Generation technique of work plan in licensing application procedure based on administrative procedure ontology: The case of Japan

HIROYUKI KAWAGUCHI and SEIICHI KOMIYA
Graduate School of Engineering
Shibaura Institute of Technology
3-7-5 Toyosu, Koto-ku, Tokyo 135-8548
JAPAN

Abstract: - Authors classified licensing application procedures in Japan as factors that comprise procedures including application documents, attachments and seal impression on documents, and developed the administrative procedure ontology that defines the reference relationship among each factor at the level of items described or listed in documents. In addition, a method to derive acceptance or rejection of item transcription in application procedures as well as work steps through inference was reviewed by utilizing the administrative procedure ontology. Consequently, if specific items in attachments are in the reference relationship with other relevant application documents, it was found to be possible to make an inference that item transcription is possible through the mediation of such attachments, by using the reference relationship defined by this administrative procedure ontology. Reduction of wait time in the application work was made possible by determining the work priority based on the referenced number among instances.

Key-Words: - Administrative Procedure Ontology, Online Application, Application Support System, Expert System, e-Government

1 Introduction

The "IT New Reform Strategy" [16], Japan's approach toward a new e-municipality which was resolved on January 19, 2006, targets utilization of online application/submission to the government as well as to local authorities to be 50% or higher by 2010. It is described that as a measure to realize the target, the "government and local authorities promote data standardization of information systems. In order to realize lump sum application of various administrative procedures at a window at the time of address change or relocation, as well as joint development of public service such as disaster prevention among local authorities, the foundation to coordinate information systems will be developed and standardized by 2007, and at the same time system reform in local authorities will be promoted based on this standard," and data standardization in electronic administrative procedures is considered to be an important task.

Attempts toward lump sum application of administrative procedures represented by address changes and relocation have been considered in the past under the leadership of the government. Although the demonstration experiment of multi-application (lump sum application) system for the birth of newborns was conducted by Hachinohe City, Aomori Prefecture in 2004 jointly with some system vendors and its convenience and demand was verified, it has not reached full-scale operation as of August 2007 [3]. As shown in this experiment, lump sum application is considered to be a very enthusiastic approach to indicate usefulness of electronic administrative procedures, while lack of general versatility and scalability in lump sum application is considered to be one of the causes that disturb full-scale operation.

Procedures in relation to the birth of newborns are commonly taken at multiple administrative windows such as census registration and resident registration, in addition to child support programs, public health centers, etc. The lump sum application proposed in the experiment has the structure that data on application items required by multiple places of application are entered at once, and only the item data necessary for each application procedure are transcribed onto individual application documents, which are delivered to each administrative window. However, application in this experiment restricts a series of procedures that begin from birth to be made at once, and it is not possible to apply to cases where

only a birth report or a claim to qualify for child benefits is submitted. Also in accordance with the reported material [4], there are approximately 80 items in all to be described in application documents (eight kinds) used for application, and these item data were manually standardized at the time of developing the experiment system. Therefore, if new application procedures are added, combination of places of application changes, or application items change in the future, the standardization work of item data has to be conducted again.

While only the data items described in application documents are standardized in this experiment, attachments (e.g., copy of resident register and certificate of registered matters) may be required in addition to application documents prepared in the case of other application procedures. Furthermore, not only a single application form is used, but also several application forms are combined depending on circumstances of an applicant in many application procedures. While the relationship between application documents and attachments will be described later, items described in attachments are also the subject of standardization in reality and handling of attachments needs to be reviewed at the same time. Furthermore, if application procedures are taken by combining various application documents and attachments and there is some kind of relationship among item data described or listed in each document, most single applications are considered to have a factor of lump sum application.

2 Background in Japan

Since administrative procedures in Japan are the theme of this report, the background relating to the customs relating to contracts as well as to administrative procedures in Japan will be explained.

2.1 Regulatory administrative activities

Although Japan is a capitalistic state, the administration imposes various regulations toward domestic economic activities and these regulatory activities are considered to be the center of administrative activities. However, laws governing regulatory activities do not always stipulate regulations in detail. This is because determining details in regulations always creates people who contrive to escape from the lattice of regulatory activities. Therefore, administrative bodies in Japan also have a nature as institutions to execute the authority called discretion, by leaving room for discretion to regulatory administrative activities.

