Law Automation.

New reserves of efficiency. Scenarios and technologies

Simplawyer
Next Generation Law

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1 LAW AUTOMATION AS A NEW GROWTH POINT

Relations between individuals, business and state keep getting more complicated. This directly effects the legal regulation, which is becoming more and more complex and controversial. We can already see that the legal system is lagging more and more behind public relations. And, eventually, such lagging will only increase, make economy less efficient and slow down development of society.

Thus, business and state are actively forming the demand for advanced technologies and approaches to legal regulation. Law automation can become a new growth point for a quicker economic development. Making norms of legislation and private relations initially machine-readable, making their execution automated and ensuring secure and trustworthy storage of key information will cause a significant decrease of costs for legal risks and a dramatic speed up of business transactions.

We have united lawyers, programmers, technical experts in one working group and prepared this concept of law automation (version 2.0). In this white paper, we suggest possible practical scenarios. We also structured the ideas about the technologies, which will be required, and about those, which are already in place. We look into the legal issues, which are related to automation and popular delusions. (Will there be any lawyers left? Will a robot create law?)

This white paper can be used in any legal way with the reference to www.automated.law and the authors.

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2 THE ESSENCE OF THE CONCEPT

2.1 The law is inefficient — it is overloaded with unnecessary discretion and work. It's unpredictable and requires enormous resources.

Is there a way ensure that the legislation is consistent from the start, with the effect that can be accurately predicted? To make state control take place in the format of automatic compliance — for prevention of violations instead of their investigation? To allow a commercially agreed transaction to be largely independent of the discretion of the parties and the mistakes of employees? To guarantee the operational activity does not contradict corporate restrictions and credit documents? To ensure the company's due diligence was conducted in 10 seconds?

To ensure that the technology of smart contracts and smart laws, distributed ledgers, the Internet of things and new legal technology have freed up a financial and creative resource? This will be possible if not only processes get automated (what is happening now), but also legal relationships do.

2.2 Such automation requires creating legal norms initially in a machine-readable form — using a special legal programming language (smart laws). This will significantly reduce the existing shortcomings — the inconsistency of the norms, the difficulty in understanding their meaning and in the practice of application. An unambiguous program code of the law would not require an interpretation.

Smart laws will help to automate part of public legal relationships. First of all, those that are based on processes and can be digitized (taxes and customs, financial regulation, ecology, etc.). This requires access to objective information — data from internal systems of companies and from sensors.

2.3 In private legal relations, automation will significantly reduce the risks arising from the discretion of the parties. The introduction of software algorithms that automatically fulfil obligations (smart contracts) will help to avoid subjective interpretation of norms, distortion of their meaning, obligations defaults.

Smart contracts will accelerate business transaction, reduce transaction costs and minimize the risks of the human factor. Interaction with smart laws will allow checking the norms of contracts for their compliance with the law in real time.

2.4 In terms of technology, an automated legal system will provide for:

(1) a software environment that includes the legal language of programming (Legal Language), protocols for information exchange, storage, etc., authentication and versioning. In this technological layer, situations will be recognized and private or public norms applied to them, interaction with a person where full automation is impossible or impractical;

(2) distributed storage as public (laws, other acts), and private rules (contract). This layer is responsible for the authenticity and completeness of the information;

(3) external interfaces and technologies — custom software, sensors, adapters. This layer will create new private and state products based on such an automated system.

3 INEFFICEINCY OF LAW

3.1 Unnecessary will (discretion)

3.1.1 How does a rule's standard lifecycle look like? Imagine several consecutive stages:

(1) will coordination.

Initiators (parliamentarians, parties to an agreement) develop a rule and agree it with other participants of the process;

(2) forming the will, which has been agreed, into the rule.

Laws and other binding acts are enacted by authorities, an agreement is executed;

(3) perception of the will, which has been agreed.

The ones, who are related to the execution of the rule (the entities, which fall under the regulation, controlling authorities, obliged and entitled parties to contracts, consultants, etc.), attempt to understand, what exactly is regulated, which norms of behavior it prescribes, how it should be understood;

(4) execution of the will, which has been agreed.

In an ideal situation entities act strictly in accordance with the rule (comply with the law, execute a contract in good faith);

(5) violation of the will, which has been agreed.

Actions of individuals, business and state incidentally deviate from an ideal model. This can occur if they understand the rule incorrectly, or knowingly distort its perception, or even understand it but willingly ignore the rules.

3.1.2 At stages 1 and 2 it is assumed that all the participants of legal relations have in some way agreed their will and are ready to act accordingly. If so, there is no need in reviewing or distorting these rules at the next stages[1].

3.1.3 Law automation can help to get rid of some of law's main flaws, which relate to understanding and complying with the agreed will, deliberate perversion of it and unlawful resistance to such will. This could lead to significant reduction of conflicts as well.

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[1] Please, refer to Section 12 for law automation limits and the situations when the rules are ignored.

3.2 Unnecessary work

3.2.1 An essential part of lawyers' and company management's work is dedicated to the process of *perception* of regulations. This work includes:

(1) consultancy — comprehending and explaining different rules, their joint action, forecasting the consequences of implementing such rules for business. Basically, it's an *attempt to understand*, what the legislator intended to state in the rule, what exactly the parties to an agreement intended, etc.;

(2) disputes, which relate to an ambiguous understanding of a rule (basically, to different views on the agreed will).

3.2.2 Law automation can help to exclude such unnecessary work by reducing economical losses from wasting time and resources on explaining the essence of rules and modeling various situations.

3.3 Unnecessary time

3.3.1 A significant part of time during interaction with a rule is wasted on:

(1) understanding its real essence, including in correlation with other rules;

(2) review of newly approved rules (law, contract) for compatibility with existing regulations;

(3) routine processes.

3.3.2 Law automation will allow to speed up legal relations on the stage of approving new rules and testing their execution, perceiving the meaning of a law or an agreement. The time will be used by the parties for commercial talks, and not for detailed consideration of every clause of the agreement by lawyers.

