Investment Decision-Making and Policy Optimization in Biomedical Engineering Based on Cost-Benefit Analysis

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Abstract
With the requirements of high-quality development in the new era, the innovation of production technology become popular. At the same time, biomedical technology has become an important component of science and technology, and the development of biomedical equipment is also the result of BME .Biomedical Engineering (BME) mainly refers to a combination of chemistry, physics, mathematics, principles of Computer Science and engineering, a study of medicine, biology, hygiene, and behaviour(Xun et al. 2024).As we all know, the design and manufacture of medical device is an expensive process for biotech companies, including design and manufacture on a wide range of science and technology such as artificial intelligence, and uncertainty in technological development is inevitable. Many people may want to find the most suitable way for them to invest on the Biomedical-Engineering relevant industry. The essay introduces the cost-benefit analysis to solve the trouble in the investments and many other areas. The aim of this passage is to give the schemes to the investors so that they can use these schemes to reduce the cost of trial and error so that they can reap greater rewards. The passage can also provide the thoughts for the government, which leading to the nation can make more suitable policies about the biomedical industry. Apart from that, this passage can also provide the new idea for other writers about the BME area.

Keywords
Cost-Benefit Analysis; Biomedical Engineering; Policy Optimization

Introduction

A cost-benefit analysis is an analysis by comparing the full cost and benefit of a project. It's a way to estimate the value of a project. The method uses currency as the main unit of measurement. The difference or ratio of costs and benefits is calculated to help decision-makers determine the most reasonable resource configuration scheme. The core of the method which is about integrating all relevant cost and benefit factors. Different ways of investments are systematically identified, quantified, and compared to provide management with clear decisions and policy basis.(Chen et al. 2025) The cost-benefit analysis can let t he value of project become clearer and more transparent by representing all factors of costs and benefits. There are many factors which affect the development of biomedical equipments such as the land, the fund, the technique and so on.

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Literature review

China's biomedical engineering field got unprecedented development opportunities. Engineering just like a catalyst, penetrated into every corner of the medical industry widely, spawned a series of innovative medical products, these products not only enrich the means of treatment, but also greatly promote the progress and popularization of medical technology. In particular, the technology of medical imaging develops rapidly. It can help doctors to detect patients by x-rays and ultrasound wave. The wish of the future about the biomedical industry is that the precised and personalized treatment for everyone. Apart from that, the development of auxiliary medical equipment based on new materials make therapy become easier. All of these equipment are playing irreplaceable roles in improving the efficiency of diagnosis ,treatment and reducing the suffering of patients.

Big market

According to the latest data released by the data service platform of China Medical Equipment Association, more than 1,000 projects have been approved by the end of September in, expand with the total budget exceeding 41.2 billion yuan, and the approval of projects is mainly concentrated in May and June. In the process frequently appear up to hundreds of millions or even billions of yuan of "large" equipment renewal projects, Guangdong, Hunan and Black Dragon Jiang's single provincial approval budget amounts to more than 5 billion yuan. "Demand is being released quickly." The agency noted. According to the data from the "2019 China Medical Device Blue Book", the economy is affected by a good level, the change in people's consumption concepts, and the continuous increase in spending power. Large, increasingly prominent personalised health needs have been in Large, increasingly prominent personalised health needs have been increasing in recent years in the medical devices sector. The market size of the medical device industry continues to grow steadily, and China's medical device market is experiencing continuous growth. China's medical device market size in 2018 was about 530.4 billion yuan, which represents an increase of 19.86%. (Lian et al. 2020）China's medical device enterprises can be divided into three categories according to the category of equipment. Among them, the first and the second class medical device enterprises have higher requirements for investment funds. Small, low technical content, the products of the third type of enterprises are used to support and sustain life, implanted in the human body, are potentially dangerous to the human body, so they must be strictly controlled to ensure effectiveness and safety. The third type of medical device enterprises belong to funds technology-intensive, although the number of enterprises in the medical device industry is increasing, there is an uneven development situation in medical device manufacturers, and the third type of medical device companies number only 1,997, accounting for a small proportion.（Lian et al. 2020）The vast majority of the domestic high-end medical device market is occupied by foreign manufacturers. Large and medium-sized medical equipment, medium and high-end medical equipment such as imaging equipment, precision instruments have always been imported, and high-end products are also extremely dependent on imports. Simon sub, Philips, General Electric, in MRI, CT, angiography machine, nuclear medicine and other large medical equipment have always occupied a major leading position in the city. The market share has exceeded 80 percent. (Lian et al. 2020) In ultrasound imaging equipment, digitisation X-ray photography system, these three companies also have more than half of the market competition share. Simon's advantage products are magnetic resonance equipment;
the main advantage of Philips is digitalisation X-ray, angiography machine; GE has a proven track record in CT, nuclear medicine, ultrasound and has a strong market-leading ability in sound and image. China's medical device industry is currently facing three major opportunities. First of all, from the perspective of potential demand, there are more than 300,000 medical and health service machines in the country. 60% of the medical instruments and equipment owned by the organisation are from the mid-80s. The products from that period need to be updated,

