

**The Evaluation of the
U.S. Small Business Administration's
Regional Innovation Cluster Initiative**

Year Three Report

July 2014

Revised November 2014

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The Evaluation of the U.S. Small Business Administration's Regional Innovation Cluster Initiative

Year Three Report

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The statements, findings, conclusions, and recommendations found in this study are those of the contractor and do not necessarily reflect the views of the Office of Entrepreneurial Development, the United States Small Business Administration, or the United States Government.

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List of Acronyms and Abbreviations

Advanced Power Cluster: Advanced Power and Energy Cluster (referred to as the Defense Alliance in the Year 1 evaluation report)

BEA: Bureau of Economic Analysis

BLS: Bureau of Labor Statistics

C4ISR: Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance

D&B: Dun and Bradstreet

Energy Storage Cluster: Northeast Electrochemical Energy Storage Cluster

FlexMatters: FlexMatters - Northeast Ohio Technology Coalition

Geospatial Cluster: Enterprise for Innovative Geospatial Solutions

TechRich: Technology Regional Innovation Cluster – Huntsville (changed from Huntsville Advanced Defense Technology Cluster in 2014)

MSA: Metropolitan Statistical Area

NAICS: North American Industry Classification System

OEM: Original Equipment Manufacturer

R&D: Research and Development

RIC: Regional Innovation Clusters

San Diego Defense Cluster: San Diego Advanced Defense Technology Cluster

SBDC: Small Business Development Center

SBIR/STTR: Small Business Innovation Research/Small Business Technology Transfer Research

Smart Grid: Illinois Smart Grid Regional Innovation Cluster

SPAWAR: Space and Naval Warfare Systems Command

WBC: Women's Business Center

PTAC: Procurement Technical Assistance Center

ITAR: International Traffic in Arms Regulations

EAR: Export Administration Regulations

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Executive Summary

The ability of small businesses¹ to drive innovation is critical to U.S. competitiveness. In recognition of the invaluable role small businesses play in the United States innovation ecosystem, the U.S. Small Business Administration (SBA) launched the Regional Innovation Cluster (RIC) Initiative in September 2010. This initiative promotes and supports industry clusters—geographically concentrated groups of interconnected businesses, suppliers, service providers, and related institutions in a particular industry or field—that have been associated with increased regional economic growth. Since the inception of the RIC Initiative, SBA has prioritized the robust evaluation of its cluster investments and pioneered performance measurement of federally funded cluster initiatives. As the third edition and year of this evaluation, this report details promising trends and outcomes, particularly the growth in cluster membership and economic activity. In many cases, the economic activity associated with SBA-supported clusters exceeds (sometimes considerably) corresponding benchmarks. For example, between Years 2 and 3, the average total employment and the average revenue of small businesses that participate in the clusters grew at an annualized rate of 6.9%, at least twice the rate of benchmark firms; average monthly payroll in cluster small businesses grew at an annualized rate of 14.1%, exceeding benchmarks by 11 percentage points.

The seven clusters participating in the Initiative during the third year include Advanced Power Cluster, Geospatial Cluster, FlexMatters, TechRich (formerly Huntsville Defense Cluster), Smart Grid, Energy Storage Cluster, and the San Diego Defense Cluster.² While the industry focus of the clusters varies, spanning geospatial, fuel-cell, and smart-grid technology industries as well as flexible electronics, and autonomous and reconnaissance systems, their core activities are similar: they act as networking hubs to convene a number of resources to help navigate funding, procurement, and supply-chain opportunities. Through technical and legal assistance, these cluster networks also work to help innovators commercialize promising technologies needed by government and industry buyers.

This report examines cluster developments during Year 3 of the program against the backdrop of accomplishments in the previous 2 years, shedding light on the ongoing implementation of the Initiative and its resulting impact on small businesses.³ It should be noted, however, that funding received by

¹ “Small business” is broadly defined here as a business with fewer than 500 employees. For a more comprehensive definition from SBA, see http://www.sba.gov/sites/default/files/files/Size_Standards_Table%281%29.pdf.

² SBA elected not to renew contracts for three additional clusters that had been included during Years 1 and 2: the Project 17 Agricultural Innovation Cluster, the Upper Michigan Green Aviation Cluster, and the Carolinas’ Nuclear Cluster.

³ Additionally, SBA now sponsors 30 other clusters through the Jobs and Innovation Accelerator Challenge. This program differs from RIC with a multi-agency collaborative structure, a more significant focus on historically underserved businesses

clusters in Year 3 was lower than in previous years due to the impact of across-the-board federal funding cuts. The evaluation is based on data collected from quarterly and annual reports, surveys and interviews with participating cluster administrators, organizations, and businesses. It describes and assesses the services provided and measures changes in key business and organizational outcomes. The report also provides important short- and intermediate-term outcomes, including the development of alliances among cluster participants, commercialization of new technologies, and improved export and marketing strategies. The evaluation also includes longer-term economic outcomes, which were compared to regional and industry benchmarks, including employment and payroll growth, business revenue growth, and new business formation. Beyond serving as a publically available evaluation of SBA's cluster initiatives, an additional goal of the evaluation is to use continuous and rapid-cycle feedback to inform the design of other emerging cluster initiatives.

Implementation

Cluster membership and activity has grown dramatically under the Initiative: the number of small businesses participating has increased more than four-fold, the number of participating foundations and nonprofit organizations has increased five-fold, and the number of associated universities, other research institutions, and public-sector agencies has tripled since the beginning of the Initiative. This rapid development has continued through Year 3, although, as might be expected, in some cases the pace of cluster growth has slowed as clusters have matured. Nevertheless, clusters reported an average increase of 43% in the number of small business participants in Year 3 alone.

Small businesses reported that their participation depended importantly on their ability to network with one another and their desire to access cluster services, while large organizations tied their participation to regional economic-development, technology-transfer, and technology-commercialization goals. The ability of clusters to offer these services and opportunities is relatively unique few small business participants reported being able to obtain similar services from other providers. In fact, during Year 3, the seven clusters delivered a total of more than 13,000 hours of one-on-one counseling, with recipient small businesses receiving an average of nearly 29 hours each. In addition, clusters reported conducting a total of 108 training, networking, showcasing, and matchmaking events in Year 3. More than three-fourths of the small businesses responding indicated that they participated at least occasionally

and communities, and a job-training and -placement program for American workers to replace foreign workers hired on H-1B visas. For a summary of the overall approach selected by the federal government in support of clusters, please see *Regional Innovation Clusters Begin to Add Up* by Mark Muro of the Brookings Institution at <http://www.brookings.edu/blogs/up-front/posts/2013/02/27-regional-innovation-clusters-muro>.

in cluster-sponsored events, and nearly half of large organization members reported that they often or always participated.

Short- and Intermediate-Term Outcomes

Short- and intermediate-term outcomes reported by small businesses and participating organizations are indicative of the considerable level and influence of cluster activity. During Year 3, the following occurred:

- More than a third of small businesses and half of large organizations reported that cluster participation increased their integration into industry supply chains.
- A majority of both small businesses and larger organizations reported establishing one or more alliances with other cluster members, and more than 70% reported that cluster activities led to increases in collaborative activity within their regions.
- Nearly 40% of small businesses reported that cluster services had some influence on their access to capital, and over \$3⁴ billion in new economic activity (e.g., grants, contracts, loans, and venture capital) accrued to affiliated small businesses during 2013 (with the majority—\$2.92 billion—accruing to TechRich).

Among small businesses, 60% reported that cluster activity facilitated their development of new products or services, and 32% agreed that their clusters facilitated commercialization and new technology development. Correspondingly, small businesses reported filing 181 patent applications, receiving 112 patents, licensing 31 technologies, and obtaining license rights to 47 technologies. These numbers represent sharp increases in activity levels compared with Year 2.

Long-Term Cluster Outcomes

Cluster-related economic activity has been robust. Measured growth in employment, revenue, and payroll across small business participants has exceeded growth rates in corresponding datasets used to benchmark small business growth. During Years 2 and 3 of the Initiative, the average total employment in cluster small businesses has increased at an annualized rate of 6.9%, greatly exceeding comparable benchmark growth rates of –0.3% and 1.6% (in the Quarterly Census of Employment and Wages, and Dun & Bradstreet datasets, respectively). Employment growth in six out of seven clusters also exceeded corresponding benchmark rates in those regions individually. Similarly, annualized revenue growth of 6.9% across clusters exceeded the 3.5% growth rate measured overall in the comparable Dun & Bradstreet sample. Average monthly payroll in cluster small businesses grew at an annualized rate of

⁴ This figure was originally "nearly \$4 billion", but revised information from TechRich prompted a downwards revision reflected in the current language. Specifically, TechRich indicated that the contracts/subcontracts figure for the cluster was \$2,922,300,000 instead of \$3,780,300,000 due to a reporting error.

14.1% per year between September 2011 and September 2013, outstripping the overall regional benchmark of 3.2% (State Personal Income Account) by nearly 11 percentage points.

Conclusion

The outcomes measured and reported in this evaluation suggest that cluster participation was correlated with higher-than-expected levels of economic growth and new business formation and that clusters made strides toward promoting innovation in their respective industries. In three years, the seven clusters participating in the RIC initiative have demonstrated their ability to evolve in response to shifting participant needs and their regional and industry contexts. They have grown rapidly in membership, scale and range of services provided, and engagement with small businesses while also formalizing their structures. In parallel, the participating clusters are improving their data-collection systems and exploring options for long-term sustainability as SBA funding begins to decrease. Cluster participants have consistently expressed their satisfaction with cluster involvement and assistance.

1. Introduction

1.1. Overview of the Evaluation

The Regional Innovation Cluster (RIC) Initiative of the Small Business Administration (SBA) was launched in September 2010 to promote and support 10 clusters—geographically concentrated groups of interconnected businesses, suppliers, service providers, and associated institutions in a particular industry or field—across the United States. Clusters act as a networking hub to convene a number of resources to help navigate the funding, procurement, and supply-chain opportunities in a specific industry. Through technical and legal assistance, cluster networks also help innovators commercialize promising technologies needed by government and industry buyers. Recognizing the challenges that small business innovators, as well as technical and investor networks, face in creating impactful marketing, SBA actively supports small business membership in emerging and mature industry clusters.

Seven clusters currently participate in the Regional Innovation Cluster Initiative: the Advanced Power Cluster, the Geospatial Cluster, FlexMatters, TechRich, Smart Grid, the Energy Storage Cluster, and the San Diego Defense Cluster.^{5,6} Based on across-the-board federal funding cuts during the recession, the amount of funds each of the seven remaining clusters received was lower in Year 3 than during the first 2 years of SBA's Initiative. The Regional Innovation Cluster Initiative (henceforth SBA's Initiative), entering its fourth year as of the writing of this report, provides funding to the organizing entities of the seven clusters to accomplish three primary goals. The first is to increase opportunities for small business participation within the clusters. The second is to promote innovation in the industries on which the seven clusters are focused, which include geospatial, fuel cell, and smart grid technologies as well as flexible electronics and autonomous and reconnaissance systems. The third goal is to enhance economic development and growth in the regions in which the seven selected clusters are operating. In accordance with the first goal, the clusters in SBA's Initiative were selected to receive funding partially on the basis of their ability and potential to provide industry-specific assistance to small businesses within their region.⁷

Optimal Solutions Group, LLC (Optimal), the evaluator of the SBA's Initiative, was tasked with providing context and information about the seven clusters and assessing the progress and outcomes of

⁵ Prior to 2014, TechRich was known as the Huntsville Advanced Defense Technology Cluster.

⁶ SBA elected not to renew contracts for 3 additional clusters that had been included during Years 1 and 2: the Project 17 Agricultural Innovation Cluster, the Upper Michigan Green Aviation Cluster, and the Carolinas' Nuclear Cluster.

⁷ "Small business" is broadly defined here as a business with fewer than 500 employees. For a more comprehensive definition from SBA, see http://www.sba.gov/sites/default/files/files/Size_Standards_Table%281%29.pdf.

the Initiative. Although cluster evaluations often focus on long-term impacts (e.g., 5 to 10 years out), SBA is also interested in what can be learned from this project in a shorter timeframe to improve current initiatives and inform those in the design phase. The purpose of this evaluation is to provide an understanding of how the Regional Innovation Cluster Initiative was implemented across the seven clusters over time. This evaluation further aims to assess the services provided by the clusters to their small businesses as well as the changes in outcomes. To that end, the evaluation focused on the following questions:

1. What services and activities did clusters provide to their small businesses, and why?
2. How did the key measures of business performance and growth change over the life of the Initiative among the small businesses participating in the clusters?
3. What has been the influence of small businesses' participation in the clusters (as perceived by the small businesses) on their key performance measures?
4. How do the changes in cluster key performance measures compare to employment, compensation, and establishment revenue benchmarks?

The evaluation design of SBA's Initiative is based on a mixed-method approach that uses data collected from cluster administrators, large organizations participating in the clusters, and the small businesses that were targeted and received cluster services under the Initiative. These data have been collected through the following means:

- A cluster administrator survey
- A small business survey
- A large organization survey
- Interviews with cluster administrators
- Clusters' proposals for SBA's Initiative, their quarterly reports, and annual reports

The qualitative data, collected mainly through the interviews and the clusters' quarterly and annual reports, are used primarily to understand the clusters' configurations, business models, types of services provided, and goals and strategies for implementing SBA's Initiative. The quantitative data, collected mainly through the three survey instruments (cluster administrator survey, small business survey, and large organization survey), are used primarily to assess the outcomes of SBA's Initiative. Because not every small business and large organization participating in the seven clusters provided a survey response, the survey results discussed in this report do not encompass every cluster participant. Additional details on the data-collection methods, the evaluation design, and the surveys' response rates are provided in the Methodology Appendix.