3.4 Unnecessary unpredictability

3.4.1 Problems related to understanding of will, different interpretation of a rule (by parties of agreement, authorities and business), or possibility of it being distorted / ignored, lead to risks of unpredictability.

When it's impossible to reliably model the future of legal relations, business tends to refrain from business activities (loss of expected gain) or to take excessive precautions from possible

negative consequences, related to wrongful understanding of a rule or willing distortion of will by the other party (direct losses).

All this unreasonably increases business operating costs.

3.4.2 Law automation will help increase transparency of interaction between business and state in public-law relations and make them extremely efficient.

It will help reduce the level of dependency on the unformalized and often substandard will of certain public individuals and businessmen.

4 LEGILSLATION AND ENFORCEMENT IN PUBLIC RELATIONS

4.1 Current state

At the stage of creation, rules often contradict each other. This occurs due to branching system of statutory acts and regulations, poor legislative techniques, human factor, deliberate creation of contradicting rules for illegal individual influence.

As a result, contradictions in rule-creating process hinder perception and enforcement of rules.

4.2 Goals

Taking into account the current state of rule-creating and its flaws, automation in this area will allow:

(1) revealing the true will of the legislator;

(2) removing contradiction of rules at the stage of their creation (in laws, contracts, private regulations);

(3) reducing costs of developing laws;

(4) reducing transaction costs of regulation and control;

(5) reducing bureaucracy and corruption at each stage of regulation.

4.3 Scenario of legislation automation

4.3.1 The maximum effect can be achieved if automation is incorporated in the process of making new legislation. Such scenario may look like this.

4.3.2 Legislative initiatives continue to be prepared in a habitual, natural language, as before. Basically, legislative initiatives are like technical specifications. Then these initiatives by means of a programming language (Section 8) are processed into code, the bill is prepared in a machine-readable form. On the next stage the bill is automatically checked for compatibility with laws, which have already been enacted. The system compares the new act with the previous ones and forms a report about the inconsistencies or contradictions, which it has found.

4.3.3 Afterwards the new law's effect is simulated. This lets the influence on economy, administrative procedures, private legal relations be evaluated.

For example, the bill suggests banning of bonuses, which the seller pays to the buyer. The system:

(1) evaluates the tax consequences for the budget due to exclusion of such payment type. In other words, the system will estimate influence of such ban on income tax and VAT (value added tax) amounts, which the budget will receive; and

(2) determines the number of contracts, which contain a bonus clause and which the parties will have to alter to comply with the new regulation. The system also calculates the resources, which are necessary to control how the participants of corresponding relations comply with the new rules. For example, the system will calculate, how much it will cost to upgrade the controlling software of state bodies.

4.3.4 The system also determines, which subordinate acts are influenced by the new regulation, which necessary amendments or regulations other bodies must pass. In this case (in certain settings), the system may not allow passing the new law if all drafts of subordinate acts are not prepared.

4.3.5 Studying of a bill takes place in the usual form — the legislator by means of a special browser sees the text in the natural language. He or she votes in the same browser but the law is passed in the form of code.

4.3.6 The work of the system doesn't stop with passing of a law. The following "life" of a rule is monitored — frequency of usage in practice, difficulties, which arise, regulatory influence evaluation etc. This will allow to amend or to abolish ineffective laws quickly.

4.3.7 One of the big tasks is to translate the laws, which have been passed earlier, into machine-readable form. There are several ways of performing it — from retaining their force in the usual form to full processing into code (as an option — by means of artificial intelligence).

4.4 Automation of environmental enforcement

4.4.1 Several levels may be distinguished in the area of automating public law enforcement:

(1) sectoral regulation — legislation and subordinate acts in machine-readable form, which set rules in a certain sector of relations. In this example the sphere is environmental law, which sets the limits of admissible emissions;

(2) software of enforcement bodies — special software, which uses the system's data to control how the entities comply with sectoral regulation. In this example it will be the software, which monitors how users of natural resources comply with emissions requirements and initiates prosecution. This software is developed separately and is, in fact, an add-on to the automated regulation system;

(3) interaction with the outer, non-digitized world. The examples of such interactions are:

(i) monitoring necessary parameters using sensors;

(ii) input of relevant data into the system;

(iii) sending signals, which are necessary to execute specific actions, to adapters (sensors, which trace key parameters of emissions of a specific natural resource user);

(4) authority's discretion — decision-making by officials in certain cases, which are initiated by the software. The example of such discretion is resolving about holding liable.

4.4.2 Scenario of automation in the area of controlling the limits of admissible emissions may look like this.

Sensors, which are installed on the source of emission (for example, on a factory pipe) collect and transmit key parameters (amount, consistency of emissions) into the system. The controlling authority's software compares the data, which it has received from the emission source, with the emission limits, which are set in the system in the form of machine-readable law (another act). The software also checks for existence of necessary licenses.

Subject to results of these checks, the system provides the controlling authority with a report, which features key parameters. Next, there may be an exit from the system for working offline. If the automatic check finds violations, the software notifies the authority's official, who starts the necessary algorithms — holding liable, covering damages.

The software forms and sends the participants of the process the necessary documents — acts, protocols, environmental damages calculations etc. Upon receiving documents the company may check with its software if the claims are justified, argue them. If a dispute arises, an algorithm for its resolution is initiated.

4.4.3 The value of the system for business is that (1) it reduces personal interaction with controllers and (2) increases predictability of legal consequences.

4.5 Automation of tax law

4.5.1 The system provides the enforcement authorities with limited secure access to information about private legal affairs (about contracts, operations). From the point of view of access level nothing changes: state bodies today may get this information from the entity, which is being inspected. But automation can reduce costs for interacting with the controllers.

4.5.2 We can illustrate scenario of law automation in tax relations with checking VAT (value added tax) deduction, which the distribution chain paid to the supplier for the food commodities, which the supplier has delivered. It may look like this.

