

# NSF Engines' Strengths, Weaknesses, Opportunity and Threat (SWOT) Analysis<sup>1</sup>

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The Strengths, Weaknesses, Opportunity, and Threat (SWOT) analysis is an organized approach to self-assess the strengths, weaknesses, gaps, opportunities, and challenges inherent in the development of products, technologies, and services. NSF is requesting a SWOT analysis in three areas: research, development, and translation (RD&T); workforce development; and broadening participation. The results of this analysis should stimulate thinking about options to maximize strengths and opportunities, address gaps and challenges, and mitigate potential weaknesses. It is not intended to be an evaluation of the importance or value of an Engine.

The NSF Engines' SWOT analysis is guided by rubrics. Established at the start of a program, rubrics should foster discussions that inform the design and content of strategic documents, establish expectations for outcomes, and guide progress.

The rubrics are comprised of three components:

- Topics: Conceptual areas of the program or project essential to its successful development and implementation.
- Criteria: Characteristics or descriptors inherent in a topic.
- Degrees of attainment: Steps along a continuum to fully achieve a criterion.

They are provided in Section B.

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Suzanne H. Plimpton  
Reports Clearance Officer  
Policy Office, Division of Institution and Award Support  
Office of Budget, Finance, and Award Management  
National Science Foundation Alexandria, VA 22314  
Email: splimpto@nsf.gov

## A. Instructions to Complete the SWOT Analysis

- **Content for the SWOT analysis.** As a retrospective assessment, any information germane to the current status of the Engine—for example, your Engine proposal, any documentation used to develop the proposal, all documents and reports developed in response to NSF requests since notification of the award, and any other information you deem relevant—could be used to respond to the rubrics.
- **Framework for assessing each criterion.** Each criterion in the rubric should be examined through the lens of strengths, weaknesses, gaps, opportunities, and challenges. These assessments may include initial thinking on options to maximize strengths and opportunities, address gaps and challenges, and mitigate potential weaknesses.

Engines are composed of a multiplicity of projects, partnerships, services, and other elements. For criteria for which there is more than one project, technology, or partnership, a SWOT analysis should be performed for each so that a detailed understanding of the status of all elements critical to the success of the Engine is obtained. Information from prior documents may apply to more than one criterion, and some repetitive use of information is anticipated.

- **Determining the degree of attainment.** The information derived from the SWOT analysis is used to determine the degree of attainment that reflects the current status of the Engine for that criterion. The degrees build sequentially from 0 to 4, where zero is no evidence, one is preliminary, two is intermediate, three is advanced, and four is mature. The selection of the degree of attainment assumes prior degrees have been completed. At this early stage of Engine development, there is great variability in the progress to establish the Engines. Many of the criteria are anticipated to be at the preliminary, possibly the intermediate, degree of attainment, and future analyses will show advancement over time. For criteria that are not applicable to an Engine program, please indicate that in the no evidence column.

While all information that surfaces during the SWOT analysis is valuable, the narrative for each criterion should reflect current status and include a rationale and evidence for the selection of the degree of attainment. This may require distinction between retrospective information that assesses the current status as opposed to prospective information that may surface during the analysis and be applicable to future planning.

- **Documents constituting the NSF deliverable.** The deliverable for the SWOT analysis will consist of a document containing the narrative supporting the rubrics ratings and an index that indicates the location of the main text and relevant information detailed in other criteria that support the rating. The narrative should summarize the results of this exercise, and an example narrative format is provided below. The index is provided in full in Appendix A.

**SWOT Narrative**

**1. Criterion being discussed** (RD&T example provided)

Topic	Criteria	Degree of Attainment				
		0. No Evidence	1. Preliminary Identity	2. Intermediate Plan	3. Advanced Activities demonstrated	4. Mature Chronicle
Regional assets to support RD&T	Industrial resources	No evidence	Unique characteristics* identified	Plan to integrate unique characteristics into your engine	Activities demonstrated	Chronicle for integration into your engine

2. Information developed by the Engines to date that is responsive to the criterion

3. Results of the assessment of Engine strengths, weaknesses, challenges, opportunities associated with the criterion

4. Options to add, enhance, or mitigate information in point 3 above

5. Assignment of and rationale for degree of attainment

Topics	Criteria	Self-rating	Explanation of Rating (e.g., narrative sections of the deliverable relevant to the self-rating)
<b>Research, Development, and Translation</b>			
Use-Inspired Research and Development	Goal(s)		
	Research proposal		
	Data sharing plan		
	Infrastructure		
	Partnerships for R&D		
Translation to Practice	Translation Goal(s)		
	Research to prototype translation		
	Prototype to low scale production		
	Production scale up		
	Data sharing plan		
	Infrastructure		
	Partnerships for translation to practice		

**Example Response Formats**

- **Submission process.** NSF will provide instructions to access a SharePoint site in a separate document.
- **Questions about the SWOT analysis.** NSF will provide contact information for Engines to obtain assistance with the SWOT analysis in a separate email.

## B. SWOT Rubrics

The rubrics in this section are responsive to the NSF request for rubrics to conduct SWOT analyses for RD&T (Section A), Workforce Development (Section B), and Broadening Participation (Section C).

### Section A. Research, Development, and Translation for Ecosystem Development

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Use-inspired Research and Development</b> (Criteria under this topic should be iterated as appropriate for each product, technology, or service that is being developed through the Engine)	R&D Goal(s)	No evidence	R&D concepts for developing Engine products, technologies, or services identified	R&D concepts integrated into a set of R&D goals	Initial R&D activities to make progress on goals identified	Initial R&D activities to make progress on goals launched
	Research approach to achieve each goal	No evidence	R&D activities for each goal identified	R&D activities integrated into a plan	R&D activities initiated	Evidence for continuing R&D activities
	Data sharing plan	No evidence	Data that should be shared identified	Plan to share data	Activities detailing steps to share data	Evidence for continuing data sharing activities
	Infrastructure	No evidence	Components of R&D infrastructure identified	Logistics plan for use, maintenance, and sustainability	Activities demonstrating use, maintenance, and sustainability	Evidence for continuing activities
	Partnerships for R&D	No evidence	Partners identified	Plan to align partners with R&D goals	Activities demonstrating alignment	Evidence for continuing activities

