International Journal of Environmental, Sustainability, and Social Sciences
ISSN 2720-9644 (print); ISSN 2721-0871 (online)
https://journalkeberlanjutan.com/index.php/ijesss

THE PUBLIC, PRIVATE, PEOPLE PARTNERSHIP FRAMEWORK FOR DEVELOPING INDONESIAN SMART CITY INFRASTRUCTURE

Volume: 3
Number: 2
Page: 267-275

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Article History:
Received: 2022-04-11
Revised: 2022-06-10
Accepted: 2022-07-21

Abstract:
The development of smart cities is an essential aspect of sustainable cities, but this initiative demands many resources. To assist the development of smart cities, the public, private partnership (PPP) concept has proven to be particularly helpful. The inclusion of the people, as a new stakeholder, is introduced to the concept to form a revised public, private, people partnership (PPPP) concept, which can improve the efficiency of developing services in a smart city via bottom-up development. Introducing the new stakeholder to the PPP framework brings new challenges. Issues related to introducing the new stakeholder in Indonesia have been divided into three categories: low awareness and limited information about government projects, human resources limitations, and uncertainty concerning government projects. Two concrete solutions are proposed to overcome this barrier: an information-sharing platform and a living laboratory-based PPPP. The objectives of this paper were, first, to analyze the stage of PPPP development in Indonesia, and then to provide a solution to facilitate its implementation in Indonesia. Three stages were identified: predevelopment, development, and maturity. Information collected included the title, authors, methodology, results, and recommendations. Data sources were primarily Science Direct, Google Scholar, and Scopus. Three of which were based on the PPPP model.

Keywoads : PPPP framework, smart city, sustainable development

Cite this as: SULISTIA, E., NAM, K.W. (2022) "The Public, Private, People Partnership Framework For Developing Indonesian Smart City Infrastructure." International Journal of Environmental, Sustainability, and Social Sciences, 3 (2), 267 – 275.

INTRODUCTION

All nations strive to make their cities 'smart', but not all nations have the same ability to achieve this goal. The many factors affecting such development include limited human resources, absence of a clear understanding of the innovative city concept, and limited knowledge of developing smart cities. In Indonesia's case, the main factor contributing to the underdevelopment of smart cities is a lack of knowledge on developing them. This paper introduces the public, private, and people partnership (PPPP) concept to facilitate the development of smart cities in Indonesia.

The PPPP concept will help Indonesia develop smart cities by optimizing a partnership between the public and private sectors. Such a partnership will enable the two sectors to support each other during infrastructure development by creating smart cities based on input from the people.

METHODS

The objectives of this paper were, first, to analyze the stage of PPPP development in Indonesia, and then to provide a solution to facilitate its implementation in Indonesia.

First, a scoping review was conducted to explore the stages of PPPP development in Indonesia. Three stages were identified: predevelopment, development, and maturity. Indonesia is currently in the development phase, details of which were elucidated using a snowball search; backward and forward citation tracking of related articles was conducted for each identified paper. Information collected included the title, authors, methodology, results, and recommendations. Data sources were primarily Science Direct, Google Scholar, and Scopus.

Second, data analysis was carried out to classify the barriers according to their risk and uncertainty into three categories: (1) low or limited awareness about government projects, (2) human resources limitations, and (3) uncertainty concerning government projects.

Third, the data from the analysis were combined with knowledge of the Indonesian context to develop a model specific to Indonesia.

Finally, potential solutions were proposed to overcome the identified barriers in Indonesia, three of which were based on the PPPP model.