If the supplier complies with all the terms of delivery the distribution chain automatically pays the supplier the goods price including VAT (further on the private side of this scenario is described in Section 5.3). The customer's special software evaluates if VAT amount, which it has paid, can be deducted. If so, the tax is taken into account when the customer calculates its current tax obligations (the customer reduces the sum of VAT due). Such software not only allows the business to understand its tax obligations in real-time, but also predicts fiscal burden and consequences depending on different wordings in the contract. For example, it determines if the bonus for buying the goods for a certain amount reduces the total price of the goods.

By means of its special software the tax office checks the legitimacy of VAT deduction in real-time. It automatically compares the conditions of the transaction and the rules, which are prescribed by law (essence of the operation, available tax reliefs and exemptions, relation to commercial activities etc.). It also evaluates the plausibility of goods delivery based on the data in the system.

After the review, the software can notify the taxpayer that the tax deduction complies with the law. In this case, in the future the tax office doesn't reevaluate such a conclusion. If the software detects illegal tax deduction, it produces a report, which contains the violations, which it has revealed, and sends it to the participants of the process. If the taxpayer disagrees with the claims and a dispute arises, an algorithm for its resolution is initiated.

4.5.3 From the taxpayer's point of view the system:

(1) reduces costs of tax administration;

(2) increases predictability of tax burden;

(3) reduces the level of tax offices' abuse by, among other things, decreasing the number of inspections.

4.6 Public procurement

4.6.1 Automation scenario in the area of public procurement when the governmental bodies arrange open tender procedure may look like this.

The customer, by means of special software, enters information about a public call, inputs bidding documentation, sets the necessary parameters at a relevant web site. The system checks such required parameters for compliance with the law.

The participants issue offers, input into the system the data, which are missing. The software checks such data (both which is present and which is absent in the system). If the offers comply with the law and bidding documentation, the system accepts all offers for evaluation, which is carried out automatically.

As a result, the software offers the person, who is empowered to approve the decision:

(1) to execute the contract with the winner and start the process of its preparation and approval; or

(2) to declare the tender void.

4.6.2 The benefit of the system is that it not only speeds up the process itself, but allows to avoid gross abuse in public procurement.

5 PRIVATE LEGAL RELATIONS

5.1 Current situation

5.1.1 Performing the contracts and corporate documents depends on the will of parties, which interpret rules subjectively. Therefore, situations are common where the parties accidentally or intentionally distort the meaning of rules, or refuse to fulfill them at all.

5.1.2 The contract execution speed depends on humans and is not always high.

5.1.3 Errors during creation and performing the obligations are common.

5.2 Goals

Automation in private legal relations will allow:

(1) speeding up and to simplify the process of executing contracts;

(2) excluding different interpretation of the conditions, which the parties have agreed;

(3) detering non-performance;

(4) reducing the probability of errors in the process of performing;

(5) simplifying authentication of information, which is significant for the parties of contract;

(6) speeding up and reduce costs of executing obligations.

5.3 Automation of legal relations under supply agreement

5.3.1 Automation of contract relations is possible via using self-executing contracts (smart contracts). Such contracts are software, which performs certain actions on its own (for example, writes off the funds from the account, changes the information about the owner in the register) if the parameters, which are set in it, are triggered. Samples of such parameters are certain actions of the counterparty, reaching a certain date, input of a certain data into the program.

5.3.2 The functionality of smart contracts should allow:

(1) to analyze applicable law and act in compliance with it;

(2) to integrate with each other. For example, a contract between a supplier and a buyer may stipulate a minimum balance on a bank account, and a contract with a bank may stipulate stopping the operations when the minimum balance is reached.

5.3.3 We can illustrate automation of contract relations by automation of grocery supply to a distribution chain. The possible scenario may look like this.

The parties agree commercial terms by any means (e-mail, at meetings etc.). Then coding specialists draft a supply smart contract considering the terms, which the parties have agreed. Likewise, today lawyers record the terms, which the parties have agreed, in draft documents in natural language.

The software allows constant debugging and testing a smart contract, which is being prepared:

(1) for compliance with law. For example, if a seller's bonus for deliveries volume, which the parties have agreed, contradicts the limitations, which are set by the trade law;

(2) non-contradiction to other contracts (for example, credit contracts), corporate rules, commercial arrangements.

The software can also automatically predict potential risks and imitate consequences if a smart contract does not comply with certain provisions of law.

The draft of smart contract is saved in the system. After that a party sends an offer. The other party via its software tests the draft and, if the results are positive, accepts.

The provisions of smart contracts, which have been algorithmized, are executed automatically. For example, a lorry is delivering the goods with RFID tags. When the goods are delivered to

the trade chain the system receives the data that the smart contract has been fulfilled in this part: the number of goods, which has been agreed, is delivered.

Not all provisions of a contract may be automated at code level. For example, often the quality of goods may be checked only by humans. In such situation, the process may go out from the system into offline. In our example employees of a trade chain perform internal acceptance of goods, check the quality. From a certain moment, the system waits for complaints about the quality of goods from the buyer's employees.

If such complaints arise, an algorithm for their resolution is initiated. If there are no complaints, smart contract transfers funds to the supplier, pays the buyer the bonus for deliveries volume, which is set by the contract.

Based on the results of a smart contract's performing, the software calculates taxes. Such calculation includes the taxes amounts, which depend on the provisions of the contract: for example, if the contract specifies that the price is reduced by the amount of bonus, which has been paid.

5.4 Automation of corporate approvals and powers of attorney

In the same way, by means of smart contracts, corporate relations may be automated. The example is automation of corporate approvals and powers of attorney. This is how the scenario may look like.

When the parties prepare to execute an agreement the software, which uses machine-readable law and the system's data, automatically checks the necessity of corporate approval. If such approval is required the general director will not be able to execute such deal without the required approval.

The software can also automatically check the credentials of individuals, who intend to execute a deal based on powers of attorney, and will block execution without necessary credentials.