Finally, this report incorporates a total of six text boxes containing selected success stories about small businesses participating in the 7 clusters in SBA's Initiative. Their names and other identifying details about these small businesses have been omitted to help protect their identities and privacy.

1.2. Report Roadmap

This report is composed of eight sections, including this introduction. Section 2 describes specific dimensions of the seven regional clusters under study and how they evolved over time for a better understanding of their operations and structures. Section 3 focuses on the implementation of SBA's Initiative and therefore covers the participation of cluster stakeholders and small businesses in the clusters, reasons for their involvement, and the services and activities provided by the clusters. Section 4 describes the outcomes of SBA's Initiative, which are the measures of effectiveness related to the implementation of the Initiative as described in Section 3. Outcomes discussed in Section 4 are divided into short-/intermediate-term outcomes, discussed in Subsection 4.2, and long-term outcomes, discussed in Subsection 4.3. Section 5 presents lessons learned in cluster operations. Section 6 provides concluding remarks. Finally, the Methodology Appendix (Section 7) contains a more detailed description of the evaluation design as summarized in Section 1.1, while Section 8 provides a brief overview of the various cluster initiatives supported by SBA as of the writing of this report.

2. Features of Clusters in SBA's Initiative

This section provides an in-depth look at the central features of the seven clusters participating in SBA's Initiative and how these features have evolved since its inception.⁸ The primary dimensions of these clusters—their geographic and industrial scope, level of organizational maturity, governance structures, service strategies, and business models—are outlined, providing a backdrop and context for the subsequent discussion of cluster activities and outcomes during the first 3 years of SBA's Initiative.

The clusters involved in SBA's Initiative vary along multiple dimensions. They are located in different regions of the United States and have operationalized the concept of geographic scope somewhat differently. There is little overlap in the industry scope and technology focus of the seven clusters, even among the subset of clusters focused on defense technology (the Advanced Power Cluster, TechRich, and the San Diego Defense Cluster).⁹ The seven clusters have implemented and developed a range of governance structures based on their respective histories and compositions. Clusters also have adopted several distinct business models that are tied to their strategic goals and to the unique regional assets they leverage. One dimension in which the clusters have converged over time is in their life-cycle stage.

Similarly to past years, changes to most of these structural and organizational aspects of cluster operations have been relatively limited in the third year of SBA's Initiative. The most significant evolution has been some expansion to the geographic scope of a subset of clusters (although these clusters still retain their essential regional focus). In addition, the Smart Grid cluster has slightly broadened its industrial scope to include subsectors that have become relevant to the original scope. Several clusters reported making improvements and adjustments to their governance structures. The Energy Storage Cluster formalized its governance structure at the end of Year 3, whereas several clusters made adjustments in the composition of some of or all their boards. The list of service providers upon which the clusters relied has stayed relatively stable, with the exception of the TechRich, which made some important adjustments to its service mix and its service providers. Most clusters continued to maintain relationships with SBA resource partners (i.e., Small Business Development Centers [SBDCs], Women's Business Centers [WBCs], and SCORE chapters), although these relationships are of varied nature and strength. By the end of the third year of SBA's Initiative, Smart Grid had progressed to a mature life-cycle

⁸ For a brief profile of each of the seven clusters (and the three no longer involved in Year 3 and onward) by a third party, please see the series of articles under the title, *A Cluster of Clusters: Where the SBA Is Investing in Regional Economies* by Catherine Clifford, published in the magazine *Entrepreneur*. This series is available at <http://www.entrepreneur.com/slideshow/225398>.

⁹ These clusters were referred to as "Advanced Defense Technology" clusters during the first two years of the RIC Initiative, but this label is no longer used in Year 3 by the SBA. In this report, the term "defense-focused cluster" will be used instead.

stage, joining the remaining six clusters; all now have reached the final stage of their organizational development. The business model employed by each cluster has, however, remained quite constant.

2.1. Geographic Scope of the Clusters in SBA's Initiative

Each cluster participating in the Initiative typically has a regional geographic scope, which may (or may not) shift as each cluster develops and matures. The ideas of geographic concentration and agglomeration—and, by extension, the need for clusters to define their *geographic scope*—underpin the cluster concept. There are various advantages to doing business associated with agglomeration. These advantages, described in various forms by such economists as Alfred Marshall, Edgar M. Hoover, and, more recently, Michael Porter, generally include the following:

- Lower overall transaction costs, particularly for knowledge transfer but also for transportation of inputs and outputs
- Increased economies of scale¹⁰ and scope¹¹ among a limited number of businesses in a given area
- Regional advantage in developing a specialized labor force
- Improved effectiveness of sharing and obtaining market information (e.g., ongoing shifts in technology and demand)
- Faster innovation through an increasingly sophisticated demand, driven by knowledge spillovers and interplay between competitive buyers and sellers

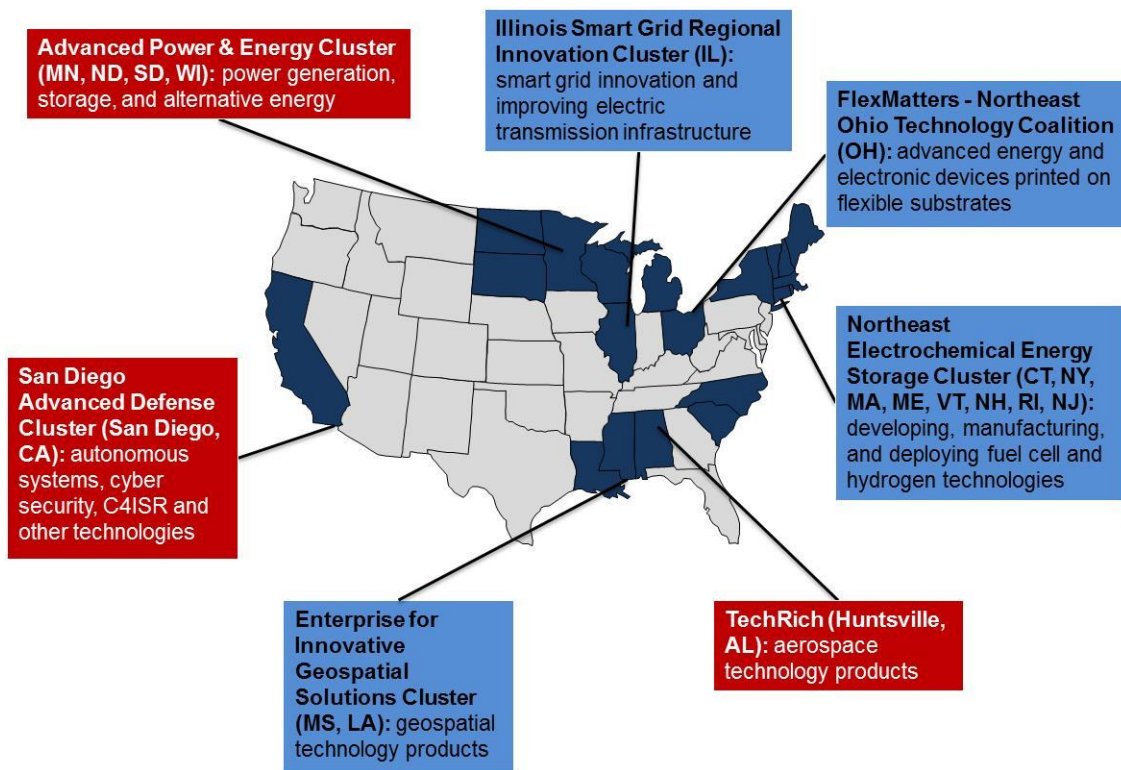
However, the meaning of agglomeration or geographic proximity is a contested topic in cluster research and has been alternatively construed by various researchers to mean “within driving distance of each other” or within a given Metropolitan Statistical Area (MSA), state, or even nation. The accelerating pace of improvements in communication technologies and logistics in recent decades has only deepened this debate.

In the context of SBA's Initiative, the clusters' geographic scope is described and discussed using two distinct concepts: the *stated* geographic scope and the *actual* geographic scope. The former was coined to describe the geographic scope that an “actively managed” cluster—one that is administered by a team of individuals and possesses a form of governance, such as those in this initiative—defined and

¹⁰ Economies of scale refer to situations where the average cost of producing goods or services declines as the volume of the goods or services produced rises.

¹¹ Economies of scope refer to situations where the average costs of production declines when a range of products or services is produced together, instead of each product or service being produced on its own.

consciously operationalizes. The stated geographic scope of these actively managed clusters is a product of their location and the strategy or roadmap devised by their management team and/or governance and is not expected to exist in traditional, spontaneously forming clusters, such as Silicon Valley. The actual geographic scope, on the other hand, is the more traditional measure derived from assessing the actual location of participants, and it exists in various forms across spontaneously forming clusters. Importantly, these two concepts are related, but they are distinct in how they evolve over time and what they imply with regard to each cluster's operations. Each cluster's current stated geographic scope is broadly mapped in Exhibit 1, and a more detailed description is provided in the first column of Exhibit 2.¹²



Source: Cluster proposals

Exhibit 1. Map of the seven clusters currently funded by SBA's Initiative. The three clusters with white text and red background are defense-focused, while the four with black text and blue background are clusters involved in a variety of industries other than defense.

A review of this information suggests that the seven clusters vary significantly with regard to the size of their stated geographic scope, which ranges from a single county for the San Diego Defense Cluster to a majority of the states that compose the U.S. Northeast region for the Energy Storage Cluster. However, this variance does not stem from an expansion in the stated geographic scope of the clusters, as

¹² Information on the stated geographic scope of participating clusters was gathered from cluster proposals, quarterly and annual reports, and interviews conducted with cluster administrators.

it was already present in their original proposals to request SBA funding. Over the 3 years spanned by the SBA Initiative, only the Energy Storage Cluster modified its stated geographic scope by formally including New Jersey on the list of states on which it already focused. This decision was made toward the end of the second year of the Initiative, in part because the cluster had prior ties to New Jersey, having been tasked by the Department of Energy to assist with the drafting of hydrogen fuel cell roadmap-guidance documents. This fact suggests that the stated geographic scope of actively managed clusters rarely changes in the short and medium terms and that when changes are made, they align with the cluster's existing relationships, strategy, and perceived competitive advantage.

Exhibit 2. Geographic scope of clusters, by number of counties and states

Cluster	Cluster's stated geographical scope	Number of states where cluster has participants	Change over the life of the Initiative in the number of states where participants are located	Percentage of participants located within each cluster's stated geographic scope
Advanced Power Cluster	Minnesota, Wisconsin, South and North Dakota	30	+13	61%
Geospatial Cluster	Mississippi and Louisiana	5	+1	90%
FlexMatters	Northeast Ohio	3	+2	84%
TechRich	North Alabama	19	+12	81%
Smart Grid	Chicago, Illinois region	4	+3	80%
Energy Storage Cluster	Eight states in the Northeast, including New York, Connecticut, and Massachusetts	13	+5	95%
San Diego Defense Cluster	San Diego County	1	No change	96%
Clusters' average	N/A	10	+5.1	83.9%

Source: Cluster proposals, quarterly reports, interviews, and administrator surveys

Exhibit 2 also provides information about the actual geographic scope of each cluster: the number of states in which the cluster indicated having participants or members is reported in column 3, whereas the change in this number of states since the start of the Initiative is reported in column 4. Overall, the seven clusters have participants in an average of 10 states, approximately the same average as in the prior year and an increase of slightly fewer than 5 states since the beginning of the Initiative.^{13, 14} However, these averages are driven by a small number of clusters, as reflected in the median number of states for the seven clusters at the end of Year 3, which is only half the average figure reported above. TechRich and the Advanced Power cluster have the largest number of states and the most significant increase in that number since the start of the Initiative. Thus, whereas the variance across clusters in the size of their stated geographic scope is important, it appears to be much greater for their actual geographic scope and for the pace at which this second definition of geographic scope evolves.

At first glance, the clusters' stated geographic scope and the actual number of states in which they reported participants appear to be inconsistently and loosely connected, aside from the San Diego Defense Cluster. For example, the Advanced Power Cluster, admittedly an outlier (see textbox on the hybrid approach to geographic scope), reported participants in 26 more states than those included in its stated scope, whereas even regular cases, such as the Smart Grid Cluster or the Energy Storage Cluster, reported participants in 3 and 5 states outside their stated geographic scope, respectively. However, a review of the actual distribution of participants, reported in column 5 of Exhibit 2, shows that at least 80% of participants involved in all clusters (aside from the Advanced Power Cluster) are located within the clusters' stated geographic scope. At 61%, this value remains relatively high for the Advanced Power Cluster, especially given its state count and the fact that it is actively pursuing a "hybrid model" to describe its geographic scope. As a result, it may be more fitting to consider the Advanced Power Cluster's stated geographic scope as a general region of focus rather than a more rigid geographic boundary within which it operates.

Aside from the idea underpinning the "hybrid model" to geographic scope, there are other explanations why the seven clusters have participants outside their stated geographic scope. For example, cluster personnel often attend regional or national trade shows and other events where they meet small businesses that fit the clusters' inclusion criteria (e.g., industry and technology of focus, technology readiness level) but fall outside their stated geographic scope.

