

NORTH DAKOTA’S PATH OF INNOVATION: A RICH HISTORY AND PROMISING FUTURE¹

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1. This article is an adaptation of the presentation and remarks made by Professor Nikola Datzov at the 2024 North Dakota Law Review Technology and Innovation Symposium, held in Fargo, North Dakota, on March 21, 2024.

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I. INTRODUCTION

The Director of the United States Patent and Trademark Office (“USPTO”)—the leader of the United States agency responsible for managing innovation—once referred to North Dakota as the home of “some of the country’s most innovative thinkers, researchers and entrepreneurs.”² A rich history of innovation supports his statement. Moreover, the North Dakota government and policy leaders have offered a clear vision for the state’s future path in innovation, centered on its core industries.

Recent studies of innovation, however, have put into question the extent of North Dakota’s current impact on innovation within the United States and beyond. One study ranked North Dakota very low among states leading in innovation, while another study ranked it near the top. Measuring “innovation” presents myriad problems in uniformity, as there is no universal definition or metrics through which innovation can be compared among different actors. Nevertheless, one of the most common ways to measure innovation in a particular geographic region is to look to its inventive activity through the patent system. Because patents provide powerful monopoly rights to exclude others from practicing patented inventions, they often serve as one of the most important ways companies and individuals can protect their innovation. “The strength and vitality of the U.S. economy depends directly on effective mechanisms that protect new ideas and investments in innovation and creativity,”³ such as those provided by patent law. As such, measuring patenting activity is often seen as an important measure and proxy of innovative activity.

To better understand the conflicting reports on North Dakota innovation, this article provides a novel empirical look at North Dakota’s patenting activity using the USPTO’s Patent Examination Research Dataset (PatEx), which includes data on more than 14 million USPTO patent applications.⁴ It thus offers new and important perspectives on: (1) how North Dakota compares to other states in its inventive record over the past few decades; (2) how innovation has been diffused throughout North Dakota; and (3) how limited access to legal professionals in North Dakota might impact its opportunity for innovation.

2. *Remarks by Director Iancu at the State of Technology Conference*, U.S. PAT. & TRADEMARK OFF. (Dec. 3, 2018), <https://www.uspto.gov/about-us/news-updates/remarks-director-iancu-state-technology-conference> [<https://perma.cc/2LU3-LZRF>].

3. *About Us*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/about-us> [<https://perma.cc/59EX-4XBR>] (last visited Aug. 7, 2024).

4. *Patent Examination Research Dataset (PatEx)*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/ip-policy/economic-research/research-datasets/patent-examination-research-dataset-public-pair> [<https://perma.cc/MQK9-DFAQ>] (last visited Aug. 7, 2024).

II. A RICH HISTORY OF INNOVATION

Although North Dakota presently might be best known for its advancements in agriculture, energy, and unmanned aerial systems (“UAS”), the state has made many diverse contributions to innovation in the United States and around the world. This article offers a few examples of those achievements to illustrate the impressive diversity of disciplines, inventors, and industries that North Dakota has helped shape with a lasting impact.

For a more exhaustive accounting of North Dakota innovation stories, Hiram Drache and Bruce Gjovig’s book (and Gjovig’s two subsequent books in the series) offers a fascinating look into the history and details of many North Dakota innovators who provided outstanding contributions in their fields.⁵ Through his work at the University of North Dakota Center for Innovation Foundation, Gjovig amassed an impressive collection of materials for the innovation that calls North Dakota its home. In the series, Gjovig highlights the stories of nearly 150 entrepreneurs and innovators who made their mark on the world and reveals a deeper pool of talent and achievement than even proud North Dakotans might expect to hail from their State. Among the interesting tales, Drache and Gjovig tell the history of Cream of Wheat (the popular breakfast cereal),⁶ the man *Time* magazine called the “Henry Ford of Agriculture,”⁷ the invention of the cattle guard by Andrew Johnston,⁸ Earl Branick’s 160 patents that established him as a leader in the automotive tire industry,⁹ Mr. Bubble¹⁰ (the best-selling bubble bath in the world), and the electric branding iron¹¹—all of which find their beginnings in North Dakota.

5. See HIRAM DRACHE & BRUCE GJOVIG, *INNOVATIVE ENTREPRENEURS OF NORTH DAKOTA AND NORTHWEST MINNESOTA: 150 YEARS OF IMPACT!* (2019); BRUCE GJOVIG, *INNOVATIVE ENTREPRENEURS FROM NORTH DAKOTA: 125 YEARS OF IMPACT!* (2020); BRUCE GJOVIG, *THE INNOVATORS FROM NORTH DAKOTA: THE CHANGE AGENTS!* (2022).

6. DRACHE & GJOVIG, *supra* note 5, at 54-58.

7. *Id.* at 68-72.

8. *Id.* at 73-74. There is some controversy as to who was *first* to invent the cattle guard, but there seems to be little question that Johnston “was the only inventor of the cattle guard with the foresight to recognize the importance of what he had done.” JAMES F. HOY, *THE CATTLE GUARD: IT’S HISTORY AND LORE* 37-42 (1982).

9. DRACHE & GJOVIG, *supra* note 5, at 78-80; *see also About Us*, BRANICK, <https://www.branick.com/about-us> [<https://perma.cc/7GAB-3Z8Y>] (last visited Aug. 7, 2024).

10. DRACHE & GJOVIG, *supra* note 5, at 125-26; *see also Mr. Bubble Bubble Bath Turns 50*, CBS MINN. (Aug. 31, 2011, 9:22 AM), <https://www.cbsnews.com/minnesota/news/mr-bubble-bubble-bath-turns-50/> [<https://perma.cc/4JG7-EALT>].

11. DRACHE & GJOVIG, *supra* note 5, at 162-64.

A. PICTURE PERFECT INVENTION

George Eastman has been called “the pioneer of popular photography and motion picture film”¹² on account of launching the “first successful roll-film hand camera.”¹³ But before Eastman received the patent for his device in 1888,¹⁴ David Houston—a North Dakota farmer—developed a novel capability to take pictures and helped pave the way for the success of not only Eastman and his Kodak Company but an entire industry.¹⁵

Prior to Houston’s invention, photography was quite cumbersome and required the use of glass plates coated in chemicals, which as a practical matter could be used only by professionals.¹⁶ At the time, Eastman had started the Eastman Dry Plate Company to better commercialize dry plates for photography.¹⁷ Houston, who had recently moved to what would eventually become North Dakota, was working in a different direction to make this technology accessible to anyone.¹⁸ Even though film had yet to be invented, in 1881, Houston anticipated the future of photography and invented a device that utilized rolled film, rather than bulky plates, inside the camera.¹⁹ Some suggest that Houston’s creation of such a camera might be what eventually led Eastman and his partners to the successful invention of film a few years later.²⁰ The patent that Houston received was for “a camera with a receptacle or box at its inner end containing a roll of sensitized paper or any other suitable tissue . . . and an empty reel, upon which the sensitized band is wound”²¹ Soon thereafter, Houston sold his patent rights for the invention to Eastman, and Kodak eventually rolled out its “first simple camera” in 1888 with the slogan: “you press the button, we do the rest.”²² The camera was dubbed “the invention of the year in photography” at the 1888 annual

12. *About*, EASTMAN MUSEUM, <https://www.eastman.org/about> (last visited Aug. 7, 2024).

13. *From the Camera Obscura to the Revolutionary Kodak*, EASTMAN MUSEUM, <https://www.eastman.org/camera-obscura-revolutionary-kodak> (last visited Aug. 7, 2024).

14. *See* U.S. Patent No. 388,850 (issued Sept. 4, 1888).

15. *Profile: David Houston*, N.D. STUD., <https://www.ndstudies.gov/gr4/early-settlement-north-dakota/part-2-great-dakota-boom/david-houston> [<https://perma.cc/7BQF-FWYW>] (last visited Aug. 4, 2024).

16. *See id.*

17. *George Eastman*, KODAK CO., <https://www.kodak.com/en/company/page/george-eastman-history/> [<https://perma.cc/M2EN-M763>] (last visited Aug. 7, 2024).

18. *See* *The Engines of Our Ingenuity*, *David Henderson Houston*, CULLEN COLL. ENG’G (Oct. 6, 2016), <https://engines.egr.uh.edu/episode/3088> [<https://perma.cc/7E6T-B2LR>].

19. *See* U.S. Patent No. 248,179 (issued Oct. 11, 1881).

20. Ellie Boese, *Photography & Farming: How a ND Man’s Inventions Changed the World*, VALLEY CITY TIMES-REC. (Sep. 23, 2021), <https://www.pressreader.com/usa/valley-city-times-record/20210923/281517934265594> [<https://perma.cc/YF6V-KTVM>].

21. ‘179 Patent col. 1, ll. 11-16.