which will ensure there is room for rapid growth in the medical device market. Second, the reform of the medical system has stimulated the potential of the low-end market for medical devices. In 2014, the growth rate of the global high-end therapeutic device market was 10%, while the growth rate for low-end medical devices was 30%. Moreover, China has become one of the world's production bases for low-end medical devices. Over the past 3 years, the export value of diagnostic and treatment equipment, healthcare and rehabilitation supplies, medical materials, and other products has increased by more than 40%. (Lv et al. 2017) Third, China has entered an aging society, with the number of elderly people over the age of 60 reaching 180 million. Older people require more medical care and health services with medical devices, especially for first aid and long-term care of smart portable universal medical products（Lv et al. 2017）

Robotics

As an example of the profound integration of modern technology and medicine, medical robotics has demonstrated unprecedented accuracy in the diagnosis and treatment of patients. It has demonstrated unprecedented accuracy in the diagnosis and treatment of patients. In the field of surgery, medical robots are no longer just simple tools, but the surgeon's right hand. Through fine remote control, robots are able to perform precise operations beyond human limits, significantly reducing surgical trauma and speeding up patient recovery. This change not only improves the safety and success rate of operations, but also opens up completely new possibilities for the treatment of complex cases, signalling a shift in medical practice towards greater intelligence and sophistication.

Gene therapy

In the field of genetic diseases, gene therapy is changing the fate of patients at an unprecedented rate. Taking the isolation and purification of malignant bone marrow cells as an example, this innovative therapy utilises advanced biotechnology to specifically remove disease-causing genes or abnormal cells from the patient's body, giving patients with genetic diseases unprecedented therapeutic hope. This treatment not only reflects our profound understanding of human，but also our profound understanding of genomics.

Biosensors

As an important tool for modern medical monitoring and diagnosis, biosensor technology is experiencing an unprecedented leap. In the traditional sense, devices such as oximeters are far from being able to meet the demands of modern medicine for accuracy and real-time performance. Nowadays, with the development and application of high-precision sensors such as biomolecular integrated circuit chips, we are able to achieve more in-depth and detailed biological information capture and analysis. These sensors are not only able to monitor patients' vital signs in real time, such as oxygen saturation and heart rate, but also perform DNA analysis at the molecular level, which provides a solid data foundation for early diagnosis of diseases and formulation of personalised treatment plans. Their application greatly promotes the intelligence and remoteness of medical monitoring, enabling patients to enjoy professional medical services even at home.

Laser Diagnosis and Treatment

The laser knife has become an indispensable tool in surgery with its high precision and low trauma. In complex surgeries such as tumour resection and vascular anastomosis, the laser knife is able to accurately cut diseased tissues and, at the same time, minimize the damage to the patient's normal tissues, which facilitates post-operative recovery and improves, therapeutic effects. In addition, laser technology is also widely used in dermatological treatment, ophthalmic surgery and other fields, and its unique advantages make the treatment of these diseases safer and more effective. With the continuous progress of laser technology, in the future, we will witness more innovative laser-based therapies being applied in clinics, bringing hope to patients.

