NATIONAL SCIENCE FOUNDATION
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NSF 19-050

Dear Colleague Letter: NSF Convergence Accelerator Pilot (NSF C-Accel)

March 15, 2019

Dear Colleagues:

The National Science Foundation invites interested parties to participate in a new endeavor, the NSF Convergence Accelerator (NSF C-Accel) Pilot. With this DCL, NSF's goals are to: (i) pilot a new NSF capability (the NSF Convergence Accelerator) to accelerate use-inspired convergence research in areas of national importance, and (ii) initiate convergence team-building capacity around exploratory, potentially high-risk proposals in three convergence topics (tracks).

As a funder of research and education across all fields of science and engineering and with relationships with universities and funding agencies around the world, NSF is uniquely positioned to pilot this approach to accelerate discovery and innovation. NSF C-Accel brings teams together to focus on grand challenges of national importance that require a convergence approach. The teams are multidisciplinary *and* leverage partnerships; the tracks relate to a grand challenge problem *and* have a high probability of resulting in deliverables that will benefit society within a fixed term. NSF C-Accel is modeled on acceleration and innovation activities from the most forward-looking companies and universities.

The NSF C-Accel Pilot intends to support fundamental research while encouraging rapid advances through partnerships that include, or will include, multiple stakeholders (e.g., industry, academic, not-for-profits, government entities, and others). The NSF C-Accel Pilot will bring teams together in a cohort that are all focused on a common research goal of national importance but which may be pursuing many different approaches.

NSF is planning to fund approximately 50 Phase 1 awards (up to 9 months and up to $1 million each). Additional funds will be available for a smaller number of Phase 2 awards. The first-step to become part of the NSF C-Accel Pilot is to submit a 2-page Research Concept Outline (RCO), aligned with one of the tracks described below, with a target submission date of April 15, 2019.

NSF CONVERGENCE ACCELERATOR PILOT - TRACKS A1, B1 AND B2

The NSF C-Accel Pilot consists of three tracks, with each track aligned with one of NSF's 10 Big Ideas, namely Harnessing the Data Revolution (HDR) (track A1) and the Future of Work at the Human-Technology Frontier (FW-HTF) (tracks B1 and B2). These tracks also align with Administration R&D Priorities including leadership in artificial intelligence (see July 2018 memo M-18-22), the President's Management Agenda (see Cross Agency Priority Goals), and the U.S. 5-Year STEM Education Strategic Plan.

The NSF C-Accel Pilot's tracks focus on use-inspired research with relatively short timeframes for deliverables and are intended to leverage partnerships. The tracks build upon existing convergence research with the intention of accelerating discovery and innovation, leading to deliverable research products.

TRACK A1: OPEN KNOWLEDGE NETWORK

The Harnessing the Data Revolution (HDR) Big Idea seeks to enable new modes of data-driven discovery. To help advance the progression from data to information to knowledge - to fully harness the data revolution - NSF seeks to create an Open Knowledge Network (OKN). Recent workshops (see, for example, https://www.nitrd.gov/news/Open-Knowledge-Network-Workshop-Report-2018.aspx) have articulated the research and development challenges and tremendous possible benefits of developing an OKN, which has the potential to drive innovation across all areas of science and engineering, and unleash the power of data and artificial intelligence to achieve scientific discovery and economic growth.

The overall goal of Track A1 is to enable the creation of a nonproprietary shared knowledge infrastructure. A knowledge network allows stored data (both structured and unstructured data) to be located and its attributes and relationship to other data and to real-world objects and concepts to be understood at a semantic level. Today, technology companies develop largely proprietary knowledge networks, often specialized for customer needs (e.g., web search, advertising placement, and question answering). Instead, this **Open Knowledge** Network will build public-private cooperation and engage convergence teams from all areas of data science and science and engineering domains to create a shared, open infrastructure.