22. *Cultural Icon*, KODAK CO., <https://www.kodak.com/en/company/page/history/> [<https://perma.cc/9SXR-7LJ3>] (last visited Aug. 7, 2024).

photographers' convention in Minneapolis, Minnesota and became a huge commercial success.²³

"The change from professional to amateur predominance not only transformed the photographic industry . . . but, more important, signaled the emergence of a mass market in photography."²⁴ Houston's invention—purchased by Eastman—not only helped with the development of the technology, but it was also an important patent in helping Kodak control the market and its competitors. In fact, Houston's patent was one of two patents asserted by Eastman against Blair Camera Co. in an infringement case in 1894.²⁵ Ultimately, Houston continued to invent, and Kodak continued to rely on (and purchase) more than 20 of Houston's innovations.²⁶ Thus, through his inventions, Houston helped bring photography to a mainstream audience and allowed everyday people to "take pictures with relative ease."²⁷

B. SUGAR SWEET INNOVATION

At a time when the University of North Dakota was barely six years old, it welcomed a chemistry professor who would revolutionize the production of sugar and help ensure the availability of sweets around the world for decades to come.²⁸ Although he was a researcher at heart, Earle Babcock refused to confine himself to his campus surroundings and focused on "the practical application of technologies and innovation."²⁹ At the behest of leaders in the State, in the 1890s, Babcock began experimenting with growing sugar beets in North Dakota and the surrounding area.³⁰ His experiments provided highly promising results, with initial sugar rates that exceeded those of established sugar beet growing states and gained commitment from farmers around the Red River Valley.³¹ In 1925, plans were laid to construct a sugar beet processing plant in East Grand Forks, Minnesota—just across the river from the University of North Dakota—that eventually became the "flagship plant for

23. Reese V. Jenkins, *Technology and the Market: George Eastman and the Origins of Mass Amateur Photography*, 16 *TECH. & CULTURE* 1, 14-17 (1975) (emphasis omitted).

24. *Id.* at 18.

25. *Eastman Co. v. Blair Camera Co.*, 62 F. 400, 403 (C.C.D. Mass. 1894).

26. DRACHE & GIOVIG, *supra* note 5, at 31-34; *see also* The Engines of Our Ingenuity, *supra* note 18; Boese, *supra* note 20; *Profile: David Houston*, *supra* note 15.

27. DRACHE & GIOVIG, *supra* note 5, at 33.

28. *Id.* at 48.

29. *Id.*

30. *Id.* at 50.

31. *Id.* at 50-51.

the American Crystal Sugar Co.”³² The plant remains one of the American Crystal Sugar Company’s four current processing plants.³³

American Crystal Sugar is now the longest-running sugar beet operation in the world and the largest U.S. manufacturer of beet sugar, harvesting 12.7 million tons of sugar beets and producing more than 3.5 billion pounds of sugar annually.³⁴ The company is responsible for providing approximately 13 percent of refined sugar in the United States, without which confectioners, breakfast cereal manufacturers, and bakers surely couldn’t produce the products that sweeten the lives of so many people around the world.³⁵ While countless contributions and downstream innovations can be credited for the success American Crystal Sugar has risen to, Babcock’s early experiments—spanning 15 years that proved the viability of sugar beet farming in the region—were the seeds that led the way for the eventual investments and commitment to the industry, which still crowns North Dakota as a critically important partner for sugar beet farming.

C. A NEW CAT IN TOWN

As an \$11.6 billion global enterprise, Bobcat does not just pride itself on being a world leader in its industry, it also touts “invent[ing] the compact equipment industry.”³⁶ However, it all started as a small, family-run business in North Dakota.³⁷ In 1958, the Melroe Manufacturing Company, which at the time was a North Dakota manufacturing company, purchased the rights to the first “three-wheeled compact loader” that had been built by two brothers in nearby Rothsay, Minnesota.³⁸ Two years later, Melroe introduced a redesigned loader (now with four wheels) as the world’s first skid-steer loader and soon after introduced the Bobcat name as its companion.³⁹ Since

32. *Id.* at 51-52.

33. *Proudly Making Life a Little Sweeter*, AM. CRYSTAL SUGAR CO., <https://www.crystalsugar.com/media/ed0pvd4m/acsc-booklet.pdf> [<https://perma.cc/Y38U-PV57>] (last visited Aug. 7, 2024).

34. *Id.*; *Making Sugar from Sugarbeets*, AM. CRYSTAL SUGAR CO., <https://www.crystalsugar.com/sugar/how-we-make-sugar> [<https://perma.cc/H9XM-5ZBT>] (last visited Aug. 7, 2024); AM. CRYSTAL SUGAR CO., *SWEETER TOMORROW 3* (2023) <https://www.crystalsugar.com/media/41gplsnd/a-report23.pdf> [<https://perma.cc/F37A-5RKW>].

35. *A Testament to the Limitless Potential of Growers*, AM. CRYSTAL SUGAR CO., <https://www.crystalsugar.com/our-company/cooperative-profile/> [<https://perma.cc/C3M3-PD4W>] (last visited Aug. 7, 2024).

36. *Innovation Leadership: We’re Driving the Industry Forward*, BOBCAT, <https://www.bobcat.com/na/en/company/about/innovation> [<https://perma.cc/256Z-QLX5>] (last visited Aug. 7, 2024); *Our History: A Legacy of Innovation*, BOBCAT, <https://www.bobcat.com/na/en/company/about/history> [<https://perma.cc/L3J2-8FBS>] (last visited Aug. 7, 2024).

37. See DRACHE & GJOVIG, *supra* note 5, at 149-50.

38. *Our History: A Legacy of Innovation*, *supra* note 36.

39. *Id.*

then, the company has achieved a long list of industry firsts in the compact equipment industry and expanded its lines of equipment and vehicles beyond loaders to include excavators, tractors, mowers, forklifts, and utility vehicles.⁴⁰

Bobcat does not hide what has made it so successful: “Bobcat Company was founded on innovation.”⁴¹ And while it now has dozens of offices around the world, its roots remain firmly in North Dakota.⁴² Its North American headquarters are in West Fargo, North Dakota.⁴³ It also has North Dakota manufacturing facilities in Gwinner, Wahpeton, and Bismarck.⁴⁴ Its “data innovation center” in downtown Fargo, North Dakota looks to bring “rapid development in new technologies and digitization” by partnering its R&D teams with “academic centers, entrepreneurs and emerging companies to advance community innovation and foster hands-on collaboration in a high-tech environment.”⁴⁵

D. FROM FARMING TO TECH

As computer technology grew in its importance and impact around the United States, so did North Dakota's commitment to innovation in the industry. One of the best-known stories involving North Dakota technology is the “bet-the-farm” story of North Dakota's current Governor, Doug Burgum.⁴⁶ After joining Great Plains Software in 1983 and becoming president in 1984, Burgum guided the company to its eventual sale to Microsoft for \$1.1 billion.⁴⁷ Since then, North Dakota has produced many innovative technology companies, such as Appareo, which has become “the U.S. industry leader in general aviation weather-and-traffic radio receivers and supplies avionics and flight-safety devices to many of the world's largest original equipment manufacturers (OEMS) and operators.”⁴⁸ More recently, the company has developed an embeddable artificial intelligence product using its proprietary

40. See *id.*; *Equipment & Machines*, BOBCAT, <https://www.bobcat.com/na/en/equipment> [<https://perma.cc/AC9L-SBS7>] (last visited Aug. 7, 2024).

41. *Our History: A Legacy of Innovation*, *supra* note 36.

42. *Locations*, BOBCAT, <https://www.bobcat.com/na/en/company/locations> [<https://perma.cc/2XTJ-KPS2>] (last visited Aug. 7, 2024).

43. *Id.*

44. *Id.*

45. *Id.*

46. See DRACHE & GJOVIG, *supra* note 5, at 249-51.

47. *Microsoft Completes Acquisition of Great Plains*, MICROSOFT (Apr. 5, 2001), <https://news.microsoft.com/2001/04/05/microsoft-completes-acquisition-of-great-plains/> [<https://perma.cc/W33T-L8NA>]; DRACHE & GJOVIG, *supra* note 5, at 249.

48. DRACHE & GJOVIG, *supra* note 5, at 237.

aviation audio that it “transcribes analog or digital aviation audio into text in near-real time.”⁴⁹

E. THE SMELL OF INNOVATION

For many inventors, the story of innovation begins with a figurative lightbulb moment. For inventor Kari Warberg Block, that moment was a mouse attack.

While on a date with her future husband, Block was attacked by a mouse that scurried up her leg. To scare the mouse away, she used perfume.⁵⁰ Years later, Block once again found herself in the unpleasant company of mice, this time those wreaking havoc on her organic vegetable farm in New Town, North Dakota.⁵¹ So, she began investigating ways for pest control by repelling rodents rather than using potentially unsafe chemicals to kill them. She worked with her friends and neighbors to experiment spraying different fragrances and study what effect they had on repelling mice.⁵² After learning that the Canadian balsam tree produces a chemical to repel rodents from its bark, Block developed Fresh Cab, “the first natural chemical-free, botanical rodent repellent that kept mice out.”⁵³ She applied for a patent, created a company, EarthKind, to help her commercialize the product, and in 2007 received approval from the EPA for her product.⁵⁴

Today, Block is a named inventor on numerous patents and patent applications,⁵⁵ and EarthKind touts itself as “America’s #1 Rated Pest Prevention Brand.”⁵⁶ Additionally, Fresh Cab not only continues to be a leading product for mice repellent, but it has also expanded its line of products to include dozens of plant-based repellants against ants, cockroaches, mosquitoes, moths, rodents, and spiders.⁵⁷

49. *Aviation Speech Recognition System*, APPAREO, <https://appareo.com/aviation/aviation-speech-recognition-system/> [https://perma.cc/2WEK-KXZB] (last visited Aug. 7, 2024).

