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2019

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INDUSTRY 4.0; RETROSPECT PROSPECT AND CHALLENGES

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Development of Mobile e-Participation System to Enhance e-Government Performance

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***Abstract*— Development of Information and Communication Technology (ICT) has been growing very fast. Utilization of ICT strongly supports the implementation of e-Government to produce quality information quickly and accurately. Government of Indonesia has been experiencing some problems in the implementation of e-Government such as rating of Indonesia's e-Government is still low compared to the Southeast Asia countries, the lack of e-Participation system which can involve citizen participation in development based on information and communication technology, and there is no system that can help the government in decision making and create policies based on citizen input. The purpose of this research is to develop e-Participation system in the government case study in the provincial government of Central Java Indonesia based on information and communication technology that involve citizen participation in development. In this research, we choose to develop e-Participation system that is required. This could provide flexibility in development process by adjusting demand in the developed system. With the establishment of e-Participation system that can support e-Government is expected to be established communication with the government through the citizen or society participation as agent using information and communication technology in the development process. Government can implement the decisions and create policies more quickly and precisely.**

Keywords*— *e-Government, e-Participation, Agent-Based System, Citizen Participation, Indonesia Government

I. INTRODUCTION

Information and communication technology (ICT) has developed very fast lately. This is because the demand to obtain quality information. Information will be qualified if accurate, timely, relevant, complete and clear. The quality information is needed because it can be used for decision making. Likewise the government, with the use of ICT is expected to accelerate development and improve services to the citizen. This is in line with the Indonesian government program as stated in Presidential Decree No. 3 in 2003 about national policy and strategy in developing electronic Government (e-Gov). e-Government is inherent in the government efforts to improve the efficiency, transparency, quality of public services, citizen participation, and economic development and also governance accountability [1]. e-Government as well as a bridge toward the transformation of the government performance in implementing citizen services that are good for the public.

Waseda University in Japan has published Waseda University International e-Government ranking in 2013. The university has been monitoring and surveying the development of e-Government in 55 countries by researcher team that was led by Professor Toshio Obi, Director of the Institute of e-Government. The results of this study, found that Indonesia was included in 40 ranking. In the ranking, Indonesia is still inferior in Southeast Asia countries, such as Singapore (1), Thailand (20), Malaysia (24), Brunei (31) and Vietnam (37) [2]. United Nation (UN) has also published World e-Government development rankings in 2012 [3]. This institution has been conducting e-Government ranking of 193 countries. In the report, Indonesia was entered in 97 ranking. Return, Indonesia is still below among Southeast Asian countries, such as Singapore (10), Malaysia (40), Brunei Darussalam (54), Vietnam (83), Philippines (88), and Thailand (92).

In ranking formulation, the United Nations division for Citizen Administration and Management Development using indicators rating as follow: 1) Information Dissemination or Outreach, 2) Access or Usability, 3) Service Delivery Capability and 4) Citizen Participation or Interconnectedness. While for the Waseda University Japan in the assessment using the indicators as follow: 1) Network Preparedness or Infrastructure, 2) Management Optimization or Efficiency, 3) Required Interface or Functioning Applications, 4) National Portal or Homepage, 5) Government Chief Information Officer (CIO), 6) e-Government Promotion and 7) e-Participation or Digital Inclusion [3]. In developing countries such as Indonesia, almost of all them have been informed by government programs, but they rarely provide consultation or decision taken on the opinion or citizen input in the government processes.