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Translation to Practice</b> (Criteria under this topic should be iterated as appropriate for each product, technology, or service that is being developed through the Engine)	Translation Goal(s)	No evidence	Steps to translate prototype product, technology, or service identified	Translation steps integrated into translation to practice goals	Adoption readiness levels for each goal are identified	Goals integrated for translation to adoption activities
	Research to prototype translation	No evidence	Translation steps for proof-of-concept to prototype development identified	Plan to achieve prototype development developed	Activities related to prototype development	Evidence for continuing activities demonstrating prototype feasibility
	Prototype to low scale production	No evidence	Low scale production design elements identified	Plan to integrate design elements	Activities related to low scale production of prototype	Evidence for continuing activities for low scale production
	Production scale up	No evidence	Production scale up design elements identified	Plan to integrate design elements identified	Activities to establish a production environment	Evidence for continuing activities to establish a production environment
	Data sharing plan	No evidence	Data that should be shared identified	Plan to share data	Activities detailing steps to share data	Evidence for continuing data sharing activities
	Infrastructure	No evidence	Components of translation infrastructure identified	Logistics plan for use, maintenance, and sustainability	Activities demonstrating use, maintenance, and sustainability	Evidence for continuing activities
	Partnerships for translation to practice	No evidence	Partners identified	Plan to align partners with translation goals	Activities demonstrating alignment	Evidence for continuing activities

\*Adoption readiness levels (ARLs) are a complement to technology readiness levels (TRLs) and manufacturing readiness levels (MRLs). ARLs assess the adoption risks of a technology and translate this risk assessment into the readiness of a technology to be adopted by the ecosystem.  
<https://www.energy.gov/technologytransitions/adoption-readiness-levels-arl-complement-trl>

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Regional Assets to Support RD&amp;T Ecosystem Development</b>	Industrial resources	No evidence	Unique characteristics* identified	Plan to integrate unique characteristics into your engine	Activities demonstrating integration	Evidence for continuing integration into your engine
	Academic resources	No evidence	Unique characteristics identified	Plan to integrate unique characteristics into your engine	Activities demonstrating integration	Evidence for continuing integration into your engine
	Entrepreneurial resources**	No evidence	Unique characteristics identified	Plan to integrate unique characteristics into your engine	Activities demonstrating integration	Evidence for continuing integration into your engine
	Environmental resources***	No evidence	Unique characteristics identified	Plan to integrate unique characteristics into your engine	Activities demonstrating integration	Evidence for continuing integration into your engine
	Access to critical supply chains	No evidence	Identify supply chains	Plan to secure supply chains	Activities demonstrating supply chains secured	Evidence for continuing supply chain deliveries

\*Preliminary degree of attainment for industrial resources: unique characteristics could be a capacity; capability; critical access to piece of equipment; materials and supplies; academic institutions, industries, and other physical locations; unique geography, or economic conditions.

\*\*Entrepreneurial resources include funding programs such as the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs and Minority Business Development Agency (MBDA) Programs; business networks, councils, and centers, such as the Small Business Development Centers and Chambers of Commerce; and entrepreneur blogs, podcasts, and websites sponsored by industry groups and universities. (<https://www.purdueglobal.edu/blog/business/entrepreneur-resources>)

\*\*\*Environmental resources generally refer to natural resources such as air, water, and soil. (<https://www.fs.usda.gov/science-technology/water-air-soil>). The term has been expanded to include any material, service, or information from the environment that is valuable to society. Examples include food from plants and animals; wood for cooking, heating, and building; and metals, coal, and oil. (<https://www.encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/environmental-resources>)

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Regional RD&amp;T Ecosystem Development</b>	Essential elements of a regional innovation ecosystem	No evidence	Elements of ecosystem identified	Relationship of elements to region of service and regional innovation ecosystem identified	Plan to leverage engine to build the ecosystem	Activities that lay the groundwork for the ecosystem initiated
	Ecosystem partnerships	No evidence	Partnerships representative of the Engine's inclusive engagement goals identified	Plan to integrate partnerships into regional ecosystem	Outreach activities to partnerships that align with regional ecosystem	Evidence for continuing outreach activities
	Staffing for the engine	No evidence	Unique regional workforce skills identified	Plan to integrate workers into the engine staffing as required by goals of your engine	Activities demonstrating integration	Evidence for continuing integration into your engine
	Workforce to develop region of service	No evidence	Unique regional workforce skills identified	Plan to attract appropriately skilled workers to the region	Activities demonstrating actions to attract appropriately skilled workers to the area	Evidence for continuing increases in regional skilled workers
	Regulatory assessment	No evidence	Regulatory implications of products and processes identified	Regulatory implications discussed with appropriate regulatory group(s)	Activities planned to address regulatory implications	Activities to address regulatory implications initiated
	Economic plan for a sustainable ecosystem	No evidence	Financial requirements to establish ecosystem estimated	Budget to achieve financial requirements	Plan to achieve financial requirements	Evidence for continuing activities to achieve financial requirements

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
				outlined		initiated
	Inclusive engagement plan	No evidence	Principles for inclusive engagement identified	Principles translated into action plan	Engagement activities initiated	Evidence for continuing activities
	Communication plan	No evidence	Principles for inclusive communication identified	Principles translated into action plan	Inclusive communication activities initiated	Evidence for continuing activities



**Section B. Workforce Development within the Region of Service**

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Labor Market for Engine-relevant industries within Region of Service</b>	Inventory of industries and employers in the region of service [Labor Demand]	No evidence	Identify the main industries and employers in the region	Plans to leverage the main industries and employers of the region	Implement activities to leverage primary Engine-related industries and employers of the region	Continuing evidence for activities that align with workforce development goals
	Inventory of talent in region of service [Labor Supply]	No evidence	Identify the labor supply of the region (including graduating students, and non-traditional labor sources*)	Plans to leverage institutions of higher education (IHEs), trade organizations, and other labor suppliers of the region	Implement activities to leverage the IHEs, trade organizations, and other labor suppliers of the region	Continuing evidence for activities that align with workforce development goals

\*Non-traditional labor sources are communities that are traditionally underrepresented in the labor market; they may include formerly incarcerated populations, Tribal populations, etc.

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Skills and Training for Workforce Development within Region of Service</b>	Education Requirements	No evidence	Identify educational requirements for skilled workforce for Engine-relevant industries	Align educational requirements with regional education ecosystem	Outreach activities to regional education programs	Continuing evidence for regional education activities
	Workforce Development Goals	No evidence	Identify Engine's workforce development goals for region of service	Identify activities to reach workforce development goals	Implement activities	Continuing evidence for activities that align with workforce development goals
	Training programs to reach workforce development goals in Engine-relevant industries	No evidence	Identify skills needed for Engine's workforce development goals	Planning for training programs in the region	Implement training programs	Continuing evidence for training program activities
	Trainings related to increasing regional entrepreneurship	No evidence	Identify skills needed to increase regional entrepreneurship	Planning for training programs in the region	Implement training programs	Continuing evidence for entrepreneurial training program activities
	Trainings related to increasing the resiliency of the workforce (capable of moving across industries)	No evidence	Identify skills needed to increase workforce resiliency	Planning for training programs in the region	Implement training programs	Continuing evidence for resiliency training program activities

