

REPORT FOR THE
ADMINISTRATIVE CONFERENCE OF THE UNITED STATES

**ALGORITHMIC TOOLS IN
RETROSPECTIVE REVIEW
OF AGENCY RULES**

Catherine M. Sharkey
New York University School of Law

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Catherine M. Sharkey*

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* Segal Family Professor of Regulatory Law and Policy, New York University School of Law. Giancarlo F. Carozza (NYU Law JD 2023) and Kevin M.K. Fodouop (NYU Law JD 2023) provided outstanding research assistance on this project. In addition to participating in and providing detailed notes and summaries of nearly all of the forty-eight Zoom interviews (all of those conducted from January-May 2022) that form the basis of the field work for the Report, Giancarlo and Kevin contributed significantly to researching and drafting the Report. Cade Mallett (NYU Law JD 2024) served as an excellent research assistant in the final stages of editing the Report. Todd Rubin at ACUS was an essential partner throughout and liaison to various federal agency contacts. Kazia Nowacki, Jeremy Graboyes, and Chair Foiss of ACUS made helpful editorial suggestions.

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Introduction

Retrospective review is critical for keeping agency rules relevant and effective but may consume significant agency resources. This Report considers how artificial intelligence (AI) algorithmic tools (broadly defined to include a wide range of computer-assisted technologies) can be used to facilitate agency retrospective review by identifying rules that are outdated or redundant; that contain typographical errors or inaccurate cross-references; or that might benefit from elaboration or clarification. It also considers how agencies can design and use AI tools in a way that promotes transparency, trustworthiness, public participation, and accountability.

A. Background: Presidential and Congressional Initiatives on AI in Government

The Trump Administration promulgated two Executive Orders (E.O.s) regarding Artificial Intelligence. E.O. 13,859, “Maintaining American Leadership in Artificial Intelligence,” promulgated on February 14, 2019,¹ set forth principles and objectives designed to continue “American leadership in AI.”² E.O. 13,960, “Promoting the Use of Trustworthy Artificial Intelligence in the Federal Government,”³ promulgated on December 3, 2020, highlighted the fact that agencies are already using AI “to accelerate regulatory reform,” and encouraged the continued

¹ Exec. Order No. 13,859, 84 Fed. Reg. 3967 (Feb. 14, 2019), <https://www.federalregister.gov/documents/2019/02/14/2019-02544/maintaining-american-leadership-in-artificial-intelligence>.

² *Id.* at 3967.

³ Exec. Order No. 13,960, 85 Fed. Reg. 78,939 (Dec. 8, 2020), <https://www.federalregister.gov/documents/2020/12/08/2020-27065/promoting-the-use-of-trustworthy-artificial-intelligence-in-the-federal-government>.

use of AI while noting that “ongoing adoption and acceptance of AI will depend significantly on public trust.”⁴

E.O. 13,859 directed the Director of the Office of Management and Budget (OMB) to issue a memorandum to all agencies to “inform the development of regulatory and non-regulatory approaches by such agencies regarding technologies and industrial sectors that are either empowered or enabled by AI” and to “consider ways to reduce barriers to the use of AI technologies.”⁵ As required by the E.O., the OMB Director subsequently issued Memorandum 21-06, “Guidance for Regulation of Artificial Intelligence.”⁶ Although “government use of AI [was] outside the scope of this Memorandum,”⁷ it put forth ten principles for agencies to consider when “formulating . . . approaches to the design, development, deployment, and operation of AI applications.”⁸ These ten principles are: public trust in AI; public participation; scientific integrity and information quality; risk assessment and management; benefits and costs; flexibility, fairness and nondiscrimination; disclosure and transparency; safety and security; and interagency coordination.⁹

With the aim of fostering public trust in governmental use of AI, E.O. 13,960 set forth nine principles for agencies to consider when “designing, developing, acquiring, and using AI.”¹⁰ These principles indicate that AI tools should be: lawful and respectful of our Nation’s values; purposeful and performance-driven; accurate, reliable, and effective; safe, secure, and resilient; understandable; responsible and traceable; regularly monitored; transparent; and accountable.¹¹ Among other responsibilities, the E.O. requires agencies to compile, on an annual basis, an inventory of all its non-sensitive, non-classified AI use cases.¹²

⁴ *Id.* at 78,939.

⁵ *Id.* at 3970.

⁶ Memorandum from Russell T. Vought, Dir., Office of Mgmt. & Budget to the Heads of Exec. Dep’ts & Agencies, *Guidance for Regulation of Artificial Intelligence Applications* (Nov. 17, 2020), available at <https://www.whitehouse.gov/wp-content/uploads/2020/11/M-21-06.pdf> [<https://perma.cc/H39P-L297>] [hereinafter OMB AI Memo].

⁷ *Id.* at 1.

⁸ *Id.* at 3.

⁹ *Id.* at 3–7.

¹⁰ Exec. Order No. 13,960, *supra* note 3, at 78,940.

¹¹ *Id.* at 78,940–41.

¹² *Id.* at 78,941. According to a recent White Paper, “at least half of agencies have failed to file an inventory of AI use cases.” Christine Lawrence, Isaac Cui & Daniel Ho, IMPLEMENTATION CHALLENGES TO THREE PILLARS OF AMERICA’S AI STRATEGY 7 (Dec. 2022). See also Ben Winters, *Two Key AI Transparency Measures from Executive Orders Remain Largely Unfulfilled Past Deadlines*, EPIC.ORG (Jan. 26, 2022), <https://epic.org/unfulfilled-ai-executive-orders> (criticizing the Trump Administration AI Executive Orders as remaining “largely unfulfilled past deadlines”).

The Biden Administration has not yet issued any new executive orders regarding AI, although it launched a new Task Force on AI¹³ and spearheaded the development of a Blueprint for an AI Bill of Rights.¹⁴

Congress enacted the National AI Initiative Act of 2020 (AI Act), as part of the National Defense Authorization Act of 2021.¹⁵ The Act aimed to create a “coordinated program across the entire Federal government to accelerate AI research and application” by providing resources and guidance to federal agencies on AI.¹⁶ The Act also created an AI Center of Excellence within GSA to support governmental adoption of AI. Pursuant to the AI Act, the Trump Administration launched the National Artificial Intelligence Initiative Office within the Office of Science and Technology Policy in January 2021, and the Biden Administration launched the National Artificial Intelligence Advisory Committee in May 2022.¹⁷ In 2022 Congress also enacted the AI Training Act, which required the Director of the OMB to establish or otherwise provide an artificial intelligence training program for the acquisition workforce, and for other purposes.¹⁸

B. Methodology

We began this project with an understanding that agencies have started making limited use of AI technologies to improve rulemaking and are actively contemplating ways to expand those uses.¹⁹ We were confronted with a dearth of information related to using AI in retrospective

¹³ See Press Releases, *The Biden Administration Launches the National Artificial Intelligence Research Resource Task Force*, WHITE HOUSE (June 10, 2021), <https://www.whitehouse.gov/ostp/news-updates/2021/06/10/the-biden-administration-launches-the-national-artificial-intelligence-research-resource-task-force>.

¹⁴ U.S. Office of Science and Technology Policy, *Blueprint for an AI Bill of Rights: Making Automated Systems Work for the American People*, at 3 (Oct. 2022), <https://www.whitehouse.gov/ostp/ai-bill-of-rights/>.

¹⁵ See William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, H.R. 6395, 116th Cong. § 5001 (2020) (enacted), available at <https://www.congress.gov/bill/116th-congress/house-bill/6395/text>.

¹⁶ See National Artificial Intelligence Initiative Act of 2020 (AI Act), H.R. 6216, 116th Cong. (2020), available at <https://www.congress.gov/bill/116th-congress/house-bill/6216>. The AI Act defines artificial intelligence as “a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments.” *Id.* § 3.

¹⁷ See Press Releases, *The White House Launches the National Artificial Intelligence Initiative Office*, White House (Jan. 12, 2021), <https://trumpwhitehouse.archives.gov/briefings-statements/white-house-launches-national-artificial-intelligence-initiative-office/>; Press Releases, *Commerce Department Launches the National Artificial Intelligence Advisory Committee*, U.S. Department of Commerce (May 4, 2022), <https://www.commerce.gov/news/press-releases/2022/05/commerce-department-launches-national-artificial-intelligence-advisory>.

¹⁸ See AI Training Act, S. 2551, 117th Cong. (2021) (enacted), available at <https://www.congress.gov/bill/117th-congress/senate-bill/2551>.

¹⁹ Professor Sharkey is a Senior Fellow at ACUS and a member of the ACUS Consultative Group for the Roundtable on Artificial Intelligence in Federal Agencies. See <https://www.acus.gov/research-projects/roundtable-artificial-intelligence-federal-agencies>. She participated in a Roundtable meeting on September 9, 2021 (via Zoom). See also David Freeman Engstrom, Daniel E. Ho, Catherine M. Sharkey & Mariano-Florentino Cuéllar, *Government by Algorithm: Artificial Intelligence in Federal Administrative Agencies* (Feb. 2020) (report to the Admin. Conf. of the U.S.), available at <https://www-cdn.law.stanford.edu/wp-content/uploads/2020/02/ACUS-AI-Report.pdf>; Admin. Conf. of the U.S., *Statement #20, Agency Use of Artificial Intelligence*, 86 Fed. Reg. 6616 (Jan. 22, 2021) (identifying issues agencies should consider when adopting, revamping, establishing policies and practices governing, and regularly monitoring artificial intelligence systems).

review.²⁰ We therefore devised an essential field study component of the project with the goal of unearthing relevant pilots and ideas that warrant further exploration.

C. Roadmap

Part I of the Report provides a brief overview of federal agency retrospective review as well as prior ACUS recommendations in this domain.

Part II of the Report presents four in-depth agency use cases of AI-enabled regulatory tools. We report on use case studies within three Cabinet-level executive branch departments: Department of Health and Human Services (HHS), Department of Transportation (DOT), and Department of Defense (DoD), as well as a pilot spearheaded by the General Services Administration (GSA) in partnership with Centers for Medicare and Medicaid Services (CMS). For each case study, we conducted a set of interviews with agency officials (current and former) and, where relevant, representatives of the firms providing technical resources and support.²¹ In addition to conducting additional research from publicly-available sources, we were also privy to a host of unpublished documents and video presentations provided by interviewees.

Part III of the Report focuses on retrospective review of agency rules and, in particular, agencies' consideration of the use of AI-enabled tools in that domain of rulemaking. Here, in addition to interviews conducted with agencies featured in our "case studies," we solicited interviews from a diverse sampling of independent and executive branch agencies.²² We conducted structured interviews with agency officials from the Federal Trade Commission (FTC), Surface Transportation Board (STB), National Credit Union Administration (NCUA), Office of the Comptroller of the Currency (OCC), Department of Education (DoEd), Bureau of Safety and Environmental Enforcement (BSEE), U.S. Coast Guard, and Department of Commerce (DOC), based on a questionnaire template we devised at the outset of the project.²³

²⁰ Professor Sharkey introduced the topic in a presentation to the ACUS Roundtable on Artificial Intelligence in Federal Agencies. *See* Roundtable Meeting on Artificial Intelligence in Retrospective Review of Agency Rules (Feb. 23, 2022, via Zoom). Professor Sharkey delivered a presentation based upon her prior research (see Catherine M. Sharkey, *AI for Retrospective Review*, 8 BELMONT L. REV. 374 (2021)) and outlined the scope of this Project. We shared the federal agency questionnaire template ahead of time with participants, which included representatives from thirty federal agencies, and invited an off-the-record discussion. We conducted interviews with two participants "on background" to follow up on information shared during the Roundtable discussion. *See* Interview with U.S. Citizen and Immigration Services Official A (Feb. 29, 2022, via Zoom); Interview with Veterans Administration Official A (March 4, 2022, via Zoom).

²¹ For a comprehensive list of interviews conducted, see Appendix I.

²² We solicited participation of sixteen agencies—identified to us by ACUS as comprising a fairly representative and diverse sample of federal agencies—half of which answered our call for full interviews.

As we explained in our email solicitation:

We are looking to engage a broad spectrum of agencies on how they currently engage in retrospective review as well as incorporate a diverse range of views on the subject of using AI tools: those who are skeptical of AI's use for this purpose, those who are enthusiastic about it, those who are ambivalent, and those who have not yet even thought about it. If you fall into any of these categories, we are eager to set up an interview with you (or a relevant colleague).

²³ The federal agency questionnaire template is reproduced in Appendix I.

In order to gain wider perspectives beyond federal agencies (and specific firms with whom they partnered), we solicited interviews from an array of private firms, regulatory beneficiaries, regulated entities, and academic and other nonprofit organizations known or identified to us with significant interests in governmental uses of AI. At the outset of the project, several academics and representatives from nonprofit organizations as well as private firms provided information that assisted us in scoping the project.²⁴ We also solicited interviews from eight private firms, five of which granted interviews and demonstrations of relevant technologies.²⁵

After conducting the bulk of agency interviews, we also solicited interviews from a diverse representative sample of eight regulatory beneficiaries, six of whom answered our call;²⁶ and, additionally, three regulated entities, one of which responded.²⁷ We conducted structured interviews based on a questionnaire template we devised ahead of time,²⁸ and rely on the content of these stakeholder interviews in Subsection II.C.3.

Part IV provides recommendations that flow specifically from our extensive field study.

I. Retrospective Review

Retrospective review entails re-assessing the costs and benefits of regulations sometime after they are promulgated. Federal agencies conduct retrospective reviews pursuant to various Executive Orders and the Regulatory Flexibility Act. Prior ACUS recommendations in 1995, 2014, 2017, and 2021 have endorsed retrospective review and encouraged agencies to create rules and rulemaking processes with future retrospective review in mind.²⁹ Retrospective review is a

²⁴ See Interview with George Washington Law Professor (January 12, 2022, via Zoom); Interview with National Academy of Public Administration (NAPA) Representatives A and B (January 20, 2022, via Zoom); Interview with Duke Law Professor (January 28, 2022, via Zoom); Interview with Mercatus Center Representatives A and B (Feb. 7, 2022, via Zoom). See also Interview with Ford Foundation Representative A (April 14, 2022, via Zoom).

²⁵ Three of the five firms participated in some manner in the agency case studies described above: Deloitte, BAH, and BeInformed. IBM, and Regulatory Group also agreed to be interviewed. See Interview with IBM Representative A (January 7, 2022, via Zoom); Interview with IBM Representative B (January 21, 2022, via Zoom); IBM Demonstration of Federated Learning (February 18, 2022, via Zoom); Interview with Regulatory Group Representative A (January 20, 2022, via Zoom).

²⁶ See Interview with Unidos Us Representative A (April 11, 2022, via Zoom); Interview with Public Citizen Representative A (April 11, 2022, via Zoom); Interview with Center for Democracy and Technology Representatives A and B (April 13, 2022, via Zoom); Interview with New America's OTI Representatives A and B (April 21, 2022, via Zoom); Interview with NAACP LDF Representative A (April 29, 2022, via Zoom); Interview with ABOUT ML Representative A (April 29, 2022, via Zoom).

²⁷ ACUS staff identified the representative sampling of three entities, chosen with the aim of “ensur[ing] we are capturing a mixture of large, medium/small, and micro.” See Interview with National Federation of Independent Business (NFIB) Representative A (March 28, 2022, via Zoom).

²⁸ The stakeholder questionnaire template is reproduced in Appendix I.

²⁹ See ACUS, *Recommendation 95-3, Review of Existing Agency Regulations*, 60 Fed. Reg. 43108, 43109 (Aug. 18, 1995) (noting that agencies have “an obligation to develop systematic processes for reviewing existing rules, regulations, and regulatory programs on an ongoing basis,” and recommending that agencies design programs to perform this review); ACUS, *Recommendation 2014-5, Retrospective Review of Agency Rules*, 79 Fed. Reg. 75114, 75115 (Dec. 17, 2014) (advising agencies to cultivate a “culture of retrospective review” and setting forth considerations for identifying regulations that are strong candidates for review and conducting retrospective

longstanding practice within federal agencies;³⁰ what is novel is the potential for incorporation of AI-enabled tools to assist in this policy-laden rulemaking domain. Indeed, as part of its “Guidance for Regulation of Artificial Intelligence Applications,” released on November 17, 2020, the Office of Management and Budget directed agencies to “consider how best to promote retrospective analysis of rules that may be outmoded, ineffective, insufficient, or excessively burdensome” and then to “modify, streamline, expand, or repeal them in accordance with what has been learned.”³¹

Agencies have a duty to conduct regulatory analysis to reduce burden and avoid duplicative regulations under E.O.s 12,866,³² 13,563,³³ 13,610,³⁴ and 13,777.³⁵ Many agencies are also subject to statutory mandates to perform periodic retrospective review of their rules and regulations.³⁶ The Regulatory Flexibility Act (RegFlex Act) requires federal agencies to promulgate “a plan for the periodic review of the rules issued by the agency which have or will have a significant economic impact upon a substantial number of small entities” in order to “determine whether such rules should be continued without change, or should be amended or rescinded, consistent with the stated objectives of applicable statutes, to minimize any significant economic impact of the rules upon a substantial number of such small entities.”³⁷ The five criteria agencies are to consider are: (1) the continued need for the rule; (2) the nature of complaints or comments received concerning the rule from the public; (3) the complexity of the rule; (4) the extent to which the rule overlaps, duplicates

analysis); ACUS, *Recommendation 2017-6, Learning From Regulatory Experience*, 82 Fed. Reg. 61738, 61741 (Dec. 29, 2017) (recommending that agencies “learn from experience at one or more stages of the rulemaking process, from pre-rule analysis to retrospective review”); ACUS, *Recommendation 2021-2, Periodic Retrospective Review*, 86 Fed. Reg. 36075, 36080 (July 8, 2021) (recommending that agencies establish plans to perform periodic retrospective review; that is, repeating retrospective review according to a specific time frame).

³⁰ See Sidney A. Shapiro, *Report for Recommendation 95-3: Agency Review of Existing Regulations* 424–42 (Jan. 15, 1995) (report to the Admin. Conf. of the U.S. (ACUS)) (citing Neil R. Eisner & Judith S. Kaleta, *Federal Agency Reviews of Existing Regulations*, 48 Admin. L. Rev. 139 (1996)), <https://www.acus.gov/report/report-recommendation-95-3-agency-review-existing-regulations> (reviewing Eisner and Kaleta’s ABA report on retrospective review as well as current review efforts); Joseph E. Aldy, *Learning from Experience: An Assessment of the Retrospective Reviews of Agency Rules and the Evidence for Improving the Design and Implementation of Regulatory Policy* 64–70 (Nov. 18, 2014) (report to ACUS), <https://www.acus.gov/report/retrospective-review-report> (drawing lessons from the Obama Administration’s retrospective review efforts to recommend review best practices); Lori S. Bennear & Jonathan B. Wiener, *Periodic Review of Agency Regulation* 53–56 (June 9, 2021) (report to ACUS), <https://www.acus.gov/report/periodic-retrospective-review-report-final> (recommending that retrospective review be performed according to a specific time frame, as well as offering guidance on choosing rules to review, soliciting public comments, and coordinating with other agencies). See also Zachary Gubler, *Regulatory Experimentation* 52–55 (Nov. 17, 2017) (report to ACUS), <https://www.acus.gov/report/regulatory-experimentation-final-report> (offering recommendations on extracting maximum value from regulatory experiments, insight which can then be used in retrospective review).

³¹ See OMB AI Memo, *supra* note 6.

³² Exec. Order No. 12,866, 58 Fed. Reg. 51,735 (Oct. 4, 1993).

³³ See *Executive Order 13563—Improving Regulation and Regulatory Review*, Obama White House Archives (Jan. 18, 2011), <https://obamawhitehouse.archives.gov/the-press-office/2011/01/18/executive-order-13563-improving-regulation-and-regulatory-review>.

³⁴ *Id.* OMB has reinforced these requirements in guidance, memoranda, and circulars, including OMB Circular A-4.

³⁵ See Exec. Order No. 13,777, 82 Fed. Reg. 12,285 (Mar. 1, 2017).

³⁶ See Lori S. Bennear & Jonathan B. Wiener, *Periodic Review of Agency Regulation* (June 7, 2021) (report to the Admin. Conf. of the U.S.) (surveying agency statutory requirements for retrospective review).

³⁷ Regulatory Flexibility Act § 3(a), 5 U.S.C. § 610.

or conflicts with other federal rules, and, to the extent feasible, with state and local governmental rules; and (5) the length of time since the rule has been evaluated or the degree to which technology, economic conditions, or other factors have changed in the area affected by the rule.³⁸

II. Algorithmic Regulatory Tools: Agency Use Cases

A. HHS: RegExplorer and the Regulatory Clean Up Initiative

1. HHS: AI Strategy and Innovation

The Department of Health and Human Services (HHS), a Cabinet-level executive branch department, established the Office of the Chief Artificial Intelligence Officer (OCAIO) in March 2021.³⁹ The primary functions of the OCAIO are to: (1) drive implementation of the HHS AI strategy; (2) establish the HHS AI governance strategy; (3) coordinate HHS’s response to AI-related federal mandates; and (4) foster collaboration across HHS agencies and offices.⁴⁰ HHS’s AI Strategy⁴¹ aligns closely with E.O.s 13,859 and 13,960 and OMB Memoranda 21-06. The high-level strategic goals are to encourage AI adoption; enable HHS-wide familiarity, comfort, and fluency with AI technology and its potential; promote AI scaling with the application of best practices and lessons learned from piloting and implementing AI capabilities to additional domains and use cases across HHS; and spark AI acceleration by increasing the speed at which HHS adopts and scales AI.⁴² Following direction from E.O. 13,960, HHS’s AI Council—the body responsible for implementing HHS’s AI Strategy—“develop[ed] an AI use case inventory to catalogue active and planned AI use cases.”⁴³

2. “AI for Deregulation” Pilot

In 2019, HHS launched a pilot project—dubbed “AI for Deregulation”—which introduced AI technologies into its retrospective review process.⁴⁴ Launched in part as a response to the

³⁸ *Id.* § 610(b).

³⁹ *About the HHS Office of the Chief Artificial Intelligence Officer (OCAIO)*, U.S. DEPT’ OF HEALTH & HUM. SERVS., <https://www.hhs.gov/about/agencies/asa/ocio/ai/ocaio/index.html> (last visited Feb. 20, 2022).

⁴⁰ *Id.*

⁴¹ HHS published an official AI Strategy in January of 2021. U.S. DEPT’ OF HEALTH & HUM. SERVS., ARTIFICIAL INTELLIGENCE (AI) STRATEGY 3 (2021), available at <https://www.hhs.gov/sites/default/files/hhs-ai-strategy.pdf>.

⁴² *HHS Artificial Intelligence (AI) Strategy*, U.S. DEPT’ OF HEALTH & HUM. SERVS., <https://www.hhs.gov/about/agencies/asa/ocio/ai/strategy/index.html> (last visited Feb. 20, 2022).

⁴³ *Id.* at 5.

⁴⁴ See Sharkey, *supra* note 20, at 376–77 (“Back in September 2019, at a presentation at The White House Summit on Artificial Intelligence in Government, the HHS Associate Deputy Secretary discussed a pilot project underway using AI to assist agencies’ retrospective review process by identifying outdated or overly burdensome rules or areas of duplication and overlap among agencies.”) (citing HHS ADS Charles Keckler, THE WHITE HOUSE SUMMIT ON ARTIFICIAL INTELLIGENCE IN GOVERNMENT: AI FOR DEREGULATION (Sept. 2019)); see also Tajha Chappellet-Lanier, *White House AI Summit Focuses on Government as a User of the Technology*, FEDSCOOP (Sept. 9, 2019), <https://www.fedscoop.com/white-house-ai-summit-government-ai-use-cases/> (“Charles Keckler . . . shared the agency’s ‘AI for deregulation’ pilot.”).

Trump Administration’s emphasis on regulatory reform,⁴⁵ as demonstrated by E.O. 13,771,⁴⁶ AI for Deregulation sought to “use natural language processing to find HHS regulations that may be too burdensome, obsolete or ineffective,”⁴⁷ and “to augment expert policy insights with artificial intelligence-driven data analysis of its regulations.”⁴⁸ HHS used Deloitte’s RegExplorer tool to pursue these goals.

