A review on the success factors of crowdfunding-based to finance small-scale infrastructure projects

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Abstract. Public-Private Partnership (PPP) schemes in delivering economic and social infrastructure are growing in developing countries worldwide. Various developing countries, including Indonesia, has also been preparing and developing numerous projects, ranging from larger-scale economic infrastructures that include toll roads to multifunction satellites and smaller-scale social infrastructures that include water supply, solid-waste management, and regional hospital projects. With the increasing numbers of smaller infrastructure projects proposed by the local government, attracting financers to invest in these projects is still a challenge the government faces. Financial institutions are still averse to making the appraisal and due diligence to such projects, owing to the nature of little historical evidence of private finance involvement in small-scale infrastructure finance. In some western countries, citizens have taken the initiative to forward and finance their local infrastructure development due to realizing the social, economic, and environmental benefits of civic projects for the local community. Theoretical research has shown the opportunity of utilizing crowdfunding for local urban infrastructure; however, the factors contributing to benefit from this finance method are yet to be identified. This paper seeks to answer questions on what success factors contribute to the opportunity to adapt the crowdfunding scheme to finance a smaller-scale urban infrastructure project by conducting qualitative literature review.

1 Introduction

Infrastructure projects can be divided into social and economic infrastructures [1]. Education, prisons, and health facilities are social infrastructures. In contrast, economic infrastructure refers to the facilities that introduce and promote economic activities, including road, land, sea, and air transport facilities, electricity, telecommunications networks, and bridges. However, the project investments of both economic and social infrastructures share common characteristics, such as the long-life cycle involving significant time-consuming development processes that are capital-intensive and complex to value [2-3].

Providing infrastructure facilities and services to the public is unquestionably the government's responsibility. The traditional way to fund infrastructure projects is through public finance strategies obtained from general taxation and public borrowing. However, the scale of infrastructure projects is becoming more complex, with increasing risk, cost, and size to meet growing demand. Therefore, the government should encourage private entities to finance, provide, operate, and manage the public [4]. Forms of concession agreements of infrastructure procurement that involve private partners have several derivatives that include the Private Financing Initiative (PFI), Public-Private Partnership (PPP), Build-Own-Operate-Transfer (BOOT), and Leasing [5]. These project financing models involving private entities vary mainly by ownership of capital assets, investment responsibility, risk assumptions, and contract duration [6].

PFI and PPP financing schemes are arranged between government entities through their public agencies, either at a central or local level, with private entities for an infrastructure-based services delivery mechanism. PPP can be attractive due to the possibilities of tapping into the private sector's source of funds and experience in infrastructure delivery. However, the complexity of the long-term nature of partnerships and the involvement of diverse entities with varying interests renders most projects controversial and risky [7].

Developing countries are continuously encouraging private sectors to invest in their economic infrastructure. Given the immediate attention from the governments to the development of large infrastructure projects in the past few decades, the Coronavirus disease (COVID-19) pandemic in 2020 has shown the inadequacies of quality and quantity in healthcare facilities in the rural area and the importance of facilitating smaller resilience infrastructure. The delivery mechanisms for healthcare infrastructure can be PPP or Business-to-Business (B2B) between state-owned and private hospitals or alternative schemes.

Based on empirical findings, the weak credit position of small-scale infrastructure projects and the opportunity of utilizing crowdfunding to finance local

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urban projects draw the prospect of using it as a source of infrastructure finance [8–10]. However, little is known about the relationship and factors to combine crowdfunding with project financing as an alternative source for small-scale project developments. This paper attempts to answer questions on what success factors should be attended to grasp the opportunity of adapting crowdfunding for smaller-scale infrastructure projects.

2 Literature study

2.1 Small-scale infrastructure projects

It was estimated that approximately 5 billion people will live in the 600 largest cities worldwide in 2025 and over 65% of the world's population will reside in urban areas by 2050 [11]. Therefore, major cities worldwide are developing infrastructure to provide basic services for the inhabitants and address urban issues caused by rapid population growth [12].

Developing urban areas does not only tackle those challenges but also provides local infrastructure assets that can improve life quality and reduce income inequality [13-14]. Furthermore, it can effectively reduce production costs through improvements in transport and connectivity and provide better access to key facilities. Thierie & De Moor [15] argued that there is a connection between growing populations in urban areas and the demands for smaller but essential urban infrastructure. Therefore, the number of proposals for regional smaller-scale infrastructure development keeps increasing.

It may not be practical to use a firm cap on considering a small-scale PPP; however, small-scale PPP projects can be differentiated from large and complex projects regarding the project preparation process [16]. In Australia, there are different measurements in defining the minimum threshold of investment cost in private-delivered infrastructure projects. For example, under its National Guidelines for Infrastructure Project Delivery, the Australian Federal Government states that if an infrastructure project were to be delivered and financed involving a private party, it would require over AUD 50 million [17].

