Actor-Network **Theory (ANT)** for Indonesia e-Government implementation

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Abstract—An Actor-Network Theory (ANT) is a well-known theory in the information system area. This approach is employed to capture actors, heterogeneous networks, and power relations. In Indonesia, there is a presidential regulation number 95 of 2018 about electronic government system. This regulation set all of the e-government implementation in Indonesia, such as governance, management, information technology audit, the organizer, acceleration, monitoring, and evaluation. Many e-government research using ANT for a theoretical lens, however, there is limited research in Indonesia districts. Therefore, this research aims to apply ANT in e-Government case studies in two districts in Indonesia. The first case study is conducted at a district of East Java in 2018 and the second one in a district of Lampung in 2019. Both cases have different social, economic, cultural, and political contexts, even though in one country, Indonesia. The first case study is an established district and another one is the new district. This research captures the global and local network actors as well as classifies their power over the e-government implementation in both cases. The results show that different contexts produce different results and achievements in e-Government implementation. The dominant factor in the e-Government success factor is the commitment of the district head. It has an impact on the strategy to implement e-Government.

Keywords—*Actor-Network Theory (ANT), Indonesia, e-Government, implementation.*

I. INTRODUCTION

An Actor-Network Theory (ANT) is a well-known theory in the information system area, including e-government. research. This approach is employed to capture actors, heterogeneous networks, and power relations. In Indonesia, there is a presidential regulation number 95 of 2018 about electronic government system. This regulation set all of the e-government implementation in Indonesia, such as governance, management, information technology audit, the organizer, acceleration, monitoring, and evaluation. Therefore, all e-government activities should be referring to the presidential regulation. This study is placed on two case studies in Indonesia. The first case is conducted at a district of East Java in 2018 and the second one in a district of Lampung in 2019. Both case studies have different social, economic, cultural, and political contexts, even though in one country of Indonesia. Furthermore, the first case study is an established district and another one is the new district. There is some e-government research that has been employed ANT for a theoretical lens. However, there is limited research in Indonesia districts. Therefore, this research aims to apply

ANT in e-Government case studies in two districts in Indonesia. Moreover, this research contributes by providing maps of local and global networks as well as the comparison between both case studies. Additionally, the novelties in this research are as follows: 1) the comparison between districts in East Java and Lampung. 2) maps of local and global networks between both case studies.

This paper consists of the Introduction section. The introduction section contains background, gaps of research in ANT application for e-government implementation in Indonesia districts, objective, novelty, the contribution of the research, and brief structure of the manuscript. The second section is a literature review which is consists of ANT and e-government. The third section is the research method which describes stages of the research. After that, the results and discussion section is forth. This section contains the identification of actors, actants, local, and global networks in both cases. The last section is a conclusion that captures the summary, conclusion, and future research.

II. LITERATURE REVIEWS

This paper presents literature reviews about ANT and E-Government as explained in more details below:

A. Actor-Network Theory (ANT)

ANT is an approach proposed by Callon, Latour, and Law in the 1980s [1][2][3]. It illustrates networks that contain diverse or socio-technical components called Actants, i.e., humans, institutions, organizations, and technological artifacts [1][2][3]. ANT includes unique actor which has their frames, theories, ontologies, metaphysics, and context. [4] captured ANT as a theory to study dynamic and ambiguous boundaries things. ANT is utilized to illustrate reality. However, it is not a traditional form of a network. In ANT assumption, the material and natural world are related with the 'social relations' [2]. Table I describes the keywords in ANT [5][6].

TABLE I. SUMMARY OF KEYWORDS IN ANT[5][6]

Keywords	Explanation
Actor (or Actant)	Human and non-human actors
Actor-network	A diverse network of collaborated interests, i.e., standards, institutions, and human
Enrollment and translation	Developing alliances between human and non-human, through a coordinating as well as

	collaborating their interests to conform along the actor-network
Delegates and inscription	The actors which exist as well as communicate for some written insights
Irreversibility	The condition that impossible to abandon to the optional condition
Black box	A congealed c of the network
Interresment	An influencing process to accept and working together with the focal actor
Immutable mobile	Irreversibility of the network component and impact to that exceed location and time

M. A. Bin Salamat and S. Bin Hassan	Identification of user group, enrolment, creating the actor-network, the actor and roles, obstacles, the causes, and obligatory passage point (OPP)
I. Faik and G. Walsham	Discussed methodological and ontological key concept
N. Kumar and N. Rangaswamy	Identification of actors, actor-networks, problematization, interresment, enrolment, and mobilization
E. Sayes	Examining nonhumans factors

