The Impact of E-Procurement Implementation in Infrastructure Projects

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ARTICLE INFORMATION

Article history:
Date Submission: 09 October 2019
First Revision: 22 November 2019
Accepted: 17 December 2019
Available online: 30 December 2019

ABSTRACT

This paper aims to explore systematically about impact as well as facilitators and barriers of e-procurement implementation in the Ministry of Public Works and Housing. This study used qualitative approach and RE-AIM framework. The data were collected from semi-structured interviews and secondary data such as blueprint, strategic planning document, performance report, activities report, and financial report. The findings show that e-procurement implementation in Ministry of Public Works and Housing has reached the target of users, reduced cost and time, followed regulation, and become routine activity. Moreover, there are facilitators of the e-procurement implementation which are software integration, data management, IT infrastructure, and roll-out strategy. However, some barriers which are legal and administrative procedure, system security, and IT staff and skills, are found as barriers in implementing e-procurement.

INTISARI

Penelitian ini bertujuan untuk menggali dampak serta fasilitator dan hambatan implementasi e-procurement di Kementerian Pekerjaan Umum dan Perumahan Rakyat. Data dikumpulkan dari wawancara semi-structured dan data sekunder seperti cetak biru, dokumen perencanaan strategis, laporan kinerja, laporan kegiatan, dan laporan keuangan. Temuan menunjukkan bahwa implementasi e-procurement di Kementerian Pekerjaan Umum dan Perumahan Rakyat telah mencapai target pengguna, mengurangi biaya dan waktu, sesuai dengan peraturan yang ditetapkan, dan menjadi kegiatan rutin. Selain itu, ada fasilitator implementasi e-procurement, antara lain: integrasi perangkat lunak, manajemen data, infrastruktur TI, dan roll-out strategy. Namun, ada beberapa hambatan antara lain: prosedur hukum dan administrasi, keamanan sistem, dan staf dan keterampilan TI, ditemukan sebagai hambatan dalam mengimplementasikan e-procurement.

1. Introduction

E-procurement has received increasing attention from the government because of its benefit. Many private sectors have proved significant benefits from the implementation of e-procurement such as improved contract compliance, increased management information, reduced transaction cost and times (Gunasekaran & Ngai, 2008; Sanders, 2007). In the public sector, it could make the government become more transparent because its system exchanges information between public sector and their suppliers. It

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reduces procurement cost by reducing the use of paper, minimizing administrative duplication, and increasing transparency, accountability, and access to the public (OECD, 2017). Croom & Brandon-Jones (2007) mentioned that e-procurement has some benefits such as less paperwork, less mistake, and more efficient purchasing process. Lewis-Faupel, Neggers, Olken, & Pande (2016) argued that e-procurement could overcome three common problems in manual procurement practices: lack of access to bid information, collusion among bidders, and corruption.

The implementation of e-procurement is also adopted in procuring infrastructure projects. Infrastructure is important because it is a key instrument in building an environment that promotes economic growth. However, the quality of public infrastructure is still low (Briceño-garmendia, Estache, & Shafik, 2004). Several reasons, such as a limited supply of local qualified contractors, collusion among contractors, and corruption among public officials have been assumed as the cause of this condition (Kenny, 2007). E-procurement improves procurement outcomes in the quality of roads and timeliness. Therefore, it is important to implement e-procurement in infrastructure projects.

Indonesia introduced e-procurement system in 2003 through Presidential Decree No. 80 Year 2003 on the Guidelines of the Procurement of Government Goods/Services. In 2008, the Indonesian government created INAPROC as a national e-procurement system in order to procure and deliver goods and services electronically. The use of e-procurement system has become mandatory for all Indonesian Government based on Presidential Regulation No. 54 Year 2010 on the Procurement of Government Goods/Services. However, the Ministry of Public Works and Housing developed the e-procurement system since 2002. They used their own system to procure infrastructure projects because they have different working characteristics and complexities that INAPROC cannot provide in its system. In 2016, the Ministry of Public Works and Housing decided to shift their system with INAPROC.

E-procurement has changed procurement practice in the Ministry of Public Works and Housing from manual to digital. The manual procurement process contributes to the corruption problem. In the manual process, government officials have an ability to selectively withhold information or refuse bids from non-favoured bidders. E-procurement provides access to all procurement data that is expected to enhance transparency and reduce corruption. It is also expected to improve the quality of infrastructure projects. However, the impact of e-procurement implementation has not been observed systematically.