In the normal state, many regulatory administrative activities form multiple licensing authorities or the linkage of administrative disposition behaviors in each field. Furthermore, the activities are governed by an administrative body comprised by a single person under the Cabinet; therefore administrative procedures occur by each administrative body with little coordination among procedures or documents in each administrative body. This form is called the "vertical administrative structure" in Japan. In addition, an operation called the administrative guidance is in the core of regulatory administrative activities in Japan. The administrative guidance is a demonstration of desire by administrative bodies, irrelevant to legal basis, i.e., voluntary compliance by applicants. For example, matters described in application documents submitted by an applicant are checked prior to receiving the application (with consent from the applicant), and change or correction of described matters is recommended in accordance with the intention of the administrative body. Thus, administrative bodies allow the possibility of flexible (or arbitrary) operation by giving their influence on application matters within the scope of their discretion.

2.2 Culture of seal impression

The culture of seal impression is one of the Japanese customs relating to contracts. It is a well-established custom in Japan to affix a seal in place of signature in order to secure declaration of intention by parties. The legal effect of seal impression is the same as signature; however provisions that require seal impression rather than signature still remain in many existing laws. As a method to certify the authenticity of seal impression, it is mandatory to register seal impression with a local authority in advance as well as to attach a seal certificate that certifies the seal is truly owned by a party in the case that declaration of intent by seal impression gives material legal influence. Furthermore, the certificates are issued by a local authority. In this sense, this system relies on administrative bodies, with a fundamentally different nature from witness by an individual.

2.3 Reliance on public certificates

Since coordination of documents among each administrative body is little due to the vertical administrative structure, it is necessary to rely on

public certificates individually issued by each administrative body in order to clarify the factual relationship surrounding an applicant. In addition to seal certificates described in the above, systems exist including certificates of corporate registration matters to demonstrate the existence of a corporation itself as well as copies of a resident register to demonstrate existence of an individual, and there is no relationship between each system. The basic resident register network finally began operation in 2002, enabling acquisition of information on resident register on the network at each administrative body; however opposite opinions by some citizens and local authorities persistently remain. Furthermore, cases where the basic resident register network is utilized are rare in administrative procedures.

2.4 Flow of application procedures to administrative bodies and factors that comprise the application behavior

Application/submission procedures to administrative bodies in Japan are stipulated in the Administrative Procedures Act. In the Act, application and submission are distinguished as a separate behavior; however since both application and submission are accepted by an administrative body as long as they satisfy formality requirements of the documents (regardless of the content), application and submission are equivalent in terms of administrative procedures if the term is limited to the point of acceptance. Therefore, the "application and submission" in administrative procedures until the point of acceptance are called the "application" hereafter.

Essentially, factors comprising the application behavior are considered to include (1) clear intention of application by an applicant, (2) an applicant and the factual relationship surrounding the applicant and (3) facts resulting in application and plan after application. In regards to (1), a legal effect is acquired by a party when signature/seal (or signature) is affixed on application documents. In regards to (2) and (3), a party makes a declaration with matters described in application documents. However, since the factual relationship cannot be authenticated by party's declaration only, an administrative body requires attachments including public certificates in order to prove the factual relationship, and it is a formality requirement to confirm whether or not there is a discrepancy in matters described in application documents by comparing them with attachments.

3 Previous studies and the purpose of this study

By focusing on the relationship between application documents and attachments in administrative procedures, the authors developed the "online application support software" that portrays application procedures as a project and behaviors such as preparation of application documents, preparation of attachments and seal impression on documents as multiple tasks included in the project, and actually prepared the application of general cargo and motor transport business report governed by the Ministry of Land, Infrastructure and Transport by using this software [8]. We also focused on the point that the "multipurpose system" operated by the government or local authorities does not provide sufficient information on application required by an applicant, and experimentally analyzed characteristics of actions by an applicant by observing his/her actions in a situation where he/she takes application procedures with only the information equivalent to that provided by the "multipurpose system" [9]. As a result of analysis, it was found that actions between those who succeed and fail in the experiment are different, such as time necessary to understand the requirements as well as work steps in application procedures. Based on the result, the application support expert system was designed to provide an applicant with work steps for smooth application procedures in a proper order and timing and installed on the "online application support software," by modeling application procedures in accordance with data items necessary for application. In addition, we quantitatively evaluated the change of efficiency in application procedures by using the application support expert system, to verify the usefulness. As a result of the verification, it was found that the structure to allow prior understanding of overall flow of application procedures by indicating work steps to enable work along procedures would work effectively [10].

