CYBERNETIC CONTEXT OF IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN JUSTICE SYSTEMS

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ABSTRACT

With introduction of ChatGPT in 2022. and its superfast popularity, artificial intelligence systems became omnipresent in almost all aspects of our society. Mutually agreed expectation is that the implementation of artificial intelligence will radically improve and transform our way of life with huge economic gains.

Wide scale introduction of artificial intelligence solutions in justice systems would have an impact not just in a technological aspect but also in social aspects of society. One of the possible perspectives to achieve better insight of the prospective of implementation of artificial intelligence in justice systems is that of cybernetics, which provides the theoretical framework for explaining the creation and maintenance of order in various systems.

This article gives an overview of the concepts of cybernetics, as a study of the complex system based on information flows, then explains the big data concept in the context of justice systems and implementation of artificial intelligence. Legal system is presented as a set of business rules which, together with databases, represent the foundation for development of efficient artificial intelligence systems. The theoretical framework of the justice system is explained from the cybernetics perspective with an emphasis on current regulatory trends in both the European Union and The United States.

KEY WORDS

CLASSIFICATION

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INTRODUCTION

Artificial intelligence (AI) is gaining more popularity in every aspect of our lives, already beating humans in some areas such as reading comprehension, image recognition and language understanding [1]. Although AI is still not present or prevalent in justice systems around the world its introduction in justice systems is inevitable. Such inevitability is even recognized by the European union - in 2018 they adopted the European Ethical Charter on the use of Artificial Intelligence in judicial systems and their environment [2].

To implement AI solutions in justice systems it is necessary to consider the impact of legal AI solutions to the entire society. This is aligned with the obligation of judges to "learn about the environment and living conditions of judicial system users" aimed at increasing "knowledge of social groups and their dynamics so that their decisions can be based on those realities" [3; p.18]. Therefore, judicial decision making goes beyond pure and strict implementation of legal acts especially because not everything can be prescribed.

This article puts the justice systems and AI implementation in the context of cybernetics and stresses the importance of making a whole picture of socio-technical impact of introduction of new technologies. It explains the justice system as a set of business rules that are prerequisites for defining and design of any new information system. Furthermore, as cybernetics can be viewed as an explanatory framework of a large socio-technical system, AI implementation is explained through elements of socio-technical system.

CYBERNETICS AND THE LAW

Cybernetics can be viewed as a discipline of systems science with the purpose to explain goal-directed behaviour from the perspective of control and information [4; p.3]. As such, this concept can be applied to all systems, from organic systems to social systems. Father of cybernetics, Norman Winer, coined the term "cybernetics" based on the Greek word kubernētēs or steersman [5; p.15]. Cybernetics provides the theoretical framework for explaining the creation and maintenance of order in various systems. The crucial mechanism of maintenance of order is the management of feedback [6]. Cybernetics is the study of feedback and its influence on systems of interest. The essence of cybernetics can be depicted through cybernetic feedback loop, Figure 1.
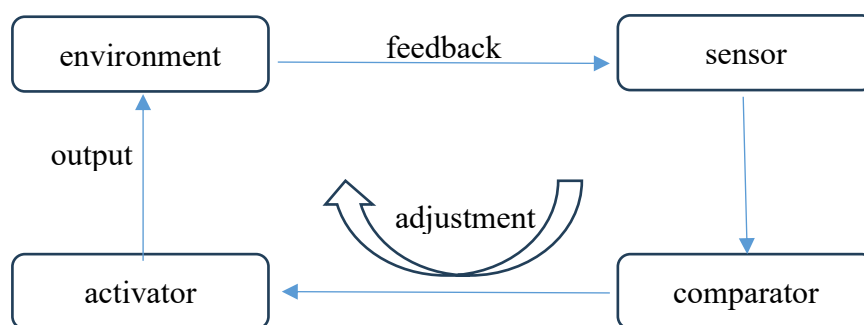

Figure 1. Cybernetic feedback loop [7].