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Partnerships for Workforce Development within Region of Service</b>	Institutes of higher learning (post-secondary school)	No evidence	Partners identified	Plan to align partners with workforce development goals	Activities demonstrating alignment	Continuing evidence for regional partnership activities
	Private sector (for-profit companies, VCs, angel investors, etc.)	No evidence	Partners identified	Plan to align partners with workforce development goals	Activities demonstrating alignment	Continuing evidence for regional private sector activities
	Trade organizations (economic development organizations, trade unions, chambers of commerce, etc.)	No evidence	Partners identified	Plan to align partners with workforce development goals	Activities demonstrating alignment	Continuing evidence for regional trade organization activities
	Public sector (local, State, and Federal Governments)	No evidence	Partners identified	Plan to align partners with workforce development goals	Activities demonstrating alignment	Continuing evidence for regional public sector activities
	Nonprofit sector (community organizations, NGOs, etc.)	No evidence	Partners identified	Plan to align partners with workforce development goals	Activities demonstrating alignment	Continuing evidence for regional education activities

**Section C. Broadening Participation**

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Outreach</b>	Engagement with new and established communities and geographies	No evidence	Principles for inclusive engagement identified	Principles translated into action plan that broadens participation	Engagement activities to achieve the action plan initiated	Evidence for continuing activities demonstrating inclusive engagement
	Communication with new and established communities and geographies	No evidence	Principles for inclusive communication identified	Principles translated into action plan	Communication activities to demonstrate outreach initiated	Evidence for continuing activities demonstrating communication and outreach
<b>Engine staff</b>	Individuals representative of the Engine's goals for inclusive engagement for their region of service	No evidence	Representative participants that align with engine goals for inclusive engagement identified	Plan to determine participants that align with engine goals and region of service	Outreach activities to participants that align with engine goals and region of service	Evidence for continuing outreach activities demonstrating alignment with engine goals and region of service
	Access path to join engine	No evidence	Steps in access identified	Steps integrated into a process to join engine	Activities to initiate access process	Evidence for continuing activities demonstrating access to join engine
	Staff participation in strategic planning	No evidence	Options for participation identified	Stakeholder consensus on options obtained	Activities that demonstrate options initiated	Evidence for continuing activities demonstrating stakeholder participation in strategic planning
	Staff participation in decision making	No evidence	Options for participation identified	Stakeholder consensus on options obtained	Activities that demonstrate options	Evidence for continuing activities demonstrating stakeholder participation in decision making

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
<b>Broadening Participation for Partnerships</b>	Representative of the Engine's inclusion goals for their region of service	No evidence	Representative partnerships that align with engine goals identified	Plan to identify partnerships that align with engine goals	Outreach activities to partnerships that align with engine goals	Evidence for continuing partnership outreach activities
	Access path to join engine	No evidence	Steps in access identified	Steps integrated into a process	Activities for access to join partnership initiated	Evidence for continuing partnership access activities
	Partnership participation in strategic planning	No evidence	Options for participation identified	Partnership consensus on options obtained	Activities that demonstrate options initiated	Evidence for continuing activities demonstrating partnership participation in strategic planning
	Partnership participation in decision making	No evidence	Options for participation identified	Partnership consensus on options obtained	Activities that demonstrate options initiated	Evidence for continuing activities demonstrating partnership participation in decision making
<b>Broadening Participation for Workforce Development</b>	Representative of the Engine's goals for inclusive engagement for their region of service	No evidence	Representative workforce that aligns with engine goals for inclusive engagement identified	Plan to develop workforce that aligns with engine goals for inclusive engagement	Outreach activities to workers to develop engine workforce	Evidence for continuing workforce outreach activities
	Opportunities to broaden participation in workforce recruitment	No evidence	Identified recruitment challenges to broadening participation in region of service	Identify solutions to broadening participation recruitment challenges	Initiate recruitment activities to meet broadening participation goals	Evidence for continuing recruitment activities that broaden workforce participation
	Access to professional	No evidence	Identified	Identified solutions to	Implement activities	Evidence for continuing

Topic	Criteria	Degrees of Attainment				
		0. No Evidence	1. Preliminary	2. Intermediate	3. Advanced	4. Mature
	development opportunity		challenges to access to professional development	professional development accessibility challenges	to increase access to professional development	activities increases access to professional development
	Compensation parity	No evidence	Regional skill-based compensation norms identified	Plan to achieve regional consensus on compensation norms	Activities detailing steps to achieve consensus	Evidence for activities that would achieve regional compensation norms

**(Optional) Other Criteria Relevant to your Engine**

Engines have the option to propose additional criteria that are relevant to the Engine but not included in the rubrics above. While it is anticipated that a criterion would be accompanied by the rationale for inclusion and a description of the strengths, weaknesses, challenges, and opportunities, an enumeration of the degrees of attainment is welcome, but not required.

**Example Format**

Topic	Criteria	Reasoning

## **C. Example Template for the SWOT Analysis Component Plan**

The following is an example template for organizing the SWOT Analysis section of the Strategic and Implementation Plan. Teams are NOT required to use this template but should include a summary of their SWOT as part of this section of the Plan.

### **I. Introduction**

[[Explanation of how the analysis will inform the Engine’s strategic decision-making and planning.]]

### **II. Summary of SWOT**

[[The purpose of this section is to summarize the outcomes of the Engine’s detailed SWOT analysis. The goal is not to list every strength, weakness, etc. but instead for the Engine to prioritize the top items in each category.]]

#### **A. Engine’s Primary Strengths**

[[For each of the below sections, list three of the Engine’s internal strengths, capabilities, and advantages of the Engine. For each strength, include up to one paragraph description of the strength, evidence supporting the strength, and reference the relevant detailed information about this strengths in the full SWOT analysis.]]

- i. Research, Development, and Translation for Ecosystem Development R&D and Translation
- ii. Workforce Development within the Region of Service
- iii. Broadening Participation

#### **B. Engine’s Primary Weaknesses**

[[For each of the below sections, list three of the Engine’s internal weaknesses. For each weakness, include up to one paragraph description and reference the relevant detailed information about this weakness in the full SWOT analysis.]]

- i. Research, Development, and Translation for Ecosystem Development R&D and Translation
- ii. Workforce Development within the Region of Service
- iii. Broadening Participation

#### **C. Engine’s Primary Challenges/Threats**

[[For each of the below sections, list three of the Engine’s internal challenges/threats. For each challenge/threat, include up to one paragraph description and reference the relevant detailed information about this challenge/thread in the full SWOT analysis.]]

- i. Research, Development, and Translation for Ecosystem Development R&D and Translation
- ii. Workforce Development within the Region of Service
- iii. Broadening Participation

#### D. Engine's Primary Opportunities

[[For each of the below sections, list three of the Engine's internal opportunities. For each opportunity, include up to one paragraph description and reference the relevant detailed information about this opportunity in the full SWOT analysis.]]