¹³ The average numbers reported here for past years do not match those in the Year 1 or Year 2 reports, since only clusters still involved in the Initiative during Year 3 are included to allow a more appropriate and accurate comparison.

¹⁴ Information on the actual locations of cluster participants was gathered from lists of small businesses participating in each of the clusters, and provided by cluster administrators.

Hybrid Approach to Geographic Scope

In a 2011 interview, Chip Laingen, Advanced Power Cluster administrator, discussed the hybrid approach adopted by his cluster: “The idea [of cluster theory] is to grow technology-based economic development in a specific region, but we’ve viewed it in the sense that even with that regional emphasis, you can’t do it without looking at all the resources that are available, especially in an age where you can connect very easily through all these other means that we have. So if there’s a small company that needs another piece of their portfolio to advance their technology and they happen to be in Washington, D.C., why wouldn’t we bring them into the mix?”

However, this model seems to require significant effort from both the cluster team and the participants located outside of the cluster’s stated geographic scope in terms of traveling. Chip Laingen and others traveled several times during the third year, including trips to Colorado, Oregon, Washington, Illinois, and New York. These trips have a cost both in terms of funds and time, however. the Advanced Power Cluster staff made these trips to small business members more productive by combining them with visits to potential partners or customers in these regions.

2.2. Industrial Scope of the Clusters in SBA’s Initiative

The industry scope of a cluster is the common denominator of the participating actors, which are linked together via a core activity (Andersson, Serger, Sörvik, & Hansson, 2004). This core activity leads to emphasis on the same markets and the development and implementation of similar technology and production processes, as observed in the California wine cluster, for example. As the region turned to the cultivation of high-quality grapes, the industry and research community worked together to improve irrigation and frost protection systems. The industry also adopted narrower vine spacing over the “8x12” spacing traditional to the region, which had been designed for maximum production through mechanical harvesting (Porter & Bond, 2008). This latter evolution was made to improve the quality of the wine, which in turn contributed to improvement in the reputation of the region.

The clusters involved in SBA’s Initiative are engaged in a broad range of industries, from flexible electronics to fuel cells and geospatial technologies. Exhibit 3 describes the industrial sector and broad technology focus of each of the seven clusters. All clusters focus on high-technology areas within their respective industrial sectors. The three clusters focusing on defense procurement (the Advanced Power & Energy Cluster, TechRich, and the San Diego Defense Cluster) are described throughout this report as the “defense-focused” clusters. However, this categorization does not prevent nondefense clusters from pursuing defense procurement, or vice versa.¹⁵ The industrial scope and broad technology focus of these seven clusters has not significantly shifted throughout the Initiative. Smart Grid reported a slight

¹⁵ For example, the Geospatial Cluster and its member companies have pursued a variety of defense-related grants and procurement opportunities with organizations including the U.S. Air Force. In addition, the San Diego Defense Cluster organized an event focused on emergency first-responders, including the San Diego Sheriff’s Department, the San Diego Fire Department, the Public Health Hazardous Incident Response Team, and Customs and Border Protection.

evolution that entailed a broader definition of smart grid technologies through the inclusion of distributed generation, certain battery technologies, and installers of smart grid-related equipment in the cluster. This evolution largely reflects the development of the smart grid industry itself.

Exhibit 3. Cluster industrial scope and focus

Cluster	Industrial sector	Broad technology focus
Advanced Power Cluster	Defense	Power and energy generation, storage, distribution, conservation, and supporting technologies
Geospatial Cluster	Geospatial	Development of geospatial technology products
FlexMatters	Electronics	Development of flexible electronic products
TechRich	Defense	Small spacecraft, environmental monitoring, intelligence-surveillance-reconnaissance, robotics, and cybersecurity
Smart Grid	Energy	Development and promotion of smart electrical grid equipment and technologies
Energy Storage Cluster	Energy	Development and strengthening of the hydrogen and fuel-cell industry and its supply chain
San Diego Defense Cluster	Defense	Autonomous systems, cybersecurity, and C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance)

Source: Cluster proposals, quarterly reports, and interviews

North American Industry Classification System (NAICS) codes are often used to describe and classify industries, and the small businesses surveyed in this evaluation reported their primary and secondary NAICS codes. However, these codes have important limitations that undermine their usefulness in classifying the industry of focus of the seven clusters, such as the fact that NAICS codes, even at their most detailed level (six digits), often do not capture emerging industries, such as flexible electronics or smart grid technology. Sometimes, codes are added to incorporate emerging industries, but this occurs with an important lag, as the codes are updated every 5 years. In addition, most small businesses use a number of different NAICS codes that tend to be significantly different from each other, rendering accurate classifications difficult.

2.3. Structure of the Clusters in SBA's Initiative

Cluster organizational and operational structures typically comprise two key components: an anchoring entity and a network of service providers. Additionally, for “actively managed” clusters, such as those studied here, two other components are important: a board of directors (or other board-like structure) and an executive management team. Anchoring entities are the organizations responsible for the implementation and development of clusters. They play an important role in coordinating the various stakeholders and, in the case of SBA's Initiative, in administering the contract with the federal agency. Four of the seven clusters studied here have a nonprofit organization as their anchoring entity, often with a mission related to regional economic development or small business assistance. Two of the remaining three clusters are organized around research universities, and one is organized around a small business. Anchoring entities do not steer the “actively managed” clusters on their own, however; all seven clusters participating in SBA's Initiative have formal governance structures in place. All seven clusters also provide some in-house services to cluster members while relying on outside service providers. Although some minor shifts occurred in cluster/service provider relationships in the third year of the Initiative, these relationships have remained relatively stable over time, as has clusters' usage of SBA's resource partners.

Exhibit 4 presents a summary of governance components for the seven clusters in SBA's Initiative. Whereas the cross-cluster discrepancies witnessed in the first 2 years of the Initiative with regard to governance structures have greatly diminished, this summary still exposes a degree of cross-cluster heterogeneity with regard to the diversity of stakeholders and their degree of involvement in governance. All clusters now have a formal governance structure in place, as the Geospatial Cluster reinforced its board of directors and the Energy Storage Cluster formalized its existing structure toward the end of Year 3 to consist of each of the Energy Storage Cluster's regional, state-based partners, including a partner in New Jersey that was not yet identified at the end of Year 2. The cluster naturally overcame its principal barrier to formalized governance —avoiding the perception that these regional partners would lose independence and autonomy—through closer collaboration over time, which resulted in greater trust.

Governance and Operational Structures in “Actively-Managed” Clusters

- *Cluster boards of directors (and other similar bodies with different names, such as executive boards or steering committees) are typically tasked with strategic planning, developing the cluster, and maintaining continuous improvement processes.*
- *Executive teams are in charge of managing the cluster and its projects, with a designated cluster administrator responsible for day-to-day operations and management. The cluster administrators leading these teams tend to be experienced project managers with extensive knowledge of the cluster’s industry and key participants. Their responsibilities generally include, but are not limited to, building relationships, moderating discussions between cluster stakeholders, providing internal and external communications, and allocating and distributing resources. Some administrators are also active in providing services such as business counseling to participants.*
- *Clusters typically maintain a network of service providers that are tasked with delivering services and activities to cluster participants.*

However, variation across clusters regarding the number and types of stakeholders included on cluster board(s) or committees remains present. For example, six clusters report having private-sector companies on their board(s) and/or committees, and these companies generally include small businesses, but Smart Grid and the San Diego Defense Cluster do not include small businesses on their boards or committees. Four clusters report the involvement of one or several universities and community colleges on their committees or boards, and six report the inclusion of nonprofit organizations, service providers, and other institutions for collaboration. Overall, only FlexMatters reports including all three types of stakeholders on its advisory committee. Although several clusters have ties with venture and angel capital entities, these actors are represented in the governance structure in only a few cases (for example, FlexMatters).

Exhibit 4. Summary of the governance structure in place at each of the clusters

Cluster	Anchoring entity	Formal governance	Types of board(s)	Board(s) composition
Advanced Power Cluster	Small business	Yes	Board of advisors	Composed of individuals tied to large (e.g. 3M, ATK) and small (e.g., Adventium Enterprises) businesses, as well as nonprofit organizations (e.g., Midwest Cleantech Open, Pew Charitable Trusts), and a legal expert
Geospatial Cluster	Nonprofit organization	Yes	Board of directors and member committees as needed	Board of directors composed of representatives from the Geospatial Cluster and Magnolia Business Alliance (organizing entity); member committee composed of participating companies
FlexMatters	Nonprofit organization	Yes	Advisory committee	Composed of NorTech (organizing entity), universities, and private-sector representatives
TechRich	Nonprofit organization	Yes	Steering committee	Composed mostly of private-sector actors and some university representatives
Smart Grid	University	Yes	Steering committee	Composed of several Illinois Institute of Technology representatives, and a representative from Energy Foundry, Illinois Science and Technology Coalition, and O-H Community Partners
Energy Storage Cluster	Nonprofit organization	Yes	Advisory board and two standing committees: Policy and Technical	Representatives of the regional partners (e.g., Massachusetts Hydrogen Coalition) form advisory board. Committees composed of industry OEMs and small businesses, state governments, and a Dept. of Energy representative.
San Diego Defense Cluster	University	Yes	Executive board and advisory board	Executive board mostly composed of service providers, military organizations (e.g., Space and Naval Warfare Systems Command [SPAWAR]), SBA, business associations, and university representatives; advisory board has similar composition but also includes multiple large businesses

Source: Cluster proposals, quarterly reports, and interviews

Exhibit 5 outlines the extent to which each cluster’s administration has provided services in house as well as each cluster’s relationship with SBA regional resource partners and the service providers with which it has contracted. These data shed light on two key aspects of cluster service provision. First, every cluster has provided some level of in-house service directly to its participants, often when the needed services were too specific to their industries of focus or membership needs or did not match the overarching service delivery strategies of outside service providers. For example, the San Diego Defense Cluster, which relies on one of the widest networks of specialized service providers among the seven clusters, has provided direct services that are tailored to the industry-specific challenges of its cluster membership, including export counseling, proposal writing, and teaming.

A second key aspect of cluster relationships is that four out of the seven clusters have had at least some degree of interaction with SBA resource partners—SBDCs, WBCs, and SCORE chapters. The depth of these interactions, however, has varied greatly across clusters. Two—TechRich and FlexMatters—have made extensive or at least sustained use of these regional resources, while the remaining two have relied primarily on SBA resources for the cross-promotion of events or to receive and offer small business referrals. Clusters falling into this second category—the San Diego Defense Cluster and the Geospatial Cluster—are labeled in the third column of Exhibit 5 as making “limited” use of SBA resources. Additionally, SBA resources were used by certain clusters (e.g., the Advanced Power Cluster) to assist in identifying new small and large companies to target for cluster participation, particularly in the first year of the Initiative.

Exhibit 5. Summary of the service provision structures in place within each of the clusters

Cluster	Services provided by cluster administration	Services provided by SBA resource partners	Other primary providers of services*
Advanced Power Cluster	Yes	No ^a	Dakota Defense Alliance , Paradigm Positioning, MilTech, and Techlink
Geospatial Cluster	Yes	Yes (limited)	Mississippi Technology Alliance, Mississippi Development Authority, and Mississippi Minority Business Enterprise Center, etc.
FlexMatters	Yes	Yes, ^b SBDC	B&D Consulting, WIRE-Net , and companies in the region on an ad-hoc basis

Cluster	Services provided by cluster administration	Services provided by SBA resource partners	Other primary providers of services*
TechRich	Yes	Yes, WBC and SBDC	Procurement Technical Assistance Center, Plosila Consulting , Economic Development Partnership of Alabama , Chamber of Commerce of Huntsville/Madison County , Bid Design , and Defense Acquisition University
Smart Grid	Yes	No	Illinois Institute of Technology's Stuart Business School, Galvin Center for Electricity Innovation, O-H Community Partners, Clean Energy Trust , Energy Foundry , and BBC Entrepreneurial Training & Consulting
Energy Storage Cluster	Yes	No ^b	New Energy New York, Clean Energy States Alliance, Hydrogen Energy Center, and Massachusetts Hydrogen Coalition
San Diego Defense Cluster	Yes	Yes (limited) ^b	CONNECT, Foundation for Enterprise Development, SPAWAR, San Diego SBA District Office, San Diego State University Research Foundation ¹⁶

Source: Cluster proposals, quarterly reports, and interviews

* Providers listed in **bold** typeface were added in the third Initiative year; those listed in ~~strike through~~ are no longer being used.

^a Cluster occasionally used regional SBDCs as part of the process of identifying potential members, especially in Year 1.

^b Cluster reported limited contact with a SCORE chapter but did not rely on the organization as a service provider.

Overall, the seven clusters have not reported any significant change over the course of the Initiative with respect to their direct delivery of services or the nature of their relationship with SBA resources in their regions. However, two clusters reported they might rely on SBA resource partners to a greater extent in the future. For FlexMatters, which already leverages the Kent State SBDC, this inclination is triggered by an expansion in its industry scope for Year 4 to include additive manufacturing, of which flexible electronics is a subset. This expansion is leading the cluster to seek expertise for mentoring in these new areas, which the regional SCORE chapter may possess. Greater use of SBA resource partners also allows FlexMatters to focus its efforts on areas where it holds a competitive advantage, especially given the reduction in the cluster's contract value after Year 2. For the Geospatial Cluster, which does not currently work closely with regional SBA service partners aside from cross-

¹⁶ The SDSU Research Foundation's website states the Foundation's purpose as "to further the educational, research and community service mission of San Diego State University." Please see <http://www.foundation.sdsu.edu/about/index.html>.

promotion of events and occasional referrals, this inclination is triggered by the opening of a WBC in the area as well as improving relationships with the regional SBDC.