(a) Regulatory Clean Up Initiative Rule

HHS’s “AI for Deregulation” pilot project culminated in the issuance of a final rule, titled “Regulatory Clean Up Initiative,” issued on November 16, 2020.⁴⁹ In this final rule, HHS disclosed that it “recently applied AI and Natural Language Processing (NLP) technology to support and accelerate [subject matter expert] reviews in cognizant divisions of HHS of unstructured text in the Code of Federal Regulations (CFR).”⁵⁰ HHS referred to its use of “an AI-driven tool” that could “highlight[] ‘candidate’ provisions that could be outmoded.”⁵¹ Its press release reported that “HHS was able to run an automated process that identified specific locations in the CFR that warrant corrections, such as those with incorrect citations and outdated regulations that have gone unnoticed.”⁵² In all, the rule “provide[d] for the correction of nearly 100 citations, the removal of erroneous language, and correction of misspellings and typographical errors among HHS regulations within the [CFR].”⁵³

⁴⁵ See HHS ADS Charles Keckler, THE WHITE HOUSE SUMMIT ON ARTIFICIAL INTELLIGENCE IN GOVERNMENT: AI FOR DEREGULATION 2 (Sept. 2019) (unpublished document) (noting that the context for the pilot was “EO 13771 and EO 13563[, which] emphasize the importance of retrospectively reviewing agency regulations and eliminating unnecessary, outdated, or overly burdensome rules”); *HHS Launches First-of-its-Kind Regulatory Clean-Up Initiative Utilizing AI*, U.S. DEP’T OF HEALTH & HUM. SERVS. (Nov. 17, 2020), <https://www.hhs.gov/about/news/2020/11/17/hhs-launches-first-its-kind-regulatory-clean-up-initiative-utilizing-ai.html> (noting that “[r]egulatory reform is a top priority of the Trump Administration,” and going on to say that “[a]s part of its commitment to strong regulatory stewardship, HHS last year launched a pilot project utilizing the same AI and NLP technologies to identify outdated or incorrect citations in the CFR”). See generally Sharkey, *supra* note 20, at 382–90 (comparing and contrasting HHS’s “‘old-fashioned’ approach to retrospective review under both the Obama and Trump Administrations to the ‘AI for deregulation’ approach taken up under the Trump Administration”).

⁴⁶ Reducing Regulation and Controlling Regulatory Costs, Exec. Order No. 13,771, 82 Fed. Reg. 9339 (Feb. 3, 2017).

⁴⁷ Chappellet-Lanier, *supra* note 44.

⁴⁸ Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. 5694, 5699 (Jan. 19, 2021); see also U.S. DEP’T OF HEALTH & HUM. SERVS., FY 2021 BUDGET IN BRIEF 13 (HHS “used an Artificial Intelligence-driven regulation analysis tool and expert insight to analyze the Code of Federal Regulations, seeking potential opportunities to modernize regulations”).

⁴⁹ Regulatory Clean Up Initiative, 85 Fed. Reg. 72,899 (Nov. 16, 2020); see *id.* (“The revisions outlined in this rule represent a portion of the results from [the pilot]”); *HHS Launches First-of-its-Kind Regulatory Clean-Up Initiative Utilizing AI*, *supra* note 45 (referring to the final rule as “represent[ing] a portion of the results from [the 2019 pilot project]”).

⁵⁰ Regulatory Clean Up Initiative, 85 Fed. Reg. 72,899 (Nov. 16, 2020).

⁵¹ *Id.*

⁵² *HHS Launches First-of-its-Kind Regulatory Clean-Up Initiative Utilizing AI*, *supra* note 45.

⁵³ *Id.* HHS noted that the rule “focused on administrative, non-substantive changes that will clean up HHS’s regulations.” Regulatory Clean Up Initiative, 85 Fed. Reg. at 72,899.

(b) RegExplorer Tool

HHS used Deloitte’s RegExplorer tool to implement its “AI for Deregulation” pilot in 2019.⁵⁴ RegExplorer is accessed through a user-friendly, web-based interface.⁵⁵ Upon selecting a region (e.g., the United States), a regulatory area (e.g., federal regulations), and a dataset (e.g., the *Code of Federal Regulations*), users are taken to a dashboard from which they can access five different tabs: “Search,” “Research,” “Analyze,” “Compare,” and “Correlate.”⁵⁶ From the “Search” tab, users can search the selected dataset by keyword, topic, or sub-topic areas. A search reveals a “treemap” of the total number of matching regulations grouped by agency. Further selecting an agency from the treemap takes users to a list of all regulations promulgated by the selected agency that match the search terms.⁵⁷ The “Research” tab provides users with the ability to find regulations by agency, sub-agency, and an optional keyword search. From this tab, a user can see the age of regulations, the number of years since their most recent update, and a “cluster map”⁵⁸ displaying this information grouped by topic or sub-topic.⁵⁹ From the “Analyze” tab, a user can search a specific regulation to analyze its citation structure and to find other regulations relating to similar topic areas. This feature of RegExplorer provides users with a full citation network map and a list of similar sections of different regulations.⁶⁰ The “Compare” tab enables users to compare regulations across government departments and identify overlapping or conflicting regulations.⁶¹ Finally, the “Correlate” tab allows users to identify correlating regulations across multiple datasets by topic, sub-topic, or keyword. It shows users the number of correlating regulations within certain sub-topic match confidence intervals and allows them to view and directly compare all matching regulations.⁶²

RegExplorer uses a variety of different NLP algorithms, including keyword technology, clustering algorithms, citation extraction and mapping, and guided Latent Dirichlet Allocation. Much of the specifics are proprietary technology and not publicly available, but each category of algorithm is summarized in Appendix II.A, *infra*.

⁵⁴ Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. 5694, 5710 (Jan. 19, 2021) (“Regarding the technology used to perform the 2019 analysis, the analysis was performed using a tool called RegExplorer.”).

⁵⁵ Interview with Deloitte Product Manager (June 29, 2021, via Zoom).

⁵⁶ *Id.*; DELOITTE, REGEXPLORER: G-CLOUD 12 SERVICE DEFINITION DOCUMENT 6 (2020), *available at* <https://www2.deloitte.com/us/en/pages/consulting/topics/ai-government-solutions.html>.

⁵⁷ Interview with Deloitte Product Manager, *supra* note 55.

⁵⁸ For a summary of what a “cluster” is, see *infra* Appendix II.A.

⁵⁹ Interview with Deloitte Product Manager, *supra* note 55.

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² *Id.*

B. DOT: RegData Dashboard

1. DOT: Data-driven Regulatory Innovation

The Department of Transportation (DOT) is a Cabinet-level executive department with eleven operating administrations,⁶³ one of which is the Office of the Secretary of Transportation (OST). Within OST, in turn, is the Office of the Chief Information Officer (OCIO), which is responsible for the “oversight of IT staffing [and] the management and delivery of innovative digital solutions across the Department and in the US transportation system.”⁶⁴ The Chief Data Officer (CDO) within OCIO is responsible for the “application of DOT data for decision-making,” as well as serving as a “liaison for data sharing and developer of new data products.”⁶⁵

2. RegData Dashboard

One of the “new data products” to emerge from OCIO is “RegData Dashboard,” a web-based application that allows DOT staff to view certain metrics associated with the different Sections and Parts of the CFR that apply to DOT.

DOT’s objective behind developing the RegData Dashboard was to explore using technology to extract DOT’s 10,740 pages of CFR information and provide new insights into its regulatory data.⁶⁶ Specifically, DOT was seeking to “apply a data-driven approach to analyzing regulations” to “inform policy decisions, analyze trends, provide management reports/monitoring, and display the entire ‘lifecycle’ of regulatory actions.”⁶⁷

⁶³ The eleven operating administrations within the Department of Transportation are: the Federal Aviation Administration, Federal Highway Administration, Federal Motor Carrier Safety Administration, Federal Railroad Administration, Federal Transit Administration, Great Lakes St. Lawrence Seaway Development Corporation, Maritime Administration, National Highway Traffic Safety Administration, Office of the Inspector General for the Department of Transportation, Office of the Secretary of Transportation, and Pipeline for Hazardous Materials Safety Administration. *U.S. Department of Transportation Administrations*, U.S. DEP’T OF TRANSP., <https://www.transportation.gov/administrations> (last visited April 18, 2022).

⁶⁴ *Office of the Chief Information Officer*, U.S. DEP’T OF TRANSP., <https://www.transportation.gov/cio> (last visited April 17, 2022).

⁶⁵ *Key Executives*, U.S. DEP’T OF TRANSP., <https://www.transportation.gov/cio/key-executives> (last visited April 17, 2022). According to the Federal CDO Council:

While there are many roles in the Federal Government that relate to data management, Chief Data Officers (CDOs) have emerged to lead organizational development of processes to leverage the power of data. CDOs enable data driven decision-making in a variety of ways, from providing and leveraging centralized agency analytics capacity to creating tools and platforms that enable self-service across their agencies and for the public. CDOs serve in a central leadership position, with visibility into relevant agency operations, and are positioned highly enough to regularly engage with other agency leadership, including the head of the agency.

See cdo.gov (“What is a Chief Data Officer”). The CDO Council is a forum for the federal CDOs. *See infra* note 300.

⁶⁶ U.S. DEP’T OF TRANSP., OFF. OF THE CHIEF INFO. OFFICER, DOT REGDATA DASHBOARD 2 (Sept. 23, 2020) (PowerPoint presentation) [hereinafter U.S. DEP’T OF TRANSP., DASHBOARD].

⁶⁷ *Id.*

DOT's RegData Dashboard was built on QuantGov, an open-source policy analytics platform developed by the Mercatus Center at George Mason University.⁶⁸ The heart of QuantGov, in turn, is RegData: "the specific process of using the QuantGov platform to collect, quantify, and analyze regulatory code."⁶⁹ Released in 2012, RegData employs machine learning to classify regulations by industry⁷⁰ and then uses various metrics to quantify regulatory load.⁷¹ These metrics include: (1) a count of "restrictions," i.e., the words *shall*, *must*, *may not*, *required*, and *prohibited*; (2) a simple word count; (3) a regulation's complexity, measured via Shannon Entropy,⁷² conditional counts, and sentence length; and (4) the date of the text's last update.⁷³

DOT's RegData Dashboard incorporates QuantGov's open-source code with the goal of parsing through DOT regulations and measuring regulatory complexity.⁷⁴ RegData Dashboard does not incorporate RegData's machine learning algorithms, as DOT already knows which industries their regulations affect.⁷⁵ RegData Dashboard does, however, include all of RegData's metrics, allowing DOT staff to view the number of words, average sentence length, Shannon Entropy score, number of requirements and conditionals, and year last updated.⁷⁶ A user can analyze these metrics on any single regulation or grouping of regulations—by CFR Title or Part, the issuing operating administration, or by year promulgated.⁷⁷ RegData Dashboard also allows an analyst to view yearly trends in any metric, again with the possibility of sorting by a variety of different groupings of regulations.⁷⁸ Finally, and one way in which RegData Dashboard differs

⁶⁸Interview with DOT Official A (March 28, 2022, via Zoom); *see About*, QUANTGOV, <https://www.quantgov.org/about> (last visited Mar. 31, 2022).

⁶⁹ *About*, QUANTGOV, *supra* note 68.

⁷⁰ "RegData uses the same industry classes as the North American Industrial Classification System (NAICS), which categorizes and describes each industry in the US economy." *The History of RegData*, QUANTGOV, <https://www.quantgov.org/history> (last visited Apr. 1, 2022); *see also* PATRICK MCLAUGHLIN, JONATHAN NELSON, THURSTON POWERS & HAYDEN WARLICK, REGDATA 4.0 USER'S GUIDE 4 (May 5, 2021) ("To create the estimates of the relevance of a CFR part to a specific industry, RegData U.S. 4.0 uses custom trained machine-learning algorithms."). The "industry-specific quantifications of regulation" enables users to "examine the growth of regulation relevant to a particular industry over time or compare growth rates across industries." *Id.*

⁷¹ *The History of RegData*, QUANTGOV, *supra* note 70.

⁷² "Shannon entropy measures, in broad terms, the frequency of new ideas introduced in documents, with simpler and more focused documents having a lower entropy score." PATRICK A. MCLAUGHLIN, REGDATA CANADA: A DATA-DRIVEN APPROACH TO REGULATORY REFORM 5 (2019) (Mercatus Center Policy Brief).

⁷³ PATRICK MCLAUGHLIN ET AL., *supra* note 70, at 5. The Mercatus Center used RegData as part of a model that claimed the U.S. economy would have been twenty-five percent larger in 2012 had the number of regulations been frozen at the levels observed in 1980. Bentley Coffey et al., *The Cumulative Cost of Regulations*, 38 REV. ECON. DYNAMICS 1, 4 (2020). Some scholars have called into question RegData's focus on obligation-imposing words without also taking into account obligation-alleviating words—an approach that skews the analysis toward measuring higher levels of burden. *See* Cary Coglianese et al., *Unrules*, 73 STAN. L. REV. 885, 921 (2021) (noting that RegData does not account for "unrules" within regulatory text, which serve to alleviate obligations on covered entities).

⁷⁴ Interview with DOT Official A, *supra* note 68. "DOT staff took the QuantGov work, which covers the entire CFR, and tailored the script for specific DOT CFR Titles and Parts to create the DOT RegData Dashboard." U.S. DEP'T OF TRANSP., DASHBOARD, *supra* note 66, at 3.

⁷⁵ Interview with DOT Official A, *supra* note 68.

⁷⁶ U.S. DEP'T OF TRANSP., DASHBOARD, *supra* note 66, at 3.

⁷⁷ Interview with DOT Official A, *supra* note 68; U.S. DEP'T OF TRANSP., DASHBOARD, *supra* note 66, at 5.

⁷⁸ Interview with DOT Official A, *supra* note 68; U.S. DEP'T OF TRANSP., DASHBOARD, *supra* note 66, at 6.

from QuantGov, the dashboard incorporates data about the total number of Information Collection Requests⁷⁹ by regulation. RegData Dashboard displays, and users can sort by, the total number of requests, total “burden hours,” and total “burden cost” associated with each CFR Part.⁸⁰

C. DoD: GAMECHANGER

1. DoD: Office of the Chief Digital and AI Officer (CDAO)

The Department of Defense (DoD) is a Cabinet-level executive branch department charged with coordinating and supervising all agencies and functions of the government directly related to national security and the U.S. Armed Forces. With an annual budget of close to \$800 billion, DoD is the largest employer in the world, with 1.4 million active-duty service members and close to 3 million total employees as of 2022.⁸¹

In 2018, DoD established the Joint Artificial Intelligence Center (JAIC).⁸² JAIC’s mission was to “[a]ccelerat[e] the DoD’s Adoption and Integration of AI to Achieve Mission Impact at Scale.”⁸³ Its AI strategy rested on five pillars: (1) “[d]eliver AI-enabled capabilities that address key missions;” (2) “[s]cale AI’s impact across DoD through a common foundation that enables decentralized development and experimentation;” (3) “[c]ultivate a leading AI workforce;” (4) “[e]ngage with commercial, academic, and international allies and partners;” and (5) “[l]ead in military ethics and AI safety.”⁸⁴

In February 2022, DoD established the Office of the Chief Digital and AI Officer (CDAO), “responsible for strengthening and integrating data, artificial intelligence, and digital solutions in the Department.”⁸⁵ The CDAO is the successor organization to the JAIC, which merged along with the Chief Data Officer (CDO), parts of Undersecretary of Defense (Comptroller) (OUSD-C), and the Defense Digital Service.⁸⁶

2. DoD’s “Mountain of Policies and Requirements”

⁷⁹ An Information Collection Request “is a set of documents that describes reporting, record keeping, survey, or other information collection requirements imposed on the public by a federal agency.” *ICR Basics*, U.S. ENV’T PROT. AGENCY, <https://www.epa.gov/icr/icr-basics> (last visited Apr. 1, 2022). Under the Paperwork Reduction Act, 44 U.S.C. §§ 3501–20, “every federal agency must obtain approval from the [OMB] before collecting the same or similar information from 10 or more members of the public.” *Id.*

⁸⁰ Interview with DOT Official A, *supra* note 68.

⁸¹ See *The Department of Defense Releases the President’s Fiscal Year 2023 Defense Budget*, U.S. DEP’T OF DEF. (Mar. 28, 2022), <https://www.defense.gov/News/Releases/Release/Article/2980014/the-department-of-defense-releases-the-presidents-fiscal-year-2023-defense-budg/>.

⁸² See *About the JAIC*, JAIC, <https://www.ai.mil/about.html>.

⁸³ *Id.*

⁸⁴ *Id.*

⁸⁵ See Deputy Secretary of Defense, Memorandum for Senior Pentagon Leadership, *Establishment of the Chief Digital and Artificial Intelligence Officer* (Dec. 8, 2021), <https://media.defense.gov/2021/Dec/08/2002906075/-1/-1/1/MEMORANDUM-ON-ESTABLISHMENT-OF-THE-CHIEF-DIGITAL-AND-ARTIFICIAL-INTELLIGENCE-OFFICER.PDF>.

⁸⁶ See Interview with DoD Official F (December 5, 2022, via Email).

DoD publishes voluminous policy and guidance documents (e.g., directives, issuances, staff manuals, circulars, and memoranda) across its various military services and department agencies.⁸⁷ Publishing such documents is decentralized; many military officers and agency officials throughout the department have the authority to issue policy and guidance documents for their respective components.⁸⁸

DoD faces numerous challenges in terms of analyzing this vast universe of regulatory guidance and policy documents. These challenges stem largely from the decentralized nature of DoD's guidance issuance process and the vast number of policy documents governing the Department's operations.⁸⁹ Individual agencies within DoD issue guidance documents that sometimes take different formats and often either conflict with one another or else create ambiguities about the roles and responsibilities of various components. According to DoD officials, agency staff (e.g. in "Agency A") are not always aware of the roles and responsibilities of other agencies within DoD (e.g., "Agencies B, C, and D"). They therefore may, at times, issue guidance documents without a full understanding of all governing authorities and requirements.⁹⁰ Moreover, DoD's ability to resolve internal conflicts relied exclusively on the current agency staff's personal knowledge and experience within the agency.⁹¹

Recognizing the security risks inherent in such a decentralized ad hoc system, especially in the context of defense intelligence,⁹² Congress required DoD to "develop and establish in policy a framework and supporting processes" that DoD should use both to (1) retrospectively ensure that its Intelligence Community (IC) "missions, roles, and functions" are "appropriately balanced and resourced" and (2) prospectively assess the most appropriate additions to these IC "missions, roles, and functions" when DoD drafts new guidance and policies.⁹³

⁸⁷ See Interview with DoD Former Official A (April 25, 2022, via Zoom); JAIC Public Affairs, *Meet the Gamechanging App That Uses AI to Simplify DoD Policy Making*, JAIC (Oct. 19, 2021), https://www.ai.mil/blog_10_19_21_GAMECHANGER.html ("Tens of thousands of documents govern how the DoD operates."). See also Interview with DoD Former Official C (May 3, 2022, via Zoom) (mentioning that DOD had over 18,000 policy documents—125,000 pages of text, 8 million words—from multiple decades, all stored as PDF files).

⁸⁸ See Interview with BAH Lead Associate (April 8, 2022, via Zoom).

⁸⁹ See Greg Little, *GAMECHANGER!*, AM. SOC'Y MIL. COMPTROLLERS (Sept. 2022), available at https://0201.nccd.net/1_2/000/000/09c/64c/2022-09-asmc-newsletter.pdf ("Did you know that if you read all the Department of Defense's policies, it would be the equivalent of reading through 'Lord of the Rings' more than 100 times?").

⁹⁰ See Interview with DoD Former Official C, *supra* note 87 (describing instances where there were many documents issued so long ago that the issuing/receiving organizations did not exist any longer, or the corresponding law had changed (removing authority or justification for policy), but that there was no easy way to spot or disentangle these occurrences).

⁹¹ See Interview with DoD Former Official B (April 13, 2022, via Zoom); Interview with DoD Former Official A, *supra* note 87.

⁹² Critically, DoD's U.S.C. title 10 authorities and the Intelligence Community's U.S.C. title 50 authorities combine and overlap for critical operational missions being executed under and across multiple components. See Interview with DoD Former Official A, *supra* note 87.

⁹³ See John S. McCain National Defense Authorization Act for Fiscal Year 2019, H.R. 5515, 115th Cong. title 16, subtitle B, §§ 1626(a)(1), (b)(1)(C) (2018) ("Strategic Programs, Cyber, and Intelligence Matters . . . Defense Intelligence and Intelligence-Related Activities"), <https://www.congress.gov/115/bills/hr5515/BILLS-115hr5515enr.pdf>. Section 1626 is designed to effectively manage the Intelligence Community (IC) "missions,

3. GAMECHANGER

In response to Congress, and, specifically, in order to map all the interdependencies between defense intelligence component requirements, DoD created GAMECHANGER.⁹⁴ DoD prototyped GAMECHANGER in-house, and subsequently enlisted Booz Allen Hamilton (BAH), which had an existing contract with DoD supporting the Advana platform, as one of GAMECHANGER's contract technical supports.⁹⁵ DoD describes Advana as its "enterprise data and analytics platform that supports [DoD's] senior-most decision-makers with executive dashboards, data tools, and other analytics products."⁹⁶ Advana is the platform for all analytics at the DoD enterprise level. GAMECHANGER is a tool in the toolset of things Advana offers the DoD.⁹⁷

GAMECHANGER is "an artificial intelligence and natural language processing application created with the purpose of improving the way DoD policymakers navigate the department's mountain of policies and requirements."⁹⁸ GAMECHANGER was originally developed as a part of JAIC's "Business Transformation Mission Initiatives," of which the goal was to "transform the [DoD's] industrial-age bureaucratic processes into digital workstreams" by creating "artificial intelligence capabilities to increase productivity of service members, automate mundane tasks, and improve data management."⁹⁹ Specifically, the tool turns the vast amount of unstructured policy data scattered across DoD into a centralized and structured repository enabling DoD staff to identify, locate, review, visualize, compare, and analyze policies through "knowledge maps."¹⁰⁰

GAMECHANGER can also assist staff as they draft new guidance and policy documents so as to avoid conflicting with or duplicating "existing issuance or other guidance" in the "[t]ens of thousands of documents govern[ing] how the DoD operates."¹⁰¹ Agency staff may want to

roles, and functions" defined across its regulatory guidance and policy documents. The NDAA provisions attempted to solve salient problems within DoD that were identified in a bipartisan committee report.

⁹⁴ DoD Former Official A, *supra* note 87, and DoD Former Official B, *supra* note 91, were part of the core GAMECHANGER development team.

⁹⁵ See Interview with DoD Official F, *supra* note 86; see also Interview with DoD Former Official B, *supra* note 91; Interview with DoD Former Official A, *supra* note 87 ("[B]uilding the GAMECHANGER application on top of Advana's existing architecture made the most sense from an efficiencies, advanced functionality, and scalability perspective.").

⁹⁶ See JAIC Public Affairs, *supra* note 87.

⁹⁷ See Interview with DoD Official F, *supra* note 86.

⁹⁸ See DIA Public Affairs, *GAMECHANGER: Where Policy Meets AI*, DIA (Feb. 7, 2022), <https://www.dia.mil/News-Features/Articles/Article-View/Article/2926343/gamechanger-where-policy-meets-ai>.

⁹⁹ See *Leading the JAIC's Intelligent Business Automation, Augmentation, and Analytics Mission Initiative*, JAIC (Mar. 4, 2020), https://www.ai.mil/blog_03_04_20.html.

¹⁰⁰ A May 2020 diagram blog article from JAIC provides a vivid illustration of this goal. The diagram contrasts (1) the regulatory analysis process "as is" with policy analysts running regulatory retrospectives manually to "find relationships between policies" and "ensure new policies do not conflict," with (2) the regulatory analysis process "to be" upon GAMECHANGER implementation, with AI tools enabling staff to efficiently review policies through structured "knowledge maps." *The JAIC's Business Process Transformation Mission Initiative Delivers*, JAIC (May 14, 2020), https://www.ai.mil/blog_05_14_20-mi_business_process_transformation_mission.html.