Since modeling of application procedures for this application support expert system was made by manual work by multiple people, granularity of factors within the model was not equalized, leading to difference in the quality of models for each administrative procedure. Therefore, an issue remained in regards to a method to become a basis for modeling as well as to a method of modeling based on laws, application documents and attachments. The purpose of this report is to review a method to derive

work steps for application procedures by inference to solve this issue, by focusing on application documents comprising application procedures, especially on the reference relationship between items to be described in documents and items described in attachments, and by developing and utilizing the lexicalized administrative procedure ontology.

4 Development of ontology

Adding metadata to documents published by the administration is often raised as a case of ontology (or metadata) utilization by an administrative body. While it is still limited to experimental operation by some administrative bodies in Japan, horizontal document management among the government and ministries has been realized by adding metadata to documents published by the administration, such as MIReG [18] in EU, e-GMS [5] in England, IPSMS [11] in Ireland, AGLS [1] in Australia and GILS [6] in the U.S. In all of these metadata, the Dublin Core Metadata Element Set (hereafter "DCMES") has been expanded to define unique elements. These expanded elements are able to define the reference relationship at the level of documents, and it has already been made possible to search and diversify coordination of administrative documents held by administrative bodies.

In EU, a project called SemanticGov has been established since 2005 as part of i2010 (the 2010 Plan). The purpose of SemanticGov is to try to solve long-term and challenging issues such as a method to realize workflow-based complicated services involving multiple administrative bodies, by solving mutual compatibility issues among administrative bodies in multiple countries as well as by making it easy to find necessary services for users of administrative services [21]. In this case, standardization at the level of items in multiple application procedures is also one of the issues, and mapping system among items called DataMediater has been proposed as a method of solution. This DataMediater covers many administrative procedures and adopts a method to map each item; therefore ontology as its product inevitably becomes heavy-weight ontology.

On the other hand, the administrative procedure ontology developed in this study is light-weight ontology, where application documents, attachments, seal impression on documents, etc. are collected and classified for the target application procedure as factors comprising application procedures, and the reference relationship among each factor described or listed in documents is defined at the level of items. Instead of adding metadata to existing documents, instances with metadata are generated from this administrative procedure ontology and association is promoted upon preparing application documents defined by each instance. Thus, it has a role as knowledge database in the expert system.

The steps to develop the administrative procedure ontology are shown in the following. We decided to use Protégé-OWL as a development tool and adopt OWL DL as an ontology description language.

4.1 Target domain

The following four different application procedures were established as respective target domains in order to develop the administrative procedure ontology. Governing laws stipulated were also investigated.

- ✓ Registration of architect's office
- ✓ Submission to commence detective business
- ✓ Submission of specified worker dispatch business
- ✓ Registration of money lending business

4.2 Vocabulary extraction

The application behavior in administrative procedures in Japan is by writing, and examination by administrative bodies is also formality examination in writing; therefore application documents and attachments as tangible objects were extracted as vocabularies from respective governing laws. Furthermore, items to be described in extracted application documents and items described in attachments were individually extracted. Extraction was manually made, without using tools relating to natural language processing, statistical processing, etc. Not only in this study but also in development and maintenance of the administrative procedure ontology, since (1) the administrative procedure ontology is a light-weight ontology developed for each application procedure, (2) it is possible to expand target application procedures in stages, (3) the overseeing administrative government agency is determined for any application procedure and there is a person in charge of procedures, and (4) the work equivalent to law interpretation necessary to develop the administrative procedure ontology has always been taken care of by administrative windows in the past, there is less advantage of automation by tools; therefore we intentionally chose the manual work.

4.3 Class definition and development of is-a relationship

Vocabularies extracted in 4.2 were classified and defined as classes. The concept of upper or lower level classes defined was further defined as the is-a relationship. In regards to items described in documents such as the location of headquarters, locations of sales offices and individual addresses for example, the address class was established as the upper level concept and defined.

4.4 Has-a relationship, reference relationship and signature relationship by property definition

There are items to be described or listed in application documents and attachments and their relationship was defined as the has-a relationship. This is enabled to describe what kind of item description is required in application documents. In addition, the reference relationship among documents was defined in accordance with items in documents. Although the reference relationship among documents can be described with metadata definition in each country with expanded DCMES, it is not possible to describe what item in a document contributes to the reference relationship. Therefore, sub-property of the reference relationship was defined to determine «what item contributes to the References relationship.» Furthermore, the relationship among signet or representative's seal and documents where a seal is affixed was defined as the Signature relationship.

