

An Exploratory Study on Construction of Electronic Government as Platform with Customized Public Services : to Improve Administrative Aspects of Administrative Processes and Information Systems

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맞춤형 공공서비스제공을 위한 플랫폼 전자정부 구축방안에 대한 탐색적 연구: 행정프로세스와 행정정보시스템 개선측면에서

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Abstract Currently Korean government is rushing the new electronic government system introduced as 'platform e-government' with big data and cloud computing technologies and systems, ultimately intending to provide the public institution services customized from the integrated counter or window for the heterogeneous resident services. In this regard, this study suggested how to design the new metadata information system in which mutual integration of information systems can take place, where heterogeneous services can be shared efficiently at the application and data unit, as a separate application that can provide a single one-stop service for residents' petition at the integrated level in the back-office based on the public data in possession of each of government ministries and related organizations. If this proposed system is implemented, the achievement of customized public service can be advanced one step forward in processing the petitions of the residents by organically connected link between 'Demand Chain' and 'Supply Chain' in the integrated window. In other words, it could be made possible through the unification of both the 'Supply Chain' performed in the office space of the officials at the back-office level and the 'Demand Chain' performed in the living space of the residents at the front-office level.

Key Words : Metadata, Administrative information systems, Front-office, Back-office, E-government, Administrative process

요약 현재 우리 정부는 플랫폼 전자정부 도입을 서두르고 빅데이터와 클라우드 컴퓨팅 기술과 시스템을 모색하여 궁극적으로는 공공기관 각각의 이종 대민서비스를 단일창구에서 맞춤형으로 제공하고자 한다. 따라서 이 연구에서는 창구의 프런트오피스 민원인의 다양한 서비스 제공요청에 대응해서 백오피스에서 단일한 방식으로 맞춤형 공공 서비스를 제공하기 위해서는 먼저 백오피스 차원에서 공공데이터가 연동되어야하므로 각 행정기관이나 부처의 공공 데이터를 기반으로 백오피스에서 통합차원에서 민원인에 대해서 단일한 서비스를 제공할 수 있는 별도의 응용프로그램으로서 앱과 데이터 단위에서 공유를 효율적으로 수행하는 이종서비스 상호 간의 정보시스템 통합이 가능한 새로운 메타데이터정보시스템을 제안하였다. 제안된 시스템이 구현되면, 민원인의 프런트오피스 차원의 생활공간에 존재하는 서비스 수요사슬과 백오피스 차원의 공무원의 사무공간에서 이루어지는 서비스 공급사슬의 일원화를 통한 단일 창구에서의 연동이 유기적으로 되면서, 민원인에 대한 맞춤형 공공서비스 달성을 한발 앞당길 수 있다.

주제어 : 메타데이터, 행정정보시스템, 프런트오피스, 백오피스, 전자정부, 행정프로세스

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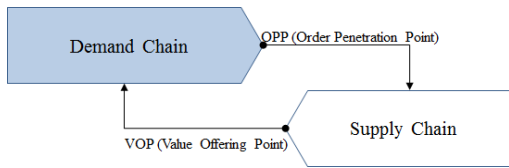
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1. Introduction

In recent years, so-called '3S', created by intelligent information environment, standing for sensor data provided by the internet of things, social data extracted from social media, spatial data provided by the spatial information technology, has been brought to the spotlight. This trend suggests the possibility of the dramatic paradigm shift with regard to the customized administrative services. The office space of the government and the living space of the residents that used to be the dual process, in the divided form of back-office and front-office, can be centralized in one single process[1]. Currently, Korean government is rushing the new electronic government system introduced as 'platform e-government' with big data and cloud computing technologies and systems, ultimately intending to provide the customized public services from the integrated counter or window for heterogeneous resident services[2,3,4]. In the e-government evaluation in 2014, UN has given South Korea the three consecutive world's No. 1 followed by 2010, 2012[5]. It has a significant meaning that e-government level of Korea was recognized as a leading position by the international community. Despite these developments, however, it is somewhat problematic that the resident's satisfaction level of Korean government's administrative services does not reach the desirable level and the government's administrative services are still low when judged by the current level of e-government service for the citizens[1,6,7]. Even though the new government presented a core challenge to 'the customized service' directly linked to the improved public services to every resident's satisfaction, in conjunction with the release of the data, upon entering the new Park Geun-hye 2013 government carrying the banner of the 'Government 3.0' ideology, in fact, it still stays as a simply ideological slogan not backed by specific discussions on the issues like 'What exactly does it mean?' and 'what