Table 1. Literatur Review

Category	Paper title	Result
	Flexible contracts to cope with uncertainty in public-private partnerships (Carlos & Rui, 2012)	A flexible contract will help shift the risk from the public to the private sector, which will help the private sector complete the project more efficiently (goals) and provide the public with revenue (annual sharing revenue) by considering different configurations.
D**evelopment of PPPs to support smart city infrastructure**	Innovative public-private partnership to support the Smart City: The case of 'Chaire Reves.' (Laurent, Laure, & Guidat, 2015)	Promote collaboration between different territories. Use a university as a bridge between stakeholders to help build a new product in a new market.
	Reforming traditional PPP models to cope with challenges of smart cities (Carlos & Joaquim, 2017)	The new PPP model will help develop ground-breaking innovations, attracting project-specific third parties to incorporate better uncertainties.
	Barriers and potential solutions to the diffusion of solar photovoltaics from the public-private–people partnership perspective–Case study of Norway (Yan, Carmel, & Alenka 2021)	Analyzing the problem from each stakeholder's perspective will help identify solutions for each category via better suggestions. A suggestion is simply an idea that needs more development before becoming useful.
Barriers to PPPP implementation	Success and failure mechanisms of public-private partnerships (PPPs) in developing countries: Insights from the Lebanese context (Dima, 2004)	For a PPP in a developing country to succeed, a suitable framework and openness between stakeholders are critical. Policy and logistics are also important factors.
	Barriers to public-private partnership projects in developing countries–Case of Nigeria (Solomon, Srinath, Lei, & Chika, 2015)	The main problem in developing a PPP in a developing country is the limited capacities of the public and private partners. Enhancing the knowledge of both sectors is essential to overcome this problem and improve execution efficiency.
PPPP f**ramework development**	A public-private people-process framework for infrastructure development in Hong Kong (Thomas, James, & Kelwin, 2013)	In Hong Kong, the development of a PPPP was based on value for money, which resulted in public opposition. The introduction of 'people' to the PPP stakeholders helped shift decision-making power to the general community.
	People as partners: Facilitating people's participation in public-private partnership for solid	Adding the 'people' element to the PPP framework is feasible without total reform of urban service agencies. Since the main problem of a developing country is that of limited

waste management (Shaiful & Syed, 2006)	resources, this issue can be solved by tapping into untapped resources. People are willing to pay more to obtain a service that they need.

RESULT AND DISCUSSION

Worldwide, PPPPs are gaining popularity because of their collaborative approach with users. This enables the flexible development of smart city infrastructures. However, adding the new aspect of people into the framework brings an additional barrier to implementation. This paper suggests solutions to this problem.

3.1 Public, Private, and People Partnership Concept

The PPPP concept has the public and private sectors working in an environment that supports each other to provide a service to people. This type of environment can be segregated into three phases: (1) predevelopment, (2) development, and (3) fully developed. Each phase indicates environment maturity within the public and private sectors.

The public, private, and people sectors can be categorized according to their roles, as shown in Table 2.

Table 2. Segregation of stake roles

No.	Group	Service entity	Roles in the environment
1.	Public	1. Major city 2. Strategic committee	Enabler: Create a vision and promote the service
2.	Private	1. University 2. Public company	Innovation: Do the research and development for the service development.
	People	1. Citizens	User: Use the service provided by the public and private sectors and give feedback.

The public, private, and people sectors can be categorized according to their roles, as shown in Table 2.

The relationships between stakeholders in each phase of the development of a PPPP are described below.

The predevelopment phase is the first phase in the PPPP environment, during which the public (government) is the lead actor in the environment. In this phase, the government agrees to provide the infrastructure to provide the primary service to the people (citizens). Furthermore, the government encourages the private sector to be involved in providing the service to the citizens by introducing the concept of a PPPP, as shown.

The second stage is the development phase. The private sector is involved in creating the service, but the government acts as a guide. However, mainly in this phase, the private sector assists the government by funding (investing) construction of infrastructure and other facilities that will help the government arrange.

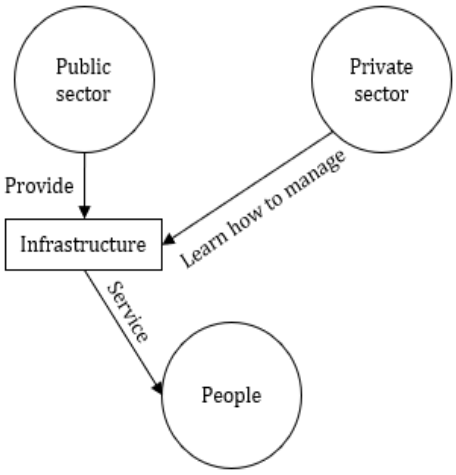

Figure 1 Predevelopment phase

in Figure 1.

