The Citizen Advisory Model for E-Government Service

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━━━━━━━━━━━━━━━━━ Abstract ━━━━━━━━━━━━━━━━━

This paper proposes a design of a citizen advisory model under the consideration of the unique characteristics of the government, namely complex structure of goals, predominance by laws, knowledge driven organization, and the good governance objectives. The legal knowledge-based technology is explored with the aims to facilitate citizens in accessing e-government services in five phases: search, intake, decision-making, explanations, and objection and appeal phases. The design of the citizen advisory model consists of four components: specific service advice, customized form fill-in service, decision-making services, and a statement of reasons service. The prototype of the citizen advisory model is illustrated using the Thai Anti Dumping and Countervailing Act 1999 as a legal domain and e-government services example.

I. Introduction

The distinguished nature of the government is a prominent issue in which both researchers and practitioners need to ruminate prior to design of e-government services. Wimmer and Traumuller [1] warn that whereas the success in e-commerce induces the use of information technology in the realm of government, it would be shortsighted to copy information systems from the private sector without paying attention to the specific aspects of the public sector. As such, the unique features of the government cannot be neglected in the design of an effective e-government service.

Lenk et al. [2] outlined three specific areas in the administrative nature of the government that set it apart from the private sector. First, the government possesses an extraordinarily complex goal structure. The government's services cover a broad range of goals (e.g. from proper function of legislation and jurisdiction to preservation of nature, etc.), which may be ambiguous or contradict with each other.

Second, the role of laws restricts and guides the way government works. It is imperative that the government act and make decisions based on applicable laws and regulations. Legal documents written for laws and regulations are normally presented in a high volume, complex, language, and frequently amended [3]. Authorities and citizens are required to know these laws and to act accordingly. Nevertheless, the laws are flexible as they give rooms for authorities to interpret their meanings with discretion in order to maintain balance in society.

Third, knowledge is of significance to the government. In other words, the government is a knowledge-driven organization [4]. The legislation, regulations, policy and administrative process are examples of government knowledge. The lack of knowledge about processes, rights, and duties on the part of a citizen can often pose serious problems [2]. We consider the lack of knowledge on the part of citizens as an acute problem, as it reflects poor governance.

Good governance is an ambitious goal to achieve in the design of e-government services. The European Principles for Public Administration SIGMA PAPERS: No. 27 [5] set up the administrative law principles that adhere to the good governance objectives, namely reliability and predictability (legal certainty), openness and transparency, accountability, and efficiency and effectiveness. The administrative principles are not only an idea based on goodwill; they are embedded in institutions and administrative procedures at all levels including e-government services.

To achieve good governance under the government's restraints as mentioned

above is not a simple task. The design of e-government services must lessen potential difficulties caused to citizens; for example, how a citizen can match his or her needs to a myriad of government service's goals, how to provide legal knowledge to citizens in order to pursue the right course of actions based on existing law (i.e. fill-in forms, pay service fee, provide information, etc.), how to ensure that the decision-making of the e-government services follows the rule of laws.

Legal knowledge based systems seem to be a prime technology candidate to cope with these problems. However, prior studies have tended to focus on a legal knowledge based system that supports legal professionals level (i.e. judges, civil servants), not at a citizen level [6]. With this respect, this paper explores the implication of legal knowledge based systems to support citizens. The design of a citizen advisory model aims to:

- alleviate citizen's confusion in dealing with the complications and complex arrays of government's service goals,
- facilitate citizens in accessing e-government services, and
- promote good governance in e-government services.

It should be noted that the issue of vagueness of concepts, open texture, and the overall problem of legal interpretation as described by Leenes [7] is not in the scope of our study.

II. Legal Knowledge Based System Technology

Legal rule-based systems and the conceptual frame-based ontology for the laws proposed by Kralingen [8] are the technologies we explore in our study.

2.1 Legal rule-based systems

We choose the legal rule-based systems as a point of departure in the design of our citizen's advisory model. Zeleznikow [6] observes that the majority of commercially available legal decision systems model fields of law that are complex but not discretionary. For example, STATUTE expert by SoftLaw [9] is the legal expert systems aims at applying rule-based techniques in government agencies. The trend toward rule based system to encode large and complex legislation will continue to a substantial extent [9].

