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The data for this project were collected from March 2013-April 2014.
Stage IV: The 21st Century Economic Development Evaluation System

Abbreviations Used in this Report

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BDS</td>
<td>Business Dynamic Statistics</td>
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<tr>
<td>BEA</td>
<td>Bureau of Economic Analysis</td>
</tr>
<tr>
<td>BLS</td>
<td>Bureau of Labor Statistics</td>
</tr>
<tr>
<td>Cap IQ</td>
<td>Standard &amp; Poor’s Capital IQ</td>
</tr>
<tr>
<td>CSA</td>
<td>Consolidated Statistical Area</td>
</tr>
<tr>
<td>D&amp;B</td>
<td>Dun &amp; Bradstreet</td>
</tr>
<tr>
<td>DUNS</td>
<td>Data Universal Numbering System</td>
</tr>
<tr>
<td>ES 202</td>
<td>Employment &amp; Wages Data</td>
</tr>
<tr>
<td>FEIN</td>
<td>Federal Employment Identification Number</td>
</tr>
<tr>
<td>GICS</td>
<td>Global Industrial Classification System</td>
</tr>
<tr>
<td>i6</td>
<td>i6 Challenge</td>
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<tr>
<td>JIAC</td>
<td>Jobs and Innovation Accelerator Challenge</td>
</tr>
<tr>
<td>LBD</td>
<td>Longitudinal Business Database</td>
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<tr>
<td>LEHD</td>
<td>Longitudinal Employer-Household Dynamics</td>
</tr>
<tr>
<td>LMI</td>
<td>Labor Market Information</td>
</tr>
<tr>
<td>MSA</td>
<td>Metropolitan Statistical Area</td>
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<tr>
<td>NAICS</td>
<td>North American Industrial Classification System</td>
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<tr>
<td>NETS</td>
<td>National Establishment Time Series</td>
</tr>
<tr>
<td>NIH</td>
<td>National Institutes of Health</td>
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<tr>
<td>NSF</td>
<td>National Science Foundation</td>
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<tr>
<td>O*NET</td>
<td>Occupational Information Network</td>
</tr>
<tr>
<td>QCEW</td>
<td>Quarterly Census of Employment and Wages</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>RDC</td>
<td>Research Data Center</td>
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<tr>
<td>SBA</td>
<td>Small Business Administration</td>
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<tr>
<td>SBIR</td>
<td>Small Business Innovation Research</td>
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<tr>
<td>SIC</td>
<td>Standard Industrial Classification</td>
</tr>
<tr>
<td>SOC</td>
<td>Standard Occupational Codes</td>
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<tr>
<td>STTR</td>
<td>Small Business Technology Transfer</td>
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<tr>
<td>TAAC</td>
<td>Trade Adjustment Assistance Center</td>
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<tr>
<td>TAAF</td>
<td>Trade Adjustment Assistance for Firms</td>
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<tr>
<td>USPTO</td>
<td>United States Patent and Trademark Office</td>
</tr>
<tr>
<td>WAC</td>
<td>WANTED Analytics Codes</td>
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Executive Summary

The Economic Development Administration (EDA) is the only federal agency that has an exclusive focus on economic development. EDA recognizes that all of its programs should be designed in such a way as to allow for effective implementation and rigorous evaluation, in order to advance the objective of delivering smarter and more accountable government.¹

The Economic Development Administration issued a three-year cooperative agreement (2012-2014) with the University of North Carolina (UNC) at Chapel Hill, to explore new performance metrics and assessment methods that will enhance the ability of all economic development practitioners and policymakers to design, implement, and evaluate programs in effective and rigorous ways.

This report summarizes: what the Research Team has learned about current economic development evaluation practices and how these relate to EDA; as well as the perceived needs of economic developers, the EDA central office and EDA program participants.

Economic Development Goals and Challenges

This project began by developing the definition of economic development.² The ultimate goal of economic development is to create economic prosperity and high quality of life. Intermediate goals - for example, to increase innovation or to reduce barriers to entrepreneurship and private sector investment - are the means to the ultimate end of creating a prosperous society.

The evaluation challenge is to ascertain progress towards these goals in complex environments, and under conditions for which impact is difficult to attribute to specific investments. It is certainly possible to consider the impact of investment on outcomes for individual firms. However, economic development investments aim to build capacity that extends beyond individual firms to benefit the larger ecosystem.

The Generic Economic Development Logic Model

In conjunction with EDA, this project developed an Economic Development Program Logic Model. The generic form of the Logic Model is considered in this report, while other reports produced under this project have calibrated the Model for the Trade Adjustment Assistance for Firms (TAAF) program, the i6 program and the Jobs and Innovation Accelerator Challenge (JIAC) program.

Moving from Phase II of the project we have consolidated the sources used to minimize the costs incurred for these data and to ease access.

Capacity Outcomes in Context

The various Capacity Outcomes examined by the Research Team have various strengths that make them more useful in certain situations than in others. Six different and non-mutually exclusive context categories were considered in this report:

- **Manufacturing Industries**

  Manufacturing is a very innovative activity that continues to be an important economic contributor across the U.S. Manufacturing industries are easier to track because they conform to North American Industrial Classification System (NAICS) codes, which are generally accepted in economic analysis. Many economic development projects target niche segments of manufacturing industries that incorporate new technologies and can be tracked in a similar manner to emerging industries.

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¹ Office of Management and Budget, Memorandum to the Heads of Departments and Agencies, July 26 2013, “Next Steps in the Evidence and Innovation Agenda.”

² Feldman, M.P. et al. (2013), Economic Development: A definition and model for investment, for background and development of the definition.
**Technology Intensive Industries**
Technology intensive industries are often referred to with a variety of names such as “high technology” and include categories such as biotechnology, life sciences, medical devices, and information technology. Although not easily tracked with standard industrial classification schemes, there are well established definitions.

**Emerging Industries**
This category of industries is more difficult to define, while offering perhaps the greatest upside potential for economic development. For example, *material science* has the potential to transform other industrial activity by offering cost-effective and flexible input materials.

**Cities or Urban Areas**
When trying to identify increases in capacity in cities, the important information to consider is the location of the project and its catchment area. Project activity can be difficult to track in large metropolitan areas. Our strategy was to examine client firm lists to refine the geographic focus.

**Smaller (and Rural) Communities**
There are specific challenges for smaller and rural communities with regards to the types of data that are available and may be useful. Often there are few firms and industries to track. The challenge is to understand the relationship of the smaller community to the larger urban hierarchy and industrial landscape.

**Distressed Communities**
Distressed communities may face a lack of infrastructure (both hard and soft) that hamper their development and may be either in cities or small and rural communities. The special challenge in these communities lies in identifying the sparks for potential economic development that may not be immediately apparent, and working with these communities to establish the necessary infrastructure to harness these opportunities.

**Recommendations**
The recommendations from this work are more generally relevant to the community of economic development policymakers and practitioners; and more specifically relevant to the EDA. In sum, the third-party data that the Research Team examined are valuable and timely and offer useful baselines for assessing accountability in project objectives.

Second, well-defined objectives and documentation of results facilitate communication with funders, performers, users, and others. Results become verifiable and quantifiable information about what has been done.

**Recommendation:** EDA take the lead in building a database system for evaluation that would be available for use in evaluation but also available to the larger community.

**Recommendation:** EDA integrate the sources reviewed here into one of their existing data platforms to more fully capture the dimensions of regional capacity.

**Recommendation:** EDA provide uniform guidelines at the proposal stage to aid in project planning, monitoring and evaluation.

**Recommendation:** EDA compare social capital networks with supply-chain mapping in a specific geographic area to better understand how firms link versus the relationship across individuals.

**Recommendation:** EDA consider incorporating the following metrics into their evaluation system: Dealmakers; Cluster Identity; Skills and Job Availability; New Contracts, Federal Spending; Private Investment; New Firm Entry; SBIR Awards; Mergers & Acquisitions/Initial Public Offerings; New Product Announcements; Trademarks.

**Recommendation:** EDA strongly consider incorporating the following metrics into their evaluation system: Social Networks; Regional Industry Vitality; Value Chain Augmentation; Patents and Patent Collaborations.

**Recommendation:** EDA-funded projects start with an articulated set of specific measurable outcomes complete with expectations about the time frame that would be possible in their community during the grant.

**Recommendation:** EDA-funded projects collect firm-level data for the purpose of evaluating the impact of economic development program participation on client firms, using comparison to a control group.
I. Introduction

Investment analysts on Wall Street and in the public sector rely heavily on data to inform their decisions. After all, they seek the highest rate of return on their money and leave nothing to chance. Sophisticated and up-to-the-minute information provided in graphic form tracks the movement of stocks, which is summarized in charts (with trend lines calibrated to comparable assets), and synthesized into indices (like the Dow Industrial Average). All these data are used to inform their investment decisions. The metrics used have become so well known that they are reported by every news service and followed by the general public.

Contrast this system to the information used when making public investment decisions, specifically those investments in economic development that affect the wealth of local economies. Economic development practitioners have limited access to timely information to assist in making the best possible investment decisions. Our objective in this report is to advance the use of data for economic development investment decisions, and project planning.

This report provides an assessment of how data sources may be used to provide metrics useful for tracking the outcomes of public investment in economic development. In an effort to increase transparency and accountability, program evaluation has focused on methods to accurately measure impact. However, ex post evaluations of prior investments tell us little about how to make current investment decisions in complex environments (discussed further in the Evaluation Challenges for Economic Development section on pages 7-8). The disclaimer, past performance is no prediction of future returns is part of an investment prospectus. Savvy private sector investors know that high returns are predicated on access to high quality and timely data and extensive monitoring. This project attempts to bring new data and metrics to the practice of economic development.

About This Project

The U.S. Department of Commerce’s Economic Development Administration (EDA) is the only federal government agency focused exclusively on economic development. Economic development creates the conditions for economic growth and improved quality of life by expanding the capacity of individuals, firms, and communities to maximize the use of their talents and skills to support innovation, lower transaction costs, and responsibly produce and trade valuable goods and services. Economic development is essential to ensuring the nation’s economic future, and requires effective, collaborative institutions focused on advancing mutual gain for the public and private sectors.

The EDA recognizes that all of its programs should be designed in such a way as to allow for effective implementation and rigorous evaluation, towards the objective of delivering smarter and more accountable government. To that end, EDA partnered with the University of North Carolina (UNC) at Chapel Hill via a three-year cooperative agreement (2012-2014), to explore new performance metrics and assessment methods that will enhance the ability of all economic development practitioners and policymakers to design, implement, and evaluate programs in effective and rigorous ways.

Throughout this project, the metrics and assessment system proposed are:

- Designed with the understanding that the primary aim of economic development policy is to catalyze the expansion of regional development capacity;
- Based on a logic model that moves from inputs to project outputs to capacity outcomes, with the ultimate goal of improving prosperity and quality of life;
- Reliant on a regularly-updated project database constructed from digital and publicly available data sources;

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3 Office of Management and Budget, Memorandum to the Heads of Departments and Agencies, July 26 2013, “Next Steps in the Evidence and Innovation Agenda.”
Suggestive of improvements in regional statistics that will benefit EDA’s immediate management purposes, but will also be useful for economic development practitioners, policymakers and program managers in project planning and implementation.

The first phase of this project explored the various sources of digital data (from both private vendors and government agencies), which could be used to provide timely and disaggregated data that could be customized to examine configurations of firms within regions. This work culminated in the report, *Innovative Data in Regional Economic Analysis*.\(^4\) The second phase of the study developed a white paper to provide background for the development of an EDA logic model\(^5\) and piloted a set of metrics.\(^6\) The third phase of the project adapted the logic model to three EDA programs to further test proof of concept and operationalize the approach.\(^7\)

### About this Study

The current study provides a synthesis of the work to date, drawing on assessments of EDA’s investments in the i6, Jobs and Innovation Accelerator Challenge (JIAC) and Trade Adjustment Assistance for Firms (TAAF) programs. This report presents a use case for capacity metrics based on digital data sources, based on what the Research Team has learned.

The final phase of this project refines and prepares final recommendations for EDA on the design of an evaluation approach from technical, methodological, and institutional perspectives. Metrics to evaluate EDA’s economic development investments designed under this project will reflect the evolution of the agency’s mission in light of the substantial restructuring and competitiveness challenges experienced by U.S. regions and traded industries. This project’s ongoing efforts, to be completed in Fall 2014, will establish the basic technical elements of a new evaluation system, to support economic practitioners and program staff in program design, progress monitoring, and assessment.

