Convergent Solutions

The Strategic Value of the Data Institute for Societal Challenges

The University of Oklahoma

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Core message

DISC is a university-wide catalyst that connects expertise, data, partners, and students across OU to transform complex societal challenges into collaborative research, external funding, workforce development, and real-world impact.

Document Roadmap

1. **Executive Summary:** DISC as OU's transdisciplinary hub for data-enabled societal impact.
2. **The Challenge:** Why complex societal problems require convergent research infrastructure.
3. **The Solution: DISC** connects teams, funds innovation, builds communities, and develops talent.
4. **Strategic Research Verticals:** Energy, extreme weather, health, and national security.
5. **Evidence of Impact:** Seed-funding return, project examples, DoD supply chain portfolio, and funding trends.
6. **Community and Ecosystem:** Communities of Practice as a practical mechanism for the One University strategy; formal convenings across disciplines serving university-wide needs.
7. **Call to Action:** Next steps for faculty, students, partners, and OU leadership.

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1. Executive Summary

In an era defined by data, artificial intelligence, and increasingly complex societal challenges, the ability to transform information into actionable solutions has become a defining advantage. From improving healthcare outcomes and strengthening communities to advancing environmental sustainability and economic resilience, today's most pressing challenges require expertise that transcend traditional disciplinary boundaries.

The University of Oklahoma is meeting this moment through the Data Institute for Societal Challenges (DISC), a university-wide institute under the Office of the Vice President for Research and Partnerships (OVPRP). DISC empowers researchers, students, and partners to harness data science, artificial intelligence, and convergent research to create meaningful societal impacts.

DISC serves as OU's catalyst for transdisciplinary collaboration, bringing together experts from diverse fields to develop innovative, data-enabled solutions to challenges that affect Oklahoma, the nation, and the world. Through a "One University" approach that connects to the Norman campus, OU Health Campus, and OU-Tulsa, DISC strengthens OU's ability to address complex issues that no single discipline, college, or campus can solve alone.

The value of DISC extends beyond individual projects and programs. Its strategic value lies in connecting people, ideas, technologies, and resources to increase research competitiveness, accelerate discovery, train students in applied problem solving, and translate innovation into outcomes that improve lives and strengthen communities.

2. The Challenge: Why a Convergent Research Engine Is Needed

The challenges facing society today are increasingly complex and deeply intertwined. Issues such as public health crises, climate change, energy transitions, cybersecurity threats, food and water security, supply-chain disruptions, workforce development, and community resilience do not exist in isolation. These "wicked problems" are shaped by multiple contributing factors, competing stakeholder interests, and rapidly evolving conditions. They are difficult to define, difficult to measure, and even more difficult to solve without expertise from multiple disciplines working together toward shared solutions. As a result, solving these problems is highly data-intensive, requiring large volumes of information as well as the capacity for storage, processing, analysis, prediction, and visualization.

Universities are uniquely positioned to tackle these challenges because they house deep expertise across many fields. However, traditional academic structures often organize knowledge into disciplinary silos that can limit collaboration, slow data sharing, and create barriers to integrating methods and perspectives. When researchers work on related societal problems without opportunities to connect their efforts, valuable insights generated in one field may not readily reach other experts. As a result, opportunities for innovation, external funding, and societal impact can be missed.

At the same time, advances in data science, artificial intelligence, visualization, computing, and digital technologies have created unprecedented opportunities to understand complex systems and develop evidence-based solutions. Realizing this potential requires more than technological capability. There is a need for coordinated approaches that bring together engineers, computer scientists, health professionals, social scientists, policy experts, educators, humanists, and community stakeholders to work across traditional boundaries.

The challenge is not lack of expertise. OU is home to world-class researchers, educators, clinicians, and innovators. The challenge is creating the connections, infrastructure, and collaborative environment

necessary to transform distributed expertise into coordinated action. Without a mechanism to intentionally foster collaboration, opportunities for discovery, innovation, and impact may remain unrealized.

Strategic need

A centralized catalyst is needed to connect engineers, data scientists, health experts, social scientists, policy experts, humanists, students, and community partners around shared societal challenges.

3. The Solution: DISC as a University-Wide Catalyst

DISC was created to address a fundamental challenge facing modern research universities: how to bring together diverse expertise, data, and resources to solve complex societal problems. DISC is not simply an institute or physical location. It is a strategic university asset and convergent research engine designed to accelerate collaboration, innovation, funding opportunities, and societal impact across the OU and beyond.