Based on information from the both institutions, one of the indicators of e-Government assessment is Citizen Participation or Interconnectedness (Waseda University) and e-Participation or Digital Inclusion (United Nation). Citizen participation to expedite development is much needed. Information from the citizen is needed by government so that the government can

move quickly to provide the best service to the public. The Government sometimes sluggish in addressing the problems that occur citizen. Besides, citizen sometimes also do not know how to make a complaint the matter. If the citizen is actively involved in providing information to the government, the existing problems will be solved quickly and appropriately by the government. This research is conducted to answer some problems that are faced by the government of Indonesia as follow: 1) the ranking of e-Government Indonesia is still low compared to the countries of Southeast Asia, 2) there is no e-participation system which can involve citizen participation in the development based on information and communication technology, 3) there is no system that can help the government in making decisions (decision making) and create a policy (policy making) based on citizen input. Fig. 1 shows the Indonesia position in the implementation of e-Government among the Southeast Asian countries.

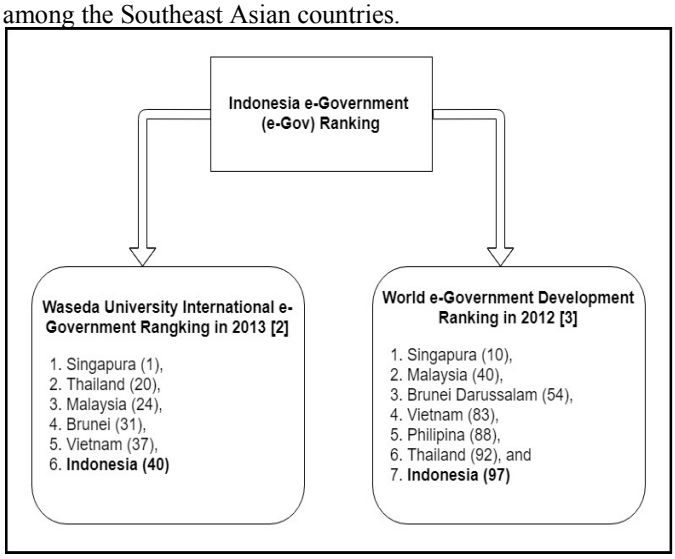

Fig. 1. Indonesia e-Government ranking

II. LITERATURE REVIEW AND RELATED WORK

e-government is the use of information and communication technology that improve the relationship between the government and other parties, known as e-Gov, digital government, online government or government transformation [4]. The purpose of e-Government is to improve the quality of public services, through the use of information and communication technology in the administration of local government in order to form clean government, transparent, and also in order to respond to the changing demands effectively [5]-[6].

There are several types of e-Government are as follows:

1. Government to Citizen (G2C)
   An information technology which has the objective to improve interaction between government and citizen and also to facilitate the public in seeking information about government.
2. Government to Business (G2B)
   A type of relationship the government with business. Because it needs a very good relationship, between the government and business circles. The goal is for the sake of ease for doing business among business society.
3. Government to Government (G2G)
   Web government that aim to meet a wide range of information needed between the government and the other government to expedite and facilitate the cooperation between the governments concerned.
4. Government to Employees (G2E)
   Type of relationship that is aimed at government officials or public servants to increase the performance and also for the welfare of the employees who worked in one of the government institutions [6].

Regarding to this research. There are some opportunities for developing the monitoring system for the events or incident that occurred in Indonesia. It can be developed by using kind of technologies such as 1) the use of satellite technology, 2) the use of cameras or video surveillance, and 3) the use of agent-based. Agent-based involves citizen or citizen and government officers who are authorized.

A. The Use of Satellite Technology

Communication satellite serves telephony and data transmission. The most important component is a transponder that receives conversation on one frequency, then amplify and transmit it back to Earth through another frequency [7]. Satellite technology that is used for communication medium has the advantage such as can cover very wide range. A communications satellite can transmit the data to reach whole Indonesia areas even cross-countries. While the weakness of the use of satellite technology is the expensive infrastructure provision. Satellite currently is used by Internet Service Provider (ISP) for connection to the Internet. Fig. 2 is an overview of the basic architecture of satellite technology.