- i. Research, Development, and Translation for Ecosystem Development R&D and Translation
- ii. Workforce Development within the Region of Service
- iii. Broadening Participation

### **III. Full SWOT Analysis**

[[This section includes the detailed analyses using the rubrics with degrees of attainment, narratives, rubrics index, etc. Note that this is the content that Engines are developing using the remainder of the guidance in this document]]

### **IV. Conclusion**

[[summarize key findings from the SWOT analysis and implications for strategic planning and decision-making.]]

### **Appendix**

[[Engines may want to include an appendix with further details such as the following (if applicable):

- Additional supporting data, charts, or diagrams relevant to the SWOT analysis
- References, sources, or stakeholders consulted during the analysis process]]



## Appendix A. Index of Engine SWOT Ratings

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Topic	Criteria	Engine rating	Explanation of Rating (e.g., narrative sections of the deliverable relevant to the self-rating)
Research, Development, and Translation			
Use-inspired Research and Development	R&D Goal(s)		
	Research approach to achieve each goal		
	Data sharing plan		
	Infrastructure		
	Partnerships for R&D		
Translation to Practice	Translation Goal(s)		
	Research to prototype translation		
	Prototype to low scale production		
	Production scale up		
	Data sharing plan		
	Infrastructure		
Regional Assets to Support RD&T Ecosystem Development	Partnerships for translation to practice		
	Industrial resources		
	Academic resources		
	Entrepreneurial resources		
	Environmental resources		
Regional RD&T Ecosystem Development	Staffing to achieve engine goals		
	Access to critical supply chains		
	Essential elements of a regional innovation ecosystem		
	Ecosystem partnerships		
	Staffing for the engine		
	Workforce to develop region of service		
	Regulatory assessment		

Topic	Criteria	Engine rating	Explanation of Rating (e.g., narrative sections of the deliverable relevant to the self-rating)
	Economic plan for a sustainable ecosystem		
	Inclusive engagement plan		
	Communication plan		
<b>Workforce Development</b>			
Labor Market	Inventory of industries and employers in the region of service [Labor Demand]		
	Inventory of talent in region of service [Labor Supply]		
Skills and Training	Education Requirements		
	Workforce Development Goals		
	Training programs to reach workforce development goals of the Engine		
	Trainings related to increasing regional entrepreneurship		
	Trainings related to increasing the resiliency of the workforce (capable of moving across industries)		
Partnerships	Institutes of higher learning (post-secondary school)		
	Private sector (for-profit companies, VCs, angel investors, etc.)		
	Trade organizations (economic development organizations, trade unions, chambers of commerce, etc.)		
	Public sector (local, State, and Federal Governments)		
	Nonprofit sector (community organizations, NGOs, etc.)		

Topic	Criteria	Engine rating	Explanation of Rating (e.g., narrative sections of the deliverable relevant to the self-rating)
<b>Broadening Participation</b>			
Outreach	Engagement with new and established communities and geographies		
	Communication with new and established communities and geographies		
Engine staff	Individuals representative of the Engine's goals for inclusive engagement for their region of service		
	Access path to join engine		
	Staff participation in strategic planning		
	Staff participation in decision making		
Partnerships	Representative of the Engine's inclusion goals for their region of service		
	Access path to join engine		
	Partnership participation in strategic planning		
	Partnership participation in decision making		
Workforce	Representative of the Engine's goals for inclusive engagement for their region of service		
	Opportunities to broaden participation in workforce recruitment		
	Access to professional development opportunity		
	Compensation parity		
<b>Other Criteria Relevant to Your Engine</b>			
<b>Topic</b>	<b>Criteria</b>	<b>Reasoning</b>	

## Appendix B. Literature Survey

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Should additional information on rubrics and the three assessment areas be helpful, a sampling of the published literature is provided here.

### 1. Rubrics

Values in Evaluation - The Use of Rubrics. Dickinson, Pauline; Adams, Jeffery (2017) In Evaluation and Program Planning 65, pp. 113–116. DOI: 10.1016/j.evalprogplan.2017.07.005.

**Conclusions.** Rubrics are an adaptable tool that can be used for determining the merit and/or worth of an evaluation or product. The development and evaluation of rubric criteria helps facilitate a deeper understanding on what is important with regard to the rubric topic.

**Abstract (abbreviated).** Rubrics are used by evaluators who seek to move evaluations from being mere descriptions of an evaluand (i.e., the programme, project or policy to be evaluated) to determining the quality and success of the evaluand. However, a problem for evaluators interested in using rubrics is the literature relating to rubric development is scattered and mostly located in the education field with a particular focus on teaching and learning. In this short article we review and synthesise key points from the literature about rubrics to identify best practice. In addition we draw on our rubric teaching experience and our work with a range of stakeholders on a range of evaluation projects to develop evaluation criteria and rubrics. Our intention is to make this information readily available and to provide guidance to evaluators who wish to use rubrics to make value judgements as to the quality and success of evaluations.

**How Program Evaluators Use and Learn to Use Rubrics to Make Evaluative Reasoning Explicit.** Martens, Krystin S. R. (2018) In Evaluation and Program Planning 69, pp. 25–32. DOI: 10.1016/j.evalprogplan. 2018.03.006.

**Conclusions.** Rubrics are an evaluation tool that can be used to develop and negotiate a shared understanding of evaluation criteria among stakeholders. While there are few formal paths to learn about rubrics, rubric guidance, training, and resources can be used to disseminate information on how to use rubrics as an evaluation tool.

**Abstract (abbreviated).** A rubric is a tool that can support evaluators in a core function of their practice—the process of combining evidence with values to determine merit, worth, or significance—however, little guidance specific to evaluation exists. This study examined, through semi-structured interviews, how a rare group of nine rubric-using seasoned evaluators from across the globe use and learned to use rubrics in their program evaluation practice. Key findings revealed rubrics were a critical component to the practice of these evaluators to make determinations, but also as frameworks to sharpen an evaluation’s focus. Additionally, findings support the notion that there is a paucity of formal channels for learning about rubrics and indicate these early adopters are instead, honing their skills through informal channels such as trial and error and by tapping into a community of practice. Future directions for training and research should include expanding understanding, application, and acceptance of use.

**Knowing the Learner: A New Approach to Educational Information. A New Approach to Educational Information.** Zachos, Paul; Doane, William (2017) ShiresPress.

**Conclusions.** Rubrics are descriptions or explanations of what evidence is needed to assign a specified rating level. Educational evaluation, including the use of rubrics, is the act of using information to help stakeholders attain desired outcomes.

**Abstract (abbreviated).** Every student, teacher, parent, educational policymaker, and institution deserves a way to know whether students are learning what is being taught. Educational assessment and evaluation are needed to create and apply this knowledge productively. Knowing the Learner is directed to everyone who wishes to understand what truly educational assessment and evaluation are (as well as what they are not). But to understand these, it is first necessary to understand the basic nature of educational activities. The book shows how to develop this understanding and how, for the field of education to move forward, teachers must become increasingly skilled in the practice of assessment and evaluation. Although Knowing the Learner delves into technical subjects, they are always presented in a way that requires no technical knowledge. For all of these reasons, Knowing the Learner can be of value to everyone who cares about improving education and particularly to those who are actively engaged in educational practice, policy, and decision-making. Readers may be surprised to discover that a new approach to assessment and evaluation is precisely what is needed, not only to make educational practice more effective but also to make it more humane.