On the other hand, there were some significant changes this year relating to the primary service providers that clusters rely upon. Service provider changes were slightly more common than they were last year and are marked in the rightmost column of Exhibit 5 (using bold font for the providers that were *added* during the third year of the Initiative and strikethrough font for those *deleted*). However, these shifts in relationships with primary service providers are concentrated within a small number of clusters—in particular, TechRich and Smart Grid—with slight adjustments also made by the Advanced Power Cluster and FlexMatters. More details on the reasons behind these shifts are provided in the textbox below.

Shifting Relationships With Outside Service Providers In Year 3

- *Smart Grid saw significant changes in its structure in Year 3 as the Energy Foundry became operational. This organization was created as a result of the Smart Grid bill that passed in the State of Illinois, and offers service opportunities that did not previously exist within the cluster, such as the ability to invest directly into small businesses. In addition, the removal of the Clean Energy Trust from the list of primary service providers was prompted by a reduction in the grant amount provided by SBA in Year 3, combined with the fact that the work undertaken by the organization had been completed or could be handled by the Energy Foundry. As discussed previously, this shift also prompted a change in the composition of the cluster's steering committee.*
- *TechRich had a change in leadership as the cluster manager was on detail from NASA and was recalled to his regular position. This, along with an evolution in the services provided by the cluster based on emerging small business needs, led to some restructuring within the cluster, the addition of three new service providers, and the removal of one.*
- *FlexMatters reported that WIRE-NET was no longer needed in the Anchor Customer Engagement (ACE) Academy program and was, therefore, dropped from the list of primary service providers.*

2.4. Maturity Stages of the Clusters in SBA's Initiative

At the end of Year 3, little remains of the variance found in past years across the seven clusters with regard to measures of cluster development and maturity. All seven clusters reached a high level of organizational development with regard to service provision for members by the end of Year 1. Smart Grid, the only cluster still transitioning toward a mature life-cycle stage as of Year 2, has made important gains in this area this year.

Exhibit 6 provides information on the chronological age of each cluster (year established), its life-cycle stage, and its phase of organizational development. Phases of organizational development are defined by a cluster's primary focus on services and assistance provision as opposed to planning and capacity building, whereas life-cycle stages are indicative of a cluster's structural development and accumulation of social capital. Criteria for classification were derived from the academic literature, available information on the clusters' histories, and cluster administrator interviews (for more information on the classifications, see the two textboxes below).

Phases of Organizational Development

Because one of the goals of SBA's Initiative is to strengthen cluster assistance to small businesses, it is important to classify the seven clusters based on their organizational capacity to provide services to their participants. Actively managed clusters can be categorized into three phases of organizational development based on their organizational capacity to reach out and deliver services to their participants:

- ***Phase 1:*** *The primary focus of the cluster administration is on planning and structuring the cluster.*
- ***Phase 2:*** *The primary focus of the cluster administration is on recruiting participants and building capacity.*
- ***Phase 3:*** *The primary focus of the cluster administration is on providing services and other forms of assistance to participants and on securing the sustainability of the cluster.*

Cluster "ages" range from 3 to 15 years—the youngest (San Diego Defense Cluster) was formally established in 2010, while the longest-lived (Geospatial Cluster) has been in existence since 1998. However, it is important to note that the San Diego Defense Cluster was spawned from the Center for Commercialization of Advanced Technologies (CCAT) at San Diego State University, which has been in operation since 2001, illustrating the limitations related to this "age" measure and its definition.

Phases of organizational development are indicative of cluster involvement in providing services to their member organizations. All seven clusters reached Phase 3 in this regard at the end of Year 1 of the Initiative, meaning their primary focus has turned to providing services, activities, and events for their participants. This evolution illustrates that clusters established upon a strong foundation (i.e., a suitable anchoring entity, a qualified and experienced management team, and an existing regional advantage within its industry of focus) can quickly navigate through the first two phases of organizational development, a useful finding for the planning and design of future cluster initiatives.

Exhibit 6. Cluster maturity, by year of establishment, focus of activities, and stage of life-cycle

Cluster	Cluster year of establishment	Cluster's life-cycle stage	Phase of organizational development
Advanced Power Cluster	2004	Mature cluster	Phase 3
Geospatial Cluster	1998	Mature cluster	Phase 3
FlexMatters	2006	Mature cluster	Phase 3
TechRich	2006	Mature cluster	Phase 3
Smart Grid	2009	Mature cluster	Phase 3
Energy Storage Cluster	2005	Mature cluster	Phase 3
San Diego Defense Cluster	2010	Mature cluster	Phase 3

Source: Cluster proposals, quarterly reports, and interviews

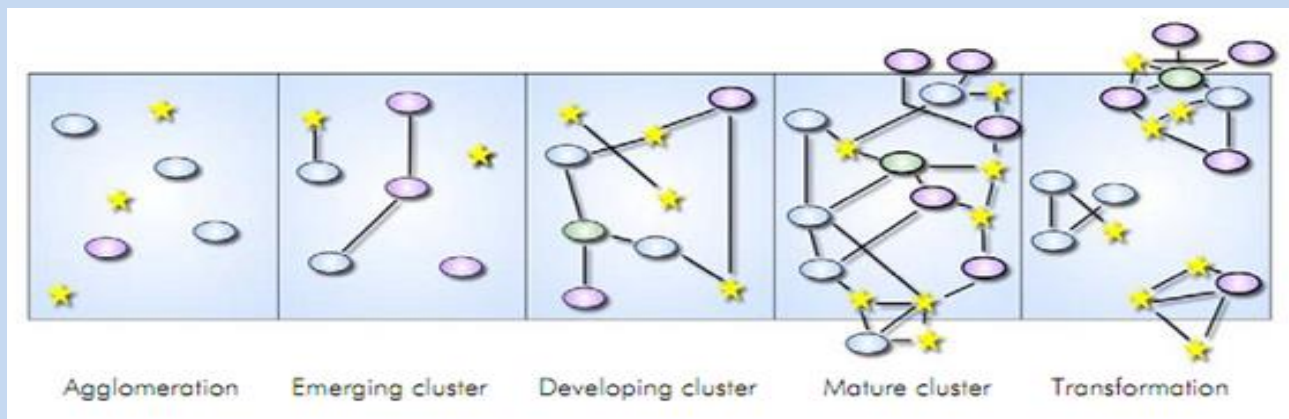
With regard to the last measure of cluster maturity, life-cycle stage (defined in the textbox below), the seven clusters have also all reached the mature stage as of the end of Year 3, whereas only Smart Grid was classified as transitioning from the developing to the mature life-cycle stage at the end of Year 2. Smart Grid's transition results from continued efforts to establish itself in the area as well as the passing of the Smart Grid bill (SB 9) through the Illinois General Assembly, which directed greater resources toward the cluster and formalized the active participation of a host of large companies involved in the electricity generation, transmission, and related fields. The cluster convenes a large and varied number of actors in the region on a regular basis while sustaining important connections outside the region and across the globe as well as unique test beds for smart grid technology that are attracting small businesses to the region. By the end of Year 3, Smart Grid was working to implement a co-working space in downtown Chicago to further foster connections and tacit exchange of information among small businesses as well as host CEOs of large companies, who will gain exposure to innovative solutions while also providing guidance to entrepreneurs.

Cluster Life-Cycle Stages

Over time, clusters will pass through a number of stages that, although not experienced the same way by all clusters, are logically ordered and can be identified and classified as follows:

- **Agglomeration:** The initial landscape before the emergence of a cluster, when small and large businesses as well as such organizations as universities, nonprofit organizations, and public-sector agencies are in close proximity but are not coordinated.
- **Emerging cluster:** Organizations and businesses initiate cooperation around a core activity and begin to understand the advantages afforded through further structuring.
- **Developing cluster:** New organizations and businesses involved in the same or related core activities begin to emerge or relocate in the cluster's region, and further linkages between organizations develop.
- **Mature cluster:** The cluster moves toward a critical mass and develops strong connections outside its region. New businesses are created through startups, spinoffs, and joint ventures, while more organizations and businesses are attracted to the region.
- **Transformation:** Markets, industries, and technologies change to the point that the cluster has to radically adapt and innovate to remain sustainable and to avoid stagnation.

The figure below offers a visual representation of the five life-cycle stages that clusters are generally thought to undergo.



Source: Andersson et al., The Cluster Policies Whitebook (2004), IKED, 29

It is important to note that, whereas now there is a perfect correlation between the clusters' "life-cycle stage" and "organizational development phase" classifications, this was not always the case, as the two measures identify somewhat different aspects of cluster development and maturity. Clusters can be focused on providing services and events (Phase 3) while still consolidating, creating connections outside their regions or the country, and moving toward a certain critical mass (i.e., a developing life-cycle stage), as was the case for Smart Grid until Year 3.

2.5. Different Business Models Used by the Clusters in SBA's Initiative

The clusters participating in the Initiative vary in one additional and critical dimension: *business model*. A cluster's business model is defined as its overarching strategy for developing a regional competitive advantage by effectively leveraging assets in its region, such as universities, supporting industries, and human capital.¹⁷ The seven participating clusters have taken a number of different approaches in this regard, where the approaches have naturally been tied to their underlying assets, opportunities, and constraints. These approaches have proven to be stable over the first 3 years of the Initiative, despite the emergence in some clusters of interesting developments affecting their key dimensions and regional assets. For instance, emerging industries and technologies often incorporate other related and synergistic technology and products as their value in the context becomes understood or they evolve to add significant value to these emerging industries and technologies. Smart Grid now considers certain types of batteries and distributed generation as relevant to its industry of focus. Inversely, a relatively niche and specific emerging industry can evolve to the point where it becomes clear that it is becoming a subset of another, less-specific industry. This led FlexMatters to broaden its industry of focus somewhat, as it now considers flexible electronics to fit within the broader emerging industry of additive manufacturing. These adjustments have implications for cluster operations, as clusters may be required to identify new experts in these areas, develop or strengthen relationships with new regional partners, or build internal capacity to add value to members in these areas. However, they may not directly change a cluster's business model, influencing more tactical decisions instead. In the case of FlexMatters, the cluster's focus remains on flexible electronics principally but may be shifting toward the intersection between flexible electronics, additive manufacturing, and biotechnology, to some degree. It is currently too early to assess whether and how the cluster's business model will be affected in the future.

Exhibit 7 outlines in broad terms the business models of clusters in SBA's Initiative. There is considerable diversity in the specific approaches used by clusters, yet several common themes also emerge. First, although all clusters have a business model that incorporates supply-chain integration, network development, the resolution of industry challenges, and the enhancement of regional assets to

¹⁷ Central to the definition of *business model* is the concept of *competitive advantage*, a concept closely tied to regional industrial clusters in Michael Porter's work. *Competitive advantage* asserts that countries aim at producing high-quality goods and services that garner a high price in the markets while maximizing the productive use of the needed inputs. This concept contrasts with *comparative advantage* (first noted by 18th-century political-economist David Ricardo), which asserts that countries should specialize in what they are most efficient at producing relative to other nations. The concept of *competitive advantage* is also tied to concepts of clusters because clusters are said to play an important role in enhancing the efficient use of inputs and fostering an environment where companies are encouraged to innovate. For more information on *competitive advantage*, please see *Competitive Advantage: Creating and Sustaining Superior Performance* by Michael Porter (1998).

some degree, the focus of each model aligns with each cluster's specific underlying strategies and characteristics:

- A number of clusters (e.g., the Energy Storage Cluster, FlexMatters, and Smart Grid) are operating within a ***supply-chain integration approach***. This involves the development of “anchor customers”—large companies with established client bases that are seeking solutions in the cluster's broad technology focus—the provision of industry-specific training (e.g., International Traffic in Arms Regulations [ITAR] and Export Administration Regulations [EAR] compliance), security clearances, workshop on industry-specific sources of public funding), and/or the provision of unique services (e.g., the creation of databases of supply-chain participants or the creation of test beds to validate and improve technologies).
- A second group of clusters—especially the defense-focused clusters (the San Diego Defense Cluster, TechRich, and the Advanced Power Cluster) and, to some extent, the Geospatial Cluster—is primarily focused on meeting the urgent and less-urgent procurement requirements of various federal agencies. They are, therefore, most concerned with ***developing extensive and robust networks*** with federal agencies and prime contractors.
- Other models exist, although they are not represented in the SBA Initiative. For example, some clusters are more idiosyncratic, with foci driven by the unique challenges of their industries or region.

The second theme to emerge from Exhibit 7 is the overall similarity in the categories and types of regional assets leveraged by each cluster. All the clusters in SBA's Initiative rely on region-specific strengths of the private sector as well as the skilled labor associated with that sector and the specializations of their regional research communities.¹⁸ A few clusters have also leveraged unique regional assets (e.g., particularly strong venture-capital communities, co-localization with important defense assets, or specialized testing facilities for new technologies, including federal research laboratories). In the longer term, it will be important to assess whether these clusters have benefited from leveraging unique assets through faster-than-average development or greater sustainability.