Although cybernetics is usually viewed as a technical discipline, it can be said that it is complementary to the rule of law. Throughout history laws represented tools to impose order and control over societies and to "guide behaviour in a way that make complex relations more predictable" by giving "standards that people can refer to and means of making decisions" [8; p.12]. The bottom line is that while cybernetics deals with the nature of business rules, legal systems deal with the implementation of business rules (legal norms). Therefore, the cybernetic feedback loop that includes the justice system can be depicted as follows:

- the environment represents a society in larger sense that includes individuals, lobby groups and political parties,
- feedback is public opinion,
- sensors are members of the society that point out to possible issues that are consequence of activities of an individual or different social groups,
- comparator, usually government agencies, law enforcement bodies, etc. use information from the comparator to initiate necessary adjustment,
- activator, it this case judicial system, explains and implements the legal norms (business rules),
- output in a form of a judicial rulings and opinions influence the behaviour of the society who, if necessary adjusts the legal norms.

The potential of application of cybernetic principles in judicial system was recognized in the early 1960's by Kerimov [9]. Today, we can talk about the sub-discipline of cybernetics referred to as legal cybernetics. Legal cybernetics focuses on the judicial decision, or transformation in the cybernetic sense. In that context the judge makes a selection of relevant legal norms or precedents and applies specific content related to the given case, and finally identifies the legal consequences based on evidence and circumstances, Figure 2 [10].
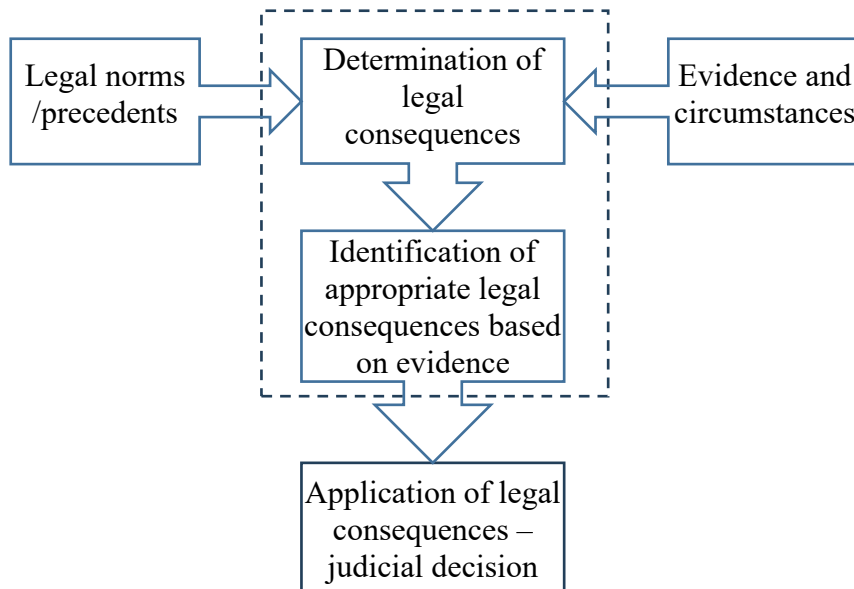

Figure 2. Logical structure of judicial decision making.

LEGAL SYSTEM AS A SET OF BUSINESS RULES

Business rules can be defined as a constraint that defines if something is under certain conditions. true or false [11; p.6]. For example, in MS Excel they can be expressed with conditional functions IF, AND, OR and NOT (latest three called Boolean logic operators). They can be divided into two general types [12], constraint rules and derivation rules.

CONSTRAINT RULES

Constraint rules represent a constraint condition that guarantees that certain conditions are met so that certain functions can be carried out. These rules can be further divided into stimulus and response rules, operation constraints and structure constraints. Stimulus and response rules are applied when predefined conditions are met. Operation constraint rules refer to conditions that must be true before and after the activity or operation. Structure constraint rules is a broader concept that represents the existence of relationship between two objects.