### About This Report

This report presents the following sections following this introduction:

**II. Evidence-Based Economic Development**

**III. Framework for Economic Development: Logic Model & Evaluation**

**IV. Study Methodology**

**V. The Utility of Capacity Metrics for EDA Projects**

**VI. Key Findings & Implications for Program Evaluation**

**VII. Recommendations**

**VIII. References**

Appendix A: Overview of Projects

Appendix B: Metrics Collection for 2010 i6 Challenge

Appendix C: Metrics Collection for 2011 i6 Green Challenge

Appendix D: Metrics Collection for 2011 JIAC

Appendix E: Metrics Collection for TAAF

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II. Evidence Based Economic Development

Evaluation is the systematic collection, analysis and use of information to answer questions about the effectiveness of policies, projects and programs. The basic question is, most simply, did this program achieve its desired effect? Citizens, politicians and policy makers want to know if the programs they fund, implement, vote for, or participate in are producing positive change to some intended effect.

Efforts are being made both within the EDA and other federal, state and local government agencies and in the larger community of economic development organizations to improve accountability and evaluation methods and metrics. These changes are spurred by government action as well as responses to changing demands and increased need in communities. Though this process of improvement is iterative and ongoing, the EDA and other government agencies have been striving to meet these new demands with more rigorous and more accurate evaluation methodologies and metrics.

This section provides a historical overview of economic development evaluation efforts, paying specific attention to EDA economic development evaluation initiatives while also considering other related efforts. The objective is to provide historical context for the current study. This chapter then concludes by enumerating the challenges involved in evaluating economic development projects and programs.

Overview of Economic Development Evaluation

The Government Performance Results Act (GPRA) of 1993 requires all government agencies to be more accountable for the outcomes of their programs, requiring agencies to establish outcome goals and metrics and to report annually on success or failure on the prior years’ goals and indicators. In 1996, the National Academy of Public Administration (NAPA) published a report on the role of the federal government in economic development. One of its primary recommendations was for the federal government to assert, as one of its main goals, the building of an evidence base for economic development practice. This would include improving the analysis (and availability of findings) regarding best practices and program evaluations to assist economic development bodies in the process of learning.\(^8\)

Also in 1996, the Government Accountability Office (GAO) reported that the Economic Development Administration, along with the Appalachian Regional Commission and the Tennessee Valley Authority, had failed to provide solid evidence as to the effectiveness of their programs. The GAO noted that, while each organization had reported the ability of the programs to leverage public funds for private funds, none of the three agencies were able to reliably link their investments to outcomes.\(^9\) In response to GPRA, and the NAPA and GAO reports, the EDA has set out to improve its evaluation program.

EDA Economic Development Evaluation Initiatives

Starting in 1997, EDA partnered with research organizations to lead evaluations of its major programs, the largest of which evaluated the Public Works program.\(^10\) Between 1997 and 2003, Rutgers University was involved in seven different evaluations of the EDA’s Public Works, Rotating Loan Funds, and Defense Adjustment programs.\(^11\) Additional organizations were issued cooperative agreements to evaluate the EDA’s

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\(^11\) Rutgers University, 1997; Rutgers University, NJ Institute of Technology, et al, 1998; Rutgers University, Princeton University, et al, 1998; Rutgers University & Burchell, Robert, 1999; Rutgers University, 1999; Rutgers University, 2002a; Rutgers University, 2002b
Planning, University Center, and Technical Assistance programs as well as evaluations of the EDA’s Economic Development Districts, Ecotourism activities, the overall cost-per-job of EDA funding, and Business Development Incentives.\textsuperscript{12} 

Building on the progress made by these efforts, the EDA’s budget for Research and Evaluation was increased from $400,000 to $1 million in 2003.\textsuperscript{13} By 2006, however, the budget was reduced to $500,000 as President Bush attempted to consolidate all federal economic development programs under the Strengthening America’s Communities Initiative (SACI). \textsuperscript{14} Though these plans were ultimately unsuccessful in congress, funding for research and evaluation remained low until 2010 when funding was raised to $1.5 million.\textsuperscript{15} 

In the years since the original round of program evaluations in 1997-2003, the EDA has continued to refine its evaluation methods. This is, in part, due to continuing criticisms from the GAO. In response to the Rutgers et al evaluation of Public Works Programs, the GAO issued a report raising several methodological concerns.\textsuperscript{16} The GAO has also been critical of the EDA on several other points, including their reliance on administrative data and grantee self-reporting as the basis for their evaluations and for duplication of programming across federal economic development programs.\textsuperscript{17} 

The most common indicators used for measuring program impact have been 1) private investment and 2) jobs created or retained. Theoretical understanding of the microeconomic, social and cultural determinants of innovation and the importance of regional industrial clusters in national economic competitiveness motivated EDA to broaden its approach to evaluation and look beyond these limited indicators to more fully capture the dynamics of regional economic development.

In 2005, EDA partnered with The Council on Competitiveness to draft a report exploring the different methods available to measure regional innovation using current datasets. Their report identified ways of measuring 11 different aspects of innovation using government statistics or survey data: human capital, R&D, financial capital, physical infrastructure, legal and regulatory environment, quality of life, idea generation, idea development, commercialization, productivity, and prosperity.\textsuperscript{18} This effort was followed up with a 2008 report from the Advisory Committee on Measuring Innovation in the 21st Century Economy.\textsuperscript{19} The conclusion was that better metrics would help improve understanding of: how innovation occurs in different sectors of the economy; how it is diffused across the economy; and how it impacts economic growth and productivity. The Committee advocated for matching firm-level data from a variety of sources to obtain a more complete picture of innovation. The Committee also advocated for the creation of longitudinal data to improve understanding of the dynamics of business and innovation.

Also in 2008, the EDA partnered with Grant Thornton and ASR Analytics to re-evaluate and improve the methodologies used in the 1998 Public Works evaluation.\textsuperscript{20} EDA also partnered with W.E. Upjohn

\textsuperscript{12} NASDA et al, 1999; Karl F Seidman Consulting Services, 2001; East Carolina University, 2001; Wayne State University, 2002; Pennsylvania State University, 2002; Bowling Green University, 2003.

\textsuperscript{13} EDA, 2003; Department of Commerce [DOC], 2005b.

\textsuperscript{14} DOC, 2006a; 2006c.

\textsuperscript{15} EDA, 2007; 2008; 2009; 2010; 2011.


\textsuperscript{17} GAO, 2000b; 2006b; 2011a; 2012.


Institute for Employment Research to create a new program evaluation tool for use by their regional offices that included indicators on regional clustering.  

In addition to searching for new evaluation methods the EDA partnered with Portland State University in 2011 to create a new project-planning tool called the Triple Bottom Line Tool. This tool has grown through the active participation of economic development practitioners around the country and will encompass numerous indicators of Sustainability, Economic Vitality, Natural Resource Stewardship, and Community Well-Being. 

Other Economic Development Evaluation Initiatives
Economic development organizations at the federal, state, and local levels along with effort from the private sector have searched for better economic development evaluation methodologies and metrics. The Science and Technology for America’s Reinvestment: Measuring the Effect of Research on Innovation, Competitiveness and Science (STAR METRICS) program with the National Institutes of Health aims to create a nationwide, searchable, and downloadable database of the most useful and informative indicators available. The system currently only includes patents and federal research grants; however, the aim is to expand the available indicators over time through its consortium of universities.

In 2011, the Economic Development Research Group (EDRG) published a guide on reliable, useful, and innovative economic development indicators in their report Economic Impact Performance Metrics that includes detailed information on where to get the data and how to use it. Likewise, the leaders of the Alabama Comprehensive Economic Development Strategy have put out their own guide on metrics to use for evaluating progress towards economic development.

In addition to improving metrics, there are attempts to improve the quality of evaluation methodologies used in economic development. Numerous authors and organizations have published guides on this subject. Evaluation methods have been tested to evaluate economic development projects in the field.

Other Agency Evaluation Initiatives
EDA has not been the only agency to come under criticism from the GAO for its practices. The Small Business Administration (SBA) has come under fire not just for its evaluation methods, but also for a lack of quality program data and program monitoring, and for significant levels of misuse, abuse, and fraud within their programs. The Department of Agriculture (USDA) has been criticized for economic development program duplication, for needing to improve their program cost estimates, and to do more to improve collaboration with other agencies. However, USDA evaluation reports are not publicly available. Some of the seminal work on the impact of government R&D (research and development) investment examined USDA programs in the 1950s and 1960s; although Mowery (2014) notes

29 GAO 2001a; 2001b; 2003a; 2003b; 2004; 2006a; 2006c; 2007a; 2007c; 2008a; 2008d; 2008e; 2009a; 2009b; 2010b; 2010d; 2010e; 2010f; 2011b; 2011c.
30 GAO, 2000a; 2007d; 2008a; 2011a.
that this research was conducted at a less complex time.\textsuperscript{32}

The Department of Housing and Urban Development (HUD), on the other hand, has done extensive evaluation work on its programs. Though GAO has noted that HUD programs have, at various times, needed improvement or better evaluation,\textsuperscript{33} GAO also cited HUD as being an example to other agencies for its active culture of evaluation and program improvement.\textsuperscript{34}

Similarly, the GAO noted the Department of Labor’s (DOL) need to improve their evaluation and accountability practices.\textsuperscript{35} The Workforce Innovation in Regional Economic Development (WIRED) program has not received significant GAO scrutiny and does not have many publicly available evaluation reports. However, DOL was also included in the GAO’s report on the duplication of economic development programs.\textsuperscript{36}

Although economic development evaluation metrics and methodologies have improved post-GPRA, GAO still notes the need for more improvement.

Going Beyond Standard Economic Multipliers
One of the most widely accepted methods for assessing economic impact currently is the use of economic multipliers since the additional rounds of spending multiply the impact of any investment. As a result, the total economic activity supported by an investment, based on backward economic linkages, is greater than the dollar amount of the expenditures. However, economic development has greater impact than simple traditional economic impact multiplier effects. Economic development projects create synergies and exponential impacts.

The catalytic nature of economic development can be demonstrated by considering that projects that translate research results in practical applications not only create new firms but can also create entire new industries. These new industries create platforms that have the potential to transform regional economies, positioning them on a higher growth trajectory and fundamentally affecting the types of jobs offered and the skills required, paying higher wages and providing efficiency gains for customers.

Current thinking is that economic development projects are not simply a series of transactions but instead contribute to building an ecosystem or \textit{Rainforest}.\textsuperscript{37} The building of ecosystem capacity can reduce transaction costs and increase knowledge flows, resulting in multiple unexpected outcomes. These are considered to be functional impacts rather than pure economic impacts that accrue as a function of undertaking a project or making an investment at a scale significantly larger than the original investment. It is necessary to move beyond economic impact studies to more fully capture the returns to public economic development investments.

Despite considerable attention and significant public resources devoted to economic development activity there is little agreement about how to best measure outcomes. Economic impact studies use multipliers to address a need to provide a number – a concrete and measurable impact of a project, investment or program. In an ideal world, a robust, accessible economic development indicator could be defined to comprehensively account for the multitude of mechanisms. However, this is far from the case.

Evaluation Challenges for Economic Development
This section enumerates some of the measurement problems inherent in evaluating economic development programs as a prelude to a new approach, which is introduced in the following section.

No Pure Treatment Effects
For EDA programs, and for economic development activity in general, there are no pure \textit{treatment effects}.\textsuperscript{37}

\begin{thebibliography}{99}
\bibitem{GAO1} GAO, 2002; 2007b; 2007d.
\bibitem{GAO2} GAO, 2000c; 2001c.
\bibitem{GAO3} GAO, 2008b; 2008c.
\bibitem{GAO4} GAO 2011a.
\end{thebibliography}
There are no patients to randomly assign to receive medication while others get a placebo.

The returns to economic development are affected by multiple individual decisions, and intervening influence that come from multiple internal actors. Regions are affected by macroeconomic policy changes that, while exogenous, certainly affect regional outcomes in ways that are not entirely predictable.

The highest scientific standard is to discern causality: if A then B. Isolating the effect of a treatment is the gold standard in science and policy. There are some examples of quasi-experiments that examine the impact of subsidized medical insurance on health outcomes or the effects of individual choices such as attending college on lifetime earnings and job satisfaction. It is impossible to attribute an outcome - e.g., an increase in sales of exported goods - to one specific program at the firm level. One of our recommendations is that firm level data be collected for the purpose of evaluating the impact of economic development program participation on client firms, using comparison to a control group.

But for regional economies there are interrelated sequences and processes that make it difficult to link economic development investments to outcomes with any degree of precision.

Complexity
Case studies of the development of regional economies reveal an extremely complex process in which public investment is an important element, but only one of many important elements. Complex systems are notoriously difficult to model. There is no reason to believe that optimizing the performance of any one component of a complex system will optimize or even necessarily improve the performance of the system overall.

Moreover, the amount of funding provided for economic development, while important to recipients, is miniscule in relation to the size of a regional economy. The attribution of good outcomes to specific programs, investments or events is probably more about good luck, publicity, and hype, rather than true causality demonstrated by sound economic analysis.

Selection Effects
The communities that apply for economic development funding appear to be better organized than the average place. The lead organizations for awarded projects are connected to professional networks and are aware of funding opportunities. This heightened awareness combined with higher levels of social capital most certainly differentiate projects that are awarded funding from those projects that do not even apply.

