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ARTICLE

Law as a Design Science

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Abstract

This Article advocates for conceptualizing law as a design science, with a comprehensive approach that integrates formal, explanatory, and design dimensions of legal knowledge. By embracing the empirical aspects of legal scholarship, this perspective challenges the traditional image of lawyers as solely reliant on linguistic constructs. Instead, it positions them as social engineers capable of shaping legal norms and interpretations in alignment with societal needs. Through analysis and illustration of its application in diverse factual contexts, the Article underscores the necessity for this evolution in contemporary legal scholarship, particularly as teleological interpretation gains prominence in legal practice.

Keywords: Legal interpretation; legal theory; egal epistemology; Teleological Interpretation; legal design

A. Introduction

An excessive focus on legal doctrine at the expense of empirical research risks alienating legal scholarship from society.[1] Signs of this potential misalignment can be observed in contemporary legal practice, with the growing preference of law firms for graduates from non-law disciplines[2] and the declining demand for legal professionals,[3] a phenomenon exacerbated by the rise of artificial intelligence.[4] This Article aims to address this disconnect by suggesting the concept of the "design proposition" as a key output of legal research.[5] A design-based approach to legal science integrates socio-legal and natural-legal design and explanatory knowledge, fostering a teleological interpretation of the law. Design science builds upon "explanatory science," which aims to develop knowledge by means of empirical description, explanation, and prediction. In turn, explanatory science rests on "formal science"—in our case, legal doctrine—which offers the necessary

[1]A. Benjamin Spencer, *The Law School Critique in Historical Perspective*, 69 WASH. & LEE L. REV. 1949, 2041 (2012).

[2]*Non-Law Open Day*, BAKER MCKENZIE, https://www.brightnetwork.co.uk/graduate-events/baker-mckenzie/non-law-open-day-baker-mckenzie (Oct. 19, 2020) (establishing that Baker Mckenzie was recruiting as much as 50% of its annual entry among non-law graduates).

[3]Jeffrey W. Stempel, *Lawyers, Democracy and Dispute Resolution: The Declining Influence of Lawyer-Statesmen Politicians and Lawyerly Values*, 5 NEV. L. J. 479, 480 (2004); Richard L. Abel, *'You Never Want a Serious Crisis to Go to Waste': Reflections on the Reform of Legal Education in the U.S., U.K. and Australia*, *in* LEGAL EDUCATION AT THE CROSSROADS 3, 5 (Avrom Sherr et al. eds., 2017); Angela Melville, *It is the Worst time in Living History to be a Law Graduate? Or is it? Does Australia Have too Many Law Graduates?*, 51 THE L. TCHR. 203, 203 (2017); Tanaka Masahiro, *Japanese Law Schools in Crisis: A Study on the Employability of Law School Graduates*, 3 ASIAN J. OF LEGAL EDUC. 38, 45 (2016).

[4]Rebecca Kunkel, *Artificial Intelligence, Automation, and Proletarianization of the Legal Profession*, 56 CREIGHTON L. REV. 69, 77 (2022).

[5]Joan Ernst Van Aken, *Management Research as a Design Science: Articulating the Research Products of Mode 2 Knowledge Production in Management*, 16 BRITISH J. OF MGMT. 19, 29 (2005).

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conceptual understandings. Law as a formal science, law as an explanatory science, and law as a design science, can be seen as a nested structure of interconnected approaches. They build upon each other, with a feedback loop reinforcing their interrelation.

The purpose here is not simply to advocate for the conceptualization of law as a "design science"because others have taken similar conceptualizing steps before—like the legal realist school—and indeed contemporary critical legal theory already engages with design thinking across the different legal domains. Furthermore, some of the legal-adjacent disciplines, such as criminology, regulation, and gender studies, naturally incorporate design science methodologies and conceptions. The scope of this Article is not merely propositional, but instead it seeks to couple the conception of law as a design science with a theory of legal doctrine that places teleological interpretation at its core, something that has not been addressed by legal scholarship thus far. Drawing on sociological theory and real-world examples, it is illustrates the heightened importance of teleological interpretation in contemporary societies. I argue that to maintain the logical coherence of modern legal systems, teleological interpretation must be supported by design propositions that are grounded in both explanatory *and* formal scientific approaches.

The Article is organized as follows: *First*, the design approach to legal science is situated within its theoretical context. *Second*, the importance of having a design-based approach in legal scholarship is examined. *Third*, three primary modes of legal research are outlined: As a formal science, as an explanatory science, and as a design science. *Fourth*, the nature of the field tested, heuristic, and grounded design propositions is explored as the ultimate output of legal knowledge. *Fifth*, a discussion addresses potential objections to the conceptualization of law as a design science. *Finally*, the main conclusions are synthesized.

B. Theoretical Context and its Development

Legal doctrine, a formal science focused on describing and systematizing legal norms, enhances and refines the logical consistency of legal systems. However, it often overlooks the empirical aspect of how these systems interact with social and natural realities. The prevailing image of lawyers, as detached from empirical realities although deeply entrenched in doctrinal frameworks, reflects the conservative perception frequently associated with the legal profession. This conservatism manifests among those who emphasize the value of historically rooted norms, as exemplified by Savigny's school, as well as those who advocate the value of overarching, enduring principles, akin to Bentham's systematic school. Both traditional perspectives focus on the past, either through long-standing or codified norms, although a more dynamic view of law emerges when seen through a designer's lens. From this viewpoint, law is not merely a reflection of historical norms or general principles, but a proactive tool crafted to address present and future societal challenges. This forward-looking perspective aligns with Harold Laswell's policy-oriented jurisprudence,[6] accentuating the strategic role of law in achieving specific policy objectives and shaping societal progress.

Despite law's longstanding recognition as a construct shaped by human intent, a "design" perspective has yet to be fully integrated into mainstream legal scholarship. This is true even though law's empirical, designable nature has been emphasized both within and beyond the legal epistemic community: Lon Fuller likened the lawyer to an architect,[7] although Herbert Simon placed law among the "design disciplines."[8] By the late 19th century, Oliver Wendell Holmes had already argued that law serves as a tool for achieving social objectives, suggesting that understanding law requires insight into social conditions.[9] Holmes even believed that legal studies'

[6]Harold D. Lasswell & Myres S. McDougal, *Criteria for a Theory about Law*, 44 S. Cal. L. Rev. 362, 392 (1970).
[7]Lon L. Fuller, The Principles of Social Order: Selected Essays of Lon L. Fuller 269 (Kenneth I. Winston ed., 1982).
[8]Herbert A. Simon, Sciences of the Artificial 111 (1996).
[9]Richard A. Posner, *The Decline of Law as an Autonomous Discipline: 1962-1987*, 100 Harv. L. Rev. 761, 762 (1987).

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future lay with economists and statisticians rather than the traditional "black-letter" scholars.[10] His vision began to materialize with the *Brandeis Brief*,[11] which underscored the value of explanatory information in litigation. In light of this, Roscoe Pound envisioned jurisprudence as "a science of social engineering."[12] This concept was later advanced by the legal realism, especially with Karl Llewellyn[13] and the Lasswell-McDougal school of law as policy.[14] In particular, Lasswell and McDougal identified the teleological orientation of legal systems, together with the dynamism and complexity of society, as grounds warranting a design approach to legal science.[15] These dynamics have only intensified since the time when these insights were articulated, reinforcing law's role as a policy instrument in a continually evolving world that demands expertise in managing interactions with both social and natural systems.

More recently, there has been a reflection on the idea of lawyers as "professional knowledge engineers," put forward by Richard Susskind[16] and David Howarth.[17] The latter, in particular, noted the high degree of uncertainty lawyers face in their problem-solving activity[18]—a logical consequence of the increasing complexity and volatility of natural and social systems—highlighting the need for more empirical knowledge on the *effects* of legal norms and principles. Unlike engineers, however, lawyers often incompletely theorize the potential impact of their "devices"—norms enshrined in statutes, regulations and contracts; and dispositions, rights and obligations, embodied in administrative acts, judgements or other legal acts—relying instead on implicit and poorly grounded assumptions.

Although the idea that law can function as a policy tool is broadly accepted, the design approach to law struggles to offer a viable alternative to formalism that allows lawyers to engage in empirically-informed normative reasoning.[19] The formalism underlying legal doctrine has a strong inertia. Legal studies are either doctrinal, addressing law as a linguistic system, or critical, broaching the legal norms as propositions that need to be changed. However, there is not an *integrative* perspective underscoring the functional empirical nature of law as part of a proper legal linguistic system. This Article seeks to address this gap by exploring the interplay between law as a formal science, law as an explanatory science, and law as a design science. The growing significance of teleological interpretation in contemporary legal practice provides the crucial hinge needed to bridge traditional formal legal doctrine with the empirical approach of a design-oriented legal theory.

At first glance, a design science approach seems useful for the formulation of legal norms, conceived as policy tools. As such, its value is readily apparent for rule-makers. However, with the

[10]Oliver Wendall Holmes, Jr., *The Path of the Law*, 10 HARV. L. REV. 457, 469 (1897).

[11]*See* Phillipa Strum, *Brandeis and the Living Constitution*, *in* BRANDEIS AND AMERICA 120 (Nelson L. Dawson, ed. 1989).The Brandeis Brief marks an instance where, instead of relying predominantly on legal references, a legal brief drew extensively from a compilation of scientific information and social science literature. Named after the then-litigator and later associate Supreme Court Justice Louis Brandeis, it played a pivotal role in the 1908 -US- Supreme Court case *Muller v. Oregon*. Presented in advocacy of a state law that sought to limit the working hours for women, the Brandeis Brief had over 100 pages, with only two dedicated to legal argumentation. The bulk of the document comprised testimonies from medical professionals, social scientists, and male workers. Their collective argument centered on the detrimental impact of extended work hours on the health of women. Emphasizing empirical evidence over traditional legal citations altered the trajectory of the United States' Supreme Court.