¹⁰¹ See JAIC Public Affairs, *supra* note 87.

review every policy document that relates to the new policy they are writing, or every policy document that their new policy may affect, before finalizing the content and language for their new policy.¹⁰² The staff also may want to compare an early draft with all existing policies for potential duplicates (to abandon the new policy or modify its scope to avoid duplicates) or conflicts (to proactively resolve such conflicts).¹⁰³ Alternatively, the staff could use GAMECHANGER to find standardized language used across existing documents to re-use the same language in the new policy.¹⁰⁴

DoD launched GAMECHANGER as a pilot in May 2020.¹⁰⁵ Early returns were promising.¹⁰⁶ With GAMECHANGER still in its infancy, in a prototype phase, an October 2020 House Permanent Select Committee on Intelligence Report indicated the Committee was “encouraged by its promising capabilities—which include enabling interagency lexicon, policy reconciliation and streamlining policy development.”¹⁰⁷ The October 2021 Committee Report was even more optimistic that “[t]his unique defense innovation effort will transform the way the Department sets policy, updates doctrine, and manages critical guidance documents.”¹⁰⁸

GAMECHANGER has firmly established itself as an effective tool for policy analysis within DoD.¹⁰⁹ In February 2022, JAIC transferred ownership of GAMECHANGER to the OUSD-C (which ran the Advana platform) and announced that the transfer was a milestone showing that GAMECHANGER had evolved “from concept to [successful] maturation.”¹¹⁰ GAMECHANGER now operates under the auspices of the newly established CDAO, which reports directly to the Deputy Secretary of Defense. As of February 2022, GAMECHANGER had integrated “policies from [more than] 27 major sources across the Government and ha[d] already

¹⁰² See Interview with DoD Former Official B, *supra* note 91.

¹⁰³ *Id.*

¹⁰⁴ *Id.* This functionality is significant “as inconsistency across DoD definitions is one of the leading challenges in standardized operational execution and governance.” Interview with DoD Former Official A, *supra* note 87.

¹⁰⁵ As of September 2020, GAMECHANGER was still in “early prototype mode” and had “a couple of hundred users . . . actively prototyping [the] system.” *Joint Artificial Intelligence Center Leaders Update Reporters on DOD AI Developments*, DoD (Sept. 10, 2020), <https://www.defense.gov/Newsroom/Transcripts/Transcript/Article/2345500/joint-artificial-intelligence-center-leaders-update-reporters-on-dod-ai-develop>.

¹⁰⁶ For example, it took the department four months to answer some preliminary questions raised by Congress by relying only on human review, whereas when using GAMECHANGER, agency staff were able to complete the same analysis in four seconds. See Interview with DoD Former Official B, *supra* note 91.

¹⁰⁷ See H.R. REP. NO. 116-565 (2020) (“Report from the House Permanent Select Committee on Intelligence on the Intelligence Authorization Act for Fiscal Year 2021”), available at <https://www.govinfo.gov/content/pkg/CRPT-116hrpt565/html/CRPT-116hrpt565.htm>.

¹⁰⁸ The House Intelligence Committee’s FY 2022 Report expressed its support for the project and its “continued maturation.” It also instructed DoD to brief the Committee on current GAMECHANGER usage by February 4, 2022, and to create a plan to transition GAMECHANGER to “programs of record” by FY 2024. See H.R. REP. NO. 117-156 (2021) (“Report from the House Permanent Select Committee on Intelligence on the Intelligence Authorization Act For Fiscal Year 2022”), available at <https://www.congress.gov/congressional-report/117th-congress/house-report/156>.

¹⁰⁹ See, e.g., Jennifer A. Miller, *Disruptive by Design: GAMECHANGER: There’s a New Game in Town!*, SIGNAL (July 1, 2021), <https://www.afcea.org/content/disruptive-design-GAMECHANGER-theres-new-game-town>.

¹¹⁰ See JAIC Public Affairs, *JAIC Transitions Ownership of AI-enabled GAMECHANGER to OUSD-C*, JAIC (Feb. 3, 2022), https://www.ai.mil/blog_02_03_22_jaic_transitions_ownership_GAMECHANGER.html.

been used by more than 6,000 [DoD] users to conduct more than 100,000 queries.”¹¹¹ In its first year of operation, GAMECHANGER led to millions of dollars in cost savings from efficiency gains, by streamlining an array of policy analysis tasks.¹¹² GAMECHANGER won an innovation award from the Office of Personnel Management.¹¹³

(a) Policy-relevant Functionalities

GAMECHANGER is a “[s]ingle, comprehensive, trusted repository of all DoD governing requirements” allowing users to “identify relevant rules, regulations, and policies requirements and track roles, responsibilities, functions, strategies, missions.”¹¹⁴ This repository has integrated data from major sources of DoD policies,¹¹⁵ including the Army Publishing Directorate¹¹⁶ and the Air Force E-Publishing database,¹¹⁷ which are automatically ingested and updated.

GAMECHANGER has three main policy analysis features: a policy search engine, a knowledge graph representing the relationships among policy documents and relevant policy “entities” (such as DoD offices, leaders, and other agencies), and a document comparison tool enabling users to upload draft policies and find semantically similar documents within existing DoD policies.

(i) Policy Search Engine

GAMECHANGER’s general search function enables users to input a word or sentence query and to review all matching policy documents in the form of “policy cards.” These cards include a wide array of metadata on the returned documents: title; link to the direct source for the

¹¹¹ See DIA Public Affairs, *supra* note 98. As of December 2022, these numbers are significantly higher: the tool pulls from more than forty major sources, is used by roughly 15,000 users, and has conducted more than 300,000 queries. See Interview with DoD Former Official A, *supra* note 87. Current DoD officials could not confirm the exact number of sources and usages. See Interview with DoD Official F, *supra* note 86. Any DoD staff with a Common Access Card (CAC) now can access GAMECHANGER, for free and without the need to create a GAMECHANGER account. See Interview with BAH Lead Associate, *supra* note 88.

¹¹² See Interview with DoD Former Official A, *supra* note 87 (discussing that GAMECHANGER decreased policy-related query times “from months to seconds,” and saved almost \$11 million in annual costs); Interview with DoD Former Official B, *supra* note 91 (same). DoD has not officially calculated the total savings attributable to GAMECHANGER. See Interview with DoD Official F, *supra* note 86.

GAMECHANGER’s development also has bifurcated from its initial policy-centered vision to enable non-policy use cases, such as financial and budgetary analysis. This “bifurcation” towards non-policy cases may slow down the development of advanced policy features. According to a former DoD official, the GAMECHANGER team started with a robust product roadmap to enhance and augment policy analytics features but lost its focus on this policy roadmap’s execution as DoD staff grew impatient to expand GAMECHANGER to non-policy use cases. The multiplication of non-policy use cases led to de-prioritization or delays for some policy features, such as expanding Document Comparison—currently only available at the paragraph level—to the sentence, document, or policy source (e.g., all documents from the Marine Corps source) level. See Interview with DoD Former Official A, *supra* note 87.

¹¹³ See DIA Public Affairs, *supra* note 98.

¹¹⁴ JAIC Public Affairs, *supra* note 87.

¹¹⁵ See Interview with BAH Data Scientist (April 19, 2022, via Zoom); see also *supra* note 111 and accompanying text.

¹¹⁶ See *Army Publishing Directorate*, ARMY.MIL, <https://armypubs.army.mil>.

¹¹⁷ See *Department of the Air Force E-Publishing*, AF.MIL, <https://www.e-publishing.af.mil>.

policy (for traceability and transparency); keywords automatically extracted from the document; “entities” affected by the policy; topics automatically generated from the document; and cross-references to other policies or statutes present within the document. GAMECHANGER also includes a “semantic match” at the top of search results, which is the document found to be most semantically close to the search query based on advanced NLP models.¹¹⁸

In addition to a general search, GAMECHANGER offers specialized search functions responding to the needs of policy analysts. GAMECHANGER includes a “Responsibility Explorer” feature, through which agency staff can easily find the policies that created responsibilities for a specific DoD agency or DoD official.¹¹⁹ The “Query Expansion” feature provides suggestions for additional keywords to search for based on the user’s initial query.¹²⁰

(ii) Knowledge Maps

GAMECHANGER builds a knowledge graph encoding the universe of agency policy documents and enables users to visualize the parts of this graph relevant to the user’s policy analysis through the “Graph View” feature.¹²¹ Graph nodes represent the policy documents and the related “entities” represented in the graph, which include DoD roles (e.g., Director of Defense Intelligence Agency (DIA)), sub-agencies or offices within DoD (e.g., U.S. Marine Corps or Joint Chiefs of Staff), other agencies (e.g., OMB), other branches of government (e.g., Congress), international organizations (e.g., NATO), and statutes (e.g., Title 40). Graph edges (i.e., links between graph nodes) represent cross-references between documents and references to entities within documents. If one policy document cross-references another policy document, the graph will include an edge between the two corresponding nodes. If one policy document mentions the Director of DIA, the graph will include an edge to link the policy document to the “Director of DIA” entity.

¹¹⁸ See *infra* Appendix II.B (for a description of these advanced NLP models).

¹¹⁹ For example, a user could search for “DIA” (Defense Intelligence Agency) and have the tool return all documents including regulatory language creating responsibilities for the DIA or any of its staff. An example of such language would be: “The director of DIA shall oversee DoD CI [(Counter-Intelligence)] analysis and production.” The search outputs identify both the entities involved (e.g., flag “the Director of DIA” as the entity for which the responsibilities are created) and the text creating responsibilities (e.g., highlight “shall oversee DoD CI analysis and production” as the responsibility). The user can export search results to a spreadsheet for further analysis. See Interview with BAH Lead Associate, *supra* note 88.

¹²⁰ Because policy analysts usually rely on precise language analysis, GAMECHANGER’s search function only applies “exact” matching—and excludes “fuzzy” matching results—to find relevant documents. Users can review these suggestions to correct their initial search query (if the tool finds that policy documents use different language to refer to what the user is searching for) or to expand the scope of their search to additional keywords (if the tool identified additional policy subject matters or policy language that are relevant to review). See Interview with BAH Data Scientist, *supra* note 115.

¹²¹ Graph View provides an efficient way to build a “knowledge map” of a particular area of DoD policy. Documents and different types of entities are displayed in different colors. Analyzing the graph visually provides policy analysts with a sense of whether the policy domain they are analyzing is dense or sparse and enables them to identify the main authorities driving DoD requirements within this policy domain. See Interview with BAH Data Scientist, *supra* note 115.

(iii) Document Comparison

GAMECHANGER’s “Document Comparison Tool” identifies the policies that may relate to the same subject matter and may define redundant, overlapping, or conflicting requirements. Using Document Comparison, agency staff can input draft policy language and then review all policies across DoD’s regulatory corpus that have high “semantic similarity” with their draft policy language. Semantic similarity goes beyond exact textual matching by assessing whether the two documents are substantially similar.¹²² Document Comparison performs its semantic similarity analysis at the paragraph level. The tool compares each paragraph in the input language with each paragraph in the compared regulations and returns the paragraphs that most closely correlate, i.e., that rank the highest on a “semantic similarity score” computed by advanced NLP models.

(b) Technical Capabilities

GAMECHANGER relies on AI technology for two main purposes. First, it uses AI to automatically parse unstructured regulatory sources and build a structured knowledge graph of policies. For this purpose, GAMECHANGER leverages data crawling technologies and knowledge graph technologies. Second, it uses NLP to give machines a semantic understanding of regulatory text and compare regulatory documents for redundancy or conflicts. To do so, GAMECHANGER leverages a transformer-based model, a cutting-edge type of NLP model. Across the board, GAMECHANGER relies on open-source technology and has made its entire codebase open-source. For further technical details, *see infra* Appendix II.B.

D. GSA/CMS: Regulatory Analytics Proof of Concept

To avoid duplicate costs across agencies and reap the benefits of centralized technical expertise, the General Services Administration (GSA) has launched multiple initiatives to provide shared software and AI capabilities for government. GSA’s recent initiative, the “IT Regulatory Analytics Pilot Study,” built a proof-of-concept (POC) for using an AI technology tailored to understanding and interpreting regulations: Knowledge Representation and Reasoning (KRR). KRR is an AI technique in which computers use human knowledge which has been encoded into a machine-interpretable format to perform formal reasoning, as opposed to more traditional approaches in which computers extract patterns from human-readable data.¹²³ This approach can be deployed to perform NLP.¹²⁴ GSA’s goal was to integrate regulatory analytics tools as part of “a larger end-to-end system architecture” of shared government IT services. Its pilot thus “seeks

¹²² For example, entering “the director of DIA is responsible for” as input could return documents including “the director of DIA shall,” as the tool understands the semantic similarity between the two formulations. *Id.*

¹²³ For example, one KRR-based AI painstakingly (and expensively, at a cost of \$10,000 per page) encoded knowledge from an introductory chemistry text into a format which an AI could understand and apply with formal logic. *See* Liddy et al., *Natural Language Processing* 3 (2007). More typical AI techniques might simply task the AI with learning the rules of chemistry from large amounts of data, avoiding the up-front costs of encoding knowledge in machine-interpretable formats but, depending on the use case, potentially impairing the accuracy with which the machine gleans that knowledge. Traditional KRR requires making some assumptions which are difficult to square with some AI use cases; for example, KRR assumes unambiguous terms and a fully consistent knowledge base. *Id.* at 3–4.

¹²⁴ *See id.*

not only to prove that the technology concept is viable for the use cases in this POC, but to evaluate whether the tools can be integrated and deployed effectively and in compliance with U.S. Federal and GSA IT standards.”¹²⁵

CMS had engaged with previous pilots for using AI in rulemaking¹²⁶ and joined the pilot to evaluate the comparative benefits from using a KRR approach.

1. GSA: Government-wide Shared IT and Technical Services Provider

GSA is an independent federal agency whose mission is to “use expertise to provide innovative solutions” to support federal agencies and to “foster an effective, sustainable and transparent government for the American people.”¹²⁷ GSA provides shared IT products and services to other agencies and develops government-wide cost-minimizing policies.

GSA’s eRulemaking program manages the Federal Docket Management System and Regulations.gov, a shared government service that publishes regulatory and deregulatory actions for over 200 federal agencies and provides a portal for the public’s submission of electronic comments.¹²⁸ Its Regulatory Information Service Center manages ROCIS.gov and Reginfo.gov.¹²⁹ Its Technology Transformation Services (TTS) office “help[s] agencies make their services more accessible, efficient, and effective with modern applications, platforms, processes, personnel, and software solutions.”¹³⁰ TTS includes a digital consulting arm (18F),¹³¹ provides agencies with a suite of software solutions (TTS Solutions),¹³² and operates a fellowship program pairing top innovators from the private sector, non-profits, and academia with government agencies to work on fast-paced government technology projects (the Presidential Innovation Fellows Program).¹³³

¹²⁵ See GSA, *Statement of Work: Regulatory Analytics Pilot Study*, at 10 (unpublished document provided by GSA Official A) [hereinafter *GSA SoW*].

¹²⁶ CMS’s Office of Strategic Operations and Regulatory Affairs (OSORA) notably had received analytics from the “regulatory cleanup” initiative conducted by HHS using Deloitte’s RegExplorer. See *infra* notes 174-176 and accompanying text. CMS also had discussed with Deloitte about using Deloitte’s tools while preserving the structure from their existing regulatory database called MediRegs. See *infra* note 228.

¹²⁷ See *GSA’s Mission, Vision and Goals*, GSA (Aug. 2017), <https://www.gsa.gov/node/78602>.

¹²⁸ See *GSA Launches Updated Regulations.gov to Improve the Integrity of Public Commenting*, GSA (Feb. 17, 2021), <https://www.gsa.gov/about-us/newsroom/news-releases/gsa-launches-updated-regulationsgov-to-improve-the-integrity-of-public-commenting-02172021>.

¹²⁹ See *Managing the Federal Rulemaking Process*, GSA (July 12, 2022), <https://www.gsa.gov/policy-regulations/regulations/managing-the-federal-rulemaking-process?topnav>. For an overview of the modules/functions supported by ROCIS, see *User Information and How To Guides*, <https://www.rocis.gov/rocis/viewResources.do>.

¹³⁰ See *Technology Transformation Services*, GSA (Feb. 2022), <https://www.gsa.gov/about-us/organization/federal-acquisition-service/technology-transformation-services>.

¹³¹ See *Technology Transformation Services: 18F*, GSA (Jan. 2022), <https://www.gsa.gov/about-us/organization/federal-acquisition-service/technology-transformation-services/18f>.

¹³² See *TTS Solutions*, GSA (Jan. 2022), <https://www.gsa.gov/about-us/organization/federal-acquisition-service/technology-transformation-services/tts-solutions> (software solutions include Data.gov, Login.gov, and Cloud.gov).

¹³³ See *The Presidential Innovation Fellows*, GSA (Dec. 2021), <https://www.gsa.gov/about-us/organization/federal-acquisition-service/technology-transformation-services/the-presidential-innovation-fellows>.

In 2017, GSA created an Artificial Intelligence Center of Excellence (AI CoE). The AI CoE runs like an AI implementation consultancy within the federal government, working with agencies' executive teams and building partnerships with the private sector to bring the latest AI technologies to government.¹³⁴

2. CMS: A Partner to Explore AI in Rulemaking

In late 2021 and 2022, GSA partnered with the Centers for Medicare and Medicaid (CMS) for a pilot study.¹³⁵ CMS is an executive agency within HHS. CMS administers the Medicare program and works in partnership with state governments to administer Medicaid, the Children's Health Insurance Program, and health insurance portability standards. It also administers HIPAA (health data privacy law) and medical quality standards. It is a very large agency, with about 6,000 staff and an annual budget around \$900 billion (including Medicaid allocations to states). CMS engages in rulemaking to establish or modify the way CMS administers its programs and enforces compliance with Medicare/Medicaid program requirements and with HIPAA requirements.

3. Proof-of-Concept: Cross-domain Analysis

GSA recognized that while “[a]spects of oversight, notice and comment, and rule publication have been supported by shared federal IT services for as long as 25 years . . . , the potential value of shared IT services for supporting this critical area of government has not been fully realized.”¹³⁶ As one of its objectives, GSA highlighted the need for agencies to process massive volumes of regulatory text across regulatory domains to analyze regulations for redundancy, inconsistency, and cumulative burden.¹³⁷

CMS's Office of Burden Reduction & Health Informatics, which directed CMS's involvement with the pilot, was especially interested in the cross-domain analysis use case's potential to help CMS reduce the administrative burden created by its regulations. CMS officials were interested in leveraging AI not only to make rulemaking more efficient but to make rulemaking “better,” i.e., more effective at achieving its regulatory goals while minimizing regulatory burden.¹³⁸

GSA and CMS contracted with TNO, a public independent research organization, and BeInformed, a regulatory software company, both based in the Netherlands, to provide the

¹³⁴ See Kathleen Walch, *How the Federal Government's AI Center of Excellence is Impacting Government-Wide Adoption of AI*, FORBES (Aug. 8, 2020), <https://www.forbes.com/sites/cognitiveworld/2020/08/08/how-the-federal-governments-ai-center-of-excellence-is-impacting-government-wide-adoption-of-ai>. The center facilitates agencies' evaluation and adoption of AI solutions by helping them analyze their enterprise data, design customer-centric software strategies, prioritize use cases, and implement AI best practices. It has developed “case studies” with the U.S. Department of Labor (bot development) and the Joint Artificial Intelligence Center (AI/ML tools assessment and AI/ML personnel training).

¹³⁵ GSA acted as the AI service provider, whereas CMS acted as the AI service client.

¹³⁶ *GSA SoW*, *supra* note 125, at 2.

¹³⁷ See *GSA SoW*, *supra* note 125, at 3. GSA also focused on the need for agencies to review and respond to increasing volumes of comments in short periods of time during the APA notice-and-comment process. See *GSA SoW*, *supra* note 125, at 3 (mentioning that agencies may spend up to \$200,000 per rule in labor and technology resources to respond to a high volume of comments).

¹³⁸ Interview with CMS Official A (April 1, 2022, via Zoom).

technology for its proof-of-concept pilot. TNO cooperated with the Leibniz Center and the University of Amsterdam in the development of a new knowledge-graph based standard that complemented and extended the existing XML-based standards.¹³⁹ According to GSA, BeInformed is a representative company capable of leveraging these open standards as part of a software platform.¹⁴⁰ GSA determined that BeInformed’s Knowledge Representation and Reasoning technology—which the Dutch government implemented in its health care and immigration digital services¹⁴¹—could potentially support U.S. rulemaking functions.¹⁴²

(a) A Novel Approach: Knowledge Representation and Reasoning (KRR)

After surveying AI for rulemaking initiatives at other agencies¹⁴³ and performing extensive technology and market research,¹⁴⁴ GSA decided to explore a KRR approach for its shared IT service modernization.¹⁴⁵ Instead of relying solely on NLP techniques which lack a formal understanding of language and of knowledge domains represented in the text they process, GSA utilized AI tools implementing a KRR model to produce a machine-readable representation of domain-specific knowledge, which may enable superior results in supporting “knowledge work” (such as writing rules and reviewing rules) through machines.¹⁴⁶

¹³⁹ See Interview with GSA Official A (Jan. 12, 2022, via Zoom). The U.S. Congress, Government Publishing Office, and Office of the Federal Register are also adopting a U.S. Legislative Markup Language that conforms to XML-based international standards. See *id.*

¹⁴⁰ See *id.* GSA further found that the standards formed a foundation of interoperable and efficient regulatory technology solutions for governments and private sector companies throughout the world. *Id.*

¹⁴¹ See *id.* The Dutch government and Dutch researchers have invested in developing this KRR model for governmental use since 2001. See Ron van Gog & Tom van Engers, *Modeling Legislation Using Natural Language Processing*, IEEE EXPLORE (2001), https://www.researchgate.net/publication/3927578_Modeling_legislation_using_natural_language_processing; Tom van Engers & Robert van Doesburg, *At Your Service, On the Definition of Services from Sources of Law*, UVA-DARE, at 221–225 (2015), https://www.researchgate.net/publication/300403373_At_your_service_on_the_definition_of_services_from_sources_of_law (describing the use of legal knowledge representation and reasoning computational models in combination with NLP tools to support the Dutch Immigration and Naturalization Services).

¹⁴² See GSA *SoW*, *supra* note 125, at 10 (“The hypothesis is that although the proposed application architecture is unique and innovative with respect to the U.S. Federal government, that extensive research and development and a large portfolio of private sector and international past performance has resulted in mature products.”).

¹⁴³ See GSA, *Independent Projects* (unpublished document provided by GSA Official A).

¹⁴⁴ See GSA, *Technology Market Categories* (mentioning the CDO Council project on comment analysis, DoD’s GAMECHANGER initiative, the COVID Data Challenge, and HHS’s RegExplorer pilot) (unpublished document provided by GSA Official A).

¹⁴⁵ Through market research, GSA identified a significant body of orchestrated research and development in the field of legal informatics. The orchestrated research spanned a broad consortia of academic and research institutions, including the Leibniz Institute in the Netherlands, the CIRSIFID Center at the University of Bologna, and the Center for Legal Informatics at Stanford University. Among other things, this research led to the development of international standards for structuring legal information in formats that were both human readable and machine readable. See Interview with GSA Official A, *supra* note 139.

¹⁴⁶ See GSA, *Technology Market Categories*, *supra* note 144, at 1 (“Regulatory management is knowledge work, primarily involving humans who interact through written human language. In order for computers to aid knowledge workers, the information that is otherwise expressed in text needs to be encoded through machine-readable symbols.”).