50. DRACHE & GIOVIG, *supra* note 5, at 285; Geri Stengel, *How to Turn a Pesky Problem into a Billion Dollar Business*, FORBES (Sept. 16, 2015, 11:17 AM) <https://www.forbes.com/sites/geristengel/2015/09/16/how-to-turn-a-pesky-problem-into-a-billion-dollar-business/> [https://perma.cc/GNN8-2GG9].

51. DRACHE & GIOVIG, *supra* note 5, at 285.

52. *Id.* at 286.

53. *Id.*

54. *Id.* at 286-87; Off. Pesticide Programs, *Biopesticides Registration Action Document: Balsam Fir Oil*, EPA (Apr. 26, 2007), https://www3.epa.gov/pesticides/chem_search/reg_actions/registration/decision_PC-129035_26-Apr-07.pdf [https://perma.cc/U2U4-B7JR].

55. *See* U.S. Patent No. D705,414 (issued May 20, 2014); U.S. Patent Application No. 14/162,119 (filed Jan. 23, 2014); U.S. Patent No. D788,901 (issued Jun. 6, 2017); U.S. Patent No. 11,058,109 (issued Jul. 13, 2021); U.S. Patent Application No. 17/490,873 (filed Sept. 30, 2021).

56. EARTHKIND, <https://www.earthkind.com/shop/> [https://perma.cc/SS22-W4RT] (last visited Aug. 7, 2024).

57. *Fresh Cab® Rodent Repellent*, EARTHKIND,

F. HOMEGROWN AI PIONEER

Although artificial intelligence (AI) had been around for decades, some view November 30, 2022—the day OpenAI released ChatGPT—as the birth of the modern age of AI.⁵⁸ When ChatGPT took the world by storm, large language models (LLMs) had been known for many years. Yet, OpenAI's release of ChatGPT introduced the world to unprecedented capabilities that could be accessed by everyday people. ChatGPT required no computer science degree, understanding of artificial intelligence, computer algorithms, or anything of the sort; anyone with a modicum of curiosity and an Internet connection could benefit from ChatGPT's seemingly infinite wisdom. Its goal was to interact “in a conversational way.”⁵⁹ Those with computer experience and an understanding of prompt engineering surely held some advantage, but ChatGPT's intuitive interface and simplicity helped it set a record for the “fastest-growing consumer application in history” by reaching 100 million users in a mere two months.⁶⁰

While many are aware of ChatGPT's impressive growth, fewer know that OpenAI's existence finds part of its roots in North Dakota. Greg Brockman, one of OpenAI's co-founders and its first Chief Technology Officer, was born and grew up in the Red River Valley.⁶¹ After graduating from Red River High School in Grand Forks, North Dakota, he took classes at the University of North Dakota before going to (and eventually dropping out of) Harvard and MIT.⁶² In September 2023, Brockman returned to UND to talk about the influence that his upbringing in North Dakota played in his work creating OpenAI.⁶³ During his conversation with UND President Andrew Armacost, Brockman noted that the lessons he gleaned from his time at UND “really stuck with [him], and . . . underlie[] a lot of what [he has] done.”⁶⁴ He emphasized that “in North Dakota, the environment, and honestly the people

<https://www.earthkind.com/product/fresh-cab-rodent-repellent/> [https://perma.cc/32HV-GF5L] (last visited Aug. 7, 2024); see also *High-Efficiency Plant-Based Pest Control Solutions*, EARTHKIND, <https://www.earthkind.com/shop/> [https://perma.cc/SS22-W4RT] (last visited Aug. 7, 2024).

58. *Introducing ChatGPT*, OPENAI (Nov. 30, 2022) <https://openai.com/index/chatgpt/>.

59. *Id.*

60. Krystal Hu, *ChatGPT Sets Record for Fastest-Growing User Base - Analyst Note*, REUTERS (Feb. 2, 2023, 9:33 AM), <https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/>.

61. Delaney Otto, *Co-creator of ChatGPT Talks About Growing Up in Grand Forks*, INFORUM (Sept. 27, 2023), <https://www.inforum.com/news/north-dakota/co-creator-of-chatgpt-talks-about-growing-up-in-grand-forks> [https://perma.cc/N56Z-K66E].

62. *Id.*

63. Adam Kurtz, *From North Dakota and UND to ChatGPT*, UND TODAY (Sept. 28, 2023), <https://blogs.und.edu/und-today/2023/09/from-north-dakota-and-und-to-chatgpt/> [https://perma.cc/DM8A-WHYG].

64. *Id.*

in the community who supported me and my family, that was all so key to what I was able to do later.”⁶⁵

While OpenAI is certainly the product of far more than just Brockman’s upbringing, his start in North Dakota before his eventual stardom with ChatGPT is another example that the state has the capability of producing some of the most innovative thinkers in the U.S.—just as former USPTO Director Iancu said.

III. AN EMPIRICAL ANALYSIS OF NORTH DAKOTA’S INNOVATIVE IMPACT: CAUSE FOR CONCERN?

A. METHODS OF MEASURING INNOVATION

Many companies, states, and countries claim to have a commitment to innovation. Determining which of those find success in their claims, however, can prove difficult, in part, because there exist different definitions for what constitutes innovation. The distinction between innovator and entrepreneur can also often be blurred. But even more problematic, even assuming a common understanding of “innovation,” are the many ways in which such innovation can be measured.

While industry studies often look to a variety of economic data points, patenting activity (through patent applications and patent grants) has commonly been used in academic studies looking to measure innovation.⁶⁶ To be sure, patenting and innovation are not synonymous. High patent counts do not necessarily equate to high levels of innovation.⁶⁷ Moreover, innovation can be protected through other means, including trade secret protection or contract law, and some innovators never seek patents. Yet, patents play a uniquely important role in both protecting innovation and measuring the heartbeat of innovation.

65. ‘So Key to What I Was Able to Do Later’, UND TODAY (Sept. 28, 2023), <https://blogs.und.edu/und-today/2023/09/so-key-to-what-i-was-able-to-do-later/> [<https://perma.cc/U857-DL99>]; see also UofNorthDakota, *Conversation with ChatGPT Co-creator Greg Brockman*, YOUTUBE (Sept. 26, 2023), <https://www.youtube.com/watch?v=LSWy7nLDKRo&t=4s> [<https://perma.cc/Z7JD-L347>].

66. See, e.g., Jacob Dubbert et al., *Using Intellectual Property Data to Measure Cross-Border Knowledge Flows* 8 (USPTO Econ., Working Paper No. 2019-02, 2019), <https://ssrn.com/abstract=3386326> (explaining that patent count is a “standard approach in the literature” because “the flow of new patents is positively correlated with innovation”).

67. See, e.g., *id.* (“[A]n increase in patent counts or patent counts weighted by citations may not reflect an increase in valuable innovation.”); SETH G. BENZELL ET AL., WORLD INTELL. PROP. ORG., WIPO TECHNOLOGY TRENDS 2019: ARTIFICIAL INTELLIGENCE 20 (2019), <https://www.wipo.int/publications/en/details.jsp?id=4386> [<https://perma.cc/3VBW-BEG3>] (“Patents, however, only provide a part of the picture, as much research is never patented.”).

B. CONFLICTING NATIONAL REPORTS

Recent industry studies have offered conflicting viewpoints on North Dakota's national standing on innovation. For example, one 2024 study found North Dakota to be the fourth least innovative state in the United States.⁶⁸ To draw its conclusions, the study looked to "25 key indicators of innovation-friendliness," including share of STEM professionals, STEM job demand, eighth-grade math and science performance, share of technology companies, R&D spending per capita, average internet speed, and invention patents per capita.⁶⁹

Another study, performed in 2023 by "North America's largest technology trade association," found that North Dakota had the sixth highest innovation score out of all states.⁷⁰ As such, North Dakota earned the title of CTA's 2023 Innovation Champion, along with 13 other states, which boast "dynamic tech ecosystems, highly educated workforces, and particular openness to new and innovative technologies."⁷¹ This was the organization's sixth annual report evaluating "all 50 states on 11 quantitative and qualitative categories, including internet, STEM education, diversity and inclusion, and support for disruptive technologies such as self-driving vehicles, drones, and telehealth."⁷² The categories that North Dakota positively stood out in were "Drones & Advanced Air Mobility," "Self-Driving Vehicles," and "Tech Workforce."⁷³ Conversely, it fell short in "Attracts Investment."⁷⁴

So, where does that leave the conclusion on North Dakota's innovative impact? Likely, unanswered. Or with varying answers, depending on what one looks to in measuring innovation. Although the first study included some limited patenting activity data from the USPTO as one of the metrics in measuring innovation, the data on patenting activity was measured at a very high level. Comparatively, such high-level data might help to broadly place North Dakota in relation to its sister states; but it does little in helping to understand the deeper story behind the patenting activity in North Dakota. Even though patenting activity is a well-established method of analyzing innovation, there

68. Adam McCann, *Most & Least Innovative States (2024)*, WALLETHUB (Mar. 20, 2024), <https://wallethub.com/edu/most-innovative-states/31890> [<https://perma.cc/BGA2-F79L>].