Kupisz [18] proposed alternative measures to identify infrastructure project size using indicators that include capital expenditure budget, beneficiaries scale, life-cycle cost, value for money, the number of jobs created from the project construction and operation, the density of beneficiaries, as well as the amount from the government support requires and the government contracting agency (GCA). Some literature deems that small project preparation and transaction costs outweighed the economic and financial return. Imbalance cost and return are believed to discourage private investors from financing smaller projects.

On the other hand, there are several countries experienced real successful cases of delivering PPP for small-scale projects. Based on the partnership UK database in the United Kingdom (UK), 261 out of 700 infrastructure projects below GBP 10 million were listed as PPP projects, meaning that privates, in small shares, are still attracted to finance those projects. Furthermore, as previously explained, the set minimum threshold in Australia also saw a successful project delivery at the sub-national level even though they cost under the threshold. A total of 39 out of 168 projects in Australia were below AUD 50 million in capital cost [19]. Social infrastructure projects may be considered small-scale projects, such as constructing and maintaining government buildings, water and waste management, industrial recycling, prisons, and hospitals.

Even though a small-scale project requires less investment, the preparation and process framework in UK remain the same with a larger infrastructure project. For example, when it comes to involving private finance for an infrastructure project, the complex legal and technical feasibility study and lengthy procurement of local waste management projects, and the highly advanced waste-to-energy project would follow the same approval process [20]. Another common issue identified by previous studies is the limited number of institutions willing to invest in small-scale projects [21], considering that the potential revenue from small-based users is imbalanced in the cost of project preparation and transaction framework. Nonetheless, small-scale projects are not built for profit but for greater social welfare and community well-being. This research was conducted on the basis that institutional investors are not the primary match for small-scale projects; therefore, seeking potential alternative financiers, such as from the crowd, becomes more compelling.

2.2 Crowdfunding-based project financing

Community-driven funding, or crowdfunding, has been widely used to finance start-up businesses, social and art projects, to urban infrastructure. Based on the intention of funders to give or invest their money in crowdfunding projects, crowdfunding models are grouped into two categories: financial return and non-financial return. A non-financial return crowdfunding project is the most common practice. It is where funders expect a reward in the form of non-monetary rewards or the end-product in the reward-based model for no expectation at all, only philanthropic motivations in the donation-based model [22-23]. On the other hand, the financial return from the crowdfunding model, such as debt-based and equity-based campaigns, is catered to funders looking to invest their money with an expected return in the form of material rewards.

Diverse platforms of the crowdfunding ecosystem are developed and operated with a focus on the specific type of financial model and particular sector of the project itself. Donation and reward-based models are mostly used for social and creative projects with social value but not economic value. Kickstarter, IndieGoGo, and KitaBisa are among the widely known crowdfunding platform today. The types of crowdfunding models and the definition according to Shneor [23] are summarized in Table 1.

Using debt-based and equity-based crowdfunding models is seeing more private developers financing their projects. Real-estate development [24] and energy-efficiency projects are among the high crowdfunding

market size sectors due to strong and predictable revenue streams [25–27]. For example, an online crowdfunding platform in the United States raised USD 6 million for commercial real estate development. In Bogota, Colombia, Prodigy Network successfully raised USD 171.8 million out of USD 239 million required to continue the BD Bacatá Complex Building construction from individual investors, mostly local citizens of Bogota, using a crowdfunding campaign in 2011 [28].

Several terms are widely used in the crowdfunding ecosystem, regardless of the crowdfunding model. Campaign owners are the main actors raising the fundraising campaign for a certain cause through their own or third-party digital platforms [29]. Backers, funders, and investors, mostly crowdfunders, are individuals or institutions giving their money for campaign owners' perusal that may or may not retain the risk [30]. Campaign owners and crowdfunders interact in a digital crowdfunding platform. This platform is accessible for pooling the fund, providing information to crowdfunders, and being updated by the campaign owners.

Table 1. Crowdfunding model types.

Crowdfunding Model	Submodel	Definition
Debt-based	Peer-to-peer (P2P) consumer lending	Crowds consist of individual lend loans to individual borrowers
	Peer-to-peer (P2P) business lending	Mixed institutional and individual lend loans to business borrowers
	Municipal bond	The bond issued by the local government
Equity-based	Real estate crowdfunding	Direct investment from mixed institutional and individual funders into a property development project
	Start-up crowdfunding	Direct investment from mixed institutional and individual funders into registered security or equity of the early-stage company
Donation-based		Individual donations earmarked for certain social activities for philanthropic motivation
Reward-based		Individual funders collectively fund for the project that rewards a product or service

However, the opportunity of crowdfunding to be utilized for the public domain is rarely taken due to a lack of knowledge and experience on financial-return-based crowdfunding in the public sectors, and the concern regarding capital and administrative cost may be equal to or more than the current form of public finance [31]. Farajian & Ross [32] studied the flexibility of civic crowdfunding as an additional equity finance source in a public-private partnership delivery mechanism. Crowdfunding is compelling because it is not limited by geography, even though local actors mostly drive it.

