

# The Rise of Smart Justice: on the Role of AI in the Future of Legal Logistics

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## Abstract.

While in business and private settings the disruptive impact of ICT have already been felt, the legal sector is now also starting to face such great disruptions. Innovations have been emerging for some time, affecting the working practices of legal professionals and the functioning and legitimacy of legal systems.

In this paper, we present our vision for enabling the smart government ideal for legal systems by means of a framework that unifies different isolated ICT-based solutions. In particular, we will describe the tremendous potential of improvements driven by AI and challenges to deliver new services that support the objectives of legal systems.

## 1 INTRODUCTION

In the coming years, the tasks and job descriptions of those involved in the field of law will change dramatically. This change is put into motion by information and communication technology (ICT), which has shown an exponential growth in power, and goes beyond just automating (parts of) current practices [9]. In several domains, ICT already had a disruptive impact on established working practices; thereby creating a completely new industry (e.g., for newspapers and television broadcasters).

In the legal domain, a similar change has also begun as concrete ICT solutions are already emerging to improve and speed up processes. For instance, services performed by computers are replacing the task of document review that has been performed by lawyers up to now. As a result, in big law firms, paralegals, but also high-class lawyers, are being replaced by data scientists. Thus, the expensive and time-consuming process of legal research is being outsourced to a digital expert, who helps with processing massive amounts of relevant legal documents cost-effectively [21].

Another example can be found in civil law in which transactions take place under the auspices of a notary, because they have to take place on the basis of trust and they require to be controlled and registered centrally. In the near future, ICT solutions like a blockchain (a database that represents a public ledger of transactions) can be used as a replacement for such a trusted third party, thereby replacing some of the notary's tasks [23]. Even more drastic changes, [5,21] call them "disruptive technologies", can be expected in the near future as computer-based services are on the verge of replacing other legal tasks: from automatically generating

legal documents to predicting outcomes in litigation [14]. Such applications aim to improve specific processes at the operational level. In the end, ICT will affect the working practices of all legal professionals (such as lawyers and judges). The challenge for them will be to take advantage of these developments in ICT and the data generated by ICT-based devices. Otherwise, they (i.e. the lawyers) are outcompeted by others that did apply ICT to innovate [15,21,22].

Also at the higher tactical and strategic levels, developments in ICT may be exploited, in particular to obtain reliable, valid, and consistent management information. Such tools make use of the increasing amount of data that is generated at the operational level. Management information provides a comprehensive overview of all relevant information needed to make (policy) decisions. It provides insight into the functioning of the system as a whole, and can therefore be used to optimize procedures. This development relates to the smart government vision, which aims to improve government services and to enable collaboration among and participation of government entities, nonprofit agencies, private-sector companies and the public [8,16].

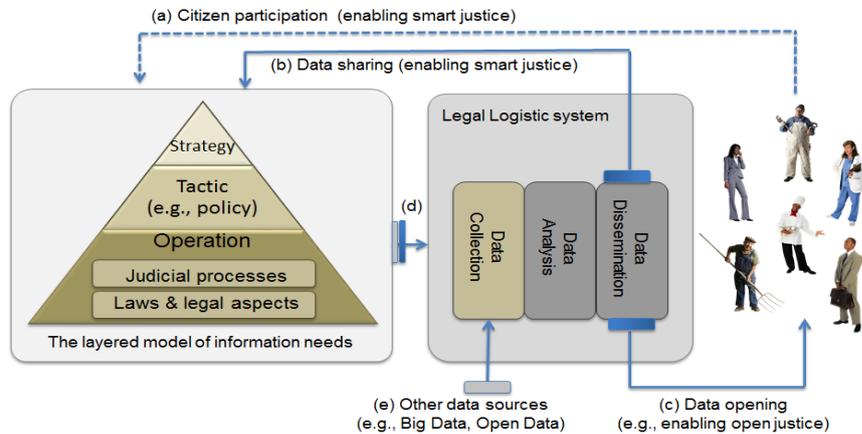
Recent ICT innovations in the legal domain have created many isolated solutions and implementations that generate increasing amounts of data. However, a unifying framework, that exploits these developments and the data produced by them, is missing. Such a framework is needed to streamline innovations and can also be considered as a roadmap towards the smart and open justice ideals. In this paper, we describe such a framework, coined as *Legal Logistics* [17] that utilizes data created by ICT to gain insight and improve processes. This framework unifies separate ICT solutions and enables stakeholders (on various levels) to take advantage of these developments. Subsequently, we will describe our vision on the future of Legal Logistics in view of the developments in research areas such as open data and big data. Moreover, we will give some interesting examples of how Artificial Intelligence (AI) will transform legal systems in the foreseeable future.