Moreover, successful applicants tend to receive multiple awards. And unsuccessful applicants reapply, often benefitting from feedback from their prior efforts, writing better proposals and ultimately recurring funding.

Of course, awarding good organization makes sense; however, it does complicate evaluation. A related question is, why more communities that might benefit from economic development programs do not apply, and how might they be encouraged.

Portfolio of Economic Development Activity
Evaluation of outcomes is easiest when comparing similar programs or inputs. Economic development engages a wide range of activities from building infrastructure to developing businesses. The EDA projects the Research Team examined are difficult to directly compare and each offers a range of services that are tailored to their specific community and program participants. Appendix A provides an overview of the diverse activities pursued for i6 and JIAC projects. This variety is warranted because the projects serve heterogeneous communities and technologies. Evaluation would be facilitated if the projects offered identical services but that would not advance the mission of the EDA or local economic development officials.

Time Lags in Realizing Benefits
Edwin Mansfield (1991) noted that the temporal lag between an academic research discovery and new product innovation was seven years. Many economists have followed, trying various approaches to estimate

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the temporal lag associated with the realization of benefits from investment in R&D. The consensus is that the time lags between investment in research and realized commercial advances are lengthy, uncertain, and vary significantly among fields. In fact, a National Academy of Science publication observed that, “History...shows us how often basic research in science and engineering leads to outcomes that were unexpected or took many years or even decades to emerge.” 40 Perhaps the best outcome is simply making progress on a variety of measures, with attention to correcting deficits and remediating problems.

The Perils of Success

Often successful efforts to build new companies results in an infusion of venture capital, a merger or acquisition or some other change to ownership that induces relocation. As a result the economic development effects on, for example, local employment are negatively impacted. The result of the efforts that built a successful company can then – by certain metrics – appear as failure.

In reality, the local area has benefited from the example of what is possible for an entrepreneurial company. This might incite others to start companies or invest in early stage activity. The founders may stay in the region and become serial entrepreneurs. Key employees will have learned skills that will benefit their next employer. As a result of the economic development effort that was mistakenly judged to be a failure on employment, capacity in the region for the next round will actually have increased.

A Cautionary Note: We Get What We Measure

The selection of performance measures can distort incentives. Managers strive to improve performance on the measures selected, which can lead to results that are not necessarily compatible with longer-term objectives. For example, by counting the number of jobs created, the incentive becomes promotion of any and all jobs as equal, while the intention is to promote high quality jobs.

There is a tradeoff between experimentation and risk. Economic development is, by its very nature, risky, especially when working with new technologies and start-up companies. The benefits from failure are often underestimated by outcome measures. In fact, Alfred Spector (the Vice President at Google) said “Failure is an important aspect of research. If there is no failure in research projects, then they are not at the right point on the risk-reward spectrum.” 41 Some of the benefits of failure in business ventures include the opportunities to: use those previously-committed resources to produce greater amounts of similar goods or to produce more highly-valued alternatives; increase profits by using cheaper outside suppliers instead of producing certain goods in-house (thus declaring particular business divisions “failures”); and learn from failures as “experimentation is risky, but informative; it is the antecedent to the discovery of new products and techniques”. 42

People v. Place-Based Policy

Some economists are skeptical of place-based economic development strategies, arguing that a tradeoff exists between local gains and national welfare. The contention is that resources are simply being redistributed from one local economy to another and to the detriment of overall national welfare.

A 2009 World Bank Report advocates for a “spatially blind” (or people-based) approach rather than place-based, as the “most effective way of generating efficiency, guaranteeing equal opportunities, and improving the lives of individuals where they live and work.” 43 The report asserts that encouraging people-

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mobility enables people to live in places where they will likely be more economically productive which, in turn, increases individual incomes, productivity, and aggregate growth, and leads to a more even geographical distribution of wealth.\textsuperscript{44}

On the other hand, proponents of place-based approaches to economic development argue that it is necessary to fully understand the local and regional context in order to create development policies that will succeed in a particular area. The place-based approach asserts that one-size-fits-all policies that do not consider the regional context of the area they are trying to assist, may have unanticipated (and potentially negative) consequences.\textsuperscript{45}

There is little empirical work on this topic to guide policy. Theoretical work tends to focus on the default, mathematically tractable assumption of constant returns to scale. However, the major contribution of the new growth theories is to recognize that knowledge benefits from increasing returns to scale rather than the constant or decreasing returns associated with physical commodities.

Activities that create knowledge and the sharing of knowledge create increasing returns that would lead to increased national welfare. But at this point neither theoretical nor empirical economics can address this question. Policy makers cannot afford to wait. As Klein and Moretti conclude, “Second best may, in practice, be very attractive relative to the status quo.”\textsuperscript{46}

The question then becomes understanding how to raise local citizen’s quality of life. This requires a logic model or theory of change to discern the mechanisms by which government investment in economic development can achieve the desired objective. Focusing efforts on estimating impact or rate of return, which despite many sophisticated evaluations, have proven unsatisfactory. Perhaps it is time to consider new approaches.


III. Framework for Economic Development: Logic Model & Evaluation

The U.S. Department of Commerce’s Economic Development Administration (EDA) adopted this definition of economic development to guide their work:

*Economic development creates the conditions for economic growth and improved quality of life by expanding the capacity of individuals, firms, and communities to maximize the use of their talents and skills to support innovation, lower transaction costs, and responsibly produce and trade valuable goods and services. Economic development requires effective, collaborative institutions focused on advancing mutual gain for the public and the private sectors and is essential to ensuring the nation's economic future.*

The ultimate objectives of economic development are prosperity and improved quality of life. Economic development is catalytic in nature, resulting from highly inter-related and reinforcing activities that generate new ideas and breakthroughs that private business activity helps to commercialize. Economic Development is the product of an ecosystem built on reinforcing investments and activities.

Public investment requires not only articulated objectives but also a defined role for government needs. The focus on capacity building harkens back to an older American tradition that began with Alexander Hamilton with government playing a role as a provider of resources and incentives that are beyond the ability of the market to provide. Government is the builder of capacity that allows the private enterprise to flourish.

This foundational framework is used in developing an updated economic development logic model to guide policy makers in evaluating their investments. This is of central interest to EDA given the agency’s recognition that regional competitiveness drives national economic performance. Framing its mission as preparing American regions for growth and success in the worldwide economy, EDA has a role as an important catalyst for economic change given that it is the only federal agency focused solely on private sector job creation and sustainability.47 Robust metrics to evaluate EDA’s economic development investments are therefore essential for understanding the evolution of the agency’s mission in light of the substantial restructuring and competitiveness challenges experienced by U.S. regions and traded industries.

To understand and gauge appropriate measures for economic development requires considering the antecedent mechanisms that lead toward these long-term economic outcomes. Only then can we begin to identify a robust set of metrics for evaluating the effect of public involvement in promoting the agency’s vision.

Logic Model for Economic Development Programs

To strengthen our understanding of regional economic development, it is critical to consider the fundamental layers that comprise the ecosystem of a regional economy. By re-conceptualizing and redefining the outcomes that promote the ultimate visions of regional economic development, we can then determine the robust metrics for systematic analysis.

As an important aside, it is also critical to emphasize discrepancies between the often conflated terms of economic growth and economic development. In simple terms, economic growth places emphasis on increasing the size of the pie while economic development focuses more immediately on improving the ingredients of the pie and then, as a result, increasing the size of the pie over the long-term. The former receives considerably more attention in policy debates and among the public than the latter by placing notable emphasis on short-term performance and outcomes rather than on the

fundamentals that support a more dynamic temporal component that includes longer term sustainability and improvements. Despite popular interest in the former, economic development is centered on a strong foundation to support an economy; this is of central interest for the EDA.

In reviewing the academic and policy analysis literatures, we relied on an inductive approach to define a set of capacities. With quality of life and prosperity as the ultimate goals of economic development investment, we offer a revised set of outcomes—Entrepreneurship, Regional Innovative Capacity, Company Capacity, and Community Capacity. These categories dovetail with The State Science and Technology Institute (SSTI), Resource Guide for Technology-based Economic Development, which considers three major outputs from technology-based economic development: advancement of a state’s or region’s intellectual infrastructure, capital, and entrepreneurial culture. Technology development, while important, is a means to an end not an end in itself. The ultimate objective of prosperity and high quality of life requires considering community, equity and sustainability.

Rather than relying on the existing outcomes, we argue that Community Capacity, Firm and Industry Capacity, Entrepreneurial Capacity, and Innovative Infrastructure better define the central mechanisms and components necessary for regional economic development that promote the vision of prosperity and quality of life. While each outcome defines a unique, yet critical, attribute of a regional economy, collectively they overlap in a complementary manner to capture the breadth of factors central to regional economic development.

The result of economic development is greater prosperity and higher quality of life, but this is realized through four dimensions of capacity outcomes:

**Community Capacity:** The physical, social, and environmental assets that influence the context for economic development.

**Firm and Industry Capacity:** The assets relevant to firms and industry - including workforce, facilities and equipment, organization, and supply chain.

**Entrepreneurial Capacity:** The potential for generating new small businesses, including a risk-taking culture, networks, and access to financial capital and a skilled workforce.

**Innovative Infrastructure:** The capacity to support new products, processes, and organizations, in terms of facilities, support services, and willingness to take risks.

These capacities are overlapping and mutually reinforcing. In sum, they provide the basis for a data-intensive overview of the status of a regional economy and the direction of change. The capacities provide a diagnosis of the prospects for future prosperity and economic wellbeing. They indicate where capacity is strong or increasing and highlight where additional investigation is required to understand roadblocks, stumbling blocks, and information gaps.

The idea is not to come up with a single impact number but to understand and measure the capacity components of the ecosystem. This approach stresses the measurement of changes in a region’s capacities – that is, the quantification of specific attributes associated with generating a stream of outcomes, such as jobs and high earnings, over time.

Factors such as trust among the people in a community, organizational structures that allow for rapid learning and adaptation, or ties between institutions that allow them to work together can be very important for determining regional dynamics and ultimate success of investments. These systems dynamics can be teased out through careful and creative data analysis. After all, if we wish to understand innovative regional economies then economists need to innovate the data we use in our analysis.

The logic model makes no attempt to measure impact, per se, but instead focuses on understanding changes to capacity that underlie economic development and subsequent economic growth. There are no direct linkages or arrows that connect specific programmatic features to outcomes. While it is certainly possible to evaluate economic development efforts at the firm or industry level

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there is no attribution of causality. The emphasis is on considering the component elements of capacity that the literature demonstrates influence economic development, and then measuring elements with quantifiable metrics.

**Focus on Capacity Increases**

In contrast to many other types of evaluation efforts for which the patient gets well or not, or the student passes the test and graduates; economic development is a continual process. One project ends and another begins in a continual quest for prosperity, economic growth and high quality of life.

EDA’s investments are expected to have larger impacts through demonstration effects, inter-firm linkages, and knowledge spillovers that build regional capacity beyond the boundaries of the individual client firm. As a result of government investment, firms engage in new activities offering a demonstration effect that incites other firms, competitors, suppliers, and customers to take notice and change their behavior. At a minimum, attention to operations and sales and marketing will impact related firms in the supply chain. Additionally, government investment creates opportunities for learning and diffusion of knowledge.

This study develops metrics that provide a data-intensive and timely view of the components of capacity in a regional economy. The analysis relies on a variety of third-party data sources that provide an assessment of the direction and magnitude of change. These metrics are useful to the design of economic development projects as they capture the current state and the potential of the innovative ecosystem that surrounds clients and potential client firms.

Given that the majority of these metrics are updated monthly or more often,

49 these metrics provide an up-to-the-minute barometer of activity in an industry and region that can be used as a starting point for understanding: the performance of the regional economy, the degree to which there is progress, or an indication that something warrants further investigation. Our approach stresses the measurement of increases in a region’s capacities – that is, increases in the potential to generate a stream of realized outcomes, such as high quality jobs, that over time lead to increased prosperity and higher quality of life.