69. *Id.*

70. CONSUMER TECH. ASS'N, 2023 CTA U.S. INNOVATION SCORECARD 2 (2023), <https://cdn.cta.tech/cta/media/media/advocacy/scorecard/us-pdfs/2023-cta-us-innovation-scorecard-white-paper.pdf> [<https://perma.cc/G7K5-86AV>]; see also *Data View Overall Scorecard*, CONSUMER TECH. ASS'N, <https://www.cta.tech/Advocacy/Innovation-Scorecard/US-Scorecard/Data> [<https://perma.cc/ES9B-UVGK>] (last visited Aug. 7, 2024).

71. CONSUMER TECH. ASS'N, *supra* note 70, at 10.

72. *Id.* at 5.

73. *Id.* at 22-23.

74. *Id.* at 22.

is surprisingly a dearth of studies examining such activity specifically within North Dakota. This article looks to fill the gap in the scholarship to better frame North Dakota's innovative footprint.

C. A NOVEL EMPIRICAL LOOK AT NORTH DAKOTA'S PATENTING ACTIVITY

Even within the limited scope of analyzing patenting activity, determining which subset of that activity is appropriately tied to *North Dakota* innovation presents some challenges. Is North Dakota innovation best represented by the number of patents that include an inventor from North Dakota? The overall number of inventors from North Dakota? The number of inventions that include only inventors from North Dakota? When the patent's leading inventor is from North Dakota? When the patent applicant (rather than inventor) lists North Dakota as its home? When the listed correspondence address is in North Dakota—perhaps indicating that the inventor or inventor has some connection to the state? Or do all of these represent some level of North Dakota innovation? It is difficult to confidently answer which of these metrics *best* represents the state of North Dakota innovation. Rather than attempt to make such a determination, this article offers data across several metrics to help provide different perspectives and a more complete picture of patenting activity with some connection to North Dakota.

An additional consideration that cannot be overlooked still remains. Issued patents represent inventions found by the USPTO to meet all the requirements of patentability under the Patent Act. But some innovation for which a patent application was submitted might not meet those criteria, for a variety of reasons. Nonetheless, innovation it still may be. Thus, in assessing the quality and quantity of innovation trends, the study in this article looks at patent applications rather than issued patents. This represents not only inventions that were granted a patent by the USPTO but also those believed (albeit wrongly) to be worthy of a patent. Whether that might be *sufficient* innovation depends on one's definition of the term. Additionally, to corroborate some of the key findings, the article also examines previously published USPTO data regarding granted patents.

It is also worth noting that the study does not differentiate between the types of patent applications. Depending on a person's claimed invention, in the United States, an applicant can apply for three different patent types: utility, design, and plant.⁷⁵ Although each patent type pertains to different inventions, and some would argue different impact and importance regarding

75. *Applying for Patents*, U.S. PAT. & TRADEMARK OFF., <https://www.uspto.gov/patents/basics/apply#types> [<https://perma.cc/G9S3-XJDW>] (last visited Aug. 7, 2024).

innovation, this study does not attempt to draw such distinctions. Moreover, the same is true regarding the importance or impact of innovation for the different classes of inventions within each patent type. Rather than attempt to draw such distinctions of importance and impact, the study here treats all patent applications as representing some innovation. Though, it should be noted that utility applications comprise more than 90% of all patent applications in the USPTO dataset. Of all the patent applications in the USPTO dataset used for this study, only 5.3% were for a design patent and a mere 0.2% were plant patent applications.

1) North Dakota's U.S. Rank in Patenting Activity

Based on the available data within the USPTO dataset, there are several ways to analyze North Dakota's patenting activity, including: (1) how many inventors are from North Dakota; (2) how many applicants are from North Dakota; (3) which applications include a correspondence address from North Dakota; and (4) how many applications include an inventor from North Dakota. First, analyzing the number of patent inventors who hail from North Dakota reveals that the state is toward the bottom of the list.⁷⁶

Table 1 – Inventors Listed on Patent Applications by State/Territory

Rank	State	Inventors	Rank	State	Inventors	Rank	State	Inventors
1	CA	4,368,538	19	IN	262,823	36	NM	54,260
2	TX	1,059,201	20	AZ	261,405	37	LA	52,477
3	NY	1,037,825	21	GA	261,170	38	VT	47,674
4	MA	994,230	22	VA	242,234	39	RI	44,643
5	WA	672,789	23	UT	159,762	40	AR	35,305
6	NJ	672,243	24	MO	157,337	41	NE	31,369
7	IL	636,779	25	TN	139,426	42	DC	24,440
8	MI	624,639	26	NH	104,013	43	ME	23,106
9	PA	613,329	27	SC	103,690	44	WV	19,672
10	OH	575,703	28	IA	100,842	45	MS	19,422
11	MN	525,068	29	ID	85,857	46	MT	17,560
12	FL	416,880	30	OK	77,130	47	HI	13,140
13	NC	373,259	31	KY	75,162	48	ND	11,657
14	CT	334,383	32	DE	74,965	49	SD	11,473

76. This does not represent unique inventors from each state. Rather, it includes the number of times one of the inventors listed on a patent application to the USPTO was from North Dakota.

15	CO	311,399		33	KS	72,678		50	WY	9,379
16	WI	294,044		34	NV	63,290		51	AK	4,573
17	OR	287,801		35	AL	58,003		52	PR	3,885
18	MD	279,012								

Second, looking at innovation from the perspective of the number of North Dakota applicants reveals a similar result.⁷⁷

Table 2 – Applicants Listed on Patent Applications by State/Territory

Rank	State	Applicants		Rank	State	Applicants		Rank	State	Applicants
1	CA	768,228		19	VA	40,383		37	NM	7,750
2	TX	210,845		20	WI	39,406		38	OK	7,725
3	MA	202,981		21	OR	38,318		39	RI	7,183
4	NY	196,397		22	DE	37,987		40	AR	5,397
5	IL	126,143		23	AZ	33,893		41	NE	4,778
6	NJ	122,653		24	MO	27,954		42	VT	3,970
7	MI	102,062		25	UT	26,527		43	ME	3,461
8	MN	97,488		26	TN	22,961		44	WV	2,537
9	PA	96,417		27	NV	16,479		45	MT	2,398
10	OH	90,591		28	NH	15,840		46	MS	2,263
11	WA	86,623		29	SC	14,733		47	PR	1,907
12	FL	66,721		30	ID	14,164		48	WY	1,841
13	NC	66,520		31	IA	13,897		49	HI	1,797
14	CT	60,215		32	KS	10,868		50	XX	1,733
15	GA	50,064		33	KY	10,543		51	SD	1,643
16	MD	48,389		34	AL	8,255		52	ND	1,541
17	IN	45,949		35	DC	8,036		53	YO	505
18	CO	44,297		36	LA	7,918		54	AK	391

Of course, states have different populations, geographies, policies, and corporate presence. So, the raw number of patent applicants and inventors from each state needs to be understood in that context. As a state with one of the smallest populations, it is not particularly surprising to find that North

77. An “applicant” for a patent is “the owner or assignee of a patent property [who] can take action in a patent application as the applicant.” U.S. PAT. & TRADEMARK OFF., MANUAL OF PATENT EXAMINING PROCEDURE § 605 (9th ed. 2022) <https://www.uspto.gov/web/offices/pac/mpep/s605.html> [<https://perma.cc/7KJP-7EPE>].

Dakota has lower numbers of applicants and inventors. The USPTO notes on its website that it expects “population to have a significant impact on utility patent totals for a given state, and in fact that’s what [it] find[s], with the two most populous states having the highest patent totals.”⁷⁸ Expecting North Dakota to compete with California in these metrics—currently boasting a population more than 50 times that of North Dakota—seems neither realistic nor fair.

To be sure, population does not always mean more patenting activity. For example, Texas and Massachusetts have comparable numbers of inventors and applicants, even though Texas currently has a population of approximately 30 million, whereas Massachusetts has a population of almost 7 million.⁷⁹ Even in states with smaller populations, the presence of one company with a heavy patenting presence can significantly skew the results. For example, the patenting activity in Idaho—which is listed 30th on the list of patent applicants in Table 2 and 38th on the list of most populous states⁸⁰—was largely dominated by one entity: Micron Technology, Inc. Between 2011 and 2015, Micron received more than 63% of the patents originating from Idaho.⁸¹ Thus, in the USPTO study, “[d]espite its relatively low population, Idaho’s patent count is greater than states with much higher population counts.”⁸² A similar story existed for Vermont, where IBM was responsible for 72.6% of the patents originating from the state.⁸³ “Again we find a smaller state (Vermont having the second-lowest population in the nation) benefitting significantly from housing a major technology company.”⁸⁴

While the tabulations of inventors and applicants in Tables 1 and 2 span several decades, such that they cannot be easily compared with the current population of each state, it is likely no coincidence that many of the smaller states by population (Wyoming, Alaska, North Dakota, South Dakota, and

78. *Utility Patents Per State Over Time*, U.S. PAT. & TRADEMARK OFF., <https://developer.uspto.gov/visualization/utility-patents-state-over-time> [https://perma.cc/89WY-M3XF] (last visited Aug. 7, 2024).