At its core, DISC connects people, ideas, and opportunities. Figure 1 illustrates this hub-and-spoke model, showing DISC as the central connector linking to OU colleges, campuses, and community partners around shared societal challenges. By fostering collaboration across disciplines, campuses, and sectors, DISC enables researchers to pursue ambitious questions that would be difficult to address within traditional academic structures.

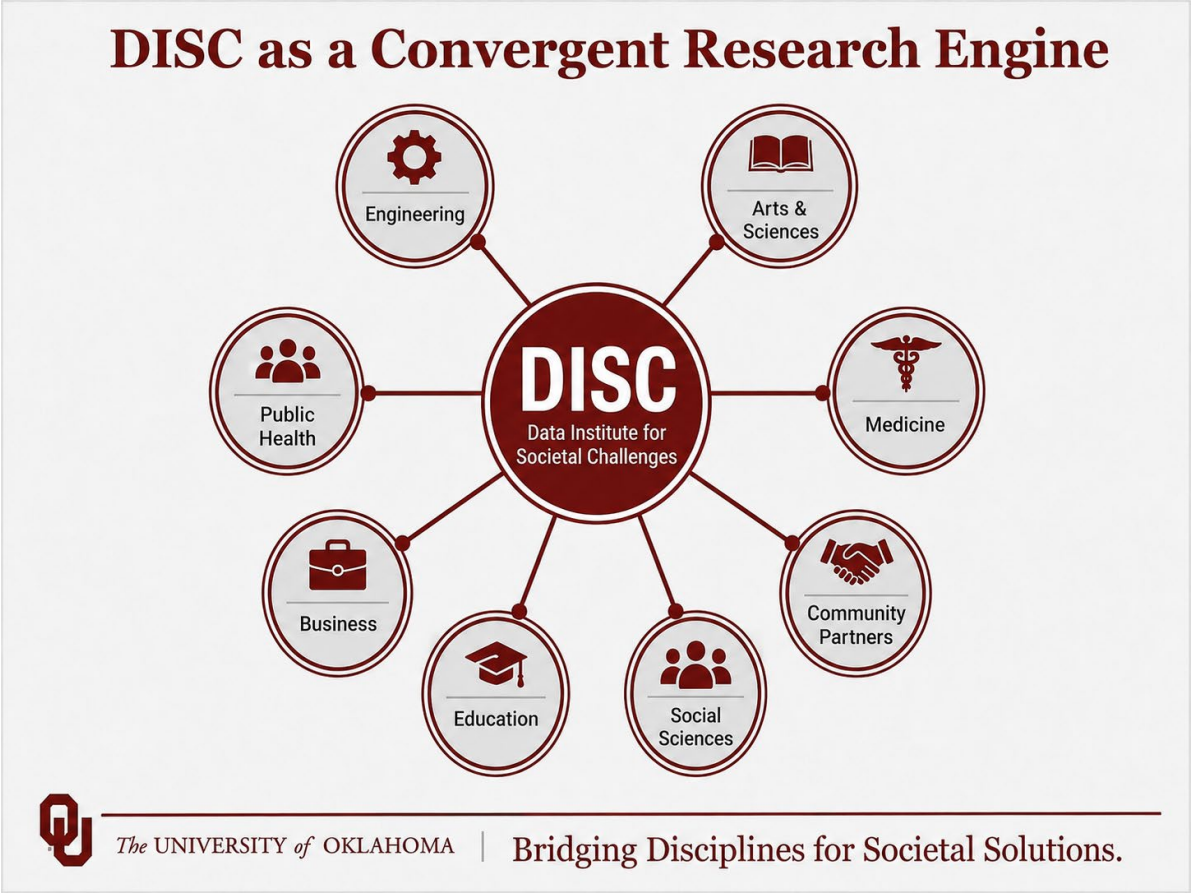

Figure 1. Hub-and-spoke model showing DISC as a convergent research engine linking OU colleges, campuses, and partners.

