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Financing of Works with Public Opening

Jorge Pablo Aguilar Zavaleta

Faculty of Engineering and Architecture, Professional School of Architecture, César Vallejo University, Peru

Corresponding author
Jorge Pablo Aguilar Zavaleta, Faculty of Engineering and Architecture, Professional School of Architecture, César Vallejo University, Peru.

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ABSTRACT
Public works financing faces a critical challenge: while traditional projects meet deadlines and budgets by 75-80%, those with public-private partnerships (PPPs) achieve 90-95% efficiency (MEF-Perú). However, a study of 37 cases in the US reveals that 40% of PPPs generate disputes due to regulatory failures or financial management (ASCE). Even more striking, "green bonds" are emerging as a solution, mobilizing USD 500 billion in 2023 for sustainable infrastructure, although "greenwashing" threatens their credibility (Climate Reality Project). The paradox: while private investment drives innovation (e.g., 20% savings in highway maintenance, CBO), its focus on profitability can neglect social benefits. Technology (AI, digital twins) promises to optimize costs by 30%, but only 15% of governments adopt it (McKinsey). The verdict? PPPs and innovative tools are key, but they require robust legal frameworks to balance efficiency and equity.

Keywords: Financing, Public Opening, Public Building

Introduction

Financing of Works with Public Opening

Public infrastructure projects (roads, bridges, water systems, etc.), vital to economic and social development, show surprisingly higher operational efficiency when financed under open public schemes. According to data from the Ministry of Finance (MEF-Peru), these projects meet deadlines in 95% of cases (vs. 75% under traditional modalities) and are on budget in 90% (vs. 80%). These figures reveal a qualitative leap in the management of public projects, demonstrating that operational effectiveness depends on the financing modality.

The findings underscore the importance of public-private partnerships (PPPs) and other forms of innovative financing. By assigning greater responsibility to the private sector, open schemes allow for strict monitoring and generate incentives to meet objectives. This phenomenon is consistent with the view of international organizations: governments adopt PPPs attracted by the "prospect of greater efficiency" and infrastructure expansion without increasing their debt. The clear relationship between openness in bidding and operational results suggests re-evaluating public management to strengthen these schemes and improve the execution of public investment.

The financing of works with public opening refers to the various funding mechanisms and strategies utilized to support infrastructure projects that serve the public good. These projects, which include roads, bridges, water systems, and public facilities, are vital for promoting economic development, public welfare, and enhancing community quality of life. As public infrastructure often requires significant capital investment, understanding the complexities of financing sources is essential for stakeholders, including governments, private investors, and community members.

Notably, the financing landscape for public works includes a combination of equity financing, debt instruments, grants, and subsidies, as well as innovative funding approaches like public private partnerships (PPPs). Equity financing allows project sponsors to raise capital by selling shares, whereas debt financing, such as senior loans and bonds, provides crucial funding that must be repaid over time. Additionally, grants and subsidies from governmental bodies offer non repayable financial support aimed at specific public initiatives. Each of these mechanisms has distinct advantages and challenges that can impact the project's viability and alignment with public interests[1,2].

Despite the potential benefits, the financing of public works also faces notable controversies. Critics highlight issues related

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to accountability in PPPs, the risk of cost overruns, and the prioritization of private profit over public welfare. Moreover, debates surrounding the sustainability of funding models, particularly in the context of environmental and social governance, underscore the necessity for transparent and equitable financing practices. These discussions are crucial as governments navigate the balance between securing immediate funding and ensuring long term societal benefits from infrastructure investments [3,4].

In summary, the financing of works with public opening is a multifaceted domain that encompasses various funding types and strategic considerations. Its importance lies not only in facilitating essential infrastructure projects but also in addressing broader economic and social challenges. As global demands for resilient infrastructure grow, innovative financing mechanisms and stakeholder collaboration will play pivotal roles in shaping future outcomes [5,6].

Types of Financing

Financing for public works projects encompasses a diverse array of sources and structures, aimed at ensuring the necessary capital is available for design, construction, and operation. Understanding the different types of financing is essential for stakeholders involved in such initiatives.

Equity Financing

Equity financing involves raising capital through the sale of shares in the project or organization. Project sponsors contribute equity to demonstrate commitment and confidence in the project's profitability. This form of financing absorbs more risk compared to debt, as equity investors typically only receive returns after debt obligations have been satisfied [1].

Debt Financing

Debt financing represents a critical component of project funding, where financial institutions provide loans that must be repaid with interest.

Senior Loans

Senior loans are secured by project assets and take priority over other forms of debt in the event of default. These loans generally come with lower interest rates due to their secured nature [1].

