper oversight.

In summary, both investment and management are crucial for effective R&D, and improving the conversion rate of research achievements is necessary, as a high conversion rate fosters a virtuous cycle of R&D investment and innovation. The case companies utilize two main strategies to acquire innovative outcomes: independent R&D and acquisitions. Acquisitions involve investing in innovative projects through mergers and acquisitions, supply chain finance, and other mechanisms. Furthermore, strengthening collaboration is essential for successful R&D; partnerships with research institutions, advanced domestic and foreign enterprises, and innovative small enterprises within the supply chain can significantly enhance the generation of innovative outcomes.

3.4. Investment and Financing

With regard to investment and financing, the case companies focus on diversifying their financing methods and capitalizing on market opportunities to mitigate risks and secure returns. They also prioritize establishing dedicated investment and financing institutions to manage debt and equity investments while actively exploring emerging financial sectors such as supply chain finance and angel investment. For example, Suez has created the Blue Orange innovation investment fund to support young companies with new technologies in the environmental services sector, positioning itself as both an investor and an industrial partner. Xingrong Environment expands its financing avenues while fully utilizing the financing capacity of its listed company status. It combines direct and indirect financing approaches, makes use of interest rate tools to lower financing costs, conducts loan replacements to evade exchange rate risks, and strengthens cooperation with banks to broaden and stabilize funding sources. Additionally, Xingrong Environment actively forges mutually beneficial strategic partnerships with upstream and downstream enterprises within the industry chain, reputable research institutions, and financial organizations to gain timely insights into domestic and international M&A investment opportunities. This promotes efficient resource integration and accelerates replication of the company's advanced management practices in newly expanded projects. In 2016, BCG established the Shuihui Environment (Tianjin) Equity Fund and the Zhongguancun Qingshanlvshui Fund to support domestic peers, while also expanding its solid waste business in New Zealand and Singapore through investments and acquisitions, thus establishing a notable brand presence in the overseas solid waste sector.

3.5. Daily Operations

BCG stands out for its robust daily operational systems. Its operational management framework encompasses nine modules: system construction, analysis, quality, information, knowledge, matters, business, technology, and operational policy

research. Analysis and quality management form the core, while information and knowledge management provide crucial support for operational management initiatives tied to matters, business, technology, and policy research, ultimately enhancing operational capabilities. Through this operational management framework and the adoption of lean management principles, BCG has established a comprehensive operational management capability focused on “one control” (managing costs and risks), “two improvements” (enhancing levels and efficiency), and “three expansions” (broadening capabilities and market presence). However, the development of this system and the implementation of lean management entail significant costs. To balance expenses and benefits, the company has effectively utilized its accumulated knowledge and capabilities by establishing secondary operational service consulting firms in Xuzhou and Ma’anshan to achieve cost recovery and value enhancement.

In summary, the foreign water industry has rapidly advanced by leveraging R&D, core technologies, cost control, brand effectiveness, financing, and mergers and acquisitions. Notably, they also emphasize supply chain finance, which facilitates access to funding and actively promotes improvements in R&D levels and the expansion of technological applications and markets through partnerships with supply chain R&D firms. In contrast, while Chinese water utilities enjoy better government-enterprise relations and place significant emphasis on branding and R&D, their brand influence still falls short compared to their foreign counterparts, and they continue to learn from foreign companies in core technology and innovation

4. Relevant Suggestions

4.1. Fully Leveraging Technological Innovation and Big Data to Enhance Service Levels

The promulgation and implementation of the 14th Five-Year Plan for the environmental protection industry guide pollution control from point source management to non-point source management. With the guidance of national policies, local governments are expected to place greater emphasis on the integrity, sustainability, and circularity of environmental projects. This may also lead to stricter industry entry barriers, prompting enterprises to integrate and extend their industrial chains. Under these circumstances, only enterprises with technological and capital advantages across multiple fields can truly establish a firm foothold in the market.

Water utilities should strengthen their internal talent development efforts, focusing on attracting elite scientific and technological personnel and exploring various fields such as digital twins, big data, and artificial intelligence. By endeavoring to create a digital management system characterized by rational layout, resource aggregation, coordination, orderly processes, reliability, and scalability, they can enhance their comprehensive development and lay a solid foundation for investment and financing initiatives (Su, 2021).

The water industry is a typical public service sector, generally exhibiting strong long-term sustainability characteristics. Therefore, it is crucial to increase technological exploration, ensure effective upgrades, and continuously strive for innovation. Moreover, this paper posits that technological R&D should not be confined to the product itself but should also maintain a continuous focus on customer needs. In the Internet era, the significant role of users in enterprise development cannot be overlooked. Major foreign water utilities have begun to utilize big data to provide better services to their customers. Big data is not limited to vast user information; it can also be harnessed to better predict market trends, optimize operational management strategies, and even inform the development of new products and services. For example, analyzing extensive water meter data can improve predictions of customer water consumption, allowing for proactive planning and allocation of water resources. This approach ensures service quality while minimizing water wastage (Li, 2021). Overall, big data has become a key trend in industry exploration and technological innovation, profoundly impacting the operational management of water utilities (Huang, 2023). It must be leveraged effectively and integrated into the entire operational process to serve users better.