Fig.1 illustrates the relationship of a copy of resident register for one individual applicant and his/her resume. Name, address, date of birth, head of household, relationship, permanent address, etc. are described in the copy of resident register, and name, address, date of birth and personal history are described in the resume, which is defined with the has-a relationship. Furthermore, in regards to name, address and date of birth, the References relationship is defined individually from the copy of resident register on the resume. Since the resume has a seal impression for this applicant, the Signature relationship with the applicant is also defined.

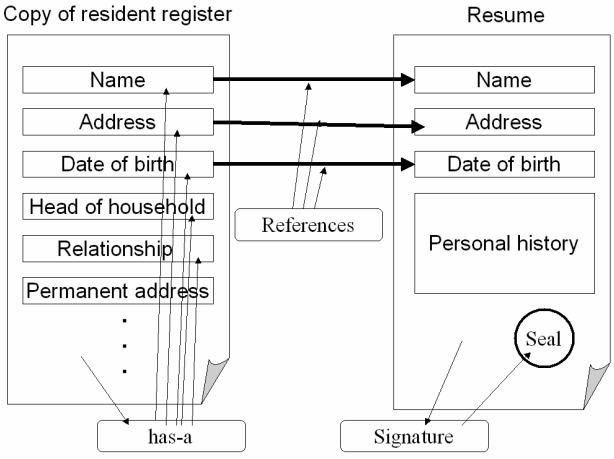

Fig.1: Has-a relationship, Reference relationship, and Signature relationship

4.5 Relationship between document binding and application documents

Since the application document binding is comprised of a combination of application documents and attachments, the relationship between the application document binding and target documents was defined as the part-of relationship. If the same application behavior has different conditions precedent (e.g., an applicant is an individual or a corporation), documents contained in the application form binding may be different; therefore only the existence of part-of relationship was defined for class definition and definition of cardinality restrictions was kept to a minimum.

Furthermore, in order to meet the diversified combination of lump sum application, four of these application procedures were not developed as single administrative procedure ontology, but an individual administrative ontology was developed for each application procedure. Based on the above, independent attachment ontology was developed in regards to a class necessary to possibly be used as attachments for each application procedure such as a copy of resident register and certificate of registration history, and imported to individual administrative procedure ontology as necessary. This makes it possible to reuse the attachment ontology in other administrative procedure ontology to be developed in the future, and improvement of generality can be expected.

5 Issue of automatic transcription

In terms of labor savings for an applicant in application procedures, the structure to automatically transcribe items entered once to other items with the same concept is very convenient, as indicated in the demonstration experiment by Hachiohe City of Aomori Prefecture. However, the risk of item

transcription without noticed by an applicant cannot be ignored. In the administrative procedure ontology developed in this study, therefore, the reference relationship was defined as "those noted to refer items" and it was considered that the same item name did not always have the same value. Lump sum application is still a separate legal application, and each administrative body independently holds the actual discretion by the administrative guidance; therefore perfect matching of items cannot be expected. Furthermore, in the case that unknown application procedures are combined for lump sum application in the future, items with the same name may not always point to the same concept.

An applicant should declare the intention of application and individually fill in documents upon understanding the content of application, and the structure to display candidates of transcription items based on the reference relationship of items and to allow an applicant to make a choice with his/her intention is effective, rather than automatic transcription.

Automatic transcription of item data based on the reference relationship between attachments and application documents can be considered as follows:

Electronic public certification is not prevalent in Japan as of August 2007, and electronic documents of attachments other than public certificates (e.g., copies of articles of incorporation, etc.) are few. Supposing that electronic documents exist, a common format of item data has not been established. Therefore, it is not possible to automatically transcribe items from attachments.

However, the reference relationship between items in attachments and application documents can be individually defined in the administrative procedure ontology; therefore if a specific item in an attachment (e.g., a name in a copy of resident register) is in the reference relationship with another application document, it is possible to infer that the specific item can be transcribed through the mediation of attachments (Fig.2).