Core competency	How DISC creates value
Transdisciplinary collaboration	Breaks down barriers between departments and forms teams around complex societal problems.
Seed funding	Provides early catalytic support for high-risk, high-reward ideas that need preliminary results before major proposals.
Community building	Uses workshops, symposiums, speaker series, meet-and-greets, and Communities of Practice to connect faculty and staff who may not otherwise meet.
Talent pipeline	Connects students to real-world data science, AI, visualization, and software development projects through applied research experiences.
Research leadership	Leads the development and execution of large, multidisciplinary research initiatives by defining research priorities, building interdisciplinary teams, directing proposal development, and guiding projects from concept through implementation.

Table 1. DISC core competencies and institutional value.

Transdisciplinary Collaboration and Community Building

DISC brings together researchers from engineering, computer science, medicine, public health, social sciences, humanities, business, education, and other fields to address shared challenges. Through its One University approach, DISC strengthens connections among the Norman campus, OU Health Campus, and OU-Tulsa.

Collaboration does not happen by accident. DISC intentionally cultivates a vibrant research community through symposiums, workshops, speaker series, networking events, Communities of Practice, and other collaborative programming that creates opportunities for meaningful engagement.

Seed Funding and Research Development

Innovative ideas often require initial support before they can compete successfully for large external grants. DISC provides seed funding that enables faculty, graduate students, and postdoctoral researchers to explore novel concepts, establish new collaborations, generate preliminary results, and pursue future funding opportunities.

To date, DISC has invested more than $1.34 million in seed funding to support innovative research, foster new collaborations, and accelerate discovery across the University. This catalytic model is illustrated in Figure 2, which shows how DISC seed funding helps generate preliminary data, enable major external grants, and produce societal impact.

Workforce Development and Talent Pipeline

DISC is not an academic unit; it is an accelerator that complements and enhances educational programs across OU. By connecting students with real-world, data-driven challenges, DISC helps bridge classroom learning and applied research.

For graduate education, DISC works with programs such as DSA 5900 Professional Practice, embedding data science students within active transdisciplinary research teams. At the undergraduate level, DISC serves as a strategic partner for Computer Science Capstone projects that support research and societal impact initiatives.

Through these partnerships, DISC strengthens workforce development by providing students with hands-on experience, professional mentorship, interdisciplinary collaboration skills, and exposure to real-world problem-solving while complementing, rather than duplicating, the educational mission of OU's academic units.

As summarized in Table 1, these core competencies position DISC as a force multiplier for the University of Oklahoma. By connecting expertise, investing in innovation, fostering community, and developing talent, DISC amplifies the impact of faculty, students, and partners across the institution. The result is greater research competitiveness, stronger partnerships, enhanced workforce development, increased external funding opportunities, and greater capacity to address the complex challenges facing society in Oklahoma, our nation, and the world.

Research Leadership

Beyond fostering collaboration, DISC leads the development and execution of major multidisciplinary research initiatives. DISC identifies emerging research opportunities, defines strategic research priorities, develops research concepts, assembles interdisciplinary teams, and leads proposal development from initial ideation through project implementation. By integrating expertise in data science, artificial intelligence, visualization, software development, and research strategy, DISC enables the University of Oklahoma to pursue ambitious research initiatives that address complex societal challenges.

DISC's leadership is demonstrated through initiatives such as the NSF ART program, NSF PIPP and other multidisciplinary research programs focused on supply chain resilience, energy, environmental sustainability, and national security. In these efforts, DISC serves not only as a collaborative partner, but also as a research leader shaping scientific vision, coordinating partnerships, directing proposal development, and leading implementation to strengthen OU's competitiveness for major external funding and increase societal impact.

The DISC Virtuous Cycle

Figure 2 depicts the repeatable pathway through which DISC seed funding helps turn promising ideas into preliminary data, competitive external grants, and societal impact.