Whereas NLP techniques are leveraged to automatically create models from data that contain knowledge in an implicit form, KRR typically uses hand-crafted models that store knowledge in an explicit way. KRR’s distinguishing feature lies in its ability to build machine-readable representations of regulatory information, which thereby enables “explicit interpretation” of rules.¹⁴⁷ This then equips machines with the ability to perform analytics and logic operations based on abstract representation of their regulatory subject matter, namely regulatory actors, regulatory actions and their results, regulatory duties and their associated rewards or sanctions, as well as the relationship between all these abstracted regulatory objects.¹⁴⁸ By building abstract regulatory representations and performing inferences using these representations, KRR enables the automation of rulemaking functionalities.¹⁴⁹ And by establishing standards for how to represent regulatory actors, actions, and duties, KRR promotes interoperability of systems across government agencies.¹⁵⁰

(b) Cross-domain Analysis Use Case

The GSA/CMS pilot included a regulatory “cross-domain analysis” use case designed to explore the feasibility of deploying AI-enabled technology to analyze and compare rules across

GSA concluded that “[machine learning]-based NLP alone” would be of “limited value” for AI in rulemaking use cases. *See* GSA, *Regulatory Data and Analytics* at 14 (unpublished document provided by GSA Official A). Previous governmental studies equivocated. A 2020 10x study agreed that NLP techniques were not mature enough to effectively support comment analysis. *See* ADITI RAO, BEN PETERSON, ANDREW SUPRENANT, 10X SYNTHESIZING PUBLIC COMMENTS, PHASE 2 REPORT 39 (2020). But a 2021 report from the CDO Council pilot concluded that new advances in NLP following the 10x study made it possible to reach high levels of accuracy in comment screening and analysis. *See* CDO, IMPLEMENTING FEDERAL-WIDE COMMENT ANALYSIS, CDO COUNCIL SPECIAL PROJECTS FINAL RECOMMENDATIONS 10 (June 2021) (“While the CDO Council concurred that there are challenges associated with the regulatory environment, recent advances in NLP with neural network and transfer learning techniques exist that were not considered in the 10x study.”).

¹⁴⁷ *See* BeInformed, *W3.1 Pilot Deliverable: Comparative Technology Approaches for Regulatory Analysis* at 13 (unpublished document provided by GSA Official A) [hereinafter *BeInformed*, *W3.1*].

¹⁴⁸ *See* GSA Reg Analytic Proof-of-Concept Briefing (Jan. 5, 2022, via Zoom) [hereinafter *GSA Proof-of-Concept Briefing*] (GSA Official A explaining why giving AI models the ability to perform operations on abstract representation of their regulatory subject matters is critical).

¹⁴⁹ KRR technology also offers the opportunity to translate machine understanding of regulations into “intelligent services.” Once an ontology represents a regulatory domain, programs with access to the ontology’s knowledge graph can interpret the corresponding rules and apply these rules to specific contexts to deliver “context-aware” services.

The POC’s comment analysis tool (*see supra* note 137) leveraged this functionality to provide information to citizens or industry actors regarding the potential effects a proposed new rule or revision could have on them. It can also be beneficial to citizens informing themselves and commenting on agency rules, as the interpretation models can power intelligent software helping citizens navigate the regulatory code and understand specific regulations. For various caveats and cautionary guidance along this dimension, see Joshua D. Blank & Leigh Osofsky, *Automated Legal Guidance at Federal Agencies* (May 27, 2022) (report to the Admin. Conf. of the U.S.).

¹⁵⁰ *See* *Information Technology—Metamodel Framework for Interoperability (MFI)*, ISO/IEC 19763-3:2020, at vi (2020) (“To promote [interoperability among heterogeneous application systems], unambiguous and formal specifications of the systems, especially of their inputs and outputs, are indispensable. Ontologies have a key role for that.”).

regulatory domains to fulfill agency mandates to reduce burdens and avoid duplicative regulation.¹⁵¹

Given the short time-frame (three months) for the pilot study, the regulatory domain was limited to a relatively small subset of CMS regulations, namely durable medical equipment regulations pertaining to subsidies for portable oxygen systems.¹⁵² Moreover, CMS was already aware of certain rule inconsistencies (in terms of how they defined which medical devices were eligible for subsidy), so the pilot was designed specifically to test whether BeInformed’s KRR technology approach could uncover these inconsistencies already known to CMS officials.¹⁵³ CMS considered the cross-domain pilot to be a success, as the BeInformed team did in fact identify the regulatory inconsistencies.¹⁵⁴

BeInformed used “ontology-based model-driven software” to conduct the pilot.¹⁵⁵ Ontology modeling is a form of KRR that encodes rules within a legal knowledge graph (or legal ontology) and can build decisional inferences based on these rules.¹⁵⁶ Specifically, the BeInformed team translated multiple CMS durable medical equipment regulations (all addressing the granting of subsidies for portable oxygen systems) into an ontology-based KRR model to build a domain-specific knowledge graph of this limited regulatory domain. By applying a KRR approach, the tool was able to represent rules in formats that are both human and machine-readable and to make explicit interpretations of regulatory rules.

By making explicit interpretations, an AI program can detect overlap or inconsistencies between regulations even if those regulations do not use the same terms to describe their subject matter—which often is the case when comparing regulations belonging to different regulatory domains.¹⁵⁷ To do this, BeInformed’s KRR approach relied on eFLINT, a recently developed open-source standard for building legal ontologies of regulatory rules.¹⁵⁸ Where KRR is an AI technique requiring that human knowledge be translated into a machine-readable format, eFLINT is such a format which is specifically designed to encapsulate legal concepts.¹⁵⁹ Because these

¹⁵¹ The “comment analysis” use case (*see supra* note 137) was developed more fully than the cross-domain analysis one.

¹⁵² *See GSA Proof-of-Concept Analytics Presentation Video* (Jan. 27, 2022) (unpublished video file provided by GSA Official A); Interview with CMS Official A, *supra* note 138.

¹⁵³ The BeInformed team emphasized that the goal of the proof-of-concept was to demonstrate what was possible with KRR on a short timeframe rather than to attempt to map the entire domain of CMS regulations or to resolve existing regulatory challenges within CMS. *See* Interview with BeInformed Team Members A & B (March 21, 2022, via Zoom).

¹⁵⁴ *See* Interview with CMS Official A, *supra* note 138.

¹⁵⁵ *See* GSA, *SoW*, *supra* note 125, at 6.

¹⁵⁶ *See id.* at 6.

¹⁵⁷ By explicitly representing the context of both legal domains within the KRR knowledge graph, the different terms used in either regulations would be linked to an explicit and unambiguous representation of the terms’ subject matter.

¹⁵⁸ *See* L. Thomas van Binsbergen, Lu-Chi Liu, Robert van Doesburg & Tom van Engers, *eFLINT: a Domain-Specific Language for Executable Norm Specifications*, ACM (2020), available at <https://dl4ld.nl/2020-09-01/eflint.pdf>. *See* Appendix II.C for further explanation of eFLINT standard and “Flint frames.”

¹⁵⁹ *See* Binsbergen et al., *supra* note 158.

ontological representations are standardized and code domain-specific knowledge, they can be effectively compared to identify similar legal constructions or intersecting obligations. The pilot’s cross-domain analysis tool leveraged this functionality to compare regulations for inconsistencies or redundancies. For further technical details, *see infra* Appendix II.C.

III. Consideration of the Use of Algorithmic Tools in Retrospective Review of Agency Rules

An algorithm that performs regulatory housekeeping might be able to accurately identify typographical errors and inaccurate cross-references within existing regulations—two inquiries that have an objectively correct answer. Moving to more substantive uses, a tool could identify regulations that are either outdated or redundant with another rule. Both of these inquiries may not have an objective correct answer: A regulation might be old, but is it obsolete? A rule’s text or regulated activity might overlap with another’s, but is one superfluous? Finally, an algorithm performing even more substantive tasks might identify existing regulations it believes could benefit from clarification or are overly burdensome. These are both arguably completely subjective inquiries: When is a regulation too complex or burdensome?

A. Agencies Involved in “Case Studies”

1. HHS (and FDA/ CMS): RegExplorer and the Regulatory Clean Up Initiative

a. Retrospective Review Experience

HHS has historically published retrospective review plans and updates.¹⁶⁰ HHS has also historically involved the public to a fairly substantial degree. HHS doesn’t have retrospective review reports after 2016. In 2020, HHS solicited comments to establish regular review cycles (e.g., every four or ten years).¹⁶¹

As a result of E.O. 13,777, HHS established a Regulatory Reform Task Force. HHS did not publish, or otherwise make available to the public, any of its metrics and progress made via the Task Force. HHS did not issue a dedicated *Federal Register* notice to announce the Task Force but published notices announcing rule updates based on the Task Force’s analysis.¹⁶² HHS identified 126 potentially deregulatory actions in 2018 and 2019.¹⁶³

¹⁶⁰ *See, e.g.*, U.S. DEPT’ OF HEALTH & HUM. SERVS., HHS July 2016 Retrospective Report (July 2016); U.S. DEP’T OF HEALTH & HUM. SERVS., HHS Retrospective Review Update (July 2015); U.S. DEP’T OF HEALTH AND HUM. SERVS., Preliminary Plan for Retrospective Review of Existing Rules (May 18, 2011).

¹⁶¹ *See* Securing Updated and Necessary Statutory Evaluations Timely, 85 Fed. Reg. 70,096 (Nov. 4, 2020).

¹⁶² *See* Removing Outmoded Regulations Regarding the Ricky Ray Hemophilia Relief Fund Program, 83 Fed. Reg. 30,081 (July 27, 2018) (“Pursuant to Section 3(d)(ii), the HHS Task Force evaluated this rulemaking and determined that these regulations are ‘outdated, unnecessary, or ineffective.’ Following this finding, the HHS Task Force advised the HRSA Administrator to initiate this rulemaking to remove the obsolete regulations from the Code of Federal Regulations.”).

¹⁶³ U.S. DEP’T OF HEALTH & HUM. SERVS., FY 2021 ANNUAL PERFORMANCE PLAN AND REPORT 65 (2020).

In November 2020, HHS issued a Notice of Proposed Rulemaking (NPRM) for its “Securing Updated and Necessary Statutory Evaluations Timely” (SUNSET) rule designed “to incentivize periodical retrospective review.” SUNSET was meant to enhance HHS’s implementation of § 3(a) of the RegFlex Act by providing for a ten-year sunset on all regulations unless “Assessed and, if required, Reviewed” by HHS.¹⁶⁴ HHS concluded that one of the most important factors in ensuring agencies conduct retrospective review is to “provide for the sunset or automatic expiration of certain regulatory requirements after a period of time unless a retrospective review determines that the regulations should be maintained.”¹⁶⁵ HHS defended this in part by insisting their “experience since 1978 has shown it is difficult to adequately conduct retrospective regulatory review if regulations do not contain sunset provisions.”¹⁶⁶ In January 2021, HHS issued the final rule, which then was subsequently withdrawn in July 2022.¹⁶⁷

The FDA is an executive branch agency within HHS responsible for protecting and promoting public health through the control of a wide range of food and drug products, such as tobacco products, dietary supplements, prescription, pharmaceutical drugs (medications), vaccines, biopharmaceuticals, and medical devices. The FDA is a large agency, employing about 18,000 people and with a budget of about \$6.5 billion as of 2022. The FDA engages both in rulemaking (including rules for product approval and for safety warning requirements) and in enforcement (including recall of drug or medical products presenting safety hazards).

The FDA follows the retrospective review practices set by its parent agency.¹⁶⁸ The FDA participated in HHS’s “Regulatory Clean-up” initiative.¹⁶⁹ In January 2021, the FDA and CMS published a notice about HHS’s SUNSET rule, which (as discussed above) made HHS rules automatically expire after ten years “unless retrospective review determines that the regulations should be maintained.”¹⁷⁰ HHS detailed its retrospective review process in its October 2021 Notice on the repeal of its proposed SUNSET Rule.¹⁷¹

b. Consideration of AI-enabled Tools

HHS (and CMS and FDA) took part in the “AI for Deregulation” pilot (detailed above) in

¹⁶⁴ Securing Updated and Necessary Statutory Evaluations Timely, 85 Fed. Reg. at 70,097 (“[A]ll regulations . . . shall expire at the end of (1) five calendar years after . . . this final rule first becomes effective, (2) ten calendar years after . . . the Section’s promulgation, or (3) ten calendar years after the last year in which the Department Assessed and, if required, Reviewed the Section, whichever is latest.”). The final rule also provides for a “continuation” of a regulation that is subject to expiration if the “Secretary makes a written determination that the public interest requires [such] continuation.” *Id.*

¹⁶⁵ Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. 5694 (Jan. 19, 2021).

¹⁶⁶ *Id.* At 5695. On May 27, 2022, HHS announced that it was withdrawing the Sunset Rule, effective July 26, 2022. See <https://www.federalregister.gov/documents/2022/05/27/2022-11477/withdrawing-rule-on-securing-updated-and-necessary-statutory-evaluations-timely>.

¹⁶⁷ *Id.* At 5694.

¹⁶⁸ Interview with FDA Official A (April 13, 2022, via Zoom).

¹⁶⁹ See Regulatory Clean Up Initiative, 85 Fed. Reg. 72,899 (Nov. 16, 2020).

¹⁷⁰ See Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. 5694 (Jan. 19, 2021).

¹⁷¹ See Securing Updated and Necessary Statutory Evaluations Timely; Proposal to Withdraw or Repeal, 86 Fed. Reg. 59,906 (Oct. 29, 2021).

which the AI tool, RegExplorer, was used to run NLP models and other AI/ML models to identify readily apparent mistakes in the rules (focusing on broken citations and instances of duplicative paperwork requirements).

HHS utilized the RegExplorer tool in a fairly narrow fashion, while recognizing wider potential uses of such tools. According to HHS, AI review was [U]seful because it suggested that large numbers of Department regulations would benefit from retrospective review. The technology identified that 85% of Department regulations created before 1990 have not been edited; the Department has nearly 300 broken citation references in the CFR; and there are more than 50 instances of HHS regulatory requirements to submit paper documents in triplicate or quadruplicate.¹⁷²

In November 2020, CMS and the FDA published a *Federal Register* notice for HHS’s final rule from the “Regulatory Clean Up Initiative,” announcing that “HHS recently applied AI and Natural Language Processing (NLP) technology to support and accelerate [subject matter expert] reviews in cognizant divisions of HHS of unstructured text in the Code of Federal Regulations (CFR), facilitating the identification of opportunities to improve HHS’s regulations.”¹⁷³

Both CMS and FDA officials received a retrospective review output from Deloitte’s RegExplorer as part of the “AI for Deregulation” pilot conducted by its parent agency HHS. After running the RegExplorer tool, HHS farmed out flagged regulations to respective agencies within the department. CMS’s Office of Strategic Operations and Regulatory Affairs (OSORA) interacted with the RegExplorer analysis.¹⁷⁴ OSORA staff flagged a not insignificant number of “false positives.”¹⁷⁵ Moreover, the CMS list was “really long” so that it was difficult and time-consuming to track back/look back to each regulation in context.¹⁷⁶

The FDA likewise was circumspect regarding the success of the RegExplorer pilot. The FDA sent the identified rules to subject matter experts within the agency, who looked at the rules, confirmed the flagged mistakes, and implemented the appropriate fix.¹⁷⁷ Using RegExplorer created efficiencies for retrospective review by automating an initial step of finding mistakes to correct. FDA subject matter experts thought that the AI tool had done a “pretty good job,” but they had identified errors in the AI’s analysis.¹⁷⁸ The FDA did not issue any notice about its use of RegExplorer as the changes were meant to be minor and not substantive and HHS had applied the “good cause” exception to avoid notice and comment for the initiative.

¹⁷² Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. 5694, 5710 (Jan. 19, 2021).

¹⁷³ See Regulatory Clean Up Initiative, 85 Fed. Reg. 72,899 (Nov. 16, 2020).

¹⁷⁴ See Interview with CMS Official A, *supra* note 139; Interview with CMS Official B (June 27, 2022, via Zoom).

¹⁷⁵ For example, where CMS had updated something around an existing regulation—and a citation flagged by HHS as broken/outdated had been replaced elsewhere. Interview with CMS Official B, *supra* note 174.

¹⁷⁶ *Id.*

¹⁷⁷ See Interview with FDA Official A, *supra* note 168.

¹⁷⁸ *Id.*

The Regulatory Clean Up Rule, however, represented only a portion of the pilot’s results.¹⁷⁹ At the end of the rule, HHS foreshadowed that it anticipated continuing to use AI “to algorithmically refine identification of potentially ‘outmoded’ regulations and . . . seek algorithmic characterization of . . . regulations which are ‘ineffective, insufficient, or excessively burdensome’, as candidates for SME [subject matter expert] review and potential reform.”¹⁸⁰

When HHS promulgated the SUNSET Rule, providing for a ten-year sunset on all regulations unless “Assessed and, if required, Reviewed” by HHS,¹⁸¹ it specifically maintained that “Artificial intelligence will not be used to perform Assessments and Reviews pursuant to [SUNSET].”¹⁸² The stated rationale for this was that “[w]hile [AI] can determine if a regulation has been amended in the last thirty years, it cannot at this time easily determine if a regulation satisfies the criteria listed in 5 U.S.C. 610.”¹⁸³ At the same time, in response to comments, HHS concluded that the study “suggests humans performing a comprehensive review of [HHS] regulations would find large numbers of requirements that would benefit from review, and possibly amendment or rescission.”¹⁸⁴

HHS’s AI Strategy allows room for using an AI tool to support retrospective review, or rulemaking more broadly. One part of the strategy is “[f]unding programs, grants, and research that leverage AI-based solutions.”¹⁸⁵ Not only does HHS “encourage grant recipients to consider AI’s utility and prioritize and enable programs, grants, and research that use AI,” the agency will also “deploy AI in the grantmaking process itself.”¹⁸⁶ This shows that HHS is willing to use AI to support purely internal functions, such as retrospective review.

2. DOT: RegData Dashboard

a. Retrospective Review Experience

DOT’s Regulatory Policies and Procedures require retrospective review, pursuant to E.O.s 12,866 and 13,563 and § 610 of the RegFlex Act.¹⁸⁷ DOT reviews all regulations on a ten-year

¹⁷⁹ Regulatory Clean Up Initiative, 85 Fed. Reg. at 72,899 (“The revisions outlined in this rule represent a portion of the results from [the pilot] . . .”); *HHS Launches First-of-its-Kind Regulatory Clean-Up Initiative Utilizing AI*, EIN PRESSWIRE, NEWS (Nov. 17, 2020), https://www.einnews.com/pr_news/530915753/hhs-launches-first-of-its-kind-regulatory-clean-up-initiative-utilizing-ai (referring to the final rule as “represent[ing] a portion of the results from [the 2019 pilot project]”).

¹⁸⁰ Regulatory Clean Up Initiative, 85 Fed. Reg. at 72,899–900

¹⁸¹ See *Securing Updated and Necessary Statutory Evaluations Timely*, 86 Fed. Reg. 5694 (Jan. 19, 2021)

¹⁸² *Securing Updated and Necessary Statutory Evaluations Timely*, 86 Fed. Reg. at 5710.

¹⁸³ *Id.* Regulatory Flexibility Act § 3(a), 5 U.S.C. § 610(b).

¹⁸⁴ *Id.*

¹⁸⁵ U.S. DEP’T OF HEALTH & HUM. SERVS., ARTIFICIAL INTELLIGENCE (AI) STRATEGY 3 (2021), *available at* <https://www.hhs.gov/sites/default/files/hhs-ai-strategy.pdf>.

¹⁸⁶ *Id.*

¹⁸⁷ Department Regulatory and Deregulatory Agenda; Semiannual Summary, Appendix D, 87 Fed. Reg. 5256, 5258 (Jan. 31, 2022) [hereinafter DOT Appendix D].

cycle:¹⁸⁸ “Generally, each DOT agency has divided its rules into 10 different groups and analyzes one group each year.”¹⁸⁹ The review schedule is not set in stone, however, and “[s]ome reviews may be conducted earlier than scheduled.”¹⁹⁰ Outside of the ten-year process, a variety of factors could motivate DOT to review a regulation ahead of schedule. For example, events such as accidents,¹⁹¹ proliferation of new technologies,¹⁹² or changes to vehicle manufacturing processes¹⁹³ could all play such a role. DOT’s experience with enforcement¹⁹⁴ and input from the public¹⁹⁵ could similarly motivate a change in the retrospective review schedule. Finally, DOT has about 25 advisory committees, composed of key stakeholders, who evaluate existing regulatory programs and provide recommendations to the Secretary of Transportation.¹⁹⁶

When reviewing an existing regulation, the operating administration¹⁹⁷ responsible for its issuance reviews the existing rule for “[r]egulatory flexibility,”¹⁹⁸ “[g]eneral updates,”¹⁹⁹ and any “[o]ther considerations as required by relevant executive orders and laws.”²⁰⁰ DOT also asks for the public’s input on “how best to lessen the [regulation’s] impact.”²⁰¹

¹⁸⁸ See *DOT’s Review Process*, U.S. DEP’T OF TRANSP., <https://www.transportation.gov/regulations/dots-review-process> (last visited March 31, 2022); U.S. DEP’T OF TRANSP., DEPARTMENTAL ORDER 2100.6A: RULEMAKING AND GUIDANCE PROCEDURES § 10(d)(1) (2021) [hereinafter U.S. DEP’T OF TRANSP., ORDER 2100.6A] (“All departmental regulations are on a 10-year review cycle, as described in Appendix D of the Unified Agenda.”); DOT Appendix D, *supra* note 187 (describing the 10-year review cycle). Guidance documents are not reviewed on this same schedule, but DOT requires that “effective guidance documents are periodically reviewed for accuracy, consistency with regulatory and statutory changes, and Administration policies and objectives.” U.S. DEP’T OF TRANSP., ORDER 2100.6A, *supra*, at § 15(c).

¹⁸⁹ *DOT’s Review Process*, *supra* note 188; accord DOT Appendix D, *supra* note 187, at 5259 (“Generally, the agencies have divided their rules into 10 different groups and plan to analyze one group each year.”).

¹⁹⁰ DOT Appendix D, *supra* note 187, at 5258.

¹⁹¹ *Id.* (“[E]vents, such as accidents, may result in the need to conduct earlier reviews of some rules.”).

¹⁹² Interview with DOT Officials B, C, and D (March 11, 2022, via Zoom).

¹⁹³ *Id.*

¹⁹⁴ *Id.* Early on, specific offices would generally be aware of regulations that need to be better defined or updated and would be receiving input from outside stakeholders. *Id.*

¹⁹⁵ DOT Appendix D, *supra* note 187, at 5258–59 (“Other factors may also result in the need to make changes; for example, we may make changes in response to public comment on this plan or in response to a presidentially mandated review. . . . We request public comment on the timing of the reviews. For example, is there a reason for scheduling an analysis and review for a particular rule earlier than we have?”).

¹⁹⁶ Interview with DOT Officials B, C, and D, *supra* note 192; see, e.g., *Aviation Consumer Protection Advisory Committee*, U.S. DEP’T OF TRANSP., <https://www.transportation.gov/airconsumer/ACPAC> (last visited Mar. 31, 2022).

¹⁹⁷ There are eleven operating administrations within DOT, see *supra* note 63.

¹⁹⁸ The issuing administration considers “[w]hether the regulation has a significant economic impact on a substantial number of small business entities and, thus, requires review under section 610 of the Regulatory Flexibility Act.” U.S. DEP’T OF TRANSP., ORDER 2100.6A, *supra* note 188, § 10(d)(2)(a).

¹⁹⁹ The issuing administration evaluates “[w]hether the regulation may require technical corrections, updates (e.g., to reflect updated versions of voluntary consensus standards that may be tied to DOT regulations), revisions, rewriting to ensure its language is clear, or repeal.” *Id.* § 10(d)(2)(b).

²⁰⁰ *Id.* § 10(d)(2).

²⁰¹ DOT Appendix D, *supra* note 187 at 5259 (“We also will seek public comment on how best to lessen the impact of these rules and provide a name or docket to which public comments can be submitted.”).

b. Consideration of AI-enabled Tools

DOT is not currently using any AI-based or other computer tools during the retrospective review process, but agency officials are open to exploring the idea.²⁰² DOT officials expressed a desire for a tool that would help a regulatory analyst “know where to start” when it came to identifying regulations ripe for retrospective review.²⁰³

While not currently used by DOT staff members in the retrospective review process, RegData Dashboard might be able to fulfill this precise function.²⁰⁴ DOT describes this iteration of the RegData Dashboard as “Phase One,” hoping to continue to evolve the tool to provide additional insights.²⁰⁵ The only current future plans for RegData Dashboard is to apply the algorithms on a more granular level—i.e., to individual Subparts or Sections of DOT’s regulations in the CFR, instead of just Titles and Parts.²⁰⁶

3. DoD: GAMECHANGER

a. Retrospective Review Experience

DoD established a retrospective review process in response to E.O. 13,563. Their process provides that the agency will review all rules three years after publication, and also review these rules on an approximately three-year cycle thereafter (the cycle may vary rule-by-rule).²⁰⁷ In setting this process, DoD wanted to entrench retrospective review as an ongoing process—not a one-off effort.²⁰⁸ Their review process only involves legislative rules and excludes policy documents.²⁰⁹ DoD has plans to include policy documents in the future, but it has proved challenging because the agency lacks a standardized and centralized repository to host these policy memoranda.²¹⁰

Outside of this three-year review process, DoD set up a “Regulatory Reform Task Force” in response to President Trump’s E.O. 13,777.²¹¹ The Task Force included ten voting members,

²⁰² Interview with DOT Officials B, C, and D, *supra* note 192.