There has been some research in exploring public sector procurement (Moon, 2005; Croom & Brandon-Jones, 2007; Doherty, Mcconnell, & Ellis-chadwick, 2013). Some studies focus on examining the implementation benefit, risk, and failures (S. R. Croom, 2000; Losch & Lambert, 2007). Other studies explored the factors which influence the e-procurement implementation and its challenges. For instance, Aman & Kasim (2011) conducted research in Malaysia about the challenges in implementing e-procurement and how to overcome these challenges. Additionally, Doherty et al., (2013) explore the factors that affect uptake and application of e-procurement within the public sector. Moreover, Vaidya, M & Callender (2006) also explore critical factors that influence e-procurement implementation success in the public sector. Although those research provide important findings, most of them do not explore the impact of e-procurement implementation.

Only a few studies focus on the impact of e-procurement project in government sector. Croom & Brandon-Jones (2007) present an e-procurement evaluation in the UK public sector. Their research explore key themes of e-procurement implementation include its impact on changes of organizational characteristic, acquisition cost, and governance structures. Moreover, Rotchanakitumnuai (2013) examines factors that enhance governance procurement and the impact of e-procurement on governance practice. Furthermore, Lewis-Faupel et al., (2015) explore the impact of e-procurement implementation in infrastructure projects in Indonesia. However, this research did not explore systematically about impact as well as facilitators and barriers of e-procurement implementation. Therefore, this paper addresses this gap by exploring the impact of e-procurement implementation and its facilitators and barriers in this sector.

2. Theory

2.1 E-Government

E-government is the use of internet-based information technology to enhance citizen access to government information and services and for other purposes (E-Government Act of 2002, 2899). Moreover, Spirakis, Spiraki, & Nikolopoulos (2010) define e-government as the use of information, communication, and technology (ICT) of the government’s transformation aimed to improve accessibility, effectiveness and responsibility. It is also expected could increase citizens’ participation and citizens’ development and influence the mechanisms of democracy. Therefore, e-government can be defined as
the use of ICT by the government to provide easier information access and better service for the people.

E-government encompasses four main groups which are citizens, business, governments, and employees.

Ndou (2004) mentioned that there are four types of E-government relationship which are government to citizens, government to business, government to government, and government to employees. The relationship between government and citizen allows the government to communicate with citizens through many forms of interactions. It also allows citizens to access information and services by use of multiple channels. The main purpose is to bring government closer to the citizens.

The implementation of e-government is supposed to ease access to public sector information and make convenient interaction with government. Therefore, e-government advances public administration and transform public service provision (Garson, 2004). In addition, e-government is expected to generate benefits for social inclusion, employment, health, and education (United Nations, 2014).

2.2 E-Procurement

An e-procurement technology is defined as technology designed to facilitate the acquisition of good by a private or public organization over the internet. It focuses on automating workflows, consolidating and leveraging organizational spending power, and identifying new sourcing opportunities through the internet (Davila, Gupta, & Palmer, 2003). In Indonesia, the Agency for Government Procurement of Goods or Services (LKPP) (2010) stated that e-procurement is the procurement of goods/services conducted by using information technology and electronic transaction based on regulation.

E-procurement could be used as a channel of influence which affects outcomes. Lewis-faupel et al., (2016) argued that e-procurement affect outcomes through three mechanisms: changing bidder’s composition, enforcing government rules and regulation, and preventing rejection of non-favoured suppliers.

2.2.1 Key Themes of E-Procurement Implementation

2.2.1.1 System Specification on E-Procurement

Croom & Brandon-Jones (2007) stated that system specification is a critical issue in the implantation of e-procurement. Issues in system specification consist of two problems: software integration and data management. Software integration is used to know the extent to which e-procurement system is able to integrate with other information systems. Whereas data management is data entry and the coding scheme employed. Issues in system specification include hardware resources, network resources, and web server, while issues in data management include are limited levels of management information about expenditure, product and service specifications in the main issues in system specification. Despite that, system specification in developing countries also includes legal and administrative procedures (Aman & Kasimin, 2011). This notion is supported by Subramaniam & Shaw (2002) that indicated legal and administration procedure as key challenges in system specification. Moreover, Kassim & Hussin (2010) found that bandwidth, computing and information system architecture are the issues that are faced by small suppliers. The finding is similar to Aman & Kasimin (2011) who show that one of the challenges of e-procurement implementation is IT infrastructure, especially in rural area.

2.2.1.2 Implementation Management on E-Procurement

Implementation management is the process of e-procurement system delivery to end-users (Croom & Brandon-Jones, 2007). They explain that roll-out strategy of e-procurement can be either an informal “evolutionary” protocol or a formal “project board”. The evolutionary protocol involves internal design and development of a bespoke system, which consequently involved gradual system development and roll-out. Sumadilga & Pudjijono (2011) found that there is a gradual implementation of e-procurement system in infrastructure projects.