Finally, the business models of the seven clusters have remained essentially static through the first 2 years of the Initiative, although several clusters have adjusted their tactical approach (e.g., services mix, capture tactics for large companies, and approach to commercialization promotion).¹⁹ This adjustment is largely to be expected, as the strategic approach selected by clusters has been driven primarily by existing regional assets and the specific characteristics and structures of and gaps in their respective industries and markets, all of which change relatively slowly.²⁰ It should be noted, however, that during the second year

¹⁸ This is consistent with the principles of cluster theory and the importance of geographic and industry scope to clusters.

¹⁹ Some of these adjustments are outlined in Section 5, *Lessons Learned*, as well as in Section 3, *Implementing SBA's Regional Innovation Cluster Initiative*.

²⁰ Furthermore, regional assets are generally the result of unique regional histories, including previous efforts to develop and retain specific industries and leadership in certain areas of research and development.

of SBA's Initiative, some clusters also worked with their partners to create new regional assets aligned with one or more of their focus areas. These assets may ultimately be leveraged to facilitate expansion into new industry segments and target markets. For example, FlexMatters played an important role in the creation of the bioFLEX Center at Kent State University, with the goal of gaining a unique position in the flexible-bioelectronics field. Sometimes, an intangible asset, such as a certification granted by a third party, may be leveraged as a competitive advantage by the clusters in their business model instead of the creation of new tangible assets. For example, in Year 3, several clusters—in particular the defense-focused clusters but also the Geospatial Cluster—coordinated with relevant regional organizations to apply for a certification of authorization from the Federal Aviation Administration (FAA) to operate unmanned aerial vehicle (UAV) test sites in their respective regions. In this case, the FAA did not select a cluster region, and therefore it remains unknown how any of the clusters would have adjusted their business model.²¹

²¹ The official decision by the FAA was made public after the end of Year 3, see <http://www.faa.gov/news/updates/?newsId=75399>, but is included here because several clusters reported on the logistics of drafting a proposal with other relevant organizations in their region.

Exhibit 7. Summary of the business model selected by each cluster in SBA's Cluster Initiative

Cluster	Business model	Predominant cluster strategy
Advanced Power Cluster	<p>Seeks to support high-technology small businesses and connect them with U.S. Department of Defense (DoD) and U.S. Department of Energy (DoE) to fulfill their priority requirements in power and energy by leveraging the following regional assets:</p> <ul style="list-style-type: none"> • A high concentration of actors involved in power and energy defense procurement • The research and development (R&D) and technology-transfer capabilities of universities and research centers • The intellectual and financial capital for high-technology innovation 	Network development
Geospatial Cluster	<p>Seeks to assist high-technology small businesses to develop and market innovative geospatial technologies by leveraging the following regional assets:</p> <ul style="list-style-type: none"> • A high concentration of federal agencies and R&D facilities with a geospatial focus • A high concentration of prime contractors • A highly skilled workforce due to universities with strong geospatial expertise and R&D 	Network development
FlexMatters	<p>Seeks to accelerate the growth of the emerging flexible electronics industry by assisting small businesses developing innovative and commercializable technologies by leveraging the following regional assets:</p> <ul style="list-style-type: none"> • Universities and research institutions largely responsible for the creation of the flexible-electronics industry • A strong manufacturing know-how • A high concentration of private-sector entities involved in the flexible-electronics industry 	Supply-chain integration
TechRich	<p>Seeks to assist small businesses with defense-procurement capabilities and to connect them to DoD, DoE, and the National Aeronautics and Space Administration (NASA) for the fulfillment of priority needs by leveraging the following regional assets:</p> <ul style="list-style-type: none"> • A concentration of defense agencies seeking innovative solutions and defense-research institutions • A high density of private entities involved in defense procurement and R&D • Several universities that focus on high technology and engineering 	Network development
Smart Grid	<p>Seeks to assist small businesses through the development of a collaborative ecosystem and the acceleration of smart grid innovation and deployment by leveraging the following regional assets:</p> <ul style="list-style-type: none"> • The availability of testing facilities • Universities and research laboratories focused on power engineering 	Supply-chain integration

Cluster	Business model	Predominant cluster strategy
	<ul style="list-style-type: none"> • A high concentration of private-sector entities in power engineering and distribution • A high concentration of venture-capital actors 	
Energy Storage Cluster	<p>Seeks to integrate small businesses into the hydrogen and fuel-cell supply chain and to improve their competitive positions by leveraging the following regional assets:</p> <ul style="list-style-type: none"> • A high concentration of hydrogen and fuel-cell industries in the Northeast • A highly skilled labor force • A high concentration of research universities and incubators 	Supply-chain integration
San Diego Defense Cluster	<p>Seeks to support and promote small businesses with capabilities in one of four technology areas aligned with DoD procurement focus areas by leveraging the following regional assets:</p> <ul style="list-style-type: none"> • The highest concentration in the world of DoD facilities involved in both R&D and operations • Multiple universities with a strong science and technology focus • A high concentration of prime defense contractors • A high concentration of innovative small businesses 	Network development

Source: Cluster proposals

3. Implementing SBA's Regional Innovation Cluster Initiative

This section details the implementation of SBA's Regional Innovation Cluster Initiative during its third year, providing an overview of the composition of cluster member networks, the use of resources and provision of services and activities by clusters, and the participation in and satisfaction with those services and activities by member organizations. The survey data collected indicate that the complex networks of stakeholder organizations that compose clusters grew substantially along most dimensions since the start of the Initiative, with growth in the number of certain types of participating organizations seemingly beginning to level off in its third year. The most significant membership growth occurred among small businesses, increasing on average an additional 38% in the third year of SBA's Initiative. Small business participation was importantly tied to the ability of businesses to network with one another and their desire to access cluster services, while large organization participation was tied to regional economic development, technology commercialization, and technology-transfer goals.

3.1. Cluster Stakeholders

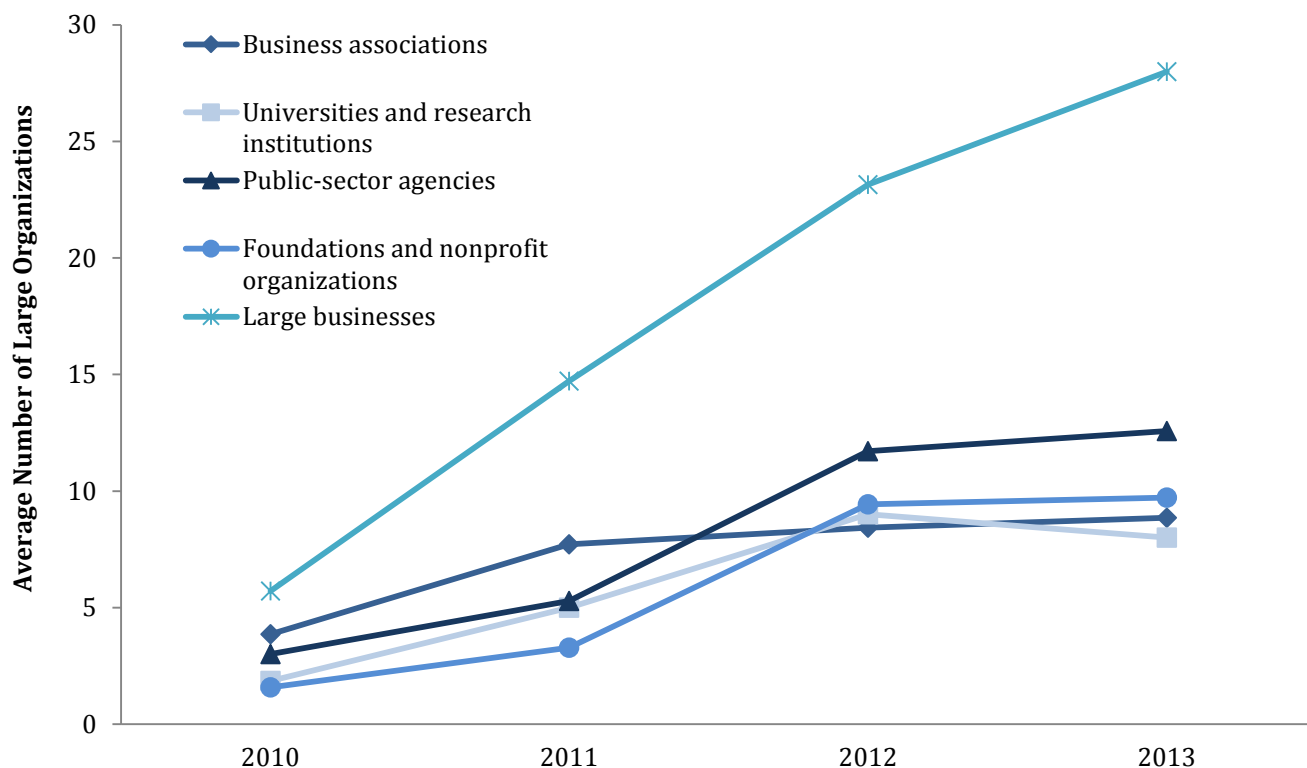
Industry clusters participating in SBA's Initiative comprise a broad spectrum of stakeholders, including small businesses, larger companies, and supporting entities, such as universities and workforce education institutions, foundations, business associations, service providers, and public-sector agencies. These organizations work synergistically together to enhance and support growth and innovation in the industries in which the clusters operate. This overview of the implementation of SBA's Initiative begins with a discussion of the interconnected networks composing each cluster, focusing in turn on various stakeholder groups. The complex networks of stakeholder organizations that compose clusters has grown substantially along all dimensions since the first year of the Initiative; during the third year, participation rates for certain stakeholder categories show signs of steadying.

By the end of the third year of SBA's Initiative (2013), the seven clusters included an average of eight universities and research institutions, seven business associations, 12 public-sector agencies, and 10 nonprofit organizations (participation of large and small businesses is discussed separately below). Public agencies represent one of the largest contingents in each cluster's network, acting as both a purchaser (e.g., U.S. Army, Federal Emergency Management Agency) and supplier (e.g., Procurement Technical Assistance Centers, District Export Councils, U.S. Commercial Services) of small business services. The number of participating universities, nonprofit organizations, and public-sector agencies has more than tripled between 2010, when SBA's Initiative began, and 2013, whereas business associations have grown

more modestly, approximately doubling (see Exhibit 8). However, growth in the clusters' large-organization networks seems to have slowed down somewhat in Year 3, despite some high-profile additions by certain clusters (e.g., the Advanced Power Cluster has worked with the Pew Charitable Trust for most of Year 3).

During Year 2, the average number of universities and research institutions, public-sector agencies, and foundations and nonprofits grew by 80%, 120%, and nearly 190%, respectively. In stark comparison, the growth rate for these same categories of organizations during Year 3 is -11%, 20%, and 3%, respectively. One possible explanation for these flattening growth rates is that some organizations did not feel cluster participation to be beneficial enough to justify further involvement. However, this hypothesis directly contradicts survey results about perceived benefits of participation among large organizations, which remained stable in Year 3 and therefore does not appear likely. Smart Grid provided an alternative explanation that better fits the overall evolution of the clusters—that this change was the result of strategic adjustments during Year 3 as well as normal fluctuations in the strength of relationships over time.

Only TechRich and the Advanced Power Cluster have shown steady or even accelerating growth in their large organizations' network during Year 3. The former reported particularly important growth in the number of universities (greater than 200%) and the number of public-sector agencies (greater than 100%) in its network, while the number of business associations and nonprofit organizations grew by 60% and 80%, respectively. The Advanced Power Cluster reported double-digit growth in all four categories, including a 75% increase in the number of nonprofit organizations and a 50% increase in the number of universities. Based on the activities and goals reported by these two clusters, it appears that TechRich's sustained growth in terms of large organizations is linked to an unusually important number of new connections made during the annual TechConnect summit combined with crucial adjustments made at the end of Year 2 and throughout Year 3 in terms of cluster operations, service mix, and leadership. The Advanced Power Cluster, by the very nature of how it operationalizes geographic scope, travels all over the country to visit its small business members and takes advantage of these trips to actively recruit and develop partnerships with organizations outside its region.