In terms of sociological origin perspective, [7] explained that the contexts locally dynamic through networks, along with economics, medicine, sociology, geography, or even statistics. Additionally, ANT utilized the insights of the sociology of science and social sciences. ANT moved from a social theory about the sociology of science and technology, into monist anthropology, comparative, or symmetrical [8]. This approach assesses unstructured cases with ambiguous boundaries[9]. ANT proposed along with cultural discourses, social and cultural anthropology, feminist theory, as well as post-structuralism concepts[9]. Furthermore, there are some limitations of ANT, i.e., [10] explained that ANT is found lacking in the establishment of critical approaches to the institutions. [11] examined the dynamic of socio-economic-political contexts and technological factors. With Digital Government, [12] used ANT to capture the global and local of actor-networks in the e-Government program. According to [13], ANT is also used as a scheme for interpretation of the e-government implementation. In the information systems field, [14] captured the establishment of NHS management information systems in the UK, and the "actor-network" approach is utilized for analyzing the result of data collection in three years. Moreover, [6] captured the GIS implementation in India and using ANT for analytical purposes. [15] also implemented ANT to capture the radiology network infrastructure in Sweden hospital. [16] captured the symmetry concept between humans and non-humans. Table II describes ANT application in several fields as shown below.

TABLE II. RESEARCHES OF ANT APPLICATIONS IN VARIOUS SUBJECTS [5][6] [11][14][15][16][17][18][19][20][21][22]

Authors (s)	Application methods
B. P. Bloomfield, D. J. Cooper, and D. Rea	Actors identification and analysis of technology application and resource management using an interpretative approach
B. P. Bloomfield and T. Vurdubakis	Identification of actors/actants, relationships, and changes
G. Walsham and S. Sahay	Describing a story, phase, key events, and anti-narrative and network building in the case.
J. Holmstrom and F. Stalder	Identification of actors, networks, interests, and agenda
S. Madon, S. Sahay and J. Sahay	Capturing problematization, interresment, enrolment, as well as mobilization
R. Heeks and C. Stanforth	Identification of network, global and local networks, power, and project trajectory.
S. Cho, L. Mathiassen and A. Nilsson	Identification of dynamics implementation content
S. Perillo	Translation discussion, a sociology association, as well as network creating

ANT is used in this research as it is a well-known and established theory in the information system. The concept has been applied in many fields, has many debate and advancement [25]. Additionally, ANT is useful for case study interpretative, and qualitative research. Also, ANT can be utilized to describe and interpret the contexts of both cases. ANT will be used to help analyze the interactions and use of technology by the various stakeholders [1][2][3].

Concerning its origin as a sociological perspective, the ANT captures phenomena about technology implementation in a particular social context.

B. E-Government

E-Government is a global and dynamic phenomenon in implementation and agenda. It is also an interdisciplinary field. E-Government agenda has been executed in various countries around the world with various social, economic, political, and cultural contexts. [26] and [27] described numerous departments researching e-Government, i.e., public administration, information systems, marketing and communication, public and policy science, management science, library and information science, accounting, business, and economics, political science, government/governance, non-academic research institutions, computer science, as well as others.

E-Government was coined in the late nineties and has since gained various definitions such as one by the US Congress in 2002: *"Government supported by Information Technologies for delivering good services and information to Government stakeholder effectively and efficiently."* [26].

In other work, E-Government has three main challenges that are as follows [28]:

1. Technical factors.
2. Economic factors.
3. Social factors.

Additionally, [27] examined the success factors of the E-Government program as follows:

1. The capability of applicable technology implementation.
2. Public awareness of the importance of E-Government.
3. Information and services are accessible to the public
4. Integration of national, regional, and local E-Government agenda.
5. E-government performance evaluation.

Furthermore, [26] suggested three objectives of E-Government as follows:

1. Efficient government.
2. Good government services
3. Appropriate democratic processes improvement

Also, there is existing research about E-Government, i.e., [29] developed a qualitative meta-synthesis methodology; [30] examined the past, present, and future of E-Governance; [31] captured the limitations of the existing E-Government discourses; [32] examined the viewpoints, methods, philosophies, and theories of E-Governance; [33] pointed out citizen-centered of e-government system implementation; [34] identified 13 themes in the eGovRTD2020 and produced an e-government research roadmap; [35] studied themes and methodologies in association with E-Government; [36] discussed e-government research topics, trends, and types.