conditions should be met as prerequisites?', 'How can the system be implemented?'[8]. Therefore, this study aims to achieve the ultimately customized services for citizens(or residents) and presents the available metadata information system for integration among different(or heterogeneous) services for the public at the back-office level which is essential to respond to the various service requests of residents at the front-office as its preconditions of information systems implementation plan. As is well known, there should be the first link as a must for coordination between the back office system in order to provide customized services from the back office level to the petition of citizen located in the front office. As the next step to achieve this end, data in possession of government organizations or ministries should be interoperable and connected to the mutual link. In order to provide customized public services in a single method or way in the back-office immediately responding to the various requests coming from the front-office service counter(or window), public data needs to be linked in the back-office level beforehand. Only then, different services therewith each of administrative organizations and departments has provided previously could be newly provided through the initially integrated back office based on the data as a single service for the petitioners or complainants. This study explores the limits of the latest research for the currently existing information systems in Chapter 2 in order to discuss the integration plan of metadata information system for the information systems integration among different services of the public institutions and the proposed system will be described in Chapter 3. Then this study explores the utility aspect and the structural analysis of the proposed system in Chapter 4 and will wrap up the discussion in Chapter 5.

2. Related research



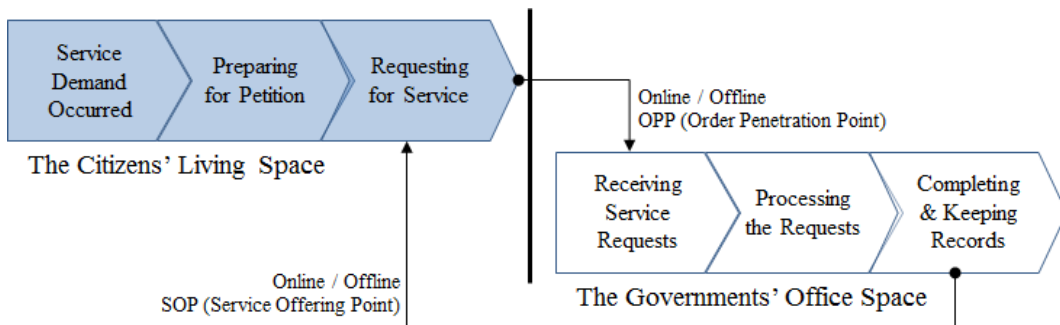
[Fig. 1] Linking Supply and Demand Chains with OPP/VOP

2.1 Discussion on developing application of external expansion as an operational model of administrative process with the OPP and the VOP concepts

OPP/VOP, the concept developed as a means of centralized supply chain management reflecting the relationship between customer and supplier, will be achieved by connecting the supply and demand chains. (See [Fig. 1])[1,9]. While the existing supply chain management model(SCM) has been only targeting the supply chain, this OPP/VOP-based model is to link the customer demand chain in the supply chain, understand the interlocking among the customer contacts that exist in the supply chain, so it can be interpreted as an integral "win-win" model for management[10,11].

If the system interlocking the supply chain and demand chain by utilizing OPP/VOP is applied to the administrative service process, it is as follows(See [Fig. 2][1]). As shown, the supply chain of the government is divided into three stages such as application and

acceptance for resident petition as request of the current government back-office level, processing the requests, completing and keeping records. The demand chain of the resident petition in the front-office level is divided into three stages such as request occurrence for services, preparation for application of complaint like petition, acceptance of complaint like petition. Therefore, in the future, in order to provide customized public services at the front-office level through the integrated window in the back-office level, it is important that service demand chain of residents is organically linked with service supply chain of the government through an external process as an extension of administrative services like [Fig. 2]. In fact, when mutual link and cooperation are achieved in 18 types of public book(five types of cadastral book, three types of the real estate registration, six types of land, four types of architecture) which are managed in the four independent database of building administrative information system named "Seumuto", residents(or citizens) will be able to save their time and efforts burning themselves out to visit about 20 related different institutions in obtaining a license just to receive more than 40 documents in the previous preparation stage[1]. In this way, if service demand chain of citizens that exists in the living space of the front-office level is organically linked with service supply chain of the government to be performed in the