Phase 1 of the Open Knowledge Network NSF C-Accel Pilot track will support building the multidisciplinary and multi-institutional teams needed to identify the development paths for an OKN, with a particular focus on exploiting publicly available U.S. Government and similar public datasets (see, e.g., https://www.data.gov). These teams may address "horizontal" challenges that apply to all domains, addressing challenges such as developing the underlying representation of facts, querying services that perform reasoning tasks with the data, or developing secured access capabilities. Teams may also choose to address "vertical" challenges specific to different topical domains such as geosciences, education,

smart health, finance, and manufacturing. A participatory design approach that considers the needs and perspectives of the many user communities will be essential.

TRACKS B1 AND B2: AI AND FUTURE JOBS; NATIONAL TALENT ECOSYSTEM

The Future of Work at the Human-Technology Frontier (FW-HTF) Big Idea is an area in which NSF is responding to the challenges and opportunities for the future of jobs and work. FW-HTF supports convergence research to understand and influence the impact of artificial intelligence on workers and work, understand and develop the human-technology partnership, design new technologies to augment human performance, illuminate the emerging socio-technological landscape, understand the risks and benefits of new technologies, and foster lifelong and pervasive learning.

Several reports and studies have highlighted the challenges and opportunities, including the 2017 report from the National Academies of Sciences, Engineering and Medicine, *Information Technology and the U.S. Workforce: Where Are We and Where Do We Go from Here* and the 2018 report from the White House Council of Economic Advisors, *Addressing America's Reskilling Challenge.* Many American organizations suffer from a talent gap. Not only do their current workers lack the requisite skills to perform 21st century work, but graduates moving into the marketplace also lack those skills. According to a 2017 report from The Business-Higher Education Forum, IBM and Burning Glass Technologies, The Quant Crunch: How the Demand for Data Science Skills is Disrupting the Job Market, an integrated set of skills, related to AI/machine learning, data science, and predictive analytics will be increasingly expected from current staff as well as new job applicants.

A National Academies report, Building America's Skilled Technical Workforce (2017), makes the argument that workers will need to be trained and re-trained across the spectrum of education levels as more types of industry digitize their operations, from manufacturing to agriculture to the service industries and beyond.[1] However, there remains, in general, a lack of alignment between educational opportunities at all levels and business demands. A holistic, more strategic, approach to this challenge is still needed.

TRACK B1: AI AND FUTURE JOBS

Building upon these fundamentals, the ultimate goal of Track B1 is to support research and development leading to technological tools that will connect individual workers with jobs, keeping in mind that periodic retraining and reskilling outside of traditional educational settings will increasingly become integral to successful lifetime careers.

Phase 1 of the AI and Future Jobs NSF C-Accel Pilot track will support team building and creating research and development plans addressing multiple components of connecting workers with jobs of the future, such as predictive artificial intelligence tools, economic and labor market analyses of needed skills for future workplaces, and educational technologies

needed for adult learning. Ensuring fair and ethical treatment of workers will be a key principle for the tools, resources and activities associated with this effort. Successful projects will consider the range of factors that impact employment and training, such as disabilities and family responsibilities. Individual projects funded in this track may be focused on particular industries or regions, specific populations such as veterans, or particular workplace types such as small businesses, decentralized manufacturing, medical facilities, or K-12 schools.

TRACK B2: NATIONAL TALENT ECOSYSTEM

The ultimate goal of Track B2 is to support research and development leading to innovative approaches for employers to support workers seeking the skills required for 21st century work related to AI, data science, predictive analytics, and other technologies of the future.

Phase 1 of the NSF C-Accel National Talent Ecosystem Pilot track will support team building and creating research and development plans addressing multiple approaches toward re-envisioning the concepts, structures, and technologies needed for employers to support continuous learning for dynamic, digitally-intensive work, and provide access to skilled talent pathways, mentors and authentic workplace experiences. Successful projects will be informed by research on STEM (science, technology, engineering, and mathematics) learning, engagement, and its social context, as well as research on organizations and collaboration. Successful projects will focus on prototyping innovative approaches such as learning environments, platforms, interfaces, or simulations, tools for analysis, assessment, or prediction, and vehicles for recruitment and engagement, with the potential for wider implementation by industry, educational institutions, and other stakeholders engaging in the co-creation of a national talent ecosystem.

