The Use of Computational Tools in Criminal Proceedings in Brazil: A Proposal for a Technological Model to Contribute to the Speed-Up of Cases Involving Persons Imprisoned Without Final Conviction

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Brazil's National Council of Justice (CNJ) records qualitative data regarding procedural slowness. Meanwhile, the National Penitentiary Department System (SISDEPEN) provides quantitative data on the incarcerated population in Brazil. An analysis of the use of computational tools that could contribute to expediting proceedings for imprisoned persons may open new approaches and contributions applicable to judicial processes. The analysis of government and judicial data, combined with a review of the scientific literature, appears promising in the search for tools to assist the judiciary in decision-making, with a particular emphasis on those detained on a provisional basis. In this context, the development of a technological model could analyze millions of cases against specific legal variables and present judges with potential situations eligible for the granting of liberty—whether provisional or otherwise—thus contributing to procedural efficiency.
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In Brazil, in the second half of 2023, there were 644,316 incarcerated individuals, of whom 175,279 were provisionally detained—that is, persons without a final judgment. Thus, provisional detainees represented 27.20% of the total prison population, approximately one-third of the total inmate population [1]. Conversely, those incarcerated with a final judgment—therefore serving sentences in a closed regime without authorization to leave the prison unit temporarily—totaled 344,649 [1]. Comparing the number of those serving final sentences in a closed regime with those provisionally detained, the percentage rises to 53.49% [1].

However, the challenge lies in analyzing a universe of 175,279 cases (as of the second half of 2023), which yields an average of 6,491 cases per state of the federation [1]. The Brazilian judiciary, however, faces a scenario of slowness, as indicated by studies from the National Council of Justice (CNJ). As of October 27, 2023, the council's ombudsman had recorded 31,714 submissions [2].

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Of these, 22,123 were complaints about delays in case processing, corresponding to 69.67% of submissions [2]. This is highly relevant, since the CNJ, in setting its goals for 2024, established celerity as its top priority through the Justice 4.0 program [2].

In this context—with many people incarcerated while awaiting trial and a considerable volume of complaints about the system's sluggishness—the following question arises: Which initiatives and experiences in the use of technology have been applied within the Brazilian justice system to optimize processes? In seeking to answer this question, the challenge is to present a conceptual model capable of integrating data from different information systems on millions of criminal cases, in order to analyze and identify cases with potential for closure or those in which the law authorizes awaiting the outcome at liberty.

Materials and Methods

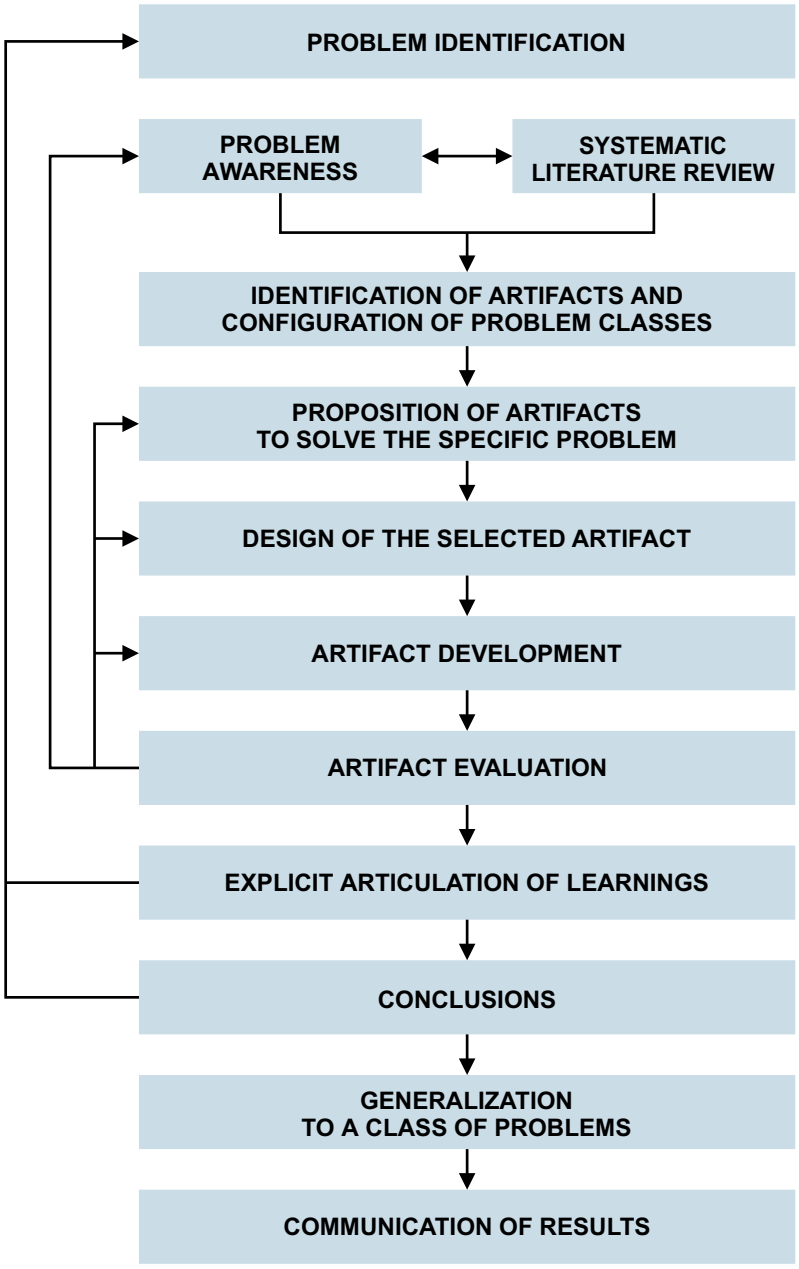
The method involves analyzing data from SISDEPEN, which records information on sentence execution, preventive detention, and security measures applied to individuals under custody in Brazil's penal system. These data are consolidated by the CNJ and published in annual reports. Thus, the research will investigate the