A rule-based expert system is a computer program that processes problem-specific information contained in the working memory with a set of rules contained in the knowledge base, using an inference engine to infer new information [10]. The

advantage of rule-based systems is its natural expression of IF⋯THEN type statements. The ease of capturing legal knowledge in a rule makes a rule-based approach an attractive choice for the design of the legal expert systems.

There are two inference techniques often used with the rule-based expert systems; forward chaining rule based and backward chaining rule based [10].

- *Forward-chaining* is an inference strategy that begins with a set of known facts, derives new facts using rules whose premises match the known facts, and continues this process until a goal stated is reached or until no further rules have premises that match the known or derived facts.
- *Backward-chaining* is an inference strategy that attempts to prove a hypothesis by gathering support information.

In order to capture legal knowledge from human expert, business rule principle is highly useful as its representation or statement can be applied directly to a rule based systems. The GUIDE business rules project report [11] defines business rules as "[A] statement that defines or constrains some aspect of the business⋯[which is] intended to assert business structure, or to control or influence the behavior of the business".

Business rules statements are intended to bridge the knowledge gap between users and developers by explicitly expressing the rules in plain language or in a format understandable to non-technical persons, enabling everyone to know the rules, access the rules, and optimize them when needed. Basically, there are five characteristics vital to the development of business rule statements: atomic, unambiguous, compact, consistent, and compatible [12]. The sample of business rule statement template can be studied from the works of Morgan [12], Ross [13] and von Halle [14].

2.2 The legal conceptual frame-based ontology

Since the nature of the government service is a multi-agent setting e.g. multi public agency involvement, it is necessary to employ forms of control knowledge and meta-knowledge. The structure of legal knowledge should describe the type of knowledge and the structure of rule so that it can reason with situations where service is provided [15]. Kralingen [8] proposes a conceptual frame-based ontology for the laws, which comprise the norm frame, the act frame and the concept frame (see table 1, 2, 3).

Table 1. Structure of a norm frame

	Element	Typification
1	Norm identifier	The norm identifier (used as a point of reference for the norm
2	Norm type	The norm type (norm of conduct or norm of competence)
3	Promulgation	The promulgation (the source of the norm)
4	Scope	The scope (the range of application of the norm)
5	Condition of application	The conditions of application (the circumstances under which a norm is applicable0
6	Subject	The norm subject
7	Legal modality	The legal modality
8	Act identifier	The act identifier (used as a reference to a separate act description)

Table 2. Structure of an act frame

	Aspect	Typification
1	Act identifier	The act identifier (used as a point of reference for the act)
2	Promulgation	The promulgation (the source of the description)
3	Scope	The scope (the range of application of the act description)
4	Agent	The agent (an individual, a set of individuals, an arrogate or a conglomerate)
5	Act type	The act type (both basic acts and specified elsewhere can be used)
6	Means	The modality of manner (the way in which the act has been performed)
7	Manner	The modality of manner (the way in which the act has been performed)
8	Temporal aspects	The temporal aspects (an absolute time specification)
9	Spatial aspects	The spatial aspect (a specification of the location where the act takes place)
10	Circumstances	The circumstance aspects (a description of the circumstances under which the act takes place)
11	Cause	The cause for the action (a specification of the reason(s) to perform an action)
12	Aim	The aim of an action (the goal visualized by the agent)
13	Intentionality	The intentionality of an action (the state of mind of the agent)
14	Final state	The final state (the results and consequence of an action)

Table 3. Structure of a concept frame

	Element	Typification
1	Concept	The concept to be described
2	Concept type	The concept type (definition, deeming provisions, factor or meta)
3	Priority	The weight assigned to a factor (only relevant when we deal with the concept type "factor")
4	Promulgation	The promulgation (the source of the concept description)
5	Scope	The scope (the range of application of the concept description)
6	Conditions	The conditions under which a concept is applicable
7	Instances	An enumeration of instances of the concept

III. The Citizen Advisory Model

The design of a citizen advisory model based on the level of service delivery has been proposed by Leenes [7]. Leenes breaks down the interaction between citizens and public administration into a chronologically five phases: search, intake, decision-making, explanation, and objection and appeal. Together with citizens' requirements and administrative laws principles, we summarized the requirements for each phase as shown in table 4.