5.5 Other scenarios of automation

The scenarios, which are described above, are not an exhaustive list, they are just a few examples. Most of existing private relations can be automated (fully or in a significant part). For example, co-investments to companies (ICO), letters of credit, target-oriented crediting, insurance, etc.

6 TECHNOLOGIES. GENERAL ARCHITECTURE

6.1 The potential system for global automation of law would consist of several layers:

(1) interface — API or regular human user interface;

(2) the program core itself;

(3) storage.

6.2 The user refers to the program part through the interface. The program part provides the user with the information, which is contained on the storage level, or records it. Or user via the interface initiates the algorithms, which are recorded on the storage level. The algorithms are then processed by the program part.

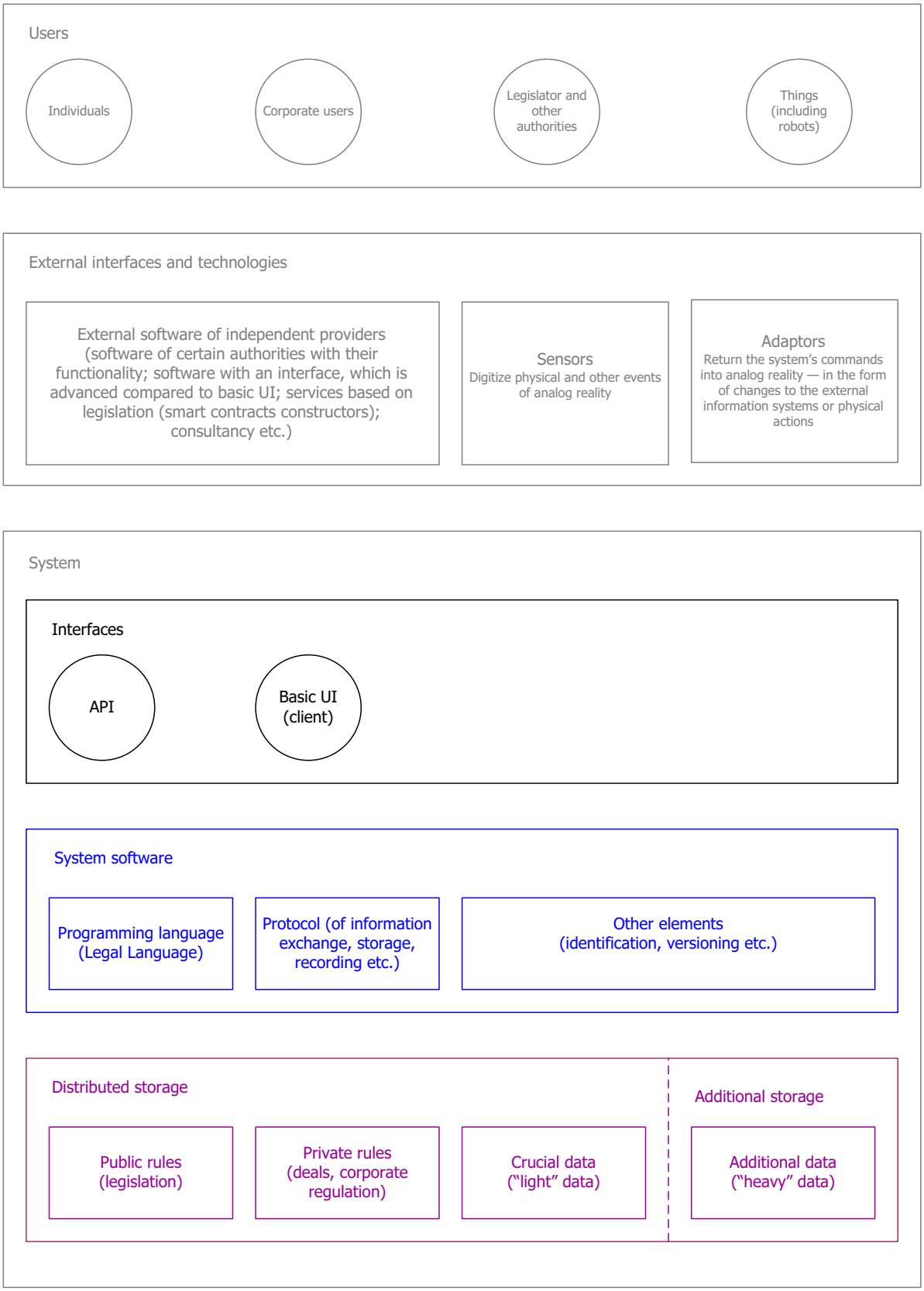
6.3 Any external software can be plugged in atop the system. It will refer to the main system via its API. This is probably what creates the key value of the system for the market and end users.

The external software may be in the forms of document constructors, service providing for certain situations, advanced interfaces or other legal products.

A separate direction — authorities' software. Most of algorithms will be in machine-readable law (for example, in administrative rules). Special software will help users with internal business processes of authorities.

6.4 Here's a chart of law automation's architecture.

(refer to the next page)


Users
Individuals
Corporate users
Legislator and other authorities
Things (including robots)
External interfaces and technologies
External software of independent providers (software of certain authorities with their functionality; software with an interface, which is advanced compared to basic UI; services based on legislation (smart contracts constructors); consultancy etc.)
Sensors
Digitize physical and other events of analog reality
Adaptors
Return the system's commands into analog reality — in the form of changes to the external information systems or physical actions
System
Interfaces
API
Basic UI (client)
System software
Programming language (Legal Language)
Protocol (of information exchange, storage, recording etc.)
Other elements (identification, versioning etc.)
Distributed storage
Public rules (legislation)
Private rules (deals, corporate regulation)
Crucial data ("light" data)
Additional storage
Additional data ("heavy" data)

7 PROCESS

7.1 Initiation of automatic review and execution. Triggers

7.1.1 The system works by reacting to different events — executing a contract, reaching a certain date, making a payment, altering law, recording data about ownership, receiving the data from GPS.