In legal terms the rules can be applied as follows:

- Stimulus and response rules – if the driver have passed red traffic light without causing an accident he should be fined XY amount of money and his driving license will be taken on the period of three months.
- Operation constraint rules – if the business has revenue of less than 1 million euro it will be taxed at a 10 % rate. If the revenue is larger than a million euro, then the business will be taxed at an 18 % rate.
- Structure constraint rules – only the active parties and the judge in the litigation can have an electronic access to court documentation.

DERIVATION RULES

Derivation rules are the outcome of a combination of constraint rules. In other words, they apply several different criteria for performing specific activities. Von Halle and Goldberg define derivation business rules as "an expression that evaluates facts, by means of a calculation or classification, leading to a new fact (i.e., conclusion)" (as presented in [13]). They can be subdivided into inference rules and computation rules. Inference rules are derived from constraint rules and after the validation that the specific facts are true, they lead to a particular conclusion. Computational rules are the result of algorithms. Again, in legal terms the rules can be applied as follows:

- Inference rules – inference rules are applied in common law systems through *res ipsa loquitur* doctrine – the thing speaks for itself. This doctrine is based on the premise "that circumstantial evidence of a particular kind can support a finding of liability" [14]. The best example would be that of medical negligence; if a surgical instrument is left inside a patient after surgery, the mere fact that the instrument was left inside the body can infer negligence without needing further specific evidence of the surgeon's actions.
- Computational rules – all cases that involve calculation of damages would be examples of computational rules. For example, in criminal cases, all calculations related to the value of tax frauds are based on computational rules.

ARTIFICIAL INTELLIGENCE, BIG DATA AND THE LAW

As discussed before, the essence of the legal system is the implementation of business rules. Business rules are represented by legal acts. These acts represent the legal norm, and it is expected that the principle of *iura novit curia* is applied. In other words, it is assumed that the judge knows the law while parties involved in the court case are in charge of providing facts (evidence) [15]. Here it must be noted that this principle traces its origins from Roman law although it is less present in common law jurisdictions [16].

BIG DATA

Court cases are sophisticated not just because of the abundance of evidence but also because of the quantity of legal acts that are the foundation for the rulings in civil law systems. At the European union level there are 8 types of legal acts, some of which are not mandatory: EU treaties, regulations, directives, decisions, recommendations, opinions, delegated acts and implementing acts [17]. Furthermore, every member state has its constitution, laws, bylaws and ordinances. Under such circumstances, can it truly be expected that the judge will know the entire legal framework that is the foundation for making judicial decision? Therefore, when discussing judicial decision making, we are discussing a big data problem.

In common law systems, the situation is even more comprehensive because judges have two roles, that of the decision maker and the role of the law maker. What this means is that in

common law systems the judge must base his decision on case law or precedents which tend to be high in volume [18]; to do that he must be able to access the database containing all of previous rulings. Again, we face a big data problem.

Big data can be defined as "the generation and accumulation of data beyond given processing capabilities to the point that users are overwhelmed by it" [19]. Because of this, almost impossible to count all the legal norms in power or the number of precedents. Furthermore, judges often face the issues of applying legal norms that are no longer in power anymore which enlarges the set of rules that judge needs to be aware of to apply them to specific court cases. Therefore, legal norms and precedents fulfil the criteria of the three Vs of big data: volume, velocity and variety [20]. In other words, the quantity of legal norms and presented facts in the court case are beyond human processing capabilities. Consequences of the big data problem are that trials usually last long; either they require time for judges to navigate through the legal framework and presented facts or the trial is repeated based on appeal.