The ‘project board protocol’ was typically employed by large organizations who undertook a formal appraisal and sourcing approach to the purchase of a third-party e-procurement system. In addition, developing countries face other challenges which are outsourcing contract (Auriol & Picard, 2009). According to him, to implement e-procurement system government need to outsource the third party. However, outsourcing contract has a service fee charge resulting in burdening the users.

Another important challenge in implementation management is IT skills (Heeks, 2006). Aman & Kasimin (2011) and Liao, Cheng, Liao, & Chen (2003) show difficulties faced by suppliers due to tedious procedures and lack of IT skills to perform e-procurement transactions. Aman & Kasimin (2011) also found that challenges of e-procurement implementation are related to IT skills. Their findings highlighted the challenges of e-procurement implementation in government sector involving system specification and implementation management. Despite that, they have not yet discussed the impact of e-procurement implementation and explore specific facilitators and barriers in infrastructure projects. Understanding the facilitators and barriers of e-procurement
implementation particularly in this sector is important due to the complexities of works. Therefore, author developed a framework that could assist understanding the e-procurement implementation in infrastructure projects by using RE-AIM framework to explore the impact as well of E-procurement system (figure1).

b) Effectiveness: measurement of effect on e-procurement system including positive and negative consequences;

c) Adoption: the extent to which Ministry of Public Works and Housing adopted e-procurement system;

d) Implementation: the extent to which the e-procurement system is implemented in accordance with the protocol; and

e) Maintenance: the extent to which the e-procurement system sustain over time.

3. Research Method

This research used qualitative method, particularly descriptive analysis aiming to describe and analyze e-procurement implementation and its effectiveness. It also used to understand the facilitators and barriers in the Ministry of Public Works and Housing, Jakarta, Indonesia. The data were collected through in-depth interviews. Documents such as blue-print, strategic planning document, performance report, activities report, and financial report, are also used to get more comprehensive data. This study was conducted in May 2018.

This research used the RE-AIM framework to explore e-procurement implementation. The framework was intended to guide planning and evaluation of evidence-based interventions (Glasgow, Vogt, & Boles, 1999). RE-AIM framework (Reach, Effectiveness, Adoption, Implementation, and Maintenance) are explained below:

a) Reach: number of people and percentage of the target population benefited from e-procurement and the extent to which they perceive its benefit;

Figure 1 Conceptual Framework  
Source: Analytical result, 2018

4. Results and Discussion

4.1 The Impact of E-Procurement Implementation in the Ministry of Public Works and Housing

4.1.1 Reach

Reach refers to a number of people and the percentage of the population targeted that are affected by a policy or program (Glasgow et al., 1999). The target group of e-procurement implementation in Ministry of Public Works and Housing are firms/suppliers (contractors and consultants), Proxy of Budget User (KPA), Commitment Making Official (PPK), and procurement team. They use the system to procure all of the packages. In 2017, almost 80% budget of the Ministry of Public Works and Housing was contractual with 11,975 packages.
There are several parties involved in e-procurement. In the Ministry of Public Works and Housing, there are 35 Procurement Service Unit (ULP). One is located in the office center in Jakarta. 34 others are located in every province around Indonesia. Internal parts which have direct involvement in e-procurement are KPA, PPK, and procurement team. Ministry of Public Works and Housing has 978 procurement teams with 2,925 members. The firms (suppliers) registered in e-procurement system is 25,000.

The number of packages in the Ministry of Public Works and Housing is around 12,000-15,000 packages. The number fluctuated depending on budget and projects. It increases in 2011 – 2015 but decreased in the last 3 years. The average number of the package that was not auctioned in one year is 111 packages or around 0.56%–1.16%. The table shows that there is a high number of packages which were not auctioned. The data from e-monitoring explains that the reason is not related to e-procurement process but technical or administration problems. For example, the fund is blocked or the projects are too difficult.