²⁰³ *Id.*

²⁰⁴ Interview with DOT Official A, *supra* note 68. RegData Dashboard has not been tested by potential users, and no regulatory action has come of it. All outcomes of using RegData Dashboard in the retrospective review process are speculative.

²⁰⁵ U.S. DEP’T OF TRANSP., DASHBOARD, *supra* note 66, at 3, 10.

²⁰⁶ *Id.* at 12; Interview with DOT Official A, *supra* note 68.

²⁰⁷ Interview with DoD Officials D and E (March 10, 2022, via Zoom). Within DoD’s 3-year review process, the method of identifying rules ripe for review is straightforward: Whatever rule reaches their third year since their last review becomes eligible.

²⁰⁸ *Id.*

²⁰⁹ *Id.*

²¹⁰ *Id.* This is especially challenging given that many officials within DoD have delegated authority from the Defense Secretary to issue policy memos. *Id.*

²¹¹ See DoD Regulatory Reform Task Force, Review of Existing DoD Regulations, 82 Fed. Reg. 48,939 (Oct. 23, 2017).

four support staff, and a team of contractors.²¹² To identify rules for their Task Force, DoD tasked rule writers to brief the Task Force on the rules they had written (including why they were promulgated, relevant developments since promulgation, and any known outstanding issues), after which the Task Force reviewed all authorities for the rules and voted on whether to consider the rules for regulatory cleanup.²¹³ The agency also published a *Federal Register* notice asking for public input on any of the considered rules.²¹⁴ The Task Force reviewed 716 rules and made recommendations on which rules to revise or repeal, most of which have been implemented.²¹⁵

DoD does not typically directly involve the public in its retrospective review activity. The agency does not publish *Federal Register* notices and does not seek comment about its three-year rule reviews. But the public can send petitions to DoD at any time to conduct a review of any rule.²¹⁶

b. Consideration of AI-enabled Tools

DoD officials (former and current) recognized the potential upside of harnessing AI-enabled tools for retrospective review. According to current DoD officials, “[i]t’s a very manual analysis right now.”²¹⁷ Given the large number of DoD regulations, a “pain point” (mentioned by current and former DoD officials) has been to identify conflicting language between different rules and identify incorrect cross-references.²¹⁸

DoD has not yet used GAMECHANGER for retrospective review,²¹⁹ but it is instructive to consider the extent to which the tool could adapt its current “prospective” regulatory analysis features (to help agency staff efficiently and effectively draft new rules or policies) into “retrospective” policy analysis features (to help agency staff efficiently and effectively review and update already existing rules or policies). Specifically, GAMECHANGER could potentially re-tool most of its current knowledge graph and AI infrastructure. But, whereas GAMECHANGER’s current data is limited to policy and guidance documents, it would require the inclusion of all agency rules and regulations and adding dedicated retrospective review AI features.

²¹² For a list of members of DoD’s Regulatory Reform Task Force, see <https://open.defense.gov/Portals/23/Documents/Regulatory/DoD-RRTF-Members.pdf>.

²¹³ Interview with DoD Officials D and E, *supra* note 207.

²¹⁴ DoD Regulatory Reform Task Force, Review of Existing DoD Regulations, 82 Fed. Reg. at 48,939 (“In accordance with Executive Order 13777, ‘Enforcing the Regulatory Reform Agenda,’ the primary DoD Regulatory Reform Task Force is seeking input on existing DoD regulations that may be appropriate for repeal, replacement, or modification.”).

²¹⁵ Interview with DoD Officials D and E, *supra* note 207.

²¹⁶ According to DoD officials, DoD is always open to receiving petitions for rule review or feedback on rules. *See id.*

²¹⁷ Interview with DoD Officials D and E, *supra* note 207.

²¹⁸ Interview with DoD Former Official C, *supra* note 87. A former DoD official mentioned that broken references were a significant issue within DoD; but it wasn’t made a policy priority. *Id.* As one current DoD official explained, given the size of DoD and the scope of its regulations, the domain for retrospective review is vast. And, so correspondingly, is the scope for making mistakes in drafting and enacting rules. Interview with DoD Officials D and E, *supra* note 207.

²¹⁹ At least, as of March 2022. *See* Interview with DoD Officials D and E, *supra* note 207.

According to former and current DoD officials, given that DoD is leanly staffed, it has proved challenging to allocate sufficient resources to the retrospective review process. Current DoD officials expressed enthusiasm about the prospect of using the GAMECHANGER tool for retrospective review in the future.²²⁰ But these same officials noted that this integration may not happen in the near term because of challenges in allocating resources to adopt the tool and train staff.²²¹ While acknowledging that there would be significant upfront costs in setting up their agency staff to use GAMECHANGER, DoD officials nonetheless believed that the benefits from using the tool would outweigh the costs.²²²

4. CMS: Regulatory Analytics Proof-of-Concept

a. Retrospective Review Experience

CMS oversees three very different programs: Medicare, Medicaid, and the healthcare exchanges. With regard to Medicare regulations, CMS updates and revises these continuously. By statute, CMS has to update the rates for payment systems and conditions of participation on an annual basis. As a result, CMS, via its Office of Strategic Operations and Regulatory Affairs (OSORA), “touch[es] on [its] rules on an annual basis.”²²³ As part of that annual updating process, CMS/OSORA conduct retrospective review for a large number of significant regulations. With regard to Medicaid and the exchanges, there are various initiatives as well as additional triggers for retrospective review. CMS involves the public in identifying rules for review through listening sessions and requests for information (RFIs).²²⁴

CMS published six notices between 2011 and 2014 announcing rules that CMS proposed would achieve regulatory reforms under E.O. 13,563 as a result of retrospective review.²²⁵

b. Consideration of AI-enabled Tools

CMS is currently exploring using AI for both retrospective analysis (e.g., to identify conflicts or errors in existing regulations) and prospective analysis (e.g., to confirm that a rule being drafted is not redundant or incompatible with previously issued regulations), and for both intra-CMS analysis and cross-domain analysis comparing CMS rules with rules by other agencies inside and outside HHS. The agency approaches retrospective review with a “burden reduction

²²⁰ Interview with DoD Officials D and E, *supra* note 207.

²²¹ *Id.*

²²² *Id.*

²²³ Interview with CMS Official B, *supra* note 174.

²²⁴ Interview with CMS Official A, *supra* note 138; Interview with CMS Official B, *supra* note 174. According to a CMS official, CMS/OSORA puts RFIs in all payment rules. *See, e.g., CMS Seeks Public Input on Patients over Paperwork Initiative to Further Reduce Administrative, Regulatory Burden to Lower Healthcare Costs*, CMS (June 6, 2019), <https://www.cms.gov/newsroom/press-releases/cms-seeks-public-input-patients-over-paperwork-initiative-further-reduce-administrative-regulatory>; *Hospital Inpatient Prospective Payment Systems and Proposed Policy Changes*, 83 Fed. Reg. 20,164, 20,167 (May 7, 2018).

²²⁵ *See, e.g., Medicare and Medicaid Program; Regulatory Provisions to Promote Program Efficiency, Transparency, and Burden Reduction*, 76 Fed. Reg. 65,909 (Oct. 24, 2011).

lens” and looks for ways, including by leveraging AI tools, to systematically explore all their regulations to find outdated policies (e.g., policies that do not represent the current state of medical technology). OSORA is interested in leveraging AI to not only make rulemaking more efficient but to make rulemaking “better,” i.e., more effective at achieving its regulatory goals while minimizing regulatory burden.²²⁶

CMS joined the GSA pilot to evaluate the comparative benefits from using a KRR approach. The cross-domain analysis use case directly relates to retrospective review. Agencies could leverage an accurate and efficient cross-domain analysis tool during retrospective review to identify rules that are redundant of other rules or contain inaccurate cross-references to other rules, and to compare the economic impact of different rules—even if they apply to different regulatory domains. The ultimate goal was to enable CMS staff to compare regulatory directives (from rules and sub-regulatory guidance) to identify inconsistency, redundancy, or cumulative burden across policies.²²⁷ Such a tool would help CMS to harmonize guidance within the same regulatory domain (e.g., compare multiple CMS regulations addressing the same aspects of durable medical equipment regulation), avoid or resolve issues with intersecting or overlapping requirements across domain (e.g., compare requirements from FDA and CMS targeted at durable medical equipment), and manage revisions to rules as the agency introduces new rules or reviews existing rules.

CMS has created a repository of its regulations called MediRegs. This database, however, does not leverage any AI capabilities and lacks the “knowledge graph structure” and metadata features which could enable advanced AI capabilities.²²⁸

OSORA maintains that technology in regulations will be essential: “We absolutely need to add technology into our process.”²²⁹ OSORA identified two fundamental challenges. First, with regard to searching for redundancies, Medicare has different payment systems and a tool would have to track whether, for example, it was updating in the inpatient or outpatient setting. Retrospective review is difficult even for human subject matter experts, indeed, it is why CMS relies so heavily on RFIs, comments from the public.²³⁰ Second, according to an OSORA official, “we never have a slowdown.”²³¹ For this reason, the agency has pursued an incremental approach: find some time, take a small area, then expand. Durable medical products was a choice area in which to start, according to an OSORA official, given its relatively new payment system.²³² Even so, pilots are a heavy load, requiring subject matter expert input as well as oversight by OSORA. For this reason, an OSORA official suggested that any AI-enabled tools should be built into the Federal Docket Management System.²³³

²²⁶ Interview with CMS Official A, *supra* note 138. Interview with CMS Official B, *supra* note 174.

²²⁷ Interview with CMS Official A, *supra* note 138.

²²⁸ See Interview with CMS Official A, *supra* note 138. CMS also had discussed with Deloitte about using Deloitte’s tools while preserving the structure from their existing MediRegs database. *Id.*

²²⁹ See Interview with CMS Official B, *supra* note 174.

²³⁰ See *supra* note 224.

²³¹ Interview with CMS Official B, *supra* note 174.

²³² *Id.*

²³³ *Id.*

B. Additional Independent and Executive Branch Agencies

1. Retrospective Review Experience

a. *Independent Agencies*

- Federal Trade Commission (FTC)

The FTC is an independent federal agency whose principal mission is the enforcement of civil U.S. antitrust law and the promotion of consumer protection. The FTC is a relatively large agency, headed by five commissioners, with more than 1,000 staff and an annual budget over \$300 million. The FTC’s primary focus is enforcement, although it does engage in rulemaking to proscribe unfair or deceptive practices.

The FTC’s retrospective review obligations arise out of the RegFlex Act. The FTC also has voluntarily followed Executive Orders on retrospective review (they are not binding on independent agencies). According to the FTC, it “reviews its rules and guides periodically to seek information about their costs and benefits, regulatory and economic impact, and general effectiveness in protecting consumers and helping industry to avoid deceptive or unfair practices” and that “these reviews assist the Commission in identifying rules and guides that warrant modification or rescission.”²³⁴ The FTC has a policy of reviewing all of its legislative rules (issued under the FTC Act) and industry guides (formal commission guidance documents, non-binding but codified in the *Federal Register*) over a ten-year cycle.²³⁵ The ten-year review cycle has become part of the FTC’s culture; moreover, the FTC prides itself on going beyond the standard retrospective review requirements by reviewing *all* its rules and industry guides.²³⁶ The FTC did not establish a regulatory task force in response to E.O. 13,777.²³⁷

The FTC’s current retrospective review process is manual and does not leverage computer tools. One staff member keeps track of a “regulatory review list” and maintains the regulatory review schedule up to date, in coordination with each FTC office. Once a rule is added to the list, one or two rulemaking staff members (domain experts) get assigned to this rule, review any issue that may have been flagged, and issue a retrospective review notice in the *Federal Register* to seek public comments on whether and how to revise the rule.²³⁸

Retrospective review may be initiated bottom-up (subject matter expert staff, which both write and enforce the rules, identify issues with existing rules) or top-down (a commissioner may institute a change or identify a concern with an existing rule). For its bottom-up component, the

²³⁴ See Funeral Industry Practices Rule, 85 Fed. Reg. 8400 (Feb. 14, 2020).

²³⁵ The FTC does not review “rules” that are not published in the *Federal Register*.

²³⁶ See Interview with FTC Official A (March 8, 2022, via Zoom).

²³⁷ The FTC did not publish any notice about E.O. 13,777 in the *Federal Register*; nor was it mentioned by FTC Official A, *see id.*

²³⁸ No staff is involved full-time with retrospective review but many staff members across the agency participate. *See id.*

process relies on (1) enforcement experience (enforcement staff may detect issues when enforcing rules); and (2) public feedback solicited through retrospective review public notices.

The FTC was among the agencies providing the most transparency to the public about its retrospective review process. The FTC publishes its ten-year review schedule in the *Federal Register* every year.²³⁹ This schedule identifies rules currently under review, rules reviewed in the past year, and rules scheduled for review in the coming year. The FTC sometimes relies on the public to identify technical errors in rules and often starts its review process by issuing a Notice soliciting public comments on “(1) [t]he economic impact of, and the continuing need for the [Rule]; (2) the Rule’s benefits to consumers; (3) and the burden it places on industry members subject to the requirements, including small businesses.”²⁴⁰ After this first stage, the FTC may initiate an NPRM to get further comments and/or initiate a rule change. Outside of the *Federal Register*, the FTC frequently posts on its blogs to inform the public about its retrospective review efforts.²⁴¹ On its website, the FTC publicizes a range of documents related to its retrospective review activities.²⁴²

- Surface Transportation Board (STB)

The STB is an independent federal agency that is charged with the economic regulation of various modes of surface transportation, primarily freight rail. The STB has jurisdiction over railroad rates, business practices, and mergers, as well as certain passenger rail and intercity bus matters. The STB is a relatively small agency, headed by five commissioners, with about 150 staff and an annual budget of about \$40 million. The STB engages in both rulemaking and enforcement activities.

As an independent agency, the STB (like the FTC) is not bound to follow Executive Orders on retrospective review, but it has chosen to follow E.O. guidance to conduct retrospective review. The STB typically initiates retrospective review projects when a newly inaugurated administration issues an E.O. instructing agencies to review regulations. The agency conducted one E.O.-driven retrospective review project in 2011 (in response to E.O. 13,563²⁴³), and one in 2017 (in response to E.O. 13,777²⁴⁴). To comply with the spirit of E.O. 13,777, STB established a Regulatory Reform

²³⁹ See, e.g., [FTC] Regulatory Review Schedule, 84 Fed. Reg. 18,746, 18,747 (May 2, 2019) (“When the Commission reviews a rule or guide, it publishes a document in the Federal Register seeking public comments on the continuing need for the rule or guide, as well as the rule’s or guide’s costs and benefits to consumers and businesses.”).

²⁴⁰ *Id.*

²⁴¹ The FTC has adopted blogs as a communication channel by virtue of being a “consumer facing” agency. See Interview with FTC Official A, *supra* note 236.

²⁴² See, e.g., *Retrospective Review of FTC Rules and Guides*, FTC, <https://www.ftc.gov/enforcement/rulemaking/retrospective-review-ftc-rules-guides> (last visited Jan. 12, 2023); *Rules and Guides Currently Under Review*, FTC, <https://www.ftc.gov/enforcement/rulemaking/retrospective-review-ftc-rules-guides/rules-guides-currently-under-review> (last visited Jan. 12, 2023).

²⁴³ See Reducing Regulatory Burden; Retrospective Review Under E.O. 13563, 76 Fed. Reg. 63,276 (Oct. 12, 2011) (“the Surface Transportation Board is undertaking review of its existing regulations to evaluate their continued validity and determine whether they are crafted effectively to solve current problems facing shippers and railroads.”).

²⁴⁴ See Regulatory Reform Task Force, 82 Fed. Reg. 28,617 (June 23, 2017).

Task Force in April 2017.²⁴⁵ The STB lacks the resources to continuously conduct retrospective review and limits its activity to “regulatory review task forces” set up in response to E.O.s. The STB does not issue many guidance documents or policy statements, so its retrospective review activity focuses on legislative rules.

The STB may identify rules for review during its adjudication or rulemaking activity.²⁴⁶ The STB’s current retrospective review process is entirely manual. Agency officials characterized it as “old school,” and acknowledged that their process may not scale effectively at a larger agency.²⁴⁷ Staff members from different offices (including Office of General Counsel, Economics, and Proceedings) get together, generate ideas about which rules to review, and assign staff within each office to take a closer look at rules potentially ripe for review. The agency also targets rules that are outdated or inconsistent, for example because they refer to the terminated Interstate Commerce Commission, which the STB replaced in 1996, or because they reference obsolete STB addresses or the names of former STB employees.²⁴⁸ The STB office directors coordinate this process and allocate downstream tasks to their office members. Individual staff members manually keep lists of rules they want to prioritize for review at STB’s next round of retrospective review.

The STB involves the public in its rule review prioritization via informal avenues. The agency solicits comments and holds “listening sessions”—i.e., not a formal hearing, but an opportunity for the public to be heard. It also frequently holds meetings with its railroad or shipping company stakeholders, with whom it maintains tight relationships.

- National Credit Union Administration (NCUA)

The NCUA is an independent federal agency that insures deposits at federally insured credit unions, protects the members who own credit unions, and charters and regulates federal credit unions.²⁴⁹ As an independent agency (like FTC and STB), they are not subject to the Executive Orders that mandate retrospective review. However, the NCUA “chose to comply with

²⁴⁵ STB did not publish a *Federal Register* Notice specifically to announce the Task Force but referred to the Task Force in two rule changes performed in 2019 that were initiated by the Task Force. *See* Water Carrier Tariff Filing Procedures, 84 Fed. Reg. 20,292 (May 9, 2019) (“In April 2017, the Board established its Regulatory Reform Task Force (RRTF) to comply with the spirit of Executive Order 13777. . . . The RRTF identified the current water carrier tariff regulations at 49 CFR part 1312 as imposing unnecessary costs on the carriers as well as the Board.”); Payment, Filing, and Service Procedures, 84 Fed. Reg. 12,940 (Apr. 3, 2019) (“In April 2017, the Board established its Regulatory Reform Task Force (RRTF) to comply with the spirit of Executive Order 13777. The RRTF’s mission is to identify Board rules and practices that are burdensome, unnecessary, or outdated and to recommend how they should be addressed. . . . [T]he RRTF identified the Board’s payment and filing procedures as a potential area for reform and, following stakeholder input, recommended in its November 2017 status report that the Board update procedural and filing rules that are in need of modernization.”).

²⁴⁶ STB may struggle to identify rules for review with the set of regulations that don’t naturally surface in STB’s enforcement or rulemaking activities. *See* Interview with STB Officials A and B (March 29, 2022, via Zoom).

²⁴⁷ *See id.*

²⁴⁸ Until recently, some regulations still referred to the ICC. *See id.*

²⁴⁹ *See About NCUA*, NAT’L CREDIT UNION ADMIN., <https://www.ncua.gov/about> (last modified Jan. 4, 2023).

the spirit of President Trump’s regulatory reform agenda and EO 13777,” and established a Regulatory Review Task Force.²⁵⁰ The Task Force issued its first report in 2017.²⁵¹

The NCUA reviews all its existing regulations every three years,²⁵² even though it is not required to by statute. The Office of the General Counsel identifies one-third of the NCUA’s existing regulations for review each year. Notice of the list of regulations to be reviewed is posted on the NCUA’s website, and the public is invited to comment on the listed regulations.²⁵³ Commentors are invited to address the understandability of the regulations, as well as areas for substantive regulatory change. Policy experts within the NCUA then summarize the content of the comments.²⁵⁴ Outside of these solicited comments, the NCUA has a “Public Affairs” email list where industry stakeholders (or anybody else) can sign up for updates on opportunities to comment.²⁵⁵

In addition to this periodic review, the NCUA “may review or revise regulations through processes outside this periodic review.”²⁵⁶ These tend to be the more technical amendments—i.e., correcting errors in the CFR on a more ad hoc basis. These error corrections are conducted fairly regularly, although not every year.²⁵⁷ The NCUA publishes a regulatory agenda in the *Federal Register* each spring and fall.²⁵⁸

Currently, the NCUA’s retrospective review process is entirely manual. The agency receives comments by email and creates summaries in word documents.²⁵⁹

- Office of the Comptroller of the Currency (OCC)

The OCC is an independent bureau of the Department of Treasury.²⁶⁰ The OCC charters, regulates, and supervises all national banks, federal savings associations, and federal branches and agencies of foreign banks.²⁶¹

There are two main avenues for retrospective review within the OCC. First, the OCC is required to review all rules every ten years (under the Paperwork Reduction Act). The public is

²⁵⁰ Regulatory Reform Agenda, 82 Fed. Reg. 39,702 (Aug. 22, 2017).

²⁵¹ *Id.*

²⁵² See *Regulatory Review*, NAT’L CREDIT UNION ADMIN., <https://www.ncua.gov/regulation-supervision/rules-regulations/regulatory-review> (last modified Feb. 22, 2022).

²⁵³ *Id.*

²⁵⁴ See Interview with NCUA Official A (April 12, 2022, via Zoom).

²⁵⁵ *Id.*

²⁵⁶ *Regulatory Review*, *supra* note 252.

²⁵⁷ See Interview with NCUA Official A, *supra* note 254.

²⁵⁸ See, e.g., *Agency Rule List – Fall 2022*, OFF. INFO. & REGUL. AFFS., https://www.reginfo.gov/public/do/eAgendaMain?operation=OPERATION_GET_AGENCY_RULE_LIST¤tPub=true&agencyCode=&showStage=active&agencyCd=3133 (last visited Jan. 12, 2023).

²⁵⁹ See Interview with NCUA Official A, *supra* note 254.

²⁶⁰ See *Who We Are*, OFF. COMPTROLLER OF THE CURRENCY, <https://www.occ.treas.gov/about/who-we-are/index-who-we-are.html> (last visited Jan. 12, 2023).

²⁶¹ *Id.*

heavily involved in this process.²⁶² The OCC puts batches of rules out for comment (by subject matter), asking the public to provide input on what they would like to see changed or what is working well. Public input is an essential part of the process.²⁶³

Second, the OCC reviews some rules outside of the ten-year cycle, for example, when statutes change, when agency policy changes, or when there are changes to the banking industry. Outside of the ten-year process, potential changes are mostly identified by hand and recorded in a centralized document.²⁶⁴ Some ideas for changes come from the Comptroller, some come from stakeholders, and some come from the other federal banking agencies (who want to ensure “lockstep” regulation in a certain area).²⁶⁵

b. Executive Branch Departments and Agencies

- Department of Education (DoEd)

The DoEd is a Cabinet-level executive department of the U.S. government. The DoEd’s mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access. The DoEd engages in rulemaking and enforcement activity, notably through its Office of Civil Rights. The Office of Postsecondary Education (OPE) is the office most involved with retrospective review because it publishes the majority of the regulations issued by the DoEd.²⁶⁶ The DoEd is a large agency with more than 4,000 staff and an annual budget of about \$70 billion.

The DoEd is not mandated to perform retrospective review by statute, but is subject to presidential Executive Orders. E.O. 13,563 tasked DoE to perform “regulatory cleanup”-type activities.²⁶⁷ In 2020, in response to E.O. 13,891, the DoEd conducted a review of its guidance documents, and rescinded many guidance documents through public notice.²⁶⁸ In response to E.O. 13,777, the DoEd formed a Regulatory Task Force and sought public input on what rules the Task Force should consider for review. It did so through an initial *Federal Register* Notice seeking public comments on which “regulations . . . may be appropriate for repeal, replacement, or modification,”²⁶⁹ followed by two public hearings focused on “postsecondary education” rules.²⁷⁰ Outside of E.O. mandates, DoEd’s retrospective review process is ad hoc, not periodic.²⁷¹

The DoEd’s typical process to identify rules ripe for review is ad hoc and lacks a centralized process. Usually, a stakeholder or an OPE agency staff will notice an aspect of a rule that should

²⁶² See Interview with OCC Officials A, B, and C (April 18, 2022, via Zoom).