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### Table IV.1: 2010 i6 Technology Commercialization and Entrepreneurship Projects

<table>
<thead>
<tr>
<th>EDA Region</th>
<th>Lead Organization</th>
<th>Geographic Focus</th>
<th>Industry Target</th>
<th>Project Name</th>
<th>Project Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta</td>
<td>Global Center for Medical Innovation</td>
<td>Atlanta</td>
<td>Cardiology &amp; orthopedics devices</td>
<td>The Global Center for Medical Innovation (GCMI)</td>
<td>Address critical gaps in the commercialization of medical devices in the fields of cardiology and orthopedics.</td>
</tr>
<tr>
<td>Denver</td>
<td>BioGenerator</td>
<td>St. Louis</td>
<td>Bioscience</td>
<td>Biogenerator: Bioscience Technology Commercialization</td>
<td>Employ a number of novel elements to substantially increase the number of very early-stage local discoveries that enter the commercialization pipeline and whose commercial viability is demonstrated and validated by third party funding, including from investors, corporate contracts, or SBIR awards.</td>
</tr>
<tr>
<td>Austin</td>
<td>Technology Ventures Corporation</td>
<td>Focus on Santa Fe; Albuquerque; Los Alamos</td>
<td>NSF &amp; NIH SBIR awardees</td>
<td>New Mexico Technology Ventures Corporation</td>
<td>Develop infrastructure for the successful maturation of technologies developed under the SBIR program into commercially viable enterprises.</td>
</tr>
<tr>
<td>Chicago</td>
<td>Austen BioInnovation Institute &amp; University of Akron Research Foundation</td>
<td>Akron &amp; NE Ohio</td>
<td>Biomedical and polymer science</td>
<td>Innovative Solutions for Invention Xceleration (ISIX)</td>
<td>Provide a systematic, easily replicable model for increasing innovation and minimizing the time from ideation to commercialization of new technologies.</td>
</tr>
<tr>
<td>Seattle</td>
<td>Oregon Translational Research and Drug Development Institute</td>
<td>Portland</td>
<td>Biotech, Nano Micro-technologies, Green Energy</td>
<td>The Oregon Innovation Cluster</td>
<td>Develop mentoring and business assistance resources necessary to innovators and startup companies, increase gap fund investments, provide internships to a wide range of students and researchers, and attract new investment capital to the state in addition to creating an independent venture-backed accelerator.</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>Innovation Works and Carnegie Mellon University</td>
<td>Pittsburgh</td>
<td>Software Gaming, Internet Aps</td>
<td>Agile Innovation System</td>
<td>Accelerate the commercialization of technologies being developed within a region's universities and small businesses.</td>
</tr>
</tbody>
</table>

Note: Full descriptions for the projects can be found in Appendix A. Detailed data analysis can be found in Appendix B.

### Table IV.2: 2011 i6 Green Challenge Projects

<table>
<thead>
<tr>
<th>EDA Region</th>
<th>Project Name</th>
<th>City of Lead Organization</th>
<th>Industry Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philadelphia</td>
<td>iGreen New England Partnership</td>
<td>Boston</td>
<td>Cleantech</td>
</tr>
<tr>
<td>Atlanta</td>
<td>Igniting Innovation: Florida Cleantech Acceleration Network</td>
<td>Gainesville</td>
<td>Clean technology &amp; energy</td>
</tr>
<tr>
<td>Denver</td>
<td>Iowa Innovation Network</td>
<td>Des Moines</td>
<td>Energy technology and innovation, bio-renewable technology</td>
</tr>
<tr>
<td>Austin</td>
<td>Louisiana Tech Proof of Concept Center</td>
<td>Shreveport &amp; Ruston, LA</td>
<td>Green Technology</td>
</tr>
<tr>
<td>Seattle</td>
<td>Washington Clean Energy Partnership Project - WA Clean Energy Regional Innovation Cluster</td>
<td>Seattle</td>
<td>Clean energy</td>
</tr>
<tr>
<td>Chicago</td>
<td>Proof of Concept Center for Green Chemistry Scale-Up</td>
<td>East Lansing</td>
<td>Green Chemistry</td>
</tr>
</tbody>
</table>

Note: Full descriptions for the projects can be found in Appendix A. Detailed data analysis can be found in Appendix C.
### Table IV.3: Jobs and Innovation Accelerator Challenge Projects

<table>
<thead>
<tr>
<th>EDA Region</th>
<th>Project Name</th>
<th>Geographic Focus</th>
<th>Industry Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seattle</td>
<td>Imperial Valley Renewable Energy Center Development Project</td>
<td>Imperial County CA</td>
<td>Renewable Energy (mainly Solar)</td>
</tr>
<tr>
<td>Atlanta</td>
<td>Space Coast Clean Energy Jobs Accelerator</td>
<td>Orlando; Melbourne &amp; Daytona Beach</td>
<td>Clean Energy</td>
</tr>
<tr>
<td>Atlanta</td>
<td>I3L (Interoperability and Integration Innovation Lab)</td>
<td>Atlanta</td>
<td>Atlanta Health Information Technology</td>
</tr>
<tr>
<td>Chicago</td>
<td>Rockford Area Aerospace Cluster Jobs and Innovation Accelerator Project</td>
<td>Rockford</td>
<td>Aerospace &amp; Advanced Manufacturing</td>
</tr>
<tr>
<td>Denver</td>
<td>Center for Innovation and Enterprise Engagement (CIEE)</td>
<td>Wichita</td>
<td>Advanced manufacturing and material (especially relevant for aviation)</td>
</tr>
<tr>
<td>Denver</td>
<td>KC Regional Jobs Accelerator</td>
<td>Kansas City</td>
<td>Advanced Manufacturing and Information Technology</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>GreenME</td>
<td>Rural ME</td>
<td>Renewable Energy, specifically wood and grass pellet technology</td>
</tr>
<tr>
<td>Chicago</td>
<td>Minnesota’s Mining Cluster – The Next Generation of Innovation and Diversification to Grow America</td>
<td>Arrowhead Region</td>
<td>Mining Materials Recovery &amp; related supply chain</td>
</tr>
<tr>
<td>Denver</td>
<td>St. Louis Bioscience Jobs and Innovation Accelerator Project</td>
<td>City of St. Louis</td>
<td>Bioscience</td>
</tr>
<tr>
<td>Denver</td>
<td>Upper Missouri Tribal Environmental Risk Mitigation (UM-TERM) Project</td>
<td>Native American Indian Reservations</td>
<td>Environmental Technicians</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>Finger Lakes Food Processing Cluster Initiative</td>
<td>Finger Lakes region</td>
<td>Food Processing</td>
</tr>
<tr>
<td>Chicago</td>
<td>Northeast Ohio Speed-To-Market Accelerator (STMA) Project</td>
<td>Northeast Ohio.</td>
<td>Advanced Energy and Flexible Electronics</td>
</tr>
<tr>
<td>Seattle</td>
<td>Portland Regional Clean Tech Advance (CTA) Project</td>
<td>Portland-Vancouver</td>
<td>Cleantech and Advanced Manufacturing</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>Southwestern Pennsylvania Urban Revitalization</td>
<td>Hill District and Homewood</td>
<td>Health Care and Renewable Energy Related</td>
</tr>
<tr>
<td>Atlanta</td>
<td>Advanced Composites Employment (ACE) Accelerator</td>
<td>Knoxville TN</td>
<td>Advanced Composites</td>
</tr>
<tr>
<td>Chicago</td>
<td>Milwaukee Regional Water Accelerator Project</td>
<td>Milwaukee</td>
<td>Fresh Water</td>
</tr>
<tr>
<td>Seattle</td>
<td>Washington Interactive Media Accelerator (WIMA) Project</td>
<td>Puget Sound Region</td>
<td>Interactive Media</td>
</tr>
<tr>
<td>Austin</td>
<td>Launching the ARK: Acceleration, Resources, Knowledge</td>
<td>AR-OK –MO Tri-State</td>
<td>Information technology</td>
</tr>
</tbody>
</table>

Note: Full descriptions for the projects can be found in Appendix A. Detailed data analysis can be found in Appendix D.
### Table IV.4: TAAF Concentrations

<table>
<thead>
<tr>
<th>EDA TAAC</th>
<th>Industry</th>
<th>Geographic Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-America TAAC</td>
<td>Machinery Manufacturing</td>
<td>Kansas City</td>
</tr>
<tr>
<td>Mid-Atlantic TAAC</td>
<td>Fabricated Metal Product Mfg.</td>
<td>Erie, PA</td>
</tr>
<tr>
<td>Western TAAC</td>
<td>Fabricated Metal Product Mfg.</td>
<td>Oakland-Fremont-Hayward, CA</td>
</tr>
<tr>
<td>Mid-Atlantic TAAC</td>
<td>Machinery Manufacturing</td>
<td>Philadelphia</td>
</tr>
<tr>
<td>Northwest TAAC</td>
<td>Plastics &amp; Rubber</td>
<td>Portland</td>
</tr>
<tr>
<td>Mid-Atlantic TAAC</td>
<td>Fabricated Metal Product Mfg.</td>
<td>York – Hanover</td>
</tr>
<tr>
<td>Mid-Atlantic TAAC</td>
<td>Machinery Manufacturing</td>
<td>York – Hanover</td>
</tr>
</tbody>
</table>

Note: See Stage III TAAF Report for additional details. Detailed data analysis can be found in Appendix D.
Table IV.5: Metrics Construction: Definitions Used for Industry & Geography

<table>
<thead>
<tr>
<th>Metric</th>
<th>Data Source</th>
<th>Update Frequency</th>
<th>Industry Definition</th>
<th>Geography Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Networks</td>
<td>LinkedIn</td>
<td>Daily</td>
<td>Keywords</td>
<td>Greater (city name)</td>
</tr>
<tr>
<td>Dealmakers</td>
<td>Capital IQ</td>
<td>Weekly</td>
<td>GICS \textsuperscript{50} &amp; Keywords</td>
<td>Firm Address</td>
</tr>
<tr>
<td>Cluster Identity</td>
<td>LexisNexis</td>
<td>Weekly</td>
<td>Keywords</td>
<td>City/Region</td>
</tr>
<tr>
<td>Skills &amp; Job Availability</td>
<td>WANTED Analytics</td>
<td>Daily</td>
<td>Keyword</td>
<td>MSA \textsuperscript{51} or county</td>
</tr>
<tr>
<td>Regional Industry Vitality</td>
<td>ReferenceUSA</td>
<td>Continuously</td>
<td>NAICS\textsuperscript{52} &amp; Keywords</td>
<td>Firm Address</td>
</tr>
<tr>
<td>Value Chain Augmentation</td>
<td>ReferenceUSA</td>
<td>Continuously</td>
<td>NAICS &amp; Keywords</td>
<td>Firm Address</td>
</tr>
<tr>
<td>New Contracts: Federal Spending</td>
<td>USASpending.gov</td>
<td>Monthly</td>
<td>NAICS &amp; Keywords</td>
<td>City</td>
</tr>
<tr>
<td>Private Investment</td>
<td>Capital IQ</td>
<td>Weekly</td>
<td>GICS</td>
<td>Firm Address</td>
</tr>
<tr>
<td>New Firm Entry</td>
<td>ReferenceUSA</td>
<td>Continuously</td>
<td>NAICS &amp; Keywords</td>
<td>Firm Address</td>
</tr>
<tr>
<td>Small Business Innovation Research (SBIR) Awards</td>
<td>SBIR/STTR Database</td>
<td>Continuously</td>
<td>Awarding Federal Agency</td>
<td>Recipient Address</td>
</tr>
<tr>
<td>Venture Capital Investment</td>
<td>NVCA Yearbook, 2014</td>
<td>Annually</td>
<td>None</td>
<td>Recipient State</td>
</tr>
<tr>
<td>Mergers &amp; Acquisitions</td>
<td>Capital IQ</td>
<td>Weekly</td>
<td>GICS &amp; Keywords</td>
<td>Firm Address</td>
</tr>
<tr>
<td>Public Offerings, including IPOs &amp; Shelf Registrations</td>
<td>Capital IQ</td>
<td>Weekly</td>
<td>GICS &amp; Keywords</td>
<td>Firm Address</td>
</tr>
<tr>
<td>R&amp;D Expenditures at Universities &amp; Colleges</td>
<td>WebCaspar</td>
<td>Annually</td>
<td>Funding Agency &amp; Academic Discipline</td>
<td>Institution Address</td>
</tr>
<tr>
<td>Patents &amp; Patent Collaboration</td>
<td>Thomson Reuters Scientific\textsuperscript{53}</td>
<td>Weekly</td>
<td>CPC\textsuperscript{54} &amp; Keywords</td>
<td>Assignee Address</td>
</tr>
<tr>
<td>New Product Announcements</td>
<td>ThomasNet</td>
<td>Daily</td>
<td>Keywords &amp; Product/Supplier Categories</td>
<td>Firm Address</td>
</tr>
<tr>
<td>New Trademarks</td>
<td>U.S. Patent and Trademark Office</td>
<td>Weekly</td>
<td>Keywords &amp; USPTO Classification</td>
<td>Firm Address</td>
</tr>
</tbody>
</table>

\textsuperscript{50} The global financial community uses global Industry Classification Standard (GICS) taxonomy, which was developed by Standard & Poor’s.

\textsuperscript{51} Metropolitan statistical area (MSA) is a geographical region with a large city at its core and close economic ties throughout the surrounding area. The Office of Management and Budget (OMB) define MSAs.

\textsuperscript{52} The North American Industry Classification System (NAICS) is used to classify business establishments according to type of economic activity and is used extensively by the federal government.

\textsuperscript{53} This is an interface that was available to this study that provides a platform to analyze data provided by USPTO.gov.