3 Methods

This paper aims to identify the success factors contributing to the adaptation of the crowdfunding scheme in financing small-scale urban infrastructure projects by reviewing the existing literature on the topic. To obtain this objective, the qualitative exploratory research design that seeks to comprehend the context of financing small-scale infrastructure projects using crowdfunding was performed. This research conducted a content analysis of the journal articles and book chapters focusing on financing small-scale infrastructure projects and crowdfunding schemes, discussing the relationship between the two aspects.

The papers reviewed were obtained from Google Scholars, a database with wide-ranging coverage for scientific publications. The search was done by using keywords that include "crowdfunding", "small-scale", "infrastructure", and "finance", particularly within the publication years of 2015 and 2020. The collected articles from this search were evaluated twice by reading the abstract for relevance, followed by the full paper after the abstract was considered relevant. Furthermore, a qualitative analysis was carried out to examine the ten articles redeemed relevant to the objective of this study. These papers were manually reviewed, categorized, and discussed on each success factor that include:

1) The project scale,
2) The enabling policy,
3) The engagement between stakeholders, and
4) The plaftorm technology.

4 Success factors of crowdsourcing-based financing for infrastructure projects

4.1 The Scale of the infrastructure projects

Based on a study done in identifying the success factors of the crowdfunding campaign, smaller to medium size project is better at reaching funding target than large and complex project due to the smaller budget requirement. Davis & Cartwright [31] worked together with a UK-based crowdfunding platform, three UK city councils (i.e., Bristol City Council, Isle of Wight City Council, and Leeds City Council), and three UK National Health Service (NHS) bodies (i.e., NHS Dudley, King's

College Hospital, and Royal Devon and Exeter NHS Trust) to investigate and develop a community-based financing feasibility study for six pilot case public projects in energy and health sectors, and mixed-used building development.

Each case study required the development of a municipal crowdfunding platform. The research team and city councils collaborated with the UK-based crowdfunding platform Abundance Investment to develop a debt-based crowdfunding model for three projects in three sectors. In collaboration with Bristol City Council and Leeds City Council, the Community Municipal Bond option for the energy industry was established. City councils have extensive expertise executing energy efficiency projects via energy audits, payback calculations, service level agreement negotiations, procurement, and contract administration.

While the Isle of Wight City Council seeks funding to develop several small and large regeneration projects, it is also pursuing mney for these initiatives. Therefore, the suitability assessment of using crowdfunding was limited to six projects in the development pipeline. As a consideration to assess the suitability, the following issues are considered to examine the selected project:

1) The practical implementation of crowdfunding to each project;
2) Financial and non-financial benefits as well as the cost of using crowdfunding;
3) Funding structure and time investment decision;
4) Community engagement; and
5) Risks and mitigation.

The process addressing the issues above can be replicated by individuals or enterprises and governments considering initiating crowdfunding campaigns to finance their projects. Notable findings from the case study on NHS projects, crowdfunding may become a competitive source of senior debt competing with institutional sources. The result indicates that crowdfunding is a solution for the barrier of finding potential lenders to finance small-scale infrastructure projects addressed by Bond et al. [8]; Thierie & De Moor [15].

In cases when crowdfunding is the sole source of funding for large infrastructure projects, such as in the NHS case studies, the practicality of successfully obtaining a huge amount of funds is lessened. Consequently, combining crowdfunding with a PPP scheme is recommended. In the 2012 analysis of the United States' enabling strategy conducted by Farajian & Ross [32] also discussed the possibility of adopting crowdfunding as a component of the PPP project financing plan.

4.2 The policy for crowdfunding-based infrastructure project financing

Providing an enabler policy for community-led funding infrastructure projects is also deemed necessary. In America, introducing the Jumpstart Our Business Start-up (JOBS) Act 2012 allowed individual enterprises and initiatives to reach the public for funding [10]. Thus, Special Purpose Vehicles (SPV) solely established for public infrastructure delivery with PPP design-build-finance-operate contract agreements have the strategy option to offer crowdfunded equity to individual investors [32].

In 2016, the JOBS Act regulation was further expanded to allow American investors to buy company equity legally, waiving the minimum wealth and investor accreditation criteria previously enforced [33]. While in most European countries, such as the Netherlands, the threshold for investing in equity-based crowdfunding is up to EUR 40,000 per platform [34].