Almost all packages in the Ministry of Public Works and Housing have been procured through the e-procurement system. All packages are procured through e-procurement based on Letter of Minister Public Works and Housing Number 57/SE/M/2015 on the Implementation of E-procurement and Letter of Minister of Public Works and Housing Number PL.02.06-Mn/840.1, 30 August 2016 on Acceleration of E-procurement. Firms cannot join the auction if they are not registered in e-procurement system. They have to register first in the system. The registration process is very easy. First, they must register online. Then, they must bring documents which are certificate of firm, Director’s ID card and business licence to Electronic Procurement Service Unit. They will verify the documents. After they approve it, firms can login in the system by using their own id and password. They also can see list of package in website and join the bidding. Procurement team also cannot auction the projects if they are not using e-procurement. All of firms have already registered in e-procurement system. The key informant stated:

“There is no project auctioned manually in the Ministry of Public Works and Housing. If they want to get the projects from this Ministry, they must use e-procurement system” (Monday, August 13th, 2018: 09.10 AM).

4.1.2 Effectiveness

Effectiveness is the impact of an intervention on the outcomes including positive and negative consequences (Glasgow et al., 1999). They discussed 2 (two) specific issues: the importance of assessing both positive and negative consequences of programs and the need to include behavioral, quality of life, and participant satisfaction outcomes as well as physiologic endpoints. E-procurement implementation has an impact not only on the ministry but also firms. Regarding this case, this policy had changed employee behaviour and their quality of performance. It also has direct impact on institution performance. Moreover, from the perspective of suppliers, this policy increases their satisfaction of auction process.

E-procurement implementation in the Ministry of Public Works and Housing begin because of demand from firms. They wanted Ministry and Public Works and Housing provided sufficient information about auction process. In manual procurement, contractors have reported that there is no official clarification about the reason why they cannot win the project. There is concern in technical reviews, procurement team tend to choose favored-bidders. Therefore, Ministry of Public Works and Housing want to implement e-procurement in order to increase transparency.

Firms are the important parties that has direct effect of e-procurement implementation. The finding shows that e-procurement has several benefits to the firms. It can increase effectiveness and efficiency. The firms said that e-procurement makes the information can be accessed easily. The key informant said as follows:

“Everything can be checked online. We can check the schedule online. When it was manual, we checked by phone. Now, downloading documents is also online. In the past, we have to take the document to the office. Now, we just upload the bidding document online” (Friday, May 25th, 2018: 13.15 PM).

On www.lpse.pu.go.id websites, all information of e-procurement can be found. Firms can download regulation and procedures related to e-procurement. There is also list of packages that will be procured and the schedule. Firms also can log in to download document and to monitor the packages they followed. It can be said that e-procurement increase transparency of the institution. After this policy has been implemented, the firm can obtain sufficient information about auction process. The key informant said:

“The implementation of e-procurement makes the auction process more transparent because our company can see the auction process by online such as company who register and the winners. We can also see the amount of price they input. We also know in what step of selection process we failed and reason why we lose” (Friday, May 25, 2018: 13.15 PM).

The key informant also said that e-procurement could reduce cost. As explanation above that e-procurement can reduce cost of copying documents, it also can reduce cost of transportation. The key informants said as follow:
“Now our company can join more packages. In the past, the list of packages that will be procured was announced in the newspaper. Now through the e-procurement system we can see an online list of packages. We can also see the time for uploading documents online. We can also learn the auction document quickly because after the list we can directly download the document. If it is manual, we must take the document in the office. It needs more time. We also need more time to learn the document and decide to join the projects or not” (Friday, May 25th, 2018: 13.15 PM).

4.1.3 Adoption

Adoption refers to the proportion and representativeness of settings who want to initiate policy or program (Glasgow, et al., 1999). In this case, adoption is the extent to which the Ministry of Public Works and Housing adopted e-procurement system and how users implement this policy. The finding shows that all users already use this system. E-procurement becomes mandatory based on President Regulation Number 54 year 2010. All contractual packages must be procured through e-procurement. Firms must use e-procurement to join bidding in the Ministry as well as KPA, PPK, and procurement team (Pokja). They must use e-procurement to bid the projects. The procurement team is not allowed procured the projects manually. The key informant (PB2) stated:

“All firms must be registered in our system first before they join bidding process. We do not allow manual procurement anymore. So if they want to get project from PU Ministry of Public Works and Housing), they must use the system and follow e-procurement process” (Thursday, May 24th May, 2018: 09.00 AM).

However, before it became mandatory, Ministry of Public Works and Housing had adopted e-procurement since 2002. Ministry of Public Works and Housing implemented the policy gradually- CTI, semi e-procurement, and full e-procurement. Gradual implementation was chosen to reduce resistance and increase acceptability from users. They started e-procurement followed a standard pattern in Indonesia which is from Java Island. The key informant (PB1) stated:

“We implemented this policy gradually. We educated users starting from CTI, semi-e-proc then full e-proc. It was not directly implemented. We considered many aspects such as internet connection, IT infrastructure, IT skills and regulation” (Wednesday, May 23rd, 2018: 11.15 AM).

