

# A FRAMEWORK OF INTEGRATED INTELLIGENT JUDICIAL INFORMATION SYSTEM

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## ABSTRACT

*The effective public security depends on the efficiency of the judicial process and procedure. Approaching to the supply chain management domain, the judicial procedures can be viewed as the complete stream sections. The legal agencies have also to deal with the information flow which need for integrating, interchanging and inter-cooperation among them. Anyway, the study in the intelligent system in the field of information technology, including data mining, is also consecutively studied and applied to various aspects in the legal domain. The study in this paper applied some of the existing technology and also suggests the possible application in intelligent judicial system. We then proposed a framework of the extension and integration for the intelligent judicial information system in Thailand. The designing methodology of this supply chain-core framework is based on the consistent cooperating of the information flow, the traditional and intelligent legal agencies.*

**Field of Research:** *judicial system, intelligent system, data mining, supply chain management.*

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## 1. Introduction

Undeniably, the efficiency of the judicial process and procedure delivers the effective public security. Public securities policies should be integrated to all sectors of the judicial system. If criminal justice procedures are not integrated for the resources and information, the performance of the public security will be restrained. In the past works, there are some integrating architecture of the judicial system were proposed. Anyway, most of them are based on the theoretically assumption that the data from various justice agencies or sectors should be integrated and centralized. (Chang, Lu, & Jen, 2008) Unfortunately, in the real application, all data from all entities may not be gathered because of some privacy policies or lacking of inter-cooperation, especially in Thailand. (Ministry of Information and Communication Technology, 2009)

According to information sharing process, the flow of integratable information should be based on the model of Supply Chain Management (SCM). (Honggeng and Benton, 2007) Basically, the SCM is a business process used to constructed enterprise-wide schemes and focus on information sharing between legal agencies since the effective information sharing strongly enhances the effectiveness of the supply chain model. The scheme of this sharing process could be either systematic or heuristic depending to the policy issue as stated. The legal agencies, such as police offices, prosecutor, courts, etc., have also to deal with the flow of information which need for integrating, interchanging and inter-cooperation among each agency that owns information and manages its flow.

Anyway, the study in the intelligent system in the field of computer science and information technology (IT) is also consecutively studied. Their development of computational technologies such

as artificial intelligence (AI), expert system (ES), or data mining (DM) has been applied to various aspects in the legal domain. Nevertheless, although they have been continuously developed, they still scatter in integrability. In this paper, we proposed a framework of the extension and integration for the intelligent judicial information system, based on the existing system architecture of the Thai justice system. The designing methodology of this framework is based on the consistent cooperating of the information flow, the traditional legal agencies and intelligent legal agencies. Anyway, the core of this framework is based on the SCM model. The expectation is that the process time of some information paths might be improved or optimized.

## **2. Related principles**

### **2.1 Global frontier in information sharing**

According to information sharing between government entities, Treglia and Park (2009) have summarized the main keys which influences the availability and efficient of the information sharing between sensitive organization. In summary, they categorized the key influences into three groups:

1) Technical influences: This key refers to the technology issues included the Interoperability, Availability, and Control. Anyway, in the last decay, the core technology and its application were widely developed and purposed. Thus, the boundary according to this type of influence is quite insignificant to the current state of development. In brief, the Interoperability could fulfill with the XML (Bray et al., 2008) and reliable network technology. The requirement in Availability is completed by some policies in data interchanging based on the efficient communication technology. The Control key requires some controlling, monitoring, and managing application. This type of key should be the base key to other keys trust.

2) Social influences: This key depends on the attitude of the users in both organization level and human level. It includes Trust, Shadow Network and Criticality. Those three keys could be reduced their boundary if the other keys are trustable enough.

3) Legal influences: This type of key consists of Policy Conflict & Competition and Governance. Both of them depend on the policy and attitude of the state or government.

Anyway, according to intelligence information sharing, they also proposed the model for balancing these keys between their role of facilitators and detractors. In our framework, we will scope the focus the Technical influences.

### **2.2 Limitation in information sharing of the judicial system in Thailand**

There was a master plan report made by the Ministry of Information and Communication Technology (2009) states that most of organizations in Thai government are using their own information system which were designed without participant from other corresponding agencies. Moreover, the Thai government is lack of action to declare standard format and apparent processes in developing system for government agencies since it were designed with individual business needs and requirements in mind.

According to those frontiers, the centralization of data among Thai organization is quite impossible. Recently, Wisedsukol, Chanyagorn, & Subphachaisirikul (2010) proposed a model of heterogeneous information integration and management for Thai justice information system. Their model is proven for manageable and reliable. Anyway, the proposed model focuses on the interchanging and avoids about the centralization. As the technology continuously grows for last two or three years, the boundary of the influences in technical and social aspect is lessened. Some of agencies adjust their attitude and awareness for cooperation in data. Thus, in our framework, the cooperating method is proposed in two integration concepts: real-time information interchanging and data centralization.