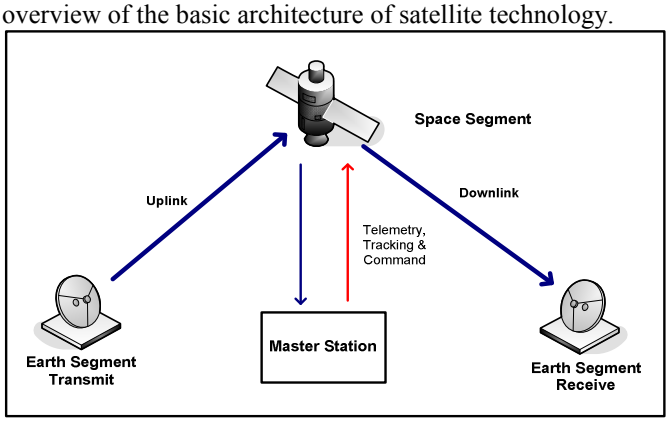

Fig. 2. The basic architecture of satellite [8]

B. The Use of Camera or Video Surveillance

The use of camera or video surveillance is currently growing very fast for security and surveillance. For example, in monitoring the density of vehicles on the road, the Indonesian National Police in the Network Traffic Management Center (NTMC) division used Closed-Circuit Television (CCTV) cameras. National Police used cameras surveillance only in certain spots just like many intersections and red lights are dense vehicles. If the government uses a camera to monitor the

events that occurred throughout the provincial government, like in Central Java province, then the government must build infrastructure by installing thousands and even millions of CCTV which is distributed to all districts and cities. In addition, the government also requires a lot of operators in the area and the Network Operation Center (NOC) with a huge cost.

The use of cameras surveillance will be very effective to be implemented within small scope such as small company, a university or a government agency. The vast area of a province in Indonesia, if monitored with a camera, it will cause many new problems such as the cost of maintenance and human resource needs. The most appropriate solution for now is to use agent-based, which involves the active participation of citizen. As good as any of the government programs, will be difficult to achieve without involving the active participation and support from the citizen.

C. *The Use of Agent-Based System*

Agent-based system is a computational model to simulate the actions and interactions of both individual and collective agents of entities such as organizations or groups by looking at its effects on the overall system [9]. To monitor the occurred events, the agent can be divided into two that are citizen (free agents) and government officials who are authorized (government agents). Citizen is invited to play an active role (participation) in monitoring and reporting to the provincial government, therefore the government can respond and act to solve it quickly and precisely [10]. The use of this agent-based system has several advantages when compared to the use of satellite technology and cameras surveillance as the media to monitor the events that occurred such as: (i) the cost to build the infrastructure is very cheap, (ii) involving participation of the whole citizen or government officials in the area which is authorized as an agent, (iii) be able to use applications that are familiar in the citizen and also developed independently, and (iv) citizen or citizen directly involved to participate in order to succeed development programs.

III. RESULT AND DISCUSSION

In this study, we propose solution for the provincial government in Indonesia, case study in Central Java province in problems solving, especially to monitor the events that occurred to facilitate region development. Those problems can be resolved quickly, if the government in this case is the Governor as decision makers get the right information, quickly and accurately so that the government can provide treatment quickly anyway (quick response). The proposed model can be implemented to all provincial governments in Indonesia and in this case study we implement in provincial government of Central Java, Indonesia.

To know the occurred events in the region of Central Java province, we propose an e-Participation system. This system will accommodate reports from citizens and officials in the area which is authorized as an agent. Then, the Governor or the designated officer can determine the events and provide a response or decisions quickly and accurately, so that the problem can be resolved. By using e-Participation system, the government will get the information, can interact or consultation with the citizen and the received information can be used to assist in decision and policy making. Citizen participation is need to optimize the result of the development process in provincial government.

e-Participation system can be constructed by utilizing the existing applications such as social media applications (Facebook and Twitter) or micro blogging (tumblr), which can leverage the existing infrastructure or to create a new infrastructure both on the client and on the server side. Facebook is a social media application that is popular in the Indonesia citizen that can be used to disseminate information in the form of multimedia. Likewise, the use of micro blogging as tumblr. Citizen and government officials can provide information in the form of text, image or video of the events that occurred throughout the region of Central Java at all times so that the provincial government in this case the governor can provide fast response (quick response).