AI AND THE LEGAL PRACTICE

Artificial intelligence can be described as a system that displays "intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals" [21; p.19]. Although litigation and legal jobs are primarily based on human based work, according to the study on use of AI in legal practice carried out by The British Institute of International and Comparative Law, AI is already present in seven areas of legal work: e-discovery, automation of the documents, predictive analytics, legal review, case management tool, automation of legal advices and expertise and knowledge management and marketing [22; p.2]. In spite of these abilities, AI is still not widely present in legal firms; only 3 % of law firms in the US, UK and Canada use ChatGPT/generative AI for firm operations, and 60 % do not even consider to use it in the near future [23; p.12]. On the other hand, 67 % of 1200 individuals from North and South America and UK working in the legal, tax & accounting, global trade, risk, and compliance fields stated that generative AI will have a high and transformational impact in their field with law firms prioritizing productivity as their main concern [24]. It must be stressed that although AI systems in judicial systems or legal practices are humbly used, there are already several generative AI tools present on the market:

- Westlaw Precision for legal research with CoCounsel AI legal assistant [25],
- Lex Machina legal case analytical tool and trend predictor [26],
- Everlaw Assistant - able to make first drafts and depositions with argumentation [27],
- Harvey AI – large language model (LLM) system aimed at assisting lawyers in legal research [28].

CYBERNETIC VIEW OF AI IN THE LAW

Artificial intelligence systems, in essence are highly sophisticated information systems and as such they represent a tool that simply aids humans in their work. That aid goes beyond simple automation of routine activities. Automation of legal advice and case management tools require a system with intelligent behaviour. In legal professions that is not enough. What is necessary is human supervision, where the human has a steering role. In the near future humans will have an inevitable role in legal practice despite the increased role of AI, primarily because of rising ethical and moral issues related to use of AI technologies. It can be expected that legal professionals will start working as members of human-agent teams sharing tasks with AI systems [29]. That situation will lead to the transformative role of AI. Narrowly viewed, certain level of job loss in different sectors and legal systems can be expected, but from the societal perspective, the application of AI in legal sectors will lead to job shifting [30] consequently creating new jobs, predominantly in the IT sector.

Taking the cybernetics perspective on AI, its implementation beyond a pure technical or engineering perspective should be considered as a part of a larger socio-technical system. The entire socio-technical system is comprised of number of elements including "technology, science, regulation, user practices, markets, cultural meaning, infrastructure, production, and supply networks" [31]. Therefore, implementation of AI systems in justice systems has a much broader impact than just making the legal system more efficient. Widely known maxim, "Justice delayed is justice denied", directly affects user experience and perception of fairness of the justice system [32]. Therefore, the inefficiency and slowness are primary reasons for the mistrust in the justice system [33]. In that manner, implementation of AI in justice system should be aimed at increasing efficiency.

Development of a large-scale AI solution for justice systems technically is the same as development of any other LLM's and it is called training. Some authors propose training of LLM's in three phases: data collection and processing, the pre-training process, and fine tuning and alignment [34]. But more appropriate is the six-step methodology suggested by Suresh and Guttag that consists of data collection, data preparation, model development, model evaluation, model post-processing and model development [35].

Apart from the LLM developmental phases, implementation of AI in justice systems requires intervention in all other elements of socio-technical systems. First off, all business rules should be transformed, and regulatory framework should be adapted to all possible uses of intelligent systems in civil and criminal cases that directly influence user practices. For example, cases related to minor violations such as traffic violations can be fully automated. Such implementation would reshape justice system markets as the consumers (parties in civil and criminal cases) would become more demanding. Research on implementation of AI in accounting services points out that clients will "expect services to be more cost-effective, faster, and more efficient. These expectations will be paired with clients setting a higher bar for cybersecurity and compliance" [36]. According to the same research, accountants fear that introduction of AI will diminish personal touch with the clients and degrade skills of the professionals.

Increasing efficiency should be implemented through transformation of business rules through:

- Transformation of user practices – how stakeholders (lawyers and judges) do their jobs. I.e. AI systems could be used to automate writing minutes from trial sessions and coordination of online trial sessions.
- Transformation of production and supply networks – the process of collecting evidence, necessary facts and making court filings according to collected facts.
- Update of regulatory framework – this is maybe the most challenging element of a socio-technical system because it raises not only legal but also ethical issues. As such, it can pose the biggest barrier to widespread introduction of AI to justice systems. The complexity of defining appropriate regulatory framework for introduction of AI systems can be best presented on the example of introduction of autonomous vehicles that are still not commercially present on roads in most parts of the world mainly due to non-existent unified regulation related to use of the unmanned vehicles [37]. Here it must be stressed that the judicial system is more sophisticated and has a much bigger impact to society as a whole.