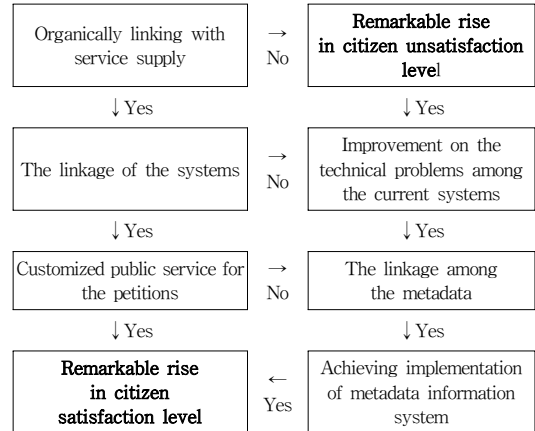
[Fig. 2] Linking Resident's Demand Chain and Government's Supply Chain

office space of the back-office level, linked to each other through the unification, it is possible to achieve a customized public service for the petitions. As a result, the government will be able to expect a remarkable rise in citizen satisfaction level in terms of public service evaluation.

2.2 Limitation of the currently existing systems and discussion framework

As can be seen from the above mentioned precedent studies, in spite of technical feasibility to provide for citizens customized public services in the front office level through the integration of the back-office level based on the linkage of the systems, the cooperation on the existing systems among the government ministries and related organizations is still lacking[12,13,14,15], so there is a need to increase the public trust and user satisfaction by improving the quality of service, by overcoming the technical problems among the current systems[16,17], and the need to make further effort in order to achieve the ultimately customized public services has arisen[18]. Certainly, it is important to strive further efforts among each of heterogeneous(or different) services -for example, in MINWON24(www.minwon.go.kr)- of the government ministries and related organizations to share information about the front-office of resident petition through the interoperability of the mutual exchange of information, as such function is indispensable to heighten the public satisfaction for residents and e-government system level. In particular, there always has been a demand to achieve implementation of metadata information system among the information systems at the level to improve the speed and the accuracy of the work. In fact, if services of government ministries and related organizations are of the same type, they can be absorbed or integrated into a new system without bigger changes in the processing. However, if the services are of the different types, it is necessary to integrate them in other forms for the mutual

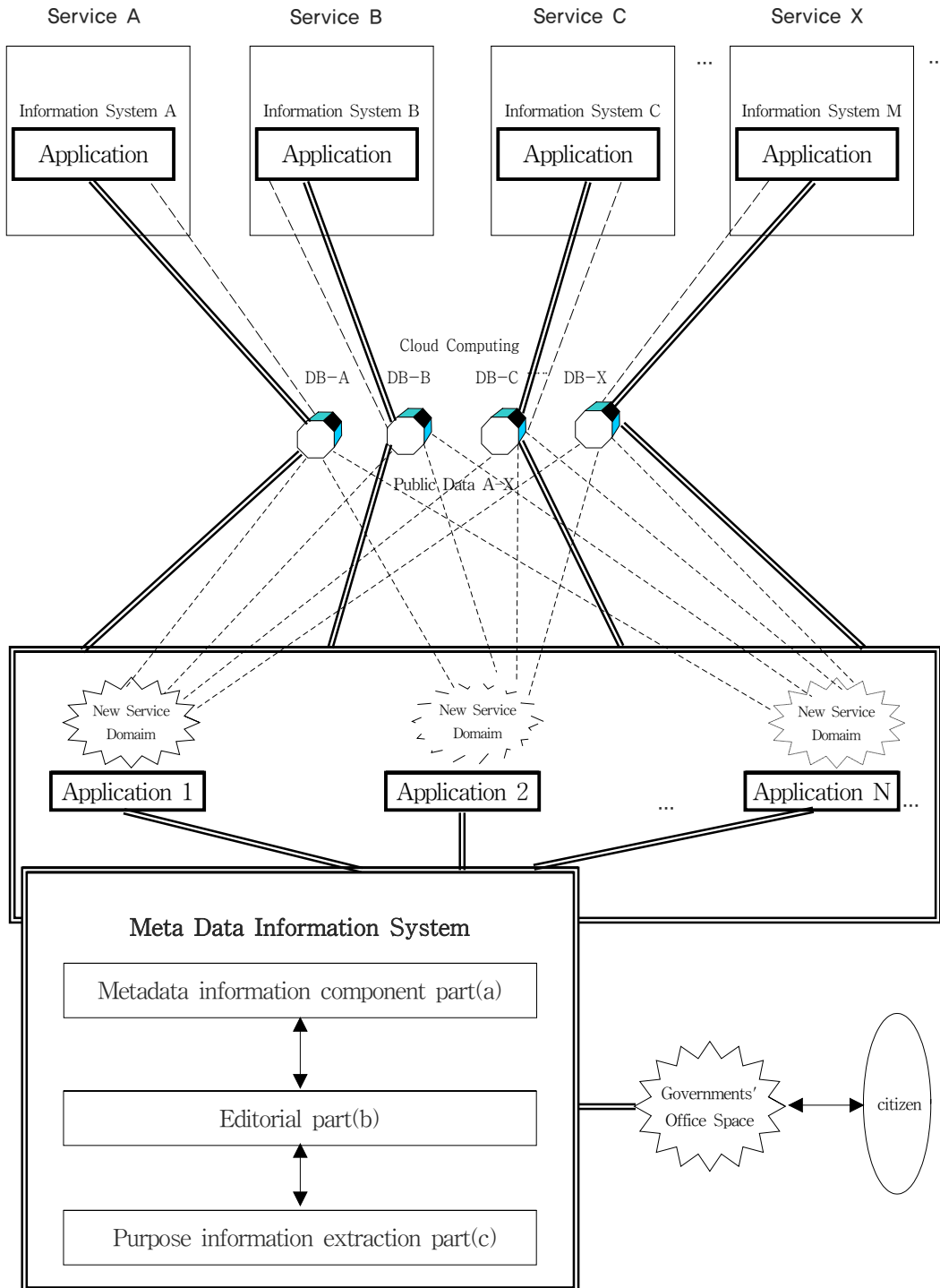
information and data-driven interlocking. Applications such as the ones using service domain application on information system existing at each of the government ministries and related organizations, there could be a huge drawback in terms of the complexity about them, because a connection should be maintained separately through mutual interlocking for each of different information systems for the integration of information systems. In fact, this increasing complexity, besides disadvantages and burden of adverse effects derived from the connection management among information systems, could bring about a lot of time consuming and workload increases in case it is applied as is. Also, this problem is aggravated upon a change in the configuration of information systems and its applications. After all, this results generate a problem such as increase of the complexity and burden of such management with regard to the development and maintenance of information systems(See [Fig. 3]).