[12]ROSCOE POUND, INTERPRETATIONS OF LEGAL HISTORY 152 (1967).

[13]Karl Llewellyn, *A Realistic Jurisprudence – The Next Step*, 30 COLUM. L. REV. 431, 458 (1930).

[14]Harold D. Lasswell & Myres S. McDougal, *Jurisprudence in Policy-Oriented Perspective*, 19 FLA. L. REV. 486, 499—500 (1966).

[15]*Id.*

[16]RICHARD SUSSKIND, THE END OF LAWYERS? RETHINKING THE NATURE OF LEGAL SERVICES 272 (2012); RICHARD SUSSKIND, TOMORROW'S LAWYERS 135 (2023).

[17]DAVID HOWARTH, LAW AS ENGINEERING: THINKING ABOUT WHAT LAWYERS DO 3 (2013).

[18]*Id.* at 82.

[19]Joseph William Singer, *Legal Realism Now*, 76 CALIF. L. REV. 465, 468 (1988).

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growing prominence of teleological interpretation, the design scientific approach also becomes vital for doctrinal interpretation. Since Savigny's seminal work, legal scholarship has recognized teleological interpretation as a criterion for elucidating the meaning of legal texts.[20] This approach involves giving meaning to norms in a manner that best achieves the law's intended objectives—*telos*—going beyond the literal meaning of the words that enunciate the norm. As such, it entails a "meta-interpretation" of the norm within its systematic and rule-making context, in the light of constitutional and legal principles, understood as objectives to be optimized.[21] The "goal" of the norm is not just the immediate empirical change that it aims to bring about—for instance, ensuring a certain level of core capital in banks, for a banking regulation framework—but the broader normative principles that inspire and determine the legal preference for that empirical situation—for example, the stability of the financial system. This form of interpretation can be subjective or objective. Subjective teleological interpretation inquires into the purpose of the norm as intended by its author, while objective teleological interpretation refers to the intent implicitly embedded in the legal system's principles and the norm's functionality.[22]

Council Directive 93/104/EC and its interpretation by the Court of Justice of the European Union (CJEU) in the *SIMAP* case[23] illustrate these concepts. Article 2 of the Directive defined 'working time" as any period during which the worker is at the employer's disposal.[24] A key issue was whether this definition included on-call time outside the workplace. The CJEU concluded that it did not, reasoning that time outside the workplace blends with personal time, making it difficult to clearly differentiate between working periods, subject to health hazards—which the Directive aimed to protect—and the rest of the time—which would be "private time" falling outside the Directive's scope.[25] From a subjective teleological perspective, this interpretation aligned with the recitals of the Directive, particularly four, five, and seven, which emphasized safeguarding workers' health and safety. From a teleological objective perspective, the interpretation was also supported by the legal principles of the 1961 European Social Charter and the 1989 Community Charter of the Fundamental Social Rights of Workers, which underscore the protection of workers' health and safety.[26] The teleology of the norm helped the legal interpreter to elucidate its meaning. However, a question lingers: What scientific knowledge did exactly justify the assumption that on call time outside the workplace allows the worker to rest and protects his health and safety? Is there empirical research showing that being on call outside the workplace enhances safety? What about mental health, do stress levels change when the worker is at home? Is there necessarily a mental disengagement at home that preserves mental health? Those are questions that can only be answered with design knowledge. Something that the CJEU did not do.

The design science approach assumes that legal norms are intended to achieve specific social effects and serve as tools to accomplish societal goals.[27] This aligns with a legal ontology defined by function rather than form.[28] The functionalist approach vindicated here assumes that legal norms are intrinsically sentences of practical import, oriented to prescribing an action. This perspective

[20]Joachim Rückert, *Friedrich Carl von Savigny, the Legal Method, and the Modernity of Law*, 11 Juridica Int'l 55, 59 (2006).

[21]Robert Alexy, *On the Structure of Legal Principles*, 13 Ratio Juris 294, 294–304 (2002) (providing an analysis in line with Robert Alexy's understanding).

[22]Aharon Barak, Purposive Interpretation in Law 88 (Sari Bashi trans., 2005).

[23]Case C-303/98, Sindicato de Médicos de Asistencia Pública (Simap) v. Conselleria de Sanidad y Consumo de la Generalidad Valenciana, ECLI:EU:C:2000:528, ¶ p. 61 (Oct. 3, 2000), http://curia.europa.eu/juris/liste.jsf?num=C-303/98.

[24]Council Directive 93/104, 1993 O.J. (L 307), art. 2 (EC).

[25]Case C-303/98 Simap, ECLI:EU:C:2000:528, ¶ 26.

[26]European Social Charter, art. 3., Feb. 26, 1965 C.E.T.S. 35; Community Charter of the Fundamental Social Rights of Workers, art. 19 Oct. 30, 1989, 6 U.N.T.S. 90.

[27]Martin Krygier, *The Concept of Law and Social Theory*, 2 Oxford J. Legal Stud. 155, 166 (1982); Joseph Raz, *On the Functions of Law*, *in* Oxford Essays in Jurisprudence 9, 287 (A.W.B. Simpson ed., 1973).

[28]Bronislaw Malinowski, *Introduction*, to Law and Order in Polynesia 17, 18 (Bronislaw Malinowski ed., 1934).

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recognizes that the significance of law is determined by its practical consequences.[29] In fact, norms are "ought-to," performative utterances, different from the "is" type of statements—constative utterances.[30] Unlike propositions, norms are not descriptively true or false, because they do not purport to describe anything, but to prescribe.

It is important to clarify that the concept of "law" is understood here in accordance with Niklas Luhmann's theory of autopoietic systems, operating with its own binary code of legality and illegality, remaining functionally autonomous but structurally coupled with other systems.[31] In our case, we are interested, first, in the social and natural systems that produce the factual situations that come to be legally qualified. Second, in the epistemic systems that explain, predict, and offer designs of efficiency maximization in those social and natural systems. Law structurally couples with the social and natural systems to produce dispositions—specific rights and obligations. I argue that law must couple with other epistemic systems in order to, not only to maximize its efficiency as a policy tool, but also its logical coherence. This conceptualization of law is instrumental, in great part captured by the metaphor of the policy tool,[32] while it keeps its character as a self-referential system of logical coherence. I set aside other aspects of law, such as its communicative action value as a medium of societal integration, shaped by rational argumentation and democratic processes,[33] or its importance as a repository of the society's moral values, reflecting and building ethical beliefs and standards. In sum, I stick to the legal positivist tradition, separating, *for the purpose of analysis and clarity*, law from morality.[34]

C. The Importance of Law as a Design Science

Why is it convenient to approach law as a design science? First, because law is inherently purposive, aiming at fulfilling specific objectives.[35] As such, it is malleable, subject to human design, both in its formulation, because the rule-maker exerts political or administrative discretion, and its interpretation, because judicial discretion is most often enabled by the "open texture" of legal language.[36]

Second, in a rapidly changing and entropic social and natural context, law cannot simply be conceived as a reflection of historical norms or immutable principles of justice. Instead, it must be fathomed as a dynamic tool crafted to proactively address and resolve present and future societal challenges. Upcoming social problems and opportunities cannot be properly addressed just by recombining previous solutions to previous problems in a syllogistic manner, as generative artificial intelligence would do. A forward-looking perspective emphasizes law's strategic role in achieving policy objectives, tackling emerging issues, and shaping the trajectory of societal progress. By virtue of its forward-looking perspective, the design legal approach offers a comparative advantage over generative artificial intelligence, contributing to overcome some of the challenges that it poses to the legal profession.

Third, and this is one of the key assertions of this Article, design knowledge is necessarily used when carrying out a teleological interpretation of the law. Although a fact becomes legally qualified when its occurrence can be subsumed into the literal sense of the legal norm—*cum in verbis nulla ambiguitas est, non debet admitti voluntatis quaestio*—[37] this literal subsumption can

[29]Brian Z. Tamanaha, *An Analytical Map of Social Scientific Approaches to the Concept of Law*, 4 Oxford J. Legal Stud. 501, 515 (1995).

[30]J.L. Austin, How to Do Things with Words 137 (2nd ed. 1975).

[31]Niklas Luhmann, Law as a Social System 9 (Klaus A. Ziegert trans., Fatima Kastner eds. 2004).

[32]H.R. Rodgers Jr., *Law as an Instrument of Public Policy*, 17 Am. J. of Pol. Sci. 638, 638 (1973).

[33]Jurgen Habermas, *Between Facts and Norms: An Author's Reflections*, 76 Denv. L. Rev. 937, 937 (1999).

[34]H.L.A. Hart, *Positivism and the Separation of Law and Morals*, 71 Harv. L. Rev. 593, 593 (2017).

[35]Mark van Hoecke, Law as Communication 126 (2002).

[36]H.L.A Hart, The Concept of Law 135 (Joseph Raz & Penelope A. Bulloch eds., 3rd ed., 2012).

[37]Dig. 32.25.1 (Paul 1 to Corinthians) ("Since there is no ambiguity in the words, no question of the will should not be admitted.").

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be nuanced, when the literal sense remains incomplete or unclear, or complemented, when the literal sense remains purposefully open,[38] by a teleological interpretation—*scire leges non est earum verba tenere, sed vim ac potestatem.*[39] The teleological dimension is always present in the legal interpretation, either as a potential nuance of the grammatical interpretation, or directly as a complementary method when the literal meaning remains open.