problem using official Brazilian data, which is fundamental for developing the research method.

Another key element for developing the research method will be the analysis of relevant scientific works on the topic. In a preliminary search, using the Scopus portal with the terms "artificial intelligence," "justice," and "criminal" applied to the "abstract" field, 352 results were found. Using the same criteria in the Web of Science portal yielded 125 results. The choice to use English terms stems from the need to encompass the most significant possible number of publications, which are generally disseminated in that language.

The results are subjected to a literature review analysis method, possibly employing the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. After reviewing the scientific output, the research

Figure 1. DSR method [3].



will develop a technological model to identify the thousands of criminal proceedings involving persons imprisoned without a final conviction and to cross-reference them with the numerous legal criteria and requirements that may allow a judicial grant of provisional or definitive liberty, thereby presenting elements to assist judges in decision-making.

The development of this technological model will follow the Design Science (DS) methodology, using the Design Science Research (DSR) method. This method aims to consolidate knowledge about designing solutions for existing systems, solving real problems by developing new solutions. To this end, Design Science employs the concept of artifacts, which refer to the products to be developed [3]. Figure 1 details of the DSR method [3].

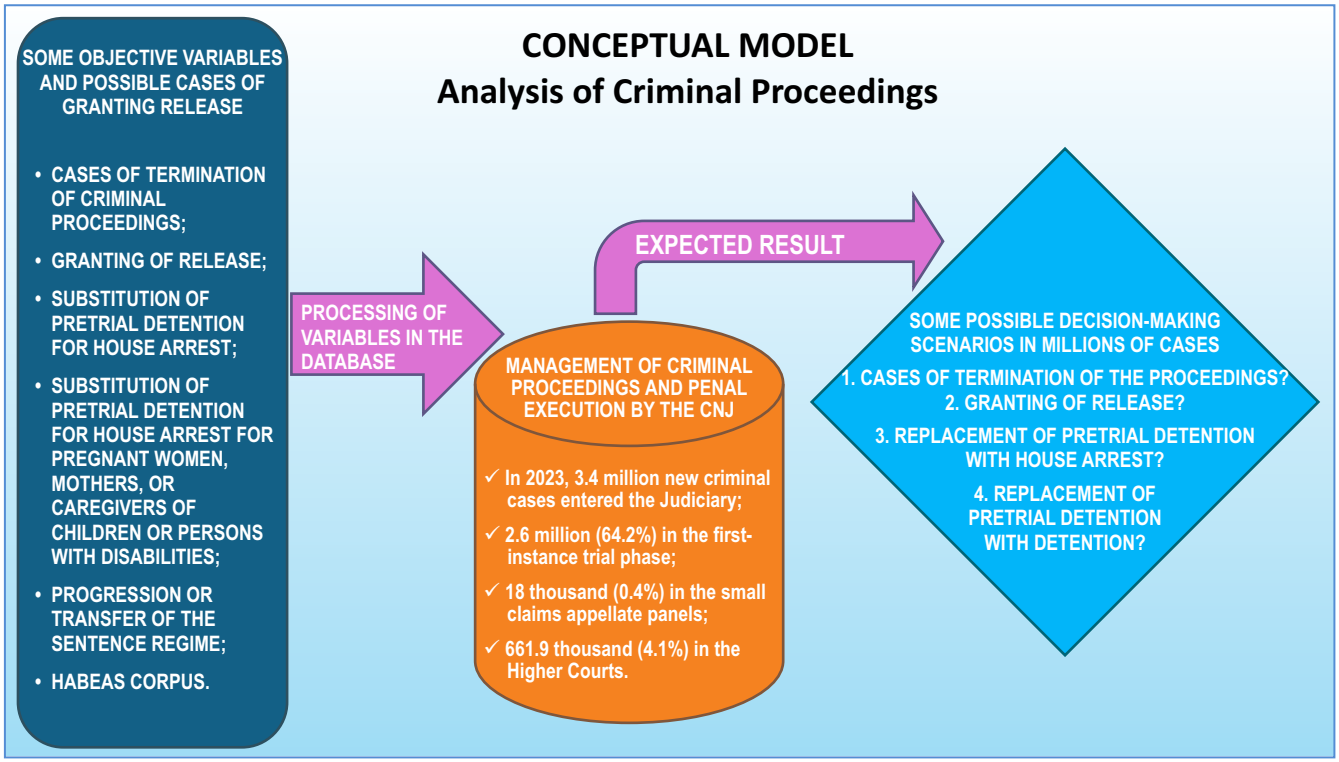
Theoretical Foundation

The conceptual model mentioned in the meth is illustrated in Figure 2 and is designed to integrate certain variables under which Brazilian legislation authorizes procedural actions, in accordance with the legal criteria outlined in the Federal Constitution [4], the Penal Code [5], the Code of Criminal Procedure [6], and the Law of Criminal Executions [7]. Examples include: extinction of criminal proceedings; the granting of provisional liberty to await the outcome; replacement of preventive detention with house arrest; replacement of preventive detention with house arrest for pregnant women, mothers, or persons responsible for children or people with disabilities; progression or transfer of the sentence-compliance regime; and habeas corpus for granting provisional liberty in the face of an arrest that has become illegal.