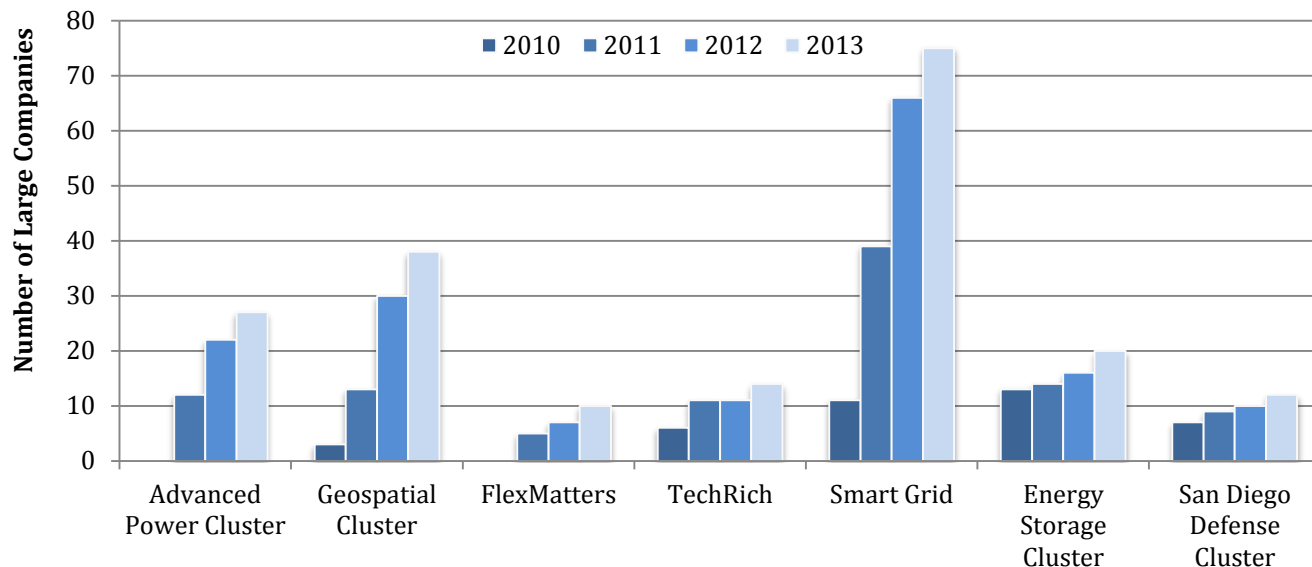


Source: RIC cluster administrator survey

Exhibit 8. Average number of large organizations participating in SBA's Cluster Initiative, 2010–2013

On the other hand, large business participation in the clusters has risen more steadily and consistently into the Initiative's third year. On average, the seven clusters have 28 large business participants, a nearly four-fold increase since 2010 and up nearly 25% in the most recent year (2012 to 2013). The total number varies significantly across the clusters, ranging from 10 to 75 with a median of 20 (Exhibit 9). Similarly, the growth pattern of that number varies significantly across clusters, with Smart Grid, the Geospatial Cluster, and the Advanced Power Cluster reporting steady growth while other clusters grew significantly less steadily and evenly. FlexMatters, the cluster with the fewest large business participants, saw the largest percentage increase in the last year. Though small in number, FlexMatters has grown its corporate relationships purposely and selectively during 2013 (from 7 to 10) through a program it designed to build in-depth knowledge of targeted "anchor" companies' technology needs. On the other end of the spectrum, Smart Grid has seen a rapid and relatively steady increase in its number of large businesses for two principal reasons. First, the provision of early-stage capital after a rigorous screening process combined with the various small business support services provided by the cluster and its relationships with utilities increased the cluster's credibility in the eyes of large businesses. Second, the various test beds offered to small businesses to validate their smart-grid products in contexts increasingly

close to real-world use made the cluster’s value proposition particularly strong for utilities and other large firms seeking to capitalize on the extensive infrastructure upgrade and the commercialization of innovative technologies.



Source: RIC cluster administrator survey

Exhibit 9. Number of large companies participating in SBA’s Cluster Initiative, 2010–2013

3.2. Small Business Participation in the Clusters

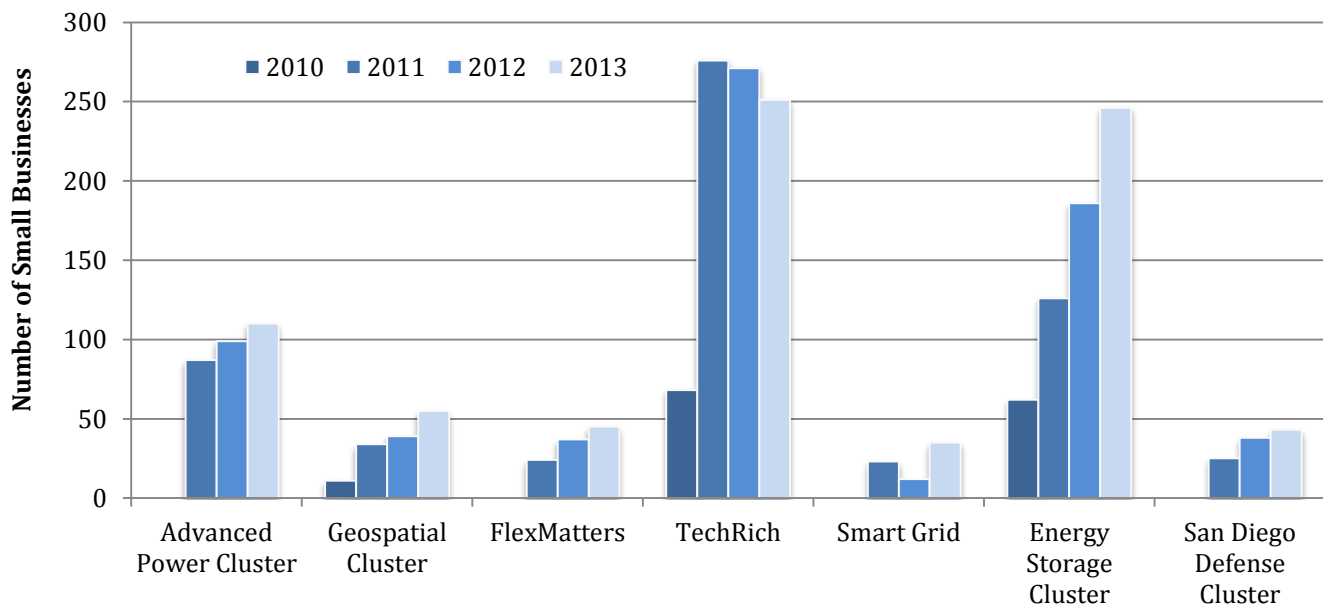
The primary goal of SBA’s Initiative is to connect small businesses to cluster networks. The seven clusters established wider networks across all stakeholder categories, including small businesses, the number of which has grown year over year in nearly every cluster since the beginning of SBA’s Initiative; during Year 3, the clusters reported an average growth rate of 43% in their number of small business participants.²² The trend in Year 3 was slightly different for TechRich, which saw a net decline in small business participation of 7%. However, it is important to keep in mind that TechRich operates on an “open membership” model, which means the participant count reported should not be viewed in the same light as those of some other clusters that have more rigid membership rules.

²² However, the growth in the total number of small business participants across the 7 clusters between Year 2 and Year 3 is 15% (from 595 small businesses to 682).

Clusters With Less Restrictive Participation Criteria

- *TechRich has a relatively open membership model. All businesses operating in Northern Alabama that are in the cluster industry and with which the cluster interacted are considered part of the cluster.*
- *The Energy Storage Cluster has partner organizations in eight states in the Northeast United States; this wider geographic scope leads to a large number of small business participants.*
- *The Advanced Power Cluster focuses on four states in the Midwest but has no geographic restrictions on participation and currently has members in 30 states across the United States.*

The number of small business participants in a cluster is reflective of the approach that the cluster has taken in providing services to its small businesses and of its geographic scope. Small businesses participating in each cluster by year are shown in Exhibit 10. In 2013, cluster enrollment ranges from 28 to 251 small businesses. Clusters with a lower number of small business participants typically have smaller geographic scopes and well-defined inclusion and exclusion criteria. Smart Grid, the Geospatial Cluster, and the San Diego Defense Cluster are good examples. These three clusters also have relatively more large business participants, which may indicate unique business conditions or cultures in those regions that affect the small business creation and/or participation rate. Other clusters have less stringent inclusion criteria or greater geographic scopes that allowed for a broader set of small businesses to meet their eligibility criteria (see textbox above).



Source: RIC cluster administrator survey

Exhibit 10. Number of small businesses participating in SBA's Cluster Initiative, 2010–2013

The 2013 cluster small businesses are made up of firms that are new to the clusters and firms participating in previous years. Slightly fewer than half the small businesses reported as participants during the third year by the clusters first joined during that same year: 21% first joined during the second year, 31% joined during the first year, and only 4% joined prior to the start of SBA's Initiative. The distribution of years when small businesses joined varies significantly among the clusters. For example, about 70% of TechRich's small businesses started during Year 3, while nearly 40% of the Geospatial Cluster's small businesses started prior to SBA's Initiative (2010 or earlier).

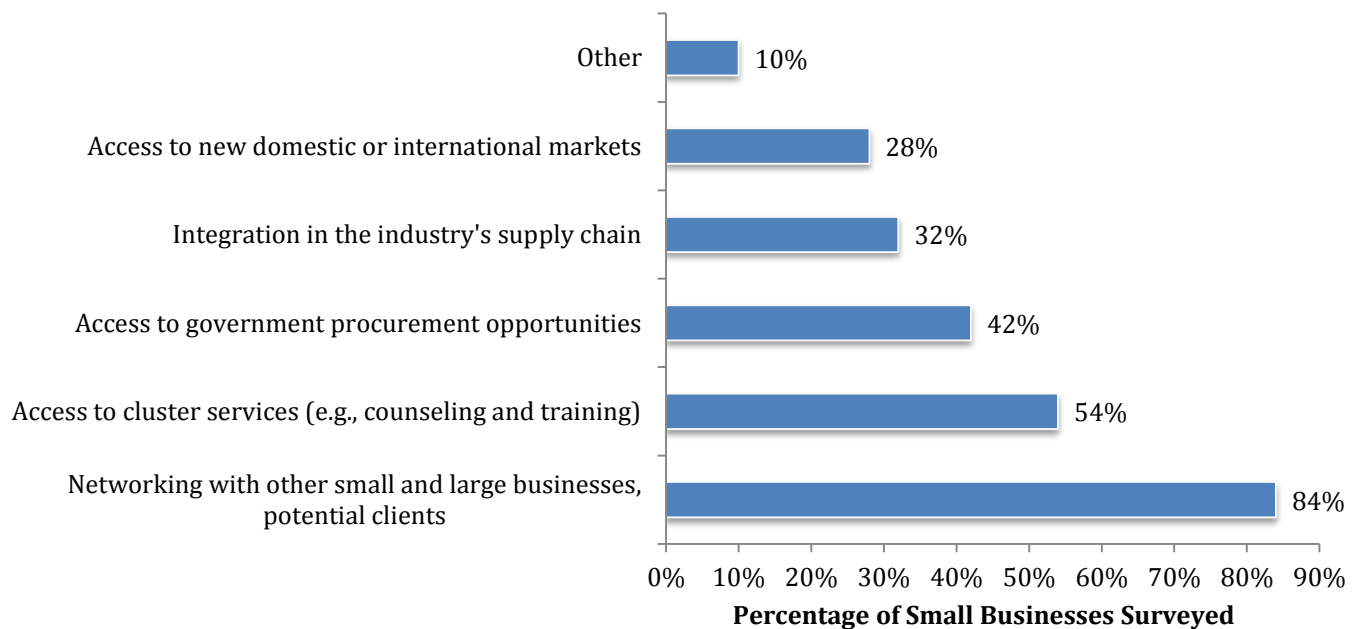
More than 99% of small businesses participating in clusters in 2013 were reported to have employees. The decrease in small businesses without employees, a trend previously noted in Year 2, seems to continue in Year 3. Although small businesses without employees made up approximately 5% of cluster members in the first year of the Initiative, this value decreased to less than 2% in the second year. This change is indicative of the growth and maturation of participating small businesses over this time period, of some smaller firms going out of business, and of the increasing focus by a subset of clusters on businesses with technology closer to market (e.g., the San Diego Defense Cluster, the Advanced Power Cluster). Among the 1% of small businesses without employees in Year 3, a fourth went out of business during the year.

Participation rates are also shaped by mergers, acquisitions, closures, relocations, and businesses that otherwise choose not to maintain annual contact with the cluster. Although firm transitions are not systematically tracked in the evaluation, anecdotally, cluster administrators reported that two small businesses closed and one was acquired during the third year of the Initiative.

3.3. Reasons for Participation in the Cluster

Clusters provide a complex and customized set of networking, coordinating, and assistance functions in a complex market environment. Thus, organizations can have any number of reasons for participation, which are likely to vary somewhat by type of organization. Large organizations and small businesses participating in the Initiative clusters were queried regarding their reasons for cluster participation in each year of the Initiative. Small businesses reported two key reasons: networking with large organizations and other small businesses and accessing cluster services. Large organizations reported the most important reasons for participating in a cluster to be spurring regional economic development, finding technology-transfer partners, and gaining access to new technologies with commercialization potential.