Attention should be directed towards the "openness in the literal meaning," which is a feature particularly prevalent in contemporary legal norms. This phenomenon is attributable, on one hand, to the inclination in certain regulations to enunciate broad semantic scopes[40] through norms that convey soft policies,[41] a tendency motivated by law's limitations to solve complex social problems *in advance*.[42] On the other hand, the interplay between norm and fact has become intrinsically ambiguous within an increasingly intricate and changing social—and natural—context, where the alignment between norm and fact becomes less evident and more problematic. All of which opens up the possibilities of legal interpretation. Stating in a bill of rights that marriage between *a* man and *a* woman shall be a fundamental right can seem categorical and clear at first sight.[43] But verifying where a transgender person fits within this semantic frame becomes a mine field of interpretive difficulty, as could be seen by the European Court of Human Rights (ECHR) in the 2002 case *Goodwin v. the United Kingdom*.[44] Similarly, expressing that a financial institution has to file for bankruptcy when its core capital reaches a certain threshold might also seem more or less simple. But interpreting when a hedge fund or cryptocurrency exchange must declare bankruptcy is highly challenging—and cases such as *Archegos* in 2021 and FTX in 2022 illustrate all too well the significant difficulties faced by financial supervisors in timely and accurately interpreting bankruptcy norms amid rapid financial innovation.[45] Accordingly, in the liquid and volatile contemporary reality, with evanescent and unclear categories, grammatical interpretation loses significance, while teleological interpretation necessarily gains it.[46]

Teleological interpretation implies discerning the interaction between legal norms and the social and natural systems in order to verify when the occurrence of certain facts, and their qualification, are causally connected with the legal teleology. The teleology refers to the aims of the norm, which can be explicitly verbalized—especially in recitals and preambles— or implicitly reflected in the real intention of the historic legislator and in the functionality of the norm within its legal system.[47] The

[38]Kay Goodall, *Comparative Statutory Interpretation in the British Isles*, 13 Ratio Juris 364, 365 (2000).

[39]Dig. 26.3.17 (Publius Juventius Celsus) ("To know the laws is not to know their words, but their intent and purpose.").

[40]Sharon Gilad, *It Runs in the Family: Meta-Regulation and Its Siblings*, 4 Regul. & Governance 485, 485 (2010).

[41]Oliver Treib, Holger Bähr, & Gerda Falkner, *Modes of Governance: Towards a Conceptual Clarification*, 14 J. of Eur. Pub. Pol'y 1, 4 (2007); Attila Kun, *How to Operationalize Open Norms in Hard and Soft Laws: Reflections Based on Two Distinct Regulatory Examples*, 34 Int'l J. of Compar. Lab. L. & Indus. Rels. 1, 23 (2018); Antonio-Martín Porras-Gómez, *Metagovernance and Control of Multi-level Governance Frameworks: The Case of the EU Structural Funds Financial Execution*, 24 Reg'l & Fed. Stud. 173, 175 (2014).

[42]Hannu Tapani Klami, *Legal Justification and Control: Sociological Aspects of Legal Philosophy*, 4 L. & Phil. 199, 211 (1985); Vincy Fon & Francesco Parisi, *On the Optimal Specificity of Legal Rules*, 3 J. of Inst. Econ. 147, 147 (2007); Miguel Poiares Maduro, *Interpreting European Law: Judicial Adjudication in a Context of Constitutional Pluralism*, 1 Eur. J. Legal Stud. 137, 144 (2007).

[43]*See, e.g.,* Convention for the Protection of Human Rights and Fundamental Freedoms 213 U.N.T.S. 221, E.T.S. 5 (May 11, 1950), art. 12.

[44]Goodwin v. United Kingdon, App. No. 28957/95, ¶ p. 79 (Nov. 7, 2002) https://hudoc.echr.coe.int/eng?i=002-5265; Alexander Morawa, *The 'Common European Approach,' 'International Trends,' and the Evolution of Human Rights Law. A Comment on Goodwin and Iv. the United Kingdom*, 3 German L.J. 4, 5 (2002).

[45]Jennifer J. Schulp, *Crypto Crash: Why the FTX Bubble Burst and the Harm to Consumers*, CATO Inst. (Dec. 14, 2022), https://www.cato.org/testimony/crypto-crash-why-ftx-bubble-burst-harm-consumers; José Alonso Olmedo, Rebeca Anguren Martin, Maria Gamoneda Roca & Pablo Perez Rodriguez, *Archegos and Greensill: Collapse, Reactions and Common Features*, 41 Fin. Stability Rev./Banco de España 47, 47 (2021).

[46]Poiares Maduro, *supra* note 42, at 142.

[47]R. Alexy & R. Dreier, *Statutory Interpretation in the Federal Republic of Germany*, *in* Interpreting Statutes: A Comparative Study 73, 93 (Neil MacCormick & Robert S. Summers eds. 1991).

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cause-effect inference between the facts and their qualification on one hand and the aims of the norm on the other hand can only be made on the basis of design propositions. These propositions can be scientifically grounded when the lawyer resorts to scientific bodies of knowledge. But they can also be based on personal beliefs, conjectures, or just previous considerations enunciated, and later repeated, in the case law and jurisprudence. When these propositions are not scientifically grounded, legal interpretation risks being logically flawed.

For instance, when a legal interpreter takes a decision qualifying the decrease of a river's flow below 15.92 cubic metre per second (m^3/s) as detrimental to the legally-protected "ecological flow,"[48] assumptions are being made as to the reduction of the river's flow, and of its qualification as detrimental to the ecological flow, on the teleology of the norm itself—in this case, the European Water Framework Directive 2000/60/EC—and the applicable legal principles. In this example, the lawyer will need to assess the connection between the actual flow and the maintenance of the ecological flow, and what would the qualification of this variation as "detrimental to the ecological flow." Then imply for the norm's teleology, protective of the environment, as well as the socioeconomic interests of the communities living along the basin, protected by their right to water.[49] Although the reduction in flow might indeed be detrimental to the environment, if this reduction is caused by the extraction of water by upstream communities, and these communities have no other way to meet their minimum hydric needs, then it might be legally justified. The ultimate goal of the lawyer would be to conceive a solution that fulfills the teleology of the legal order understood as a whole, *optimizing* all the legally-protected aims and interests at stake.

In the example of the ecological flow, determining the hydric needs of the environmental system and of the riverbank communities will require natural and socio-legal design knowledge, which answers the question of how much water is needed to meet the legitimate biological needs of the ecosystems and the socio-economic demands of the affected communities. These cause-effect inferences can be scientifically grounded or not. The lawyer might choose not to search for the support of the scientific design knowledge. In that case, the—potentially bogus—assumptions that will guide the legal interpretation will be the byproduct of a self-contained and solipsistic understanding, which might have arrived, parochially, via personal assumptions, through case law or previous doctrinal studies.[50] But only up to date scientific evidence can ensure that the chances of a wrong decision—that is, a decision that does not contribute to the realization of the legal goals, neither to the enhancement of the legal order's logical coherence—are minimized.

In another example, the *Banco Popular* case, the CJEU ruled that allowing defrauded shareholders of a banking institution to assert their right to access justice and seek compensation could threaten the stability of the European Union's (EU) financial system.[51] "Stability of the financial system" is a legal principle enshrined in Directive 2014/59/EU, which provides a framework for the recovery and resolution of credit institutions and investment firms.[52] Consequently, the CJEU straightforwardly denied all shareholders the possibility of claiming civil compensation, regardless of their factual circumstances or legal arguments. The Court's reasoning in *Banco Popular* was based on a causal explanatory *assumption*: Permitting

[48]Enrique San-Martín Gonzalez, Beatriz Larraz & María Soledad Gallego, *When the River Does not Naturally Flow: A Case Study of Unsustainable Management in the Tagus River (Spain)*, 45 WATER INT'L 189, 211 (2020) (referring to the Tagus River in Talavera de la Reina).

[49]Andrés Molina-Giménez, *Legal Analysis and Case Study on the Choice Between Setting Environmental Flows by Using Reclaimed Water in Non-Permanent Rivers and the Sustainable Management of Groundwater in Southeast Spain*, 12 WATER 2171, 2174–76 (2020).

[50]Lasswell & McDougal, *supra* note 14, at 501.

[51]Case C-410/20, Banco Santander v J.A.C. and M.C.P.R., ¶¶ 37, 46 (May 5, 2022), http://curia.europa.eu/juris/liste.jsf?num=C-410/20 (requesting a preliminary ruling from the Audiencia Provincial de La Coruña).

[52]Directive 2014/59 of May 15, 2014, Establishing a Framework for the Recovery and Resolution of Credit Institutions and Investment Firms, 2014 O.J. (L 173) 190 (EC).

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shareholders to pursue legal claims in court, *cause*, would undermine the stability of the EU's financial system, *effect*. The CJEU did not explicitly explain this causal link, and we are left to assume that it is likely rooted in the belief that limiting due process rights is necessary for swift and decisive financial crisis management, ensuring legal certainty in order to incentivize potential banks to step in and bail out failing institutions. However, this leaves important questions unanswered: Does denying shareholders their right to due process really preserved financial stability, especially several years after the resolution took place? How much—if at all—should the human right of due process[53] be sacrificed for enhancing legal certainty in order to make the bail-in appealing to potential rescuers? What is the investment-risk trade off that the EU legal order should guarantee in order to avoid potential banks to walk away from bailing failing banks out? By failing to *couple* EU law with economic science to substantiate its claims about financial stability, the CJEU grounded its decision on assumptions rather than on scientific design knowledge. And this left economists and lawyers alike wondering how exactly the stability of the EU financial system would have been compromised had the shareholders been allowed to go to court. This case illustrates how the absence of a solid explanatory and design-based legal approach can distort doctrinal interpretation, leading to an outcome that can diverge from the intended teleology of the norm. In short, a poorly motivated judicial decision.