[Fig. 3] Discussion Framework

3. Implementation plan of customized public services and the proposed system

As discussed above, there is a crucial need to achieve the linkage of data and the exchange of information



[Fig. 4] Meta Data Information System

among heterogeneous(or different)services. This is to improve resident satisfaction by providing customized public services in front-office level based on the integration of back-office level through system linkage among the government ministries and related organizations, with the minimal changes to the currently existing information systems, while maintaining information systems that provide each service basically. Especially for this, It is necessary to implement the metadata information system that performs integration of information system among different services that can be efficiently shared in units of application and data in another application(See [Fig. 4]). The proposed system (Metadata Information System) in this study is composed as follows. Metadata information component part(a) has the metadata information mapped into the system where the connection is maintained -focused on the public data of cloud computing system- in the data unit to the information of information system A-M in the government ministries and related organizations for providing a plurality of different services. Editorial part (b) is functioning for the editorial purpose, such as identifying the information needed to extract the appropriated information for the requested service by using the metadata information that is mapped by the metadata information component part(a) describing what the desired information service is. The system is also composed of 'Purpose information extraction part (c)' to generate the desired information because it is necessary to extract and process to obtain the corresponding meta-information from information system using at each of the government ministries and related organizations serving a plurality of different services, using the extracted information identified by the 'Editorial part (b)'. As shown, algorithm complexity(=====, double lines in the Fig.4, Information System M + Application N, namely M + N of the method) applying the proposed metadata information system to this study is simpler than the

one not applying algorithm complexity(-----, dotted lines in the Fig.4, Information System M × Application N, namely M × N of the method). A more detailed discussion about the implemented system is proceeded in the following.