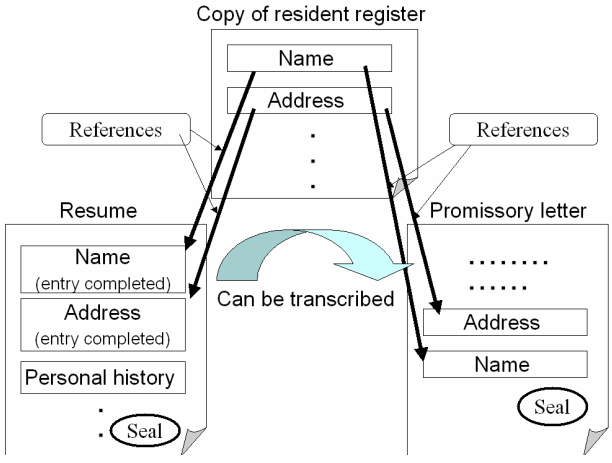

Fig.2: Item transcription through the mediation of attachments

6 Method to automatically propose work steps

The method to derive work steps is reviewed, using the case where submission to commence detective business and submission of specified worker dispatch businesses are made at the same time by utilizing the administrative procedure ontology developed.

6.1 Preparation of application procedure list

In the case that submissions to commence detective business and of specified worker dispatch business are made at the same time, initial conditions are given including whether an applicant is an individual or a corporation (initial condition 1) and the number of directors in the case of a corporation (initial condition 2). In the case that an applicant is a corporation comprised of three directors, application documents and attachments to be prepared are inferred in accordance with the application document binding class to commence detective business defined by the initial condition 1 and the administrative procedure ontology in advance as well as with the submission document binding class for specified worker dispatch business. Furthermore, the number of document copies inferred based on the initial condition 2 (copies of resident register in the number of directors as well as resumes are necessary) is finalized to generate instances. The list of these instances will become the application procedure list.

6.2 Proposal of work priority based on the reference relationship

Each instance in the application procedure list maintains the reference relationship defined by the administrative procedure ontology in advance. In order to reduce the wait time in work upon application procedures, the work priority of referenced instance should be higher than the reference instance in terms of the reference relationship among instances. Therefore, the reference relationship among instances in the application procedure list is illustrated in Fig.3 using a digraph.

The work priority among instances can be obtained based on this digraph using the method indicated by Page, etc. [20]. First of all, weight is given to each vertex to make the total 1. Secondly, weight for each vertex is distributed to directed edges with the vertex as a starting point and weight for each edge is determined. Then, weight for each vertex is re-defined as a total value of weight for edges with the vertex as an ending point. The convergence value when these are repeated until the weight for each vertex converges will be the weight in order to obtain the work priority. When W is the eigenvector indicating weight for each vertex, the matrix D is a square matrix of the proportion of the weight for each directed edge to the weight for the starting point, and D^t is the transposed matrix of D, the following relationship can be obtained (c is a constant):

$$W = cD^tW \qquad (1)$$

c is equivalent to the inverse number of a corresponding characteristic value; however since the characteristic value is 1, it is considered as a problem of characteristic value as follows:

$$W = D^tW \qquad (2)$$

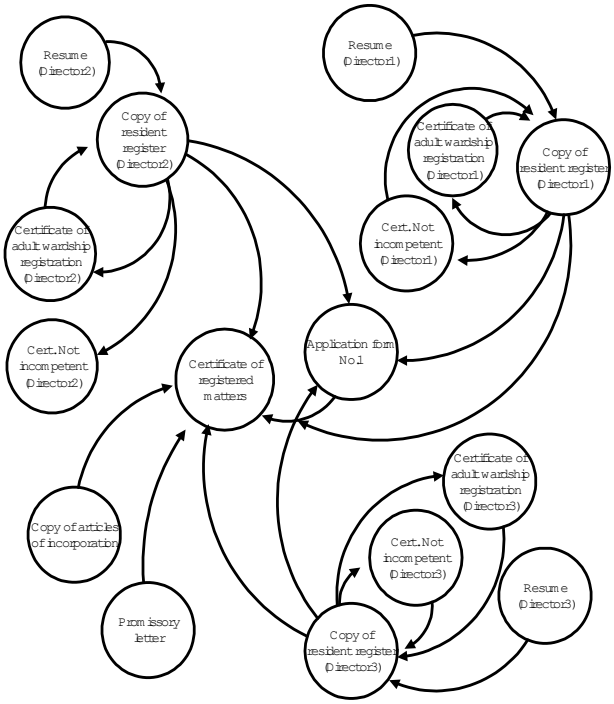

Fig.3: (Partial) Digraph indicating the reference relationship

As a result of obtaining W, it is possible to propose work priority in the application procedure list by arranging instances in the order of larger weight given to each instance. When the number of reference relationships among each instance is accumulated based on the digraph in Fig.3 and the work priority is obtained with the eigenvector W of weight using GNU Octave, it is found that obtaining a certificate of registered matters is the work that should be approached first of all to the extent of Fig.3, as shown in Table 1.