Besides the social complexity's effect on legal certainty, it should be noted that nowadays the interpretation of a norm is not done in isolation, but together with overarching legal principles. Legal principles, especially constitutional ones, have a teleological nature, to the extent that they convey ideas of social transformation. And this implies that legal interpretation requires more design knowledge, in order to lay out a path to attain the goals of the norm. The constitutionalization of the legal order, characterized by the expansion of constitutional principles and their mandates for teleological optimization,[54] has significantly enhanced the teleological nature of law. Constitutional principles have become increasingly pervasive and influential, guiding the interpretation of legal norms through a structured "program."[55] This program directs legal systems both in the furtherance and limitation of constitutional principles, comprising teleological criteria that structurally couple the legal qualification of factual scenarios with design propositions.[56] The teleological influence of constitutional principles operates on two levels: Positive and negative. From a positive perspective, under the principle of favorable interpretation, legal norms should be interpreted in the way that best fulfills the constitutional teleology. From a negative perspective, any limitation on a principle must conform to the proportionality test,[57] that looks bidirectionally to the principle to be limited and another principle to be favored.

The proportionality test consists of three steps: Suitability, necessity, and proportionality *strictu sensu*.[58] Suitability assesses the adequacy of the limiting act to further the teleology of the principle to be favored. Necessity evaluates whether less restrictive means exist to further that teleology. Proportionality *strictu sensu* weighs the benefits of the limiting measure against the sacrifices imposed on the limited principle. Each of these steps relies on an design scientific understanding: Determining whether a measure contributes to a legal objective requires understanding its expected effects under certain circumstances, evaluating alternative measures

[53]G.A. Res. 217 (III) A, Universal Declaration of Human Rights (Dec. 10, 1948), art. 10.

[54]Robert Alexy, *On the Structure of Legal Principles*, 13 Ratio Juris 294, 295 (2000).

[55]Niklas Luhmann, Ecological Communication 66 (John Bednarz, Jr., trans., 1989).

[56]*See* Niklas Luhmann, *Closure and Structural Coupling: The Differentiation of the Legal System*, 13 Cardozo L. Rev. 1419 (1991) (describing "structural coupling" as a way of referring to the specific links between legal communication and other linguistic spheres).

[57]Victor Ferreres Comella, *Beyond the Principle of Proportionality*, *in* Comparative Constitutional Theory 229, 229 (Gary Jacobsohn ed., 2018) (becoming the key constitutional tool to control the restriction of rights approved by legislative or executive powers).

[58]Vicki C. Jackson, *Constitutional Law in an Age of Proportionality*, 124 Yale L. J. 2680, 3094 (2014).

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necessitates a comparison of their expected effects, and balancing benefits against sacrifices depends on knowing the effects of the limiting act on the competing legal principles—some to be limited, others to be favored.[59]

The design science approach is crucial for developing a critical theory of law, understood as a reflexive method that examines the appropriateness of certain norms and interpretations with the aim of favoring specific empirical situations. When doctrinal lawyers engage in critical theory, they risk becoming "sorcerer's apprentices," potentially relying on non-scientifically grounded assumptions about norms' societal impact. These assumptions may be flawed, or just misunderstood by the jurist. At the same time, the conception of law as a tool cannot be left entirely to other epistemic communities lacking the methodologies and knowledge necessary to properly interpret legal norms. Disciplines such as public policy and political science—in the context of public law—business theory, and sociology and psychology—in the context of private law or criminal law—often lack the conceptual understanding and the nuanced interpretation of legal norms, which are the product of a process of doctrinal refinement. Although these fields provide valuable insights, they cannot independently supply the explanatory and design knowledge required to fully understand, formulate, and evaluate legal norms in ways that optimize their interaction with other social systems.

In summary, this Article argues that the relevance of academic legal research would be enhanced if it integrated more solution-oriented design knowledge. This is particularly important given that, first, the social and natural facts that come to be qualified by the legal norms are particularly complex, in a globalized and ever entropic world, where cause-effect relations evolve rapidly, requiring continuous updates to the explanatory and design assumptions used by legal doctrine. Second, legal norms must now accommodate increasingly expanding and intricate international and constitutional principles,[60] which carry a reinforced teleological dimension. Third, the legal system is becoming less of a reflection of a "natural order" rooted in long-standing practices or immutable principles and more the conscious product of political will, conveying explicit goals of social transformation.

D. A Comprehensive View of Legal Design Science

I. Law as a Formal Science

Law as a formal science refers to legal doctrine, which focuses on studying law *qua* normative system, limiting its scope to legal texts and judicial decisions. Legal doctrine views legal texts and case law as abstract structures embedded in formal symbolic systems. It employs a dual methodology: Deductive reasoning, prevalent in civil law traditions,[61] and inductive reasoning, prevalent in common law systems.[62] Through deduction, legal concepts and taxonomies are clarified, while induction interprets law in relation to various factual circumstances. Both methods aim to interpret norms and principles in order to attain higher levels of logical consistency of the legal order.[63]

The primary goal of doctrinal theories is to develop interpretive frameworks that optimize the coherence and consistency of the legal order as a speech system. In this vein, doctrinal research

[59]Aharon Barak, Proportionality: Constitutional Rights and Their Limitations 356 (2012).

[60]Armin von Bogdandy, *Comparative Constitutional Law: A Contested Domain*, *in* The Oxford Handbook of Comparative Constitutional Law 35, 31 (Michel Rosenfeld & András Sajó eds., 2012).

[61]John D. Arras, *Getting Down to Cases: The Revival of Casuistry in Bioethics*, *in* Ethics and Medical Decision-Making 463, 465 (2017).

[62]Benjamin N. Cardozo, The Nature of the Judicial Process 13 (1921) (inspiring Oliver Wendell Holmes' statement in *Lochner vs. New York*, 198 U.S. 45 (1905) ("General propositions do not decide concrete cases.")).

[63]Armin von Bogdandy, *The Past and Promise of Doctrinal Constructivism: A Strategy for Responding to the Challenges Facing Constitutional Scholarship in Europe*, 7 Int'l J. of Const. Law 364, 387 (2009).

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constitutes a self-referential process[64] that resembles other non-empirical sciences, such as mathematics or philosophy, where the validity of hypotheses depends on logical coherence rather than empirical verification. Consequently, legal doctrine lacks an empirical dimension, making it impossible to concretely assert "true" or "false." Legal doctrine instead concludes with more or less convincing.

For instance, a ruling denying defrauded shareholders of a bank the right to assert their claims in court, based on the argument that it might jeopardize "financial stability,"[65] could be contested by a lawyer emphasizing the human right to due process. Neither interpretation can be empirically tested for "truth." Instead, they are judged by their persuasive power. Here, the strength of an argument lies not only in its lexical-semantic logical consistency, as legal language often invites rhetorical-syntactic—and even "artistic"—elaboration to attain the desired persuasive impact.[66] Legal arguments are thus assessed not only for their logical merit but also for their rhetorical finesse,[67] lending legal doctrine an artistic dimension akin to that found in the humanities.[68]

In legal design science, the primary role of legal doctrine is to clarify the teleology of legal norms and principles. That is, to define the intent or purpose underlying norms and principles within a given legal system. This intent may not always be explicit or clear, either due to sloppy legislative technique, deliberate ambiguity, or conflicting political goals. Legislators, constrained by bounded rationality, may not always articulate a clear or consistent goal for the norm.[69] Judges, as ultimate interpreters of the law—and at the same time *de facto* accountable to the legal epistemic community[70]—apply the norm to specific cases, and whichever teleology assumed in these applications emerges through inductive inferences drawn by legal doctrine. Over time, the teleology of a norm may evolve, following a "living tree" interpretation,[71] and legal doctrine must then trace these shifts in meaning.

Legal doctrine provides a key input to law as an explanatory science. Its primary value in this regard lies in the formulation of concepts and clarification of the meaning of norms within their legal systems and in relation to specific cases.[72] Concept formation is essential for scientific explanation,[73] as concepts translate taxonomies that deepen our understanding of reality and enable an effective intervention. For example, the assertion that "recognizing a principle of non-discrimination based on gender is essential for improving human rights standards"[74] reflects an

[64]Anne Ruth Mackor, *Explanatory Non-Normative Legal Doctrine: Taking the Distinction Between Theoretical and Practical Reason Seriously*, *in* METHODOLOGIES OF LEGAL RESEARCH. WHICH KIND OF METHOD FOR WHAT KIND OF DISCIPLINE? 45, 64 (Mark Van Hoecke ed., 2011).

[65]Directive 2014/59 of May 15, 2014, Establishing a Framework for the Recovery and Resolution of Credit Institutions and Investment Firms, 2014 O.J. (L 173) 190 (EC).

[66]Elizabeth Mertz, *Legal Language: Pragmatics, Poetics, and Social Power*, 23 ANN. REV. OF ANTHROPOLOGY 435, 440 (1994).

[67]JAMES BOYD WHITE, HERACLES' BOW: ESSAYS ON THE RHETORIC AND POETICS OF THE LAW 10-11 (1985); ANDREW ABBOTT, METHODS OF DISCOVERY: HEURISTICS FOR THE SOCIAL SCIENCES (CONTEMPORARY SOCIETIES) 11–12, 34 (Jeffrey C. Alexander ed., 2004).

[68]David Howarth, *Is Law a Humanity: (Or Is It More Like Engineering)?*, 3 ARTS & HUMANS. IN HIGHER EDUC. 9, 10 (2004).

[69]Charles E. Lindblom, *The Science of "Muddling Through"*, 19 PUB. ADMIN. REV. 79, 81 (1959).

[70]Martin Shapiro, *The Success of Judicial Review and Democracy*, *in* ON LAW, POLITICS AND JUDICIALIZATION 149, 175 (Martin Shapiro & Alec Stone Sweet eds., 2002); Sergio Graziadei, *Democracy v Human Rights? The Strasbourg Court and the Challenge of Power Sharing*, 12 EUR. CONST. L. REV. 54, 76 (2016); Antonin Cohen & Antoine Vauchez, *Introduction: Law, Lawyers, and Transnational Politics in the Production of Europe*, 32 L. & SOC. INQUIRY 75, 77 (2007).