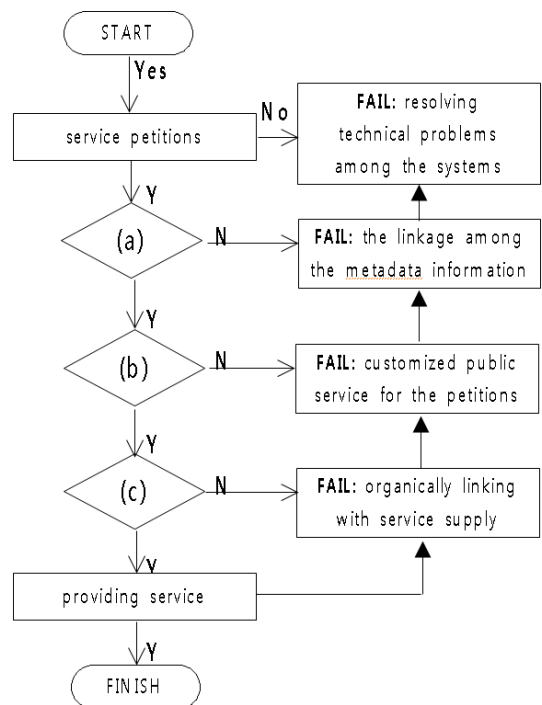
First, Metadata information component part(a) in the implemented system, for example, links the public data (public data A-X) of services(Service A and Service B, Service X etc.) on information systems based on the heterogeneous(or different) services of the government ministries and related organizations. And it is mapping the information in the database (DB-A, DB-B, DB-C, ..., DB-X, ...) as the metadata information. Next Editorial part (b) sets the extracted information to build the desired information on the basis of the mapped metadata information by metadata information component part(a). Then purpose information extraction part (c) extracts the metadata information of the information system related to the various services by using the extracted information constructed in editorial part (b) and produces the desired information after processing in conjunction to the specified condition. Thereafter, the desired information generated based on the above processes is provided in the system by the application through a consistent(or single) interface written in a standard format. The metadata information component part(a) maintains and manages, creates a connection as link in the unit of data in order to configure the metadata information containing mutual different service logic of the government ministries and related organizations. In other words, this method is different from the one to be managed by using the current application source code for a data connection, or text-based mapping table in a sense that this makes it possible to respond flexibly to changes in heterogeneous services and service logics by maintaining the connection of the data units, through the structural and manageable metadata information as visualized. Consequently, the metadata information component part(a) is to be constructed as

the independent link of one another for each application in terms of system integration, so it is made possible to easily correspond to the change of management and recycling. Further, the desired information requested in the process of the system integration based on the metadata information component part(a) can be edited by editorial part (b) identifying the information needed to extract the required information to perform the desired services by using the metadata information that is mapped by the metadata information component part(a). All in all, this method is easy to maintain and modify the source code of the application in the system that occurs during system integration in reality, because of separating the process of representing from the procedure of processing the desired information. Thus, editorial part (b) is configured to ensure ease of use in case of management change and to prevent errors in the development by using the metadata information generated in the metadata information component part(a), rather than controlling the recording unit of each database directly. Also, this method can prevent problems that may occur down the road within the estimated time of the project at the development stage, because it is made possible to calibrate the desired information through the metadata information and describe the desired information directly through the editorial part (b).

After all, the metadata information component part(a) that maps to the metadata information and editorial part (b) for editorial purpose of identifying the information needed to extract information to perform services by using the metadata information mapped by the metadata information component part(a) in terms of the desired information for services, as described above, are put together to verify the substance and increase the possibility of data integration in the most basic unit in terms of substantial system integration under the close relatedness with one another.

Next, purpose information extraction part (c) to generate the desired information necessary to extract

and process to extract the corresponding meta-information from information system used at each of the government ministries and related organizations serving a plurality of different services carries out independently functions such as processing and extracting items out of the desired information from editorial part (b) and the metadata information sourced from the metadata information component part (a). Therefore, the purpose information extraction part (c) performs the function of extracting or processing the editing information for the desired information created by editorial part (b) according to the requested service. After all, purpose information extraction part (c) provides a consistent interface in the application by processing the metadata information according to the standard format and by generating, managing the desired information in accordance with the standard format(see [Fig. 5]).



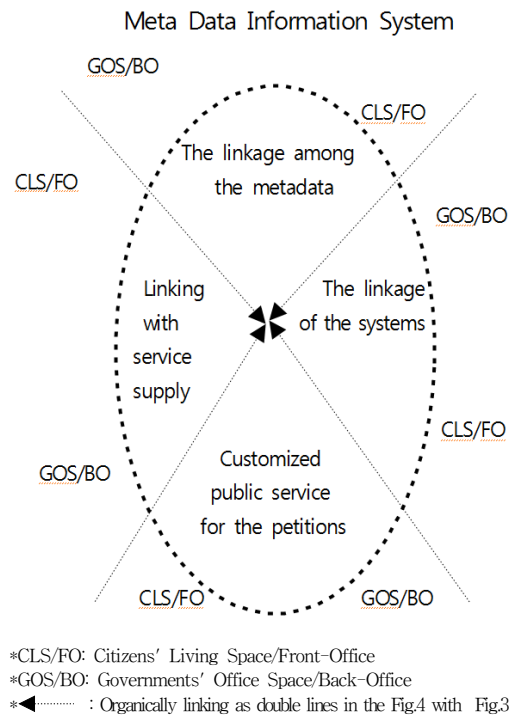
[Fig. 5] Flow Chart with Algorithm for the Proposed System