## 2 LEGAL LOGISTICS DEFINED

We define Legal Logistics as a framework *to collect, analyze and integrate all relevant data to gain descriptive, predictive or comparative insight into the functioning of legal systems* [17]. To do so, the objectives of a legal system have to be transformed into meaningful indicators that can be measured using the data available. With this insight the stakeholders (i.e. legal professionals, agencies, researchers and policymakers) can achieve

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**Figure 1: An illustration of the Legal Logistics framework**

key objectives and innovate services. In a sense, an information system based on the Legal Logistics framework is a measurement tool to gain insight into the level of well-being of a legal system using statistical information on the past, present, or future state of the system.

Figure 1 shows the Legal Logistics framework. The framework consists of 1) the Legal Logistics system (Figure 1, right rectangle) and 2) various stakeholders who require insight into the legal system. These stakeholders are in turn divided into two groups: 1) legal professionals with different tasks and information needs (Figure 1, left rectangle) and 2) the general public (Figure 1, on the right). The Legal Logistics system represents the technical part of the framework where various ICT solutions are implemented and unified. This system is divided into three stages: 1) data collection, 2) data analysis, and 3) data dissemination.

In the data collection stage, relevant data are obtained from the information systems of the agencies within the legal system (see arrow-d in Figure 1) or from other (external) sources (e.g., social media data, open data, and big data; see arrow-e in Figure 1). In the data analysis stage, the collected data are subsequently exploited to determine relevant and meaningful indicators. In the data dissemination stage, (statistical) information relating to these indicators is shared with agencies within the legal system (see arrow-b in Figure 1) or is disseminated to the public (see arrow-c in Figure 1). In a judicial setting, data dissemination is a separate stage that incorporates procedures to deal with transparency and privacy purposes when sharing the information [2].

With respect to the stakeholders in the framework, the agencies in legal systems have different types of tasks and, as a result, different information needs. These tasks and information needs can be viewed as different layers (see Figure 1, the triangle on the left). The lowest level encompasses operational tasks where legal professionals handle legal cases and enforce laws. Professionals performing these tasks need to share data to perform routine day-to-day operations, for example, to determine the identity of a person. For such tasks, detailed individual-level data often needs to be shared. The middle layer includes the tactical tasks that policymakers or advisers carry out to propose (changes in) policies or legislation. The highest level is concerned with the strategic tasks carried out by top management (i.e., the parliament or ministers): setting long-term objectives and strategies for achieving these objectives. For both tactical and strategic tasks, stakeholders need statistical data (i.e., management information) to make informed decisions. Such decisions may involve optimizing tasks on an operational level.

In general, the Legal Logistics framework can be applied to all legal systems that involve these three layers to some extent. It is

particularly useful for providing insight into the functioning and performance of a legal system and determining whether its objectives are met.

### 3 THE CURRENT STATE OF LEGAL LOGISTICS

Within the Research and Documentation Centre of the Dutch Ministry of Security and Justice we have realized a prototype of the Legal Logistics framework for the Dutch criminal justice system.. Our implementation of the framework currently focusses on two purposes 1) providing reliable management information on a tactical or strategic level to improve processes [8,16] (arrow b in Figure 1) and 2) sharing data publicly in order to provide transparency and stimulate the open justice and open government initiatives [1,2, 3,11] (arrow c in Figure 1).

The first purpose is important, because to understand how the criminal justice system functions, it is not sufficient to have access to the information of the separate agencies. Instead, information on the relations and flows between agencies is required. Such insights can only be gained by relating or integrating the data from the different agencies in a coherent manner. However, while the agencies work closely together in the Dutch criminal justice system, this is not as straightforward as it seems [6,16,17].

The second purpose is in line with the vision of a smart government. This aims at using ICT for open-government, open innovation in public agencies, and maximum interoperability among public agencies [13]. A smart government seeks for the best way to serve citizens and the society and aims to improve government services (i.e., by making them quick, measurable, affordable, and sustainable) and enable collaboration among government entities, nonprofit agencies, private-sector companies, and the public [11].