In Indonesia, equity crowdfunding has been officially regulated in Indonesia under the Financial Service Authority (OJK) regulation number 37/POJK.04/2018. However, the possibility of initiating a crowdfunding model to finance public infrastructure remains in the realm of uncertainty. Private finance can invest through the PPP mechanism as outlined in Presidential Decree Number 38/2015 and National Development Planning Ministerial Decree Number 4/2015, and through direct partnership with regional government as outlined in Government Decree Number 28/2018.

Certain issues, such as investors' criteria, arrangements for investment value restrictions, and the process framework for integrating crowdsourcing into the project development, must be considered to progress and support crowdfunding as an alternative form of infrastructure finance.

4.3 The engagement between stakeholders

The involvement and active participation of the community and local government, according to additional research, drives the success of crowdfunding initiatives. The engagement between funders and campaigners, in this example between the community and the government entity serving as the government contracting agency (GCA) for civic projects, should be enhanced on the digital platform and in-person interactions [10, 35]. The community investors can raise their concerns or inputs to the project's development but also feel secure with the direct government involvement through public consultation and investor gatherings; furthermore, they can feel confident with the direct government involvement [36]. Trust between parties can also be built with consistent and recurring interactions. By conducting deeper engagement with the community, the campaign would also mobilize non-financial contributors' support. Increasing social capital through time helps market the project and eventually secure approval and assistance from the local community. The successful delivery of infrastructure projects is depended on acceptance from the community. Engagement with funders or backers from the different geographical locations of the project also plays an important role in driving the project. Brent and Lorah [37] found that from the data extracted from one crowdfunding platform (i.e., Ioby) in the United States, finds that in 659 projects completely funded from 16,428 individual funders, the average distance between funders and project is over 300 miles (around 482 km).

As a result, how the campaigners, GCA for the infrastructure project, market their project should be able to reach the interlocal community.

4.4 The technology of the crowdfunding platform

In online interaction, campaigners must periodically update the crowdfunding platform's project information [28]. As Van der Waldt [35] suggested, the platform model of crowdfunding should be transparent and accountable. The crowdfunding platform plays a significant role in bridging the campaigners and funders; studies have shown that the information given to the potential funders would raise the campaign's chance of reaching the goal target [38-39].

Based on the review discussed above, Table 2 is a summary of the success factors in conducting financial-return-based crowdfunding initiatives to finance projects specifically for infrastructure projects. Success factors can be categorized into four categories:

1) The characteristics of the project being funded is in the medium to small-scale project, bringing benefits to local community;
2) The existence of the policy enabling and regulating the crowdfunding ecosystem to finance the small-scale infrastructure projects;
3) The active interaction between parties particularly community, funders, and campaigners; and
4) The technology and behavior of crowdfunding platform as intermediaries for funders and campaigners.

A study by Koch et al. [44] focusing on the aspects of project-specific and founder-specific found that the funding success was strongly influenced by the project description, related images and videos, and the question regarding the founder's success track on financing other projects. In contrast, a study by Borrero-Domínguez et al. [45] focusing on reward-based crowdfunding projects found that location, experience, human capital, and gender area are significant in the success of a crowdfunding scheme. Thus, this study complemented the previous studies on the success factors of crowdfunding schemes, particularly in the technical aspect of small-scale infrastructure project finance.

5 Conclusion

Crowdfunding is the potential to be an alternative and supplementary to traditional financing for smaller-scale infrastructure projects. Derived from the analysis of several previous studies, this paper has summarized the success factors in conducting financial-return-based crowdfunding initiatives to finance projects specifically for infrastructure projects. This study helps strengthen the previous research stating that crowdfunding is compatible and more manageable for financing smaller-scale infrastructure projects. However, the review of this study was limited only to scientific articles; hence, it can be further investigated in future research by examining the real case studies of small-scale infrastructure project financing utilizing crowdfunding schemes.

Table 2. Success factors variables in crowdfunding for small-scale infrastructure projects.

Categories	Success factors variables	References
Project Scale	Medium to a small-scale project	[9, 31, 35]
	Project with economic, environmental, and social values	[32, 40]
	The project benefits the local community	[9]
Enabling Policy	Equal opportunities for institutional and individual investors to invest	[32]
	Setting the criteria for individuals who can become investors in equity-based crowdfunding	[32]
	Arrangements for limits on investment value that individuals can make	[31-32]
Stakeholders	Funding achieves more targets if initiated or encouraged directly by the community	[35, 42]
	Online and offline interactions during the fundraising phase to increase social capital	[36]
	Government involvement is a factor that provides a sense of security for funders	[36]
	Sufficient digital literacy in society	[43]
Platform Technology	Use of a web-based information system to maintain transparency	[41]
	Project information that can be accessed on the platform includes at least internal rate of return (IRR) projections, project risks, guarantees, risk mitigation, disbursement plans, project initiator profiles	[28, 35]
	Updated project information that users can access periodically	[28]

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