E-procurement required technology to operate it such as stable internet access and computer. It also required an operator who has IT skill. At the beginning of this policy, some officers and firms were difficult to use it. It is because the limitation of internet access and the lack of human resources who can operate this system. The difficulties to implement this policy is experienced both the ministry and firms. Furthermore, if they implemented full e-procurement directly, it would obstruct and delay infrastructure projects. Therefore, they implemented this policy gradually. The implementation is through socialization.

E-procurement becomes routine activities in the Ministry of Public Works and Housing. In the past, users use this system because it is an obligation. There was an evolution of e-procurement from obligation to necessity. Users of e-procurement need this system to support the job. E-procurement becomes part of their job activity. They don’t want to use manual e-procurement. They prefer to use e-procurement because it simply their task. The key informant (PB1) said:

“Several years ago e-procurement was an obligation for all users. At that time, the Minister is Mrs. Erna. Now, it is not an obligation anymore. E-procurement is a necessity. If the system down, this ministry cannot conduct an auction. There would be no projects. Moreover, procurement team said that they don’t want use the manual system” (Wednesday, May 23, 2018: 11.15 AM).

4.1.4 Implementation

Implementation refers to the extent to which policy or program is delivered as intended (Glasgow, et al., 1999). In this case, implementation is the extent to which the e-procurement system is implemented in accordance with the protocol. There are Presidential Decree on Public Procurement and its amendments:

a) Presidential Regulation No. 54/2010
This presidential decree stipulates that public procurement must conduct electronically through LPSE. 

b) Presidential Regulation No. 35/2011
This presidential decree stipulates the procurement process of consulting service suppliers in the field of law to face a lawsuit from a particular party and the provisions of consulting service suppliers in the context of mitigation of natural disaster through direct appointment.

c) Presidential Regulation No. 70/2012
This decree stipulates the technical guidelines of procurement issued by the Head of LKPP. It determines that if there any changes in term of technical implementation of procurement, the revisions do not need to be changed by Presidential Decree. It is revised by the Head of LKPP.

d) Presidential Regulation No. 172/2014
This decree stipulates a procurement process to accelerate the supply of seeds and fertilizers to farmers through direct appointment.
e) Presidential Regulation No. 4/2015
In this presidential decree, the mandatory use of electronic procurement of goods and services is stipulated, simplifying provider requirements in participating e-procurement.
f) Presidential Regulation No. 16/2018
This presidential decree stipulates three changes; terms, definition, and regulation. It simplifies requirement of suppliers.

The implementation of e-procurement in the Ministry of Public Works and Housing is in accordance with regulations. In the past, they used their own system that had several differences with regulations. Full e-procurement that Ministry of Public Works and Housing used was established and operated based on Minister Regulation. However, the system that LKPP built is based on Presidential Regulation. There are some differences in the implementation of e-procurement system.

“E-procurement has been implemented in accordance with regulations because we use the e-procurement system from LKPP (SPSE). The system was designed based on Perka LKPP Number 1 of 2015 concerning LPSE. In the past, the ministry did not use the system from LKPP. We use our own system, full e-procurement which was designed based on minister regulation. But now we have not used this, so it is in accordance with the regulations. If there are changes in regulations, the system must facilitate these changes” (PB1, interviewed on Wednesday, May 23rd, 2018: 11.15 AM).

4.1.5 Maintenance

Maintenance refers to the sustainability of policy or program and becomes relatively stable. In this case, maintenance is the extent to which e-procurement system sustain over time. E-procurement becomes mandatory since government stipulates Presidential Regulation Number 54 year 2010. This regulation supports this policy. Until now, government still concern to implement accountable and clear procurement of goods and services. In addition, they want to simplify the procedures of procurement so it will enhance competitiveness among suppliers. The government stipulated the last amendment of e-procurement through Presidential Regulation No. 16 Year 2018. It shows that e-procurement is still supported by regulations. The key informant stated (PB1):

“Until the end of 2017, this policy still mentioned in the regulations. It means that the application of e-procurement is still supported. The e-procurement system in the Ministry of Public Works and Housing will be used in the next period” (Wednesday, May 23rd, 2018: 11.15 AM).

E-procurement in the Ministry of Public Work and Housing becomes part of the routine organizational practices. In the first time it was implemented, this policy is mandatory for users. Procurement team use this system to conduct auction process. They announce list of the project that will be auctioned from this system. Suppliers must register first, before they can join the auction. The users were forced to use e-procurement system. However, now e-procurement is a need for Ministry of Public Works and Housing. It becomes routine activities in Ministry of Public Works and Housing.