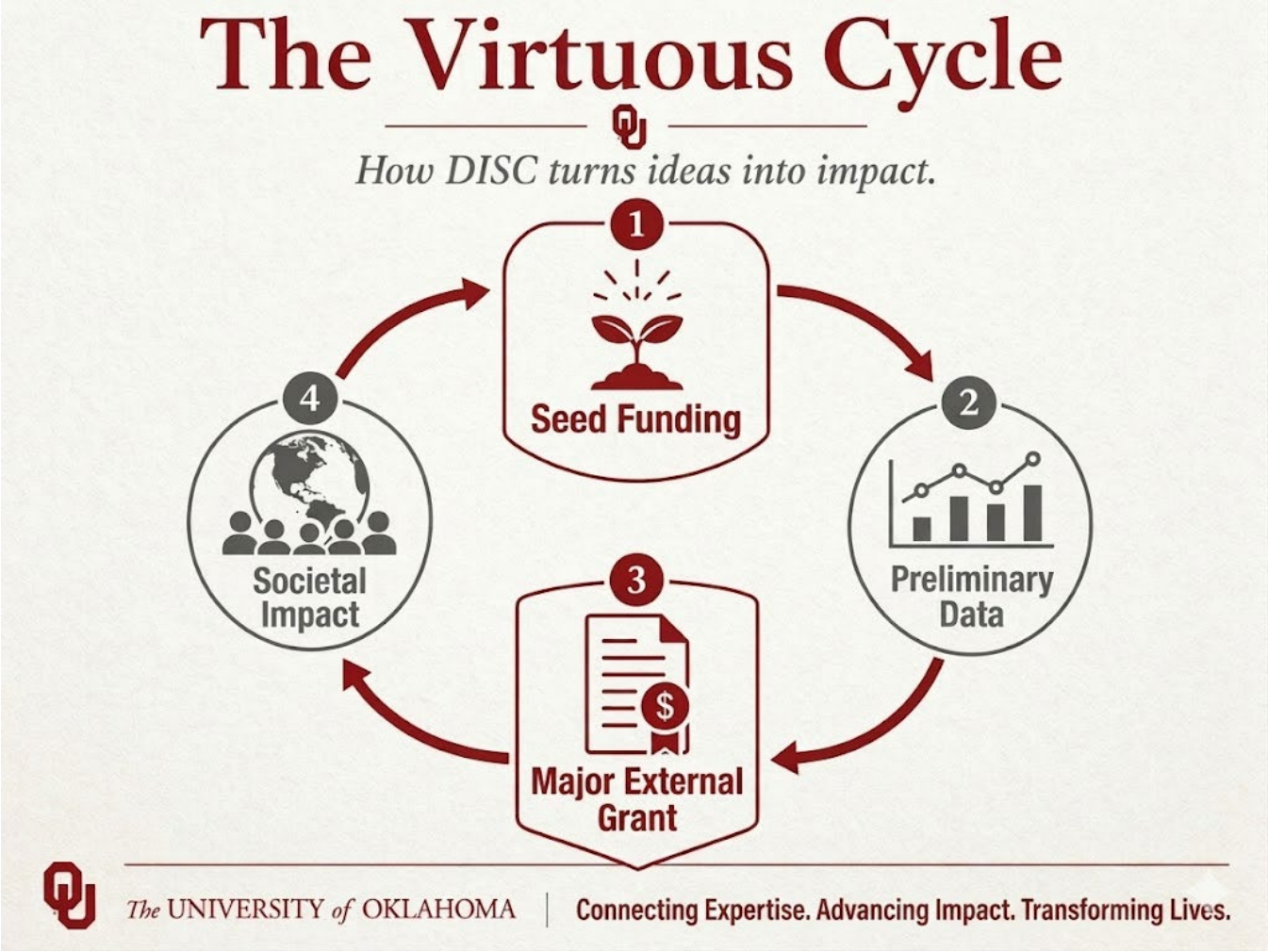

Figure 2. DISC virtuous cycle: seed funding produces preliminary data, which enables major external grants and societal impact.

4. Strategic Areas of Impact

Table 2 summarizes the strategic research areas where DISC strengthens OU capacity, including energy, extreme weather, health, and national security.

Area of Impact	Strategic emphasis
Energy	Builds on Oklahoma's historic and emerging leadership in energy to shape a secure energy future.
Extreme Weather	Deepens understanding and predictive capability in severe weather, directly benefiting communities across Oklahoma and beyond.
Health	Advances medical research and innovation to improve patient outcomes and community well-being.

National Security	Leverages OU's expertise in radar innovations, advanced manufacturing, materials engineering, data science, and resilience to contribute to national defense.

Table 2. Strategic areas of impact supported by DISC.

5. Evidence of Impact: The Proof

The value of DISC is ultimately measured not by the programs it operates, but by the outcomes it enables. By connecting expertise across disciplines, investing in promising ideas, and fostering a culture of collaboration, DISC transforms innovative concepts into funded research, impactful discoveries, and real-world solutions.

Seed funding return

DISC has invested more than $1.34 million in seed funding to support 142 interdisciplinary research teams involving 420 researchers. These investments have generated approximately $7.37 in external research support for every $1 invested by DISC.