Table 1: Work priority based on reference relationships

Instance	Weight W
Certificate of registered matters	0.39758
Application form No.1	0.34906
Copy of resident register (for three directors)	0.27488
Certificate of adult wardship registration (for three directors)	0.23173
Certificate of not- incompetent (for three directors)	0.21826
Copy of articles of incorporation	0.20117
Promissory letter	0.20117
Resume (for three directors)	0.20117

6.3 Restriction to work in the behavior of affixing a seal

The behavior of affixing a seal is subject to external constraint (time constraint controlled by a person who has the authority to affix a seal) in the execution of application work; therefore in the case that the same seal is affixed on multiple documents, it is possible to reduce the time required to exchange documents to affix a seal by taking the behavior of affixing a seal at the same timing. In the definition of signature relationship in the administrative procedure ontology, the constraint conditions in the act of affixing a seal are not established. Therefore, in order to avoid the issue that «a seal is affixed on blank application documents in advance,» it is necessary to impose a restriction to conduct the work of signature relationship after proposing work priority with the reference relationship.

Supposing that multiple works are not performed in parallel when the application work is conducted by one person, the application work can be indicated by Gantt chart as shown in Fig.4, based on the work priority. The timing of possible seal impression is upon completion of documents that require seal

impression by a person responsible for affixing a seal. Therefore, a structure was developed to notify that all documents are ready for seal impression, upon completion of preparation of all documents that require seal impression by one person responsible for affixing a seal, by giving a property value that indicates whether or not preparation is complete to each instance generated and arranged up to 6.2 and by monitoring this property value.

At this time, if a "person responsible for affixing a seal is an individual and a representative of a corporation," it is possible to take the behavior of seal impression at once since the same person affixes seals even if different seals are used. This can be realized by giving a person responsible for affixing a seal the role as an individual or a representative of a corporation, to notify the readiness of seal impression to the person responsible for the role.

7 Conclusion

In this study, a method to automatically propose the work steps in application procedures to an applicant is reviewed, by developing and utilizing the administrative procedure ontology.

Professionals of legal business who specialize application procedures (e.g., administrative scriveners and judicial scriveners) have been accumulating know-how in regards to application procedures by acquiring the knowledge on application procedures from relevant laws and by preparing application documents through conference with administrative

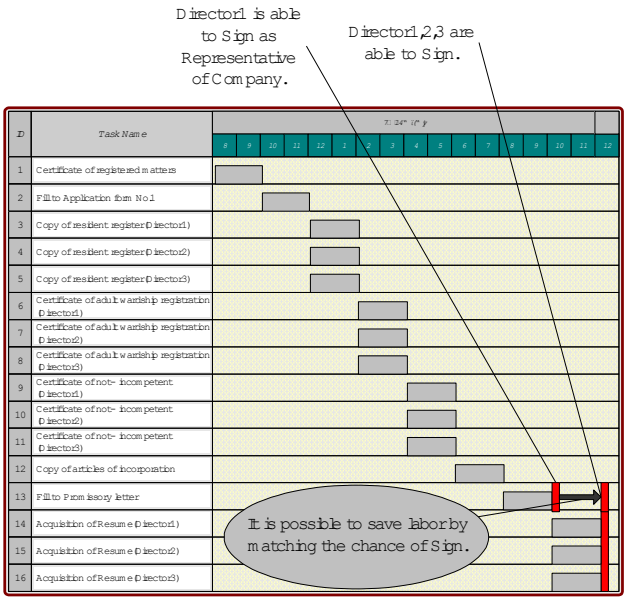

Fig.4: Timing of affixing a seal by Gantt chart

bodies. Development of administrative procedure ontology and automatic proposal of work steps is nothing else but to systematize and publicize this know-how. The review in this study is considered to be meaningful in the sense that by reducing the burden on general citizens to learn professional knowledge in regards to application procedures, it becomes easier for them to take application procedures on their own.