A. *The Proposed Framework*

In this study, we propose an alternative solution to overcome the problem of the difficulty of monitoring the occurred events in the region of Central Java. The first alternative is to use the infrastructure and the existing systems. The second alternative is to build new applications and infrastructure (dedicated system). The use of both methods is to accommodate the information that was sent by the community, where each method has advantages and disadvantages. The first alternative can be described its architecture in Fig. 3 as follows:

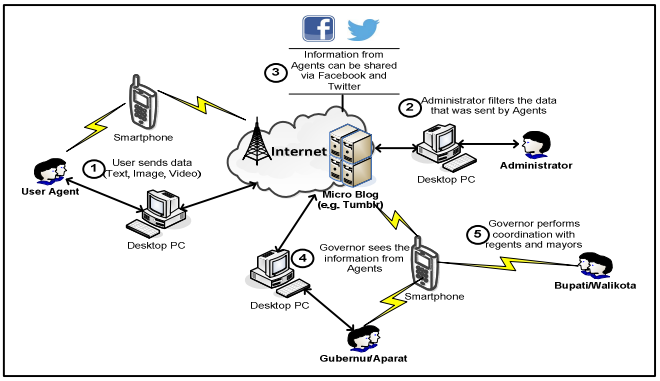

Fig. 3. e-Participation system using the existing infrastructure

In the first alternative solution, the citizen (free agent) and local government officials who are authorized (government agents) can transmit data in the form of text, image or video (multimedia) and location coordinate at the map to the application of micro blog in this case is a tumblr account that modified belonging to the provincial government of Central Java, accompanied by information name, email sender, title and the location coordinate. Text, image or video that has been transferred and stored on the server, then can be shared to social media such as Facebook and twitter so that information can be spread wider and can accommodate a lot of comments from citizen (participation). In the implementation, only requires an administrator to filter text, image or video has been sent by the agent. Information from the agent will be stored on

a server that is owned by the micro blog. If the information that was submitted by citizen is correct in accordance with the provisions therefore the administrator can publish it, so with the contrary, if the information that was submitted is incorrect (garbage) then the administrator can perform the removal and not display it on the website. The advantage of this method is that it needs relatively low cost, because it does not need to build more infrastructure such as build servers, hire programmer, procurement storage, network installation and others. Then to the drawback is we could not process the data that has been sent by the agent flexibly to become a valuable information that can be used to aid decision-making processes and policies such as grouped by the district or city.

In the second alternative solution, all of the infrastructures are developed in the sense of not using an application that already available. Applications built to resemble an existing application (micro blog) that is developed by ourselves. The infrastructures to be developed are server, programmer, storage, software and network. The development of infrastructure is relatively costly but when compared to the use of satellites and surveillance cameras, this alternative solution is relatively cheaper than them. However, this alternative solution has many advantages compared to the first alternative solutions. By using the self-developed system, the system will be more flexible and adaptable to user needs. The developed system will be more accommodating and is designed to be more user friendly adjusted to the user. In addition, the information received and stored can be processed to obtain information that can be used to help the decision making process. The second alternative solution can be described as in Fig. 4 as follows:

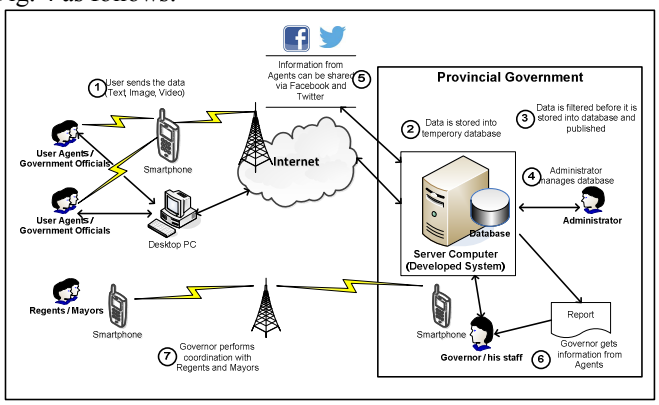

Fig. 4. The developed e-Participation system

e-participation system is based on information and communication technology (website), which can be accessed through desktop computers, laptops, netbooks, tablets, and smartphones to connect directly to the Internet everywhere and every time. Android application that can be installed on smartphones and tablets can also be developed to facilitate access to information. Then, to know the location or information on it (pictures and video) that are sent, the agent must enable the Global Positioning System (GPS) before using the camera by way of setting up the GPS tag on the camera settings menu on the smartphone or tablet being used. With the location information and time, the administrator can perform data processing to be valid information that can be used to assist in decision and policy making.

B. Implementation of the Proposed Network

In this study, authors choose to develop its own system is required. This could provide flexibility in development by adjusting demand in the developed system. By using a self-developed system, the government has several advantages such as: (a) database that is stored on a own server; (b) utilizing a blend of systems are built and the existing social media; (c) database can be used for more important purposes, such as: decision making, and (d) more flexible output (adjustable). Besides the advantages, the development of the customized system itself will require a lot of funds. For this problem, the government could use the existing infrastructure that is owned by the local government with additions according to the needs. It means that the existing infrastructure can be improved to implement the developed system.

The infrastructures that are required to develop a dedicated system are as follow:

a. A Data Center (spot) that is used to put the server and store the data and applications complete with security systems. Data Center consists a number of servers that include: storage server, application server and database server. These servers will be used in a cluster system to handle the process fairly large.
b. Network infrastructure (internet) with a bandwidth of at least 1 x STM 1 piece (about 155 Mbps)
c. Expert programmer to develop a tailor made application of micro-blogging.
d. Personnel as administrator who will operate the developed applications.

The developed applications can be used to send and receive data in the form of multimedia and spatial data from the event locations by activating the GPS feature when capturing data. Data events that occur and require immediate treatment such as a disaster, road conditions, public infrastructure, services and other government officials. Fig. 5 is several events that require immediate attention due to have a broad impact to the citizen.

Fig. 5. Some examples of incident or events

The mechanism of the use of the developed systems to deliver the event or incident to the provincial government (the governor) is as follows:

a. User agents send the text, image or video to the developed web-based system include with GPS coordinate tagged on

image or video if it is sent using smartphone with GPS capability to ensure the validity of location that being reported.

b. Administrator filter the data to be stored in the database that that is used to produce the desired information
c. Administrator manage and maintain database
d. The filtered information then disseminated through social media (twitter and facebook)
e. The Governor may open the system, getting information and responded well to the information of the user agent
f. The Governor then coordinate with the district or city government to settle complaint or information of the user agent.

The broad society and government officials can use the system to inform the incidents or events that occur and meets. With the hope that these events and incidents can immediately get treatment and resolved. Governor could follow up the report from the public in coordination with the district or city government. Fig. 6 shows the user interface that can be used by the public make a complaint or report the incidents or events in the vicinity.