The implemented Legal Logistics framework [17] unifies several information systems [8,16,20] that systematically collect, analyze and disseminate data about the Dutch criminal justice system. These systems mainly concentrate on generating management information by bringing together data coming from different sources. At our research centre, we developed three different systems that are currently used by policymakers and advisers in the Dutch criminal justice system. Each system fulfills a different information need and has a different purpose. More specifically, we developed prototype systems to 1) monitor (case) flows within and between organizations [8] 2) measure elapsed times [16], and 3) predict future workloads [20]).

These systems mainly take the data produced and registered by the agencies within the criminal justice system (such as the police, prosecution, and courts) as an input (arrow d in Figure 1). These data pertain to the criminal cases being worked on and the corresponding offenders. Typically, the collected data sets are highly structured and contain some attributes to identify the case and the suspect/convict involved and some relevant events (temporal data) relating to the procedure followed (e.g., the date the case was received by the agency, the date of important decisions, and the date the case was finished). Our research centre developed a data warehouse and a dataspace system [6,8] for collecting, storing, cleaning, selecting, and integrating the data required. The data are subsequently analyzed and enriched, for instance, by calculating meaningful indicators (such as elapsed time, output, stock, and production). These indicators measure two objectives of a criminal justice system: effectiveness and efficiency [17].

The thus generated management information is shared with governmental agencies, policymakers and advisors in the criminal justice system to allow them to define the future research agenda, to answer policy-related questions, and to assess the effectivity of standing policies. Using this information, they are, for instance, able to detect bottlenecks, unexpected differences, and potential problems, and therefore, they can take better and informed tactical and strategic decisions. As part of the smart government ideal with its open data component, the collected data and enhanced information are also shared with various other external user groups (like scientists, journalists, and the public). In this way, two other objectives of a criminal justice system are met: accountability and transparency. In [17] these objectives are described in detail.

Thus, the implemented Legal Logistics framework shows how data generated by ICT in the Dutch criminal justice system can be utilized to gain and provide insight into the functioning of the system. It provides concrete solutions for collecting and integrating data from various sources, measuring meaningful indicators from these data, and sharing the results. However, this implementation comes with two types of challenges: 1) data quality and semantic interoperability issues when collecting and integrating data and 2) privacy-related issues when disseminating data. Moreover, it lacks a solid feedback mechanism directly to the professionals working at the operational level, since at the moment only statistical management information is being shared. The participation of the public is also open to further improvement. [17] describes in detail how these challenges are to be addressed. Here, we will largely focus on the issues relating to data quality, as AI can play an important role in overcoming some of them.

Agencies in the criminal justice system use administrative information systems with highly structured data to register their operational activities. Since this is not their core business, key problems with the data like, incompleteness, inaccuracy, and inconsistency are not uncommon [6,8,16]. Although there are sound and effective techniques to deal with functional dependencies in the field of data management [4], the management of quantitative (e.g., similar attributes having the same values) and qualitative dependencies (e.g., attributes do not usually show large deviations over time) is mainly left to domain experts and cannot yet be automated fully [6].

External data sources (arrow e in Figure 1) can be a valuable source of knowledge in order to make the data more reliable and complete. In addition, recent developments in AI may be explored in order to represent domain knowledge and automatically handle

incompleteness and inconsistencies. How this changes legal logistics in the future will be explained in the next section.

## 4 THE FUTURE OF LEGAL LOGISTICS

Only recently, as explained in the previous section, the first steps were taken towards connecting and integrating data of multiple agencies resulting in concrete solutions for generating management information for policymakers and advisers on a tactical or strategic level. Given the rapid developments in AI-driven ICT, we envision a future in which all kinds of different data (legal and non-legal; structured and unstructured) are combined and used by smart devices for various purposes and at different organizational levels. Consequently, this will have a tremendous impact on public participation in legal systems, the working practices of the professionals involved, and the nature and validity of the data available for these tasks. This will be explained in the remainder of this section.

In the near future, the main developments in Legal Logistic are to be found in the fields of big and open data. Open data relates to the smart government ideal, which has an open data component. In the foreseeable future we see developments in the direction of semi-open data in order to frame, acknowledge, and encourage such open data initiatives [2,3]. The prospects of big data for the legal domain are very diverse; it could be the key resource for innovative programs and services. In fact, we already see new applications emerging (on the operational level) that use big data techniques such as predictive policing [18] and (text) analysis of criminal files [19].