The citizen advisory model aims to use legal knowledge based systems to support each phase of e-government services. The design of legal knowledge based systems comprise two components, namely rule-based repository and legal knowledge based ontology. Each component has different usefulness in the citizen advisory services (see figure 1).

Table 4. The e-government services phase and its requirements

Phases	Descriptions	Citizen Advisory's Requirements	Administrative Laws Principle
Search	Citizens search for conditions and requirements listed for the services.	Advise citizens in matching his or her situations with appropriate services under relevant laws.	Reliability and predictability
Intake	Citizens conduct an actual formal transaction with the government, such as input data, submit applications, etc.	Assist citizens before or during the application form fill-in process.	Efficiency and effectiveness
Decision making	Authorities receive applications and make decision based on legal rules and regulations.	Ensure that the decision making by the e-government services strictly follow the rule of laws.	Reliability and predictability
Explanation	Citizens receive results of the decision making with explanations.	Provide the reasons, fact, and evidence of administration decision in the statement of reasons.	Openness and transparency
Objection and appeal	Citizens can object to the decision or file court of appeal to the government.	Provide the right to redress through appeal information.	Openness and transparency, Accountability

Rule-based repository

Legal knowledge from experts is obtained and coded into the rule-based repository. The business rule template is used as the knowledge representation and communication format between a public authority and knowledge engineer. Rule-based repository provides knowledge for the specific service advice and customized form fill-in service.

- *Specific service advice* aims to support the *search phase* by helping citizens match their situations or needs to appropriate services provided.
- *Customized form fill-in service* aims to support the *intake phase* by providing a customized form fill-in in relation to citizen's situations.

Legal knowledge based ontology

Based on Kralingen's conceptual frame-based ontology, the norm frame, act frame and concept frame can be constructed and modeled from legal documents. The instance of laws contained in the ontology provides knowledge for the decision making service and the statement of reasons service.

- *Decision making service* aims to support the *decision making phase* by providing the rule of law and the responsibilities of public authorities information to citizens.
- *Statement of reasons service* aims to support the *explanation phase and objections and appeals phases* by providing the statement of reasons, which contains facts and evidence, situations, legislation, reasoning, legal justifications, responsible authorities, the grounds and a sufficient degree of justification to enable the interested party to prepare an appeal against the administrative decision.

Figure 1. Citizen Advisory Model

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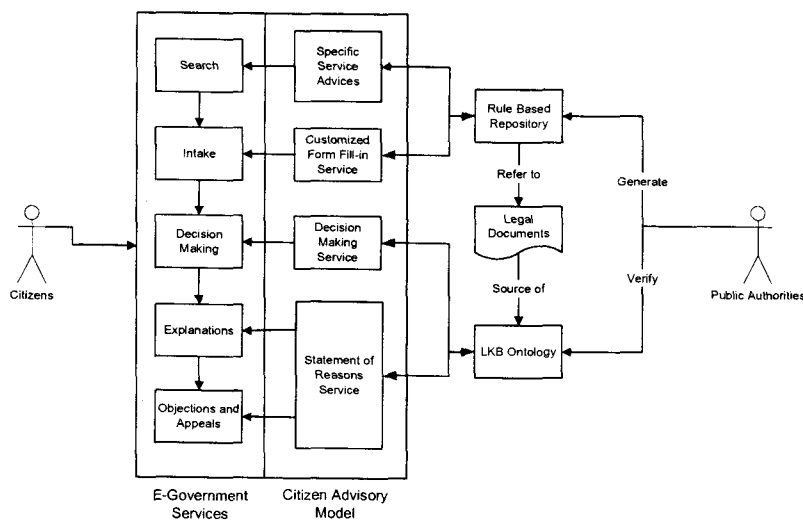
IV. Prototype Systems