Mezzanine Debt

Mezzanine debt ranks below senior loans but above equity in terms of repayment priority. It often carries a higher interest rate because it entails greater risk for lenders. Mezzanine financing can be an effective way to bridge the gap between equity and senior debt [1].

Bonds and Debentures

Bonds and debentures are alternative debt instruments that allow organizations to raise capital from a broader investor base. Bonds are typically secured by the issuer's assets, whereas debentures are unsecured, relying on the issuer's creditworthiness. Both instruments obligate issuers to make periodic interest payments and repay the principal at maturity [1].

Grants and Subsidies

Grants and subsidies represent non repayable financial assistance provided by government entities or other organizations. These funds can be crucial for public works projects, especially in sectors aimed at enhancing public welfare and economic development. While they do not require repayment, they often come with specific conditions regarding usage and reporting [2,3].

Asset Based Financing

Asset based financing involves providing loans against specific project assets, al lowing companies to secure funding through tangible collateral. This approach not only assures lenders but can also enhance cash flow management for borrowing entities[1,4].

Public vs. Private Funding

Public funding is provided by government entities and aims to promote public welfare and development, whereas private funding is sourced from individuals or organizations in the private sector, often with expectations of financial returns or specific outcomes [3]. Each has its advantages and disadvantages, which must be carefully considered based on the goals and needs of the project [2,5].

Sources of Funding

Public Funding

Public funding refers to financial resources allocated by government entities, such as federal, state, and local governments, for projects aimed at promoting public welfare, economic development, and infrastructure improvements. This type of funding is commonly accessed through grants, contracts, and subsidies, and typically requires recipients to meet specific eligibility criteria, including demonstrating potential public impact and adhering to regulatory frameworks [3,6]. Public funding often comes with stringent accountability and reporting requirements to ensure effective utilization of taxpayer money and to maintain public trust [3,7]. Local governments, in particular, leverage various public funding sources to finance essential infrastructure projects, including roads, bridges, and water systems, often combining these funds with other financing methods like municipal bonds [5,6].

Characteristics of Public Funding

The characteristics of public funding include its focus on transparency and compliance with government regulations. Decision making authority often lies with the funding organization, which can introduce bureaucratic processes that limit flexibility for recipients. Public funding can be subject to budget fluctuations, making long term sustainability a key consideration [3,5,6]. Examples of public funding sources include federal and state grants aimed at local infrastructure projects, which municipalities often access to bridge financing gaps and meet community needs [8].

Private Funding

In contrast, private funding is provided by individuals, organizations, or investors from the private sector and offers more flexibility and control to the recipients. Eligibility criteria for private funding can vary significantly and may include factors such as project viability, alignment with the funder's values, and the track record of the individuals involved [3,9]. While private funding allows for a more agile decision-making process, it may also involve more competition and a more complex application

process. Private sources can include venture capital, community development financial institutions, and impact investors, particularly focused on projects aimed at benefiting low-income communities [3,10].

Characteristics of Private Funding

Private funding typically comes with less stringent reporting requirements compared to public funding, allowing recipients greater freedom in how they manage the funds. However, this type of funding may be less stable in the long term due to the shifting priorities of private donors and investors [3,5]. For instance, while private investors might provide critical funding for specific projects, their involvement can sometimes necessitate compromises in project scope or priorities to meet funding conditions [3,9,10].

Local Funding Strategies

Local governments often utilize a combination of public and private funding sources to finance infrastructure. Strategies can include using local general taxes, special user fees, and impact fees imposed on developers to support infrastructure improvements associated with new projects [5,11]. For example, impact fees are one-time charges that help fund the increased demand on public infrastructure created by new developments [10,12]. This multifaceted approach enables localities to address infrastructure deficits while balancing various community needs and priorities [6,7].

Methods

Project Evaluation and Selection

Overview of Project Evaluation

Evaluating projects for financing, particularly in the context of Public Private Partnerships (PPPs), requires a meticulous analysis to ensure economic soundness and alignment with financial goals. The process involves assessing the viability of potential projects, focusing on sustainability and the potential for long term success [1,13]. A thorough Cost Benefit Analysis (CBA) is essential, as it captures the costs and benefits associated with a project solution, confirming its net value to society and aiding in the selection or prioritization of projects [13].

Project Selection Criteria

The selection of projects eligible for financing under programs like the Green Bond initiative adheres to specific criteria. Projects must comply with World Bank safeguards, procurement policies, and undergo independent reviews to ensure integrity and performance [14]. The Project Selection Criteria are used to identify suitable mitigation and adaptation projects, leading to a list of eligible candidates that disburse funds over several years during implementation [14].

In assessing whether an infrastructure project should be public sector only or involve private sector participation, an objective analysis of costs and benefits to taxpayers is critical. However, many governments face challenges in conducting these assessments systematically, often leading to decisions that may favor PPPs unduly [15].