4. Discussion: verification and analysis of the proposed system

The proposed system in this study constitutes the $M : N$ structure by placing the N pieces of application (like Application 1- N) to M pieces of information system(like Information System A- M) in the mutual heterogeneous(or different) services(like Service A and Service B, Service X etc.) of the government ministries and related organizations. Therefore, the complexity can be represented in $M + N$, and the system can be implemented in a simple configuration because the application and the database corresponding to the requested services are directly connected with metadata information system(Meta Data Information System as a double line in [Fig. 4]). Meanwhile, unlike this proposed system, -as shown by the dotted line in [Fig.4]- the currently existing system configuration has shown weak points in providing customized services for the residents and disadvantages of implementation in the $M \times N$ type in terms of complexity of the system because the N pieces of application developed from each of new service domains maintains individual connection to one another, with the M pieces of different databases(see [Fig. 4]).

Eventually, the metadata information system of $M + N$ method proposed in this study, because its complexity is simpler than $M \times N$, there is utility of unification in the management of database connection. Further, the metadata information system of $M + N$ method reduces the workload in the management, modifications and maintenance for the application and the database, the time consumed in the system can be substantially saved, ultimately, it can lead to increase of the possibilities to provide customized services for the residents at the integrated counter or window(as front-office level). Therefore, by implementing the metadata information system in this study, in other words, the application construction for the system integration arising from the different databases for the

different types of services as well as the same kind of services, it can be made possible to respond actively by providing customized service upon request for the various complaints in the petition window(as front-office level), the number of which is expected to be on the remarkable rise. Also, it can be made possible to enhance a maintenance convenience, flexibility to the change of management in units of the data required by the system integration, when the integration among the systems equipped with a mutual relationship is put in place by performing extraction and processing functions divided into independent stages, with the edited information for the desired purposes based on the metadata information and the configuration of metadata information(see [Fig. 6]).



[Fig. 6] Linking Resident's Demand Chain and Government's Supply Chain with Meta Data Information System

5. Conclusion

A prerequisite to achieve the ultimately customized service for residents is to make the integration of the information system among heterogeneous services in public institutions at the back-office level to accommodate the service request and various complaints in the petition window of the front offices. In addition, in order to perform the customized services at the back office level for the petition as requested from the front office, initially, it is necessary to cooperate and make the link among the back-office systems, public data between the government ministries and related organizations should be cross-linked accordingly. However, the current problem is that the administration information systems of the government ministries and related organizations separated as individual information systems can not provide customized service for the residents through a mutual organic connection in integrated petition window. In particular, there is a considerable gap between the status quo and the method of implementing the public data under cloud computing system on the e-government system as the platform highlighted as the futuristic e-government system recently.

Having said that, this study presented an integrated public administration information systems structure where public data can be interlinked at the back office level, reflecting such awareness. To be specific, this study suggested the metadata information system that can expect mutual integration of information systems among heterogeneous services shared efficiently in units of application and data with a separate application that can provide a single service for residents with integrated level for petition in the back office based on the public data in possession of each of government ministries and related organizations. In other words, it is an important task to connect mutual link among the public data, initially in the back office, to provide

customized public service for residents at the integrated, unified level to respond to the various services requested by residents in the front office located in the petition window.

In this regard, Metadata information system of M + N method proposed in this study have three major advantages. First, the proposed system can implement integration process to serve residents through the minimum change at each of administrative information systems providing heterogeneous(or different) services in the government ministries and related organizations by presenting the system model for the integration of administrative information systems in the heterogeneous services as well as the same kind of service. Secondly, the proposed system can save the time and cost by presenting the efficient system structure to increase the flexibility of public service in change and modify the new service request. Thirdly, it is reasonably foreseeable that the proposed system can increase of residents' satisfaction level by discovering a new service as a consequence of enabling information system integration in the government ministries and related organizations.

After all, if this proposed system is implemented, the achievement of customized public service can be advanced one step forward in processing the petitions of the residents by organically connected link between 'Demand Chain' and 'Supply Chain' in the integrated window. In other words, it could be made possible through the unification of both the 'Supply Chain' performed in the office space of the officials at the back-office level and the 'Demand Chain' performed in the living space of the residents at the front-office level.

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