[71]Bradley W. Miller, *Beguiled by Metaphors: The "Living Tree" and Originalist Constitutional Interpretation in Canada*, 22 CAN. J. OF L. & JURIS. 331, 331 (2009).

[72]JOSEF REDLICH, THE COMMON LAW AND THE CASE METHOD IN AMERICAN UNIVERSITY LAW SCHOOLS: A REPORT TO THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING 16 (1914).

[73]CARL G. HEMPEL, FUNDAMENTALS OF CONCEPT FORMATION IN EMPIRICAL SCIENCE 1 (M. Van Hoecke ed., 2011).

[74]Antonio-Martín Porras-Gómez, *Constitutional Transformation and Gender Equality: The Case of the Post-Arab Uprisings North African Constitution*, 42 OXFORD J. OF LEGAL STUD. 235, 265 (2022).

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underlying formal theory about what human rights are and how they are measured, and what non-discrimination is.

II. Law as an Explanatory Science

In explanatory sciences, the primary research outcome is a causal model that accounts for the behavior of dependent variables based on changes in independent variables.[75] The purpose of an explanatory science is to develop knowledge that describes, explains, and, where possible, predicts aspects of the empirical world. Although precise predictions are difficult in social sciences, the goal is to identify patterns of causality and draw probabilistic inferences about how cause-effect relations might unfold, thus building a pragmatic understanding.[76]

As a social institution, law operates as a symbolically-embedded language designed to achieve societal objectives. When law is viewed as an instrument with a functional purpose, its empirical application reveals identifiable patterns of recurrence. Explanatory legal studies focus on how legal norms, the independent variables, influence social and natural realities, the dependent variables. Thus, law as an explanatory science explores the social and natural effects produced by legal norms.[77] Understanding law implies understanding those social and natural effects, which requires knowing the respective social and natural conditions and resorts.[78]

The explanatory dimension of legal science we are focusing on in this Article is teleological, in the sense that it seeks to understand the cause-effect relationships that legal norms trigger within social and natural systems. This approach differs from traditional factual legal explanatory knowledge, which is primarily concerned with qualifying facts. Lawyers, therefore, work with two types of explanatory knowledge: Factual and teleological.

From a factual perspective, the goal is to determine the legal qualification of compounded facts that occur as part of a chain of events. The connections between these events are understood through the application of explanatory sciences. For instance, in the case of a woman dying from a gunshot, the lawyer must consider not only her death but also the shot, the gun, and the finger that pulled the trigger all of them—*causally* linked.[79] Here, the focus is on explaining the sequence of events that constitute the factual situation.

Teleologically-oriented explanatory knowledge looks at how a factual situation impacts a legal objective. For example, if a chemical is to be classified as "of very high concern," the legal interpreter must assess characteristics like bioaccumulation and toxicology, requiring explanatory knowledge.[80] Here the explanation centers on how the factual situation influences a legal objective and, in turn, how the possible legal consequence can affect that objective.

When legal qualifications are guided by a teleological program, explanatory knowledge is present, as it assesses the consequences of applying—or not applying—a norm to a particular factual situation. Teleologically-oriented legal explanation identifies patterns of recurrence in the empirical application of norms, drawing from legal history and comparative law to reveal patterns over time—diachronically—or across different jurisdictions—synchronically. However, recognizing patterns of recurrence alone is not sufficient for establishing causality, because the

[75]Joan E. van Aken, *Management Research Based on the Paradigm of the Design Sciences: The Quest for Field-Tested and Grounded Technological Rules*, 41 J. OF MGMT. STUD. 221, 224 (2004).

[76]C.S. Peirce, *What Pragmatism Is*, 15 THE MONIST 161, 176 (1905).

[77]*Statement of Principles of Ethical Research Practice*, SOCIO-LEGAL STUD. ASS'N (2009), § 1.2.1, chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.slsa.ac.uk/images/slsadownloads/SLSA_Board_2021/SLSA_Ethics_Statement_-_September_2021.pdf.

[78]OLIVER WENDELL HOLMES JR., THE COMMON LAW 5 (1881).

[79]Richard Basson, *Man Charged with Murder After Woman Dies from Gunshot Wound*, THE INDEPENDENT, (Sept. 25, 2003), https://www.independent.co.uk/news/uk/leicestershire-leicestershire-police-melton-mowbray-police-grantham-b2417854.html.

[80]Case T-636/19, Chemours Netherlands BV v. European Chemicals Agency, ¶ x (Feb. 23, 2022) http://curia.europa.eu/juris/liste.jsf?num=T-636/19 (Appealed to ECJ in Case C-293/22).

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recurrence in the effects of a certain norm gives an evidence of correlation, not of causation.[81] For verifying causation, there needs to be an awareness of the underlying social mechanisms. Case studies become essential for providing nuanced explanations of the socio-legal and natural-legal mechanisms at work, particularly when the reality where these mechanisms operate is characterized by its complexity and dynamism. Legal researchers studying the effects of norms must also consider whether the outcomes they observe are caused by the norms themselves or by other confounding variables, that need to be controlled.

The goal of legal explanatory science is to shed light on the real-world effects of law. For some traditional, legal-doctrinal scholars, this may seem like a "non-legal" endeavor, beyond the exclusive remit of legal science. However, viewing the empirical impact of law as an extra-legal variable is ontologically erroneous, because the verbal enunciation of a legal *norm* does not create by itself a specific legal mandate—that is, a disposition in the form of *rights* or *duties*. Conceiving law as a system open to its empirical environment,[82] the specific rights and duties are the result of the interaction between norms and facts: Norms interact with the social and natural reality in order to create the legal disposition,[83] much like a grain of sand interacts with an oyster to create a pearl. In this way, the disposition resultant of a specific norm-fact combination expresses a precise solution for a particular case, and was already contained, in a potential way, in the legal order. The legal order can be seen as containing a possible response to any factual situation: In a sense, it is not composed by the limited entirety of black-letter legal norms, but by the potentially infinite range of law-fact combinations.

As legal norms interact with empirical reality, they inevitably engage with other linguistic systems,[84] most notably, scientific explanatory frameworks.[85] The legal linguistic system becomes "structurally coupled" with these systems of explanatory and design propositions.[86] Consequently, understanding how legal norms interact with social and natural systems is essential to understanding the legal order. In the case of the teleological interpretation, this requires examining how natural and social facts stimulate the law *and* how the legal response, in turn, impacts the natural and social systems. In this sense, socio-legal, and natural-legal studies are not a mere intellectual quirk for social or natural scholars, or just an empirical endeavor exclusive to legal practitioners in order to clarify compounded facts needing legal qualification. Rather, they are critical components of a comprehensive doctrinal understanding of law as a purely formal system.

Teleologically-oriented legal explanation draws on sociology, psychology, economics, political science, and natural sciences. Therefore, there needs to be an interdisciplinary component:[87] Legal scholars cannot be lone riders, they must broaden their scope of study to other disciplines and collaborate with researchers from other fields to develop a well-rounded understanding.

III. Law as a Design Science

The mission of a design science is to generate knowledge that professionals can use to develop solutions to real-world problems. Although understanding the nature and causes of problems, the focus of explanatory sciences, is fundamental for designing solutions, there are key distinctions between design and explanatory approaches.

[81] Abbot, *supra* note 67, at 39.

[82] Gunther Teubner, Law as an Autopoietic System 15 (1993).

[83] *See* Friedrich Karl von Savigny, System of the Modern Roman Law 8 (William Higginbotham trans., 1867) (reprenting the legal order as an organic structure that, upon coming into contact with reality, came to life).

[84] Hugh Baxter, *Autopoiesis and the Relative Autonomy of Law*, 19 Cardozo L. Rev. 1987, 2044 (1997).

[85] David L. Faigman, *Judges as Amateur Scientists*, 86 B.U. L. Rev. 1207, 1208 (2006).

[86] Niklas Luhmann, *Operational Closure and Structural Coupling: The Differentiation of the Legal System*, 13 Cardozo L. Rev. 1419, 1432 (1992).

[87] Lasswell & McDougal, *supra* note 14, at 499.

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First, unlike explanatory sciences, design sciences not only seek to understand the nature and causes of problems, but also explore the advantages and disadvantages of alternative solutions to types of problems. The typical output is the design proposition[88]—a type of norm, or a type of interpretation, for a type of goal—rather than the causal model. Second, design propositions are heuristic in nature because they address changing social phenomena in contextualized settings. Therefore, they do not offer detailed solutions. Third, although explanatory propositions are analytical, breaking down phenomena into components, design propositions are more synthetic, integrating elements into a unified solution. Fourth, in design science, the "why" question focuses on solving a particular type of problem, making the independent variable a prospective intervention rather than an empirical observation. Although explanatory approach looks backward, design science takes a forward-looking approach.[89] Fifth, the dependent variable in design propositions must represent something of value, such as improving democratic standards in constitutional law, enhancing environmental sustainability in environmental law, or reducing litigation in civil law. Sixth, the independent variables in the design propositions describe elements that legal designers can change or implement, such as a legislative act, an administrative regulation, a judgement or a contract.

Design science in law adopts pragmatic research objectives, aiming to understand and improve areas of human performance. It leverages explanatory knowledge to optimize the alignment between the intent enshrined in the legal norms and the factual realities they address. This approach not only asks what the law is, what it does, and how it works, but also how it could be designed to work better.[90] By emphasizing the social context in which legal norms operate, law as a design science highlights the instrumental role of law in shaping social behavior.[91]

From an instrumental viewpoint, legal norms are tools used by actors seeking to bring about or prevent some sort of social change. Legislators must anticipate the effects of their laws and judges must consider the impact of their rulings on litigants and on the society at large. As do public administrators when they enforce the law, and lawyers when they draft contracts and give advice. The work of legal professionals consists in making something useful that works for their clients[92] and stakeholders. Legal practitioners following the design method typically start with: first, teleological clarification, defining the goals and values enshrined in the law, supported by legal doctrine; second identifying the factual conditions of the situation, focusing on cause-effect relationships as determined by explanatory sciences; and third, choosing among legal instruments, considering the relationships between means and ends, potential side effects, unforeseen consequences, and unintended adverse effects.

