Architecture Governance Model of Local Government Website

(Comparative Study between the City and District of Malang)

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Abstract. Information provided in government website nowadays are part of the services to the community. Basically, the website is expected to simplify the community effort in reaching the services. However, several websites are available with lots of information that is hard to understand. It can be the problem of server limitation or incapability to manage the information. In general, in the context of e-government, the technical implementation of services and policies has received little attention. The purpose of this paper is to identify information management of local government as part of public services. This study conducted a comparative study between the website of the Malang city and district government in East Java Province. To complement the analysis, interview to both website developer was conducted. The result shows that direct- and supporting-services on the website are classified based on functions of organizations' structure. These services will be different among one local government to another. Understanding local characteristic is also important to provide the optimal services to public. Studies about information management in website of government may be abundant on the internet, yet the implementation of organization function as fundamental considerations for the website architecture governance is very limited.

Keywords: Architecture Governance · Information Management · Website · Local Government

1 Introduction

Information technology by utilizing the internet has dominated in various activities of human life to affect various sectors, both the industrial sector, education, government, and others. Data by *We Are Social* in January 2020 shows that *internet* penetration in Indonesia has reached 64% [1]. This means that around $\pm$ 172 million Indonesians have *access to the internet.* The penetration experienced a growth of $\pm$ 25 million people (17%) compared to the data in January 2019. The level of penetration affects the circulation of information in cyberspace. The results of the National Voice of Youth Survey on news access (INDICATOR), which was conducted on March 4–10, 2021,

showed that young people most often accessed information online, then TV. of those who are active online, the majority of 78% access them through social media, namely Instagram is the most news source, then Facebook and Youtube. In the past week, most young people (60.1%) took related comments on social media, and around 31.8% shared news on social media. This illustrates that now information is abundant and has become an important commodity.

The development of the above phenomenon is certainly in line with the study of Information Science. Information science is inseparable from three concepts, namely data, information, and knowledge which are interrelated [2]. Data is usually understood as the raw material for information, which is generally understood as the raw material for knowledge. Knowledge is the highest-level construct. If this is the case and information science is related to all three, then it should be called science, not information science. It should be noted that science can explore knowledge and its building blocks, information, and data, whereas information science is prevented from exploring knowledge because it is at a higher level. These three concepts are important to understand and apply in various sectors for optimal management of information in cyberspace.

One form of information management in cyberspace is presented in the form of a *website. Website* adoption in various sectors has different goals. In the industrial sector, *websites are* used to reach a wider range of customers by creating e- *commerce* [3]. In the education sector, the *website is* used as a learning process innovation with *e-learning* [4]. While in the government sector, the *website is* used to realize *good governance* in the form of *e-government* [5, 6]. Furthermore, this study focuses on the use of websites in government.

The use of websites by the government is certainly an effort to provide better services to the public. One of the electronic-based public services is utilizing the *website* as a medium of information [7]. This is also an effort to implement Presidential Instruction No. 3 of 2003 which reads that every line in the government is obliged to provide electronic-based public services.

With electronic-based public services through the *website,* the government is expected to improve the quality of services, both to the community and businesspeople, including improving the performance of an effective and efficient bureaucracy to realize good and clean governance [8]. The use of the *website is* believed to provide many advantages, such as easier access to information by the public, information being easily distributed by *website* managers, and the existence of various *platforms* (multi-*platform)* [3]. The convenience offered is one of the main reasons for the massive use of *websites* by various government sectors and has even become a necessity for most government agencies. The existence of the *website* helps as well as cover the limitations of the government in terms of disseminating various information so that the public does not experience information gaps [9].

For that, in managing the website, of course it cannot be separated from the matter of ICT. "ICT architecture is a description of the set of components and the relationships between them" [10]. Inconsistency of technical realization still exists in developing e-Government services [11]. Most e-government projects fail miserably (35%) or partially (50%) because of the large gap that exists between 'current reality' and 'e-government project design'. Government has recognized that ICT infrastructure is very important for

e-government development [12] as well as long-term investment decisions [13], therefore studying e-government at the ICT level is an important requirement for building success. e-government systems, and 'in the absence of a reliable and inexpensive technological infrastructure, e-government development will remain an unrealized dream' [12].