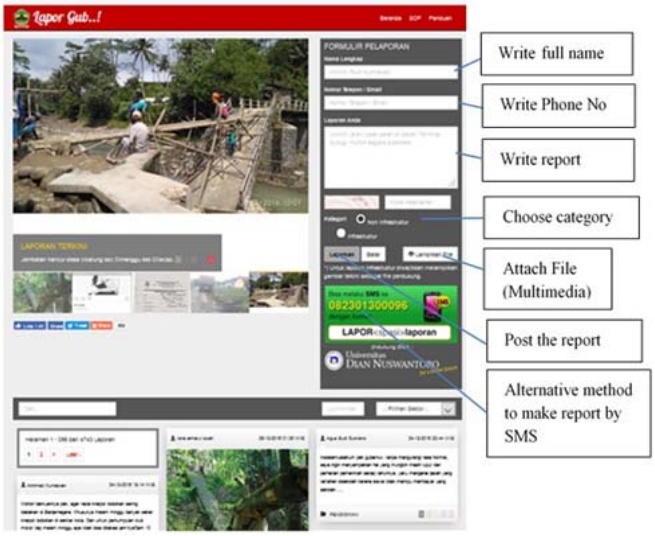

Fig. 6. User interface to write complaints

Based on Fig. 6, the people who know occurrence both infrastructure and non infrastructure category, for example a road infrastructure damage due to the flood, then the public can write a report to the Government immediately to get response. By using this system, the Governor and his staff can provide rapid response in dealing with events and incident in the community. After completing the form, then the administrator will see the message, if the information meets the criteria and deserves to be published, then the administrator will save to the server and publish to the citizen to be monitored by the public. Messages are stored on the server will wait for an answer from the governor and his staff. Governors can get information from the public quickly and then coordinate with subordinates to respond to such information. Fig. 7 shows the reports from people who have received that was responsed by the government through the relevant agencies.

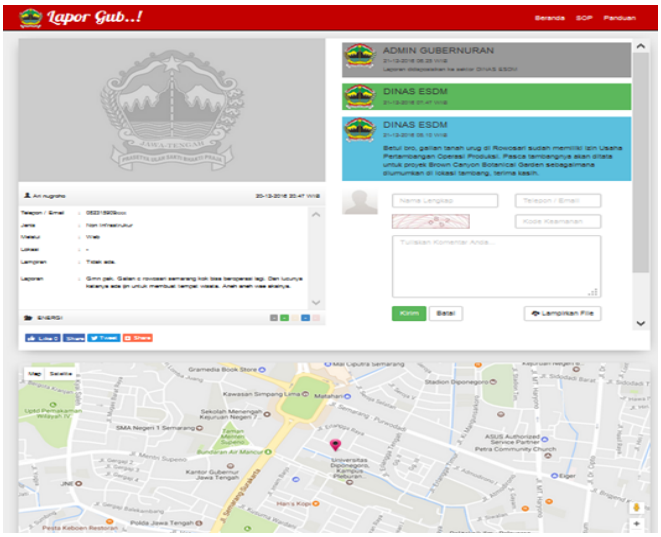

Fig. 7. Complaint that was responsed by the Governor and his staff

Based on Fig. 7 above, information or complaints from the public will be responded by the Governor or his staff of the Department and the head of district or city areas. The location also include a scene by adding a map, so that it can immediately be followed up to the scene. From the public complaint data that is stored in the database server, then it can be retrieved, processed and analyzed to obtain information that very valuable and can be used for decision-making such as: a) reports complaints by district or city; b) reports of public participation. The report can be presented with a variety of tabulation but not only in graphic form.

The developed system is not trivial task. The system needs some modules on the server and the mobile device. The successfully integrated system will be give many contribution to the user. Fig. 8 shows the user interface of the mobile system of e-Participation.

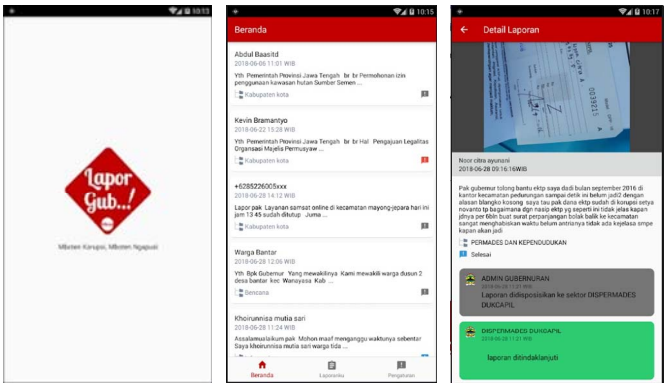

Fig. 8. User interface of the mobile system of e-Participation

By using dedicated system, the information can be customized then analyzed and synthesis according to the government and public need, such as information per district or city, making graphic for the citizen participation and how the progress of com pliant from citizen is solved. Fig. 9 describes some examples of the reports that can be used by government to help in decision making and make policies.