### **2.3 Data mining application in judicial judgment**

According to the reliable data interchanging, the intelligent application for each justice agencies is required for enhancing the efficiency and performance in judicial system. Since the availability of the data according to the methodology in information interchanging, data mining method should be appropriately applied. The data mining, as known as the analysis step of the Knowledge Discovery in Databases process (Witten and Frank, 2005), an interdisciplinary subfield of computer science, is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, statistics, and database systems. Xie (2008) has suggested and summarized the specification requirements of the data mining application, specific to a module of case guiding. This paper rises for the awareness in case sources, system structure, and updating. Their details are below:

1) Case sources for the information database: The sources are normally various and distributed. The type of case, or data, might be either in textual format or structure format. If the data source is textual, the text-processing, such as natural language processing or text mining, module should be intermediated to structuralize the cases, legal documents or other related documents. To retrieve the information in legal texts, Smith (1997) proposed the methodology the using of lexicons in information retrieval in legal databases. This system works well in term of semantic text retrieval.

2) The system structure and function module of the information: The suggested key is that the system design and objectives should be advances, manageable, reliable and scalable. Another key is the function of subsystems should cover: case processing subsystem, maintenance & management subsystem, and utilization subsystem. These functional modules are considered for the design of our framework.

3) The update of the information database: This is typically requirement of the cooperative system. The centralized information should be updated and managed by schedule according to the policies of the organization for the consistent approach.

There are some researches which proposed the data mining application in legal domain. For example, Thammaboosadee, Watanapa, & Charoenkitkarn (2012) proposed a framework of multi-stage classification system for identifying sentences related to criminal law. This framework was then proven in the real legal application (Thammaboosadee and Watanapa, 2013). Another more general example was proposed by Liu, Chang, & Jim-How. They developed the classification and clustering for case-based criminal summary judgments. This system benefits for the court for analyze the statistic and trends according to the existing precedence.

### **2.4 Human-computer interaction in judicial system**

According to the down-stream of the information flow, the required information should be finally friendly delivered to the user which may then activate the next process step. Thus, the design of Graphic Users Interface (GUI) in data mining-based legal application is also important. An example of the GUI supporting in police office level was proposed by Chen et al. (2005). This kind of visualized GUI satisfies the requirement for the police level which may need for the deep details analysis. Another example of supporting GUI in higher judicial level was developed by Thammaboosadee and Silparcha (2009) for the benefit to illustrate the judicial process in court level and to deliver the information via the application interface. In the prison level, Campbell et al. (2012) developed the system and its GUI for the prison officers with the specification of data analysis and interchanging between other agencies. The main purpose is to gather data and analysis in various aspects.

## **3. Framework design**

This paper proposes the framework of integrated intelligent judicial information system. The designing is based on the integration of two approaches: the supply chain management model and the data mining technology as an intelligence system. Figure 1 shows how this framework creates the justice supply chain which similarly works to the parts of up-stream, middle-stream, and down-stream of a manufacturing supply chain. Ideally, if this framework is able to integrate all information in the central database, all law enforcement will be able to access the latest information and resource on demand. However, because of the boundary from social and legal influences, some information might be not allowed for sharing or online transferring. Thus, the communication lines shown in Figure 1 are separated into 3 types: transferring from agency to central database (centralizing), automatic transferring from agency to agency (transferring) and manually transport from agency to agency (transporting). The involved agencies are police offices, prosecutor, courts, and prisons which have general architecture as shown in Figure 2. All of them have their own database which also has issues in interchanging or integration depending on internal policy. All of the transferred information is in the extensible mark-up language (XML) format. Its more specific extension could be the Global Justice XML Data Model (United States Department of Justice, 2004). This is the international and opened standard for the justice domain. Thus, each agency has to be consisted of an XML convertor which functions in converting XML to target relational database and vice versa. Each agency may deploy several data mining (DM) modules which interact with their own database. The output from each data mining module is reported to user of each agency in individual or integrated.