Every year Ministry of Public Works and Housing will conduct early auction. The auction will be held in a year before the fiscal year. In July, a year before fiscal year, Secretariat General will issue a letter of e-procurement preparation. Then, Minister of Public Works and Housing at National Meeting will announce that procurement will be held in August. In September, the Minister will issue a letter to instruct early auction. The early auction is conducted through e-procurement. Therefore, e-procurement becomes routine activities in Ministry of Public Works and Housing.

At the individual level, e-procurement has long term effect. After 16 years applying this policy, user preference changes from manual to electronic procurement. Now, both suppliers and procurement team prefer to use e-procurement system than manual. It simply their tasks and give security for procurement team because all of steps in auction process are recorded in the system. So, if there is a problem with provider they can notify Electronic Procurement Service Unit. They don’t want back to use manual e-procurement. Key informant (PB2) said:

“I don't want to carry out the auction manually. E-procurement facilitates my tasks. Before implementing e-procurement, we have to announce the auction on newspapers. Now, we just type on the PC and announce it on website. I also feel more secure using e-procurement because all activities during the auction are recorded. If something goes wrong, it can be traced” (Thursday, May 24th May, 2018: 09.00 AM).

4.2 Facilitators and Barriers of E-Procurement Implementation in the Ministry of Public Works and Housing

4.2.1 Facilitators

4.2.1.1 Software Integration

The Ministry of Public Works and Housing established integrated system of e-procurement called Integrated Procurement System. It has been implemented since November, 2017 including three (3) steps of e-procurement. The purpose of the integrated
system is to enhance efficiency and effectiveness of the e-procurement process. However, the Ministry still focus on developing system in preparation step which is procurement team assignment. In Integrated Procurement System, procurement team is formed electronically. KPA proposes list of packages that will be procured to Head of Procurement Service Unit. The official letter of proposal is uploaded in Integrated Procurement System. Procurement Service Unit will check proposal of projects. If all requirements are complete, Procurement Service Unit will determine member of Procurement team. The composition of procurement team will be suited to the project. All of process will be conducted electronically through the system.

This integrated system was established to make the process more effective and efficient. Key informants (PB1) stated:

“Previously, the focus of e-procurement is only in selection. Well, if we talk procurement, procurement of goods and services the process must be from the preparation until implementation. That is why we make electronically the data. For example, in the preparation process before we implemented this system the assignment of procurement team still through the correspondence. They sent the letter manually. It took several days to ratified team members. Now through this system, KPA can directly apply the name of procurement team. It is verified by using barcodes” (Wednesday, May 23rd, 2018: 11.15 AM).

System specification is related to integration of budgeting and monitoring system. Budgeting system (RKA-K/L) is developed by Ministry of Finance whereas and monitoring system (e-Monev) is developed by Ministry of Public Works and Housing itself. The procurement performance in infrastructure projects is depends on these two systems. All infrastructure packages must be compiled first in budgeting system. It will be ratified in November. However, The Ministry of Public Works and Housing have to conduct earlier procurement which is in August because the complexity of the Works on infrastructure projects. It is conducted to accelerate infrastructure performance and avoid projects delay The Ministry of Public Works and Housing can announce project winners earlier by conducting earlier procurement. Thus, infrastructure projects can be immediately undertaken by contractors.

Ministry of Public Works and Housing integrates budgeting system, e-procurement, and e-monitoring. The system is called Development of Integrated Procurement System Based Information Technology. This system is expected to enhance e-procurement performance and data security. In addition, the integrated system will facilitate either suppliers or government to access data and monitor the progress of the projects. Integrated e-procurement system can be seen in the following figure. The operator of budgeting system must upload data from its system to e-monitoring. From e-monitoring the data will automatically uploaded to e-procurement. Then, procurement team will conduct auction. If operator of budgeting system does not upload data of packages, the procurement team cannot conduct auction.