²⁶³ See *id.*

²⁶⁴ See *id.*

²⁶⁵ *Id.*

²⁶⁶ See Interview with DoEd Official A (March 25, 2022, via Zoom).

²⁶⁷ *Id.*

²⁶⁸ Exec. Order No. 13,891, Promoting the Rule of Law Through Improved Agency Guidance Documents, 84 Fed. Reg. 55,235 (Oct. 15, 2019).

²⁶⁹ See Evaluation of Existing Regulations, 82 Fed. Reg. 28,431 (June 22, 2017).

²⁷⁰ See Regulatory Reform; Public Hearings, 82 Fed. Reg. 40,518 (Aug. 25, 2017).

²⁷¹ See Interview with DoEd Official A, *supra* note 266.

be corrected and flag it for review. Flagged issues typically include incorrect cross-references or section numbering.²⁷² The DoEd also may review a rule after it has been asked by Congress to amend specific aspects of the rule. The 2020 guidance review featured a more centralized process, with the Office of General Counsel (tasked with executing the E.O.) coordinating the review across DoEd offices (each office assigned one or two staff to the guidance review).²⁷³

The retrospective review process is “pretty labor intensive.”²⁷⁴ Notably, its 2020 guidance review involved one or two people per office and lasted about eight months.²⁷⁵ One of the most time-consuming aspects was identifying all the relevant guidance documents, especially given that there is no organized repository of guidance. The agency does not use any technology to conduct its review, save spreadsheets.²⁷⁶

The DoEd typically does not involve the public in identifying rules ripe for review.²⁷⁷ Notably, the DoEd did not seek comments on its decision to rescind guidance documents as part of its 2020 guidance review.²⁷⁸ Still, for its 2011 retrospective review in response to E.O. 13,563, the DoEd published in the *Federal Register* to announce its review process and to seek comments.²⁷⁹

- Bureau of Safety and Environmental Enforcement (BSEE)

The BSEE is an agency within the U.S. Department of the Interior. BSEE “engages in retrospective review of its regulations in accordance with E.O. 13563 and E.O. 13610 ‘to ensure, among other things, that regulations incorporating standards by reference are updated on a timely basis.’”²⁸⁰ The BSEE does not conduct retrospective review on a set schedule, and current reviews are all conducted manually.²⁸¹

²⁷² *Id.*

²⁷³ *Id.*

²⁷⁴ *Id.*

²⁷⁵ A DoEd official described this guidance review as “a big project” and “time consuming.” *Id.*

²⁷⁶ *Id.*

²⁷⁷ *Id.*

²⁷⁸ In 2020, the DoEd did not announce its guidance review efforts but only published in the *Federal Register* to announce that it had rescinded rules as a result of its review project. *See* Notice of the Rescission of Outdated Guidance Documents, 85 Fed. Reg. 54,148 (Aug. 31, 2020) (“announc[ing] the guidance documents the [DoEd] is rescinding because they are outdated, after conducting a review of its guidance under Executive Order (E.O.) 13891.”); Notice of the Rescission of Outdated Guidance Documents, 86 Fed. Reg. 5172 (Jan. 19, 2021) (“mak[ing] corrections [from the first notice] to the included list of documents for [OPE].”).

²⁷⁹ Reducing Regulatory Burden; Retrospective Review Under E.O. 13563, 76 Fed. Reg. 39,343 (July 6, 2011) (requesting comments on DoEd’s “preliminary plan for the retrospective analysis of its existing regulations as part of its implementation of Executive Order 13563”).

²⁸⁰ Oil and Gas and Sulfur Operations on the Outer Continental Shelf—Oil and Gas Production Safety Systems, 81 Fed. Reg. 61,834, 61,855 (Sept. 7, 2016) (quoting OFF. OF MGMT. AND BUDGET, EXEC. OFF. OF THE PRESIDENT, OMB CIRCULAR A-119: FEDERAL PARTICIPATION IN THE DEVELOPMENT AND USE OF VOLUNTARY CONSENSUS STANDARDS AND IN CONFORMITY ASSESSMENT ACTIVITIES 4 (2016)).

²⁸¹ *See* Interview with BSEE Official A (March 25, 2022, via Zoom).

BSEE regulations incorporate by reference approximately 125 industry standards.²⁸² Each industry standard can be upwards of 300 pages and tens of thousands of words long—often much longer than the entirety of the BSEE’s regulatory text.²⁸³ By national and international mandates, all industry standards must be updated every three to five years. Thus, every year, the BSEE reviews the text of changed industry standards, the volume of which represents about 25 times the amount of their total regulatory text.²⁸⁴ As a smaller agency, this represents a significant burden.

Outside of the review of standards-incorporating regulations, the BSEE generally reviews their regulations by subpart—i.e., the BSEE will analyze all the regulations in a given CFR subpart at one time.²⁸⁵ Subparts are often prioritized by the BSEE through external input, both from the current administration and from the public more broadly.²⁸⁶ With respect to the latter, the BSEE engages with the industry and the public through yearly forums and workshops designed to facilitate input on which regulations or standards need updating.²⁸⁷

- U.S. Coast Guard

The U.S. Coast Guard—formerly within DOT but since 2003 housed within Department of Homeland Security (DHS)—is the principal federal agency responsible for maritime safety, security, and environmental stewardship in U.S. ports and waterways. The U.S. Coast Guard is the only military branch within the DHS.

The U.S. Coast Guard undertakes retrospective review on a periodic basis.²⁸⁸ It currently does not use any technology for the retrospective review process, but it has a centralized database of all regulations and policy documents. All cross-references are linked and the database can be used to highlight potential rules for economists to review.²⁸⁹

- Department of Commerce (DOC)

The DOC is an executive department of the U.S. federal government concerned with creating the conditions for economic growth and opportunity. The DOC works with businesses, universities, communities, and workers to promote job creation, economic growth, sustainable development, and improved standards of living for Americans.

In 2015, the DOC published a plan to “accelerate progress on retrospective review”²⁹⁰—which was required by E.O. 13,563. Regulations are likely reviewed (or identified for review) at

²⁸² *Id.*

²⁸³ *Id.*

²⁸⁴ *Id.*

²⁸⁵ *Id.*

²⁸⁶ *Id.*

²⁸⁷ Interview with BSEE Official A, *supra* note 281.

²⁸⁸ See Interview with Coast Guard Official A (April 11, 2022, via Zoom).

²⁸⁹ *Id.*

²⁹⁰ See *Retrospective Review of Regulations*, OFF. PRIV. & OPEN GOV’T, <https://osec.doc.gov/opog/OG/retrospectiveregs.html> (last updated Mar. 1, 2017).

the department level. Technology probably is not used in the retrospective review process at the department level.²⁹¹

2. Consideration of AI-enabled Tools

Of the additional eight agencies interviewed, across the board, officials in all but one were open to the use of AI-enabled tools in the retrospective review process.²⁹²

Two of the eight agencies had some limited experience with AI-enabled tools to analyze comments in the notice-and-comment process. One agency used DocketCAT for some rulemakings as a way to organize and streamline the notice-and-comment process. But, thus far, it had not used the tool for rulemakings with a high volume of comments. Another agency uses a computer program called “Relativity,” an eDiscovery tool, to handle large batches of comments.

Several agencies’ officials mentioned specific tasks that would seem to lend themselves to AI-enabled tools. One agency official mentioned her desire for a tool that would automatically identify when cross-references would need to be updated. For example, whenever a new rule is published, the tool would flag it and identify where the agency cites it in their own rules. The same would be true for statutory changes. A second agency’s official was likewise very open to the idea of using an AI-enabled tool in such a fashion, especially if it would help review the voluminous industry standards that change every year. A third agency’s official would be open to using any technology that could help them increase efficiency in conducting retrospective review and free their human capital for other tasks. A fourth agency’s official mentioned how difficult economic analysis of a regulation’s effect is. Despite their breadth of economic talent, it remains especially difficult to measure the savings from an event that did not happen. And a fifth agency’s official mentioned that a tool that flags regulations ripe for retrospective review would be helpful.

But, almost without exception, the agencies raised specific concerns or hurdles in the way of experimentation with AI for retrospective review. First, there was the question of priorities. One agency mentioned that given its primary focus is not on rulemaking, testing AI tools for retrospective review would not likely surface to the top of the priority list. Second, there was the question of limited capacity and the need for additional resources. One agency’s official mentioned that, as a principal data scientist within the agency, his time is fully allocated to data retrieval and predictive modeling tasks used in some of their rules.

None of the agencies interviewed thought it would be realistic for them to build an AI-enabled tool in-house. One agency official was emphatic that, especially as a small agency, it did

²⁹¹ See Interview with DOC Official A (April 20, 2022, via Zoom). The DOC official was not aware of *any* pain points in the retrospective review process. *Id.*

²⁹² One agency had considered using AI-enabled tools for rulemaking but had decided against it. The agency received a demonstration from Deloitte of RegExplorer’s comment analysis features but found the tool lacking because it did not sufficiently support agency staff in writing a final rule (it merely helped with understanding the topics within comments). The agency declined to see RegExplorer’s retrospective review demonstration. According to the agency official we interviewed, the agency was unlikely to proactively seek efficiency tools for retrospective review, given that there is not a strong desire at the agency to devote time to retrospective review unless the agency is compelled to do so.

not have the in-house capacity to develop such a tool. Another agency’s official mentioned that even though they had significant programming experience within the agency to build various economic tools, they nonetheless did not have the necessary expertise to build such AI-enabled tools in-house.

Finally, few agency officials interviewed expressed an opinion as to what position their respective agency might take with regard to public disclosure of use of AI-enabled tools in retrospective review. Notwithstanding the fact that most agencies issue public notices about their current retrospective review process, there was some reluctance expressed by one agency official as to whether the agency would inform the public about its use of AI to identify rules if it were to adopt AI tools for retrospective review.

C. Stakeholders

After conducting the bulk of agency interviews, we also solicited interviews from a diverse representative sample of eight groups that represent the interests of regulatory beneficiaries, six of whom answered our call,²⁹³ and an additional three groups that advocate on behalf of entities subject to regulations by the types of agencies we interviewed, one of which responded.²⁹⁴

Ensuring “Trustworthy AI” and “Explainable AI” was among the chief concern explored during our stakeholder interviews.²⁹⁵ We borrowed definitions from HHS’s “Trustworthy AI Playbook”: “Trustworthy AI refers to the design, development, acquisition, and use of AI in a manner that fosters public trust and confidence while protecting privacy, civil rights, civil liberties, and American values, consistent with applicable laws.”²⁹⁶ Likewise, a common theme in the HHS Playbook is the importance of “Explainable AI”—which aims to guard against “legal and regulatory [risk],”²⁹⁷ and increase public trust and loyalty.²⁹⁸

²⁹³ See Interview with UnidosUS Representative A (April 11, 2022, via Zoom); Interview with Public Citizen Representative A (April 11, 2022, via Zoom); Interview with Center for Democracy and Technology Representatives A and B (April 13, 2022, via Zoom); Interview with New America’s OTI Representatives A and B (April 21, 2022, via Zoom); Interview with NAACP LDF Representative A (April 29, 2022, via Zoom); Interview with ABOUT ML Representative A (April 29, 2022, via Zoom).

²⁹⁴ See Interview with National Federation of Independent Business (NFIB) Representative A (March 28, 2022, via Zoom).

²⁹⁵ For the stakeholder questionnaire template, see Appendix I.

²⁹⁶ DEP’T HEALTH & HUM. SERVS., TRUSTWORTHY AI (TAI) PLAYBOOK 5 (2021), available at <https://www.hhs.gov/sites/default/files/hhs-trustworthy-ai-playbook.pdf>; see also DEP’T HEALTH & HUM. SERVS., TRUSTWORTHY AI (TAI) PLAYBOOK: EXECUTIVE SUMMARY (2021), available at <https://www.hhs.gov/sites/default/files/hhs-trustworthy-ai-playbook-executive-summary.pdf> [hereinafter TAI PLAYBOOK]. The *TAI Playbook* was HHS’s response to E.O. 13,960’s directives in order “to support . . . deploying reliable, explainable, non-biased, and secure AI systems. DEP’T HEALTH & HUM. SERVS., ARTIFICIAL INTELLIGENCE (AI) STRATEGY 6 (2021), available at <https://www.hhs.gov/sites/default/files/hhs-ai-strategy.pdf>.

²⁹⁷ HHS defines legal and regulatory risk as, “[u]nfair practices, compliance violations, or legal action due to biased data or a lack of explainability.” TAI PLAYBOOK, *supra* note 296, at 5.

²⁹⁸ *Id.* (noting the “key risk” of “[l]oss of public trust and loyalty due to lack of transparency, equitable decision-making, and accountability”).

Among the seven stakeholder interviews, there was some level of support (ranging from cautious to enthusiastic) for exploration of the use of AI in retrospective review from all but two representatives, who self-identified as “AI skeptics.”

Five of the representatives would endorse the use of an AI-enabled tool to flag rules ripe for retrospective review—so long as it was used to “assist” human subject matter expert reviewers (as opposed to making decisions). Several mentioned that they assumed AI would simply flag rules, after which the agency would explain the underlying rationale when actually updating and/or repealing a rule. One representative was convinced that retrospective review was the most promising rulemaking context for the use of AI: “Agencies should focus there, see how that goes, and maybe then extend its learning into the notice-and-comment arena.” Another commented, “AI is key in retrospective review, because no one wants to do the work, and it’s low priority; so AI is perfect for that.” One representative commented that the retrospective review process is “highly resource intensive”; this representative would rather see agencies “use their limited resources to look forward, not backward.” In other words, retrospective review “should not come at the expense of agencies solving emerging problems that they are tasked to solve.”

Another representative mentioned the use of an AI-enabled tool could be a “win-win” for both regulated entities and regulatory beneficiaries. For example, it could identify areas in need of regulation as well as those “overburdened” by regulation. One representative elaborated upon how “[i]t could identify gaps in the regulatory scheme,” whereas as of now, retrospective review is “just for looking at regulations on the books, not for looking for regulatory gaps where more regulations are needed.” As a general matter, one representative mentioned that it would be helpful to “narrow down the set of regulations that agencies should look at for retrospective review.” One representative mentioned that it would be great if agencies were able to “use AI to get other people involved earlier in the process.” For example, small businesses may not know that they will be affected by certain regulations until the regulations are enacted, whereas AI might be able to identify what regulated entities would be implicated and involve them earlier in the process. A couple representatives saw promise for the introduction of AI into regulatory impact analysis.

Three of the representatives were enthusiastic about the prospect of the potential for an AI tool to “free up agency resources,” with one commenting that “moving from the paradigm of humans paging through the CFR to an AI algorithm that takes the human out and is much less resource-intensive is definitely a policy benefit,” and another adding that, “if AI can free up agency resources, that’s a huge plus.”

According to the skeptics, it would be nearly impossible to write an all-encompassing algorithm that would be accurate to flag rules in need of review given that so much of regulatory text is incredibly difficult to unpack and is so context-specific. The concern raised was that so much of the regulatory quality depends on agency expertise and experience. The representatives were skeptical that AI could replace or even channel this. One representative elaborated further that the initial layer of filtering or identification may be over- or under-inclusive. And even if over-inclusive, the agency would still “need a human element” to review all the flagged rules. One representative was doubtful that any AI-enabled tool would outperform “low-tech” approaches such as, for example, taking the time to speak with compliance experts for industries affected by various paperwork burdens created by regulations. A second representative worried about agencies

prioritizing retrospective review because they will get credit for “cleaning up their books” at the expense of needed substantive changes.

Various caveats and concerns were raised even among the more enthusiastic representatives. Two of the representatives were “not very confident” that agencies would be using sufficiently trustworthy AI.²⁹⁹ One representative had “strong concerns when it comes to trust and impact on privacy.” Another representative emphasized that “trustworthy is a dynamic relationship,” such that agencies need to continuously evaluate the tools they are using: “Just because the tool works in one situation for one year, that doesn’t mean it’ll remain trustworthy in a couple of years, maybe in a new context.” As a result, one representative suggested that an agency such as GSA or the Government Accountability Office should be empowered to review all AI algorithms on an ongoing basis.

Several representatives also insisted that transparency and public involvement were prerequisites for their support of the use of AI in retrospective review (and rulemaking more generally). Several representatives specifically linked transparency with public awareness and, more specifically, enabling informed comments from the public. One representative suggested that if any agency were putting a new affirmative obligation on someone then it would need transparency—namely the use of AI would then have to be part of the rulemaking with opportunities for the public to comment; but otherwise, if for example “removing regulations and cleaning up the book,” there wouldn’t be such an issue “unless someone advocates for this area to be regulated.” Another representative described the need for “transparency of the tool” in terms of “where and how it’s being used, at which points in the process.” Another representative equated transparency of an AI tool with the “openness with which it is written.” Making the move from transparency to public involvement, one representative insisted that once an agency has identified the particular rules, it would put out the list for public comment. Another representative suggested that if information regarding agency use of AI is subject to the Freedom of Information Act, then this could be an additional “guardrail.”

While transparency and public involvement are always concerns in the retrospective review process, some representatives thought that the use of AI-enabled tools heightened such concerns. One representative mentioned the “poor optics” of a presidential administration “coming into the picture and using AI to further their goals.” Two representatives suggested that the HHS SUNSET Rule “poisoned the well” on retrospective review, given that it was explicitly de-regulatory. One representative went further to elaborate that it “soured the community’s thinking about retrospective review” given that it used retrospective review “as a smokescreen for partisan objectives.” According to this representative, “[i]t seems like they’re hiding the true reasons of the decisions behind the AI.” Another representative analogized concerns to those raised in the context of cost-benefit analysis (CBA), namely some efforts to “econometrically systematize CBA” have “included a lot of hidden variables.”

Finally, most of the representatives had views on the existing procurement process and reforms thereto. Most of the representatives assumed that agencies would need to out-source for

²⁹⁹ On the opposite pole, one representative doubted the need for any trustworthy principles given her view that “AI is supposed to make it more objective anyway” so why should agencies be “messing with it”?

AI-enabled tools. One representative would like for agencies to seek stakeholder input on this outsourcing decision (i.e., to whom, etc.). Two of the representatives were extremely critical of the status quo of the governmental procurement process, mentioning that it “lacks standards” and any information or guidance is “too vague.” One of the representatives mentioned fruitful and productive exchanges with GSA on the topic of embedding into contract language requirements for transparency and various types of audits. Most of the representatives agreed that agencies’ simply disclosing the use of “proprietary” technologies is “sub-optimal.” And most thought that open source code should be “the default.” One representative explained that “[i]f it’s not the case, there is going to be concerns and suspicions about the tool. It will probably result in the public distrusting the agency.” Another representative advocated for what she termed the “model card framework,” namely “the idea that developers create cards that outline basic information so that other people who use the tool can see all the foundational information.”

IV. Recommendations

(1) Encourage Pilots with AI-enabled Tools and Facilitate the Sharing of Information and Experience Among Federal Agencies.

The most significant contribution of this ACUS Report is modeling and encouraging the facilitation of sharing information and experiences among federal agencies that are either using, experimenting with, or considering the use of AI-enhanced tools in the retrospective review process (or regulatory policy and decision making more generally). It is worthwhile to consider additional sharing mechanisms to institutionalize such information-sharing. The CDO Council may be well poised to serve this role.³⁰⁰

The DoD’s experience with GAMECHANGER provides an instructive example. Given its ability to apply state-of-the-art NLP techniques across regulatory domains, other entities that engage in regulatory analysis have expressed interest in using GAMECHANGER, including the U.S. Patent and Trademark Office and some private healthcare organizations.³⁰¹ According to a

³⁰⁰ The CDO Council was established by statute in the Foundations for Evidence-Based Policymaking Act of 2018 (P.L. 115-435) 44 USC § 3520A. The Council’s mission is to “improve government mission achievement and increase the benefits to the Nation through improvement in the management, use, protection, dissemination, and generation of data in government decision-making and operations.” cdo.gov. Its purpose is defined as follows:

The CDO Council shall meet regularly to establish government-wide best practices for the management, use, protection, dissemination, and generation of data; promote and encourage data sharing agreements between agencies; identify ways in which agencies can improve upon the production of evidence for use in policymaking; consult with the public and engage with private users of Government data and other stakeholders on how to improve access to data assets of the Federal Government; and identify and evaluate new technology solutions for improving the collection and use of data. The CDO Council shares responsibilities with other interagency councils that conduct and impact data-related activities, including those focused on information technology, statistics, information security, evaluation, privacy, freedom of information, and other government objectives. The CDO Council coordinates its activities with these councils and bodies in order to assure that these activities are complementary and carried out efficiently and effectively.

³⁰¹ See Interview with BAH Data Scientist, *supra* note 115. Early in the initiative, GSA’s Technology Transformation Services (TTS) had considered taking a role in developing GAMECHANGER and scaling its use at

former DoD official who was involved in the development of GAMECHANGER, “Congress and OMB were particularly interested in the technology behind GAMECHANGER as a prototype for natural language processing and business intelligence across the federal government.”³⁰² Another former DoD official (also part of the core GAMECHANGER development team) stated that Congress has been very bullish on GAMECHANGER and on expanding its use not only to other federal agencies but also to the legislative branch.³⁰³

The GSA/CMS Regulatory Analytics Proof-of-Concept likewise has ambitions to serve as a template for a concept of a shared service that could be provided to other federal agencies. The pilot explored a novel technological path for federal agencies by evaluating whether “Knowledge Representation and Reasoning” (KRR) approaches could provide better results than other AI technologies, such as NLP. In theory, AI models leveraging KRR might obtain greater accuracy in identifying rules ripe for retrospective review, given that such models embed a substantive understanding of their subject matter that traditional NLP-based models lack. Compared with an NLP-only tool such as the RegExplorer tool deployed by HHS, KRR tools may find hard-to-detect similarities or inconsistencies between regulations and across regulatory domains where different terms or a semantic approach have been used to describe the same underlying concept or subject matter. But the start-up costs for such an approach are great; the GSA/CMS pilot thus offered a small-scale experimental run.

(2) Insist on Open Source and Interoperability for AI-enabled Tools.

Using open-source technology presents clear advantages for federal agencies. Using open-source technology increases transparency into how the technology functions and allows the agency to build independent internal capacity in order to understand and implement the underlying technology.³⁰⁴ Insisting on open-source technology also prevents vendor “lock-in,” i.e., a situation forcing an agency to stay with a vendor given resources already invested in the vendor’s proprietary technology. Unlike with proprietary technology, an agency that contracts with an outside vendor initially to implement technology with open-source standards could take simultaneous (or subsequent) steps to build the necessary technical expertise in-house or ask another vendor to build upon the open-source standard.

With GAMECHANGER, DoD aimed to build an open technology infrastructure, to which external software and AI developers could contribute, and which other government agencies could leverage for their own regulatory use cases. With this in mind, DoD insisted on making

other agencies. *See* GSA, *Independent Projects*, *supra* note 143. This partnership failed to materialize after DoD pledged to invest much more into GAMECHANGER than GSA could commit to invest. *See* Interview with DoD Former Official A, *supra* note 87. GSA’s Center for Excellence on AI remained as a partner on the GAMECHANGER project, however. *Id.*

³⁰² *See* Interview with DoD Former Official B, *supra* note 91.

³⁰³ *See* Interview with DoD Former Official A, *supra* note 87. Notably, Congress referred to GAMECHANGER in three bills. *Id.*

³⁰⁴ *Cf.* Deirdre K. Mulligan & Kenneth A. Bamberger, *Procurement as Policy: Administrative Process for Machine Learning*, 34 BERKELEY TECH. L.J. 773, 814 (2019) (arguing that AI tools, and especially tools procured from the private sector, “displace[] rational expert agency decision making” because agencies are incapable of understanding how AI tools make decisions).