An excellent example of the predevelopment phase is the 2014 bus contract in Singapore. The Land Transport Authority (LTA) introduced a new bus contract to better respond to ridership and commuter needs. The LTA (public) owns the assets (e.g., vehicles and depots), leasing them to the operators (private), and the operators bid for management of the system, receiving a fixed fee for so doing. The LTA is responsible for planning routes and services. In Indonesia, the first stage involves, mainly, the government funding infrastructure development, such as improving access to electricity, water sources, and logistics.

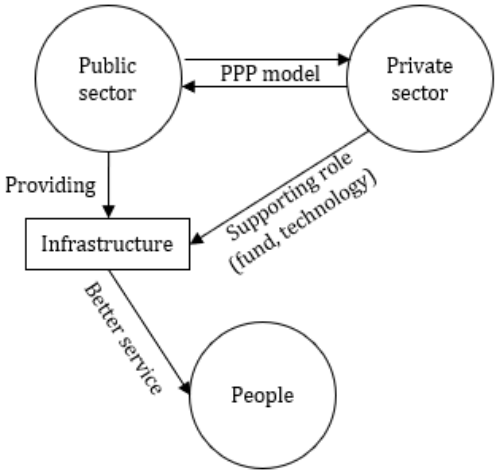

Figure 2 **Development phase**

provides more services for the people, as shown in Figure 2.

The private sector supported the funding, design, installation, operations support, maintenance, and technical management to offer a better way to provide the service to the people. As an example of the development phase, the Athens urban transport organization set up a PPP contract in 2016 to implement an integrated automatic fare collection system (electronic ticket system).

The last phase is the mature phase. Generally, in this phase, the public and private sectors have already developed a partnership from which all essential services have been developed. The private sector can develop the service according to the needs and ideas of the citizens. Following a successful partnership between the public and private sectors, management is needed to ensure that innovation does not end at this point. The people need to assume management responsibility to ensure that the public, private, and people sectors continue to communicate. This will ensure the continued development of the service according to the needs of the people, as shown in Figure 3.

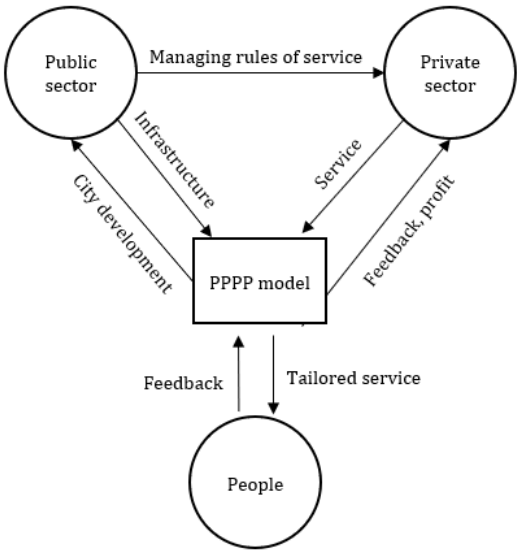

Figure 3 **Developed phase**

An example of the mature phase is mobility-on-demand (MoD) in the suburbs of northern Virginia. The suburban area has limited public transport because of its relatively low population density. The private sector provides an alternative service (MoD) to help solve this problem. This approach facilitates short-term access for citizens to a transportation mode on an as-needed basis. The service is tailored to the needs of the citizens.

3.2 Stage development of PPPs in Indonesia

The development of smart cities in Indonesia focuses on the development of infrastructure technology and basic service since the infrastructure in Indonesia is incomplete. To accelerate infrastructure development, the Indonesian government is partnering with the private sector, but the main contribution from the private sector is providing services for the people. The large cities in Indonesia of Jakarta, Surabaya, and Bandung are also trying to involve the people in their smart cities development via 'e-Musrenbang' or 'Musywarah Perencanaan Pembangunan Secara Elektronik'. Surabaya has been using this program since 2010, but the results from citizen involvement have been below expectation (Novy, 2017).

Indonesia has been using the private, public, and people partnership (PPPP) model since 2010. Although it has tried to involve citizens in its development, citizen involvement remains low. This is primarily due to human resources limitations. Since the main concept of the PPPP is to obtain bottom-to-top inputs, Indonesia needs a communication channel to ensure that suggestions are acted upon.

3.3 People barriers to the implementation of PPPPs in Indonesia for smart city infrastructure development

The 'people' aspect of the PPPP framework brings a new barrier to the implementation of PPPPs in Indonesia.

Table 2. Main barriers for people.