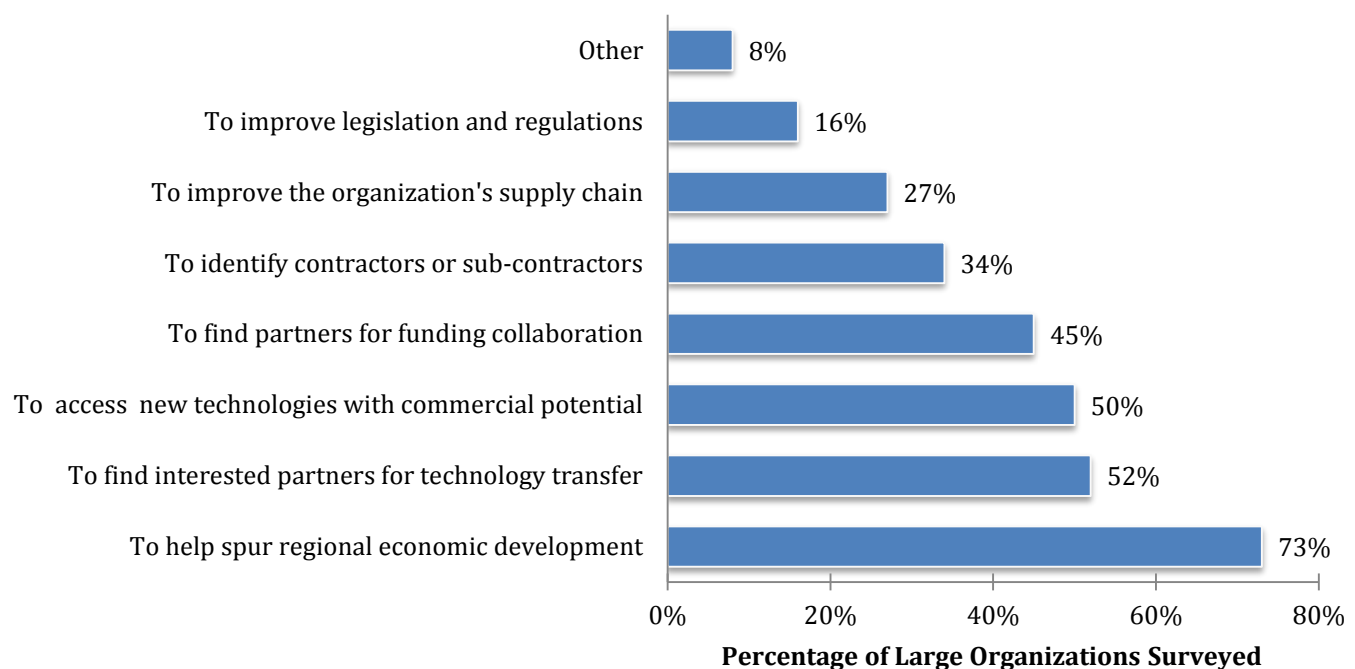
Among small businesses surveyed, 84% selected the ability to network with other small businesses and large organizations as a key reason for their cluster participation (see Exhibit 11). Furthermore, this was the most commonly selected reason in every year of the Initiative and across nearly all clusters. In addition, slightly more than half of small businesses (54%) indicated that access to cluster services was an important reason for cluster participation, while access to government procurement channels remained important among small businesses of the defense-focused clusters in particular, as indicated last year. Although little has changed in the aggregated distribution of reasons for participation over the past year, the percentage of businesses listing access to government procurement channels as a reason for participation decreased drastically for TechRich (61% in Year 2 versus 40% in Year 3), whereas it has remained relatively stable in the other two defense-focused clusters. Interestingly, the Geospatial Cluster, which also operates in industries where government agencies are a principal customer, had half as many respondents indicate government procurement as a top reason this year compared to last year. It appears that the uncertainty in government procurement tied to the government shutdown, sequester, and budget uncertainties have not consistently affected the expectations of small businesses involved in these fields. In part, this might be due to the volume of private-sector opportunities within each of the defense-focused cluster's specific technology focus areas. Another noteworthy but surprising finding is the decrease in the frequency at which access to domestic and international markets was selected between Year 1 and Year 2 (35% in Year 2 versus 28% in Year 3).



Source: RIC small business survey

Exhibit 11. Reasons for small business participation in the clusters

Large organizations were also queried about their motivation to join their clusters and, as shown in Exhibit 12, 73% cited a desire to help spur regional economic development as a predominant factor. Other key reasons for participation, indicated by at least half the large organization respondents, included finding interested partners for technology transfer (52%) and gaining access to new technologies with commercialization potential (50%). There have been slight shifts in these responses over the years of the Initiative. For example, the percentage of large organizations citing regional economic development and the percentage citing an interest in improving their supply chains both decreased several percentage points in Year 2 and rose again in Year 3. However, the top three choices have remained unchanged over the Initiative and vary little among the clusters.



Source: RIC large organization survey

Exhibit 12. Reasons for large organization participation in the clusters

3.4. Cluster Services and Activities

Clusters participating in SBA's Initiative provide various services designed to address the multifaceted needs of their member organizations while they work toward fulfilling shared goals of business advancement and regional economic development. Goals of service provision range from facilitating collaboration within the clusters and supporting the development of new technologies to improving small business marketing strategies and international export volume (see Exhibit 13). All seven clusters provided some services directly to their participants through the first 3 years of the Initiative, while four out of seven also relied to varying degrees on one or more regional SBA partners. As in

previous years, clusters variously provided extensive one-on-one counseling to member businesses hosted significant numbers of group events and activities. Group events can include: *matchmaking events* to provide cluster members with the opportunity to connect and create teams with other organizations; *networking events* enabling cluster members to meet potential customers; *showcasing events* at which members can market their products or services; and, *training events*. (More detailed definitions of cluster-sponsored events are provided in the methodological appendix, Section A.2.) During the third year of the Initiative, the seven clusters reported a total of 108 such events, although only three clusters—the Geospatial Cluster, the Energy Storage Cluster, and the San Diego Defense Cluster—sponsored two-thirds of them.

Small businesses and large organizations both reported being active participants in cluster services/activities and events. Among small businesses reporting, a significant majority indicated at least occasional participation in cluster-sponsored events, such as networking and showcase events. Slightly more than half of large organization members also reported that they often or always participated in cluster-organized events. This level of participation was broadly consistent with that reported during the first 2 years of the Initiative for both small business and large organization participants. Very few small business participants reported that they could obtain similar services from other providers, suggesting that (from the perspective of small businesses) cluster services were unique and filled a void in service provision. Similarly, a significant majority of large organizations reported that the expected benefits of cluster participation had at least “somewhat” materialized.

Exhibit 13. Examples of services provided by clusters participating in SBA's Initiative

Types of Services	Cluster-Specific Examples
Goal: Facilitating alliances and collaborations among cluster participants and with outside organizations	
<ul style="list-style-type: none"> Events fostering collaboration among cluster participants around a specific objective or opportunity Targeted networking events that included cluster members or entities external to the cluster (e.g., foreign delegations of industry executives, representatives of various DoD agencies, or university faculty) Referral of small businesses to appropriate large firms, organizations, or regional resources 	<ul style="list-style-type: none"> <u>TechRich</u>: Hosted ideation events that brought together small businesses to identify their potential contribution toward a specific set of opportunities related to advanced energy (e.g., Rapid Innovation Fund [RIF], SBIR/STTR). The cluster then facilitated team building and supported the two most promising teams during proposal development and review. <u>San Diego Defense Cluster</u>: Held a workshop on how to increase the success rate of small businesses in teaming and bidding on federal contracts. <u>Advanced Power Cluster</u>: Connected a small business developing a device to charge electric vehicles and hybrids automatically and wirelessly with another member company selling electric vehicles designed for delivery and grounds maintenance. <u>FlexMatters</u>: Led a project involving multiple small businesses and a large company with complementary capabilities with the goal of developing a smart mouth guard to detect traumatic brain injuries. This collaboration led to the submission of a joint proposal.
Goal: Increasing small businesses' access to capital	
<ul style="list-style-type: none"> Information provision: Listing of funding opportunities via cluster's website or newsletter Technical assistance: Mentoring, application-writing assistance for various funding opportunities Matchmaking: <ul style="list-style-type: none"> Recommendation letters for small business funding applications Assistance in finding partners to improve strength of funding applications Introductions between investors (e.g., venture capital firms) and cluster participants 	<ul style="list-style-type: none"> <u>San Diego Defense Cluster</u>: Made regular website posts of funding opportunities relevant to small businesses engaged in specific technology areas of interest to DoD. <u>Geospatial Cluster</u>: Sent e-mail alerts regarding Small Business Innovation Research (SBIR). <u>Geospatial Cluster</u>: Mentored a small business regarding SBIR applications and review of final proposal before submission. <u>Energy Storage Cluster</u>: Organized the Connecticut Innovation Summit, Fall 2012, where 70+ small businesses showcased their products to angel and venture funders and prospective customers. <u>Advanced Power Cluster</u>: Introduced two potential investors to a small business member in need of financing to fulfill two contractual agreements with Fortune 100

Types of Services	Cluster-Specific Examples
	<p>companies.</p> <ul style="list-style-type: none"> • <u>TechRich</u>: Organized a program where small businesses that had never submitted a proposal before could apply to receive up to \$5,000 in proposal writing and development assistance, with a strong focus on training.
<i>Goal: Enhancing small businesses' development or commercialization of new technology</i>	
<ul style="list-style-type: none"> • Workshops on technology transfer and commercialization of new technology • Assistance with steps for developing or commercializing a new product • One-on-one counseling on business strategies for technology transfer • Connection of small businesses with universities or other research organizations that assist with key linkages for technology transfer • Provision of direct access to test beds and other testing facilities 	<ul style="list-style-type: none"> • <u>Smart Grid Cluster</u>: Assigned Ph.D. engineering students from a participating university to work with five small businesses, providing assistance with bench testing, algorithm development, and other technical support crucial to moving toward a final product. • <u>San Diego Defense Cluster</u>: Connected a small business with an engineering faculty member at San Diego State University to execute the third-party validation and testing of a product. • <u>Energy Storage Cluster</u>: Leveraged in-house expertise in fuel-cell technology to counsel a member small business on challenges associated with the development of a ceramic membrane. • <u>Smart Grid Cluster</u>: Provided 10+ small businesses with an opportunity to test and demonstrate their products on one or several smart-grid test beds. The cluster also connected several small firms with the Argonne National Laboratories for testing and third-party validation.
<i>Goal: Improving small businesses' marketing strategies</i>	
<ul style="list-style-type: none"> • One-on-one counseling or workshops on marketing strategies • Referrals to larger organizations that can serve as mentors or to other regional resources • Direct showcasing of cluster participants' products and capabilities in high-profile settings 	<ul style="list-style-type: none"> • <u>Energy Storage Cluster</u>: Co-hosted the webinar "Marketing & Sales Promotion: What Mix Will Drive the Highest ROI?" through which participants learned about cost-effective and efficient methods for marketing. • <u>FlexMatters</u>: Created ACE Academy, a sustained, in-depth training program that prepares small businesses to best engage "anchor customers"—large firms with established market presence and a variety of needs—and capture identified opportunities. • <u>Advanced Power Cluster</u>: Assisted a small business with marketing counseling and DoD introductions, culminating in the business's providing lightweight armor samples

Types of Services	Cluster-Specific Examples
	to MilTech (a partnership between TechLink and the Montana Manufacturing Extension Center that focuses on hands-on product design, prototyping, and manufacturing assistance with the aim of a faster transition of technology to the market at a lower cost).
<i>Goal: Increasing exports</i>	
<ul style="list-style-type: none"> • Seminars, workshops, individual counseling • Referrals to regional resources specializing in exports • Trade missions to various locales organized by the cluster on behalf of participating small businesses 	<ul style="list-style-type: none"> • <u>TechRich</u>: Offered the Export Control Update Conference to inform participants about export controls through a variety of subject matter experts and agency representatives. This event was followed a few months later by another focused on foreign military sales, particularly in Canada and Asia. • <u>San Diego Defense Cluster</u>: Facilitated a meeting between the International Trade Administration and a small business cluster member interested in collaborating with an Israeli firm to design an unmanned helicopter system for India. • <u>TechRich</u>: Organized a trade mission to Montréal and Québec to discover new customers and showcase the capabilities of select small businesses. In preparation for the trip, the cluster provided individual coaching and the services of a local export-compliance specialist free of charge. • <u>Geospatial Cluster</u>: Organized a trade mission to Brazil where representatives from, five small businesses handpicked companies in the country with specific geospatial needs.
<i>Goal: Assisting with intellectual-property issues and patent applications</i>	
<ul style="list-style-type: none"> • Workshops on intellectual property and how to incorporate intellectual-property considerations into business plans and strategies • One-on-one assistance with patent application process • Connections with intellectual property specialists who can assist with patent applications 	<ul style="list-style-type: none"> • <u>Geospatial Cluster</u>: Hosted Fall 2011 workshop on intellectual property rights. • <u>FlexMatters</u>: Planned a half-day workshop focused on strategic use of intellectual property and use of intellectual property in the context of teaming. • <u>Geospatial Cluster</u>: Provided mentoring on intellectual property to an important subset of small business participants.
<i>Goal: Services aimed at building small businesses' organizational capacity</i>	

Types of Services	Cluster-Specific Examples
<ul style="list-style-type: none"> • One-on-one counseling, group workshops, and presentations by experts • Assistance with registration for various disadvantaged business statuses, e.g., 8(a) 	<ul style="list-style-type: none"> • <u>TechRich</u>: Organized a seminar on cybersecurity to inform small businesses about risk-reduction strategies and ways to increase security of online systems. • <u>Energy Storage Cluster</u>: Co-hosted a 1-day workshop on developing a growth action plan, including goal setting, developing commercialization strategies, establishing a brand, and driving return on investment. • <u>Geospatial Cluster</u>: Hosted workshop on key elements of business operations in high-technology industries, including branding, government contracts, accounting, and human resources.