For instance, in qualifying an accidental killing, such as a grandmother giving her own fouryear-old granddaughter a fatal overdose of sleeping pills[93] as involuntary manslaughter, the design approach would begin, first, by clarifying the teleology of the law. Clearly, the aim of the primary norm that prohibits the homicidal conduct is to protect the right to life and ensure societal peace and security.[94] In contrast, the aims of the secondary law that envisages the punishment can be conceptualized as "retribution, deterrence, rehabilitation and

[88]Mario Bunge, Scientific Research II: The Search for Truth 132 (1967).

[89]Van Aken, *supra* note 5.

[90]Roscoe Pound, Jurisprudence 349 (1959).

[91]*See* William Twining, *A Post-Westphalian Conception of Law*, 37 L. & Soc'y Rev. 199, 240 (2003) (advocating for an instrumentalist perspective of the law, by virtue of which the "point" of a legal provision is about motive, purpose, or expectation).

[92]Howarth, *supra* note 17, at 68.

[93]Paul Duggan, *Grieving Grandmother Spared Prison in Girl's Death*, The Washington Post (Feb, 21, 1990), https://www.washingtonpost.com/archive/local/1990/02/21/grieving-grandmother-spared-prison-in-girls-death/5ffef977-ec9a-43c2-b93f-598adbaa4007/.

[94]Markus Dirk Dubber, *Toward a Constitutional Law of Crime and Punishment*, 55(3) Hastings L.J. 578 (2003).

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incapacitation,"[95] which can be positivized in norms such as the right to rehabilitation.[96] The factual conditions of the situation at hand need to be determined, identifying the elements that are relevant to cause an effect in the norm's teleology. This implies knowing the risks of a sleeping pill in the human body. A decision must be made regarding the appropriate legal response, considering how it would align with the law's goals. This would require verifying, first, that the homicidal action effectively went against the goals of the right to life. Second, discerning the consequences that the qualification of involuntary manslaughter would have, in terms of the prison sentence, looking at how people would be affected by the enforcement of the law. Is the grandmother having a dissolute life that requires redress? Is the grandmother a danger for the society? Does the grandmother have other grandchildren who rely on her? Did the grandmother plead guilty? Did she repent? Are there other relatives who could claim revenge? All these psychosocial factors should to be assessed against the goals of "retribution, deterrence, rehabilitation and incapacitation."

D. Design Propositions

A design proposition can be defined as "an instruction to perform a finite number of acts in a given order and with a given aim,"[97] linking an intervention with an expected outcome.[98] This concept reflects "practical wisdom" in the Aristotelian sense,[99] offering guidance on what is feasible, what is not, and what should be done and what should not be done.

Design propositions must be understood as general, field-tested, grounded, and heuristic.[100] "General" means they provide broad solutions for types of problems rather than specific fixes for individual cases.[101] "Grounded" indicates that the proposition is based on an understanding of why the legal norm or disposition produces the desired effect. Without grounding, design propositions risk becoming mere "rules of thumb."[102] To ensure grounding, the researcher must rely on explanatory science, answering the question: "Why will this intervention, in this context, lead to the expected outcome?". "Heuristic" implies that some uncertainty remains, as the social and natural environment where norms and dispositions operate is complex and dynamic.[103] Finally, "field-tested" means that the design legal propositions have been tested in their intended field of application.[104]

In this vein, casuistry can be considered as the "handmaiden" of legal design science, by allowing to "test" the design hypotheses in particular contexts.[105] For example, it is one thing to suggest that enshrining limitation clauses in a constitutional bill of rights negatively impacts democratic transformation processes, but quite another to put this into practice and observe it playing out in different types of contexts.[106] Design propositions can be validated through statistical generalization *and* case studies, the latter capturing the full complexity of social and natural reality[107] and helping to overcome problems of omitted variable bias. Case studies and cross-case analyses are the

[95]Robert A. Pugsley, Retributivism: A Just Basis for Criminal Sentences, 7 hofstra l. rev. 382 (1978).

[96]International Covenant on Civil and Political Rights, Mar. 23, 1976, 999 U.N.T.S. 171, art. 10.3 ("The penitentiary system shall comprise treatment of prisoners the essential aim of which shall be their reformation and social rehabilitation.").

[97]Mario Bunge, Scientific Research II: The Search for Truth 132 (1967)

[98]Van Aken, *supra* note 5, at 23.

[99]Aristotle, Nicomachean Ethics 3 (W.D. Ross trans., Book I).

[100]Van Aken, *supra* note 5, at 23.

[101]*Id.*

[102]Margaret S. Archer, Realist Social Theory: The Morphogenetic Approach 153 (1995).

[103]Van Aken, *supra* note 5, at 23.

[104]*Id.*

[105]Archer, *supra* note 102, at 153.

[106]Antonio-Martín Porras-Gómez, *Limitation Clauses and Constitutional Transformation: The Case of the New Arab Constitutions*, 18 Muslim World J. of Hum. Rts. 167, 188 (2021)

[107]Mary S. Morgan, *Reflections on Exemplary Narratives, Cases, and Model Organisms*, *in* Science Without Laws: Model Systems, Cases, Exemplary Narratives 264, 264–74 (Angela N. Creager, Elizabeth Lunbeck & M. Norton Wise eds., 2007).

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necessary complement of quantitative results, allowing to learn about the fit between design propositions and their context, examining the assumed causal mechanisms more closely while avoiding problems of measurement error that haunt any statistical study in social sciences.[108]

Design propositions address field problems through legal principles, constitutional and legislative acts, regulations, administrative practices, judicial practices, or private legal instruments like contracts and wills. They can target improvement issues, such as enhancing human rights protections or safeguarding the interests of mentally challenged individuals entering into contracts, or creation problems, such as facilitating democratic transitions or establishing foundations.

The "mathematical" formulation of legal design propositions can be expressed as follows: A norm (A), when interpreted as (A') and applied to a type of factual situation (B), produces legal outcome (C) through a series of causally connected events. This formula, written as $(A \rightarrow A') \wedge (A' \wedge B) \rightarrow C$,[109] represents the relationship between legal norms, interpretations, factual situations, and outcomes. For a rule maker seeking to create a particular social condition (C) in a context (B), the most effective norm to adopt is (A), and for the rule interpreter, the best interpretation is (A'). An example of a design proposition for a rule-maker would be: An order to speed up a democratic consolidation process, as recommended by international legal principles enshrined in Article 25 of the International Covenant on Civil and Political Rights (C) after a democratic transition (B), create a constitutional court (A).[110]

An example of a design proposition used by a legal interpreter can be seen in the 2007 D.H. and *Others v. the Czech Republic* case before the ECHR.[111] In this case, the Court's interpretation was based on a socio-legally grounded type of solution (A') that linked applicable legal norms (A) with a desired outcome (C). The relevant norm (A) was Article 14—prohibition of discrimination—in conjunction with Article 2 of Protocol No. 1—right to education—of the European Convention on Human Rights.[112] The type of factual situation (B) was the systematic placement, upon *objective* criteria, of a large proportion of population from a certain ethnicity in special institutions, resulting in *de facto* segregation—namely, Roma children were placed in higher proportions in schools for children with mental disabilities, which negatively impacted their chances of human development.[113] The desired outcome (C) was achieving substantive equality.

The Court's interpretation (A') held that indirect discrimination in accessing a fundamental social right, such as education, can result in segregation and impede the sociological integration of marginalized groups.[114] This interpretation implied that states have a responsibility to actively prevent indirect discrimination by ensuring that policies do not disproportionately disadvantage vulnerable groups. In this case, the Court, referencing an extensive empirical study addressed the issue of institutional practices that, while maintaining formal equality, can still foster substantive social exclusion.[115] This ruling underscored that public policies, even if seemingly non-

[108]Adam Chilton & Mila Versteeg, *Measurement and Causal Identification in Constitutional Law: A Reply to Niels Petersen and Konstantin Chatziathanasiou*, 19 Int'l J.L of Const. L. 1842, 1851 (2021).

[109]For the sake of scientific clarity: $(A \rightarrow A')$: This denotes that the legal norm A is interpreted in a specific way A'. $(A' \wedge B)$: This indicates that the interpreted norm A' is applied to the factual situation B. $(A' \wedge B) \rightarrow C$: This shows that applying the interpreted norm A' to the factual situation B produces the result C.

[110]Nancy Maveety & Anke Grosskopf, *"Constrained" Constitutional Courts as Conduits for Democratic Consolidation*, 38 L. & Soc'y Rev. 463, 486 (2004).

[111]Others v. the Czech Republic, App. No. 57325/00, ¶ 74 (Nov. 13, 2007), https://hudoc.echr.coe.int/fre#{%22itemid%22:[%22001-83256%22]}.

[112]Convention for the Protection of Human Rights and Fundamental Freedoms, Apr. 11, 1950, 2889 U.N.T.S. 213, art. 14; Protocol to Amend the Convention for the Protection of Human Rights and Fundamental Freedoms, June 6, 2013, 15 C.E.T.S. No. 213, art. 2.

[113]Others v. the Czech Republic, App. No. 57325/00, ¶ 171 (Nov. 13, 2007), https://hudoc.echr.coe.int/fre#{%22itemid%22:[%22001-83256%22]}.

[114]*Id.* at ¶ 99.