Artificial Organs

The development of artificial organ technology has brought the light of hope to countless patients with end-stage diseases. From the first prosthetic

limbs to today's complex heart valve replacements, artificial organ technology has come a long way. These artificial organs can not only effectively replace the patient's damaged organs or tissues and restore their physiological functions, but also improve the patient's quality of life to a certain extent. Especially with the rapid development of material science, tissue engineering and regenerative medicine, artificial organs are developing in the direction of being closer to nature and possessing self-repairing ability.

Relevant Risks and potential solutions

The development of the biomedical and health industry relies on the research and development of new technologies. At the same time, it is directly related to people's life, health and safety. Therefore, when developing products, the control of quality and effect is very strict. Generally speaking, the emergence of a new device needs to go through three stages: scientific research, pilot test and clinical trial to ensure the normal use and safety of the device, and to understand the function of the device and possible negative effects. This is a relatively long process. In addition, problems can arise at every stage of new device development. In the short term, the emergence of new technologies is highly uncertain and has a relatively low success rate, exacerbating investment risks.

Market Risks

The steady development of China's biomedical industry depends not only on policy support, but more importantly on the market. On the one hand, biomedicine is closely related to people's lives, and its field capacity and market increment are very considerable and indispensable for future development. On the other hand, the biomedical health industry is globally competitive. As long as the patent of the principle of equipment of some medical device companies expires, there may be many other companies launching the same type of instruments at the same time. The trend of reform policies guides the basic approach and planning of business operations. Both the dependence of the business model on capital investment and the urgency of the business model determine whether a company can survive the fierce competition in the industry and generate profits. This is one of the elements that investors need to consider when making an investment. Although the development of the medical equipment industry is highly dependent on the research and development of new technologies, the high investment in the research and development phase makes the economic benefits of newly developed equipment less favourable than those already available in the market, which requires investors to be cautious when considering what kind of business model to invest in, or else they will face certain investment risks.

Risks in scientific research and experimental development

Scientific research and experimental development (R&D) is an activity in the field of biomedical health aimed at deepening the understanding of the field and using the knowledge gained to creatively carry out activities to create new applications. Currently, there is a vast market in the country. The total profit of biomedical equipment industry is increasing year by year, which is one of the sunrise industries. However, as a high-tech industry, the innovation ability of China's biomedical device industry is still insufficient, which will most likely hinder the further development of the biomedical device industry. The experimental cost of scientific research and development is very high, which not only requires the state to increase R&D investment, but also requires investors to invest a large amount of one-time investment in the early stage and continuous investment in the R&D link. If there is a financial chain break in the research and development stage of new technology and new equipment, it is very likely to lead to the failure of the whole project. Even if the new product development is successful, biomedical companies will still encounter intellectual property protection risks. Producing patented devices can be a business that brings huge profits, and a few companies will choose to steal other people's R&D results, which will not only disrupt the market, but also affect the interests of investors.

Policy Risks

There are certain uncertainties in the technological development of the biomedical equipment industry Qualitative and trial and error costs, so that many of China's biomedical equipment enterprises are in the early stage of entrepreneurship, and are actually in a non-profit state, highly dependent on government policies and government support. At present, China's government will be biomedical department technology as one of the future key development direction, and biotechnology vigorously support for 'high-end technology', but at the same time, because the biomedical equipment industry is directly related to the people's life and health safety, the government in promoting the rapid development of the industry at the same time, but it is also necessary to regulate the industry through the legal laws Behavioural regulation. The government achieves this through the formulation of laws and regulations and industry guidelines. In order to ensure the health and safety of biomedicine, to a certain extent, biology has raised the entry threshold of the medical industry. Even if the relevant companies develop new types of devices or medical technologies, they may not be in line with policies such as the Measures for the Administration of the Wholesale and Issue of Biological Products Facing the risk of not being able to be marketed, increased investment in the biomedical health industry Uncertainty about capital raises the risk.