PROPOSAL SUBMISSION PROCESS

Phase 1 of the Pilot will use the Research Advanced by Interdisciplinary Science and Engineering (RAISE) mechanism, a mechanism used to submit multidisciplinary project ideas to NSF.

PHASE 1: RESEARCH CONCEPT OUTLINE SUBMISSION

Proposers are invited to respond to this DCL through the submission of a two-page Research Concept Outline (RCO) as a PDF file. The PDF file should be submitted, with a target date of **April 15, 2019,** as an email attachment to C-Accel@nsf.gov. In order to be considered for an invitation for a full proposal, an RCO is required. RCOs must comply with standard proposal margin and spacing requirements (see PAPPG, Chapter II.B.2).

RCOs must contain the following information:

- **Title**. A proposal title beginning with C-Accel Pilot - Track A1 (Open Knowledge Network), C-Accel Pilot - Track B1 (AI and Future Jobs), or C-Accel Pilot - Track B2 (National Talent Ecosystem)
- Convergence Accelerator **Project Description.**
  - Indicate how the project idea requires research relevant to two or more intellectually distinct disciplines.
  - Discuss the intended practical application or useful results and the potential timeframe for these deliverables.
- Names and organizational affiliations of the proposed **team**, including designation of a **Principal Investigator**
  - Describe how the multi-stakeholder convergence team includes, or will include, private sector entities, academic and non-academic organizations.
  - Describe how each of the team members will contribute to creating a bold research and development plan and advancing the convergence research.

The submitted RCOs will be reviewed by NSF staff in accordance with the merit review criteria approved by the National Science Board (intellectual merit and broader impacts) and to ensure that the potential proposals have the basic characteristics of NSF Convergence Accelerator projects: relevance to one of the tracks in the DCL, diversity and capacity of research teams and partners, novelty and potential impact of proposed work, and appropriateness for the RAISE mechanism. Those that effectively address one of the three tracks may be invited to submit a full RAISE proposal.

PHASE 1: FULL PROPOSALS

If invited, full proposals are due on **June 3, 2019**. Proposers must follow the guidance for the RAISE proposal mechanism specified in the NSF *Proposal and Award Policies and Procedures Guide* (PAPPG; see Chapter II.E.3). Phase 1 efforts will focus on research plan development and team formation leading to a proof-of-concept and will include NSF-organized convenings for training and cross-cohort collaboration.

Full proposals will be reviewed in accordance with the merit review criteria approved by the National Science Board (intellectual merit and broader impacts), keeping in mind the nature of the DCL and the RAISE funding mechanism. Proposers are advised that, based on the portfolio of ideas received, NSF anticipates that full proposals will first be reviewed by internal experts and that for groups of the most promising proposals, NSF will seek additional advice from external reviewers.

Definitions and useful information can be found at the forthcoming NSF Convergence Accelerator Frequently Asked Questions (FAQs) page.

PHASE 2 OF THE PILOT (2020 – 2023)

In parallel with the release of Phase 1 funding, NSF anticipates releasing a call in mid-2019 for Phase 1 awardees to submit Phase 2 proposals. Near the end of Phase 1, teams will pitch to a blue-ribbon panel. Evaluation of teams': (i) Phase 1 performance, (ii) their pitch, and (iii) their Phase 2 proposals will determine which teams are selected to advance to multi-million-dollar Phase 2 NSF C-Accel awards.

Phase 2 proposals will enable the delivery of the tangible research products identified and described in Phase 1. The goals of the NSF Convergence Accelerator Pilot can be realized at the end of Phase 2 as new innovations begin to have a positive impact on society.

CONTACT

Please note that Research Concept Outlines (RCO) should be submitted to C-Accel@nsf.gov. General questions about this DCL may be directed to:

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[1] Another National Academies report, Data Science for Undergraduates: Opportunities and Options (2018), focuses on the implications for middle and high schools as well as community colleges and encourages partnerships across these institutions.