\textsuperscript{54} The Cooperative Patent Classification (CPC) system is a joint partnership between the United States Patent and Trademark Office (USPTO) and the European Patent Office (EPO) to harmonize patent categorization.
IV: Study Methodology

This study examined three EDA programs: the i6 Challenge; Jobs and Innovation Accelerator Challenge (JIAC)\textsuperscript{55}; and, the Trade Adjustment Assistance for Firms (TAAF). Stage II of this project built a database of the i6 and JIAC projects. Stage III examined the TAAF program. Detailed assessments of each program can be found in separate Stage III reports.

Data collection methods included reviews of original proposals and quarterly reports, review of online and printed materials, and site visits and interviews. The Research Team contacted each of the EDA funded grant recipients to request information and documentation on their project, including the names and addresses of clients firms with whom they provided services or technical assistance.

The metrics data exercise required decisions about industry and geographic focus in order to be implemented. There is great heterogeneity among the projects, reflecting local context and capabilities. The Study Team reviewed the proposal and examined the lists of client firms who had been provided services. We engaged in conversations with the project lead organizations to help define the geographic and industry scopes for each project. The purpose was to understand the range of projects for illustrative study purposes.

This section documents our definition of the industrial and geographic scope for each project. The metrics collected for each program are provided in the Appendices. This section then examines the industrial and geographic detail provided by the metrics data sources and the methods used to align projects with data sources. This section concludes with a project typology that will be used subsequently to discuss the interpretation and utility of each metric.

Refer to Table IV.1: 2010 i6 Technology Commercialization and Entrepreneurship Projects on Page 13

The i6 Challenge

The i6 Challenge funds the creation and expansion of Proof of Concept Centers to: accelerate entrepreneurial thinking among innovators and researchers; assist entrepreneurs and startup companies; develop a network of experts to support entrepreneurs and new ventures; and spark future job creation and economic growth across the U.S.\textsuperscript{56} The Study Team examined the 2010 Technology, Commercialization & Entrepreneurship awarded project, and the 2011 i6 Green Challenge. There is one project in each of the six EDA regions for each competition.

Table IV.1 provides a listing of the 2010 Technology, Commercialization & Entrepreneurship awarded projects, along with their EDA region and lead organization.

Each project has an industry/technology focus. Some of the materials were very specific about focus. For example, the Global Center for Medical Innovation specified cardiology and orthopedic devices, which was broadened to medical devices. This is a well-established industrial category. Other projects, notably The Oregon Innovation Cluster, focus on a range of technology-intensive emerging industries, including biotech, nanotech, micro-technologies and green energy. Agile Innovation System, a joint venture of Innovation Works and Carnegie Mellon University, had a focus on

\textsuperscript{55} The research team was primarily interested in i6 and JIAC projects funded by the EDA. The i6 and JIAC programs, however, are part of interagency programs in which multiple agencies – including NSF, NIH, SBA, and ETA, respectively – may fund a grantee. This study is only considering those grantees where EDA contributed funds.

\textsuperscript{56} \textit{i6 Challenge: Office of Innovation and Entrepreneurship}, Economic Development Administration.
software, gaming and internet apps. While software and gaming are able to be categorized, the technology focus of the client firms suggests new emerging activity that used a new digital platform. This type of emerging activity is difficult to assign to an existing industrial category but presents potentially high value creative activity. Innovative Solutions for Invention Xceleration (ISIX), which was one of the research team’s first site visits, also covers emerging activity at the intersection of medicine and new materials, blending two traditional strengths of Northeast Ohio. Finally, the New Mexico Technology Ventures Corporation does not have a specific technology or industry focus but targets firms that have received NSF and NIH SBIR awards, as candidates for rapid growth.

To discern the geographic focus, we reviewed client lists and limited our analysis to the locations with the greatest concentrations of firms. For example, the New Mexico Technology Ventures Corporation has a focus that encompasses the entire state; however 92% of the client firms are in Albuquerque (63%); Santa Fe (17%) or Los Alamos (12%). For the analysis, the Research Team focused on these three cities rather than the entire state.

Refer to Table IV.2: 2011 i6 Green Challenge Projects on Page 13

Table IV.2 provides a listing of the 2011 i6 Green Challenge, which focuses on the emerging green technology sector. No standard and generally accepted definition of green technology is available, which complicates the definition of the industry. Our strategy was to use text mining for keywords in data sources. The 2011 i6 projects do have slightly different orientations under the umbrella of green technology. For example, iGreen New England Partnership focuses on cleantech, while the Iowa Innovation Network has a focus on bio-renewable technology.

Moreover, many of the projects are described as virtual proof of concept centers, with geographically distributed projects. For these projects the expected capacity benefits were expected to accrue to the city where the lead organization was located. This assumption was verified by examining the location of client firms.

Refer to Table IV.3: Jobs and Innovation Accelerator Challenge Projects on Page 14

The Jobs, Innovation Accelerator Challenge (JIAC)
The JIAC program provides grants to promote high-growth regional industry clusters. In cooperation with a number of other federal agencies, EDA funded 20 JIAC projects in 2011. The key objectives of the JIAC program are to: accelerate the formation of new high-growth businesses, the growth of existing businesses and the creation of high-wage jobs; support the deployment of new processes, new technologies and new products to grow sales and create jobs; increase exports and business interaction with international buyers and suppliers; advance the commercialization of research, including federally funded research; enhance the capacity of businesses in the cluster, including small and disadvantaged businesses; develop the skilled workforce needed to support growing clusters; and ensure diverse workforce participation in clusters through outreach, training, and the creation of career pathways.

Table IV.3 provides detail on the 20 JIAC projects we studied. Projects focus on emerging industries that defy conventional categorization. For example, the Milwaukee Regional Water Accelerator Project focused on technologies to provide fresh water, which is recognized as a global challenge. Certainly, this is a high opportunity industrial focus that defied standard industrial classification. The research team identified keywords associated with the project proposal and materials and relevant to the activities of client firms. This was a creative exercise and the project managers, who have greater understanding of the technology, would be in a better position to delineate specific terms. Text mining of the key terms was then used to construct the metrics.\(^{57}\)

Projects also focused on infusing new technologies into established sectors. For example, the Minnesota Mining Cluster is introducing new recovery techniques to increase efficient resource use in a very mature industrial sector. The research team felt that, while

\(^{57}\) Specific search terms used depend on the source. The search terms for JIAC are described in Appendix D.
mining is a well-established and easily tractable industrial category, it would not adequately capture the activities of this project.

To define geographic coverage for each project we examined project materials and client lists. In some cases the project geographic coverage was large. The Minnesota Mining Cluster covers the Arrowhead Region in Minnesota, which runs from Duluth, 150 west to Canadian Border and includes the Northeast part of Minnesota (Aitkin, Carlton, Cook, Crow, Itasca, Koochiching, Lake and St. Louis Counties). Different data sources use different geographic definition, which will be covered in the next section. Program managers have a better understanding of their catchment area. The Research Team spent much time with Google maps, trying to understand the most appropriate geographic units to analyze. There appears to be a discrepancy between the political necessities of including a large geographic unit and the natural limits of geographic clustering.

The Southwestern Pennsylvania Urban Revitalization Project had a very specific geographic focus on the Hill District and Homewood Neighborhoods in the City of Pittsburgh. These projects focus on specific zip codes, which the analysis could accommodate.

Refer to Table IV.4: TAAF Industry Concentrations on Page 15

Trade Adjustment Assistance for Firms (TAAF)

The Trade Adjustment Assistance for Firms (TAAF) program predates EDA by providing services to firms adversely affected by international trade. The TAAF program supports a national network of 11 independent/non-profit or university-affiliated Trade Adjustment Assistance Centers (TAACs), who work directly with firms in their regions through a public-private partnership in which federal funds and firm resources are combined to support the implementation of a business recovery plan (adjustment proposal). Client firms work with consultants to implement a series of projects aimed at increasing efficiency and sales.

Efforts that engage client firms and consultants may certainly build capacity within regions, especially when client firms are concentrated within an industry and location. The Research Team identified seven geographic and industry concentrations for examining the use and utility of metrics for traditional manufacturing clusters.

Table IV.4 provides the industry and geographic concentrations of TAAF manufacturing clients we examined. Data provided by the TAACs provided the basis for the identification of the TAAF concentrations, as detailed in our Stage III report. The TAACs track 6-digit NAICS, a very specific categorization. Our analysis used three-digit NAICS for the TAAF industry definition. Six of the 11 TAACs provided client firm zip codes, which were aggregated to MSAs.

Refer to Table IV.5: Metrics Construction: Definitions Used for Industry & Geography on Page 16

Overview of Data Sources

The Research Team attempted to economize on the number of data sources used and the cost of data sources as a refinement to the work for this phase of the project. Full descriptions of the data sources are available in the Phase II Pilot Study and are briefly summarized in the following section and the accompanying Appendices.

Some of the sources analyzed are freely available on the internet. These include:

- LinkedIn (Social Networks);
- USA Spending (New Federal Contracts);
- Small Business Innovation Research (SBIR) Database (SBIR/STTR Awards);
- National Venture Capital Association (NCVA) Yearbook (Venture Capital Investment);
- WebCASPAR (Research and development expenditures at Colleges and Universities);
- U.S. Patent and Trademark Office (USPTO) Patent & Patent Collaborations; Trademarks); and

Other sources require a subscription. These include

- Capital IQ (Dealmakers; Private Investment; Mergers and Acquisitions; Public Offerings);
- ReferenceUSA (Regional Industrial Vitality; Value Chain Augmentation; New Firm Entry); and
- Wanted Analytics (Skills and Jobs Availability).
Table IV.5 lists the metrics, provides the respective data sources and the categories available for defining geography and industry. The level of accessible detail in each data source is noted; this indicates the geographic unit for which data are available for analysis.

Defining Geographic Focus
The majority of the sources have data available for individual firms by address, which allows for great flexibility in defining a project’s geographic area. Firm address can be geocoded to get a precise overview of the spatial configuration of firm for a given activity. For example, geographic information systems can locate firms that have filed for patents, introduced new products or been granted trademarks so that project lead organizations can connect and possibly include them in activities.

Most of the sources used provide the zip code in the address of individual firms or institutions, which can be useful in mapping the geographic distribution of activity. Zip codes can easily be aggregated to county or Metropolitan Statistical Area (MSA) using standard statistical software.

Wanted Analytics does provide information at the level of zip code but the relevant area for this metric is the labor market area, which is best captured at a higher level of geographic aggregation, such as the MSA or group of continuous counties.

Industrial Focus
Classification codes are listed in Table IV.5 to offer insight on the data source’s compatibility with other data sources. Many of the sources use unique classification schemes although crosswalks can be found back to NAICS, the government standard classification. Our approach was to investigate alternative schema in different metrics. These could be vetted with project managers and refined over time.

Text mining through keywords is another way that we identified data for the metrics. Most of the sources provide text that can be examined or “mined” to fit the descriptions of targeted projects using keywords or phrases. The search terms used can be customized to fit specific projects. The Appendix details the terms used by the Study Team for each project.

A Note on Timing of Capacity Increases
For ease of analysis, we define 2006 – 2009 as a pre-project period and 2010 – 2013 as the project period, providing four-year blocks of time. This uses data through the end of calendar year 2013. Of course, 2008 – 2009 were the years of the recession, which certainly affects our indicators, although the precise potential bias is difficult to discern. For example, firms may have accelerated new product announcements in 2008-2009 to booster sales while curtailing R&D during that time, resulting in fewer introductions during the recovery.

There appear to have been temporal lag between the announcement of the project award and the first expenditures that enable a project to make progress towards implementing programs and having impact. Any delays in the receipt of funding will certainly affect the timing of the realization of any capacity increases.

Analytic Project Categories of Metrics Assessment
To synthesize the analysis the Research Team noticed patterns that suggested categories to gauge the usefulness of the metrics and to make suggestions for the uses of data in different circumstances.

The analysis uses three technology/industry categories:
- Technology Intensive industries
- Emerging Industries
- Manufacturing Industries

And three categories for places:
- Cities
- Smaller (& Rural) Areas
- Distressed Regions

These six categories will be used in the analysis of the utility of the metrics that follows. Technology intensive industries have standard and generally accepted definitions. For example bioscience or medical devices are more easily defined in the various classification schemes. Both the Global Industry Classification Standard (GICS) taxonomy which was developed by Standard & Poor’s and the USPTO patent classification schemes have definitions that are widely used.

Other industries that are the focus of economic development are still emerging and lack standard definition. The most common emerging industry in the projects we analyzed was the Green sector. Projects use
a plethora of terms to describe their activities, while there was no agreement in the academic or policy literatures. The analysis relied on keywords and text mining to define emerging sectors. Emerging industries have the greatest transformative potential.58

Manufacturing is the third category considered. Manufacturing is well studied and more easily classified using standard definitions such as NAICS. The TAAF projects were in traditional manufacturing industries while some of the JIAC projects incorporated manufacturing industries.

Of course, the aforementioned categories are not necessarily mutually exclusive: it depends on how the project is defined and the precise focus. For example, a project may be defined as biotechnology, a standard technology intensive, yet the companies may be pursuing a cutting edge emerging technology focus. Or a project might appear to be focused on manufacturing while using new technology in innovative ways. Our purpose is not to categorize projects but to offer insights about how metrics and data can be used for analysis in economic development and assist in project planning and achieving outcome.