Leveraging Strategic Investments

DISC's seed funding program serves as a catalyst for innovation, providing researchers with the resources needed to establish new collaborations, generate preliminary results, and pursue competitive external funding opportunities. These investments are intentionally designed to reduce barriers to collaboration and accelerate the development of high-impact research initiatives.

Since its inception, DISC has invested more than $1.28 million in seed funding to support 142 interdisciplinary research teams involving 420 researchers across the University of Oklahoma. These investments have helped researchers generate $7.37 in external research support for every $1 invested by DISC. This nearly 7.4:1 return on investment demonstrates the effectiveness of DISC's model: modest, strategic investments can unlock transformative research opportunities with significant scientific, economic, and societal impact. The return on investment calculation is based on outcome data reported in follow-up surveys to DISC by University of Oklahoma researchers who received seed funding. Beyond the financial return, these investments have strengthened the University's research enterprise, expanded collaborative networks, and accelerated the development of solutions to complex societal challenges

Building Research Capacity Through Seed Funding

A compelling example of DISC's impact is a seed-funded project led by Dr. Chenghao Wang, Assistant Professor of Meteorology, focused on developing a Historical Comprehensive Hourly Urban Weather Database (CHUWD) for energy system modeling. Through DISC's strategic investment, Dr. Wang and his collaborators generated preliminary results, strengthened interdisciplinary partnerships, and established a foundation for future research.

The project subsequently secured more than $4.3 million in external funding from federal agencies, including the U.S. Environmental Protection Agency (EPA), the National Science Foundation (NSF), and NASA. These awards support research focused on climate resilience, urban meteorology, energy systems, air quality, and advanced urban climate modeling.

Similarly, DISC seed funding supported Dr. Junle Jiang, Assistant Professor in the School of Geosciences, in advancing research on physics-informed forecasting and risk assessment of human-induced seismicity. The project developed innovative computational approaches that integrated geological and industrial datasets to better understand wastewater injection and earthquake potential across Oklahoma while evaluating seismic risk factors affecting local communities.

The preliminary research, analytical frameworks, and interdisciplinary collaborations established through the DISC-funded project positioned Dr. Jiang's team to successfully secure a $360,000 National Science Foundation award for the project, *Collaborative Research: Investigating Links Between Earthquake Swarms, Aseismic Processes, and Fault Zone Heterogeneity in Volcanic and Geothermal Areas*. The seed-funded work also expanded educational opportunities by incorporating real-world datasets into teaching, student engagement, and outreach activities.

Together, these projects illustrate DISC's ability to support faculty across diverse disciplines—from meteorology and climate science to civil engineering and environmental resilience—while helping transform promising concepts into externally funded research programs with meaningful societal impact. Table 3 highlights selected examples of DISC-enabled research capacity and external funding.

Project spotlight	Impact enabled by DISC
Dr. Chenghao Wang - Urban Weather Database	DISC seed support helped establish a Historical Comprehensive Hourly Urban Weather Database (CHUWD) for energy-system modeling. The project subsequently secured more than $4.3 million in external funding from EPA, NSF, and NASA for climate resilience, urban meteorology, energy systems, air quality, and advanced urban climate modeling.
Dr. Junle Jiang – Seismic Risk Modeling	DISC seed support enabled the development of physics-informed forecasting and risk assessment approaches for human-induced seismicity by integrating geological and industrial datasets to better understand earthquake potential and seismic risk in Oklahoma. The project subsequently secured a $360,000 NSF award for research investigating the links between earthquake swarms, aseismic processes, and fault zone heterogeneity in volcanic and geothermal environments, while also advancing educational and outreach opportunities through the use of real-world geoscience datasets.

Drs. Charles Nicholson and Andrés D. González - DoD Supply Chain Resilience Portfolio	DISC has supported multidisciplinary teams working on AI, machine learning, predictive analytics, and visualization for supply-chain risk management and resilience. Collectively, these projects have secured more than $8.2 million in Department of Defense funding.

Table 3. Selected examples of DISC-enabled research capacity and external funding.

Enabling Large-Scale Collaborative Research

DISC's impact extends beyond seed funding. The Institute also serves as a collaborative partner that helps researchers pursue and execute large-scale, multidisciplinary initiatives by providing project coordination, technical expertise, research development support, and strategic management services.