Risk Management and Allocation

A pivotal aspect of project evaluation is the identification and allocation of risks. Risks must be strategically distributed among parties involved, including sponsors, lenders, and contractors. Effective mitigation strategies may involve hedging against exchange rate risks, obtaining insurance, or crafting precise contractual agreements to balance the project risks, ensuring it remains attractive to investors and sustainable over time [1].

Importance of Competitive Selection Processes

Governments must create transparent and competitive processes for selecting private sector partners. Clear communication regarding selection requirements, timelines, and evaluation criteria is crucial. A well-run selection process not only attracts qualified bidders but also lays the groundwork for a productive partnership with the chosen contractor [15,16].

By focusing on a combination of price, capability, and reputation of bidders, governments can avoid pitfalls such as low-ball offers that later lead to renegotiations. Legislative measures, like those enacted in Colombia, can further protect public interests by mandating re-bidding under certain conditions [15].

Results and Discussion

Case Studies

Public Private Partnerships in Infrastructure

A variety of public private partnerships (P3s) illustrate their diverse applications in infrastructure development. Eight specific case examples highlight uses such as the design, construction, and operation of a water treatment plant, as well as the financing, operation, and maintenance of a courthouse. These instances serve as valuable resources for individuals and organizations considering P3 arrangements for their projects [17].

Chicago Infrastructure Trust

In response to inconsistent and unpredictable state and federal infrastructure funding, the Chicago Infrastructure Trust (CIT) was established in 2012. This initiative aimed to foster innovative financing solutions and deliver essential infrastructure projects while stimulating economic development and job creation. Key stakeholders included the City of Chicago, Chicago Public Schools, and the Chicago Department of Transportation, among others [18].

Highway Management Case Studies

An examination of older highways, such as the Chicago Skyway and the Indiana Toll Road, provides insight into the operational and maintenance cost impacts of transitioning to private management. Both highways, originally constructed via traditional methods, were leased to private companies in the mid2000s. Following the transition, both experienced reductions in operational costs. However, these changes were influenced by various factors, including the 2007–2009 recession and fluctuations in traffic, complicating the assessment of the lease's direct effects [19].

Dispute Analysis in U.S. P3 Projects

Research focusing on 37 case studies of infrastructure and construction projects within the U.S. revealed critical insights into the factors causing disputes in public private partnerships. Key causes identified include legal and regulatory challenges, financial issues, and poor management practices. The study aimed to understand not only the primary factors behind disputes but also the relationships among these elements, providing early warning signs to help mitigate potential conflicts in future projects [20].

Innovative Funding Mechanisms

Reports analyzing social impact bonds have illustrated the potential of alternative funding mechanisms to drive innovation and address social challenges. These studies emphasize the importance of case analyses in understanding which funding structures are most effective in achieving positive outcomes, particularly for low- and moderate-income communities [21].

Table 1: Comparison of project completion vs. projects with public opening

	Traditionally executed works	Works with public opening
Met deadlines	75%	95%
Met budgets	80%	90%
Completed 100%	77%%	92%

NOTE: Extracted from MEF-PERU, 2023.

Regulations and Policies

Importance of Legal and Regulatory Frameworks

A clear legal and regulatory framework is essential for achieving sustainable solutions in the financing of public works and infrastructure projects. This framework not only helps to establish guidelines for investment but also fosters an environment that encourages service delivery to underserved populations, particularly the poor [22].

Inconsistent laws and regulations often hinder access to basic services such as water, electricity, and transportation, emphasizing the need for reforms that align institutional incentives with broader public interests [23].

Stakeholder Involvement in Regulatory Design

Effective regulation requires the input of diverse stakeholders who have vested interests in the infrastructure projects. For instance, when designing regulations for an airport project in Asia, planners engaged various groups including end users, government ministries, and organizations involved in similar initiatives to ensure that the regulatory objectives were clearly defined from the outset. This collaborative approach prevented the focus from shifting to less critical details, allowing for a more streamlined development of regulatory specifics later on [15].

Benchmarking and Impact Assessment

Benchmarking against international regulatory practices is a valuable tool for initiating public-private partnerships (PPPs). By examining how different regulatory frameworks have succeeded or failed in other contexts, governments can better assess the potential impacts of their own regulations, particularly concerning tariff structures that influence the financial viability of infrastructure investments. For example, the return on investments in electricity and gas networks is significantly impacted by tariff regulation, which, in turn, affects network quality and economic growth [15,24].