In general, in the context of e-government, the technical implementation of services and policies has received little attention [14]. Although, several researchers e.g. Ebrahim & Irani [15] have developed and proposed a common e-government architecture framework representing the alignment of IT infrastructure with business process management in the public sector, none of them focused on the building blocks major technical and fundamental, which will work. as an intermediary layer to link existing and future e-government services to the core of e-government infrastructure. Understanding the design of e-government projects will help governments to understand their own motivations for the concept of e-government and to avoid potential challenges encountered during the establishment of e-government systems.

Therefore, this study will conduct a comparative study of the Malang city and district government websites in the perspective of an environmental approach in East Java Province. The results of the research are expected to contribute to the development of a website with governance that is in accordance with the character of the community. The main objective of this study is to build a technical framework for e-Government to understand the building blocks that underlie e-government systems' impact on governments, service providers, application developers, concerned users (citizens) and other stakeholders. Identifying the technical building blocks for an e-government project is the most important for the successful implementation of e-government in the future which will save a lot of time, research, money and avoid failure. This architecture will reduce confusion around e-government implementation through understanding the key technical building blocks, and technology requirements for building a successful and sustainable e-government system.

2   Proposed Approach

This study uses a mixed methods and/or multi-disciplinary approach, as recommended for use in conducting socio-technical interdisciplinary studies such as e-government [15, 16]. The study by Baheer et al. [17] provide an overview of the stages to find answers to research questions and develop a technical architecture structure for e-Government called e-Government Environment. As shown in the table, in the early stages of the study, a comprehensive systematic literature review will be conducted as a reference for e-Government practices. Thus, enabling in-depth analysis of the website architecture under study.

Comparative analysis will be carried out on previous studies to gather experience, implementation, and efforts in e-government implementation, especially e-government frameworks and architectures. This is because of the need to have a general idea of the components of the framework. Therefore, the main objective of this analysis is to find the key technology support and building blocks of e-government systems. This step begins with selecting local governments that have a record of best practices (best practices), availability of relevant publication documentation, reviewing those that have
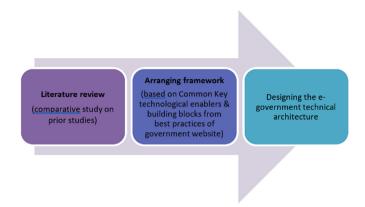
Fig. 1. Research flow.

e-Government maturity with the best value, and making them more representative. We consider several local governments, and geographical variations are also considered. To achieve this objective, we will examine the literature listed by Google Scholar, and the possible search engines.

In addition, this research is more focused on the technical aspects of e-government, and subsequently to produce a model called the technical architecture of e-government. To that end, we used a design science research methodology [18] to design the framework, because the design science research paradigm is proactive when it comes to technology [19]. The expected result of the first two stages is the proposed technical architecture in the implementation of e-government. It is very important to validate this architecture, and it will be completed through analysis of existing case studies and comparing proposed architectures (Fig. 1).

3   Results and Discussion

3.1   Architecture of e-Government Website of Malang City and Regency Government

The e-government architecture defines the standards, infrastructure components, applications, technologies, business models and guidelines for e-commerce and among organizations that facilitate government interaction and promote group productivity. In the development of the framework architecture, business processes are necessary for the successful implementation and management of e-government activities. Likewise, application integration and interaction tools have played an important role in improving business processes in organizations and their applications such as e-business, e-commerce, enterprise application integration (EAI), web services, etc. The integration is realized in the services provided by a website.