Geographic breakdowns such as urban and rural are more straightforward and are mutually exclusive. Cities are a category for which economic activity is dense and data are readily available. There is less data available for smaller and more rural areas. Distressed areas can be either rural or urban. One strategy that would increase the usefulness of the metrics and assist in economic development is to identify how these projects fit into the national hierarchy of places and global value chains.

V. The Utility of Capacity Metrics for EDA Projects

This section evaluates the Capacity Metrics and offers recommendations on their utility. The analysis considers the metrics analysis, which was provided in the Appendices. Appendix B considers the 2010 i6 Challenge; Appendix C considers the 2011 i6 Green Challenge; Appendix D considers the 2011 JIAC projects; and, Appendix E considers the TAAF program.

Community Capacity

Community Capacity captures social capital, which is elusive to measure but critically important for economic development. Our considerations focus on economic activity, and include:

- Social networks
- Dealmakers
- Cluster Identity

Community Capacity may also be expanded to measure the social, civic and environmental quality of the community and general population, as developed by the EDA-funded Initiative on Triple Bottom Line Development at Portland State University.

Social Networks

Online presence, particularly through social media, provides opportunities for an organization to engage with its community and also for individuals to identify with an organization, industry or activity. Larger social networks are associated with greater problem-solving ability, increased collaboration, and higher productivity.

Participation in professional online social networking sites provides a metric of the degree of connectivity and the capacity of the social network. To measure social networks the Research Team used LinkedIn, a free online site that is updated daily, with over 250 million members, 3.6 million company pages, and 2 million interest group pages. In a study that examined six months of data on the average time spent on social media websites, the average number of pages per visit, and the average bounce rate, LinkedIn was rated the Social Media website with the third most highly engaged visitors (ahead of Facebook and Twitter).59

The data analyzed provides a snapshot of the social network, which can be used as a baseline to assess growth in the number and types of local participants. Over time, the size and degree of connectivity should increase for the focal organizations or industry clusters targeted by economic development.

Many distressed communities, especially in rural areas, lack online presence, which can be due to a lack of resources. Alternative methods to measure social capital in distressed communities could be explored.

The majority of the i6 and JIAC lead organizations had online profiles or group pages. The number of individuals who identified with the project varied significantly and did not appear to correlate with city size. All industrial sectors had online social networks, including manufacturing. For emerging industries it is possible to use keywords to identify firms with related activities and individuals with related experience to include in program activity.

Recommendation: This metric is low-cost and has utility for tracking economic development capacity changes. The underlying data would be useful to program activities. A simple on-line presence would help coalesce a community of common interest around a project. Any increase in the number of LinkedIn members would signal an increase in the social network.

Dealmakers

Dealmakers serve as a proxy for social capital by visualizing the degree of interlock between local

Most individuals in a regional economy function in only one role, either as founder, executive, manager, or board member. We define Dealmakers as highly connected individuals with concurrent affiliations with multiple firms within the regional economy. These are the individuals who can easily make connections between firms.

This metric assesses social capital by relying on the key individuals that serve as the backbone of the local economy. Increasing the number of individuals with multiple firm affiliations is expected to intensify the potential for knowledge flows and information sharing.

The Research Team used Capital IQ, a proprietary data source maintained by Standard & Poor’s. This source provides one of the most comprehensive cross-sectional datasets for public and private U.S. firms, with information on the key individuals associated with firms. This information is used to examine the interlock between companies and sectors in the regional economy. Data are updated weekly but this analysis is perhaps best updated at annual increments to perceive changes in the network structure.

Figure V.1: Social Capital Network in Wichita

Contrast the Wichita network with the Pittsburgh network in Figure V.2. Although the two cities have similar populations their network configurations reveal different levels of social capital and connectivity. The software industry, which is the focal industry for the 2010 i6 Agile Innovation System project (again shown in red), is highly connected to the main network, which is more densely populated.

Figure V.2: Social Capital Network in Pittsburgh

The dealmaker metric serves as a diagnostic that measures the degree of inter-firm connectivity for a region and industry. Increases in the density of the network would increase information flows and social capital. The algorithm enables an identification of companies and individuals, whom economic
development officials may wish to engage in projects. The data cover all geographic regions and industries. The research team recommends comparing the social capital network with supply-chain mapping in a specific geographic area to better understand how firms link versus the relationship across individuals.

Recommendation: This metric is a point of departure for measuring social capital and has strong potential to measure increases in capacity. It is possible to identify key individuals in the local economy and to make connections within sectors.

**Cluster Identity**

Citations to the name of a regional industrial cluster can provide a proxy measure of the branding of places to define an identity. Changes in the frequencies of citations reflect changes in public awareness of the cluster.

Data on newspaper mentions of cluster names are available through LexisNexis. LexisNexis offers the most central repository of media publications; it has the full text of articles from more than 2,500 large national and international newspapers and more than 300 regional and local U.S. newspapers. Broadcast transcripts and blogs are included. Files are updated daily, weekly or monthly as material becomes available. The Research Team took a second step as part of this cluster identification metric. The word documents generated from the LexisNexis searches were input to TagCrowd to generate a word bubble image (as seen in Figure V.3), which visually describes the frequency of word use and proximity of terms used together.

This method provides a quick visual barometer of how the region and industry are portrayed. We examined two time periods: before the projects began and after project completion. The results, presented in the Appendices, reveal that the number and types of mentions changed over the course of the project, both increasing and decreasing. A decrease in press coverage would warrant further investigation.

This metric is less useful for emerging industries and for smaller cities and depressed regions. For manufacturing industries and for technology-based projects there were significant results.

Recommendation: This metric provides a diagnostic about the way the industry and region are perceived in the media. It is perhaps most useful for project monitoring rather than planning or evaluation. Our advice is for project managers to delve more deeply into content provided by the LexisNexis media search and use the TagCrowd Diagrams for illustrative purposes.

**Firm & Industry Capacity**

The vitality of regional and national economies rests in a fundamental way on the capacities of existing firms and industries. Firms draw on resources from their external environments to effectively overcome challenges. Understanding the health of an economy, therefore, requires an understanding of the strength of existing firm and industry capacity and the resources that

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support production and exchange. While much emphasis is often placed on the initial startup of new firms, this capacity considers:

- Skills and Job Availability
- Regional Industry Vitality
- Value Chain Augmentation
- New Contracts: Federal Spending
- Private Investment

Skills and Job Availability
Tracking the demand for occupational skills through job postings provides an appreciation of newly emerging industrial activity, as well as an understanding of how industrial structure is changing. Data on labor supply – including job seekers’ education, skills, and experience – are valuable for assessing a region’s human capital. Resumes provide the content for these data points. This, coupled with data on labor supply – including detail on what employers are looking for in employees – offers a comprehensive view of regional labor market characteristics and dynamics. Updates are made daily, allowing real time tracking of labor market change.

The WANTED Analytics tool, which is updated daily, is designed to support customized data queries to produce a Talent Sourcing Report for a comprehensive overview of the job market for the industry and location specified – including the Local Hiring Scale (a measure of how difficult the position is to fill based on market conditions – 100 being most difficult and 1 being least difficult), Salary, Average Posting Period, Candidate Supply Count, Skills and Certifications in Demand, Heat Maps (offering national comparisons), Competition for Talent, Common Job Titles and Sample Profiles. Comparison with other cities and industries are presented in graphic format.

The hiring scale and median salary were available for all the geographies we examined. There is coverage for small cities and distressed areas. Detailed Talent Sourcing reports were readily available for technology-based industries and manufacturing industries. It is also possible to search for specific skills/certifications and to assess the degree to which job seekers match job openings.

Emerging industries, which lack precise definition, presented more of a problem for the Research Team. However, local economic development officials who have better understanding of specific key terms could calibrate reports to their activities. Manufacturing industries have good coverage.

Recommendation: The quality and availability of jobs is of central concern for economic development. These data would facilitate project planning and monitoring. Often a lack of skilled labor limits the growth of firms and industries. These data provide information for engaging in talent development and recruitment. Moreover, these data enable tracking of the direction of wages and skill requirements in the local economy.

Regional Industry Vitality
Regional Industry Vitality measures the strength of the local concentration of firms. By examining this metric over time, increases in the strength of the cluster can be measured.

The Research Team used the Historical Businesses database, a product of Reference USA that incorporates customizable regions and tracks establishments. This is a comprehensive source for which data are updated continuously. One of the potential challenges with using ReferenceUSA as a data source is that they do not maintain long-term information about closed firms; every six months they purge information about closed firms so the database has lost some of the information regarding firms that have not survived. An alternative to ReferenceUSA could be the Longitudinal Employer-Household Dynamics data.

This measure helps local developers to understand industrial activity in the region: it is easy to gauge the

62 An annual subscription for WANTED Analytics for a university library was quoted at $9,000 for the first year and $3,000 annually thereafter.

63 ReferenceUSA explained this to the Department of Commerce during a presentation, as shared with the UNC Research Team by EDA staff on July 3rd, 2014.
number of establishments\textsuperscript{64} and employment and to track changes over time. All of the projects examined had representation using this measure and all had a net increase in number of establishments from 2010 to 2014. Of course, these increases may reflect the timing of the end of the national recession and cannot be attributed to the EDA funded projects directly. At best, firm vitality increased in the industry and region for all the projects, signaling increased capacity.

Moreover, it is possible to examine the constituent firms in an industry and region. This provides a listing of firms that might be targeted for membership in cluster organizations, which could be used to estimate the market penetration of a lead organization.\textsuperscript{65} Using data collected for this metric it is possible to calculate an index that uses the number of individuals or organizations that identify with a project as the numerator with the denominator as the total employment or establishment in the focal industry and geography.

Recommendation: These data on the number of establishments and employment provide a simple and straightforward metric of regional industrial vitality and good coverage for all regions.

**Value Chain Augmentation**

Vibrant local value chains drive economic development by increasing the exchange of market relevant information and creating efficiencies between firms that have supply and distribution relationships. The value chain identifies the supporting industries with the closest linkages to the targeted industry, and then measures the changes in these industries.

To quantify the economic health of the value chain, the industries with backward and forward linkages to a specific industry can be measured. For example, and at the simplest level, a change in the number of establishments or employment in linked industries in a region provides information of how an industry is situated within larger relationships. There was significant variation in the projects the Research Team examined.

Value chains provide a means to identify and address local deficiencies.\textsuperscript{66} The analysis presented here used national input-output tables but the value chain could be constructed locally.\textsuperscript{67} Please see Figure V.4 for a visual example of a value chain. RefUSA, updated continuously, was a valuable tool because it allows for customizable regions.

Identified deficiencies in the value chain may suggest: the use of strategic incentives to attract firms to relocate and become part of the local value chain; opportunities for entrepreneurs; or useful information for trade missions. While firms benefit from these proximate relationships there is often a lack of information about ways that firms can work together.

The importance of local buyers and suppliers vary by industry but all firms are situated with value chains. Proximate value chains may be more important for manufacturers, who depend on suppliers. Indeed, Pisano and Shin (2012) argue for closer ties among American manufacturing firms.\textsuperscript{68}

Constructing a local value chain is perhaps most valuable for small places and distressed economies. Value chain analysis has become well established in international development planning but appears less well used in communities in the United States.

Recommendation: The Value Chain Augmentation metric is useful to assess the development of the value chain for the industry that is the focus of a project. This metric has utility for project planning, monitoring and

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\textsuperscript{64} An establishment is a single physical location where business is conducted or where services or industrial operations are performed. Firms can have multiple establishments.

\textsuperscript{65} We found great variation in the definitions of client firms among the EDA funded projects, which seems appropriate given the range of activities provided.


\textsuperscript{67} An example of a locally constructed value chain for the North Carolina Textile Industry can be found at http://www.nctextileconnect.com/value_chain.cfm.

evaluation purposes. Increases in the value chain would signal increased competitiveness.

Figure V.4: Example of a Value Chain: NC Textile Industry

Source for this graphic is Stacey Frederick, NCSU College of Textiles.
New Contracts: Federal Spending
New contracts demonstrate one measure of local firm’s ability to successfully compete. The Federal Funding Accountability and Transparency Act of 2006 requires that the details of federal funding be made available to the public. No such data exists for non-federal sources, so this data provides a window into firms’ success. USAspending.gov provides information about federal funds awarded. Access is free and data are updated every 30 days.

Government procurement is an important lead user for new technology that supports open innovation and promotes innovation.⁷ Government contracts provide a stable revenue source that is important for small and medium sized firms.

Given the typically high level of competition for federal funds, organizations selected to receive funding must effectively demonstrate their capacity and ability to successfully use agency funds. Thus, the award of federal funding seems to be a great indicator of an individual firm’s competitiveness that scales when awards are aggregated to regional industries.