## 2. SWOT Analysis

**SWOT Analysis: A Theoretical Review.** E. Gurel and M. Tat. J International Social Research: 10(51) (2017).

**Conclusions.** (1) SWOT Analysis is a valuable strategic management technique for planning and decision making to achieve long-term goals of an organization. (2) The qualitative examination of strengths, weaknesses, opportunities and threats reveals an organization's current situation and makes it possible to develop future action plans for the organization. (3) Strengths and weaknesses of the SWOT approach are reviewed.

**Abstract.** This study is a literature review on SWOT, qualitative and descriptive in nature. The study will examine SWOT Analysis in a historical, theoretical, time frame perspective, as an effective situation analysis technique which plays an important role in the fields of marketing, public relations, advertising and in any fields of requiring strategic planning. SWOT Analysis is an analysis method used to evaluate the 'strengths', 'weaknesses', 'opportunities' and 'threats' involved in an organization, a plan, a project, a person or a business activity. In this qualitative and descriptive study, firstly the position of SWOT Analysis in the strategic management process is explained, secondly the components of SWOT Analysis is examined. The study includes an international sports wear brand's SWOT Analysis; historical origins of SWOT, advantages-disadvantages and the limitations of SWOT is also reviewed.

**The Origins of SWOT Analysis.** Richard W. Puyt, Finn Birger Lie, and Celeste P.M. Wilderom. Long Range Planning: 56 (2023).

**Conclusions.** (1) SWOT analysis has traceable origins (situated in Silicon Valley in the sixties of the past century) and (2) enables a well-founded process of co-creative strategy making by all managers within an organization. (3) SWOT's current use is most often as a generic canvas or brainstorming scheme as part of strategic planning and strategic issue management systems.

**Abstract.** The origins of SWOT analysis have been enigmatic, until now. With archival research, interviews with experts and a review of the available literature, this paper reconstructs the original SOFT/SWOT approach, and draws potential implications. During a firm's planning process, all managers are asked to write down 8 to 10 key planning issues faced by their units. Each manager grades, with evidence, these issues as either safeguarding the *Satisfactory*; opening *Opportunities*; fixing *Faults*; or thwarting *Threats*: hence SOFT (which is later merely relabeled to Strengths, Weaknesses, Opportunities and Threats, or SWOT). Subgroups of managers have several dialogues about these issues with the instruction to include the needs and expectations of all the firm's stakeholders. Their developed resolutions or proposals become input for the executive planning committee to articulate corporate purpose(s) and strategies. SWOT's originator, Robert Franklin Stewart, emphasized

the crucial role that creativity plays in the planning process. The SOFT/ SWOT approach curbs mere top-down strategy making to the benefit of strategy alignment and implementation; Introducing digital means to parts of SWOT's original participative, long-range planning process, as suggested herein, could boost the effectiveness of organizational strategizing, communication and learning. Archival research into the deployment of SOFT/SWOT in practice is needed.

**What Are the Benefits and Pitfalls of Innovation Ecosystems?** Klaudia Gabriella Horváth. *Review of Economic Theory and Policy*: 17(3) (2022)

**Conclusions.** (1) SWOT analysis applied to the case study on the Tungsram agricultural innovation ecosystem revealed that the major motive for collaboration is the possibility to create new value by sharing knowledge and resources to reduce the cost of innovation; (2) Trust-based relationships (often based on prior relationships) influence both the selection of partners and the cohesion of the cooperation; and (3) Identifying a credible ecosystem leader to define and manage common business goals and strategy is key for the long-term operation of an ecosystem.

**Abstract.** Whereas innovation ecosystems became widely popular lately, our knowledge is quite limited on the practical implementation of the relevant ecosystem models, specifically in Hungary. Hence, the aim of this paper is to analyse an innovation ecosystem as a case study related to one of the biggest Hungarian multinational company, called Tungsram. The research is considered to be a qualitative research, as the methodology incorporates document analysis and 26 semi-structured interviews with the ecosystem's participants. The results show that the main benefits of participating in ecosystems are: new value creation by resource and knowledge sharing, networking and minimizing the cost of innovation. Meanwhile, the pitfalls of cooperation are closely related to the credibility of the ecosystem leader, to the formulation of the ecosystem's strategy and to the quality of the absorptive capacity of the partners.

**Accelerating Innovation Ecosystems: The Promise and Challenges of Regional Innovation Engines.** Jorge Guzman, Fiona Murray, Scott Stern, and Heidi L. Williams. *National Bureau of Economic Research Working Paper No. 31541* (2023).

**Conclusions.** (1) Careful consideration of the interplay between meaningful stakeholder engagement, systematic assessment, and tailored strategic interventions are critical to address regional bottlenecks or target latent and distinctive regional opportunities; (2) Meaningful and cost-effective opportunities that leverage impact on engine's ecosystems require adequate resources and effective management practices; and (3) Relational trust among regional stakeholders should advance the objectives of each participating stakeholder.

**Abstract.** Motivated by the establishment of major U.S. Federal programs seeking to harness the potential of regional innovation ecosystems, we assess the promise and challenges of place-based innovation policy interventions. Relative to traditional research grants, place-based innovation policy interventions are not directed toward a specific research project but rather aim to reshape interactions among researchers and other stakeholders within a given geographic location. The most recent such policy - the NSF “Engines” program - is designed to enhance the productivity and impact of the investments made within a given regional innovation ecosystem. The impact of such an intervention depends on whether, in its implementation, it induces change in the behavior of individuals and the ways in which knowledge is distributed and translated within that ecosystem. While this logic is straightforward, from it follows an important insight: innovation ecosystem interventions – Engines – are more likely to succeed when they account for the current state of a given regional ecosystem (latent capacities, current bottlenecks, and economic and institutional constraints) and when they involve extended commitments by multiple stakeholders within that ecosystem. We synthesize the logic, key dependencies, and opportunities for real-time assessment and course correction for these place-based innovation policy interventions.

**Regional Innovation: Federal Programs and Issues for Consideration.** Julie M. Lawhorn, Marcy E. Gallo, Adam G. Levin, Emily G. Blevins. Congressional Research Service report R47495 (2023)

**Conclusions:** In light of the findings in the report, CRS recommends Congress consider place-based development policies, such as (1) options to expand the Federal role in the development of Regional Innovation Systems (RIS) or make adjustments to the scope and scale of RIS assistance; (2) enhanced oversight of how RISs are implemented and coordinated between Federal agencies and across multiple levels of government; (3) options to integrate services provided by other Federal programs, such as capital access, infrastructure, and existing research institutions with RIS grantees; and (4) building the capacity of support organizations in under-resourced and disadvantaged communities and expanding access to capital for entrepreneurs. Better evaluate the outcomes of strategies used to address socioeconomic and regional disparities may also be of congressional interest.