79. *State Population Totals: 2020-2023*, U.S. CENSUS BUREAU, <https://www.census.gov/data/tables/time-series/demo/popest/2020s-state-total.html> [https://perma.cc/4FWA-6MJD] (last visited Aug. 12, 2024).

80. *See id.*

81. U.S. PAT. & TRADEMARK OFF., PATENTING BY GEOGRAPHIC REGION (STATE AND COUNTRY), BREAKOUT BY ORGANIZATION: IDAHO (Aug. 7, 2024), https://www.uspto.gov/web/offices/ac/ido/oeip/taf/stcsg/id_stcorg.htm [https://perma.cc/7GMU-46LQ].

82. *Utility Patents Per State Over Time*, *supra* note 78.

83. U.S. PAT. & TRADEMARK OFF., PATENTING BY GEOGRAPHIC REGION (STATE AND COUNTRY), BREAKOUT BY ORGANIZATION: VERMONT (Aug. 7, 2024), https://www.uspto.gov/web/offices/ac/ido/oeip/taf/stcsg/vt_stcorg.htm [https://perma.cc/ZW3T-H4M8].

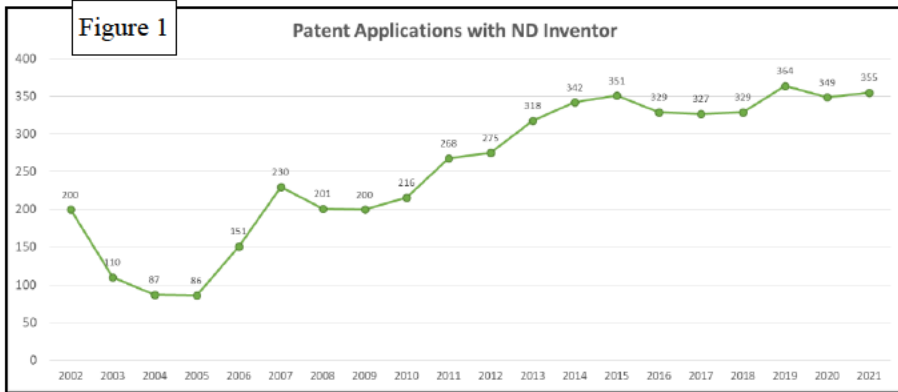
84. *Utility Patents per State over Time*, *supra* note 78.

Montana) also find themselves toward the bottom of the lists for total inventors and applicants.

As highlighted below, further comparing the patenting trends of some states with populations comparable to North Dakota offers additional helpful context and perspective.

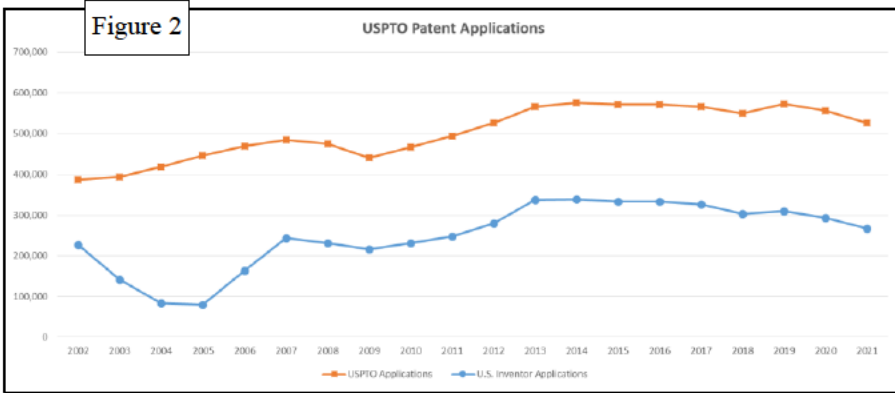
2) *North Dakota Patenting Activity Over Time*

The period of 2009 to 2015 may be the most sustained growth in patent applications with at least one North Dakota inventor. During that time, North Dakota inventors contributed to an increase from 200 patent applications in 2009 to 351 in 2015—an increase of 175%. As promising as that period looked, however, the following six years proved less inspiring, with significant stagnation. In 2021, North Dakota inventors were listed on 355 applications—merely 4 more than in 2015.

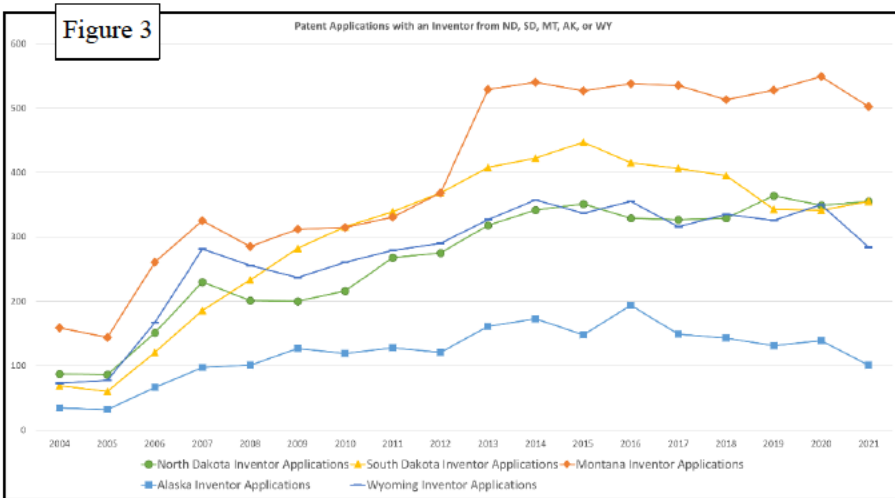


On its face, Figure 1 presents some cause for concern. Yet, putting North Dakota patent inventor activity into context of national trends—and the trends of other states—perhaps eases some of that angst.

As shown below in Figure 2, overall USPTO patent applications, and those that included at least one United States inventor, both tapered off from 2016 to 2020.



Moreover, comparing the trends of North Dakota’s inventor activity to several other states also suggests that North Dakota is not falling behind its peers. Figure 3 shows the number of patent applications that include at least one inventor from North Dakota, South Dakota, Montana, Alaska, or Wyoming.⁸⁵



As shown above, after 2015, South Dakota and Alaska each experienced a steady decline in applications featuring an inventor from their state.

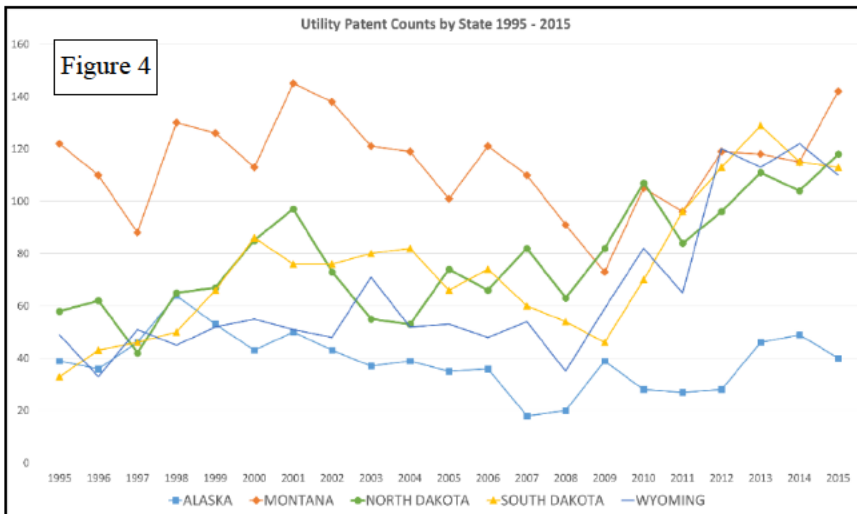
85. South Dakota, Montana, and Wyoming were selected as examples based on their similar population and geographic location in the same region. Alaska was used as a non-regional example with a similar population.

Montana and Wyoming maintained a generally consistent pace, similar to North Dakota. Thus, North Dakota's patent inventor curve (number of patent applications listing a North Dakota inventor) is not nearly as alarming in the context of these national and regional trends. In fact, the USPTO's own tool for analyzing patent trends shows that North Dakota had the fourth highest growth rate in patents per capita from 2003 to 2015, trailing only Washington, Kansas, and California.⁸⁶

An older study by the USPTO of utility patent grants for each of those states between 1963 and 2015 shows similarly promising results:⁸⁷

Table 3 – Utility Patents Granted 1963 through 2015

State	Patents
Alaska	1,537
Montana	4,140
North Dakota	2,960
South Dakota	2,708
Wyoming	2,391



86. *Utility Patents Per State over Time*, *supra* note 78.

87. U.S. PAT. & TRADEMARK OFF., EXTENDED YEAR SET - PATENT COUNTS BY COUNTRY, STATE, AND YEAR: UTILITY PATENTS (2015), https://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_utilh.htm [<https://perma.cc/BX2S-T5AS>]. The origin of the patent was determined by the residence of the first-named inventor. *See id.*

Overall, taking into account both studies, if North Dakota looks to climb the rankings in innovation, it will need to improve its stagnant curve. However, it also appears that—for now—North Dakota is not falling further behind its comparable sister states in patenting activity when viewed through patent applications and patent grants.