7.1.2 Such events (triggers) initiate functions of the system, which compare legislation and private regulation (Section 8.2). These functions will evaluate consequences of an event, record creation, alteration or termination of legal relations etc.

7.1.3 Triggers may be of different types, for example:

(1) payments;

(2) transfer of assets;

(3) reaching certain time;

(4) event;

(5) creating private rules (for example, rules of articles of association or of internal regulations);

(6) executing a deal;

(7) triggering a sensor (speed, temperature, location, other physical parameters');

(8) initiating a process, manually or automatically (for example, a tax office begins an inspection or triggers of a function from a contract algorithm are on);

(9) passing of a new public rule, its entrance into force, its repealing;

(10) going ex-system (Section 7.4).

7.1.4 Parties of private legal relations or authorities will be able to create their own triggers.

7.1.5 The type of trigger can affect the following:

(1) minimum parameters, which must be transferred to the trigger or from it;

(2) range of law and private rules review (Section 7.2) — array of rules, review of which the trigger launches;

(3) the way the trigger acts. For example, certain types of triggers must not only initiate checking the legislation, but also fixate the information, which is contained in them, and operations with such information (logging).

7.2 Detecting the applicable regulation

7.2.1 The system must react to a huge number of external and internal events. If each event triggers a full review of all existing legislation and private rules then, basically, every event will cause review of millions of rules.

If the system reviews hundreds of thousands rules each second for millions of companies and individuals this will excessively load it. Such overload will require huge computing capacities and amounts of energy.

7.2.2 To reduce such costs the system must minimize the number of rules, which it checks in relation to each event. For example, when video surveillance detects speeding, only the legislation about liability for speeding and the corresponding traffic regulations block are initiated, and such blocks as inheritance law, family law, tax law are not engaged.

7.2.3 The main goal is to determine the applicable regulation.

7.2.4 A possible approach is using ready blocks of regulation, which are applicable to certain triggers. For example, when a speeding sensor is triggered — the administrative code, which specifies the liability for speeding, and traffic rules are reviewed. When an emission sensor is triggered — an environmental block is reviewed. If there is an issue about stock deals — a block, which consists of legislation about joint stock companies, stock market, tax regulation, counter money-laundering, currency regulation etc. is initiated.

7.2.5 If there are no such limitations for a trigger, all the rules are reviewed without exceptions. However, on the first stage it's not crucial because digitized legislation will not be numerous.

7.3 Processing rules (review and execution)

7.3.1 Rule processing is a separate function of the software. It reviews if all elements of users' relations (for example, the users' status and the deals, which are being executed by them) comply with regulation.

7.3.2 Rule processing mechanism supposes:

(1) comparing rules (for example, contract rules to rules of law); and

(2) producing a result.

7.3.3 The result of processing may be:

(1) changes in records — about the status of participants, rights on assets, parameters of legal relations and other information, which is stored in the system. For example, after the system processes a decision about assigning an executive body it makes a corresponding record in a legal entities' register;

(2) change of private rules. The example is change of a corporation's articles of association (change of corporate procedures' algorithms, which are set in the articles) subject to the results of a vote;

(3) change of algorithm's action. For example, a supply contract may stipulate a bigger bonus for deliveries volume than the maximum one, which is set by the law on trade. If so, the system pays only the amount, which is allowed by the legislation;

(4) blocking the algorithm's action. For example, if a deal, which is prohibited subject to a credit contract, is executed without bank's consent, such deal is not performed;

(5) command to a thing. For example, under a pledge agreement the borrower may not use an automobile due to a serious delay of loan payment. If such delay occurs the automobile will block the engine start;

(6) giving notice or informing. For example, before sending an offer the system will warn that the contract does not comply with the law and private rules;

(7) going ex-system (Section **Error! Reference source not found.**) — a request for an external reaction. For example, an algorithm of a services agreement may request the client's confirmation that the services have been rendered properly. An algorithm continues its automatic work after it has received such confirmation.

7.4 Going ex-system

7.4.1 For the system to function it must interact with other external systems or participants. For example, under a supply smart contract the quality of goods must be checked on a certain stage. Or an official must at his or her discretion choose one of several solutions.

In such cases, the algorithm will require actions in the offline real world.

7.4.2 That's why the algorithms should be able to include scenarios when the system interacts with the offline reality (going ex-system).

7.4.3 Going ex-system may be designed:

(1) either not to expect users' reaction. Generally, these are the situations when the system has provided the users with all the information, which they use in objective reality. For example, a message that advance payment has been received and a party must provide another party with a service; or

(2) to presume a responsive reaction. For example, the system will expect approval of goods quality during acceptance. The algorithm continues to execute itself after it has received the confirmation.

Different consequences may be set for various situations when the system has not received the necessary response. Such consequences may be set in the rules (public or private) or in the system.

7.5 Data recording principles

7.5.1 All information is stored in the system permanently.

7.5.2 Its alteration takes place in the form of a new entry with new data. For example, if parties change a contract clause the previous version isn't deleted. A new version of such clause is created. The versions differ by status — one is in force and all other versions have no force.

This will allow to see all the history of data alteration (legislation, contracts, information about facts etc.).

7.6 Time

7.6.1 Time is an important legal parameter. Specific legal consequences can depend on its accuracy. For example, who was the first to issue a bid during an auction or if an obligation was fulfilled before the due term.

7.6.2 To set the system time of an event the following may be used:

(1) the time, which corresponds to the coordinated universal time (UTC);

(2) median time of the system's users — if making reference to UTC is impossible.

7.6.3 The time of an event is recorded on the level of devices, which interact with the system. If the device's time differs from the system time, such difference is compensated when such time is recorded into the system.

8 PROGRAMMING LANGUAGE

The key and most valuable element of law automation are machine-readable rules. Rules will become machine-readable if they are written in a programming language.