Potential solutions

Related theory

There are many risks that the investors in the biomedical industry can't escape so that they should weaken it or solve it. We introduce the cost-benefits analysis theory.

The basic concept of cost-benefit analysis：

The cost-benefit analysis is an evaluation by comparing the full cost and benefit of a project A way to estimate the value of a project. The method uses currency as the main unit of measurement. The difference or ratio of costs and benefits is calculated to help decision-makers determine the most reasonable Resource configuration scheme. At its core, it is about integrating all relevant cost and benefit factors Lines are systematically identified, quantified, and compared to provide management with clear decisions Policy basis.

Principles of cost-benefit analysis.

The cost-benefit analysis mainly follows the two principles of benefit maximization and opportunity cost. The principle of benefit maximization requires enterprises to choose those programs that maximize net benefits (benefits minus costs) in the case of limited resources; the opportunity cost principle requires companies to consider the choice of a particular option in their cost-benefit analysis and other alternatives that can be used to maximize the benefits.

The place of cost-benefit analysis in economics and management:

as an important decision-making tool, cost-benefit analysis plays a pivotal role in both economics and management. In the field of economics, cost-benefit analysis is an important means to evaluate the efficiency of market resource allocation, which can help policymakers make the best choice when resources are scarce. In the field of management, cost-benefit analysis is widely used in enterprise strategy formulation, project management, investment evaluation and other aspects, which can provide data support for enterprise decision-making through quantitative analysis, help enterprises make efficient use of resources, and maximise economic benefits.

Support strategic decision-making

Strategic decision-making refers to the decision-maker's decision on the direction and vision of the development direction and development of the enterprise The rationality of decision-making is related to the overall, long-term and directional development of the enterprise. Through cost-benefit analysis, businesses are able to accurately assess the economics of different strategic decisions benefits, feasibility, and execution costs to identify the optimal strategic path. Other than that when it comes to expanding the market, extending the product line extending the product line, or entering new areas, businesses can

connect through cost-benefit analysis. We comprehensively evaluate the development potential of new markets and the investment of product lines into the cost and expected return of the new business, and make an informed strategy based on the results of the assessment pick a little. At the current stage, the medical device industry is increasingly the basis for industrial expansion. This trend, and the corresponding overall scale of the industry, has also been prominently expanded. The medical device industry should be included in the category of sunrise industry, which is embodied in learning the basic characteristics of the crossover and the complete range of products (Gao et al 2020).

Supporting Investment Decisions

Investment decisions refer to the efforts of investors to achieve their intended investment objectives by using certain scientific theories, methods, and means to analyse the necessity, objectives, scale, direction, structure, costs, and benefits of investments through specific procedures. Based on the results of the analysis, the best investment plan is selected. The rationality of the investment decision directly impacts the financial health and long-term growth potential of the business. Cost-benefit analysis plays an important role in investment decisions. By analysing the expected benefits and costs of each investment project, companies can not only accurately identify the most economically beneficial investment projects but also quantify the rate of return and risk level of each investment project, providing a scientific basis for making correct investment decisions, thereby maximizing both short-term and long-term benefits.

Case study

Today, I want to take Neusoft medical as an example and I will use cost and benefit analysis to evaluate this company.

Company profile:

Neusoft Medical, a subsidiary of Neusoft Group, was founded in 1998 and is headquartered in Shenyang, China. It specializes in medical imaging equipment, medical IT solutions, and health management services. It is specialized in CT, MRI, X-ray, ultrasound and other medical imaging equipment; AI-assisted diagnostic systems; medical cloud platforms; and telemedicine services. At the same time One of the leading medical imaging equipment manufacturers in China, with over 40,000 units installed globally, covering more than 110 countries.

Competitors

International brand： GE Healthcare, Siemens Healthineers and Philips occupy more than 60% of the global high-end market share. Domestic brands: United Imaging Healthcare (domestic leader in CT/MRI) Myriad Medical (multi-field coverage), Vandong Medical (low-end and mid-range equipment). Domestic vendors (e.g., Union Shadow) are increasing their investment in the high-end field, compressing profit margins.