Based on the citizen advisory model, we choose the trade measure services under the Royal Thai Anti Dumping and Countervailing Act 1999 [16] as a legal domain of our prototype development. The trade measures are legal actions taken by the government (i.e. antidumping measure, imported quota measure, etc.) to protect or remedy domestic industries from unfair international competition (i.e. imported dumping products, foreign government subsidy products, etc.). To trigger a trade measure service by the government, citizens or businesses must file a petition complaint to the Department of Foreign Trade in order to raise the case.

To decide whether the petitioner is eligible to file an anti dumping complaint, the four criteria specified by laws must be valid: the determination of dumping, the determination of industry injury, the determination of subsidy, and the determination of petitioner status. Under each criterion, there are rules and procedures that citizens must fully understand and comply with in order to avoid unnecessary delay or rejection of the petition.

This paper illustrates the prototype of the specific service advice, the customized form-fill-in service, and the decision-making service. The statement of reasons service is left for future works.

4.1 The specific service advice and the customized form-fill-in service

We begin our prototype by constructing the rule-base repository. Rather than starting the prototype development by interviewing experts and design problem solving architecture, the analysis of law document is scrutinized first. After completing the law analysis process, interview sessions are conducted with legal experts using business rules statement template as a communication format (see [17] for more details).

From the business rule statement, the logic knowledge of "IF/THEN" structure is applied as a knowledge representation. Public authorities can create, verify, update, and test business rules via a user interface as shown in figure 2.

Figure 2. The Prototype Screen of Rule-Based Repository
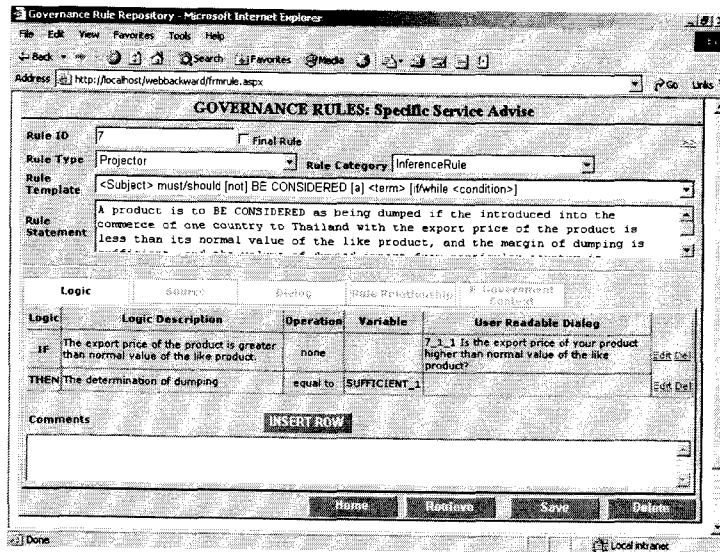
The specific service advice provides a matching service between citizen's situations and service rules. Citizens simply input trade situations by answering, "YES" or "NO" to questions in the dialog. Based on the backward-chaining rule-based technique, the system uses a non-exhaustive search technique to fire rules or stop searching rules after it reaches valid recommendations. The user interface is shown in figure 3.