The web framework is organized into four layers connected by bidirectional arrows that present the hierarchical levels of e-government implementation and describe the logical connections of each relevant layer that enable bidirectional data and service

transmission (Fig. 2). The top level of the framework represents the access layer which describes who may use government services and what access channels are. Across these channels, the e-government portal should integrate all government information and services from different departments and organizations, representing the e-government layer. With respect to the e-government layer, the e-business layer emerged to manipulate and integrate government data sources across government agencies and make information and services available to e-government portals in real-time. At the lower level of the framework, e-government ICT infrastructure should be built to reach all parts of government and hence, support e-government operations and provide effective and reliable e-government services.

Based on the layer mapping on the government website architecture above, the Malang city and district government websites will be analyzed. The analysis is done by looking at the implementation of the architecture, what doesn't exist yet, and what's new on the website. The results of the core analysis are presented in the table below and will be narrated in the following paragraph.

Use Access Layer. At this layer, the website will show who may be using government services and what access channels are. In general, the Malang City and Malang Regency
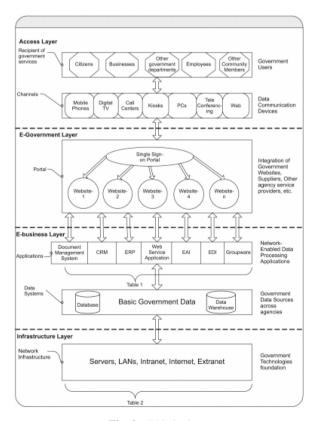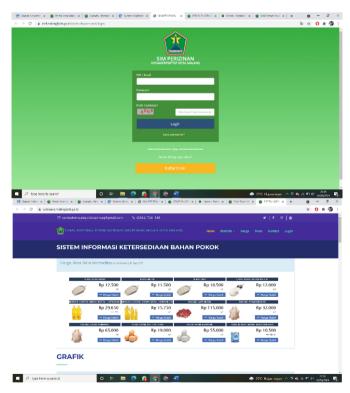

Fig. 2. Website layer.

websites can be accessed by the wider community, businesspeople, other governments, employees, and other communities. Based on page loading speed, the Malang City Government website appears faster than the Malang Regency website. The homepage of the Malang City website appears within two (2) seconds, while the Malang Regency website does not appear for up to one (1) minute. However, both only provide information in Indonesian, even though there is information about tourism, regional facilities, and events/activities that have the opportunity to be accessed by foreign citizens.

On the homepage of the Malang City website, Malangkota.go.id, there are 18 main menus that connect various information and services that can be accessed. Some information can be accessed directly, some require advanced access such as NIK – National ID Number (Fig. 3 above). This shows that there is information that can be directly accessed by the general public, some for certain communities, for example. This variety of information can be accessed through the website page on a PC or cell phone. By using a cellphone device, the service provides access options in the form of a website, sms, email, or social media (Fig. 3).

e-Government Layer. The e-Government layer defines how electronic data can be integrated into one easily accessible data center, meaning that electronic data and information from various levels of government are integrated into one central website. The integrated electronic data center that can be accessed at one door is not only intended

Fig. 3. Information access (above, below).

for its usefulness to the community, but it also defines the relationship between government affairs, departments in government organizations that are interconnected. This layer allows users to interact and communicate so that the website portal is an interactive medium for the community to obtain information and public services.

On the Malang City government website, the available services and information are collected in the same website, users can access public services that are integrated into features that are in accordance with the subjects and services in Malang City. In addition, there is also information about business institutions, business actors, communities, and other community services such as CCTV which is part of the Malang Smart City Program. However, there are some links that are still under *maintenance* so they cannot display the linked site. On the Malang City website, the grouping of features is separated according to the needs of the community, making it easier for users to access public information, public services, and required regional documents. Access to public services linked to the website is sufficient to cover related agencies, so that people can use one-stop access on the Malang City website.