Infrastructure is another element that consists of all necessary physical resources that are needed for a functioning socio-technical system [38]. Although it is a crucial prerequisite for the implementation of AI in justice system, infrastructure is developed independently due to a surge in general data demand. Such a surge can be directly related to the usage of LLM's, such as ChatGPT, that reached one million users in only five days [39]. To put that in data perspective – a complex information system for medical radiology bases it's functioning on approximately 300 million parameters while LLMs like ChatGPT need at least a trillion

different parameters to function as expected [40, 41; p.4]. Such data processing requirements can be served adequately only by server farms or by distributed systems. Apart from increased computational demands, increased use of generative AI puts the pressure also on network bandwidth, security measures, power supply, and distribution network [42].

Market elements of socio-technical system solutions is closely related to cultural meaning. AI market is expected to rise to total of 1811,8 billion USD by 2030. This increase will greatly impact the Chinese economy at a total of 26,1 % GDP, then North America (14,5 % of GDP), Southern Europe (11,5 % of GDP) , developed Asia (10,4 % of GDP), and then Northern Europe (9,9 % of GDP) [43]. In other words, it can be said that among developed countries around the world AI systems have the most acceptance in China and the least acceptance in Europe. The reasons for that can be traced to more a conservative approach to general legislation related to information technologies. In that manner, EU recently endorsed the Artificial Intelligence Act – universal regulatory framework for general implementation of AI in all EU member states [44]. The emphasis of that act is the protection of public interest through setting strict AI implementation standards.

So far, the US does not have such comprehensive federal regulation; although there is a number of proposed laws related to the regulation of use and development of AI [45]. It is important to mention that in the US the White House Office of Science and Technology Policy published The Blueprint for an AI Bill of Rights that is "a guide for a society that protects all people" from AI threats [46]; but that Blueprint is not enforceable by law or in any way legally binding. On October 30 2023 president Joe Biden issued the Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence [47], that is aimed at regulating the implementation and responsible use of AI, but it is not as strict as the Artificial Intelligence Act, especially because it lacks data privacy regulatory framework [48]. Because the laws are a consequence of societal values, they do not represent just regulatory framework of sociotechnical system but also the cultural one. Together, these two elements define the prospects of the market. Referring to the justice systems, it can be expected that introduction of AI would be slow because of cultural elements, with better acceptance in Common law systems (like the USA) than in Civil law systems (like Europe). This is also evident through the number of AI-related bills passed into law where the USA is the leader [49; p.267].

Based on all socio-technical elements, it can be concluded that the large scale introduction of AI in justice systems will be slow primarily due to social elements of the system. Another reason for slow introduction of AI in judicial systems lies in insufficient theoretical research of the relationship between the law and information systems where current research is focused mainly to organizations and not to the macro level [50]. Furthermore, the legal profession is conservative because the functions of lawyers and judges "are those of conservators of certain values of the past which have proved to be worthy of preservation" [51].

CONCLUSION

With the emergence of LLMs and sudden widespread use of generative AI systems in many different fields, AI is often viewed as a solution to all problems with the prospects of improving and ultimately replacing work of many professionals. Implementation of AI in justice systems offers the same opportunities but there are still many obstacles resulting from the social side of justice systems to overcome. Apart from transformation of existing business rules on which justice systems are based, the major efforts should be aimed at facing the non-technical issues of AI implementation such as fear of AI, conservativism of legal experts, and making appropriate regulatory framework. Consequently, it can be expected that the justice systems will be among the last areas of human activity to join the AI revolution.

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