3) Concentrations of North Dakota Patenting Activity

Taking an even deeper dive into the state of innovation within North Dakota presents, perhaps, an even more interesting—even if not particularly surprising—revelation: North Dakota's patent applicants are highly concentrated.

Examining the listed city of the inventors within the USPTO dataset shows that a very high percentage of North Dakota inventors are based in only a few cities within the state. As shown in Table 4, more than half of the inventors are from Fargo, West Fargo, or Grand Forks.⁸⁸

Table 4 – North Dakota Inventors by City

Rank	City	Inventors	Percent
1	Fargo	3,998	34.4%
2	Grand Forks	1,182	10.2%
3	West Fargo	1,037	8.9%
4	Bismarck	984	8.5%
5	Jamestown	459	3.9%
6	Dickinson	449	3.9%
7	Wahpeton	269	2.3%
8	Williston	236	2.0%
9	Lisbon	191	1.6%
10	Mandan	164	1.4%
11	Minot	152	1.3%
12	Kindred	120	1.0%
13	Horace	109	0.9%
14	Thompson	90	0.8%
15	Gwinner	86	0.7%

88. The USPTO dataset includes entries where there is an obvious typo (e.g., Fargo is listed as “Fergo” or “Frago”). In attempting to “clean up” the data and capture the complete scope of entries for Tables 4 and 5, obvious spellings were corrected in calculating the totals; however, it is possible that a minimal number of misspelled entries were not captured.

Looking to applicants offers similar results. Table 5 below shows that Fargo, West Fargo, and Grand Forks dominate the number of North Dakota patent applicants. Separate USPTO reports of granted utility patents from 2000 to 2015 likewise show that Cass County (home to Fargo and West Fargo), Grand Forks County (home to Grand Forks), and Burleigh County (home to Bismarck) lead the pack when it comes to North Dakota inventors⁸⁹ and North Dakota patents.⁹⁰

Table 5 – North Dakota Applicants by City

Rank	City	Applicants	Percent
1	Fargo	595	38.6%
2	Grand Forks	291	18.9%
3	West Fargo	261	16.9%
4	Bismarck	72	4.7%
5	Dickinson	38	2.5%
6	Lisbon	25	1.6%
7	Wahpeton	22	1.4%
8	Mandan	15	1.0%
9	Jamestown	14	0.9%
10	Kindred	12	0.8%
11	Minot	12	0.8%
12	Williston	12	0.8%
13	Gwinner	10	0.6%
14	Devils Lake	9	0.6%
15	Thompson	9	0.6%

It might be tempting to conclude that this is due to the presence of North Dakota State University in Fargo and the University of North Dakota in Grand Forks. Table 6 shows that NDSU and UND heavily factor into the list of repeat applicants; however, there is also an impressive amount of diffusion

89. U.S. PAT. & TRADEMARK OFF., U.S. RESIDENT INVENTORS AND THEIR UTILITY PATENTS BREAKOUT BY STATE REGIONAL COMPONENT: NORTH DAKOTA (2015), https://www.uspto.gov/web/offices/ac/ido/oeip/taf/inv_countyall/nd_invcounty_gd.htm [<https://perma.cc/Q5BN-5PVC>].

90. U.S. PAT. & TRADEMARK OFF., U.S. STATE PATENTING BREAKOUT BY REGIONAL COMPONENT: NORTH DAKOTA (2015), https://www.uspto.gov/web/offices/ac/ido/oeip/taf/county-all/nd_county_gd.htm [<https://perma.cc/TYN5-CDUG>].

after the top five on the list.⁹¹ Indeed, most applicants on the list applied for a patent fewer than three times. The USPTO's own analysis of entities who received a patent in North Dakota between 2011 and 2015 identifies many of the same parties and supports the same conclusion.⁹²

Table 6 – North Dakota Institutional Applicants

Rank	Institutional Applicant Name	No. of Times Applicant	Percent
1	Clark Equipment Company	180	22.3%
2	NDSU Research Foundation	123	15.3%
3	University of North Dakota	62	7.7%
4	Energy & Environmental Research Center (UND)	58	7.2%
5	Intelligent Agricultural Solutions LLC	35	4.3%
6	Appareo Systems, LLC	30	3.7%
7	PRx Performance, LLC	13	1.6%
8	Packet Digital, LLC	11	1.4%
9	Steffes Corporation	10	1.2%
10	Agri-Cover, Inc.	9	1.1%
11	Minn-Dak Farmers Cooperative	8	1.0%
12	Summers Manufacturing Company, Inc.	7	0.9%
13	Crary Industries, Inc.	6	0.7%
14	Dakota Technologies, Inc.	6	0.7%
15	Medora Environmental, Inc.	6	0.7%

4) Access to Innovation Counsel

The USPTO dataset includes data for the listed correspondence address for each application. As explained in the documentation supporting the dataset, the entity whose address is listed in most situations is the law firm or

91. In tabulating the counts for each entity in Tables 6, 7, 8, and 10, the same approach to “clean up” the data was taken as for the city names in Tables 4 and 5; though, the same caveat regarding a minimal number of uncaptured counts exists for this data as well.

92. U.S. PAT. & TRADEMARK OFF., PATENTING BY GEOGRAPHIC REGION (STATE AND COUNTRY), BREAKOUT BY ORGANIZATION: NORTH DAKOTA (August 7, 2024) https://www.uspto.gov/web/offices/ac/ido/oeip/taf/stcsg/nd_stcorg.htm [https://perma.cc/EUF8-WS2M].

legal department of a company.⁹³ Indeed, as shown in Table 7 below, the entities most often listed with a North Dakota address appear to be law firms or lawyers. Moreover, looking at the correspondence entities listed in the USPTO dataset shows that patenting activity is strongly concentrated among a few entities.

Table 7 – Correspondence Entities with North Dakota Correspondence Address

Rank	Correspondence Entity Name	Count	Percent
1	Neustel Law Offices, LTD	1,724	51.7%
2	Danielson Legal LLC	538	16.1%
3	Michael S. Neustel	180	5.4%
4	Robert E. Kleve	129	3.9%
5	Curtis V. Harr	102	3.1%
6	David A. Lingbeck	70	2.1%
7	Ross	59	1.8%
8	Fargo Patent & Business Law	39	1.2%
9	University of North Dakota	27	0.8%
10	Brainstorm Consulting, LLC	26	0.8%

Perhaps what stands out even more about the correspondence data is that nearly all of the patent application correspondence is directed to one city: Fargo. This suggests that prosecution of patent applications—and access to patent counsel in North Dakota—is very highly concentrated in only that city. If that is the case, it presents a concern for how innovators not near Fargo can access counsel to help them with their innovation.

93. RICHARD D. MILLER, U.S. PAT. & TRADEMARK OFF., TECHNICAL DOCUMENTATION FOR THE 2019 PATENT EXAMINATION RESEARCH DATASET (PATEX) RELEASE 52 (2020), <https://www.uspto.gov/sites/default/files/documents/PatEx-2019-Technical-Doc.pdf> [<https://perma.cc/AC44-UJ7B>].

Table 8 – Correspondence Cities in North Dakota

Rank	Correspondence City	Count	Percent
1	Fargo	2,862	85.8%
2	Grand Forks	183	5.5%
3	Bismarck	64	1.9%
4	West Fargo	41	1.2%
5	Minot	15	0.4%
6	Dickinson	12	0.4%
7	Williston	9	0.3%
8	Cooperstown	8	0.2%
9	Mandan	8	0.2%
10	Devils Lake	5	0.1%
11	Lisbon	5	0.1%
12	Lincoln	4	0.1%
13	Jamestown	3	0.1%
14	Steele	3	0.1%
15	Bottineau	2	0.1%

To determine if the legal needs of North Dakota inventors are being met, we can look more closely at the correspondence addresses for applications that list a North Dakota inventor. Examining that data shows that most of those applications are prosecuted with an entity outside of North Dakota. In fact, more than 30% of applications with a North Dakota inventor identify a correspondence address in Minnesota.

Table 9 – Correspondence States for Patent Applications with a North Dakota Inventor

Rank	State	Count	Percent
1	MN	2,204	31.8%
2	ND	931	13.4%
3	IL	640	9.2%
4	IA	255	3.7%
5	WI	246	3.6%
6	PA	238	3.4%
7	VA	232	3.3%
8	DC	204	2.9%
9	CA	188	2.7%
10	WA	176	2.5%
11	CO	173	2.5%
12	TX	158	2.3%
13	KS	133	1.9%
14	GA	99	1.4%
15	NY	94	1.4%

The takeaway that many North Dakota inventors are seeking legal help with their innovation outside of North Dakota is further corroborated by looking at the names of the correspondence entities for the patent applications listing a North Dakota inventor. Only one of the top seven entities is a North Dakota law firm (Neustel⁹⁴). In contrast, four of the top seven entities are law firms based in Minneapolis, Minnesota that specialize in intellectual property law (Westman,⁹⁵ Schwegman,⁹⁶ Merchant,⁹⁷ and Kinney⁹⁸).