# Figure 3. The Prototype Screen of Specific Service Advice
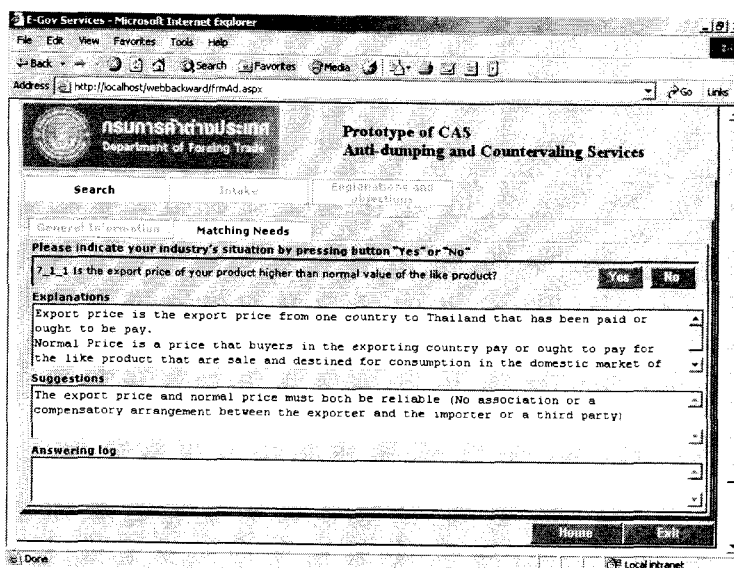
The customized form fill-in service aims to customize petition form for citizens to fill-in based on specific needs. The forward-chaining rule-based technique is applied as an inference technique. The user interface as shown in figure 4.

knowledge-base solely on the determination of dumping constraints.

In order for citizens to be eligible to file a petition under the determination of dumping constraints, there are three rules:

Figure 4. The Prototype Screen of Customized Form Fill-in Service
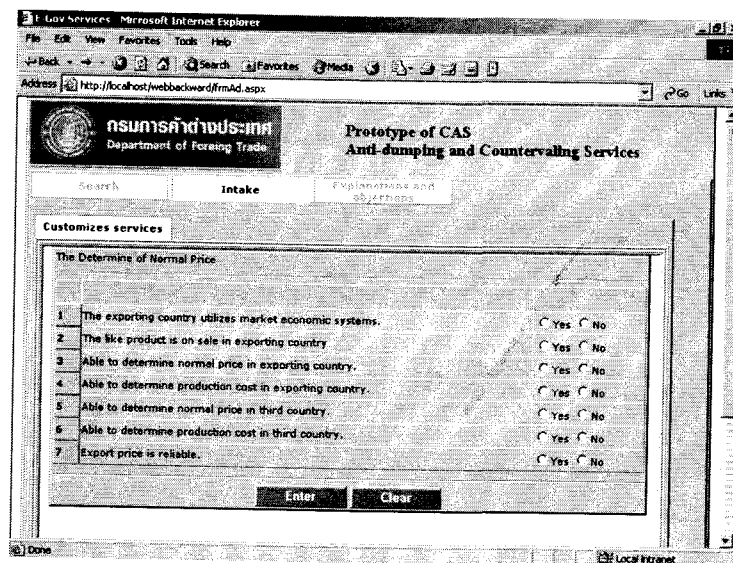
4.2 The decision-making service

The decision-making service is an internal process where the system receives inputs from the intake phase and performs an assessment against a legal knowledge-based system in order to reach a final decision. The legal knowledge based ontology is constructed based on Kralingen's conceptual frame-based ontology. We use Protégé 2.0.1 [18] as a tool to create the legal knowledge-base. For the sake of simplicity, this paper illustrates the legal

1) The export price and normal price must be reliable (true: export price, true: normal price).

2) The export price must be less than the normal price (true: export price < normal price).

3) The margin of dumping must be more than 2% (true: ((normal price - export price) / CIF export price) * 100 > 2%).

Using Protégé 2.0.1, the sample of norm frame instance is shown in figure 5.