[115]Others v. the Czech Republic, App. No. 57325/00, ¶ 188 (Nov. 13, 2007), https://hudoc.echr.coe.int/fre#{%22itemid%22:[%22001-83256%22]}.

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discriminatory, must be scrutinized for their broader social impacts to ensure they do not perpetuate systemic discrimination.

The legal interpreter may exercise varying degrees of discretion in shaping a particular legal interpretative design, largely influenced by the interpretive scope permitted by the grammatical precision of the legal norms. As previously noted, the complexity and volatility of the factual reality in which law operates often broadens this scope. Additionally, linked to the volatility of social reality, judicial discretion also extends to the prioritization of different time horizons. A legal interpreter might, for example, evaluate that a legal provision will produce certain effects in the short term but different outcomes in the medium term, each with varying levels of epistemic certainty, requiring the prioritization of one horizon over the other. In the case mentioned earlier, for instance, the ECHR took a medium to long-term view. Although the short-term impact of segregating Roma children into special education institutions may appear negligible for their enjoyment of social rights, the long-term consequences could be devastating.

E. An Integrated Conception of Law as a Design Science

The concept of law as a design science does not reject traditional legal doctrine or socio-legal, or natural-legal, explanatory approaches. On the contrary, it integrates these academic efforts into a cohesive, sequential system. Law as a formal science, expressed through legal doctrine, is needed for ensuring that legal designs respect the ontological nature of law as a logically coherent system of norms. Legal designs must be "legally sound," meaning they must align with a proper interpretation that maintains consistency within the legal order.[116] Once this "legally sound" interpretation is in place, socio-legal and natural-legal studies can identify patterns of norm implementation, providing explanatory insights into the mechanisms that produce certain outcomes. In order to be scientifically grounded, design propositions have to build upon explanatory propositions. Socio-legal and natural-legal research can explain and, inasmuch as possible, predict legal phenomena and their impact. For this purpose, there needs to be a cross-fertilization between law and natural sciences, sociology, political science and economics. Just as engineers draw on the natural sciences, so too lawyers should draw on history, economics, sociology, psychology, political and, the case being, natural sciences.[117] Based on these explanations, legal scholars can formulate design hypotheses. Therefore, there is a collaboration between law as an explanatory science and law as a design science, much like the relationship between physics and engineering.

Challenges in conceptualization, operationalization and measurement in explanatory sciences can only be resolved through reference to formal sciences. Just as physics relies on mathematics, legal explanation must build on legal doctrine. For example, an explanatory study on the effects of personal liberty protections must be grounded in an understanding of the different conceptualizations of liberty—some emphasize the right to liberty as personal autonomy, although others refer to the prohibition of arbitrary arrest and detention.[118] Similarly, when analyzing human rights violations, conceptual difficulties arise,[119] starting with the very definition of what constitutes a rights' violation.[120] Courts across jurisdictions often diverge on what violates a specific right. For example, what constitutes a violation of the freedom of expression differs

[116]Richard H. Fallon Jr., The Meaning of Legal Meaning and Its Implications for Theories of Legal Interpretation, 82 U. CHI. L. REV. 1235, 1242 (2015).

[117]HOWARTH, *supra* note 17, at 6.

[118]Louis Henkin, *Privacy and Autonomy*, 74 COLUM. L. REV. 1410, 1415 (1974).

David L. Shapiro, *Habeas Corpus, Suspension, and Detention: Another View*, 82 NOTRE DAME L. REV. 59, 60 (2006).

[119]Robert Justin Goldsten, *The Limitations of Using Quantitative Data in Studying Human Rights Abuses*, *in* HUMAN RIGHTS AND STATISTICS 35, 35 (Thomas B. Jabine & Richard Pierre Claude eds., 1992).

[120]*Id.*, at 38–41.

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between the United States and European jurisdictions.[121] Equally, debates about what practices constitute torture tend to diverge, across time and space, at the definitional level.[122] This highlights the need for doctrinal clarity in legal explanations.

This integrated system of formal, explanatory and design sciences is characterized by a series of feedback loops between its components. Regarding the feedback between legal design science and legal doctrine, the understanding of how, and how well, the law meets its goals, gives a clue as to how norms should be interpreted in conformity with their intrinsic teleology. In this vein, the invention of a design proposition will help to elucidate the proper interpretation of a legal norm in order to meet its teleology. This should inform legal doctrinal inquiries, because legal interpretation depends upon which of the interpretive options best serves the norm's underlying purposive design.[123] For instance, assuming that an objective of legal systems is to reduce litigation, if it is found that a way to reduce post-divorce litigation is to grant sole custody,instead of joint custody,[124] then judges will have one reason to interpret divorce norms in a way more favorable to sole custody.

Legal designers also contribute to explanatory sciences by identifying areas where more knowledge is needed, especially when design proposals reveal unintended consequences. For instance, if the immunization of medical device manufacturers from certain types of liability claims is found to be a good way to increase the approvals for high-risk product categories, but this makes physicians more risk averse,[125] then the design scholar will signal the need for socio-legal explanations to understand the reasons accounting for the physicians' behavioral shift towards risk-aversion.

Explanatory scientists, in turn, inform doctrinal scholars by pointing out areas needing conceptual refinement. For example, if research shows that recognizing organizational rights — such as the right to form political parties, freedom of association, or the right to unionize— materially improves their respect in practice,[126] this would signal a need for deeper doctrinal exploration of the constitutional rights' categorization as "organizational."

Explanatory legal knowledge is necessary for a proper legal interpretation. Judicial decisions often rely on implicit, unexpressed variables,[127] which can be referred as the "dark matter" of legal reasoning.[128] The explanatory and design legal scholarship contributes to uncover this dark matter. Although the shortsighted reliance on implicit assumptions of how the social and natural reality function may have sufficed in simpler, more stable contexts, contemporary social and natural systems are far more complex and dynamic. A criminal lawyer, judge or legislator of the 19th century might have comfortably relied on morally grounded assumptions to assume that certain acts are intrinsically criminal and deserve punishment.[129] However, today's more complex and dynamic societies quickly turn upside down explanatory assumptions, requiring in this case explanations that focus on how punishment effectively achieves specific political and

[121]Thomas Hochmann, *Why Freedom of Expression is Better Protected in Europe than in the United States*, 2 **J.** FREE SPEECH L. 63, 64 (2022).

[122]Goldstien, *supra* note 119, at 39.

[123]Theunis Robert Roux, *Judging the Quality of Legal Research: A Qualified Response to the Demand for Greater Methodological Rigour*, 24 LEGAL EDUC. REV. 173, 177 (2014).

[124]Guido de Blasio & Daniela Vuri, *Effects of the Joint Custody Law in Italy*, 16 J. OF EMPIRICAL LEGAL STUD. 479, 506 (2019).

[125]Elissa P. Gentry & Benjamin J. McMichael, *Responses to Liability Immunization: Evidence from Medical Devices*, 17 J. OF EMPIRICAL LEGAL STUD. 789, 812 (2020).

[126]Adam S. Chilton & Mila Versteeg, *Do Constitutional Rights Make a Difference?*, 60 AM. J. OF POL. SCI. 575, 585 (2016).

[127]Kylie Burns, *It's Not Just Policy: The Role of Social Facts in Judicial Reasoning in Negligence Cases*, 21 TORTS L. J. 73, 105 (2013).

[128]Justin Malbon, *Judicial Values*, *in* APPEALING TO THE FUTURE: MICHAEL KIRBY AND HIS LEGACY 579, 580 (Ian Freckelton & Hugh Selby eds., 2009).

[129]Morris R. Cohen, *Moral Aspects of the Criminal Law*, 49 YALE L. J. 987, 987 (1939).

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legal goals, such as rehabilitation or crime reduction. In this context, the decision to punish certain acts becomes more informed by a mechanism-intent thinking[130] that conceives punishment as a means to attain certain goals, both political—the overall reduction of crime, the enforcement of a certain social "order"—and legal—enshrined in legal and constitutional principles, such as the right to rehabilitation.[131]

The greater complexity and dynamism of the 21st century, together with the expanding role of constitutional and legal principles,[132] reinforces the need for a mechanism-intent approach in legal reasoning. For example, in tort law, a 19th century legislator, judge or tort litigator might have taken for granted a "fatalist" stance towards potential damages that could be caused by hazardous activities, leading to a restrained appreciation of damages compensation. However, over the years, the awareness that accidents could be technologically controlled has led to a teleological understanding of tort law as a means to incentivize risk management in hazardous activities.[133] A more complex society, a more pervasive regulatory activity, an extension of the reach of the state in its intervention, and the constitutionalization of the legal order, have all enhanced the teleological imprint of the law. As a result, the mechanism-intent focus of the legal activity has become reinforced.

Law is constantly evolving: As soon as the natural and social settings change, legal *dispositions* tend to change. For instance, the right to water in a region with abundant rainfall might mean universal water provision for all purposes, but if the climate changes, it could be limited to no more than securing drinkable water for domestic use. Similarly, the right to housing in a developed country might require ensuring everyone has access to adequate housing, while in a developing context, it may merely entail nominally establishing a social housing program. Introducing a right to veto legislative drafts in an upper chamber might be interpreted extensively in a politically monolithic context with clear and stable majorities—in order to foster political pluralism—but more narrowly in a highly fragmented parliament—where a possible abuse of the legislative veto would go against the effectiveness of the legislative activity. Even in a field where legal certainty is paramount, such as criminal law, volatility can still be present. For example, the crime of hunting an endangered species may vary within the same country: In one region, the species might be endangered, while in another, it might not be, leading to differing criminal legal consequences.[134] These examples underscore that legal doctrine cannot merely focus on the literal wording of norms; it must also thoroughly understand the underlying natural, social, political, and economic mechanisms, and the norm-fact interactions that best fulfill the norm's teleological objectives. Especially when the climate changes, ecosystems change, the economic welfare changes and the political dynamics change at high speed. As societal change accelerates, a design-based approach to law becomes increasingly necessary.