The main cost

Pressure from centralized procurement price reduction: Centralized procurement of medical devices has led to the decrease on product prices. For instance, the unit price of one of its winning CT models was 1.428 million yuan, significantly lower than the maximum limit of 2.6 million yuan.

High strategic investment: The company has continuously increased its investment in R&D and marketing to promote the transformation towards AI and data value, which has an impact on short-term profits.

Historical profit challenges: the company has faced issues such as a year-on-year decline in gross profit margin (2018-2020: 39.9% → 38.7% → 36.7%) and a relatively high dependence on government subsidies for net profit.

Ecological cooperation and value-added: General Technology Group's investment in Neusoft not only brings capital support but also opens up business space for empowering its vast medical system.

High-end market technology barriers: High-end MRI, PET-CT and other equipment still rely on

imported core components (such as superconducting magnets, detectors).

International political risk: Trade restrictions in some countries (e.g., tighter FDA review in the U.S.) affect exports.

Financial and Strategic Trends (as of 2023)
Revenue Performance: 2022 revenue of ~$3.5 billion, up 18% year-on-year; net profit margin of ~10%.

The main benefit:
Neusoft Medical differentiation: price-performance advantage, localised service capability, medical IT integration capability.
Technology development: The first development of CT (1997) and 256-slice wide-body energy spectrum CT (2021) in China.

AI-enabled: NeuAI platform supports auxiliary diagnosis of lung nodule and stroke. The implementation of intelligent products: AI medical solutions such as "Tianyi" have been applied in dozens of top hospitals including Peking Union Medical College Hospital and West China Hospital, demonstrating that the technology has entered the commercial harvest stage.

Globalisation layout: Overseas revenue accounts for about 40%, focusing on expanding emerging markets such as Southeast Asia, the Middle East and Latin America. Established localised cooperation with Brazil, Russia and other countries.

Policy dividend: Benefiting from the 'domestic substitution' policy, the proportion of domestic equipment purchased by tertiary hospitals has increased. Participated in the development of medical imaging equipment industry standards. Participated in the formulation of industry standards for medical imaging equipment.
Sinking market demand explosion:

Demand for upgrading equipment in county medical and primary medical institutions (China's "Thousand Counties Project" policy). Neusoft launches mid-range CT and DR equipment to capture the market.

AI and digital healthcare: Medical imaging AI market size CAGR exceeds 30% (2023-2028), Neusoft NeuAI platform and hospital cooperation cases increase.

Cloud medical solutions (e.g. "medical cloud") help remote diagnosis.

Overseas emerging markets:
Southeast Asia, Africa and other regions have large gaps in medical infrastructure and strong demand for cost-effective products.
Strategic Moves:
The firm collaborated with Baidu and Tencent to develop medical AI algorithms and it layout "equipment + service" model, providing equipment leasing, maintenance and value-added services at the same time.

Technology Breakthroughs:
It strengthen the development of medical AI technology and the independent R&D of core components (e.g. high-field-strength MRI magnets).

Ecological integration: It wants to deepen the service capability of the whole chain of "imaging equipment + AI + cloud platform".
Emerging Markets: The market expands to Africa and the Middle East through the Belt and Road Initiative.

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Discussion
This paper set out to explore how cost-benefit analysis can serve as a practical framework for navigating the complex investment landscape in biomedical engineering. Beyond addressing investor challenges, it aimed to provide actionable insights for policymakers and spark further academic discussion. While the analysis reveals notable structural and content-related shortcomings, it also delivers meaningful contributions to the field. A balanced evaluation

of its strengths and weaknesses offers a clearer picture of its overall value.

Key Contributions and Positive Impacts

1. Introducing Cost-Benefit Analysis: A Much-Needed Decision-Making Tool

One of the paper's most significant strengths lies in its effort to integrate cost-benefit analysis into biomedical engineering investment decisions—a domain traditionally plagued by high uncertainty, lengthy R&D cycles, and substantial capital requirements. For biotech firms and investors, the stakes are exceptionally high: developing a single medical device can take years, involve multi-stage validation (research, pilot testing, clinical trials), and carry the risk of failure at any phase. Yet, existing investment approaches often lack systematic frameworks to weigh trade-offs.