Figure 5. The Sample of Norm Frame Instances from Prot?g? 2.0.1

```
([LKBS_Prototype_Instance_50000] of Norm
      (act+identifier "specify-valid-export-normal-price")
      (promulgation "The AD/CVD Act 2542, Article 14")
      (norm+identifier "norm_3a")
      (norm+type Norm_of_conduct)
      (scope "Rule of Law: valid export normal price")
      (subject "Authority")
      (condition+of+ap. "'export price' = 'reliable' and 'normal price' = 'reliable' and 'export price' <
'normal price")
      (legal+modality ought_to))
([LKBS_Prototype_Instance_50006] of Norm
      (act+identifier "specify-invalid-export-normal-price")
      (promulgation "The AD/CVD Act 2542, Article 14")
      (norm+identifier "norm_3b")
      (norm+type Norm_of_conduct)
      (scope "Rule of Law: valid export normal price")
      (subject "Authority")
      (condition+of+ap. "'export price' = 'unreliable' and 'normal price' = 'unreliable' and 'export
price' >= 'normal price")
      (legal+modality ought_to))
([LKBS_Prototype_Instance_2] of Norm
      (act+identifier "specify-insufficient-margin-of-dumping")
      (promulgation "Ministry Act 5 (2543)")
      (norm+identifier "norm-1a")
      (norm+type Norm_of_conduct)
      (scope "Rule of Law: sufficient margin of dumping")
      (subject "Authority")
      (condition+of+ap. "'margin of dumping' < 2%")
      (legal+modality ought_to))
([LKBS_Prototype_Instance_40006 of Norm
      (act+identifier "specify-sufficient-margin-of-dumping")
      (promulgation "Ministry Act 5 (2543)")
      (norm+identifier "norm-1b")
      (norm+type Norm_of_conduct)
      (scope "Rule of Law: sufficient margin of dumping")
      (subject "Authority")
      (condition+of+ap. "'margin of dumping' >= 2 %")
      (legal+modality ought_to))
```

In order to decide whether the petition submitted by citizens is eligible for the services, the petition case must be assessed based on the determination of dumping norm. We reuse the 'Assessment' task template from the CommonKADS methodology [19] as an inference technique to assess the legal knowledge-base, which consists of abstract, specify, select, evaluate, and match.

General characteristic

Goal Find a *decision category* for a petition based on the determination of dumping norms.

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Terminology **Case**: the request for an antidumping petition.

Decision category: the validity-of-the-petition yes or no.

Norms: the Royal Thai Anti Dumping and Countervailing Act 1999, the determination of dumping provision.

Input   A petition case: "export price, normal price, and CIF price"

Output   A decision: "the result of assessing the petition case".

The language used to describe the control structure of the task for the case study is VisualBasic.Net as shown in figure 6.

Figure 6 The control structure of the assessment task

```
Private Sub Submit_Petition_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
Handles Submit.Click
    Dim input(2) As String
    Dim result As Boolean
    input(0) = "export-price"
    input(1) = "nomal-price"
    input(2) = "CIF-price"
    result = getAssessment(input)

End Sub

Private Function getAssessment(ByVal InputExport_Price As String()) As Boolean
    Dim oAssessment As New clsAssessment()
    Dim oCaseDescription As New case_description(InputExport_Price)
    Dim oAbstracted_case As abstracted_case
    Dim oNorms As norms, oNorm As norm
    Dim oNorm_value As norm_value
    Dim oEvaluation_results
    Dim oDecision As decision
    Do
      oAbstracted_case = oAssessment._abstract(oCaseDescription)
      If oAbstracted_case.Has_Solution Then
        oCaseDescription.assign(oAbstracted_case)
      End If
    Loop While oAbstracted_case.Has_Solution
    oNorms = oAssessment._specify(oAbstracted_case)
    For Each oNorm In oNorms.norm
      oNorm = oAssessment._select(oNorms)
      oNorm_value = oAssessment._evaluate(oAbstracted_case, oNorm)
      oEvaluation_results = oNorm_value.ADD(oEvaluation_results)
      oDecision = oAssessment._match(oEvaluation_results)
      If oDecision.Has_Solution Then
        Return oDecision.value
        Exit For
      End If
    Next
End Function
```

V. Conclusions and Future Works

Legal knowledge based systems have proved to be useful in the design of the citizen advisory model to support citizen requirements under the unique characteristic of the government while simultaneously achieving good governance objectives. Nonetheless, there still remain a lot of works to be done in the future development. First, the design of the statement of reason service during the explanation phase and objection and appeal phase must be comprehensive, user friendly and easy to understand. Second, the discretion issue of laws exercised by authorities must be included in the design to achieve the openness and transparency principle. Third, the interoperability of legal ontology between various agencies and platform must be standardized and materialized to support a one-stop services e-government in the future.

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