8.1 Goals of programming language

8.1.1 Goal number one — algorithmizing legal processes. There are no considerable difficulties here. Even now you can use either specialized (for example, Solidity) or common programming languages.

8.1.2 Much bigger potential is hidden in the possibility to automatically compare different rules:

(1) private rules with rules of legislation (checking for compliance with legislation);

(2) new public rules to those, which are already in force (search for inconsistency of prospective law and law in force);

(3) private rules between each other (checking for possibility to execute a contract from the point of view of corporate rules, rules of other contracts).

8.1.3 Law enforcement automation requires that the rules (private and public) are compared with attributes of different events of objective reality. For example, speed from radars with provisions of the Administrative Code, which specifies liability for speeding.

8.2 Checking essence of regulation (substance)

8.2.1 Today when lawyers make legal analysis of a situation or of a rule they compare:

(1) certain laws, contracts etc. with the surrounding reality (for example, with evidence of a violation — running a red light); or

(2) rules between each other (for example, a contract is compared with law).

There is a "target", which is compared (the target, which is being reviewed), and a rule, to which it is compared (base rule).

A set of *facts* — for example, a red light, which is switched on for the automobile, movement of such automobile beyond the stop line at this moment — can be such target. The base rule

in this example will be the *definition* of running a red light. This is a legal model of a violation, which leads to liability. Thus, facts are compared with the definition.

Another rule can also be a target. For example, a contract clause, which stipulates that:

(1) if a buyer purchases goods for a certain amount, it shall get a bonus; and

(2) the bonus shall not change price of the goods.

8.2.2 The peculiarity is that rules in smart contracts and new laws will not always be set identically to existing base rules. The new rules will differ from the acting ones by name of variables, functions, code architecture.

We have to consider that the essence of regulation may be the same both in the rule, which is being reviewed, and in the base rule. For example, in both cases we are talking about a supply contract of food produce to a distribution chain. At the same time, the code of the contract and law will not be identical.

Thus, the system should be comparing *something other than the code*.

8.2.3 The system should compare the very essence of regulation (substance) — institutes, concepts, parameters, which are described. We define substance as a separate term.

Substance is a legally relevant institute, characteristic, casus or event, which is fixated in a machine-readable rule. Substance can be found in rules of legislation and contracts.

It is, in fact, a unit of sense, which has its own legal importance. A substance can include other substances without limitation of inclusion level. From a programming point of view, substance is like a function, which outputs a certain value.

Here are a few examples of substance: unlawful tax advantage, contribution into company's assets, transfer of assets, type of contract (for example, supply agreement), type of produce, characteristics of an entity (distribution chain; entity with a monopolistic position) — any event, characteristic, institute, which has an influence on regulation.

8.2.4 Users can agree on their own substances or use the substances, which are given by the regulation.

8.2.5 You can discern three types of substances:

(1) firmly determined;

(2) softly determined (declared);

(3) mixed.

8.2.6 Firmly determined substance.

Such substance is definitively determined. It has a limited set of characteristics, which are reviewed, or of rules how such characteristics are defined.

For example, contribution into a company's assets has a finite set of characteristics:

(1) an entity transfers its assets to a corporation;

(2) the entity, which transfers assets, owns a share in the corporation;

(3) there is a corporate decision to transfer assets;

(4) the corporation has no obligation to this entity due to the transfer.

One of the problems, which needs to be solved, is defining the search boundaries for substance. Solving this problem means answering the question — where the system will be looking for necessary elements. It may look for them within one clause, one function, within the entire contract, within a package of documents or within all documents and additional information. For different substances search boundaries may be set in the rule itself or in the substance parameters.

8.2.7 Softly determined (declared) substance.

There are rules or parameters, which cannot be described or describing of which is too expensive. Or those, which users, on the contrary, seek to hide.

For example, rendering the services in good faith. Such rendering is determined by a set of characteristics (for example, a contractor has transferred to a client an agreed document). To a large extent, the client subjectively defines if the provider has rendered the services properly: the client cannot automatically precisely determine to what extent the document complies with the conditions of a deal.

Another example is execution of a sham transaction (for example, for gaining an unlawful tax advantage).

Since a softly determined substance cannot be determined automatically through an algorithm, it can be fixated in the form of a presumption or declaration. These presumptions can be:

(1) set in the code of a contract. For example, the parties can presume that their contract is a rental contract;

(2) proposed on a unilateral basis. For example, a notary public can presume that an obligation was fulfilled. Or a tax office based on results of inspection will declare unlawful tax advantage, and the law's code will further work with this presumption.

8.2.8 Mixed substance.

These are rules, in which one part of situations is described with a finite set of parameters (firmly determined substance), and the other part — in the form of an open list or an estimative category.

Examples are attributes of affiliated party transactions. Part of attributes is related to interest of individuals with accurately defined positions — member of a board of directors, sole executive body, member of an executive board. But in the same definition, which is specified in law, there is a clause about entities (other than individuals with accurately defined

positions), which or who may give the company obligatory instructions. Defining them automatically with absolute accuracy is not yet possible.

9 SECURE STORAGE

The information, which is used in the automated law system, has a significant influence on legal relations. That's why it will be subject to serious requirements for protection from unauthorized access and alteration. Besides, taking into account the potential volume, scalability should be taken into consideration.

9.1 Available information

For the system to function properly, the system itself and various users need constant access to the following information:

(1) public rules (legislation, court cases, which contain new rules);

(2) private rules (contracts, unilateral deals, corporate rules).

Private rules have legal importance not only for their direct users. They may create tax consequences, violate licensing law, be subject to antitrust control.

Some private rules must be accessible to all users of the system (for example, corporations' articles of association). In some cases, the parties themselves may provide third parties with access to confidential information — for example, a loan debtor may provide the creditor bank with access to some of its commercial contracts;

(3) legally important information (data about the status of entities and objects, data about legally important facts etc.).