This indicator was available for all the types of industries and geographic regions considered. Project names and abstracts are available along with the funded amount and the funding agency.

Recommendation: These data are useful as an indicator of regional expertise that signals increases in capacity. The underlying data are free and easy to access and download for analysis with standard software packages.

Private Investment
New private investments signify capacity increases with an expectation for future growth in productivity, employment and value added. Data on aggregate investment by sector and location are generally not publicly available; a more viable strategy is to start from company-level information and to aggregate to the focal project.

The Research Team used data from Standard and Poor’s Capital IQ platform. Capital IQ, updated weekly, is one of the more comprehensive data sources on private firms available in the United States, capturing those that have received bank, private-equity or venture capital financing. It tracks location and identifies classes of activity.

Because this metric relies on company-level reports, gathering and summarizing these data is rather laborious work, further complicated by the lack of NAICS codes in the data. However, these data provide the best window on changes in the investment profile of a cluster.

Recommendation: Growth in investment is indicative of the prospective performance of a region and industry. By examining investment before, during and after economic development program interventions, it will be possible to draw some conclusions about the potential impacts of these government programs on the broader economic vitality of the regional economy.

Entrepreneurship Capacity
The capacity to support entrepreneurial activity is becoming increasingly important to economic development. The identification of opportunity, organization of resources to exploit opportunity, and the realization of meaningful value is the consensus definition of entrepreneurship. Value may be realized through the creation of new firms as well as other types of social activities. Entrepreneurial capacity is certainly related to firm and industry capacity but captures earlier stage activity. Metrics include:

- New Firm Entry
- Small Business Innovation Research (SBIR) Awards
- Venture Capital Investment
- Mergers & Acquisitions
- Initial Public Offerings

New Firm Entry
New firm formation indicates expansion of economic activity. The entry of new firms signals perceived opportunity. Although new firm formation does not ensure long term survival, these actions point toward

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an increase in industrial capacity in the area. A larger concentration of firms in an industry should convey the benefits of agglomeration activity.

The Research Team used the U.S. New Businesses Database, a product of ReferenceUSA, which tracks companies that were formed within the past two years throughout the United States.\(^71\) This online subscription tool is updated continuously. The databases of ReferenceUSA, including its historic files, do not maintain long-term information about closed firms; every six months they purge information about closed firms so the database has lost some of the information regarding firms that have not survived\(^72\).

Recommendation: This metric did capture new firms for all of the projects examined. There was coverage in small communities and in rural areas. All types of industrial sectors were included.

A next step would be to vet this information against other sources. ReferenceUSA is gaining popularity as a source for studying new firm entry for academic studies, addressing a long articulated need for better data on new firm formation.

Small Business Innovation Research (SBIR) Awards

Growth in funding for firm research indicates the development of capacity. Data on private research funding are more difficult to track, especially for privately held small (and entrepreneurial) companies. The federal SBIR program is a well-known, competitive program sponsored by 11 federal agencies.\(^73\) The objective is to provide competitive extramural R&D funds to small businesses for proof-of-concept demonstration and product development as they move toward commercialization. Moreover, SBIR awards are highly competitive and draw attention to firms and are demonstrated to produce a \textit{halo effect} or even additional investment.\(^74\) SBIR awards enable a measure of innovative capacity but moreover reflect entrepreneurial efforts.

SBIR has a long history of funding fast-growing firms and these data provide a means of identifying firms with growth potential. The \textit{New Mexico Technology Ventures Corporation} focuses its client services on assisting SBIR awardees.

The SBA maintains a web-based repository of SBIR award data that is easily queried, downloaded and analyzed with standard statistical software. SBA continually updates this database on a rolling basis. There is less activity in smaller cities and in traditional manufacturing industries.

Recommendation: These data provide insights into new firms that have received funding to develop a new technology. Increasing the number of awards would

\(^71\) The US New Businesses Database allows access to data similar to the Census Bureau BDS data without the confidentiality restrictions of the BDS data.

\(^72\) ReferenceUSA explained this to the Department of Commerce during a presentation, as shared with the UNC Research Team by EDA staff on July 3\(^{rd}\), 2014.

\(^73\) The 11 federal agencies that participate in the SBIR/STTR program include: Department of Agriculture, Department of Commerce (National Oceanic and Atmospheric Administration and National Institutes of Standards and Technology), Department of Defense, Department of Education, Department of Energy, Department of Health and Human Services, Department of Homeland Security, Department of Transportation, Environmental Protection Agency, National Aeronautics & Space Administration and National Science Foundation.

indicate that firms in the region are producing competitive technology.  

**Venture Capital Investment**

Venture capital finances entrepreneurial firms with high growth potential. Information on venture capital activities is scarce, and when it exists it is less detailed. Moreover, venture capital is concentrated in a few locations in the U.S. This study describes the number of venture capital deals and their value using the National Venture Capital Association’s 2014 Yearbook. These data are readily available and updated annually, yet they are neither region- nor industry-specific. Better data may exist, from such sources as Thomson Reuters (specifically ThomsonOne), though it would be extremely labor-intensive to produce, and methods used (for instance, to build the NVCA summary data) are not widely available.

Recommendation: This metric has limited utility for the economic development projects that EDA funds due to the lack of detail. These investments can be tracked through local business press releases.

**Mergers & Acquisitions/Initial Public Offerings**

These measures of liquidity events provide an indicator of successful exits. These data are part of the Capital IQ database which is updated weekly.

Although economic development officials and program managers are well aware of this activity, systematic tracking of these transactions help define the context of the regional economy. Mergers and acquisitions can change the structure of the local economy. Any ensuing layoffs could create demand for entrepreneurial services.

IPOs are significant events for entrepreneurial firms and signal the realization of value from entrepreneurial efforts.

Recommendation: Tracking financial transactions in a region - through mergers and acquisitions as well as IPOs - improves good decision-making by providing an understanding of changes in ownership in the local economy.

**Innovation Infrastructure**

Innovation Infrastructure defines the capacity to come up with ideas, move those ideas forward and ultimately realize economic benefits. Innovation is the scaffolding for an industrial ecosystem’s future growth. It defines the capacity to come up with ideas, move those ideas forward and realize the economic benefits. Specific metrics considered include:

- R&D Expenditures at Universities & Colleges
- Patents & Patent Collaborations
- New Product Announcements
- Trademarks

**R&D Expenditures at Universities & Colleges**

Increases in R&D funding for universities indicate inflows of resources for the conduct of research that may be relevant to project activity. Changes in university R&D reflect improved innovative capacity and investment. Changes reflect improved innovative capacity that may lead to further downstream discoveries and new firm formation.

Many economic development projects are led by academic institutions, have academic institutions as partners or aspire to work with academic institutions. These publicly available data are searchable by university and academic discipline via NSF WebCASPAR. This data is updated annually.

The ability to customize data queries and search by academic institution and field is attractive. Stratifications include university, city, state, zip, state, region, type of institutional control (public vs. private), and highest degree granted by academic discipline.

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75 There is a phenomenon of SBIR mills - firms that get large number of SBIR awards with little motivation to grow, however, these firms are the exception.

76 The NSF data only includes R&D activity for higher education institutions that offer at least a bachelor’s degree.

77 Faculty-level data is not currently available through this source. Maryann Feldman currently serves as the PI for an NSF grant where she is building an individual-level database tracing university-funding activity across a handful of institutions. Currently, PI-level data on university funding is not accessible in a central repository; however,
Moreover, federal R&D can be analyzed for each of the six federal agencies. There is approximately a two-year delay to access the data; this limits the usefulness of this measure.

Recommendation: This metric is limited to time delays. One option for measuring university activity could be: following awards to academic research from USASpending.gov (as described above) to provide an indicator of investments in university R&D. Another option is: tracking patents from universities, described below, as a measure of university inventive activity.

**Patents & Patent Collaborations**

Patent applications are a measure of inventive activity frequently used in economic studies. Patent applications reflect the intention to protect intellectual property as a first step in the patenting process; this captures the timely production of ideas that have potential value.

Patent applications provide a means to profile inventive technologies that may provide the basis for competitive advantage and to understand what entities (patent assignees) and individuals (patent inventors) are actively protecting intellectual property.

Patent collaborations provide a means to assess the degree to which inventors within a region are benefitting from knowledge flows with other entities, both inside and outside the region. If firms collaborate within the region, this is an indicator of regional synergies that are important to building regional capacity. If local firms collaborate with firms outside the region, then there must be a perceived value to working and engaging with that local expertise. Collaboration signals that other entities want to work with firms in the region and indicates potential transfer of knowledge to the region that builds capacity for future economic development.

The U.S. Patent and Trademark Office (USPTO) provide patent data. Access is free and data is updated weekly. There are paid subscription services which can prepare customized reports analyzing keywords and providing summary data. It is possible to analyze regional strengths and make comparisons to other regions.

The basic USPTO data does provide insights into who is patenting in a region (both individuals and organizations), with whom they work and what technology fields are represented. These data can be used to establish regional expertise and to track progress in increasing innovative capacity.

Recommendation: Patents are a readily accessible and useful metric of inventive activity in a region. There is greater coverage for technology-based and emerging industries. Technology-oriented cluster projects should be able to measure an increase in patenting application activity. The utility of patent data is limited by covering only certain types of industrial activity and innovation; as such, this metric should not be used as the sole measure but instead combined with new product announcements and trademarks.

**New Product Announcements**

New product announcements provide a means to capture private sector innovative activity. The introduction of new products is the culmination of a process that begins with an understanding of markets and user needs; incorporates creative new ideas and technologies; and involves professional services from lawyers, marketing specialists, and designers. Rather than focus on the presence of individuals with these skills, our metric captures the realization of the process, with the idea that the realization of a new product introduction utilized the innovative infrastructure in a region and industry.

Our measure is from ThomasNet.org, a service of ThomasNet, which connects buyers and sellers in an online platform. The focus is business-to-business products primarily in manufacturing industries. These data capture the announcement of new products available for sale and provide a measure of the type of activity that may ultimately lead to job growth and investment.

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78 The six federal agencies include: Department of Agriculture, Department of Defense, Department of Energy, Department of Health and Human Services (including NIH), National Aeronautics & Space Administration, National Science Foundation. In addition, there is an additional row of data for Other Federal Departments and Agencies.
Each observation is a new product announcement with details on the name of the new product, detailed supplier and product categories, the company making the introduction, and information on the location where the innovation was developed. The data are updated daily and are easily searchable by company name, location, and industrial category.

Recommendation: This source is most useful for manufacturing products. The information is detailed in terms of product specifications. Individual firm level data are available and it is easy to aggregate to capture geographic level detail.

**Trademarks**

Trademarks protect intellectual property for important industrial innovations. Trademarks identify products or services from a particular source, and the granting of a trademark is evidence of innovative activity. The trademark registration signals that a company has produced intellectual property that it considers valuable enough to protect. Trademarks also serve as an incentive for manufacturers, providers, or suppliers to consistently provide quality products or services to maintain their business reputations.

These data, available from USPTO which updates weekly, are newly introduced and the data files are not as clean as the USPTO patent data. Still we were able to find significant activity for the projects. It would be useful for project managers to examine this data.

Recommendation: Trademarks, along with patents and new product announcements provide a full picture of inventive activity in a region and technology. We would recommend using this source to identify firms who are actively filing trademark protection in the focal technology.

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**Reflective Conclusions**

The data we present here demonstrates differences in capacity for the city and industry combinations that may be useful to: understanding where economic development resources are invested; monitoring progress towards achieving objectives; and providing the basis for evaluating what programmatic features work well in increasing the various capacity metrics.

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79 TAAC officials indicated in interviews that their clients do not apply for patents, so the study team did not examine that indicator. The other form of intellectual property is trade secrets, which are more difficult to measure but may be reflected by new product introductions, which were also examined.
VI. Key Findings & Implications for Program Evaluation

This technical assistance project aims to provide the Economic Development Administration (EDA) with a performance and impact measurement system that supports the agency’s mission to lead the federal economic development agenda by promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy. The digital data that we examine provided useful capacity measures of regional economic activity that surpassed client survey data (primary data collection) or the information that could be provided by publicly accessible government statistics.

This project is predicated on the belief that better data will yield better economic development projects and better results. Further, communities will only be able to respond to economic challenges and engage in economic development if they have data to provide an understanding of the dynamics of the components of their innovative ecosystem. Rather than focus solely on jobs or other measurable outcomes, the capacity for communities to compete is synergistic and relies on social capital, creativity and extra-market motivations. These metrics we examine provide indicators of the capacity of a place and industry to generate future economic prosperity. The data are specific to the industries and regions where EDA has invested. The data are timely and capture current activity. They hold a promise for informing decision-making and could be gainfully employed by the community of economic development practitioners.

The recommendations are drawn from the Research Team’s extensive review of program materials, and review of past evaluations. These efforts have benefitted from meetings and interviews with EDA funded project managers and client firms. Finally, the Research Team has engaged in lengthy, but rewarding, data collection that has demonstrated that economic development can make more evidence-based decisions that will increase prosperity and quality of life in American communities.