Furthermore, the Malang Regency website in general has been integrated into one portal, but the features displayed are related to service-related information, meaning that the portal cannot be used for public service submissions. When viewed from the appearance of the website, the features in it have not been grouped according to the subject with related agencies. There are still some features that cannot display related documents, functionally the Malang Regency website has not been able to integrate public services and information needs, but rather the functions of data storage and archives that can be accessed by users. In the e-Government feature which is access to central services one door there is still an error so it cannot be accessed by website users.

e-Business Layer. The e-Business layer is a layer that focuses on the use of applications and various ICT tools that are used for knowledge sharing and information processing both inside and outside the organization. In short, this layer integrates *front-end* applications such as those used to support the *interface of* government websites and *back-ends* such as website databases. So that this layer will be a strong foundation for integrating various governments in a one-stop portal that is useful for maintaining government data and business processes.

At this layer there are various applications and systems that support the use of this layer, namely Database Management System (DBMS), Customer Relationship Management (CRM), Enterprise Resource Planning (ERP), Web Service Application, Enterprise Application Integration (EAI), Data Warehousing, Electronic Data Interchange (EDI), Document Management Systems, Data and Knowledge Management, and Groupware. The use of these applications can be adapted to the needs of government portals, in which not all applications must be used.

In general, Malang City and Malang Regency have used website services where it is the right choice as an approach in developing the integration of the e-Business layer. In the Malang City and Malang Regency websites, there are several characteristics possessed by the applications mentioned above, the following is an explanation of the characteristics of the Malang City website and the Malang Regency website:

DBMS. The DBMS is a set of components that define and regulate the selection, storage, management, and use of data in a database environment. One of the characteristics of a

DBMS is that it can present data and records to the public via the WWW. This is shown on the Malang City website and Malang Regency website, they use the WWW in launching their website. The website can also access various information contained in the services or features on the website. Other characteristics such as supporting simultaneous data access and controlling data access can also be seen on the Malang City website which contains features for accessing various regional documents, regional applications, and transparency of regional budgets. However, some of them can only be opened by related parties and some of them cannot be accessed. Meanwhile, the Malang Regency website can be accessed regarding regional budget transparency data and other public service information.

CRM. CRM is the alignment of government business processes with citizens' needs to manage and ensure they are served logically and reduce the costs of service providers regardless of line of business. Some of the characteristics of CRM are creating trust between the community and the government, creating a community profile, enabling high-level services, saving people's time, and increasing transparency and openness of government transactions.

On the Malang City website, a service that is in line with CRM is the Online Sambat service. This service serves as a bridge for aspirations, suggestions, criticisms, complaints, and questions from the public to the Malang City government. It can be seen in the statistics on the use of this service which is also quite high, where until 2021 there have been 8962 complaints from residents. The flow of using Sambat Online is also explained in detail starting from inputting the complaint to the final stage, namely the follow-up of the complaint to the relevant OPD.

Meanwhile, on the Malang Regency website, a similar service is called Surat Warga. This service serves as a means of reporting citizens to Malang Regency government agencies. To use this service, the community can sort out the destination SKPD and write the contents of the report. It can also be seen that the response of the relevant agencies is quite active in responding to public reports.

From these two services, it can be said that the Malang City and Malang Regency websites have CRM characteristics in the form of intergovernmental business processes with the needs of citizens in ensuring they get good service through means that can channel the aspirations of citizens to the government directly.

ERP. ERP is a system that represents business management that integrates the flow of information through all functions of the organization to automate corporate business processes. Some of the characteristics possessed by this system are that it can resolve discrepancies between government systems, support high-level decision making, support financial and human resource management, and establish interactive relationships between public sector organizations and other partners and suppliers.

On the Malang City website, there is no information regarding cooperation with other partners, only general information about regional facilities, public services, and other governments, which only includes the name of the place and full address. The flow of information is only found in government organizations which are only limited to linking the OPD website or agency link in Malang City.

The Malang Regency website is also almost the same, only general information is provided with other business partners, such as the site features of regional apparatus,

public services, and regional potential. The flow of information from other organizations is also limited to linking website links to various OPDs or agencies in Malang Regency.