Big and open data can be exploited at the tactical and strategic level of a legal system for generating more reliable management information. As explained above, currently, only structured administrative or survey data are available and often the quality of these data and the reliability of the sources is uncertain. Additional (big) data sources with semi-structured or unstructured data could be used to analyze the validity of the registered data and complete them. For instance, when information on certain verdicts is missing (or not registered correctly in the information system), this information can be obtained by automatically extracting it from the court files (semi-structured text documents) using text analysis techniques. Furthermore, as another example, social media data may be used to validate survey data obtained through questionnaires, for example, about people's sense of security in public places. Often what people answer in a questionnaire is different to what they actually experienced, for instance, because they do not remember what happened or do not want to answer the question. Moreover, it is hard to determine whether a respondent gives a socially accepted answer or not. Social media are platforms where people usually immediately express what they experienced. Therefore, social media data can, with some caution, be used as an addition to data taken from traditional questionnaires. Another approach to involving citizens in the data collection process, is through crowdsourcing [7].

Another potential use for big data on a tactical or strategic level can be found in the field of policy evaluation. The evaluation of policies is a hard and time-consuming task. Ex-post evaluation studies require, among other things, that baseline measurements, corresponding to the conditions before the start of an intervention, are compared to the observed outcomes at the time the intervention is completed. Usually, between the initiation and completion of an

intervention, there is a long time interval in which many phenomena may occur in the society that also affect the intervention. Consequently, the observed differences cannot be attributed fully to the intervention itself. Using big data may help in better identifying the (hidden and) arising social phenomena in the course of a policy intervention, and compensating their impact on baseline and current measurements.

Beyond these applications of ICT and AI for the foreseeable future, in the more distant future we envision much more disruptive developments. In our vision, the next frontier for legal systems will be cutting-edge AI-driven technology. Such technology will enable advanced, smart, and knowledge-based data analysis, for instance, to determine the context of the data, represent and exploit domain knowledge, and reason with uncertainty. With such techniques, it is, for instance, possible to automate the data integration process mentioned in the previous section, which nowadays requires manual human effort as dependencies need to be handled and domain knowledge needs to be modeled. As the law still relies heavily on reasoning by people, once AI is capable of proper legal reasoning, much will change. To do so, AI-driven applications require adequate domain knowledge and the ability to quickly adapt to changes (in the law or society).

Technologies from the fields of big data and AI are currently already available to help lawyers to prepare for litigation [12]. A digital legal expert called ROSS helps lawyers to “power through” their legal research and aims to keep them up to date on new court decisions that could impact their own ongoing cases. A lawyer can ask questions like “can a company gone bankrupt still conduct its business?” and ROSS gives a cited answer and topical readings from legislation, case law, and other secondary sources after having red through the entire body of law. Similar programs may also support judges with forming a thought-out judgement about the case based on all data and knowledge available. Smart devices can also help to visualize the information to legal professionals in a new manner using augmented reality technology, such as, for example, the HoloLens [10]. With the HoloLens a HoloTrial could be created, a nontraditional method of presenting evidence and legal theories during a trial.

Not only legal professionals will benefit from these developments, it will also be beneficial to citizens and laymen. In our view, the public will have access to (legal) data via personal devices, while these devices will also be able to reason about these data and use domain knowledge. This will help citizens to better understand complex systems, such as the law, and will support them in reasoning about their particular needs (e.g., information about a legal case). As a result, people will be able to participate much more in the legal system. For example, when someone has a dispute with his neighbor about his garden fence, he could consult his legal app on his smart phone to determine which legal steps to take, or whether a case would be successful when brought to court.

However, before AI will play an important role in the future of Legal Logistics, some difficult challenges remain to be overcome. Although the AI domain has made significant gains in learning and decision making under uncertainty, it still faces specific challenges concerning the legal domain. These include, amongst others, the challenge of incomplete knowledge about the world, reasoning with uncertainty and also adapting to a (fast) changing environment and context (e.g., due to changes in legislation) . Therefore, to enable AI-driven technology that will further transform the legal domain, addressing these challenges is becoming more pressing than ever before.

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