GAMECHANGER code open source, available on GitHub, giving access to any other agency (or organization outside government) to download and use GAMECHANGER for its own purposes.³⁰⁵ All of GAMECHANGER’s features are available through its open-source version, on GitHub except DoD’s proprietary data and models trained specifically for DoD, which proved too big to host on an open-source online repository.³⁰⁶

GAMECHANGER presents relatively low startup costs for any agency interested in implementing it. According to the Booz Allen Hamilton (BAH) data scientist GAMECHANGER liaison, in theory, anyone can download and run GAMECHANGER on a computer laptop.³⁰⁷ The GitHub code repository for each GAMECHANGER program provides instructions for how to implement it.³⁰⁸ In practice, implementing GAMECHANGER would require a server infrastructure enabling different GAMECHANGER services to communicate via API, which adds some startup costs.³⁰⁹ Still, once an agency sets up GAMECHANGER it could then use the tool for free as long as it had the necessary technical capabilities in-house to configure its software infrastructure, run its data crawler APIs, and train its open-source models on agency data.

GSA likewise made it a prerequisite to build AI solutions that would be open-source and interoperable with data architectures and data analytics services spearheaded at other agencies as well as within the legislative branch. GSA required the proof-of-concept tools to be capable of applying structure to regulatory text under open-source data standards, which would promote government-wide interoperability.³¹⁰ The pilot also required interoperability with other regulatory data structures used across the U.S. government, including with the United States Legislative Markup format, which Congress and the Government Publishing Office have developed to translate legislative publications into machine-readable documents.³¹¹

³⁰⁵ Interview with DoD Official F, *supra* note 86 (“The DoD has chosen to open source all of the code for GAMECHANGER to provide anybody within the DoD, the federal or local government, and private individuals access to code and resources that we are developing.”); *see also* Interview with DoD Former Official A, *supra* note 87 (stating that one goal for making GAMECHANGER open source was to allow other agencies to take advantage of their investment); *dod-advana/GAMECHANGER*, GITHUB.COM, <https://github.com/dod-advana/GAMECHANGER> (GitHub repository last updated on Jan. 8, 2022). Under this open model, neither DoD nor BAH owns intellectual property rights in GAMECHANGER. *See* Interview with DoD Former Official A, *supra* note 87 (mentioning that the only proprietary part of DoD’s implementation of GAMECHANGER are the instances where secure, non-public data is introduced into the tool).

³⁰⁶ *See* Interview with BAH Data Scientist, *supra* note 115. Only the DoD agency data and the models trained on DoD data are missing from the GitHub open-source code base. DoD excluded agency data as such data which are non-public and sensitive, and excluded models mainly because such models have too-big file sizes to be hosted on GitHub. *See id.*

³⁰⁷ *Id.*

³⁰⁸ *dod-advana/GAMECHANGER*, *supra* note 305.

³⁰⁹ *See* Interview with BAH Data Scientist, *supra* note 115.

³¹⁰ *See GSA SoW*, *supra* note 125, at 4-5.

³¹¹ *See id.* at 23. The USLM format is an XML data standard which encodes metadata on top of regulatory text. *Id.* at 5. The USLM standard is available as an open-source project on GitHub. *See usgpo/uslm*, GITHUB.COM, <https://github.com/usgpo/uslm> (last visited Apr. 4, 2022). In 2018, GPO published, in the USLM format, a subset of the Statute Compilations maintained by the Office of the Legislative Counsel of the U.S. House of Representatives (Statute Compilations include public laws that either do not appear in the *U.S. Code* or that have been classified to a title of the *U.S. Code* that has not been enacted into positive law). Publication of these Statute Compilations serves

BeInformed’s legal ontology standard, eFLINT, is open source and designed to be interoperable.³¹² And, in their evaluation of the pilot, CMS officials specifically identified the open-source standards as a key benefit.³¹³

Contrast both GAMECHANGER and eFLINT open-source technologies with the RegExplorer tool used for HHS’s AI for Deregulation—requests for information on the tool’s inner functioning were met with a response that the tool was “proprietary.”³¹⁴

(3) Change the Procurement Model

OMB is charged with providing guidance and principles for the federal acquisition and use of AI.³¹⁵

By making GAMECHANGER open source and freely available to all government agencies, DoD also hoped to raise the bar for regulatory analysis tools developed by the private sector.³¹⁶ Moreover, proceeding in this manner could potentially transform the existing procurement model. Any privately procured tool would now need to surpass GAMECHANGER; if it did not, an agency could simply use GAMECHANGER for free.³¹⁷

as a pilot in preparation for broader adoption of the USLM standard. *See Statute Compilations*, GOVINFO.COM, <https://www.govinfo.gov/app/collection/comps> (last visited Apr. 4, 2022).

³¹² ISO/IEC 19763-3 (ISO, 2010) (“To promote interoperation among application systems, unambiguous and formal specifications of the systems, especially of their inputs and outputs, are indispensable. Ontologies have a key role for that.”). eFLINT frames defining an agency’s legal knowledge graph can also be exported into JSON and RDF format, which also are open standards. Two other leading legal representation ontology standards, CEN Metalex and Akoma Ntoso, are likewise open-source standards.

³¹³ *See* Interview with CMS Official A, *supra* note 138 (mentioning that eFLINT presents the key advantage of being open source compared to a proprietary tool such as RegExplorer, which would preserve the agency’s ownership over the technology implementation and tool’s training data, as well as the agency’s ability to explore and remove any potential bias within the tool).

³¹⁴ In response to a comment inquiring about the underlying algorithms used by Deloitte in a 2019 analysis, HHS answered:

While RegExplorer is proprietary technology, some of the models deployed within RegExplorer include keyword technology (a structured and iterative approach to process, analyze, and return keyword search results); a clustering algorithm (a cluster is a machine-generated group of regulatory documents that have been algorithmically gathered together based on a set of similar characteristics, such as the relevant sub-agency, placement of text within the regulatory dataset, similarity of text content, and text format and structure); citation extraction and mapping; and similar section analysis.

Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. 5694, 5710 (Jan. 19, 2021).

³¹⁵ *See* AI in Government Act of 2020, sec. 104. The AI in Government Act was passed as part of the 2021 Consolidated Appropriations Act, Pub. L. No. 116-260, div. U, tit. I, 134 Stat. 2286 (2020).

³¹⁶ *See* Interview with DoD Former Official A, *supra* note 87 (mentioning that, with the introduction of GAMECHANGER, the government would no longer accept getting “less-than-subpar solutions” from contractors who, in addition to sometimes providing subpar solutions, also own the tool’s intellectual property).

³¹⁷ *See* Interview with DoD Former Official B, *supra* note 91 (referring to this as “changing the procurement model”).

DoD prototyped GAMECHANGER in-house, and subsequently enlisted BAH (which had an existing contract with DoD supporting the Advana platform) as one of GAMECHANGER’s contract technical supports.³¹⁸ DoD has brought on additional partners for these and other efforts.³¹⁹ Military service members, DoD civilians, and others have contributed to the codebase that makes up GAMECHANGER (and other products on Advana).³²⁰

(4) Consider More Structured Rules to Unlock AI Rulemaking Capabilities.

One of the more counter-intuitive recommendations to arise from our study of the use of AI-enabled tools in retrospective review is to encourage federal agencies to consider a more structured format for their rulemaking so as to obviate the need for sophisticated NLP technologies to sort and index their underlying topics and issues addressed, as well as to unlock potential further AI rulemaking capabilities.

DOT’s use of its RegData Dashboard is instructive here. Given the structured nature of DOT’s rules, there was no need for it to deploy the NLP tool to help it identify overlapping rules. Even more germane, the cross-domain pilot convinced CMS officials of the need to add more structure and metadata to its existing repository of regulations in order to unlock more advanced AI rulemaking capabilities.³²¹

(5) Consider Desirability and Feasibility of More “Explicit” Interpretation of Rules.

Beyond structured rulemaking, agencies might also consider the desirability and feasibility of more “explicit” interpretation of rules. Centralized KRR capabilities within GSA have the potential to provide an effective way to scale transformative AI for rulemaking functionalities, in a rapid and cost-effective manner, across federal agencies. Significantly, KRR need not be an exclusive approach but can be used in combination with other AI methods and other rulemaking services.³²² Indeed, one of the key requirements of the pilot was for KRR tools to be both open-

³¹⁸ See *supra* note 95 and accompanying text.

³¹⁹ See Interview with DoD Official F, *supra* note 86. DoD approved a budget to hire technology company subcontractors and to partner with education and research institutions in developing GAMECHANGER’s technology and functionalities. See Interview with DoD Former Official A, *supra* note 87. The agency also hoped to attract external developers, notably from the private sector, to contribute to GAMECHANGER’s open-source code base. See *id.* (stating that one goal for making GAMECHANGER open source was to show the world the code and let people tell them how to make it better).

GAMECHANGER’s goal of fostering an external community of developers, however, has not fully materialized. The open-source project has seen a limited number of contributors, with most updates coming from a single contributor. See *List of Code “Commits” to GAMECHANGER Project*, GitHub, <https://github.com/dod-advana/GAMECHANGER/commits/main> (showing the history of revisions to GAMECHANGER’s code base). The lack of marketing about GAMECHANGER to the software community may explain the initial lack of participation. Still, it remains unclear how the GAMECHANGER team intends to incentivize developers outside of the government to contribute to the project. See Interview with DoD Former Official A, *supra* note 87.

³²⁰ See Interview with DoD Official F, *supra* note 86.

³²¹ Interview with CMS Official A, *supra* note 138.

³²² Indeed, BeInformed has developed NLP functionalities that operate as a layer on top of KRR models, although these were not leveraged during the GSA/CMS pilot. Interview with BeInformed Team Members A & B, *supra* note 153.

source and interoperable.³²³ It would, however, be difficult to model explicit interpretations of regulations through KRR across a widespread corpus of regulatory domains. Some types of legal information, such as judge-made legal standards, are not easily encoded with explicit interpretations. For those regulations that are well suited for explicit interpretations, it still takes significant effort to build the models.

(a) Desirability

The ability to have machine programs perform rule interpretation upstream (which NLP tools cannot do) could allow agencies to automate more rulemaking and avoid devoting agency staff resources to repeatedly interpret rules downstream (e.g., when they review a regulatory paragraph for retrospective review or to respond to a rulemaking comment).³²⁴ Such machine interpretation would still be reviewed by human staff, which avoids risks from delegating regulatory judgment and decision making to computer programs.³²⁵

BeInformed states that an advantage of using eFLINT is that it requires rulemakers to agree on such “explicit interpretations” of their enacted regulations, which ensures uniform interpretation and facilitates agency discussion of the potential effects of regulations. Beyond uniformity, using eFLINT may enable traceability. The ability to interpret rules may equip regulators to trace the impact of regulatory changes. Whereas rulemakers usually face challenges in evaluating the downstream impact of a potential rule change, the formal interpretation of rules enables traceability between the change and the resulting burden on the regulatory process and regulated entities.³²⁶ Being able to trace such “burden” effects, however, would require accurate models for burden estimation to be available from multiple regulatory domains managed by multiple agencies. eFLINT is only the standard; developing the models in conformance with the standard requires significant effort.³²⁷ By developing central capacity for expertise and technology as a shared service provider, GSA could make this as efficient as possible technologically and procedurally, but it still takes time with an agency subject matter expert to provide the explicit policy interpretations.

³²³ See *supra* notes 310-311 and accompanying text.

³²⁴ For example, comparing their eFLINT implementation to domain-agnostic NLP, the BeInformed team states that eFLINT enables agency officials to perform the “interpretation of sources of norms” upstream and to avoid subject matter experts’ having to repeatedly interpret rules downstream whereas “domain agnostic NLP tools shift the burden of making precise norm interpretations both towards those persons that perform the comment analysis as well as further downstream.” BeInformed, *W3.1*, *supra* note 147, at 3.

³²⁵ See *GSA Proof-of-Concept Analytics Presentation Video*, *supra* note 152.

³²⁶ See *GSA Proof-of-Concept Briefing*, *supra* note 148.

³²⁷ The BeInformed team mentioned that they have “built simulations based on eFLINT and “Flint frames” for advanced policy-simulations, where [they], for example, calculate the effects of rewards versus punishments on compliance and costs distribution over the stakeholders.” Interview with BeInformed Team Members A & B, *supra* note 153.

It is uncertain, however, what level of accuracy these estimation methods currently achieve. It is important to note that KRR standards such as eFLINT do not themselves provide functionalities to calculate burden. Rather, they facilitate the development of additional tools to calculate burden by structuring the regulatory domain and making explicit the set of actors, actions, duties, and rewards involved by a regulation, which all constitute factors in evaluating the “burden” created by this regulation.

One important potential limitation of KRR methods, however, concerns their ability to encode judicially developed standards under an “administrative common law” regime. The GSA/CMS pilot emphasized the KRR method’s ability to provide “explicit” and “unambiguous” representation of rules described in legal sources.³²⁸ The GSA/CMS pilot involved encoding rules with explicit requirements, namely patient and device requirements for receiving a Medicare subsidy for a medical device. But it is uncertain to what extent eFLINT can encode vague regulatory standards subsequently clarified by judicial opinions—not atypical given “administrative common law”—and apply such standards to specific situations. For example, how would such a model encode standards such as “reasonableness” in civil liability or “logical outgrowth” in administrative law?³²⁹

(b) Feasibility

Even if KRR appears desirable in theory, agencies must confirm that they could reap the benefits of implementing KRR in practice. CMS officials sought to compare the performance of this KRR approach with NLP-only tools (such as RegExplorer).³³⁰ But, due to the short duration of the proof-of-concept engagement (three months), BeInformed could only include a very small subset of CMS’s “regulatory domain” into its KRR knowledge graph and did not quantitatively compare the pilot’s results with results that could have been obtained on the same regulations using NLP-only tools.

In the absence of performance comparison between the pilot’s approach and more traditional AI approaches such as NLP, it is impossible to evaluate whether adopting KRR services would be worth their additional technical complexity and heightened design and implementation costs. The BeInformed team laid out the areas of technical capabilities available to KRR and missing from NLP (such as formal interpretation of rules and increased transparency over the

³²⁸ See BeInformed, *W3.1*, *supra* note 147, at 2 (“The big advantage of eFLINT being that it provides unambiguous representation of an interpretation of the norms described in legal sources, preventing multiplication of interpretation efforts downstream.”). BeInformed’s examples of eFLINT frames focused on contexts featuring relatively straightforward rules (such as immigration conditions for obtaining a visa). See Interview with BeInformed Team Members A & B, *supra* note 153.

³²⁹ When probed on this point, the BeInformed team minimized the challenge of adapting their system to common law and judicially created standards. See Interview with BeInformed Team Members A & B, *supra* note 153 (mentioning that the implications from the difference between civil law and common law systems were “not that big” without providing details on how their KRR models would incorporate judicial standards that are challenging to make “explicit”). The BeInformed team also referenced a paper using eFLINT to evaluate the application of a legal clause in U.K. courts. But the evaluated legal clause also referred to immigration requirements (application for temporary asylum) and involved an explicit rule (applicant must not have committed a war crime or crime against humanity), not a vague standard. To the extent that rule needed further interpretation (e.g., it may not be evident how to classify an action as a war crime or crime against humanity), the paper did not elaborate. See Robert van Doesburg & Tom van Engers, *Using Formal Interpretations of Legal Sources for Comparing the Application of Exclusion Clauses in the UN Refugee Convention* (2018) (Ph.D. thesis, University of Amsterdam, Leibniz Center for Law), available at https://www.researchgate.net/publication/342304313_Using_Formal_Interpretations_of_Legal_Sources_for_Comparing_the_Application_of_Exclusion_Clauses_in_the_UN_Refugee_Convention.

³³⁰ See Interview with CMS Official A, *supra* note 138.

model's functioning) but did not perform a quantitative evaluation of the performance success metrics defined by GSA.³³¹

GSA envisions that it would develop the central capacity as the shared service provider in terms of expertise and technology solutions.³³² A participating agency would then provide the policy expert who would walk through a systematic information exchange with the GSA shared service team member. Given the substantial volume of regulations that an agency would have to translate into eFLINT, as well as the highly technical nature of this process, an agency would likely incur substantial costs in adopting eFLINT for its entire corpus of regulations.

The GSA/CMS pilot's white paper acknowledges that "building a domain ontology comes at a price," but posits that the benefits of machine-readable representation and interpretation of rules are worth the costs.³³³ An overall assessment should consider the upfront costs incurred as a shared service (with enterprise efficiencies) balanced by the downstream costs avoided in a return on investment. The return on investment would most likely be there for the more complex, burden-imposing regulations warranting a thoughtful prioritization of which rules would benefit from the upfront effort.³³⁴

The GSA/CMS pilot, however, did not provide much evaluation as to these potential costs or return on investment. Given that the BeInformed team manually coded the analyzed CMS regulations, the CMS team did not receive training on how to use eFLINT and did not get a sense of the cost or feasibility of building the necessary IT infrastructure and operational processes to use KRR for rulemaking on an ongoing basis.³³⁵ The BeInformed tools require a significant amount of manual work by regulation subject-matter experts to build eFLINT ontology models and translate regulatory text into corresponding Flint frames. While reviewing a regulation, the agency staff would manually write code in eFLINT's domain-specific language to encode regulatory information. Upon update of such a regulation, the agency staff would have to manually translate the update into eFLINT. Because creating the ontology models and filling eFLINT is a prerequisite to reaping benefits from KRR tools, this manual work may prove to be a costly initial step for many agencies.³³⁶

³³¹ GSA set forth the criteria for evaluating the KRR technological approach, including metrics for analytical precision, processing efficiency, and interoperability. *GSA SoW*, *supra* note 125, at 7-8. BeInformed made a general claim that KRR tools "perform slightly better than the pure domain agnostic NLP tools." BeInformed, *W3.1*, *supra* note 147, at 3. The BeInformed team was not able to compare KRR performance with standard NLP performance because they ran out of time due to delays in identifying an appropriate use case for the pilot. Interview with BeInformed Team Members A & B, *supra* note 153.

³³² See Interview with GSA Official A, *supra* note 139.

³³³ See BeInformed, *W3.1*, *supra* note 147, at 3.

³³⁴ See Interview with GSA Official A, *supra* note 139.

³³⁵ See Interview with CMS Official A, *supra* note 138.

³³⁶ The BeInformed team emphasized that some use cases would not require having all the agency's regulation within eFLINT. See Interview with BeInformed Team Members A & B, *supra* note 153. For example, comment analysis or intelligent services could function as long as the regulation under consideration by the comments or the web service has been translated into eFLINT Frames. But the inclusion of a large subset—if not all—of agency regulations would be needed before KRR can be effectively leveraged for retrospective review. For cross-domain analysis, eFLINT would further need to include regulations from other relevant agencies.

Although GSA ended the pilot confident that KRR technology represented the best direction in building AI for rulemaking tools,³³⁷ CMS was still in a “learning phase” and intended to re-evaluate all AI methods tested by its different offices before committing to any specific approach.³³⁸

³³⁷ See Interview with GSA Official A, *supra* note 139.

³³⁸ See Interview with CMS Official A, *supra* note 138.

Appendix

APPENDIX I: INTERVIEWS

PART I: AGENCY USE CASES

A. HHS: Reg Explorer and the Regulatory Cleanup Initiative

Agency Officials

- HHS Former Official A: [Zoom Interview, Feb. 11, 2022]
- HHS AI Official B:[Zoom Interview, Feb. 28, 2022]
- HHS AI Official C: [Zoom Interview, March 22, 2022]
- HHS ONC (Office of the National Coordinator) Official D: [Zoom Interview, April 06, 2022]
- HHS ASPE (Assistant Secretary for Planning and Evaluation) Official E: [Zoom interview, October 24, 2022]
- FDA Official A: [Zoom interview, April 13, 2022]

Deloitte Representatives

- Deloitte Product Manager: [Zoom Interview, June 29, 2021]
- Deloitte Managing Director: [Zoom Interview Feb. 9, 2022]

B. DOT: RegData Dashboard

Agency Officials

- DOT Official A: [Zoom interview, March 28, 2022]
- DOT Officials B, C, and D: [Zoom interview, March 11, 2022]

C. DoD: GAMECHANGER

Agency Officials

- DoD Former Official A: [Zoom Interview 04/25/22]
- DoD Former Official B:[Zoom Interview 04/13/22]
- DoD Former Official C: [Zoom Interview 05/03/22]
- DoD Officials D & E: [Zoom Interview March 10, 2022]
- DoD Official F: [Email Interview 12/05/22]

BAH Representatives

- BAH Data Scientist: [Zoom Interview April 19, 2022]
- BAH Lead Associate: [Zoom Interview April 7, 2022]

D. GSA/CMS: Regulatory Analytics Proof of Concept

Agency Officials

- GSA Official A: [Zoom Interview Jan. 12, 2022]
- CMS Official A: [Zoom Interview, April 1, 2022]
- CMS Official B: [Zoom Interview, June 27, 2022]
- CMS Official C: [Zoom Interview 04/01/2022]

BeInformed Representatives

- BeInformed Team Members A & B: [Zoom Interview, March 21, 2022]

PART II: RETROSPECTIVE REVIEW

A. Independent Agencies

- FTC Official A: [Zoom Interview, March 8, 2022]
- STB Officials A & B: [Zoom Interview, March 29, 2022]
- NCUA Official A: [Zoom Interview, April 12, 2022]
- OCC Officials A, B & C: [Zoom Interview, April 18, 2022]

B. Executive Branch Departments & Agencies

- DoEd Official A: [Zoom Interview, March 25, 2022]
- BSEE Official A: [Zoom interview, Mar. 25, 2022]
- Coast Guard Official A: [Zoom Interview, April 11, 2022]
- DOC Official A: [Zoom Interview, April 20, 2022]

C. Stakeholders

- NFIB Representative A: [Zoom Interview, 03/28/22]
- Public Citizen Representative A: [Zoom Interview 04/11/22]
- Unidos US Representative A: [Zoom Interview 04/11/2022]
- CDT Representatives A & B: [Zoom Interview, April 13, 2022]
- OTI Representatives A & B: [Zoom Interview 04/21/22]
- About ML Representative A: [Zoom Interview, April 29, 2022]
- NAACP LDF Representative A : [Zoom Interview April 29, 2022]

ON BACKGROUND: ADDITIONAL INTERVIEWS

Agency Officials

- USCIS (US Citizen and Immigration Services) Official A: [Zoom Interview Feb. 29, 2022]
- VA (Veterans Administration) Official A: [Zoom Interview, March 4, 2022]

Academics

- George Washington Law Professor (January 12, 2022, via Zoom)
- Duke Law Professor (January 28, 2022, via Zoom)

Nonprofits

- National Academy of Public Administration (NAPA) Representatives A and B (January 20, 2022, via Zoom)
- Mercatus Center Representatives A and B (Feb. 7, 2022, via Zoom)
- Ford Foundation Representative A (April 14, 2022, via Zoom)

Firms

- IBM Representative A (January 7, 2022, via Zoom)
- IBM Representative B (January 21, 2022, via Zoom)
- IBM demonstration of Federated Learning (February 18, 2022, via Zoom)
- Regulatory Group Representative A (January 20, 2022, via Zoom).

INTERVIEW QUESTIONNAIRE TEMPLATES

Federal Agencies

For All Agencies

- 1) How does your agency currently attempt to identify rules that are:
 - a. Outdated
 - b. Redundant
 - c. Contain inaccurate cross references
 - d. Contain typographical errors
 - e. Are in need of elaboration or clarification?
- 2) What other types of retrospective review (beyond identifying such rules) does your agency conduct?
- 3) What principal “pain points” and sources of inefficiencies does your agency face when performing retrospective review?
- 4) Does your agency involve the public, if at all, in identifying rules to be reviewed?
- 5) Does your agency engage in retrospective review, for all or a portion of your rules, on a set interval (e.g., every five years)?
- 6) Do you conduct the same sort of retrospective review process for things that aren’t “legislative rules”? (For example, statements of policy or guidance documents.)
- 7) Has your agency used AI tools in retrospective review?
➔ *Branch out to line of questions A or B*

A. For Agencies Currently Using AI for Retrospective Review

AI for retrospective review:

- 8) What form of AI does your agency use to assist with retrospective review of rules (e.g., natural language processing-based software)?
- 9) Did your agency develop these tools in house or did it procure them from an outside vendor?
 - a. If your agency developed these tools in house, which kind of employees (e.g., data scientists, engineers, etc.) were involved in developing them? Did your agency face any challenges with internal capacity building?
 - b. If your agency procured them from an outside vendor, what decided your agency to not develop them in house? Who were the decisionmakers for the procurement process? What considerations went into selecting the vendor? How does your agency oversee the vendor? What types of training does your staff get on the vendor’s tools?
- 10) Has your agency trained staff involved in the rulemaking process in how to use AI-based tools?
 - a. If yes, how effective has this training been? What challenges have your agency encountered in this training?
 - b. If not, are you considering this training?
- 11) Did your agency consider potential issues with litigation and/or violating statutory or APA requirements? If yes, what type of claims was your agency concerned about?
- 12) Developing, procuring, deploying, and overseeing AI-based tools to assist with retrospective review cost money and staff time. Among the many competing priorities

your agency faces, what caused it to decide to allocate its limited resources to these endeavors?