Web Service Application. Web service applications are encapsulated business functions from requests to simple replies in full business process interactions. Where government organizations can integrate powerful, sophisticated search engines in Internet, extranet, and intranet environments without the need for large capital investments or substantial systems integration. Some of the characteristics possessed by this application are offering standardized service interfaces and common communication protocols, providing comprehensive and dynamic integration capabilities with back-end systems, reducing integration costs, handling payment processing, stock charts, quotes, bidding, and auction processes, and implemented via XML/HTTP.

On the Malang City website, there is already a search engine and can be used, but full business process interactions cannot be carried out directly on the website because the majority of the functions of the website only provide information and cannot make transactions directly on the website, because to process other businesses only have a website link from the relevant agency so that business processes are carried out on the related website. The interface is also clear, and the website has been implemented using HTTP.

For the Malang Regency website, the search engine feature cannot be used and is still in the testing phase where if you try it, the feature will display the page https://uji coba-web.malangkab.go.id/mlg/. Regarding the interaction of business processes on the website, there are also not many, only Citizen Letter services and general information about services on the website. Similar to the Malang City website, for other business processes involving other agencies, it is only limited to linking the website of the relevant agency. When you first open the website, there are still some interfaces that don't work, where when some services are clicked, they only display the service image logo. The website has been implemented using HTTP.

EAI. EAI is the integration of intra- and inter-organizational systems by securely combining the functionality of different applications in government organizations. Its characteristics are that it supports data, object, and merging processes, transports and transforms information between applications, provides rapid response to changes, and reduces integration and development costs.

Both the Malang City and Malang Regency websites have an integration system with other similar organizations, namely only linking to other agency website links such as OPD in the city or district.

Data Warehousing. Data warehousing is a database whose storage is integrated, usually historical, and aggregated information drawn from multiple, heterogeneous, autonomous, and distributed information sources. Some of its characteristics are that it can collect and integrate data from separate sources, help find and use information and records regardless of their physical format and location and be used for strategic decision making.

If look at the Malang City and Malang Regency websites, the database storage used has not been seen directly. However, database integration with other organizations has not been seen because the integration is still limited to linking the related OPD website

links. For information such as regional documents, budget transparency, LKPJ can still be accessed on the Malang City and Malang Regency websites.

EDI. EDI is the electronic transfer of structured data and services using approved messaging standards between computer applications. Some of its characteristics are that it can design document exchanges between organizations, support application-to-application interfaces, accelerate business processes and transactions, and provide efficient services.

   In the Malang City and Malang Regency websites, there is no service that can exchange documents between organizations. But both have interfaces that support applications to other applications. Like linking other agency website links.

Document Management System. Document management systems are useful for storing and managing multimedia format records linked to automated workflows and electronic document repositories. There are several characteristics of this system, namely it can share documents among organizations, improve supply chain efficiency, and increase the efficiency of maintenance, access, and sharing of documents via the internet. This function cannot be viewed directly from either the Malang City or Malang Regency websites.

Data and Knowledge Management. Data and knowledge management is a systemic approach to capture information and knowledge about organizations, processes, products, services, customers, procedures used to plan and evaluate programs in various fields ranging from capital development, economic forecasts, to school achievement. Some of its characteristics are being able to control processes outside the internal structure of government, providing formalized and mapped results and data to government portals, and making knowledge available to the public.

   The Malang City and Malang Regency websites have functions that work almost the same in this regard. Both display various information about the organization, products, services, procedures and others on the website. On the Malang City website there are news pages, articles, announcements, public services, regional documents, regional budget transparency, information, regional facilities, information on taxes and levies, regional applications, to other agency websites. While the Malang Regency website provides information on agendas, activities, announcements, profiles, government, regional apparatus, regional potential, public services, regional budgets, information on prices of vegetables, commodities, hospitals and health centers, as well as links to websites of other agencies.

Groupware. Groupware is a collaboration tool that allows employees working in teams to share information and resources to work interactively, regardless of an individual's physical location, such as email, bulletin boards, and the collaboration web. The characteristics possessed by this tool are supporting decision making, updating news and new notifications for staff, facilitating communication between citizens and officials, and reducing communication costs.