In summary, viewing law as a design science means operationalizing legal studies as an integrated endeavor that encompasses formal, explanatory, and design dimensions. These three forms of legal research interact in a continuous process of forward and feedback loops, forming a dynamic system of legal knowledge that is responsive to the complexities of contemporary societies. The diagram below represents this interaction:

[130]Michael Barzelay, *Understanding Mechanism-Intent Thinking and Analysis in Public Management*, *in* Public Management as a Design-Oriented Professional Discipline 37, 37 (2019).

[131]Edgardo Rotman, *Do Criminal Offenders Have a Constitutional Right to Rehabilitation?*, 77 *J. Crim. L. & Criminology* 1023, 1023 (1986).

[132]Von Bogdandy, *supra* note 63.

[133]L. Friedman, *Civil Wrongs: Personal Injury Law in the Late 19th Century*, 12 Am. Bar Found. Rsch. J. 351, 375 (1987).

[134]Antonio Mateos Rodríguez-Arias, *Los Delitos Contra los Recursos Naturales y el Medio Ambiente, la Flora, Fauna y Animales Domesticos, Tras la Reforma de 2015 del Codigo Penal*, 32 Ann. Fac. Der. U. Extremadura 1, 12 (2015).

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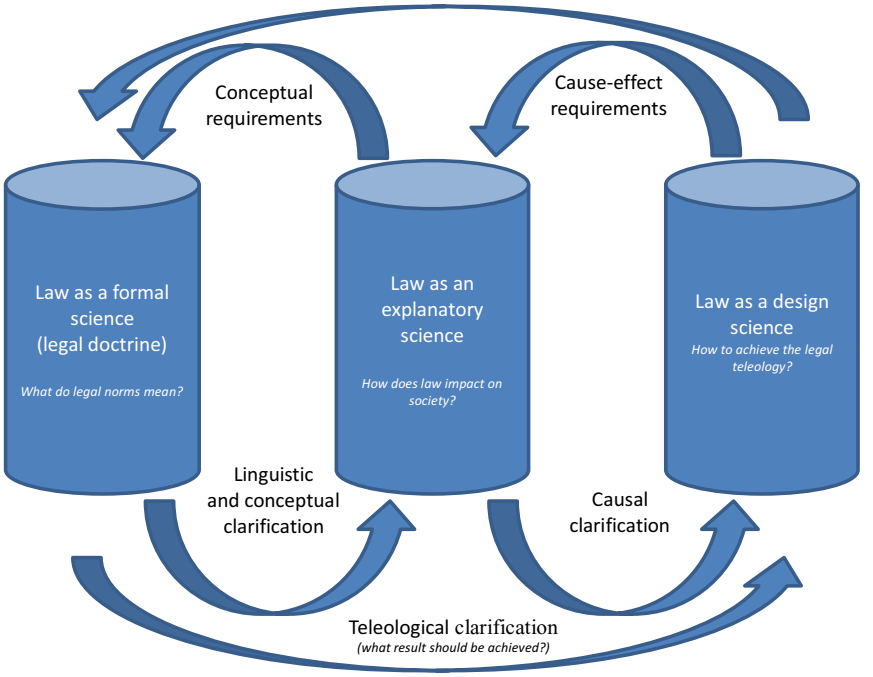


Diagram: Teleological Requirements—Is the interpretation of the norm optimal to attain the purported teleology? And, is the teleology feasible?

F. Discussion

A design approach is vital not only for interpreting legal norms in a way that strengthens the logical coherence of the legal system, but also for critically assessing them when their interaction with social and legal realities produces outcomes that fall short of their intended teleological goals. The design scientific dimension of legal research is necessarily stumbled upon when the legal scholar discusses "the need for reform" or labels legislation as "ineffective." For that purpose, the yardstick under use needs to be clarified. In criticizing the law, is the legal scholar relying on legal-doctrinal, formal categories such as intelligibility and consistency within the legal system? Or do they, consciously or unconsciously, also considering the practical effects of the law? One of the key contributions of law as a design science is its ability to unravel this false closure which shapes contemporary legal studies, and to clearly expose implicit, and potentially flawed, understandings of how law functions instrumentally within society and nature. By adopting a design science approach, legal scholars can uncover and later theorize and refine forms of supposedly "neutral" legal reasoning, offering a more comprehensive understanding of how law operates and how it can be improved.

The term "design proposition" may initially suggest a mechanistic approach to legal interventions. However, legal norms will not necessarily always produce the exact outcomes intended.[135] Social phenomena are intrinsically probabilistic,[136] and the role of design propositions is precisely to reduce the likelihood of errors in achieving desired results. Ignoring the probabilistic nature of these propositions contradicts empirical evidence, which demonstrates recurring patterns in how reality responds to types of legal stimuli. For example, recognizing a certain right in a constitutional charter will likely have an impact, which will not be

[135]John Griffiths, *The Social Working of Legal Rules*, 35 J. of Legal Pluralism & Unofficial L., 14 (2003).
[136]Faigman, *supra* note 85.

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entirely random. Although much depends on the social context in which the norm is applied, that context is not chaotic. It can be analyzed, categorized, and scientifically understood, allowing for more informed legal design.

Law as a design science assumes the possibility of anticipating the social effects of legal norms. To claim otherwise would suggest that the legislator, or the citizens engaging in contractual activities, are unable to predict the outcomes of their actions. For some scholars who argue against conceiving law as a social tool, renouncing the instrumental seriousness of the social sciences is a way to keep the colorful veneer of an artistic humanity, by virtue of which legal studies would be limited to providing retrospective explanatory narratives. This perspective, however, would strip law of its function as a reflexive activity and diminish democracy into a surrealist theatre of absurdity, where rule-making becomes little more than a game of chance. Such a view would regress the concept of law to a primitive understanding, as though norms arise "naturally," whether from custom, divine will, or the unspoken interests of social elites.

It is important to recognize that law as a design science does not presuppose the existence of complete reliable scientific knowledge across all factual circumstances. In reality, there are situations where such knowledge is incomplete or where complexity and volatility of circumstances just make it difficult to apply a clear scientific framework. This was particularly evident during the COVID-19 pandemic, when both the facts and the scientific understanding of the situation were unclear. Rather than undermining the validity of law as a design science, this underscores the need for even more robust design knowledge.[137] Ultimately, the role of the legal decision-maker is not to deliver the most accurate decision, but rather the best-justified one. In this process, scientific knowledge, no matter how precarious or incomplete, remains indispensable.

Another objection to the conceptualization of law as a design science is rooted in the belief that law is epiphenomenal, merely reflecting deeper social and behavioral processes rather than acting as an instrument for achieving goals. This view, reminiscent of Marxist theory's notion of law as part of a social "superstructure," argues that law cannot serve as a tool for social change. However, it is more reasonable to contend that law not only reflects the social context but also actively shapes it.[138]

That said, the legal system does not necessarily function as a seamless chain of command where the "orders" of the rule-maker are transmitted in a uniform and undistorted manner.[139] The social space between the state and individuals, and among individuals themselves, is not a normative vacuum where legal instructions pass through unaltered. The interpretation envisioned by the rule-maker is not necessarily the one that reaches and influences the individual, just as the intent of contracting parties may not always align with the stipulation that binds them. Distorting factors and unexpected outcomes are inevitable. Precisely, understanding them is part of law as a design science.

G. Conclusion

This Article has sought to bridge the gap between traditional, formal legal scholarship and the empirical perspective of law as a policy tool. By integrating the formal, explanatory, and design dimensions of legal knowledge, we have proposed a comprehensive framework that positions lawyers not just as interpreters of linguistic constructs but as social engineers capable of crafting legal norms and their interpretations to better respond to societal needs.

As teleological interpretation inevitably gains prominence in legal practice, the need for an evolution in legal scholarship becomes clear. Legal systems become more complex and

[137]Robert Alexy, *Formal Principles: Some Replies to Critics*, 12 I•Con 511, 514 (2014).
[138]Christopher McCrudden, *Legal Research and the Social Sciences*, 122 L. Q. Rev., 632, 649 (2006).
[139]Griffiths, *supra* note 135.

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interconnected with other linguistic systems, and a purely doctrinal approach risks alienating law from the very society it is meant to serve. Embracing a design-based perspective enables legal professionals to develop propositions that are both logically coherent and empirically sound. Our exploration of a nested structure of law as formal science, explanatory science, and design science, has highlighted the necessary interdependence of these modes of legal research.

Although frameworks such as legal realism and critical legal theory have touched on aspects of design thinking, integrating the design science with a teleological doctrinal perspective can bring new depth to legal scholarship. Conceptualizing law as a design science with teleological interpretation at its core empowers legal professionals to proactively address the complex, rapidly evolving challenges of the modern world, moving beyond purely syllogistic and reactive reasoning—something that artificial intelligence can do better. The future of this approach hinges on two key developments: Fostering deeper critical inquiry and refining doctrinal analysis. Regarding the *deeper critical inquiry*, legal research must prioritize pragmatic solutions to real-world problems, although keeping with the consistency and remaining aligned with the goals of legal systems. Achieving this requires moving beyond limited understandings[140] of psychology, economics, sociology, political science, and natural sciences, to embrace explanatory and design knowledge rooted in interdisciplinary commitment. As for the more *refined doctrinal analysis*, it is important to recognize that limiting legal scholarship to its formal-science dimension risks producing flawed doctrinal conclusions and render the lawyer's activity irrelevant, especially in the face of the challenges posed by artificial intelligence. Teleological interpretation, which seeks to align legal norms with their intended empirical purposes, has now become indispensable. And this interpretation must be grounded in design science. Herein lies the importance of law as a design science in navigating the complexities and challenges of the contemporary world.

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[140]Faigman, *supra* note 85, at 1207.

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