4.2. Focusing on the Big Picture, Implementing Lean Management, and Improving Water Quality

In the process of modern city development, the importance of effective internal water supply systems is self-evident. Where public needs and expectations arise, quality water supply and livelihood guarantees must be put into action. As significant livelihood enterprises, water utilities should focus on enhancing service quality through a comprehensive approach that optimizes management elements, aiming to provide superior water resources to the community (Zheng, 2024).

Technology, market dynamics, and financing are prerequisites for the development of water utilities, while management serves as a crucial underlying component. Good management maximizes the effectiveness of these three areas, whereas poor management can undermine even well-established enterprises. Lean management is an excellent approach to consider and recommend. It addresses all aspects of an enterprise and emphasizes detail-oriented management, offering comprehensive and meticulous advantages. Based on the findings thus far, water utilities demonstrate elements of lean management in areas such as branding, quality, and cost reduction. In the future, water utilities could expand the scope of lean management, embedding these principles throughout their operations to achieve better growth.

Quality cost management is also a key aspect of lean management, where quality costs encompass the expenses necessary to maintain products at an established quality level. In the context of water scarcity and increasing public demands for health and wellness, how to achieve nutrient-rich drinking water at a low cost is one of the pressing issues that water utilities must address. Quality cost management encourages water utilities to simultaneously focus on cost and quality, which

is worth exploring. Quality costs can be divided into explicit costs and hidden costs, with hidden costs often overlooked by many enterprises. However, elements like negative publicity costs can have a substantial impact on a company's reputation and performance and must not be ignored. Generally, a company's quality costs are established; therefore, it is advisable for water utilities to continuously segment their cost items and contents, calculating their preventive and appraisal costs as well as internal and external loss costs. This will help identify suitable quality cost points for their specific enterprises and integrate them into the performance assessment system, thereby implementing effective quality cost management.

4.3. Seizing Policy Opportunities to Innovate Investment and Financing Models

Currently, domestic water price adjustments lag behind the rise in rigid costs. Traditional water supply business revenues are growing more slowly than costs, resulting in limited profit margins. Enhancing the industrial chain through investment and financing and pursuing related diversification is a common strategy among water utilities in both domestic and international markets. With the release of the water network planning outline in 2024, water utilities are expected to sustain a trend of continued external investment growth. Water utilities can engage in relevant diversification and industrial chain enhancements by implementing mergers and acquisitions, utilizing supply chain finance, and continuously innovating investment and financing methods. This will allow them to strategically allocate projects and broaden their revenue streams while cultivating new profit growth points.

The capital market offers an array of financing tools and valuation advantages. By harnessing this power, water utilities can rapidly reduce the gap between themselves and international water industry giants, potentially becoming leading national firms. They may also consider employing supply chain finance to facilitate interconnectivity within the industry chain, thereby improving their capacity for research and development as well as financing. Building on this foundation, water utilities need to activate their existing assets to achieve diverse and positive operational outcomes (Shi, 2024; Mu, 2024). Additionally, utilizing various government policy supports is essential; they should explore opportunities to expand the scope of investment and financing while steadily investigating cooperative models with the government (Lu, 2024). Actively learning from successful domestic and international examples, water utilities should seek effective support from senior water administration and financial institutions, employing innovative thinking to explore new pathways for investment and financing model development (Tan, 2024).

5. Conclusion

Despite achieving certain results in exploring the opportunities and challenges

faced by water utilities in the new era, this study still has some deficiencies that need to be further improved in future research.

Firstly, there are certain limitations in data collection and analysis in this study. As water utilities involve multiple fields and aspects, including water supply, drainage, sewage treatment, and other links, the difficulty of data acquisition and processing is relatively high. Therefore, there may be issues of incomplete and inaccurate data collection in this study, leading to potential biases in the analysis results.

Secondly, although this study proposes some specific suggestions on exploring water utilities management strategies and technical support, it lacks in-depth theoretical analysis and empirical research. For example, specific methods and measures for implementing lean management practices, optimizing and refining management elements, and other aspects have not been thoroughly discussed and validated in this study.

Furthermore, although this study puts forward some suggestions on innovating investment and financing models, it does not conduct an in-depth analysis and comparison of advanced domestic and foreign practices. There may be significant differences in investment and financing models for water utilities among different countries and regions. Therefore, learning from and borrowing domestic and foreign advanced experiences requires more in-depth and comprehensive research.

Lastly, this study emphasizes the importance of continuous innovation in promoting the healthy and rapid development of water utilities, but it does not delve into the specific innovation paths and measures. With the continuous advancement of technology and changing market demands, water utilities need to innovate continuously to adapt to new development needs. Therefore, research on how to drive the innovative development of water utilities needs to be further deepened.

In summary, although this study has achieved certain results in exploring practice of water utilities in the new circumstance, it still has some deficiencies. In future research, it is necessary to further improve data collection and analysis methods, deeply explore specific methods and measures for water utilities management strategies and technical support, conduct in-depth analysis and comparison of domestic and foreign advanced practices, and explore specific paths and measures for the innovative development of water utilities.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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