9.2 Data access rights

If sensitive data are stored in systems like open public blockchains, the problem how to combine encryption and access rights management must be resolved. As a result, unauthorized access of any type must be excluded: for example, when a state authority based

on a court decision obtains a key, which it can legally use itself, but can also illegally pass it to other parties.

9.3 Authenticity of data

9.3.1 The system must have access to authentic data.

To achieve this the following must be excluded:

(1) data falsification. The data cannot be falsified without detecting falsification; and

(2) data deletion. The situation when the user detected unauthorized access but, nevertheless, the data are simply gone, must be prevented.

9.3.2 Making the data impossible to falsify and delete is possible if they are stored in a distributed manner on maximum number of independent devices.

9.4 Scalability: amount, speed of transactions

9.4.1 Today public blockchains (distributed ledgers) solve the problems of ensuring data authenticity. If all legally important information is stored in a blockchain the risk of its falsification or deletion will be minimal.

But that means that the amounts of data, which are stored on each device, will constantly increase and storage capacity of common user devices will simply run out. For example, if the amount of data increases by 500 TB per hour, the number of users, who are ready to store such data, will rapidly drop progressively as data are accumulated.

Another option — instead of storing the data itself in a blockchain storing only its hash codes. This approach is similar to IPFS (Inter Planetary File System). Such approach will decrease the amount of data in a blockchain. But this increases the risk of unauthorized deletion of genuine information, which has the main value.

9.4.2 Third approach — a closed blockchain with participants, who have significant technological resources. This may soften issues with scalability. But a blockchain, which is controlled by a limited number of participants, loses, to a large extent, its original advantages.

9.4.3 To work out a compromise variant the following goals must be achieved:

(1) storage must be distributed between many independent users;

(2) the amount of data, which are stored, must not exceed the size, which is reasonable for common equipment (for example, 100–200 GB);

(3) the data itself must be stored, not only its hash code (or other derivatives).

These goals may be achieved, among other things, if (i) a part of users, not all of them, store fragments of information; (ii) such fragments are distributed in a random pattern and redistributed regularly.

9.4.4 A separate issue with existing blockchains is transaction transfer capacity. Automation of a country's legal system requires adequate transfer capacity and possibility to scale the infrastructure.

9.4.5 Besides, different rules of storage may be applied to different types of data. Relatively light text and numeric data may be stored in a distributed manner among many users.

"Heavy" data (for example, video surveillance records) or data, which are not likely to be used (for example, parameter data from aircrafts or autopiloted vehicles, which are usually used only in case of accidents) may be stored in more *centralized* systems.

Decentralized systems may store hash code from such "heavy" or rarely used data.

9.5 Environmental friendliness

9.5.1 Today, when users store the data in a distributed manner, different technological and economic mechanisms are applied to prove that the data are authentic. The examples of such mechanisms are Proof of Work, Proof of Stake.

The existing methods cannot ensure throughput capacity, which is necessary for the system. And the costs of computation capacity in the Proof of Work method are unreasonable. The system must provide users with an efficient and ecofriendly instrument of record verification.

9.5.2 The data verification method must comply with the principle of minimum computation capacity costs, which are needed for system maintenance.

9.6 Charge-free system

9.6.1 Today performing operations or storing data in public blockchains requires fee ("gas"). In part, this was done to avoid abuse of system resources or errors (for example, infinite algorithm loops).

9.6.2 But paying for a law system, which is universally available, contradicts the principle of universal availability itself. Although, perhaps, in theory some operations may be charged for, which is similar to paying state duties.

9.6.3 Another issue, which must be worked through, is creating alternative ways of protecting the system from overload. These ways must be free of charges for operations and storage.

9.7 No blockchain

Considering today's limitations of the blockchain, it may be reasonable to look for a solution not only in technologies, which are available today, but in the areas of economics and law. For example, if decentralization is ineffective from technical point of view, can economic or legal mechanisms demotivate unconscientious behavior of users, who control important data or software.

10 IDENTIFICATION AND ACCESS RIGHTS

The system needs a good balance of identification and privacy.

10.1 Necessity of identification

Identification allows to determine access rights to system functions and to the data, which are stored in the system (Section 10.3).

10.2 Level of identification

10.2.1 The main principle is that identification must be absolutely minimum necessary at each stage of user's work with the system. The system or other participants of legal relations must receive only the data, without which an operation or receiving information are impossible or dangerous. This is an approach, which is opposite to the one when the system provides the user with maximum amount of data when the user enters the system.

The same principle must be applied to a user's activity logging (recording history of his or her actions).

10.2.2 A significant part of functions must be available without any identification. For example, access to public data, which are stored in the system (legislation, incorporation documents).

10.2.3 Any additional identification is possible only after express user's consent. At the same time, if there is no user's consent, he or she does not get the necessary level of access to functions or data.

10.2.4 The system in real-time:

(1) notifies the user about any additional user information, which the system is currently handling (for example, when the user launches additional functions);

(2) requests user's authorization:

(i) for gathering his or her data form external devices (mobile devices, hard drives, cloud storages etc.);

(ii) digitizing actions, things and events (photo scanning, microphone recording, signals from mobile devices etc.).

The problem of how to conveniently provide users with different data for different levels of identification on each area of work with the system (as opposed to single provision the user with maximum amount of data) is solved on the interface level.

10.3 Access rights to system's data and functions

10.3.1 Since the information is entirely available to the system, we must be sure that access to it is granted only to entities, who or which are entitled to it.

10.3.2 Therefore, the system must include a possibility to set access rights for different elements of data and system's functions. The rights may be set:

(1) on the legislative level (public rules) for various types of information and functions. For example, information from open registers is visible to anyone, and the information, which is a tax secret, is available to a limited number of users;

(2) on the private rules level. Parties may set absolute confidentiality (with exceptions, which are set by imperative rules) or make the information open to specific users;

(3) on system level for a certain type of information. For example, legislation in its majority will be open to all users.

10.3.3 Access rights to information and functions may change with time. For example, some users may get new access to data based on court order.