4.2.1.2 Data Management

The Ministry of Public Work and Housing developed a centralize database. The data includes contract addendum, blacklist, billing rate, unit price and products. Procurement data is scattered throughout the procurement service unit so it is difficult to access. Especially when monitoring and evaluating a project. In addition, there is no centralized data backup for an electronic procurement document. Therefore, the document is not safe. It could have lost if there is a disaster. To overcome this problem, Ministry of Public Works and Housing establish centralize procurement data in one database. The project is still in process. Key informants explained (PB1):

“There are many benefits to managing data in one database. All of the data will centralize in one database. However, the data of e-procurement in the Ministry of Public Works and Housing still spread in work unit. There is also no data backup. In fact, infrastructure projects need data such as KAK, RAB, HPS, and billing rates of professional expertise. The data is used as references for procurement team to select contractors. For instance, project of bridge planning which is consultancy package requires professionals. It is difficult to determine billing rate of professionals although the range has been regulated in National Association of Indonesian Consultants. If procurement team want to know data of billing rate in one city, they have visit or contact PPK who has the data. So we established PBJ Terintegrasi” (Wednesday, May 23rd, 2018: 11.15 AM).

4.2.1.3 Implementation Management

Findings show the use of formal “project board” protocol (Croom & Brandon Jones, 2007) to ensure the success of e-procurement implementation. The participation of e-procurement is mandatory to all government agencies and suppliers. However, Ministry of Public Works and Housing had initiated to implement e-procurement system before government enacted regulation that every government institution has to adopt this system. The Ministry decided to adopt the e-procurement to simplify the procurement process. The system is gradually implemented to avoid resistance and increase acceptability. At the beginning of the
implementation of E-Procurement, the Internet is a relatively new thing known by the public. Stakeholders were not ready if Ministry of Public Works and Housing applied full e-procurement. It would inhibit and slow down the procurement process resulting in a delay in the implementation of infrastructure projects for public works. The key informant (IT1) stated:

“We implement this policy gradually. We educated users starting from CTI, semi-e-proc then full e-proc. It was not directly implemented. We considered many aspects such as internet connection, IT infrastructure, IT skills and regulation” (Wednesday, May 23rd, 2018: 15.15 PM).

4.2.1.4 IT Infrastructure

The Ministry of Public Works and Housing had provided adequate IT infrastructure. The finding shows that there are facilitators related to IT infrastructure. It includes hardware resources, network resources, and web server. Bandwidth management and internet connection are the tools that support e-procurement performance in Ministry of Public Works and Housing. The data center in the Ministry of Public Works and Housing has used redundant which are Data Center 1 (DC1) and Data Center 2 (DC2). Furthermore, they also provide high bandwidth to facilitate auction packages in all over Indonesia. Key informants (PB1) elaborated:

“It infrastructure in Ministry of Public Works and Housing is adequate to conduct auction. We use VPS, virtual server. Using VPS can save costs and can increase memory. Next year we have a budget for server to improve internet network so that there is no more technical disruption on internet connection” (Wednesday, May 23rd, 2018: 11.15 AM).

Problem of IT infrastructure is founded in a remote area. Supplier and government agencies located in remote areas have difficulty in access internet and electricity services. Based on Activity Report, in Lamandau Regency power outage is often occur. It is already anticipated by using the generator in the office LPSE as a backup for the operational support LPSE. However, the generator cannot operate due to abnormal voltage.

4.2.2 Barries

4.2.2.1 Legal and Administrative Procedure

The Ministry of Public Works and housing has difficulty in applying some regulation and procedures of e-procurement. Sometimes, the regulation and procedures obstruct the e-procurement implementation. The regulation often changes. There are several amendments of these regulations. The last amendment is The Presidential Regulation No. 16 of 2018. The key informant (PB1) stated that the challenge in this year is to implement this regulation.

“The barriers for the Ministry of Public Works and Housing is an amendment in regulation. The regulation which is Presidential Regulation No. 16 of 2018 requires several changes in the e-procurement system. LKPP has updated version 4 while this Ministry still uses version 3.6. If there is a new update, the changes are quite significant. In version 3.6 we make document then upload it in the system. Meanwhile for the new version the document is filled out in the system. If this policy is implemented, users will have difficulty” (Wednesday, May 23rd May, 2018: 11.15 AM).

4.2.2.2 System Security

The most important thing in this system is about security. Recently, there was a problem with a hacker. It disturbed bidding process. The hacker is indicated want to remove some important documents. They were suspected as part of firm that wants to win the projects. So they remove some documents from their rivals. The key (IT1) informant explained:

“A hacker had removed several pages of bidding documents. It is important part of the document because procurement team will consider the winner from it. We need strong security system to protect our database” (Wednesday, May 23rd, 2018: 15.15 PM).