**Abstract** (abbreviated): In recent years, Congress has increased support for economic development policies that incorporate a regional innovation systems (RIS) approach. RIS are composed of public and private sector partners, including educational and research institutions, investors, firms, economic development organizations, and entrepreneurs, among others. The RIS approach seeks to develop an ecosystem that fosters linkages between organizations so that a region may increase jobs, attract investment, and otherwise support economic development and related goals. The



rationale for increased federal involvement in developing connected, innovative regional economies is often associated with concerns that the United States is ceding its global technology and economic competitiveness position, in particular relative to China. Proponents of RIS policies also view the approach as a means of addressing regional barriers to innovation and entrepreneurship and strengthening the capacity of regional stakeholders. Some policymakers and analysts consider federal support for RIS as a way to help revitalize and restructure places and regional economies that have been impacted by globalization and international trade. Others emphasize the spread of innovation and bolstering innovation capacity in specific regions as a means of creating well-paying jobs and combating socioeconomic and regional disparities.

### **3. Innovation Ecosystems**

**Innovation Ecosystems: A Conceptual Review and a New Definition.** Granstrand, Ove; Holgersson, Marcus (2020) In *Technovation* 90-91, p.102098. DOI: 10.1016/j.technovation.2019.102098.

**Conclusion:** This review shows that actors, artifacts, and activities are all elements in an innovation ecosystem, linked together through relations, including complement and substitute relations. This review also points at the importance of institutions and the evolving nature of innovation ecosystems.

**Abstract (abbreviated):** The concept of innovation ecosystems has become popular during the last 15 years, leading to a debate regarding its relevance and conceptual rigor, not the least in this journal. The purpose of this article is to review received definitions of innovation ecosystems and related concepts and to propose a synthesized definition of an innovation ecosystem. The conceptual analysis identifies an unbalanced focus on complementarities, collaboration, and actors in received definitions, and among other things proposes the additional inclusion of competition, substitutes, and artifacts in conceptualizations of innovation ecosystems, leading to the following definition: An innovation ecosystem is the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors. This definition is compatible with related conceptualizations of innovation systems and natural ecosystems, and the validity of it is illustrated with three empirical examples of innovation ecosystems.

**Accelerating Innovation Ecosystems: The Promise and Challenges of Regional Innovation Engines.** Guzman, Jorge; Murray, Fiona; Stern, Scott; Williams, Heidi (2023) In National Bureau of Economic Research. DOI: 10.3386/w31541.

Described previously in SWOT Analysis section.

**Valuing Value in Innovation Ecosystems: How Cross-Sector Actors Overcome Tensions in Collaborative Sustainable Business Model Development.** Oskam, Inge; Bossink, Bart; Man, Ard-Pieter de (2021) In *Business & Society* 60 (5), pp. 1059–1091. DOI: 10.1177/0007650320907145.

**Conclusion:** This paper highlights how each actor in any innovation ecosystem has individual interests that are a condition for the continuing existence and further development of the innovation ecosystem. Furthermore, that paper finds that cross-sector actors engage in a process of valuing value, which is a search and discovery of environmental, social, and economic value creation and capture.

**Abstract (abbreviated):** This article aims to uncover the processes of developing sustainable business models in innovation ecosystems. Innovation ecosystems with sustainability goals often consist of cross-sector partners and need to manage three tensions: the tension of value creation versus value capture, the tension of mutual value versus individual value, and the tension of gaining value versus losing value. The fact that these tensions affect all actors differently makes the process of developing a sustainable business model challenging. Based on a study of four sustainably innovative cross-sector collaborations, we propose that innovation ecosystems that develop a sustainable business model engage in a process of valuing value in which they search for a result that satisfies all actors. We find two different patterns of valuing value: collective orchestration and continuous search. We describe these patterns and the conditions that give rise to them. The identification of the two patterns opens up a research agenda that can shed further light on the conditions that need to be in place in order for an innovation ecosystem to develop effective sustainable business models. For practice, our findings show how cross-sector actors in innovation ecosystems may collaborate when developing a business model around emerging sustainability-oriented innovations.

**A Conceptual Framework for Developing of Regional Innovation Ecosystems.** Pidorycheva, Iryna; Shevtsova, Hanna; Antonyuk, Valentina; Shvets, Nataliia; Pchelynska, Hanna (2020) In *EJSD* 9 (3), p. 626. DOI: 10.14207/ejsd.2020.v9n3p626.

**Conclusions:** The innovation ecosystem at the regional level will be effective only if the organizational core is created on the basis of public-private partnership, which unites interest in innovations and capable regional actors. The innovation ecosystem must be subject to continuous change under the influence of new motivations of participants and new external conditions of macroeconomic, technological, and institutional nature—not only regional or national content, but also taking into account global perspective of fast and large-scale changes.

**Abstract (abbreviated):** The article highlights a conceptual framework for developing of regional innovation ecosystems at the Nomenclature of Territorial

Units for Statistics (NUTS) 1 level. The conceptual model of the regional innovation ecosystem of Ukraine has been suggested taking into account features of its current territorial division. The key dimensions of the model include the goal of the ecosystem, its actors, the environment and the system of internal and external interrelationship. Considering the specifics of regional governance in Ukraine, it was substantiated that it is advisable to use the existing network of regional research centers as institutional tools to support regional innovation ecosystems at NUTS 1 level. It is suggested to create special coordination centers, in particular, regional innovation councils at NUTS 2 level.

### **3. Workforce Development**

**Four Promising Practices from a Workforce Development Partnership.** Myran, Steve; Sylvester, Paul; Williams, Mitchell R.; Myran, Gunder (2023): In *Community College Journal of Research and Practice* 47 (1), pp.38–52. DOI: 10.1080/10668926.2021.1925177.

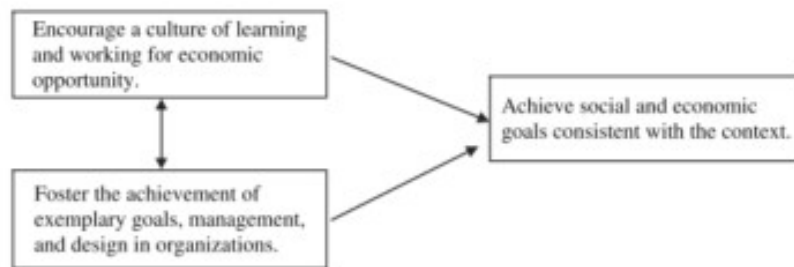
**Conclusion:** The program is framed along the following four components: (1) the role of employers, (2) the role of governmental agencies and nonprofit organizations, (3) a collaborative network of employers and other community partners, and (4) a spirit of creativity and innovation.