III. RESEARCH METHODS

This is a combination of desk and case studies research. The step by step in this research consist of setting up a research design, then literature reviews of ANT and e-government, after that set up two case studies. The first case study is an established district in East Java province. The second one is a new district in Lampung province. We conducted projects in the first district in 2018 for four months and the second one in 2019 for 4.5 months. The projects are developing a masterplan of e-government based on presidential regulation number 95 of 2018 about the electronic government system. Therefore, this research is based on the masterplan and our observation. In developing the masterplan of the district in East Java, we conducted observation, focus group discussion (FGD), and interviews with the related stakeholders, such as the head, secretary, and staffs of the communication and informatics department, the secretary, and staffs in more than 20 departments in the district government. We also studied documents and reports regarding the district and e-government implementation, such as profile, statistics, news, policies. In the second project, we developed an e-government masterplan based on observation, FGD, questionnaires have been filled by more than 30 departments and sub-districts. Also, 1000 questionnaires have been filled by people. The questionnaires for departments captured e-government existing conditions and requirements for the future. Additionally, the questionnaires for people explored people's opinions and expectations about e-government implementation in the district. Furthermore, we analyzed the masterplans and identified the global and local network actors and classified the global and local actors by their power over the e-government implementation in both cases. After that, we compared the results between both districts. Table III presents a comparison of step by step research in both case studies.

TABLE III. COMPARISON OF STEP BY STEP DEVELOPMENT OF E-GOVERNMENT MASTERPLAN IN BOTH CASE STUDIES

A district in East Java	A district in Lampung
Observation	Observation
FGD	FGD
Interviews the head, secretary, and staffs of the communication and informatics department, the secretary, and staffs in more than 20 departments in the district government	Questionnaires have been filled by more than 30 departments and sub-districts
Studied documents and reports regarding the district and e-government implementation, such as profile, statistics, news, policies.	1000 questionnaires have been filled by people

	Studied documents and reports regarding the district and e-government implementation, such as profile, statistics, news, policies.

Furthermore, Fig. 1 describes the overall step by step of the research as shown below
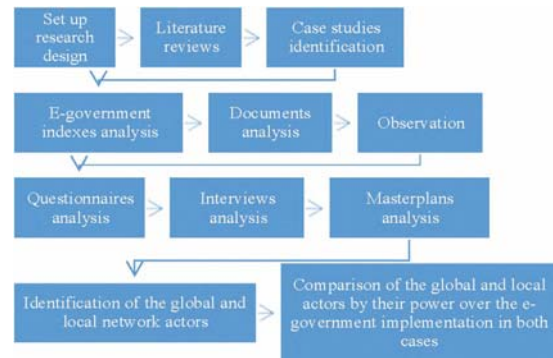

Fig. 1. Step by step of the research

IV. RESULTS AND DISCUSSION

In the case studies identification, e-government indexes are important to captured and analyzed. Table IV points out a comparison of e-government indexes between both districts. The indexes are taken from the official website of e-government http://spbe.go.id/ developed by the Ministry of state apparatus empowerment–Republic of Indonesia. The indexes are open data for the public.

TABLE IV. A COMPARISON OF E-GOVERNMENT INDEXES BETWEEN TWO DISTRICTS

Parameters	A district in East Java	A district in Lampung
E-government index	1.82	1.68
E-Government predicate	Enough	Less
E-Government policy domain	1.24	1.41
E-Government governance policy	1.29	1.00
E-Government service policy	1.2	1.7
Governance domain	1.71	1.14
Institutional	1.5	1.00
Strategy and planning	2.00	1.00
Information and Communication Technology	1.67	1.33
E-government service domain	2.06	2.03
Government administration	2.00	2.43
Public service	2.17	1.33

Furthermore, table V shows a comparison of global and local actors and actants in both districts. Overall, there are similarities actors in the global network, such as ministers of state apparatus empowerment, communication and informatics, home affairs, national development planning/national development planning body, head of technology assessment and implementation body as well as head of state code body and cyber body, and governor. The global network actors are based on presidential regulation number 95 of 2018 about the e-government system.

However, there is a difference in the local network, such as a vice head of the district in a district of East Java. Moreover, there are local actors in a district of Lampung, such as the head of the district and the local development planning body. The other actors and actants in the local network are the same, such as the communication and informatics department, other departments, consultants, potential users, and e-government systems.

The role of the head of the district in both cases regarding e-government masterplan development is different. In the first FGD of the district in East Java, the vice head of the district opened the meeting and delivered a speech as well as an instruction to the departments to support e-government implementation. The consultant could not meet the head of the district directly to discuss the e-government masterplan and implementation. In another district of Lampung, the masterplan consultant discussed with the head of the district. Also, the development of an e-government masterplan in a district of East Java was coordinated by the communication and informatics department. However, the local development planning body coordinated the e-government masterplan development in the district of Lampung.