By advocating for cost-benefit analysis, the paper provides a structured method to quantify and compare project costs (e.g., R&D expenditures, manufacturing setup, regulatory compliance) against potential returns (e.g., market share gains, long-term profitability, societal health improvements). This approach is particularly valuable for diverse stakeholders:

Government bodies can use it to prioritize funding for projects with the highest public health impact per unit cost.

Private investors can assess which technologies offer the best risk-adjusted returns, avoiding over-concentration in hyped but unproven areas.

Biotech firms can optimize resource allocation between innovation and operational efficiency.

While the paper doesn't fully execute this framework (a gap addressed later), its mere introduction of the concept fills a critical void in the literature, offering a first step toward more rational investment decisions.

2. Mapping the Biomedical Landscape: Opportunities and Challenges

The literature review, despite its organizational flaws, succeeds in painting a broad yet insightful picture of China's biomedical engineering sector. It highlights two overarching trends:

Growth Drivers: The industry is buoyed by rising demand (e.g., aging population requiring more medical devices, increasing affordability of healthcare), technological leaps (e.g., medical robotics enabling minimally invasive surgeries, AI-powered diagnostics improving accuracy), and policy support (e.g., incentives for domestic substitution to reduce reliance on imported high-end equipment).

Structural Barriers: Yet, the sector faces formidable hurdles—foreign dominance in premium segments (e.g., MRI/CT machines with over 80% market share controlled by Siemens, GE, and Philips), uneven quality across domestic firms (small players often producing low-tech, high-risk products), and the long, costly path from innovation to market (new devices require rigorous validation, delaying returns).

This balanced view isn't just descriptive; it underscores the need for tools like cost-benefit analysis to help stakeholders navigate this "opportunity-rich but risk-laden" environment.

3. The Neusoft Medical Case Study: Grounding Theory in Practice

The inclusion of Neusoft Medical—a leading Chinese medical imaging firm—as a case study adds practical relevance. Though the analysis is not exhaustive, it illustrates real-world trade-offs investors and firms grapple with:

Costs: Pressure from centralized procurement (forcing price cuts, e.g., a CT model's winning bid at ¥1.428M vs. a ¥2.6M ceiling), heavy R&D/marketing investments (impacting short-term profits), and historical struggles (declining gross margins from 39.9% to 36.7% over 2018–2020, reliance on government subsidies).

Benefits: Competitive edges (localized service, cost-effective pricing, integrated medical IT solutions), technological leadership (first domestic CT in 1997, 256-slice energy-spectrum CT in 2021), and strategic moves (AI diagnostics deployed in top-tier hospitals, overseas expansion to Southeast Asia and the Middle East, policy tailwinds from "domestic substitution" initiatives).

Even without deep quantitative modeling, the case study bridges the gap between theory and

practice, showing how cost-benefit principles could be applied to evaluate such trade-offs more rigorously.

Conclusion

1. Structural Disorganization: A Fragmented Narrative

The paper's structure undermines its potential impact. Transitions between sections are abrupt the introduction sets up the importance of cost-benefit analysis but doesn't clearly link to the methodology's application. The literature review jumps erratically from broad industry trends to specific technologies (robotics, gene therapy) and then to risks, creating a disjointed flow. For readers, this makes it challenging to follow the logical progression from problem identification to solution evaluation.

Moreover, sections often fail to deliver on their implied promises. The methodology section, for instance, explains cost-benefit analysis in general terms but doesn't articulate how it will be tailored to biomedical projects or applied to the Neusoft case. This misalignment between sections suggests a lack of cohesive planning.

2. Superficial Treatment of Core Concepts

While the paper mentions cost-benefit analysis, its application is shallow. In the Neusoft case, costs and benefits are listed descriptively (e.g., "price pressure," "AI advantages") but not quantified. Key tools like net present value (NPV), benefit-cost ratios, or sensitivity analyses—which would transform qualitative observations into actionable insights—are absent. Without these, the analysis remains speculative, limiting its utility for investors who need hard numbers to compare projects.