One of the most significant examples is a portfolio of Department of Defense (DoD) projects focused on supply chain resilience and risk management led by Drs. Charles Nicholson and Andrés D. González. Modern supply chains are increasingly complex and vulnerable to disruption from geopolitical instability, natural disasters, economic shocks, and supplier failures. Addressing these challenges requires expertise spanning data science, artificial intelligence, engineering, visualization, business, and decision sciences.

DISC has supported these efforts by helping coordinate multidisciplinary teams, providing project management support, facilitating collaboration among researchers, and contributing technical expertise in data analytics, visualization, and decision-support systems. Collectively, these projects have secured more than $8.2 million in Department of Defense funding to develop innovative approaches for supply chain risk management and resilience.

The resulting research leverages artificial intelligence, machine learning, predictive analytics, and advanced visualization technologies to identify vulnerabilities, assess supplier risk, model network resilience, and support data-driven decision-making for critical defense supply chains. These efforts are helping the Department of Defense better understand complex supplier networks, anticipate disruptions before they occur, and strengthen mission readiness through more resilient supply chains.

Beyond national security applications, the tools, methodologies, and insights generated through this research have broader implications for industry, government, and communities seeking to improve the reliability and resilience of complex systems.

Category	Total Funding ($M)	Share of Portfolio
Health	69.09	17.7%
Energy / Environment / Extreme Weather	278.73	71.6%
Defense / Security	41.75	10.7%
TOTAL	**389.57**	**100%**

Table 4. Funding portfolio distribution by strategic domain, FY2021-FY2025.

DISC-supported and affiliated projects generated approximately $390 million in externally funded research between FY2021 and FY2025, with 72% of funding concentrated in Environment, Energy, and Extreme Weather research, 18% in Health, and 11% in Defense and Security.

Publication Outputs

Publications represent one of the most visible outcomes of DISC's investment in interdisciplinary research. By bringing together expertise across disciplines and enabling collaborative research, DISC helps generate peer-reviewed scholarship that advances scientific discovery, strengthens the University's research reputation, and lays the foundation for future external funding and innovation. As shown in Figure 4, DISC-affiliated researchers produced nearly 100 publications in FY26, demonstrating continued scholarly productivity across the Institute's research portfolio.

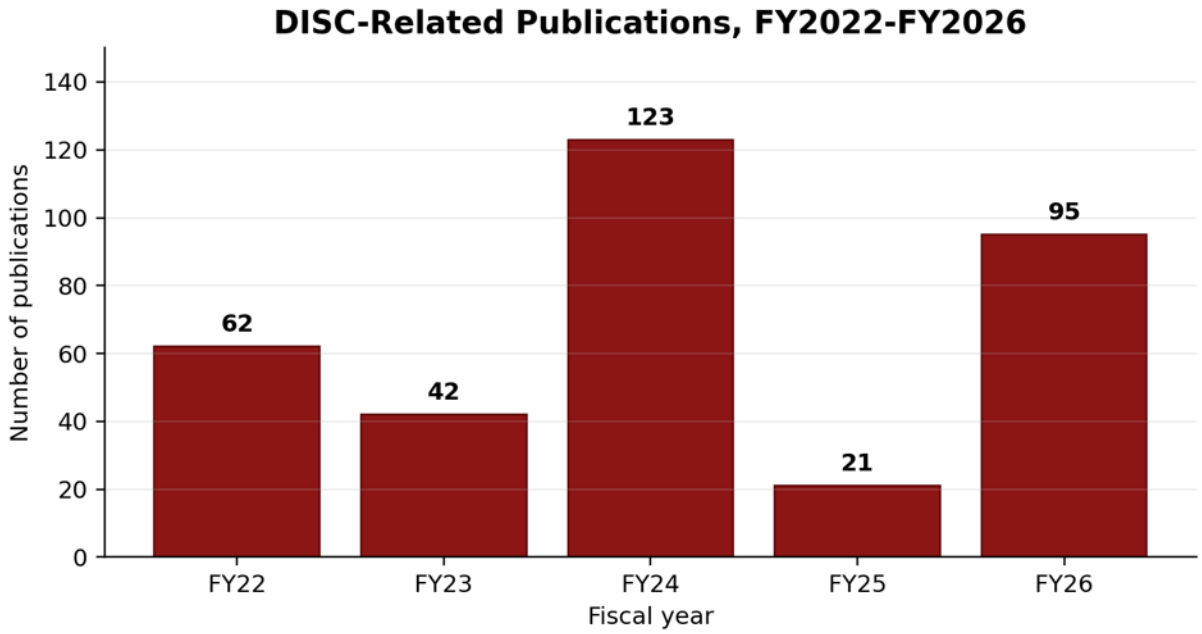

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Figure 4. DISC-related publications by fiscal year, FY2022-FY2026