No.	Main barriers	References
1.	Low awareness and limited information concerning government projects	(6) (8) (14)
2.	Human resources limitations	(1) (2) (3)
3.	Uncertainty regarding government projects	(7) (13) (16)

From the people's perspective, the barriers mainly derive from three aspects, namely, low awareness and limited information concerning government projects, human resources limitations, and uncertainty regarding government projects concerning benefits for the citizens.

1) Low awareness and limited information concerning government projects.
   Generally, most Indonesian citizens have little knowledge of government programs. Citizens still do not understand the government-offered employment insurance program (BPJS ketenagakerjaan) [6]. Additionally, they are unaware of the subsidized loan interest program whereby the government provides financial assistance to small businesses [14].
2) Human resources limitations
   According to the human resources index released by the World Bank, Indonesia is ranked 87 of 157 countries. Concerning countries in the Association of Southeast Asian Nations (ASEAN), Indonesia is ranked behind Vietnam (48), Singapore (1), Malaysia (55), Thailand (65), and Philippines (84) [1]. According to the International Student Assessment (PISA) of the Organization for Economic Cooperation and Development (OECD), Indonesia's ranking has not significantly improved since 2001. Compared with neighboring countries, 52% of Indonesian students are considered low performing [2]. Another study found that only 4.3% of working-age people (in a survey of 1,000 people) are skilled. This, compared with 34.7% for Singapore (34.7%), demonstrates that Indonesian human resources need to be significantly improved [3].
3) Uncertainty regarding government projects.
   Three examples of government projects or programs relating to Indonesian citizens are relevant to this discussion. First, the 'Lumpur Lapindo' disaster on 29 May 2006 (14 years ago) displaced about 40,000 people and mud continues to flow [7]. The second example is the salary subsidy program offered during the COVID-19 pandemic. By December 2020, the subsidy has not been fully used, with about 1.19% of the fund still on hold or not yet distributed [13]. Last, the megaproject Hambalang was begun in 2003 and was expected to be finished in 2012; the project is still stalled [16].

Potential solutions to overcome the people barrier in PPPP smart city infrastructure development

The various barriers were analyzed and potential solutions were proposed for the three sectors. Table 4 presents potential solutions to overcome the barriers and

how each group can contribute.

Table 3 Potential solutions to barriers

Barrier	Potential solutions	Public action	Private action	People action
1. Low awareness **2. Uncertainty regarding government projects**	Information sharing platform	Provide a platform for PPPP projects	Provide information about the results of collaboration	Involvement in different types of platforms
3. Human resources limitations	PPPP based on a living laboratory	Provide the space	Setting up a collaborative project	Designing a new incentive with other sectors

The first solution is to design different types of information-sharing platforms both online and offline. Participation of the public, private, and people sectors is essential.

To solve barrier (1) concerning low awareness and limited information about government projects, an online information-sharing platform will help citizens obtain information from the private and public sectors regarding the project. This information includes benefits, financial reports, policies, and managerial and operational aspects.

The online platform system has been used in South Korea, notably in the metropolitan city of Seoul. The online platform is called 민주주의 서울 or Democracy Seoul, and is separated into four main parts. The first part is the citizen proposal whereby a citizen can provide an idea or suggestion for developing the city. In the second part, the citizen can indicate any need for law enforcement in the city. In the third part, the citizen can debate or provide an opinion on the topic and the city's development. In the last part, Seoul city asks the citizen for their opinion about the management of the project, i.e., the city seeks feedback from the citizen.

An offline platform will help solve barrier (2) related to the uncertainty of government projects. An online platform alone is not enough. An offline platform is additionally needed; meetings, workshops, and advertisements are potential channels to help build trust and communication regarding a government project. Consultants from the public and private sectors who are knowledgeable about the government project can mitigate confusion and uncertainty concerning the collaborative project.

The remaining barrier (3) concerns human resources limitations. Having a university as a lead partner of a living laboratory (LL)-based PPPP can help to overcome this barrier. The university assembles the platform and facilitates structured information gathering from the public and private sectors for the benefit of the people. Having a university as a research partner also guarantees a bottom-up opinion within the PPPP framework.