Addressing the Need for Evaluation

There will always be a need for evaluation. The overarching purpose of design of the proposed EDA evaluation system is to determine the impacts of EDA’s investments on the nation’s regional economies, in terms of realized outcomes and increases in economic development capacity. To be most effective, the evaluation system will provide project monitoring and midterm assessment to allow for input from EDA staff to increase project performance. Finally, the evaluation system should be able to aid project selection decision-making by providing information useful to matching investments to regional needs.

To achieve this purpose, EDA would create and maintain a database with information on each funded project, including detailed project characteristics and project outputs and outcomes. Data sources would include the project proposal, and periodic progress reports. Grantee submissions on post-project outcomes will be replaced, when possible, with information from 3rd party data sources.

To assess each project in context, EDA also would create and maintain a nationwide regional economic database, including data relevant to economic performance, industrial and community structure, and resources (e.g., workforce, physical infrastructure).

The objective is to allow EDA to analyze the complex relationships between project characteristics, federal investment, economic context, and realized outcomes.

The timely availability of data would allow EDA to carry out regular evaluations quickly, across programs. The framework would let the agency compare and contrast the investment outcomes of its various programs and enable it to recommend more effective allocations of scarce fiscal resources.

Consistent cross-program evaluations would let EDA more easily aggregate impacts across all of its investments and communicate findings to OMB and Congress.

The most defensible evaluation framework focuses on individual firms, as the basic unit of economic activity in the economy. And data should be collected from third-party digital sources to minimize respondent burden.
and to allow for the temporal lags inherent in realizing economic returns.

In Stage II of this project established the potential of matching client firms with third-party data. The TAAF report of Stage III provided a limited demonstration of how client impacts could be established with a control group and sophisticated econometric analysis. It is possible to match client firms to third party databases and track their progress. The sources we use rely on individual firm names and addressed, enabling record matching. It is possible to then compare to carefully constructed control groups.

Further, consistent cross-program evaluations would let EDA more easily aggregate impacts across all of its investments and communicate findings to OMB and Congress.

Recommendation: EDA take the lead in building a database system for evaluation that would be available for use in evaluation but also available to the larger community.

**Recommendations on Data Sources**

Third party data provides insights into regional economies that will be useful for proposal preparation, project evaluation and reporting purposes for economic development professionals. Capacity view of a regional economy provides more comprehensive assessment of what is missing in a regional economy, as well as a means to determine if capacity metrics are changing. The variety of third party data sources available can provide a more integrated and complete picture of a regional economy. The promise of third party data offers a potential to streamline report requirements for government projects and can certainly lessen the administrative burden on their client firms. Moreover, monitoring these data may signal strategic changes for economic development project directors that can improve the performance of the project by identifying specific weaknesses or limitations.

Recommendation: EDA integrate the sources reviewed here into one of their existing data platforms to more fully capture the dimensions of regional capacity.

**Proof of Cluster**

The informed use of data begins with the proposal. Data are critical to understanding the current status of regional economies and to crafting economic development solutions. For example, many places attempt to build biotechnology or life science clusters; however, these efforts may be fruitless at best, and counterproductive to national productivity at their worst. The use of data to justify projects and investments seems a necessary condition for undertaking a project.

Some projects proposals made good use of data while others did not. One differentiating fact appears to be the use of expensive consultants, which are beyond the means for most communities. Standards provided in the Request for Proposals could ask for baseline data that would establish the potential of the industry and articulate how the project is defined and why the community has some advantages to build upon. Some rationale for the choice of technological focus should be provided in the grant application.

EDA might suggest criteria to help establish both the definition of the cluster and to help grantees establish a baseline for tracking the development of an industry in the defined geography.

Recommendation: EDA provide uniform guidelines at the proposal stage to aid in project planning, monitoring and evaluation.

**Defining Expected Project Outcomes**

Economic development projects are unique; the challenge is to enable projects to have the opportunity to be responsive to the needs of their local ecosystem and adaptive to changing circumstances and new opportunities.

This project has defined a set of metrics that we expect will be refined and built upon with use. The community of practitioners should be encouraged to specify outputs, outcomes and metrics in proposals. Defining a set of expected capacity outcomes would help focus projects, while providing indicators of progress towards meeting expected project outcomes, and allowing economic development officials an opportunity to examine trends that are moving in the wrong direction.
EDA should streamline cooperative agreements with award recipients. Notable delays in timing between the announcement of the award and the receipt of funding were reported. This not only frustrates the grantee, but also complicates any evaluation efforts.

Recommendation: EDA-funded projects start with an articulated set of specific measurable outcomes complete with expectations about the time frame that would be possible in their community during the grant.

Recommendation: EDA-funded projects collect firm-level data for the purpose of evaluating the impact of economic development program participation on client firms, using comparison to a control group.

Next Steps
The Research Team hopes to share these results with the projects analyzed. It would be useful to gain their perspective on the utility of the metrics. This should be a focus of the June meeting.
VII. Recommendations

Throughout this research project, the research team noted various opportunities to improve the efficiency or overall quality of evaluation of EDA-funded projects. Below is a table which lists these recommendations – either for EDA or projects/firms funded by EDA. These recommendations are listed throughout the text of this report but have also been collected here for ease of reference.

Table 4. Recommendations for EDA and EDA-funded projects

<table>
<thead>
<tr>
<th>Actor</th>
<th>Recommendation</th>
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</thead>
<tbody>
<tr>
<td>Economic Development Administration</td>
<td>Take the lead in building a database system for evaluation that would be available for use in evaluation but also available to the larger community.</td>
</tr>
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<td>Integrate the sources reviewed here into one of their existing data platforms to more fully capture the dimensions of regional capacity.</td>
</tr>
<tr>
<td>Economic Development Administration</td>
<td>Provide uniform guidelines at the proposal stage to aid in project planning, monitoring and evaluation.</td>
</tr>
<tr>
<td>Economic Development Administration</td>
<td>Compare social capital networks with supply-chain mapping in a specific geographic area to better understand how firms link versus the relationship across individuals.</td>
</tr>
<tr>
<td>EDA-Funded Projects</td>
<td>Start with an articulated set of specific measurable outcomes complete with expectations about the time frame that would be possible in their community during the grant.</td>
</tr>
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<td>EDA-Funded Projects</td>
<td>Collect firm-level data for the purpose of evaluating the impact of economic development program participation on client firms, using comparison to a control group.</td>
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</table>

This research project explored sixteen different metrics as potential measures of community capacity, firm & industry capacity, entrepreneurship capacity, and innovation infrastructure within the industries and locations of the EDA-funded projects. Of these, the research team recommends that EDA incorporate fourteen metrics into their evaluation system. The research team has chosen to strongly recommend four metrics as these metrics seemed to provide the greatest promise and opportunity for contributing to thorough yet efficient evaluation. Please see Table 5 below for information on each of the metrics and the project stages during which they should be examined.

Table 5. Metrics Recommendations

<table>
<thead>
<tr>
<th>Metric</th>
<th>Recommendation</th>
<th>Metric Summary</th>
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<tbody>
<tr>
<td>Social Networks</td>
<td>STRONGLY Recommended to include within project planning and evaluation stages (collecting baseline and post-project data).</td>
<td>This metric is low-cost and has utility for tracking economic development capacity changes. The underlying data would be useful to program activities. A simple on-line presence would help coalesce a community of common interest around a project. Any increase in the number of LinkedIn members would signal an increase in the social network.</td>
</tr>
<tr>
<td>Dealmakers</td>
<td>Recommended to include within project planning and evaluation stages (collecting baseline and post-project data).</td>
<td>This metric is a point of departure for measuring social capital and has strong potential to measure increases in capacity. It is possible to identify key individuals in the local economy and to make connections within sectors.</td>
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<tr>
<td>Metric</td>
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</tr>
<tr>
<td>Cluster Identity</td>
<td>Recommended to include within project monitoring stage to gain an understanding about perceptions of the media.</td>
<td>This metric provides a diagnostic about the way the industry and region are perceived in the media. It is perhaps most useful for project monitoring rather than planning or evaluation. Our advice is for project managers to delve more deeply into content provided by the LexisNexis media search and use the TagCrowd Diagrams for illustrative purposes.</td>
</tr>
<tr>
<td>Skills and Job Availability</td>
<td>Recommended to include within project planning and monitoring stages.</td>
<td>The quality and availability of jobs is of central concern for economic development. These data would facilitate project planning and monitoring. Often a lack of skilled labor limits the growth of firms and industries. These data provide information for engaging in talent development and recruitment. Moreover, these data enable tracking of the direction of wages and skill requirements in the local economy.</td>
</tr>
<tr>
<td>Regional Industry Vitality</td>
<td>STRONGLY Recommended to include within project planning and evaluation stages (collecting baseline and post-project data).</td>
<td>These data on the number of establishments and employment provide a simple and straightforward metric of regional industrial vitality and good coverage for all regions.</td>
</tr>
<tr>
<td>Value Chain Augmentation</td>
<td>STRONGLY Recommended to include within project planning, monitoring, and evaluation stages (collecting baseline and post-project data).</td>
<td>The Value Chain Augmentation metric is useful to assess the development of the value chain for the industry that is the focus of a project. This metric has utility for project planning, monitoring and evaluation purposes. Increases in the value chain would signal increased competitiveness.</td>
</tr>
<tr>
<td>New Contracts: Federal Spending</td>
<td>Recommended to include within project planning, monitoring, and evaluation stages (collecting baseline, project, and post-project data).</td>
<td>These data are useful as an indicator of regional expertise that signals increases in capacity. The underlying data are free and easy to access and download for analysis with standard software packages.</td>
</tr>
<tr>
<td>Private Investment</td>
<td>Recommended to include within project planning, monitoring, and evaluation stages (collecting baseline, project, and post-project data).</td>
<td>Growth in investment is indicative of the prospective performance of a region and industry. By examining investment before, during and after economic development program interventions, it will be possible to draw some conclusions about the potential impacts of these government programs on the broader economic vitality of the regional economy.</td>
</tr>
<tr>
<td>New Firm Entry</td>
<td>Recommended to include within project planning, and evaluation stages (collecting baseline and post-project data).</td>
<td>This metric did capture new firms for all of the projects examined. There was coverage in small communities and in rural areas. All types of industrial sectors were included.</td>
</tr>
<tr>
<td>SBIR Awards</td>
<td>Recommended to include within project planning and evaluation stages (collecting baseline and post-project data).</td>
<td>These data provide insights into new firms that have received funding to develop a new technology. Increasing the number of awards would indicate that firms in the region are producing competitive technology.</td>
</tr>
<tr>
<td>Venture Capital Investment</td>
<td>NOT recommended to include within evaluation system for EDA-funded projects.</td>
<td>This metric has limited utility for the economic development projects that EDA funds due to the lack of detail. These investments can be tracked through local business press releases.</td>
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<td>Mergers &amp; Acquisitions/ Initial Public Offerings</td>
<td>Recommended to include within project planning and evaluation stages (collecting baseline and post-project data).</td>
<td>Tracking financial transactions in a region - through mergers and acquisitions as well as IPOs - improves good decision-making by providing an understanding of changes in ownership in the local economy.</td>
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<td>This metric is limited to time delays. One option for measuring university activity could be: following awards to academic research from USASpending.gov (as described above) to provide an indicator of investments in university R&amp;D. Another option is: tracking patents from universities, described below, as a measure of university inventive activity.</td>
</tr>
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<td>Universities &amp; Colleges</td>
<td></td>
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<tr>
<td>Patents &amp; Patent Collaborations</td>
<td>STRONGLY Recommended to include within project planning and evaluation stages (collecting baseline and post-project data), in combination with new product announcements and trademarks.</td>
<td>Patents are a readily accessible and useful metric of inventive activity in a region. There is greater coverage for technology-based and emerging industries. Technology-oriented cluster projects should be able to measure an increase in patenting application activity. The utility of patent data is limited by covering only certain types of industrial activity and innovation; as such, this metric should not be used as the sole measure but instead combined with new product announcements and trademarks.</td>
</tr>
<tr>
<td>New Product Announcements</td>
<td>Recommended to include within project planning and evaluation stages (collecting baseline and post-project data).</td>
<td>This source is most useful for manufacturing products. The information is detailed in terms of product specifications. Individual firm level data are available and it is easy to aggregate to capture geographic level detail.</td>
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<tr>
<td>Trademarks</td>
<td>Recommended to include within project planning and evaluation stages (collecting baseline and post-project data).</td>
<td>Trademarks, along with patents and new product announcements provide a full picture of inventive activity in a region and technology. We would recommend using this source to identify firms who are actively filing trademark protection in the focal technology.</td>
</tr>
</tbody>
</table>
VIII. References


Department of Commerce. (2006b). *Presidential Budget*. Washington, DC.


Impacts of Tax Expenditures: Evidence from Spatial Variation Across the U.S.” working paper.


IX. Appendices

Appendices available upon request.