Fig. 9. The output types from the developed system

In this developed system, there are many modules that are included on the system (Web-Based and Android). The developed system is made as user friendly as possible so that the user can operate the system with easy and enjoy. The user can also use smartphone with GPS feature to access the developed system. It will be easier to capture the data that will be sent to the developed system in mobile environment. Fig. 10 shows the resume of the module that are developed for the system.

MODULE OF THE DEVELOPED SYSTEM	
Module of User Management	**Module of Web Content**
Data of User	Menu Customization
Data Access Authority Levels	Website Content Customization
Data Access Rights	Text Link Management
User Password Modification	Image Link Management
Modification Access Authority Levels	**Module of Actions**
Modification of User Access Rights	Reports are Verified by SKPD
Module of Report	Filling the Actions
Filling Report Form Online	Reports Action Progress
Get Automatic Location	Verifying the Finished Action
Metadata Time	**Module of Reports or Statistics**
Metadata Location	Accumulated Statistik reports
Preview of the Reporting Locations	Statistics of Sector Reports
Reports Log	Statistic of Reports Status (Entered Report, Returned Report, Verified Report, In Progress Report, Finished Report)
Verified Reports	Printing Process of Returns Report
Reports Unanswered	Customize Report and Statistics
Reports Returned	**Module of System in Android**
Reports Rejected	Reporting by Android Application
Reports in the Follow-Up Process	Notification of Reporting Status
Module of Integrated System	Reporting History
Integration of Email Confirmation for Trailblazer & Sector	Get automatic location
	Metadata Time
Integration of Report from SMS, E-Mail, Twitter and Fb	Metadata Location
	Integrated Play Store

Fig. 10. Modules of the developed system

C. *Evalution and Analysis*

The proposed framework has been successfully implemented and used by the user. The developed system received the report is open but not directly published, where there are several admins or operators that validate the report first. Regarding to the place, the location of the uploader (citizen as the agent) is checked whether the geotagging in the photo or image is appropriate or relatively close to the location of the uploader. This is to protect that the image taker is the one who uploaded it. This developed system has also been provided a feature to take pictures directly from the application (live photo) and can be directly uploaded. Content in the form of photos or images is also checked by the application system, when the photo is taken, if it is more than 24 hours, there will be a notification that uploader must use the most recent photo.

The uploader will also be verified whether they are truly human (not a robot) by using captcha. Then, to integrate many channels from various social media used, this system utilizes the open API that is available on each social media. By using the hashtag account included, the system can recognize the incoming report. The e-Participation system has begun to be applied by central government and also several province governments in Indonesia. But, the method and framework that are proposing is adjusted to the user needs through several stages of development and testing the system until it finally can be implemented and provide benefits to the citizen.

IV. CONCLUSION

The developed model can be developed in the provincial government in Indonesia. In this study, we use study case in provincial government of Central Java, Indonesia. Based on the research results that has been done, researchers can make conclusions as follow: 1) e-Participation system can be developed in provincial government based on information and communication technologies that involve citizen participation, 2) e-Participation system can assist the government in making decisions (decision making) and create policies (policy making) based on feedback from the citizen. By using the developed model for 34 provinces in Indonesia, e-Government ranking can be increased and be better. For further research, e-Participation system can be developed for the various needs to support e-Government as in the areas of health, economics and so forth.

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