Another example of using a university as an offline platform in South Korea. With its program called 'Smart Campus Challenge', the university studies innovative smart solutions via industry-university ties. The university provides a stable environment for the project. Three benefits accrue to this method. First is the university's development of innovative growth engines by discovering and demonstrating smart innovative solutions. Second, enhancement of the university's ability to solve urban problems as an innovation agent and finally, the realization of a next-generation smart city model by promoting public information openness and utilization and convergence with private information.

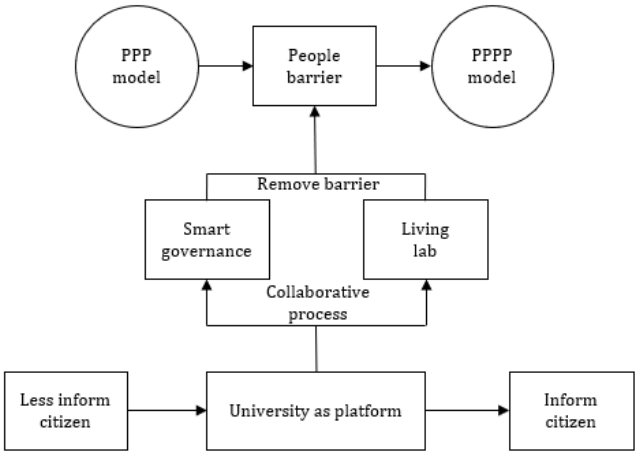

Figure 4 University as a key platform

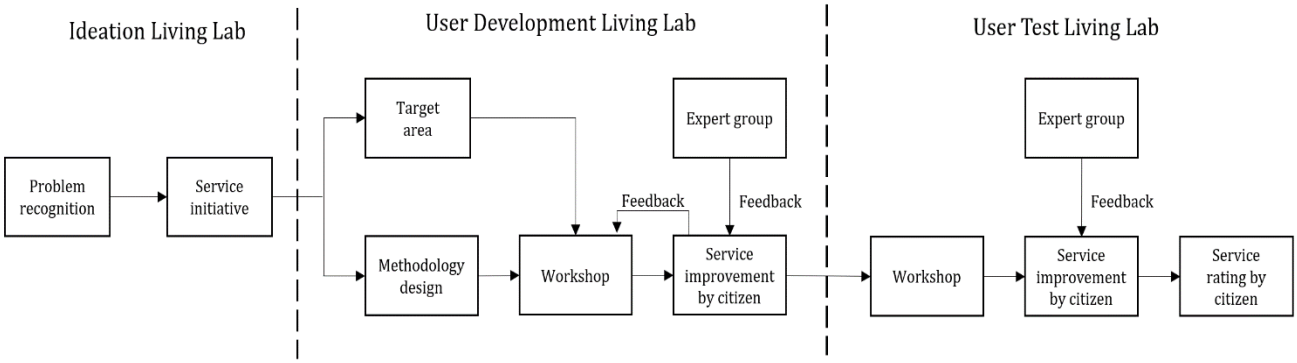

Figure 5 living lab concept complete cycle

CONCLUSION

Research has shown that adding people to the PPP framework to form the PPPP framework can help the public sector develop smart city infrastructure. Including this additional stakeholder provides flexibility and improved goal setting. However, the adoption of the new framework for infrastructure development in Indonesia has three barriers to implementation: (1) low awareness and limited information about government projects, (2) human resources limitations, and (3) uncertainty regarding government projects. After analyzing these barriers and the current context in Indonesia, an information-sharing platform and an LL-based PPPP are proposed as solutions.

However, developing these solutions will require large amounts of time and energy to organize the different stakeholders and persuade them to participate in the program. The status of ongoing projects indicates that it is pretty difficult to engage citizens because of their low level of trust in the public sector. Considerable time will be needed for the stakeholder to reach an agreement on the project's benefits. Finally, there are currently no examples of using this method in Indonesia; implementation will be highly challenging and unforeseen problems will arise that will require solutions.

This study has certain limitations. The current absence of PPPPs in Indonesia introduces bias. Only nontechnical barriers to the implementation of the new stakeholder in the PPPP framework in Indonesia have been discussed. This may have limited our analysis of how best to promote the development of the PPPP framework in Indonesia.

CONFLICT OF INTEREST

The authors declared no competing interest and did not receive any financial assistance from funding agencies in the public, commercial, or not-for-profit sectors.

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