Government Initiatives and Infrastructure Development

Government policies play a critical role in catalyzing infrastructure development. Recent legislative measures, such as the Infrastructure Investment and Jobs Act (IIJA) in the United States, have allocated significant funds for modernizing utilities and addressing pressing public needs. These initiatives not only provide immediate benefits but also help secure long-term financing for projects with stable cash flow [24]. Moreover, such policies can encourage cooperative governance among local authorities, enhancing regional investment and infrastructure delivery strategies [9].

Challenges in Public Sustainable Finance

The existing sustainable finance paradigm faces challenges due to institutional constraints that limit public investment capabilities. In countries like Germany, strict fiscal rules and an aversion to sovereign debt have resulted in low growth rates, highlighting the need for more effective public financing mechanisms to support sustainable initiatives [25]. The urgency of addressing climate change necessitates rapid and decisive action within these constraints, underscoring the importance of an adaptable regulatory environment that encourages public investment in sustainable infrastructure [26].

Conclusions

Impact on Society

Public Private Partnerships (PPPs) and Accountability

Public private partnerships (PPPs) have emerged as a significant framework for addressing various societal concerns, including environmental improvement and urban economic development. However, critics argue that the lack of accountability mechanisms in PPPs can lead to adverse outcomes, such as cost overruns and the mismanagement of public assets [27,28]. Civil society organizations (CSOs) emphasize the intrinsic weaknesses of the PPP model, highlighting the need for clear agreements to ensure public services remain accessible and affordable while balancing private sector profit motives with social objectives [27,29].

Economic Implications

The financing of infrastructure through PPPs is often justified by the potential for enhanced efficiency and innovation brought by the private sector. Studies have shown that PPPs can improve compliance with regulatory standards and yield cost savings in some cases, particularly within water utilities [19,30]. Nevertheless, there is a concern that the private sector's focus on profitability might result in under investment in essential infrastructure, which may not generate immediate financial returns but offers significant social benefits [19,13]. The economic multiplier effect of infrastructure investment further emphasizes its importance, as every public dollar spent is estimated to generate $1.50 in economic activity, particularly crucial during periods of recession [30].

Environmental and Social Sustainability

The shift towards a 'green' economy has reshaped the financing landscape, with stakeholders increasingly prioritizing energy efficiency and sustainability in infrastructure projects. The UN’s Sustainable Development Goals (SDGs) underscore the necessity of sustainable infrastructure investments to achieve broader developmental objectives [31]. However, the challenge remains to ensure that private sector involvement does not compromise the environmental goals of these projects. The need for resilient and sustainable infrastructure is paramount, and integrating environmental considerations into PPP agreements is vital for long term societal benefits [31,32].

Unintended Consequences

Despite the potential benefits of PPPs, they are not without risks. Analysts have pointed out that reliance on private financing may undermine innovation and lead to unforeseen negative consequences [32,33]. Additionally, the complexity of these arrangements can sometimes obscure the true costs and benefits associated with public works projects, making it difficult for governments to assess the overall impact on society effectively [33]. As such, careful consideration of the contractual frameworks and accountability measures is crucial to ensure that PPPs deliver on their promises of societal enhancement while minimizing risks.

Future Trends

Innovative Financing Mechanisms

As global demand for modern and resilient infrastructure intensifies, there is an urgent need for innovative financing solutions. Traditional funding models frequently fall short of meeting the substantial financial requirements for largescale infrastructure projects. Governments are increasingly exploring new financing strategies, including public private partnerships (PPPs), impact bonds, and green bonds, which serve as pivotal mechanisms for attracting private investment into public infrastructure projects [5,34].

Green Bonds

Green bonds have emerged as a crucial financing tool, particularly in emerging markets where they present unique opportunities for sustainable development. These bonds enable financing for projects related to renewable energy, energy efficient public transit, and biodiversity conservation, among others. However, the growth of the green bond market is accompanied by challenges such as greenwashing, where the environmental benefits of the bonds may be overstated. Ongoing efforts by banks and issuers to enhance transparency and accountability through annual impact reports aim to mitigate these risks and strengthen trust in this financing mechanism [35]

Technological Integration

Technological advancements are reshaping the infrastructure financing landscape. The integration of tools such as big data analytics, 5D building information modeling (BIM), and digital twins allows for improved planning, execution, and evaluation of infrastructure projects. These technologies not only enhance efficiency but also provide new avenues for attracting investment by demonstrating the long-term value of projects [36,31]. The rise of electric vehicles (EVs) and renewable energy solutions further underscores the necessity for adaptable infrastructure that can meet evolving demands [36].

The Role of Research and Development

To fully capitalize on these trends, a significant increase in research and development efforts is required. Policymakers and financial institutions must collaborate to foster an environment conducive to innovation, ensuring that new financing models align with sustainability and resilience objectives. Continued exploration of financing mechanisms and technological integration will be essential for addressing the financial challenges associated with public infrastructure projects in the future [5,31].

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