   Both on the Malang City and Malang Regency websites, this function is not found. The news provided on these websites is only about activities in the city and district of Malang.

If you look at the applications and systems that exist in the e-Business layer above, several things can be found on the Malang City and Malang Regency websites. Here are some shortcomings that can be used as an evaluation:

- Some regional documents and other data provided on the website are accessible and some are not accessible.
- Integration with other organizations or agencies is only limited to linking a website link, so it cannot carry out business processes or transactions in full directly on the website.
- The system for merging the functionality of all government organizations cannot be viewed directly on the website, there are only links to websites of other government organizations
- Database integration cannot be viewed directly on the website.
- Electronic data transfer cannot be found on the website.
- The feature for storing and managing multimedia format records connected with automated workflows cannot be seen on the website.
- Collaboration tools between employees to work interactively cannot be found on the website.
- The search service cannot be used because it still has information in the trial stage (for Malang Regency Website).

Infrastructure Layer. The infrastructure layer is a layer that functions to reach all parts of the public sector organization in agreeing on a communication system. So, the focus of this layer is the technology that must be provided before e-government services are provided to the public effectively. The technology at this layer also integrates the operation of information systems and applications at the e-business layer throughout the organization. It is recommended that at least the IT infrastructure layer has server applications, hardware and operating systems, and data and application development tools. Choice of technologies that can be used such as LAN, server, internet, intranet, and extranet.

Local government supported by KOMINFO (Indonesian Ministry of Communication and Informatics) with the updated infrastructure annually. They provide a main website, several specific websites, and representative website for each village. There will be an officer who help community to access information and public services.

3.2   Website Architecture Model for Local Government

The main model in Fig. 2 which is used as a reference for analysis will be the basis for sharing the environment in a website. The environment in this study is defined as a place with relevant facilities to carry out activities with a particular focus. With the development of technology, the existence of a website has become one of the environments that are now widely used, both from the government sector, education, trade, health, and so on. In this study, the main environment is the website of the Malang City and Malang Regency Governments. The website is divided into four environments, namely the environment that shows access, electronic government, electronic business, and infrastructure. The
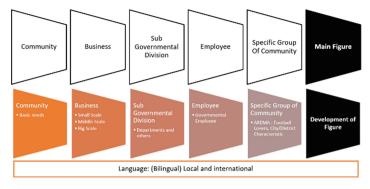
Fig. 4. Development of access environment.

model used as a reference describes the relationship between the government and users in general, with identification on the local government website providing input in the form of programs recommended by the national government, as well as special needs in the area for the development of the model.

The first environment is about the environment related to access, namely who can get access and the media provided to do that access. Society in general is the focus of government services. The different roles of everyone based on work, needs, or other interests affect the form of website access required.

In the Fig. 4 above, the model shows who can use the government website according to their individual needs. In this case, the public can use the website as a source of information and a means to take advantage of government services, such as taking care of business licenses and letters related to population. People who are not natives can use the website as a means to find out information related to tourism and register to take part in these tourism activities. Individuals as employees can exclusively access the website by logging in to get information related to work. For this reason, it is also recommended to use a language that is not only Indonesian or national, but also provides information in an international language or English. For businesses, grouping based on business scale needs to be done because the government encourages the development and ease of bureaucracy for MSMEs (Micro, Small, and Medium Enterprises). This categorization will affect the access load on the website, the requirements, and the flow that users need to take. For relations between departments or agencies in the government, one data portal can facilitate documentation and use of population data across departments or agencies. This also makes it easier for people to not always repeat filling out personal data forms. Then, for other community groups, it can be grouped in terms of hobbies and characteristics of the city or district. In this case, for example Malang City, the AREMA football club has an attraction and loyal fans that can be an opportunity to attract certain community groups to use the website. One example is providing registration links to watch stadiums, purchase merchandise, as well as news related to AREMA as well as fan participation.