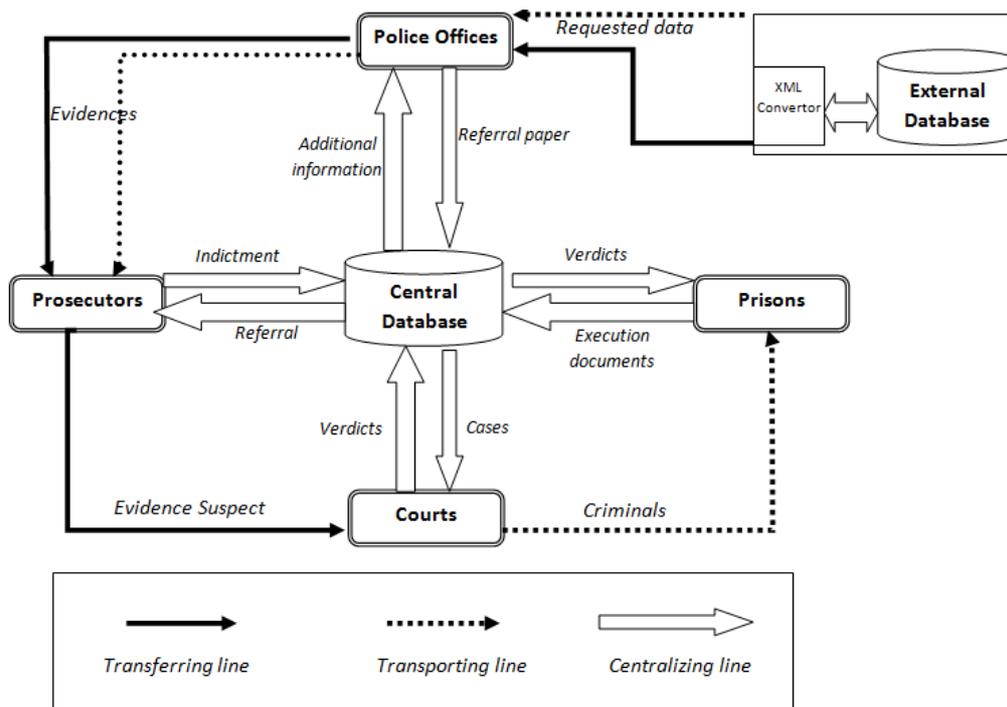
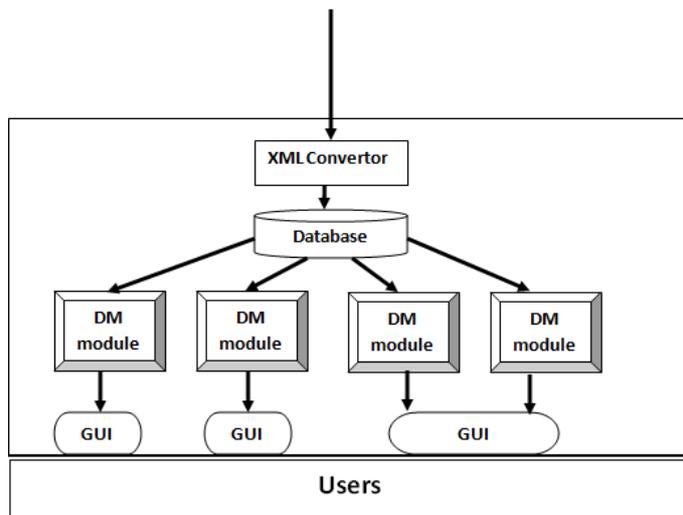
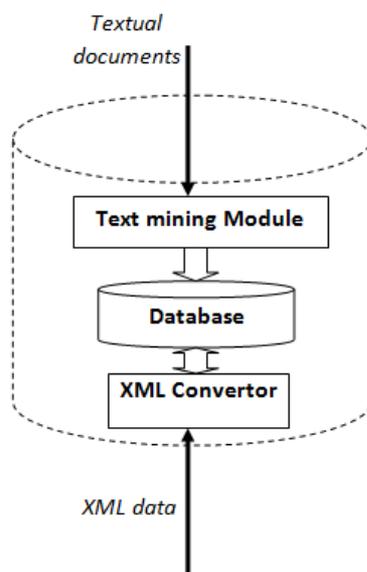


Figure 1: A framework of the intelligent judicial information system



**Figure 2: A general component of the law enforcement agency**

According to the central database shown in Figure 3, this part of the framework has purposes to centralize the data from all agencies together which are also needed for the XML convertor. Anyway, some of input may be in textual format. The text mining technology should be deployed to semanticize the text of input document and store its appropriate format in database.



**Figure 3: The central database of the framework**

An external data sources may be involved especially to the police offices which may request the evidence or any other information from the agency outside the justice system. This depends on the policy of those external agencies in data interchanging. Anyway, similar to the justice agencies, the information should be in XML format and need for some conversion.

As shown in Figure 1, the interaction between external agencies with the police offices and the police offices and prosecutor may be either transferring or transporting line, depending on the policy or culture for each region. All of justice agencies may share some information to central database for the purpose of reducing the probably format inconsistent while agency to agency transferring.

#### 4. Conclusion

If Thailand justice system is viewed as a loop of supply chain, the management of its upper-stream, middle-stream, and down-stream units (agencies) can be integrated. When this integration is effected, the relationships between the law enforcement agencies will grow closer and the gaps in their information sharing will disappear especially when applying the knowledge discovery in database method, or data mining, to each agency. Depending on the attitude and policy in the organization level and government level respectively, the problems and the gaps in public security will be dealt with effectively, and an improvement in public security management will undoubtedly follow.

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