TABLE V. COMPARISON OF GLOBAL AND LOCAL ACTORS AND ACTANTS BETWEEN THE TWO CASES

Network Classification	Actors and actants in a district in East Java	Actors and actants in a district in Lampung
Global network	• Minister of state apparatus empowerment • Minister of communication and informatics • Head of technology assessment and implementation body • Head of state code and cyber body • Minister of home affairs • Minister of national development planning/national development planning body. • Governor	• Minister of state apparatus empowerment • Minister of communication and informatics • Head of technology assessment and implementation body • Head of state code and cyber body • Minister of home affairs • Minister of national development planning/national development planning body. • Governor
Local network	• Vice head of the district • Communication and informatics department • Other departments • Consultants • Potential users • E-Government systems	• Head of the district • The local development planning body • Communication and informatics department • Other departments • Consultants • Potential users • E-Government systems

Different achievements of both cases is depending on many factors, such as e-government budget, human resources, network access, information technology infrastructures, commitment, and role of the district head. The district in East Java as an established one has better of those factors than the new district in Lampung. Therefore, the e-government indexes of East Java's district mostly better than Lampung's one.

Moreover, all of the global and local network actors have power based on their authority and capability. Therefore, table VI and VII provides the classification based on bureaucracy and technology. All of the global network actors in both cases have similar power, such as ministers of state apparatus empowerment, communication, and informatics, home affairs, national development planning/national development planning body, and governor have a bureaucracy power base. Additionally, the head of technology assessment and implementation body, as well as the head of state code body and cyber body, have a technology power base. Also, some of the local network actors have the same power, such as the communication and informatics department has a technology power, other departments have bureaucracy power, consultants have a technology power, and potential users have has a technology power.

However, there is a difference for some local actors, such as the vice head of a district in East Java has bureaucracy power. Additionally, the head of the district and the local development planning body in a district of Lampung have bureaucracy power as well.

TABLE VI. CLASSIFICATION OF THE GLOBAL AND LOCAL ACTORS BY THEIR POWER OVER THE E-GOVERNMENT IMPLEMENTATION IN A DISTRICT OF EAST JAVA

Actors and actants	Network classification	Bureaucracy power base	Technology power base
Minister of state apparatus empowerment	Global	+	
Minister of communication and informatics	Global	+	
Head of technology assessment and implementation body	Global		+
Head of state code and cyber body	Global		+
Minister of home affairs	Global	+	
Minister of national development planning/national development planning body	Global	+	
Governor	Global	+	
Vice head of the district	Local	+	
Communication and informatics department	Local		+
Other departments	Local	+	
Consultants	Local		+
Potential users	Local		+

TABLE VII. CLASSIFICATION OF THE GLOBAL AND LOCAL ACTORS BY THEIR POWER OVER THE E-GOVERNMENT IMPLEMENTATION IN A DISTRICT OF LAMPUNG

Actors and actants	Network classification	Bureaucracy power base	Technology power base
Minister of state apparatus empowerment	Global	+	
Minister of communication and informatics	Global	+	

Head of technology assessment and implementation body	Global		+
Head of state code and cyber body	Global		+
Minister of home affairs	Global	+	
Minister of national development planning/national development planning body	Global	+	
Governor	Global	+	
Head of district	Local	+	
The local development planning body	Local	+	
Communication and informatics department	Local		+
Other departments	Local	+	
Consultants	Local		+
Potential users	Local		+

In the district of Lampung, the local development planning body has bigger power and an important role for the e-government masterplan development and implementation. Budget and coordination are under the local development planning body. The communication and informatics department has a very small budget to implement e-government. Therefore, the implementation will be coordinated both of the local development planning body and communication and informatics department.

In this research, ANT is very useful as a theoretical lens to help analyze both case studies, particularly for the identification of global and local network actors and actants as well as classification the actors based on the bureaucracy and technology power bases. This ANT application is the following method by [25].

V. CONCLUSIONS

The results show that different social, economics, politics, cultural contexts produce different results and achievements in e-Government implementation. There are some success factors for e-government implementation, such as e-government budget, human resources, network access, information technology infrastructures, commitment, and role of the district head. Furthermore, the dominant factor in the e-Government success factor is the commitment and role of the district head. It has an impact on the policy and strategy to implement e-Government. In this research, ANT is very useful as a theoretical to help analyze both case studies, particularly for the identification of global and local network actors and actants as well as classification of the actors based on the bureaucracy and technology power bases. This research hopefully makes implication for practice, such as the decision-maker of e-government implementation should consider and identify the actors, actants, local, and global network. Also, the power base of those actors and actants are important to identify. Identification of those things is important to make the e-government implementation successful. For theory, this research extends the body of knowledge of ANT and e-government fields, especially for the Indonesia case. The future research will capture the 4 moments of translation: problematization, interresment, enrolment, and mobilization for both case studies.

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