Next is the media and ways to access information and services provided by the government. The media used, in a technology environment, can take advantage of software
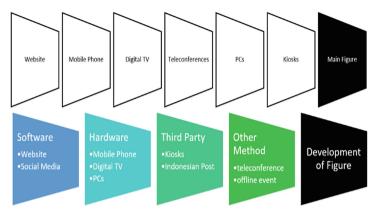
Fig. 5. Development of access environment specific to the media and ways to access information.

and hardware. The use of software can use websites, social media, and others. Utilization of hardware can use the type of technology that makes it easy for users to access, whether mobile phones, laptops, PCs, or others (Fig. 5). Ways to access information can also use teleconferences or offline activities such as visiting residents from house to house. Another way is to use third parties, such as Pos Indonesia as an extension of information or agents to facilitate the process of public services. In this environment, it can be concluded that the classification of access for whom and through what media can clarify the usefulness of local government websites. This illustrates the ease and friendliness of access for anyone with a variety of media.

The second environment is electronic government (e-government). This layer defines how electronic data can be integrated into one easily accessible data center, meaning that electronic data and information from various levels of government are integrated into one central website. Various local government services based on the agencies that provide, these services are grouped into main, support, and media services. This categorization will affect the flow of information because of the high intensity of access.

In the next step, the elements of Structures by Mintzberg in 2002 help explaining the proposed model in the last part of discussion. Architecture is essentially arranged based on the organization structure, which has five functions (Fig. 6). Applications are information technology to support the implementation of functions. Therefore, application services can be classified based on the function of the organizational structure. The main or direct services must be in accordance with the needs of the community.

Application is the automation of the implementation of functions or services within the organization, core functions or direct services. The application reflects the implementation of the function. The theoretical application of organizational structure can be grouped into five organization functions. Every function has a rule. Making applications should follow the rules of each of these functions. The operating core is a direct service function in the organization because direct service is a service that directly meets the needs of the community. Indirect services (four other functions in the structure) are supporting the operating (business) core or direct services or basic services (Fig. 7).
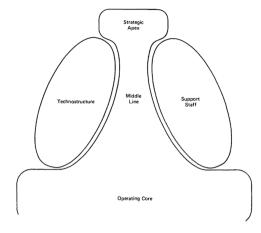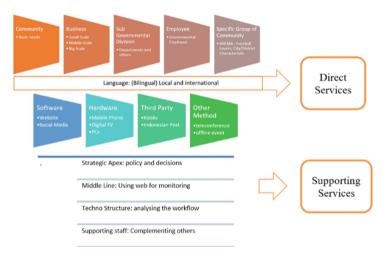
Fig. 6. Five basic part of organization.

Fig. 7. The proposed model for local government website architecture.

In the office, in bottom organization lockets/units or sub-units (operating core) the jobs do not pile up, the leader in middle line could organize the work process correctly and rapidly, the leader in the high level (strategic apex) could make decisions appropriately and swiftly, techno-structure could make work systems and procedures properly, and support staff can support the other parts of organization. Based on these five functions, the new organization structure should be enhanced to the characteristics of collaborative organization structure oriented to the needs of citizens to have implication in fostering the quality of public services [20]. Additionally, a study recommends that government should choose the models of collaborative organization characterized by leadership shared internally and externally [21].

4 Conclusions and Future Work

Government website is the face of the organization which simplify the services to be accessed by the public. Therefore, website is the automation of the implementation of functions or services within the organization, core functions or direct services. The application reflects the implementation of the function. Every function has roles and rules. Making applications should follow the rules of each of these functions. The operating core is a direct service function in the organization because direct service is a service that directly meets the needs of the community, while indirect services (four other functions in the structure) are supporting the operating (business) core or direct services or basic services. These services will be different among one local government to another. Understanding local characteristic is also important to provide the optimal services to public.

This research has limited analysis on only two websites, for previous research it would be better to develop it on other local government websites. This will broaden the picture of the governance of the government website architecture in Indonesia, so that in the future, the utilization of the website will be more optimal for public services.

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