94. *Our Legal Services*, NEUSTEL, <https://neustel.com/> [<https://perma.cc/H9WX-KVfV>] (last visited Aug. 7, 2024).

95. *Intellectual Property Law Services*, WESTMAN, CHAMPLIN, & KOEHLER, <https://wck.com/intellectual-property-law-services/> [<https://perma.cc/5HQ8-QSB4>] (last visited Aug. 7, 2024).

96. *About*, SCHWEGMAN, LUNDBERG, WOESSNER, <https://www.slwip.com/about/what-we-do/> [<https://perma.cc/2E5K-98RN>] (last visited Aug. 7, 2024).

97. *About M&G*, MERCHANT & GOULD, <https://www.merchantgould.com/about/overview/> [<https://perma.cc/98XB-Q98P>] (last visited Aug. 7, 2024).

98. *About Kinney and Lange*, KINNEY & LANGE, <https://www.kinney.com/about-kl/> [<https://perma.cc/GP7U-PQT8>] (last visited Aug. 7, 2024).

Table 10 – Correspondence Entities in Patent Applications with a North Dakota Inventor

Rank	Correspondence Entity	Count	Percent
1	Westman Champlin & Koehler, P.A.	478	6.9%
2	Deere & Company	412	5.9%
3	Neustel Law Offices, Ltd.	352	5.1%
4	Schwegman Lundberg & Woessner, P.A.	194	2.8%
5	Blue Leaf I.P., Inc.	160	2.3%
6	Merchant & Gould P.C.	147	2.1%
7	Kinney & Lange, P.A.	140	2.0%
8	Pioneer Hi-Bred International, Inc.	133	1.9%
9	Dykema Gossett PLLC	120	1.7%
10	Michael Best & Friedrich LLP (Mke)	92	1.3%

Since there are currently 22 registered patent practitioners in North Dakota and 1,385 in Minnesota, perhaps this is not especially surprising.⁹⁹ It is possible that law firms and lawyers outside of North Dakota are prosecuting patent applications with North Dakota inventors because those applications also include inventors from other states (and thereby a connection to other states). However, examining the correspondence address for North Dakota applicants suggests otherwise. Table 11 demonstrates that for patent applications submitted by a North Dakota applicant, Minnesota is listed as correspondence address more than four times more often than North Dakota.

99. See *infra* Table 13.

Table 11 – Correspondence States for Patent Applications with North Dakota Applicants

Rank	State	Count	Percent
1	MN	442	42.0%
2	ND	107	10.2%
3	IL	80	7.6%
4	WI	80	7.6%
5	KS	52	4.9%
6	CA	42	4.0%
7	VA	35	3.3%
8	TX	28	2.7%
9	IA	20	1.9%
10	CO	16	1.5%

Looking at listed correspondence addresses for the top five patent applicants with a North Dakota address reveals even more distinct results: Minnesota is listed on 172 occasions, whereas North Dakota just once. Table 12 below suggests that the top five applicants with a North Dakota address—all of whom are clearly based in North Dakota—appear to look to patent counsel outside of North Dakota.

Table 12 – Correspondence States for Top Five North Dakota Applicants

State	Count
MN	172
WI	43
KS	25
VA	22
IA	15
CA	14
KY	8
IL	4
DC	3
NY	3
IN	2
MA	1
MO	1
ND	1
PA	1
TX	1
UT	1

Without further qualitative data, it is difficult to pinpoint the reason for these results. However, the data on access to patent counsel within North Dakota suggests, not only that access to patent counsel is limited to a few cities within North Dakota, but also that the top patent applicants from North Dakota choose to seek patent counsel from outside the state. Whatever the reason for these trends, neither appears to bode well in ensuring adequate access to counsel for North Dakota innovators.

Indeed, all of this raises a familiar concern: whether there exists adequate access to counsel in North Dakota. The lawyer shortage—generally and for entrepreneurs specifically—in rural states, such as North Dakota, is well documented.¹⁰⁰ As Professor Alexandra Sickler has previously explained, a shortage of lawyers who can provide transactional legal services surely impacts the entrepreneurial opportunities in the state.¹⁰¹ With regard to innovation, lack of sufficient counsel in North Dakota may also be impacting North Dakota's potential for driving future innovation.

Additional national data on the availability of patent counsel appears to corroborate this concern. In addition to the dataset of applications and accompanying information utilized above, the USPTO makes available the complete roster of patent practitioners licensed to practice before the USPTO.¹⁰² That roster identifies 22 individuals (patent attorneys and agents) with North Dakota listed as their address.¹⁰³ Combining that data for the current roster with the 2020 state populations, as shown in Table 13, reveals that North Dakota not only has the third fewest practitioners licensed to practice before the USPTO, it is fourth worst in patent practitioners per 10,000 people.¹⁰⁴

100. See, e.g., Alexandra P. Everhart Sickler, *A Rural State Perspective on Transactional Skills in Legal Curricula and Access to Economic Opportunity*, J. AFFORDABLE HOUS. & CMTY. DEV. L. 499, 499-500 (2019).

101. *Id.* at 499.

102. *Find a Patent Practitioner*, U.S. PAT. & TRADEMARK OFF., <https://oedci.uspto.gov/OEDCI/practitionerSearchEntry#roster> [<https://perma.cc/JHK4-YHAU>] (last visited Aug. 7, 2024).

103. Anecdotally, from the author's own observations, the number of practitioners who actually practice patent prosecution in North Dakota is likely even lower.

104. *Historical Population Change Data 1910-2020*, U.S. CENSUS BUREAU (Apr. 26, 2021), <https://www.census.gov/data/tables/time-series/dec/popchange-data-text.html> [<https://perma.cc/KR97-5D52>].

Table 13 – Number of Patent Practitioners by State

Rank	State / Territory	Patent Practitioners	State Population (2020 Census)	Patent Practitioners Per 10,000 People	Residents per Practitioner
1	District of Columbia	2,583	689,545	37.46	267.0
2	Massachusetts	2,745	7,029,917	3.90	2,561.0
3	Virginia	2,604	8,631,393	3.02	3,314.7
4	Minnesota	1,385	5,706,494	2.43	4,120.2
5	California	9,242	39,538,223	2.34	4,278.1
6	Illinois	2,843	12,812,508	2.22	4,506.7
7	Maryland	1,143	6,177,224	1.85	5,404.4
8	New York	3,727	20,201,249	1.84	5,420.2
9	Washington	1,378	7,705,281	1.79	5,591.6
10	New Jersey	1,652	9,288,994	1.78	5,622.9
11	Pennsylvania	1,859	13,002,700	1.43	6,994.5
12	Michigan	1,363	10,077,331	1.35	7,393.5
13	Texas	3,870	29,145,505	1.33	7,531.1
14	Ohio	1,451	11,799,448	1.23	8,131.9
15	Vermont	55	643,077	0.86	11,692.3
40	Rhode Island	66	1,097,379	0.60	16,627.0
41	Florida	1,254	21,538,187	0.58	17,175.6
42	Maine	61	1,362,359	0.45	22,333.8
43	Hawaii	50	1,455,271	0.34	29,105.4
44	Montana	37	1,084,225	0.34	29,303.4
45	Wyoming	19	576,851	0.33	30,360.6
46	South Dakota	29	886,667	0.33	30,574.7
47	West Virginia	57	1,793,716	0.32	31,468.7
48	North Dakota	22	779,094	0.28	35,413.4
49	Arkansas	61	3,011,524	0.20	49,369.2
50	Alaska	13	733,391	0.18	56,414.7
51	Mississippi	27	2,961,279	0.09	109,677.0

Therefore, even for its size, North Dakota has fewer qualified professionals to assist North Dakota inventors with protecting their innovation.

IV. THE GROUNDWORK FOR A PROMISING FUTURE OF INNOVATION

North Dakota not only owns a rich history of innovative contributions, the state has a commitment and focus on ensuring innovation well into the future. The state “welcome[s] homegrown entrepreneurs—and those looking for a place to establish their enterprises—to grow their businesses and create quality jobs for our skilled workforce.”¹⁰⁵ Its future innovative plans are concentrated on six of its major industries: “Food & Agriculture,” “Energy & Natural Resources,” “Autonomous Systems,” “Information Technology,” “Tourism,” and “Advanced Manufacturing.”¹⁰⁶

For “Food & Agriculture,” North Dakota “lead[s] the nation in spring wheat and sunflower production” and is the “No. 1 honey-producing state in the country for 19 years running.”¹⁰⁷ As a “hotbed for emerging crops like industrial hemp, hops, fava beans, and carinata,” it is poised to continue building on a strong history of farming.¹⁰⁸ Moreover, it is a leader in the ethanol industry and is “opening new doors into food manufacturing; IPA, wine and cider production; and Agritourism.”¹⁰⁹ Perhaps most importantly, the state—and those leading the charge in this space—have recognized that “[h]orses and plows have been replaced with drones, apps and other technology, . . .” to improve product quality and process efficiency.¹¹⁰

In the “Autonomous Systems” space, North Dakota is a proven leader poised to continue to grow its footprint in striving to be “the Silicon Valley of drone innovation.”¹¹¹ Not only is North Dakota only “one of seven FAA test sites that conducts vital research for integrating uncrewed aircraft systems (UAS) into our national airspace system,” it has numerous established partners, “like Northern Plains UAS Test Site, Grand Sky Business and Aviation Park, University of North Dakota and North Dakota State University,” to help drive its potential ahead.¹¹² North Dakota’s Grand Sky park is “the

105. *Innovation & Industries*, N.D. STATE GOV., <https://www.nd.gov/innovation-industries> [<https://perma.cc/2GQE-ZS55>] (last visited Aug. 7, 2024).