**Abstract:** This article reports on four synthesis findings from the Credentials to Careers (C2C) initiative – a consortium of seven community colleges working to create and implement innovative programs to train or retrain unemployed and displaced workers for STEM, advanced manufacturing and health-care related careers. These are (1) collaborating with community partners to meet the needs of employers and trainees, (2) tapping into local knowledge and investing in curriculum, (3) “minding the gaps” between each stage of their college career, and (4) using career navigators to support student success. In discussing the implications of this work, we ask what synthesis observations might offer comprehensive, specific and actionable knowledge for the changing workforce development climate of community colleges? As such, the implications suggest lessons and actionable knowledge that community college leaders and faculty members might draw from in their own efforts to meet community, student and workforce development needs.

**The Emergence of ‘Workforce Development’: Definition, Conceptual Boundaries and Implications.** Jacobs, Ronald L.; Hawley, Joshua D. (2009): In Rupert Maclean (Ed.): *International handbook of education for the changing world of work: bridging academic and vocational education*: Springer, pp. 2537–2552. Available online at [https://link.springer.com/chapter/10.1007/978-1-4020-5281-1\\_167](https://link.springer.com/chapter/10.1007/978-1-4020-5281-1_167).

**Conclusion:** The definition of workforce development traditionally referred to government-sponsored or funded activities for disadvantaged people, focusing on job training and remedial education. This definition expanded in the 1990s and the authors propose it encompasses policies, programs, and activities related to working and learning challenges. Workforce development programs have extremely broad goals, and thus many activities can be classified as workforce development.

There is an emphasis on employing organizations, educating organizations, and broader socioeconomic goals.



**Fig. 1** Workforce development framework

**Abstract:** This chapter begins a much-needed discourse about workforce development, a term used with increasing frequency among educational practitioners, policy-makers and scholars alike. In spite of the increasing use of the term, there has been limited discussion about its meaning and implications for established fields of study (Giloith, 2000; Grubb, 1999; Harrison & Weiss, 1998). This discourse is critical for both theoretical and practical reasons, particularly given the economic and social benefits that are expected from workforce development programmes (Grubb & Lazerson, 2004).

Specifically, the purposes of this chapter are: (a) to discuss the emergence of workforce development based on five historical streams; (b) to propose a definition and conceptual boundaries for workforce development; and (c) to explore the implications of workforce development on policy-makers, researchers and practitioners.

**Evaluation of the Workforce Development Agreements.** Carrière; April (2022): In Employment and Social Development Canada. Available online at <https://www.canada.ca/content/dam/canada/employment-social-development/corporate/reports/evaluations/workplace-development-agreements/wda-en.pdf>, checked on 1/18/2024.

**Conclusion:** Canada’s Workforce Development Agreement (WDA) program provides a framework for workforce development agreements. This report provides a

framework for how to evaluate WDAs. The evaluation matrix in Appendix A includes exemplar criteria for evaluating a WDA. Appendix B provides a literature review on effective programs and services for workforce development of specific underserved populations.

**Executive Summary** (abbreviated): The Workforce Development Agreements (WDAs) are a key mechanism to provide training and employment supports to Canadians. Through bilateral agreements with provinces and territories (P/Ts), financial support is provided for the design and delivery of programs and services to help participants obtain the training, skills, and work experience they need to improve their labour market outcomes. The agreements also allow for the provision of support to employers seeking to train current and future employees.

The agreements' broad participant and program eligibility criteria aim to give P/Ts the flexibility they need to design and deliver programs and services that meet their jurisdictions' labour market needs. The agreements aim to support those who are further away from the labour market or are underemployed, and include targeted funding for persons with disabilities as well as funding that can be used to serve other underrepresented groups, such as Indigenous peoples, youth, older workers, women, immigrants and newcomers to Canada.

#### **Evaluation objectives**

- Describe the types of programs and services funded by the agreements and the delivery approaches.
- Identify the labour market needs and priorities that the agreements are being used to address.
- Examine the labour market outcomes observed for participants.
- Identify strengths and challenges associated with the design and implementation of the agreements.

**Promising Practices for Strengthening the Regional STEM Workforce Development Ecosystem.** Board on Higher Education and Workforce Committee on Improving Higher Education's Responsiveness to Regional STEM Workforce Needs: Identifying Analytical Tools and Regional Best Practices; Board on Higher Education and Workforce; Policy and Global Affairs; *National Academies of Sciences, Engineering, and Medicine* (2016): Washington D.C.: The National Academies Press. Available online at [https://thescienceexperience.org/Books/Practices\\_for\\_Strengthening\\_Regional\\_STEM\\_Workforce\\_Development\\_Ecosystem.pdf](https://thescienceexperience.org/Books/Practices_for_Strengthening_Regional_STEM_Workforce_Development_Ecosystem.pdf), checked on 2/2/2024.

**Conclusion:** The main stakeholders in a STEM workforce development ecosystem: higher education, local employers/industry, intermediary bodies

(economic development organizations, chambers of commerce, etc.), policy/government, and nonprofit/philanthropic. There is a mismatch of university graduates and workforce needs especially in regard to narrow STEM skills and broad STEM skills. Proactive engagement of business and university leaders is needed for the STEM workforce development ecosystem.

**Executive Summary** (abbreviated):

To explore common and proposed practices in establishing partnerships among academia, governments, and industry, a committee organized under the auspices of the Board on Higher Education and Workforce of the National Academies of Sciences, Engineering, and Medicine undertook an 18-month study of the extent to which universities and employers in five metropolitan communities (Phoenix, Arizona; Cleveland, Ohio; Montgomery, Alabama; Los Angeles, California; and Fargo, North Dakota) collaborate successfully to align curricula, labs, and other undergraduate educational experiences with current and prospective regional STEM workforce needs.

The key topic for this study was as follows: How to create the kind of university-industry collaboration that promotes higher-quality college and university course offerings, lab activities, applied learning experiences, work-based learning programs, and other activities that enable students to acquire knowledge, skills, and attributes they need to be successful in the STEM workforce.

**Workforce Program Design and Evaluation.** Allison Moe, Cory Chovanec, and Robin Tuttle: Better Buildings Workforce Accelerator Workshop. National Renewable Energy Laboratory. Available online at <https://www.nrel.gov/docs/fy23osti/86302.pdf>, checked on 3/5/2024.

**Conclusion:** Workshop to help design and evaluate a workforce development program. The steps to developing a workforce development program are:

- Regional Market Analysis: challenges, demand and opportunities, job market, potential partners;
- Program Development: high-level goals/objectives, general approach, implementation details;
- Partner Engagement: Partner responsibilities, building trust, formalizing the partnership;
- Program Implementation: developing materials, recruitment, trainee engagement, tracking; and
- Program Evaluation: tracking, reviewing goals and metrics, making changes to improve the program.