11 LEGAL ISSUES

11.1 Express recognition of smart contracts

Formally, there are no conceptual preclusions for executing and performing the deals using smart contracts. But in practice difficulties with proving both the fact that the smart contract has been executed and its contents may occur.

Express recognition of smart contracts as contracts, which are executed in simple written (or, maybe, special) form is needed for the system to function fully.

11.2 System requirements, obligation of use

11.2.1 To be implemented, the system must be legalized as an element of the general law system. Among other things, passing legislative acts in machine-readable form must be permitted.

11.2.2 Each country will decide the level of obligation to use the system and its separate functions.

For example, obligation to execute certain deals (stock exchange) only through the system.

The scientific and business community must help to find the necessary level of obligation.

11.3 Co-relation of copies and actions in system and ex-system

When the system is implemented, a situation is possible when the data about an object or a rule are contained both in the system and out of it (for example, in external registers). If the data differ, priority of one data over the other must be set.

The same situation is probable if different controversial actions in parallel take place inside and ex-system (for example, passing a title to different entities).

Priority of information versions or different actions must be set on the legislative level (perhaps, in a discretionary form).

An alternative approach is possible, when, due to certain parameters, actions in the system or ex-system will be limited.

11.4 Possibility to challenge system's actions in court

Actions, which happen in the system, and their consequences do not require a special approach. Deals and obligations fall under the same classic institutes of nihility, good faith etc. For example, even if the deal was performed automatically, but shouldn't have been performed, — it can be nullified and the parties may be returned to their initial legal positions.

Procedural changes are also unnecessary. We can just go the standard way of judges' specialization. Technical problems (for example, analysis of contract code) may be resolved with the help of experts.

12 LIMITS OF AUTOMATION. ISSUES BEYOND CONCEPT. DELUSIONS

12.1 Principal limitations

12.1.1 In certain cases, automation of legal relations is impossible or difficult:

(1) if legal relations are bound to people's will (for example, subjective side of a violation) or to elements, which cannot be measured and digitized automatically (for example, a strike, a cartel agreement). Legal relations are influenced by the part of objective reality, which cannot be digitized —

(i) due to limitations of equipment (for example, when force majeure circumstances are being determined); or

(ii) peculiarities of obligations (for example, the ones bound to a personality);

(iii) action of legal rules, which are abstract and universal;

(2) when regulation depends on an unpredictable number of scenarios options. It's better to formulate a regulation as a basic principle, not to enumerate specific variants.

12.1.2 Besides principal limitations, certain negative consequences of automation can be determined:

(1) possible faults of automated systems;

(2) costs of purchasing, installing and service of automated systems;

(3) possibility of technology abuse.

12.2 Issues beyond concept

12.2.1 We have analyzed the main elements of universal automation in this concept. First and foremost, we studied them from the point of view of legal system and requirements to technology. But there are areas, which need additional research. That's why several questions were not covered in the concept.

12.2.2 Ethical issues, including:

(1) to what limits it is possible to exclude humans from automated law enforcement;

(2) on what principles will be based decision-making by machines;

(3) how to consider the infinite variations of life situations, which need human discretion. How to evaluate situations when 100 % execution of rules leads to negative consequences (for example, correlation of violations with concept of justifiable defense).

12.2.3 Social consequences, including significant reduction of humans, who are involved in the legal system.

12.2.4 Transformation of legislation architecture and of legislative process: implementing special requirements for trigger fixation, for definition of users etc.

12.2.5 Issues of Internet of Things (IoT) — data exchange standards, safety, obligatory parameters.

12.2.6 These issues should be evaluated separately and corrected in the process of particular developments in the area of automation.

12.3 Popular delusions

12.3.1 "Lawyers will be out of work"

This isn't so. Only the amount of work, which relates to routine functions, to understanding legislator's or contract parties' will, to rules interpretation, to taking part in resolution of certain disputes categories will decrease.

But there will be more expert work — forming new law concepts and actualization of existing institutes, regulatory acts development, review of complex matters and taking part in dispute resolution.

12.3.2 "Robots will replace the parliament"

Robot is generally not the right definition.

The basis for this delusion is that rules will not be formed by people at the beginning of the process. This is, obviously, incorrect. Regulation of legal relations (private, public) will be

based precisely on the will of people, who wish to coordinate their cooperation with each other.

12.3.3 "Law can be translated into code" / "Law cannot be translated into code"

Both statements are inaccurate.

The law's goal is to regulate human behavior.

In most cases, such regulation is a model of actions, which are allowed, of certain algorithms. This part may be translated into code, since it doesn't differ that much from the principles of software functioning. At the same time, a part of legal regulation doesn't fall under such algorithmization. There are concepts, which require human deliberation or his or her direct participation — fairness, reasonableness. Efficient description of such concepts by means of programming language is impossible or irrational.

12.3.4 "Blockchain has already automated everything"

Blockchain is more of an area of data storage and in some cases of smart contracts execution. Universal automation is wider. Blockchain is used as one of its important, but not fundamental elements.

13 COOPERATION

13.1 Projects for business

13.1.1 Our team develops automation projects for separate areas (categories of transactions) — we prepare the concept and requirements list, develop and integrate the necessary software.

13.1.2 Consultancy, audit

We consult about implementing automation technologies in law, audit existing processes for their further automation.

Contact us at corporate@automated.law

13.2 **Projects for state**

13.2.1 We analyze texts of legal acts, prepare recommendations for improving the architecture and interface of documents, their convenience for the end user, transparency of regulation. We develop technologies for systematization of legal acts, prepare them for placement in electronic systems and programs, which are used for automation of processes, approvals, etc.

13.2.2 We take part in development of regulatory acts, help to prepare the base for further automation.

13.2.3 We advise about automation of procedures, interdepartmental approvals. Both from the legal and technical sides. We develop, structure and supervise the work from idea to implementation.

13.2.4 We automate procedures, approvals, make them more convenient and attractive for users.

Contact us at government@automated.law

14 TEAM

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