Similarly, the discussion of risks (e.g., R&D uncertainty, market competition, policy shifts) is broad but lacks depth. For example, it notes that R&D has a "low success rate" but doesn't explore mitigation strategies (e.g., collaborative research, phased funding). Market risks are acknowledged (e.g., global competition) but not analyzed in terms of how firms might adapt (e.g., niche targeting, strategic partnerships).

3. Language and Academic Rigor

The language often hinders clarity. Grammar errors, awkward phrasing (e.g., "problems can arise at every stage of new device development"), and repetitive constructions (e.g., "the development of... the development of...") distract from the content. More critically, the paper lacks the precision expected in academic writing—citations are sparse, and sources (e.g., Lian et al. 2020, Lv et al. 2017) are sometimes dropped without clear context or synthesis. The absence of a standard academic structure (e.g., abstract, methodology, results, discussion) further reduces its credibility.

4. Limited Critical Engagement

The analysis rarely questions assumptions or explores nuances. For instance, it treats "policy support" as uniformly positive without examining potential downsides (e.g., over-reliance on subsidies distorting market dynamics). Similarly, the discussion of emerging technologies (e.g., AI diagnostics) highlights benefits (e.g., improved accuracy) but not risks (e.g., data privacy concerns, algorithmic bias). This superficiality limits the paper's ability to provoke deeper thought or offer robust solutions.

III. Synthesis: A Foundation with Room to Grow

In summary, this paper makes a commendable first attempt to bridge the gap between economic evaluation tools and the biomedical engineering sector. Its introduction of cost-benefit analysis, overview of industry dynamics, and practical case study provide a foundation for more refined research. However, its impact is constrained by structural disorganization, shallow analysis, language inconsistencies, and a lack of critical depth.

To realize its potential, future iterations should:

1. Strengthen Structure: Reorganize sections to ensure logical flow—from problem definition (investment challenges) to solution framework (cost-benefit analysis) to application (case study) and implications.
2. Deepen Analysis: Apply quantitative cost-benefit methods (e.g., NPV calculations, risk-adjusted returns) and critically evaluate risks with targeted mitigation strategies.

3. Enhance Academic Rigor: Improve language precision, expand citations, and adhere to standard academic formats.
4. Foster Critical Thinking: Explore nuances in policy impacts, technological trade-offs, and stakeholder motivations.

By addressing these gaps, the paper could evolve from a preliminary exploration into a seminal contribution, offering investors and policymakers a reliable toolkit for fostering sustainable growth in biomedical engineering.

Conflict of Interests: the author has claimed that no conflict of interests exists.

References

1. Xun et al. (2024): This work outlines the fundamental concepts and scope of Biomedical Engineering (BME), establishing a necessary foundation for the paper's context. It also facilitates an introduction to the interdisciplinary characteristics of BME and its significant role in advancing medical device technology.
2. Chen et al. (2025): Their analysis details the methodology of cost-benefit analysis, with a focus on the use of monetary units for measurement, the computation of cost-benefit differentials and ratios, and the synthesis of relevant factors to inform decision-making. These aspects form a core component of the methodological framework presented in this paper.
3. Lian et al. (2020): This reference characterizes the current landscape of China's medical device sector, supplying data on overall market scale, the categorization of companies within the industry, and the market distribution across different product categories. Additionally, it identifies key growth opportunities, including potential demand for device upgrades, influences from healthcare system reforms, and demographic shifts toward an aging population.
4. Lv et al. (2017): Expanding on market potential, this study investigates further prospects within China's medical device market, such as increasing exports of medical products and rising demand for healthcare services driven by demographic aging. It is utilized to substantiate the discussion of market opportunities within the literature review.
5. Gao et al. (2020): This research examines the medical device sector as an emerging industry, discussing its distinctive features. It is referenced to support the argument for employing cost-benefit analysis in evaluating related investment decisions