## 4. Broadening Participation

**Summary and Analysis of Request for Information to Make Access to the Innovation Ecosystem More Inclusive and Equitable.** Olszewski, Tom; White, Taylor (2022): Available online at [https://www.whitehouse.gov/wp-content/uploads/2022/09/09-2022-Equitable\\_Innovation\\_Ecosystem\\_RFI\\_Analysis\\_Public\\_Clean.pdf](https://www.whitehouse.gov/wp-content/uploads/2022/09/09-2022-Equitable_Innovation_Ecosystem_RFI_Analysis_Public_Clean.pdf), checked on 1/24/2024.

**Conclusion:** The report identified four overarching types of barriers to inclusive innovation ecosystems: (1) barriers to entry, (2) educational and knowledge barriers, (3) structural and cultural barriers, and (4) Federal programmatic barriers. The report also identified three common traits associated with successful inclusive innovation programs: (1) partnering closely with the communities the programs aim to help, (2) evaluating the situation of the community being served and the impact of the programs, and (3) providing sustainable, reliable support for an enterprise from development to commercialization.

**Executive Summary (abbreviated):** OSTP published a *Request for Information to Make Access to the Innovation Ecosystem More Inclusive and Equitable* (Inclusive Innovation RFI) in the Federal Register, soliciting comments between the dates of June 3 and July 5, 2022 with the aim of gathering input from the public to identify and better understand:

1. Barriers that prevent innovators from underrepresented groups or underserved communities from participating in the U.S. innovation ecosystem;
2. Examples of government programs or other initiatives that have seen success in supporting innovators from underrepresented backgrounds; and
3. Recommendations to meet the specific needs of innovators from underrepresented backgrounds and underserved communities to increase their participation in the innovation ecosystem.

**Cultural Diversity and Regional Innovation: Evidence from China.** Guo, Mengmeng; Yu, Yixiang; Ye, Jingjing (2024) In *Growth and Change* 55 (1), Article e12704, e12704. DOI: 10.1111/grow.12704.

**Conclusion:** Cultural diversity does contribute to regional innovation. Cultural diversity has a significant positive impact on innovation, suggesting that in China the knowledge spillover brought by the diversity in culture exceeds the cost of conflicts and mistrust.

**Abstract (Abbreviated):** The cultural diversity brought by migrants has attracted widespread interest in recent years. This paper investigates the relationship

between migrant cultural diversity and regional innovation by constructing panel data of provincial migrant cultural diversity and combining them with invention applications data from China's State Intellectual Property Office. The empirical results show that the migrant cultural diversity, measured by migrant's hukou and dialect respectively, has a positive impact on regional innovation. The effect still holds after a series of robustness tests and addressing endogeneity issues. Furthermore, the further analysis implies that the effects of the migrant cultural diversity in workers aged from 30 to 50, engaged in an innovative occupation, working in high market-competitiveness or inclusive provinces are more pronounced. Our study supplements the current research on the relationship between migrant cultural diversity and regional innovation.

**DEIA Is Essential to Advance the Goals of Translational Science: Perspectives from NCATS.** Hussain, Shadab F.; Vogel, Amanda L.; Faupel-Badger, Jessica M.; Ho, Linda; Akacem, Lameese D.; Balakrishnan, Krishna et al. (2023). In *Journal of Clinical and Translational Science* 7 (1), e33. DOI: 10.1017/cts.2022.482.

**Conclusion:** Encouraging robust representation of diverse populations in biomedical research can enable equitable access to scientific advances and contribute to a holistic understanding of disease and health. Data can also be leveraged to advance DEIA in translational research. Furthermore, using a DEIA lens can allow researchers to recognize different barriers to accessing understandable, accurate, and relevant information on translational findings.

**Abstract (abbreviated):** The National Center for Advancing Translational Science (NCATS) seeks to improve upon the translational process to advance research and treatment across all diseases and conditions and bring these interventions to all who need them. Addressing the racial/ethnic health disparities and health inequities that persist in screening, diagnosis, treatment, and health outcomes (e.g., morbidity, mortality) is central to NCATS' mission to deliver more interventions to all people more quickly. Working toward this goal will require enhancing diversity, equity, inclusion, and accessibility (DEIA) in the translational workforce and in research conducted across the translational continuum, to support health equity. This paper discusses how aspects of DEIA are integral to the mission of translational science (TS). It describes recent NIH and NCATS efforts to advance DEIA in the TS workforce and in the research we support. Additionally, NCATS is developing approaches to apply a lens of DEIA in its activities and research – with relevance to the activities of the TS community – and will elucidate these approaches through related examples of NCATS-led, partnered, and supported activities, working toward the Center's goal of bringing more treatments to all people more quickly.



**What Does "Diversity" Mean for Public Engagement in Science? A New Metric for Innovation Ecosystem Diversity.** Özdemir, Vural; Springer, Simon (2018) In *Omics: a journal of integrative biology* 22 (3), pp. 184–189. DOI: 10.1089/omi.2018.0002.

**Conclusion:** The authors of this paper developed a new diversity metric, Frame Diversity Index, which can usefully measure (and prevent) errors in the framing of a research question in an innovation ecosystem. The use of this metric can help broaden the concepts and practices of diversity and inclusion in science, technology, innovation and society.

**Abstract (abbreviated):** Diversity is increasingly at stake in early 21st century. Diversity is often conceptualized across ethnicity, gender, socioeconomic status, sexual preference, and professional credentials, among other categories of difference. These are important and relevant considerations and yet, they are incomplete. Diversity also rests in the way we frame questions long before answers are sought. Such diversity in the framing (epistemology) of scientific and societal questions is important for they influence the types of data, results, and impacts produced by research. Errors in the framing of a research question, whether in technical science or social science, are known as type III errors, as opposed to the better known type I (false positives) and type II errors (false negatives). Kimball defined “error of the third kind” as giving the right answer to the wrong problem. Raiffa described the type III error as correctly solving the wrong problem. Type III errors are upstream or design flaws, often driven by unchecked human values and power, and can adversely impact an entire innovation ecosystem, waste money, time, careers, and precious resources by focusing on the wrong or incorrectly framed question and hypothesis. Decades may pass while technology experts, scientists, social scientists, funding agencies and management consultants continue to tackle questions that suffer from type III errors. We propose a new diversity metric, the Frame Diversity Index (FDI), based on the hitherto neglected diversities in knowledge framing. The FDI would be positively correlated with epistemological diversity and technological democracy, and inversely correlated with prevalence of type III errors in innovation ecosystems, consortia, and knowledge networks. We suggest that the FDI can usefully measure (and prevent) type III error risks in innovation ecosystems, and help broaden the concepts and practices of diversity and inclusion in science, technology, innovation and society.