These figures were compiled from publication information submitted by DISC-affiliated faculty, staff, and collaborators. Because participation in the data-collection process was voluntary and some individuals may not have responded or provided complete publication records, the reported totals should be interpreted as conservative estimates, or lower-bound counts, rather than a complete inventory of DISC-related publications. Accordingly, actual publication productivity may be higher than the numbers presented.

6. Community and Ecosystem: Communities of Practice

DISC's Communities of Practice (CoPs) are one of the Institute's most visible mechanisms for turning OU's distributed expertise into coordinated collaborative action. Rather than operating as formal academic units, CoPs function as lightweight, mission-driven communities that bring together faculty, staff, students, and partners who share common research interests.

This community-building role is central to DISC's value proposition. Complex challenges such as supply-chain resilience, extreme weather, trustworthy artificial intelligence, digital transformation, hydrometeorology, cybersecurity, and public health cannot be solved by a single discipline.

Through CoPs, DISC provides the social and intellectual infrastructure needed to connect people across departments, colleges, campuses, and research traditions. These communities help researchers find collaborators, test ideas, share methods, identify funding opportunities, and form the interdisciplinary teams needed to compete for large-scale external grants.

In this sense, CoPs are more than networking groups. They are a practical expression of OU's One University approach, connecting the Norman campus, OU Health Campus, OU-Tulsa, and external partners around shared societal challenges.

Community / Group	Focus Area	Strategic Value to OU
Digital Humanities	Connects faculty and staff engaged in, or interested in, digital humanities work and support future directions for OU's Digital Humanities program.	Strengthens collaboration across arts, humanities, data, archives, and digital methods while linking DISC's data-enabled mission to humanistic inquiry.
Supply Chain	Enhances understanding, design, and resilience of supply chains and supply-demand networks affected by natural and human-caused hazards.	Aligns with OU strengths in resilience, defense, logistics, risk modeling, healthcare, food, water, and energy systems.
3D Workflow	Connects researchers and practitioners working with 3D data, digital preservation, ethical guidelines, storage solutions, and shared technology needs.	Creates coordinated infrastructure and standards for 3D technologies while reducing duplication across departments.
Human-Centered Trustable AI	Brings together OU Norman, OU Health Sciences, and ORMF researchers working on reliable, trustable, human-centered AI systems.	Positions OU to lead in responsible AI, generative AI, visual analytics, information science, social science, psychology, and domain applications.
Hydrometeorology	Integrates AI, machine learning, visual analytics, ecology, and hydrology to address complex ecological and hydrological challenges.	Supports climate, environment, water, and predictability research priorities while forming teams around emerging funding opportunities.
Opioid Research Group	Membership group of approximately 90 students, faculty, and staff across OU campuses focused on research addressing the opioid crisis in Oklahoma and the United States.	Creates a cross-campus public health research network that can share events, funding opportunities, and collaboration needs. This group has transitioned from a community of practice into a resource sharing network.

Table 5. Current DISC Communities of Practice and membership groups, with focus areas and strategic value

7. Call to Action

- **For faculty and researchers:** Join a DISC Community of Practice, identify collaborators, and develop ideas that can move toward seed funding or external proposal opportunities.
- **For students:** Engage with CoPs and DISC-supported projects to gain exposure to interdisciplinary research, applied data science, AI, visualization, digital methods, and community-focused problem solving.
- **For industry, government, and community partners:** Partner with DISC and its CoPs to connect OU expertise with practical data challenges, workforce needs, and societal priorities.
- **For OU leadership:** Continue supporting CoPs as a cost-effective mechanism for building cross-campus research capacity, strengthening proposal competitiveness, and advancing the One University strategy.

Bottom line

DISC is a force multiplier for the University of Oklahoma: it connects expertise, invests in promising ideas, builds durable communities, strengthens the student talent pipeline, and helps turn data-enabled discovery into external funding and societal impact.