Conclsuion

The technological model, as shown in Figure 2, emerges as a way to analyze numerous variables

Figure 2. Conceptual model for the analysis of criminal proceedings [8].



of objective criteria (legal determinations of a general and abstract nature, applicable to society at large without distinction) and subjective criteria (applicable to concrete cases, individualizing persons according to the principle of individualized sentencing) using data from thousands of cases involving individuals imprisoned without a final conviction.

The expected result is that the model will help save staff time in the criminal justice system by reducing the manual analysis of cases involving provisional detainees. This would produce procedural celerity and, consequently, contribute to reducing the number of incarcerated persons awaiting trial—thus serving as another instrument to improve the delivery of judicial services in Brazil.

References

1. Brasil. Ministério da Justiça. Secretaria Nacional de Políticas Penais. Sistema de Informações do Departamento Penitenciário Nacional – SISDEPEN; 2023. Available at: https://www.gov.br/senappen/pt-br/servicos/sisdepen
2. Conselho Nacional de Justiça. Relatório Anual 2023. Brasília: CNJ; 2024. Available at: https://www.cnj.jus.br/wp-content/uploads/2024/02/relatorio-anual-v-10-2024-01-25.pdf
3. Dresch A, Lacerda DP, Junior JAV A. Design science research: método de pesquisa para avanço da ciência e tecnologia. Porto Alegre: Bookman; 2020.
4. Brasil. Constituição da República Federativa do Brasil de 1988. Brasília, DF: Diário Oficial da União; 5 out 1988. Available at: http://www.planalto.gov.br/ccivil_03/constituicao/ConstituicaoCompilado.htm
5. Brasil. Decreto-Lei nº 2.848, de 7 de dezembro de 1940. Código Penal. Brasília, DF: Diário Oficial da União; 31 dez 1940. p. 23911. Available at: https://www.planalto.gov.br/ccivil_03/decreto-lei/del2848compilado.htm
6. Brasil. Decreto-Lei nº 3.689, de 3 de outubro de 1941. Código de Processo Penal. Brasília, DF: Diário Oficial da União; 13 out 1941. Available at: https://www.planalto.gov.br/ccivil_03/decreto-lei/del2848compilado.htm
7. Brasil. Lei nº 7.210, de 11 de julho de 1984. Institui a Lei de Execução Penal. Available at: https://www.planalto.gov.br/ccivil_03/leis/l7210.htm
8. Conselho Nacional de Justiça. Justiça em Números 2024. Brasília: CNJ; 2024. Available at: https://www.cnj.jus.br/wp-content/uploads/2024/05/justica-em-numeros-2024-v-28-05-2024.pdf