Expansion of a method to navigate administrative procedures themselves is also considered to be effective as a measure to improve the low utilization rate of electronic application system at the government or local authorities. Data standardization in electronic administrative procedures is an important task as described, while it is impossible to avoid combination explosion of items described in application documents among administrative bodies as well as among administrative procedures when data standardization is considered for administrative procedures governed by each administrative body. Definition of reference relationships through the mediation of attachments is considered to make it possible to flexibly respond to the data standardization work targeted by the government.

We expect that review in this study will contribute to improvement of convenience in electronic administrative procedures.

References:

[1] AGLS, AGLS Metadata Standard, *http://www.naa.gov.au/recordkeeping/gov_online/agls/summary.html*, Accessed 7 Aug 2007.

[2] AIDOS(INSTAC/Committee for Advanced Integrated Documents Standardization), *Introduction to technique of ontology –Web ontology and OWL- (in Japanese)*, TDU Press, Tokyo, 2005.

[3] Hachinohe City, Aomori Prefecture, The promotion plan of e-Hachinohe, *http://ns.city.hachinohe.aomori.jp/plan/e_hachi/*, Accessed 7 Aug 2007.

[4] Hachinohe City, Aomori Prefecture, One stop multi application system with lifetime events, *http://www.e-ap.gr.jp/topics/040806/hachinohe.pdf*, Publishing House, Accessed 7 Aug 2007.

[5] e-GMS, e-Government Metadata Standard, *http://www.esd.org.uk/standards/egms/*, Accessed 7 Aug 2007.

[6] GILS, Global Information Locator Service, *http://www.gils.net/browse.html*, Accessed 7 Aug 2007.

[7] Ichii, M., Yokomori, R., Matsushita, M., Inoue, K., An Analysis Method of Software Class Design using Component Rank, *Technical report of IEICE. SS*, Vol.105, No.229, pp. 25-30, 2005.

[8] Kawaguchi, H., Komiya, S., Research on revitalization plan of e-Government by using "Online application support software", *Technical report of IEICE. KBSE*, Vol.106, No.197, pp. 5-10, 2006.

[9] Kawaguchi, H., The Experiment of Behavioral Trait Analysis in Administrative Procedures, *Conference of JSIS & JASI 2007*, Nagoya, Japan, 2007.

[10] Kawaguchi, H., Komiya, S., Development of the Multipurpose Expert System Based on Behavioral Trait Analysis in Administrative Procedures, *Asia-Pacific Industrial Engineering and Management Systems*, Kaohsiung, Taiwan, 2007.

[11] IPSMS, Irish Public Service Metadata Standard, *http://www.gov.ie/webstandards/metastandards/index.html*, Accessed 7 Aug 2007.

[12] Kanzaki, M., *Introduction to RDF/OWL for Semantic Web (in Japanese)*, Morikita publishing, Tokyo, 2005.

[13] Komura, N., et al., Systematic Description of Functional Knowledge Based on Functional Ontologies and Its Use for Supporting Design of Functional Structures(Special Issue “Management and Application of Design Knowledge”), *Journal of Japanese Society for Artificial Intelligence*, Vol.17, No.1□pp.73-84□2002.

[14] Kondo, K., et al., Semantics Driven Development of Software Systems Based on Business Ontologies, *Research Report of Japanese Society for Artificial Intelligence*, SIG-SWO-A402-01□ 2004.

[15] Kozaki, K., et al., *Introduction to Developing Ontology (in Japanese)*, OHM sya, Tokyo, 2006.

[16] Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society, New IT Reform Strategy, *http://www.kantei.go.jp/foreign/policy/it/ITstrategy2006.pdf*, Accessed 11 Jul 2007.

[17] Kurematsu, M., Yamaguchi. T., Legal Ontologies Codify Legal Knowledge (<Special Issue>Feature Articles on Developed Ontologies), *Journal of Japanese Society for Artificial Intelligence*, Vol.19□No.2□pp.144-150□2004.

[18] MIReG, Management Information Resources for eGovernment, *http://ec.europa.eu/idabc/en/document/2361/5927*, Accessed 7 Aug 2007.

[19] Mizoguchi, R., Engineering of Ontology *(in Japanese)*, OHM sya, Tokyo, 2007.

[20] Page, L., et al., The PageRank Citation Ranking: Bringing Order to the Web, *http://www-db.stanford.edu/~backrub/pageranksub.ps*, Accessed 2 Jul 2007.

[21] SemanticGov, Services for Public Administration, *http://www.semantic-gov.org/*, Accessed 8 Aug 2007.