106. *Id.*

107. *Food & Agriculture*, N.D. STATE GOV., <https://www.nd.gov/innovation-industries/food-agriculture> [<https://perma.cc/K4UK-4WHN>] (last visited Aug. 7, 2024).

108. *Id.*

109. *Id.*

110. *Id.*

111. *Autonomous Systems*, N.D. STATE GOV., <https://www.nd.gov/innovation-industries/autonomous-systems> [<https://perma.cc/67HY-9LUF>] (last visited Aug. 7, 2024).

112. *Id.*

nation's first UAS business and aviation park."¹¹³ The state also developed "a statewide network enabling UAS flights Beyond Visual Line of Sight (BVLOS)," which is "the first such program of its scale in the U.S." and puts North Dakota in position to be "the nation's epicenter of commercial UAS activity."¹¹⁴ It is "investing over \$79 million to advance research and development in [the UAS] industry" and more than 50 UAS companies call North Dakota their home, who also employ more than 1,000 people within the industry.¹¹⁵ Even more impressive is that all of this is "forecasted to go up, up, up by 2026" such that UAS becomes "a \$100 billion sector offering 100,000 jobs in research, manufacturing and service."¹¹⁶

Advanced Manufacturing continues to be a strong part of North Dakota's economic prosperity, with manufacturing comprising 7.3% of the State's Gross Domestic Product (GDP) and showing a 108% GDP growth during the past decade.¹¹⁷ At a time when much of manufacturing has found its way overseas, North Dakota has seen expansion.¹¹⁸ Its impressive list of manufacturing partners includes "Doosan (Bobcat), John Deere, CNH Industrial, Air Liquide and Caterpillar," many of which also find themselves on the list of patenting entities identified above.¹¹⁹ In light of the increasing globalization of businesses and competition, North Dakota has openly acknowledged that its "future expansion of [its] manufacturing sector will come not from substantial labor growth, but rather from innovation and productivity gains, as well as a strong focus on developing foreign markets."¹²⁰ Its hope is that with support from key partners and "the innovation resources within the North Dakota University System," it can continue sustained growth to keep its "position as an innovative manufacturing state."¹²¹

North Dakota's history and footprint in the energy and natural resources industries are well-known and firmly-established. But as the world's needs and priorities have seen significant change and evolution in recent years, North Dakota does not intend to fall behind. Since "90% of [its] oil, 82% of [its] natural gas, and half of [its] electricity are exported," North Dakota's

113. *UAS (Uncrewed Aircraft Systems)*, N.D. DEP'T COM., <https://www.medialibrary.nd.gov/assetbank-nd/assetfile/94930.pdf> [<https://perma.cc/AS8R-Q7A9>] (last visited Aug. 7, 2024).

114. *Id.*

115. *Autonomous Systems*, *supra* note 111.

116. *Id.*

117. *Manufacturing*, N.D. DEP'T COM. (May 21, 2024), <https://www.nd.gov/innovation-industries/advanced-manufacturing> [<https://perma.cc/7T79-7884>].

118. *Id.*

119. *Id.*

120. *Id.*

121. *Advanced Manufacturing*, N.D. STATE GOV., <https://www.nd.gov/innovation-industries/advanced-manufacturing> [<https://perma.cc/7T79-7884>] (last visited Aug. 7, 2024).

abundance in natural resources will allow it to fuel the rest of the world while also growing its own development.¹²² As the “second-largest energy-producing state in the nation,” North Dakota hopes to rely on “fostering innovative, long-term strategies to meet [the] nation’s growing energy demand.”¹²³ Its commitment to diversifying its energy appears to be growing, with “40% of [North Dakota’s] electricity [coming] from renewable sources” in 2023.¹²⁴ North Dakota’s vision for the future of energy, and in maintaining its dominance in that space, is grounded in commitment to “innovation over regulation.”¹²⁵

Notwithstanding the strength of all the other industries, North Dakota’s future in innovation within the Information Technology (IT) industry might be its most important. IT is already “one of North Dakota’s largest industries and continue[s] to be a driver for all sectors of the state’s economy,” as it is responsible for 6.5% of the state’s GDP and contributes more than \$3.6 billion per year to the GDP.¹²⁶ As already highlighted, North Dakota is no stranger in this space with numerous prominent examples of innovation in IT and software.¹²⁷ It is home to the third largest Microsoft campus in the United States,¹²⁸ and in addition to its strong and extended relationships with software and IT companies, such as Microsoft and Amazon, it is “ranked #1 in the nation for ultra-fast internet access,” with 77% of North Dakotans having gigabit internet access.¹²⁹ Thus, as more of society turns to emerging applications of artificial intelligence, transitions to the digital world, and puts premiums on telecommuting, North Dakota’s experience and infrastructure will provide it with excellent opportunity to further enhance its ability to bring innovation within its borders. Its emerging technologies are primarily focused on “energy production, biomedical, UAS/precision ag, software development and defense technologies,” though North Dakota’s government recognizes that “IT is a major center for innovation that stimulates job growth in areas like agriculture, health care, energy production and autonomous systems.”¹³⁰

122. *Energy & Natural Resources*, N.D. STATE GOV., <https://www.nd.gov/innovation-industries/energy-natural-resources> [<https://perma.cc/238W-HKHP>] (last visited Aug. 7, 2024).

123. *Energy and Natural Resources*, N.D. DEP’T COM., <https://www.medialibrary.nd.gov/assetbank-nd/assetfile/94918.pdf> [<https://perma.cc/6S4F-FH2C>] (last visited Aug. 7, 2024).

124. *Energy and Natural Resources*, *supra* note 122.

125. *Id.*

126. *Information Technology*, N.D. DEP’T COM. (May 21, 2024), <https://www.medialibrary.nd.gov/assetbank-nd/assetfile/104323.pdf> [<https://perma.cc/SUC7-PSA7>].

127. *See, e.g., supra* notes 46-49.

128. *Information Technology*, *supra* note 126.

129. *Id.*; *Information Technology*, N.D. STATE GOV., <https://www.nd.gov/innovation-industries/information-technology> [<https://perma.cc/SUC7-PSA7>] (last visited Aug. 7, 2024).

130. *Information Technology*, *supra* note 126.

To ensure that innovation stories like those noted earlier will continue to be part of North Dakota's future, the state provides significant resources and support for innovators not already part of large, established companies. The UND Center for Innovation and NDSU Research & Technology Park are just two examples of the organizational support for emerging companies and innovators. The UND Center for Innovation, whose mission is to "foster innovation, nurture creative ideas, and empower aspiring entrepreneurs in Grand Forks, ND" has been a large part of North Dakota's stories of innovation since 1984.¹³¹ The NDSU Research & Technology Park shares a similar vision for "serv[ing] as an activator for innovation in science and technology leading to discoveries that contribute to North Dakota's economic development."¹³²

V. CONCLUSION

North Dakota's rich history of innovation provides a litany of important and significant contributions to the world. Moreover, its vision for the future sets an aggressive agenda to continue sustained innovation across all of its major industries. While some recent studies rank North Dakota lower in innovation compared to other states, others rank North Dakota toward the top. Inevitably, such studies speak to the ambiguity of how one chooses to define "innovation" and measure its accomplishments. In one of the most frequent innovation metrics, however, North Dakota appears to be moving in the right direction. This novel empirical study of North Dakota's patenting activity suggests that the state is not only maintaining its pace of inventive production, but also improving in comparison to some of its most comparable states. It also raises an area of concern, however. Regardless of the stability and growth in North Dakota's industries, including those central to its vision for the future, protecting innovation is an important part of the process. The clustering of inventive activity within a few select cities, as well as limited opportunities for the access to qualified legal professionals, raise concerns for how and where North Dakota innovators will look to guidance as they seek to protect their innovative ideas from increasing global competition through intellectual property, such as patents. To that end, it will be critical to ensure that the well-documented concerns, generally, regarding access to legal

131. *The UND Center for Innovation*, UND CTR. FOR INNOVATION, <https://www.innovators.net/> [https://perma.cc/6EQJ-JZVW] (last visited Aug. 7, 2024); *About Us*, UND CTR. FOR INNOVATION, <https://www.innovators.net/about/> [https://perma.cc/3VFM-YH4B] (last visited Aug. 7, 2024).

132. *About Us*, NDSU RSCH. & TECH. PARK, <https://ndsuresearchpark.com/about-us/> [https://perma.cc/3ZYR-7MGV] (last visited Aug. 7, 2024).

counsel in rural states, such as North Dakota, do not inhibit the otherwise fruitful efforts in moving North Dakota innovation forward.