- 13) How does your agency avoid overreliance on these tools to conduct retrospective review? Put another way, how does your agency ensure that these tools aren't making final decisions?
- 14) Does your agency inform the public of its use of AI for retrospective review?
- 15) Does your agency seek public input on its use of AI for retrospective review?

AI for rulemaking more broadly:

- 16) Has your agency used AI in other aspects of rulemaking (e.g., comment analysis)?
- 17) For what additional areas of rulemaking would your agency consider using AI? If you could automate any step in the rulemaking process, what would it be?
- 18) Would your agency be concerned about potential issues with litigation and/or violating statutory or APA requirements if it were to implement such use cases of AI rulemaking?

B. For Agencies Not Currently Using AI for Retrospective Review

- 8) If not AI, has your agency used any type of computer tools / statistical techniques (including CBA type) to conduct retrospective review?
- 9) Is your agency open to the idea of using AI-based tools to assist with retrospective review?
- 10) Would your agency likely develop these tools in house or procure them?
 - a. What considerations does your agency take into account for deciding whether to develop in house or procure a technology or tool?
 - b. If your agency would likely develop these tools in house, which kind of employees (e.g., data scientists, engineers, etc.) would be involved in developing them?
 - c. If your agency would likely procure them from an outside vendor, what considerations would go into selecting the vendor? Who would be the decisionmakers for the procurement process? How would your agency oversee the vendor?
- 11) Would your agency be concerned about potential issues with litigation and/or violating statutory or APA requirements? If yes, what type of claims would your agency be concerned about?
- 12) If you could accurately automate one step in the retrospective review process, what would it be?
- 13) Developing, procuring, deploying, and overseeing AI-based tools to assist with retrospective review cost money and staff time. Among the many competing priorities your agency faces, what would cause it to decide to allocate its limited resources to these endeavors?
- 14) How, if at all, would your agency avoid overreliance on these tools? Put another way, how would your agency ensure that these tools aren't making final decisions?
- 15) How, if at all, would your agency inform the public of its use of AI for retrospective review?
- 16) How, if at all, would your agency seek public input on its use of AI for retrospective review?

AI for rulemaking more broadly:

- 17) Has your agency used AI in other aspects of rulemaking (e.g., comment analysis)?
- 18) For what additional areas of rulemaking would your agency consider using AI? If you could automate any step in the rulemaking process, what would it be?
- 19) Would your agency be concerned about potential issues with litigation and/or violating statutory or APA requirements if it were to implement such use cases of AI rulemaking?

Stakeholders

- 1) How are you engaged with rulemaking and/or retrospective review?
- 2) Is it appropriate for agencies to use ML/AI in the rulemaking/retrospective review process?
- 3) What parts of the retrospective review process do you think are most amenable to being supported with an AI-based tool?
- 4) More broadly, what parts of the entire rulemaking process do you think are most amenable to being supported with an AI-based tool?
- 5) Conversely, which parts of the rulemaking process (and the retrospective review process more specifically) do you think are out of reach for current or currently developing technology?
- 6) What priorities should agencies keep in mind as they consider whether and how to use AI in the rulemaking/retrospective process?
- 7) How sanguine are you about agencies' commitments to "Trustworthy AI," namely "the design, development, acquisition, and use of AI in a manner that fosters public trust and confidence while protecting privacy, civil rights, civil liberties, and American values, consistent with applicable laws?"
- 8) How about agencies' commitments to "Explainable AI," including attention to:
 - (a) legal and regulatory risk (defined as "unfair practices, compliance violations, or legal action due to biased data or a lack of explainability"); and
 - (b) enhancing public trust
- 9) When adopting an AI tool, how should an agency ensure that it remains faithful to important principles of administrative law such as:
 - (a) transparency
 - (b) reason-giving
 - (c) public participation, and
 - (d) accountability
- 10) Agencies typically assert that any AI tool is designed not to replace but rather to "augment" human judgment, interpretation, and decision making. What safeguards (if any) should the agency put in place to avoid potential overreliance on an AI tool?
- 11) What factors should agencies consider when deciding whether to develop a tool in house or procure one from a vendor? Should the use of "open-source" standards and/or the public disclosure of training datasets be a pre-requisite? How much disclosure to the public is warranted in either situation?
- 12) Are you aware of any legal concerns or risks that may be associated with using an AI-based tool in the rulemaking/retrospective review process? (e.g., violating APA/statutory requirements)

APPENDIX II: Technical Details of AI-Enabled Tools

A. HHS/Deloitte RegExplorer³³⁹

- *Keyword Technology*: HHS has described “keyword technology” as “a structured and iterative approach to process, analyze, and return keyword search results.”³⁴⁰ This includes keyword extraction (or keyword detection or keyword analysis), which is “the automatic identification of a set of the terms that best describe the subject of a document.”³⁴¹ Methods of keyword extraction vary from simpler, statistical approaches, to more complex linguistic, machine learning, or graph-based approaches. For example, a common statistical method is TF-IDF (term frequency-inverse document frequency), which identifies the “importance” of a word by calculating the normalized number of times it appears in a document (the term frequency) and multiplying it by a logarithmically scaled inverse fraction of the documents containing that word (the inverse document frequency).³⁴² More complex ML methods can be either supervised (trained on a set of keywords) or unsupervised, and graph-based text representation methods vary widely.³⁴³
- *Clustering Algorithms*: HHS has defined a “cluster” as “a machine-generated group of regulatory documents that have been algorithmically gathered together based on a set of similar characteristics, such as the relevant sub-agency, placement of text within the regulatory dataset, similarity of text content, and text format and structure.”³⁴⁴ More specifically, RegExplorer uses neural networks (a subset of ML) to create these clusters, which have been validated by statistical tests and regulatory specialists.³⁴⁵ Among other things, these neural networks allow computers to “understand how concepts in a given

³³⁹ In response to a comment inquiring about the underlying algorithms used by Deloitte in a 2019 analysis, HHS answered:

While RegExplorer is proprietary technology, some of the models deployed within RegExplorer include keyword technology (a structured and iterative approach to process, analyze, and return keyword search results); a clustering algorithm (a cluster is a machine-generated group of regulatory documents that have been algorithmically gathered together based on a set of similar characteristics, such as the relevant sub-agency, placement of text within the regulatory dataset, similarity of text content, and text format and structure); citation extraction and mapping; and similar section analysis.

Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. 5694, 5710 (Jan. 19, 2021). Additional categories of algorithms were mentioned in an interview with a Deloitte product manager. See Interview with Deloitte Product Manager.

³⁴⁰ Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. at 5710.

³⁴¹ Slobodan Belinga et al., *An Overview of Graph-Based Keyword Extraction Methods and Approaches*, 39 J. INFO. & ORG. SCIS. 1, 1 (2015).

³⁴² See Anand Rajaraman & Jeffrey D. Ullman, *MINING OF MASSIVE DATASETS 8* (Cambridge Univ. Press 2012).

³⁴³ See Slobodan Belinga et al., *supra* note 341, at 2–4. In a graph-based model, a “document is modelled as a graph where terms (words) are represented by vertices (nodes) and their relations are represented by edges (links).” *Id.*

³⁴⁴ Securing Updated and Necessary Statutory Evaluations Timely, 86 Fed. Reg. at 5710.

³⁴⁵ See Daniel Byler, Beth Flores & Jason Lewis, *Using Advanced Analytics to Drive Regulatory Reform 8*, DELOITTE, <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/public-sector/us-ps-using-advanced-analytics-to-drive-regulatory-reform.pdf>.

piece of text relate to each other—for example, that boat and ship are similar”³⁴⁶—enabling a deeper comparison of and a more faithful clustering of regulations. Neural networks themselves do not produce clusters, but they can provide meaningful information from which clusters can be created.

- *Citation Extraction and Mapping*: Deloitte does not provide information on what techniques or methodology it uses for citation extraction and mapping. But, generally, the purpose of such algorithms is to faithfully identify, extract, and map any citation in a given text.³⁴⁷ RegExplorer focuses on extracting citations—mainly citations to other regulations—in any given regulation.³⁴⁸
- *Guided LDA*: Latent Dirichlet Allocation (LDA) is a method of topic modeling—discovering topics in a collection of documents and then automatically classifying an individual document within a discovered “topic.”³⁴⁹ Generally, topic modeling is an unsupervised class of ML algorithms, but the adjective “guided” implies at least a semi-supervised algorithm. In fact, “GuidedLDA” is a publicly available Python package that implements traditional LDA in a semi-supervised process.³⁵⁰

B. DoD/Booz Allen Hamilton GAMECHANGER

- *Rule Data Crawler*: Data crawling is a method of data extraction, typically performed over large quantities of data to speed up the data collection process, which automatically collects data from the Internet or from any document or file.³⁵¹ GAMECHANGER provides a Data Crawler API (Application Programming Interface) that enables organizations to automatically upload regulatory documents from their web sources (e.g., website listing all their policies) into GAMECHANGER.³⁵²

³⁴⁶ *Id.*

³⁴⁷ For information on citation extraction algorithms, see generally BRETT POWLEY & ROBERT DALE, HIGH ACCURACY CITATION EXTRACTION AND NAMED ENTITY RECOGNITION FOR A HETEROGENEOUS CORPUS OF ACADEMIC PAPERS (2017), <https://web.science.mq.edu.au/~rdale/publications/papers/2007/49.pdf>

³⁴⁸ For an example of a RegExplorer citation map, see REGULATING FOR NSW’S FUTURE, NSW TREASURY 8 fig. 3 (July 2020), <https://www.treasury.nsw.gov.au/sites/default/files/2020-07/FINAL%20Treasury%20report%20210720.pdf>.

³⁴⁹ See David M. Blei et al., *Latent Dirichlet Allocation*, 3 J. MACH. LEARNING RSCH. 993 (2003).

³⁵⁰ *Welcome to GuidedLDA’s Documentation!*, READ THE DOCS, <https://guidedlda.readthedocs.io/en/latest/> (last visited March 5, 2022).

³⁵¹ See *Web Scraping vs Web Crawling: The Differences*, OXYLABS (May 4, 2021), <https://oxylabs.io/blog/crawling-vs-scraping>.

³⁵² [dod-advana/gamechanger-crawlers](https://github.com/dod-advana/gamechanger-crawlers), GITHUB, <https://github.com/dod-advana/gamechanger-crawlers>. This crawler accesses the relevant web sources, generates PDF documents from the webpages or downloads PDF files already hosted on the webpages, and uploads to the GAMECHANGER database both these PDFs and a JSON representation of these policy documents. See Interview with BAH Data Scientist. Alternatively, the organization can manually upload their policy files in one file location referenced in their GAMECHANGER configuration and run the GAMECHANGER Data API to generate JSON documents from that data. [dod-advana/gamechanger-data](https://github.com/dod-advana/gamechanger-data),

- *Knowledge Graph Generation, Search, and Pattern Recognition*: GAMECHANGER uses knowledge graph technology to structure data and organize it into a policy knowledge graph. Such graph technology creates and updates the nodes and edges within the knowledge graph, mainly relying on automation and complemented by review and additions by human subject matter experts. On top of the graph, GAMECHANGER leverages search and pattern recognition technologies to let users find policy documents and access document metadata.

GAMECHANGER uses on an open-source knowledge graph algorithm called neo4j.³⁵³ Most of the graph can be created from policy documents automatically. AI extracts patterns of words within documents to understand relationships between terms in the policy domain’s vocabulary and to extract the relevant “entities” within the policy domain. Based on such pattern recognition, AI also can infer relationships between documents and between documents and entities.³⁵⁴ On top of this automated process, human subject matter experts can review the graph for inaccuracies or manually code important entities or known relationships.³⁵⁵

GAMECHANGER automatically augments the metadata available in the knowledge graph with topic generation and topic modeling technologies. Topic generation identifies a list of most important words within a document based on their relative frequencies in the document and in the rest of the policy corpus. GAMECHANGER uses the tf-idf (term frequency–inverse document frequency) statistic to identify such “topic” terms.³⁵⁶ Topic modeling groups documents into “topic” clusters (instead of identifying top terms for

GitHub, <https://github.com/dod-advana/gamechanger-data/tree/dev/dataPipelines> (API to perform the “data engineering work” of GAMECHANGER, including “turning raw publication data into processed JSON format”).

³⁵³ See *Knowledge Graph*, NEO4J, <https://neo4j.com/use-cases/knowledge-graph> (mentioning that neo4j also is used by technology companies such as Lyft, Airbnb, Cisco, and eBay). Neo4J offers paid licenses but provides a fully open source “Community Edition.” See *Licensing*, NEO4J, <https://neo4j.com/licensing>.

³⁵⁴ Possible relationships include “child of,” “mentions,” “is similar to,” or “is related to.” See Interview with BAH Data Scientist.

³⁵⁵ *Id.* Tuning graph generation models requires a fine balance. If the models are made too broad, then the human reviewers need to discard a lot of inaccurate entities and relationships. But if the models are too narrow, many entities and relationships may be missing from the graph, thereby forcing human experts to add them manually—assuming they identify their absence.

As of April 2022, graph generation was not yet leveraging the advanced NLP models used in other parts of GAMECHANGER, but porting it to such advanced models was on the team’s short-term roadmap. See Interview with BAH Data Scientist (mentioning that the cross-references in the graph are not generated by ML, but that the team plans on building transformer models for these operations).

³⁵⁶ tf-idf is a standard method to identify important terms within a document. See tf-idf, WIKIPEDIA, <https://en.wikipedia.org/wiki/Tf%E2%80%93idf>. GAMECHANGER uses the open-source implementation of tf-idf provided by Gensim. See *TF-IDF Model*, GENSIM, <https://radimrehurek.com/gensim/models/tfidfmodel.html>.

It computes the tf-idf metric for all terms within a document and returns the top five terms as “topic” metadata.

individual documents).³⁵⁷ For topic modeling, GAMECHANGER relies on non-negative matrix factorization (NMF), a type of linear algebra algorithms using matrix properties to identify clusters of similar documents.³⁵⁸ GAMECHANGER’s NMF topic modeling features are still in development/testing.

GAMECHANGER applies search technology on top of its knowledge graph of policy documents. It deploys ElasticSearch, a widely used open-source search and analytics engine.³⁵⁹

- *Transformer “Large Language Models” for Natural Language Processing (NLP):* GAMECHANGER relies on Natural Language Processing (NLP) to perform most of its policy language analytics functions, such as “Responsibility Explorer” or “Document Comparison.” Its NLP models use “transformers,” a deep learning technique adapted to training “large language models” relying on millions (if not billions) of parameters.³⁶⁰ Transformer models have become the benchmark of high-performance NLP.³⁶¹ GAMECHANGER uses the open-source versions of these language models wherever possible, to increase transparency and applicability across use cases and organizations.³⁶²

Transformer NLP models within GAMECHANGER implement the SBERT (or Sentence-BERT) open-source transformer framework, which is available in the Python programming language.³⁶³ SBERT provides semantic comparisons and semantic search functionalities,³⁶⁴ which make it especially suited to GAMECHANGER’s main policy use cases. SBERT converts each analyzed paragraph into a “paragraph embedding,” a representation of the paragraph into a vector space in which such embeddings can be

³⁵⁷ Topic modeling is an unsupervised learning method (meaning that it can find patterns in “input” data without being shown “input-output” pairs). See *Unsupervised Learning*, WIKIPEDIA, https://en.wikipedia.org/wiki/Unsupervised_learning. As a result, topic modeling would not provide a name or category for the document clusters it identifies. A human subject matter expert would have to review the cluster and determine what it stands for.

³⁵⁸ See Interview with BAH Data Scientist. NMF is an alternative to Latent Dirichlet Allocation (LDA), described *supra* at text accompanying notes 349-350. See also CDO, IMPLEMENTING FEDERAL-WIDE COMMENT ANALYSIS, CDO COUNCIL SPECIAL PROJECTS FINAL RECOMMENDATIONS (June 2021) (using LDA in the CDO pilot for comment analysis to identify clusters of similar comments).

³⁵⁹ ElasticSearch provides a search engine that centrally stores and organizes data to make searches faster (even as database size increases) and more relevant. See *ElasticSearch*, ELASTIC.CO, <https://www.elastic.co/elasticsearch>.

³⁶⁰ See Julien Simon, *Large Language Models: A New Moore’s Law?*, HUGGINGFACE BLOG (Oct. 26, 2021), <https://huggingface.co/blog/large-language-models> (mentioning that the BERT-Large model, run by AI company HuggingFace, has 340 million parameters).

³⁶¹ See Britney Muller, *BERT 101: State of The Art NLP Model Explained*, HUGGINGFACE BLOG (Mar. 2, 2022), <https://huggingface.co/blog/bert-101> (“Since their introduction in 2017, Transformers have rapidly become the state-of-the-art approach to tackle tasks in many domains such as natural language processing, speech recognition, and computer vision. In short, if you’re doing deep learning, then you need Transformers!”).

³⁶² See Interview with BAH Data Scientist.

³⁶³ See *SentenceTransformers Documentation*, SBERT, <https://sbert.net/index.html>.

³⁶⁴ *Id.* (mentioning that SBERT is “useful for semantic textual similar, semantic search, or paraphrase mining”).

spatially compared.³⁶⁵ SBERT “embeds” all paragraphs in the policy document corpus into the vector space.³⁶⁶ To conduct a semantic search, SBERT would convert the query’s text into the same vector space and identify the closest embeddings from the corpus. These closest embeddings are estimated to have a high semantic overlap with the query and are returned at the top of search results.

GAMECHANGER has finetuned its SBERT transformer models for the analysis of policy documents. It used a pre-trained model called “distilroberta-base”³⁶⁷ as its baseline and trained it on the corpus of forty thousand policy documents within GAMECHANGER to teach it to operate on policy language.³⁶⁸ GAMECHANGER also trains different models to refine them for specific policy analysis tasks, such as identifying cross-references within documents.³⁶⁹ GAMECHANGER implements “symmetric” semantic models as it always runs comparisons between two paragraphs—units of text of roughly the same length.³⁷⁰

Transformer models operate under the hood of multiple GAMECHANGER features. With regard to the “Document Comparison Tool,” an “embedding” model translates each document’s paragraph into an embedding in the vector space,³⁷¹ and then a “similarity” model ranks the top results by semantic similarity to the query.³⁷² Although (as mentioned above) most search functionalities use ElasticSearch, GAMECHANGER’s search results display at the top the document most semantically similar to the query using a transformer

³⁶⁵ This means that the model can calculate a metric of the “distance” that separates two embeddings in this vector space.

³⁶⁶ See *Semantic Search*, SBERT, <https://sbert.net/examples/applications/semantic-search/README.html> (providing an overview of embedding based semantic search and a graphical illustration of how to conceptualize the vector space distance between two embeddings).

³⁶⁷ distilroberta-base is a variation of the BERT model that has been “distilled” to reduce the size of the model and increase its speed while retaining high levels of accuracy. See distilroberta-base, HUGGINGFACE, <https://huggingface.co/distilroberta-base>.

³⁶⁸ See Interview with BAH Data Scientist.

³⁶⁹ *Id.*

³⁷⁰ See *Semantic Search*, *supra* note 366 (“For symmetric semantic search your query and the entries in your corpus are of about the same length and have the same amount of content. An example would be searching for similar questions: Your query could for example be ‘How to learn Python online?’ and you want to find an entry like ‘How to learn Python on the web?’.”). The GAMECHANGER team is considering giving users the option to select different levels of comparisons beyond paragraph, including page-level or document-level comparisons. See Interview with BAH Data Scientist. It also is considering offering the option to compare between different levels, for example finding all paragraphs that are semantically similar to a queried sentence, which would require the implementation of “asymmetric” semantic models. See *Semantic Search*, *supra* note 366 (“For asymmetric semantic search, you usually have a short query (like a question or some keywords) and you want to find a longer paragraph answering the query. An example would be a query like “What is Python” and you want to find the paragraph ‘Python is an interpreted, high-level and general-purpose programming language. Python’s design philosophy ...’.”). The BAH data scientist whom we interviewed mentioned that his team would have to find a new model to implement asymmetric models, but that once they found an appropriate model, making the change would take “two line[s]” of code. Interview with BAH Data Scientist.

³⁷¹ See Annex Figure 14.

³⁷² *Id.*

model.³⁷³ Transformer models also power the “Query Expansion” feature. The model used there embeds the query text into a vector space and finds similar search queries in this space.

C. GSA/CMS BeInformed: KRR POC

- *Machine-Readable Representation of Rules*: KRR leverages machine-readable versions of regulatory information instead of applying predictive models to unstructured regulatory text (like NLP tools do). To translate information into a machine-readable format, KRR relies on ontology models, which create a graphical architecture of the regulatory domain. The ontology’s knowledge graph constitutes an abstract representation of the actors, actions, and duties referenced in the regulatory rules and guidance.
- “*Flint frames*”: To code an ontology of the CMS regulations, the pilot leveraged the open source eFLINT standard. eFLINT represents a legal knowledge graph by storing metadata for a regulation that categorizes actors, actions, and duties related to this regulation. Metadata are organized in computer objects called “Flint frames,” which include database elements such as the name of an action (e.g., “granting an immigration visa”), the pre-conditions for the action (e.g., “visa applicant must have filled all necessary application forms”), the interested party for the action (e.g., “visa applicant”), and the results from the action (e.g., “grant immigration visa”).³⁷⁴

Designing a regulatory ontology and filling in the corresponding Flint frames remains a manual process. Subject matter experts can use the Flint Editor, a computer code editor program, to translate a regulation’s text into eFLINT’s domain-specific programming language.³⁷⁵ Subject matter experts also would need to continuously monitor updates to regulations previously added to eFLINT and manually reflect these updates into the eFLINT code.³⁷⁶

BeInformed and ontology researchers have been evaluating the use of NLP to pre-fill Flint frames.³⁷⁷ While such NLP tools could not fill the interpretation elements of a Flint frame and therefore will never fully automate the process of creating and maintaining the KRR

³⁷³ Users can provide feedback on the results (thumbs up / thumbs down), which gets incorporated into further model training.

³⁷⁴ The BeInformed team demonstrated examples of eFLINT Frames representing an “act” and a “duty.” *See* Interview with BeInformed Team Members.

³⁷⁵ The BeInformed team demonstrated the use of the Flint Editor, which subject-matter experts use to translate regulations into Flint Frames. *See* Interview with BeInformed Team Members.

³⁷⁶ The BeInformed team mentioned that agency staff could leverage a notification service alerting them to rule changes, but that updating the rule interpretation within eFLINT (if necessary) would be a manual task. However, a subset of the operations required to update Flint frames could be automated using NLP techniques. *See* Interview with BeInformed Team Members.

³⁷⁷ *See* BeInformed, W3.1, at 13 (“An obvious direction is to leverage NLP tools where possible to support the manual annotation of semantic metadata.”); *see Proof-of Concept Briefing*.

knowledge graph,³⁷⁸ they could significantly speed up the process by identifying action, actors, and other frame elements within the regulatory text and automatically build links between Flint frames within the ontology knowledge graph.³⁷⁹

- “*Calculus*”: The domain-specific knowledge stored in eFLINT frames enables other AI programs to search, interpret, and process the underlying regulatory information. BeInformed has developed a protocol called “*Calculus*” to program such operations on regulatory rules.

³⁷⁸ See *Proof-of-Concept Briefing* (BeInformed Team Member B stating that “making the interpretation” is definitely something that has to be done by a human).

³⁷⁹ The BeInformed team estimates that NLP can pre-fill up to approximately 80% of the Flint Frames content. See Interview with BeInformed Team Members. Although this would never become a fully automated process, such NLP support in building Flint Frames could substantially drive down implementation costs, assuming that it can guarantee sufficient accuracy.