4.2.2.3 IT Skills

E-procurement system in the Ministry of Public Works and Housing is administered by Electronic Procurement Service Unit. However, this unit merges with Center for Data and Information Technology, Information System Subsection. They not only have functioned as Electronic Procurement Service Unit but also handling job-related to information system. There is no specific unit that has job description as Electronic Procurement Service Unit. The key informant (IT3) stated:

“LPSE in Ministry of Public Works and Housing does not have a separate unit but joins Center for Data and Information System. LPSE task is only to ride on our main task because we initially developed the e-procurement system. We have to serve e-procurement for all of Indonesia while the staff is only two persons” (Wednesday, May 23rd, 2018: 09.20 AM).

Findings show the barrier related to lack of IT skills. IT staffs who have skills in the field of information technology, particularly related to the application software still inadequate, so that if there are technical problems, it will take time to solve the problem. E-procurement in Ministry of Public Works and Housing requires qualified staff to perform as the
system administrator. However, the number of staffs that can hold such roles is insufficient. Based on BluePrint, Ministry of Public Works and Housing still needs 9 persons who have IT skills as system administrator, network administrator, and database administrator.

4.3 Discussion

The topic of e-procurement has become a common topic in government and private sector. E-procurement has proved many benefits such as reduce cost, increase transparency and avoid corruption among public officials. However, the impact of e-procurement in infrastructure projects is rarely been discussed. Using RE-AIM framework, this study explores the impact of e-procurement as well as its facilitators and barriers in this sector. The main results show that generally the e-procurement implementation in Ministry of Public Works and Housing is generally positive. Meanwhile, facilitators and barriers are analyzed by adopting a framework from Aman & Kasimin (2011).

The positive impact of e-procurement in the Ministry of Public Works and Housing is supported by several facilitators. The facilitators are system specification (system integration and data management), IT infrastructure, and roll-out strategy. They developed integrated procurement steps which are preparation, selection, and implementation. It includes budgeting and monitoring system. The finding supports with prior research by Rajkumar (2001), Subramanian & Shaw (2002) and Aman & Kasimin (2011) that system specification was found to be critical to the operational performance of the e-procurement system. They also had established adequate IT infrastructure in order to enhance e-procurement performance because IT infrastructure is important tools to support auction process. Heeks (2006) also stated that IT infrastructure is the challenges of e-procurement implementation faced by government in developing countries. In implementation management, roll-out strategy that was used by Ministry of Public Works and Housing is projects board protocol. The strategy is by implementation e-procurement gradually. The positive impact is minimal resistance from users. The finding support research from Croom & Brandon (2007). However, researcher found other factors that influence

![Figure 2 A New Conceptual Framework: E-Procurement Implementation](Source: Analytical result, 2018)
e-procurement performance the different from the framework from Aman & Kasimin (2011). Initiative and commitment from the leader is important factor that supports e-procurement performance.

However, there are several barriers that are faced by Ministry of Public Works and Housing. The barriers are legal and administrative procedures, system security, and IT skill. This finding supports Scholl & Klischewski (2007) research that legal and administrative procedures often obstruct e-procurement implementation. Heeks (2006) Kassim & Hussin (2010) and Aman & Kasim in (2011) also stated that e-procurement performance is strongly influenced by IT skills. However, outsourcing contract is not found in this research. Another barrier of e-procurement implementation is found in system security. The new concept of e-procurement implementation is shown in figure 2 above.

5. Conclusion

RE-AIM framework analysis shows several findings of the impact of e-procurement implementation in infrastructure projects. The target of e-procurement implementation is users of this system; firms/ suppliers, KPA, PPK, and procurement team. They have been used this system to conduct auction process. However, there are some packages that cannot be procured through e-procurement which is packages that are funded by donor country (loan and grant). E-procurement implementation in Ministry of Public Works and Housing reduce cost and time by reducing the used of paper, minimizing administrative mistake and enhance transparency. All users of e-procurement system use this system to conduct auction process because it is compulsory from Presidential Regulation Number 54 of 2010. In Ministry of Public Works and Housing the policy has been implemented gradually since 2002 until now. Therefore, the users do not have significant difficulty in applying the system.

Public Works and Housing has been run in accordance with regulations and standard operational procedure. They already use system that provided by KPPD that establish based on the regulation. It becomes part of the routine organizational practices. Moreover, there is an evolution of the using of e-procurement from compulsory to necessity in Ministry of Public Works and Housing. The users do not want to use manual procurement. They prefer to use electronic than manual procurement because it helps them to accomplish their tasks.

The findings also show that facilitators and barriers were found in two key themes of e-procurement implementation. The facilitators in system specification are software integration and data management. In implementation management the facilitator is roll out strategy. IT infrastructure also supports implementation of the policy. The barriers of e-procurement implementation are legal and administrative procedures, system security and IT skill. Moreover, there is no outsourcing contract.

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