Source: Cluster quarterly reports and interviews

3.4.1. Provision of Services

Cluster administrators in SBA's Initiative have considerable flexibility in the mix of resources they use to assist participants. In particular, they can assist through the following activities:

- Provision of in-house services
- Utilization of services provided by SBA resource partners, such as SBDCs, WBCs, and SCORE chapters
- Leveraging of the expertise of other resources or organizations, such as business schools, technological institutes, business and technology support organizations, Procurement Technical Assistance Centers, and Manufacturing Extension Partnership centers

Clusters considered their competitive advantage in each of these service-provision methods and selected a mix of in-house, SBA-affiliated, or third-party provisions based on their local and regional resources, along with the existence of groups with similar missions and the needs of their small businesses. Exhibit 4 in Section 2.3 shows that all seven clusters provided some services directly to their participants and that four of the seven clusters also relied to a varying extent on one or more SBA partners (e.g., SBDC, WBC, SCORE) for service provision to small businesses. This approach allowed those four clusters to focus their own efforts on highly specific services that fell outside the scope of SBA partner capabilities while leveraging the existing SBA network of assistance, thus limiting the duplication of services offered. FlexMatters, for example, took this approach by focusing on highly specific flexible electronics assistance from experts in the field and in-depth training on the SBIR process and capture planning while also relying on the Manufacturing & Technology SBDC at Kent State University for manufacturing assistance and more routine services.

All seven clusters also relied on third-party organizations, many of which provided advanced and specialized mentoring, counseling, and technical assistance:

- The Advanced Power Cluster relied on TechLink²³ and MilTech, both at Montana State University, to provide access to labs for research and development, prototyping, and technology licensing.
- Smart Grid used BBC Entrepreneurial Training & Consulting to provide expert advice on developing successful SBIR/STTR proposals.
- TechRich relied on Bid Design, a business development firm, to provide up to \$5,000 in proposal writing assistance and training to small businesses with limited experience in the area. The objective is not simply to generate strong and competitive proposals but also to build the small businesses' capacity to do so on their own in the future.

²³ TechLink primarily assists companies with licensing new technologies from DoD but it also evaluates technology and fosters partnerships with DoD labs and other organizations for joint R&D.

Cluster administrators divide their time between management activities related to the general setup, management, and strategic planning of the clusters and service-provision activities, such as counseling, training, and offering events to cluster participants. Accordingly, administrators must decide how to optimally allocate their funding between these two categories of activities.

Exhibit 14. Percentage of SBA funding spent on providing services vs. cluster management activities

Cluster	Percentage of SBA funding spent on providing services ^a	Percentage of SBA funding spent on cluster management ^b
Advanced Power Cluster	65%	35%
Geospatial Cluster	88%	12%
FlexMatters	72%	28%
TechRich	81%	19%
Smart Grid	79%	21%
Energy Storage Cluster	75%	25%
San Diego Defense Cluster	71%	29%
All clusters	76%	24%

Source: RIC cluster administrator survey

^a Percentage of SBA funding spent on providing services to cluster participants (e.g., counseling, training, and events)

^b Percentage of SBA funding spent on overall cluster setup, ongoing management, strategic planning, and other activities where there was no interaction with cluster participants

As reported in Exhibit 14, the percentage of SBA funding spent on providing services in Year 3 ranged from 65% for the Advanced Power Cluster to 88% for the Geospatial Cluster, averaging 76% across the seven clusters. This average was somewhat lower than in Year 2 (81%) but remained significantly higher than the value for Year 1 (61%). At first glance, this number contradicts the finding reported in the Year 2 evaluation—that as clusters improved their organizational capacity and progressed through their life-cycle stages, they actively focused more resources toward service provision. After all, as reported in Exhibit 6, all clusters have now reached the mature life-cycle stage and are in Phase 3 of their organizational development, so their proportion of funds used toward services should remain stable or improve. However, the fact that almost all clusters aside from Smart Grid reported a lower percentage of funds used toward service provision for Year 3 suggests that another factor is at play—in particular, SBA issued new contracts with the seven clusters for Year 3 under which their funding decreased by

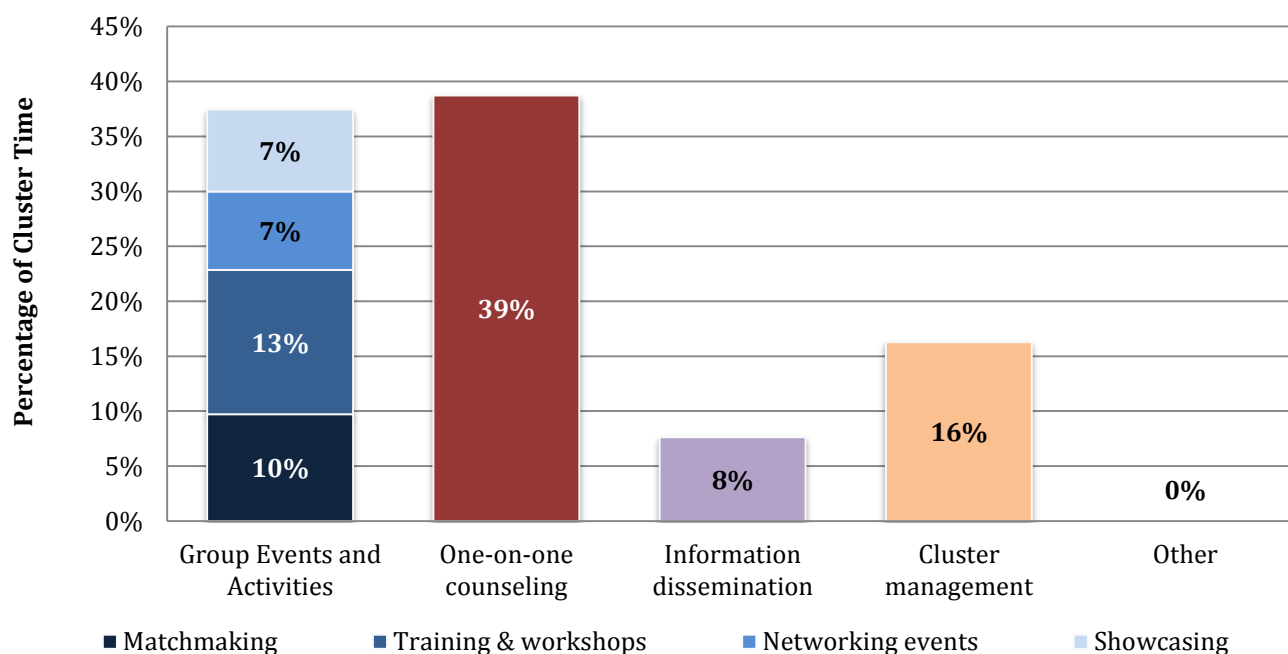
approximately 36%.²⁴ Based on the reasonable assumption that a significant portion of cluster management costs are essentially fixed because many tasks performed in this category need to happen regardless of service volume and offerings (e.g., compliance with SBA documentation request, strategic planning, adjustments to the service mix, coordination with regional service providers and partner organizations), a decrease in funding would naturally increase the proportion of funds used toward cluster management. In fact, based on interviews and other information gathered from the clusters, the case can be made that clusters had to focus more on cluster management as a result of the funding cuts, as their number of participants did not decrease and therefore adjustments to the service mix had to be made. Smart Grid, the outlier with regard to the evolution of its share of funding used toward service provision, shares this status as a result of the inclusion of the Energy Foundry, which receives funds from other sources and is playing an important role in cluster management along with the Illinois Institute of Technology.

3.4.2. Cluster Services and Activities by Type and Frequency

The services and activities that clusters provide to small businesses can be classified in six categories: (1) one-on-one counseling, (2) networking events, (3) training events, (4) matchmaking events, (5) showcasing events, and (6) information dissemination.²⁵ On average, clusters dedicated a slightly greater share of their time to one-on-one counseling than to group events and activities, such as matchmaking, training and workshops, networking, and showcasing events (39% versus 37%; see Exhibit 15). The majority of time spent on group events went to training and workshops (13%) and matchmaking events (10%). Cluster management, which included strategic planning and cluster promotion, accounted for 16% of cluster time, while information dissemination accounted for 8%. These figures have evolved somewhat since Year 2, with the principal differences being that clusters reported a 9 percentage point increase in the time spent on one-on-one counseling and a 3 percentage point decrease in the time spent on matchmaking. In addition, the “other” category decreased from 3% to 0% of clusters’ time, while information dissemination also decreased by 3 percentage points.

²⁴ Original contracts had a value of approximately \$603,000 per cluster, whereas the new contracts are worth approximately \$385,000.

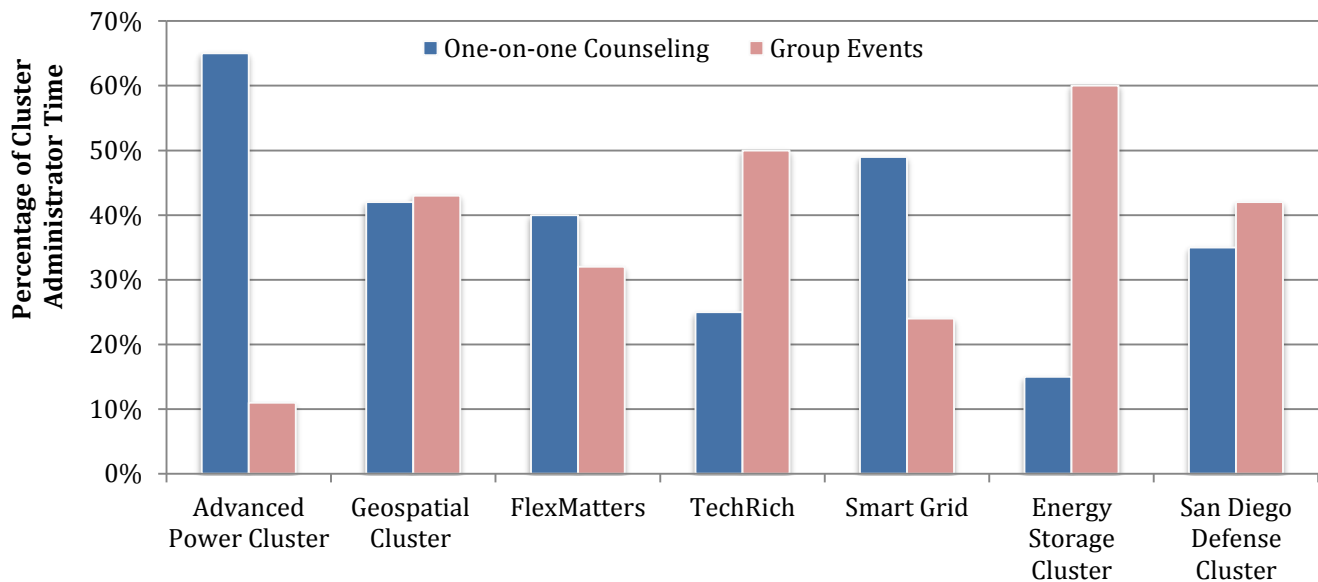
²⁵ A detailed discussion on what each of these services entails (and how they were defined for the purposes of the surveys conducted for this evaluation) is included in Section A.2 of the Methodology Appendix.



Source: RIC cluster administrator survey

Exhibit 15. Percentage of cluster administrator time spent on different service activities

On average, the seven clusters reported dedicating 76% of their time on group events and activities or one-on-one counseling during Year 3, an 8 percentage point increase compared with the 68% reported in Year 2. However, as was the case in past years, estimated time spent on these two categories of activities varied considerably across clusters (Exhibit 16). The Advanced Power Cluster remained the cluster reporting the highest percentage of time spent on one-on-one counseling (64%), while the Energy Storage Cluster and TechRich reported the lowest shares (15% and 25%, respectively) but also had the highest reported uses of time for group events (60% and 50%, respectively), much of which was devoted to training and workshops. Of the remaining four clusters, three (the Geospatial Cluster, the San Diego Defense Cluster, and FlexMatters) reported a relatively balanced split between one-on-one counseling and group activities, whereas Smart Grid reported allocating significantly more time to one-on-one counseling.



Source: RIC cluster administrator survey

Exhibit 16. Percentage of cluster administrator time spent on one-on-one and group services

Some interesting findings emerge from comparing the time allocation of the seven clusters between Year 2 and Year 3. On average, the proportion of time dedicated to one-on-one counseling has not changed significantly between these years, but this figure hides important differences for a certain number of clusters. TechRich and Smart Grid both reported an important increase in time allocated toward one-on-one counseling for Year 3 (15 and 20 percentage points respectively), whereas FlexMatters reported a decrease of 11 percentage points. The increase in one-on-one counseling reported by TechRich and Smart Grid occurred in spite of a rise in the proportion of time allocated toward group events (15 and 7 percentage points, respectively), meaning the two clusters focused more on both of these services. For FlexMatters, the decrease in on-on-one counseling occurred as part of a 13 percentage-point contraction in time allocated toward both group events and one-on-one counseling. These differences across years imply important changes in the service mix of these clusters, which did not appear for some of their peers, such as the Advanced Power Cluster, the Geospatial Cluster, or the Energy Storage Cluster.²⁶ The reasons behind this evolution in service mix are likely as unique as each of the clusters and their strategy. For example, the San Diego Defense Cluster indicated its greater focus on group events in Year 3 was adopted to improve the efficiency of service delivery. On the other hand, the overall increase in direct service provision (one-on-one counseling and group events) by TechRich stemmed from a reported increase in

²⁶ Although the Energy Storage Cluster did report an 11% increase in the combined time allocated towards one-on-one counseling and group events, in large part due to an 8 percentage point increase in the proportion of time allocated towards group events.

the level of sophistication among participating small businesses, requiring more one-on-one counseling for idiosyncratic issues, as well as a greater demand by cluster small businesses for information related to exports, SBIR, and new market, which would prompt more group events. The increase in direct service provision reported by Smart Grid stems from the infusion of resources tied to Energy Foundry.

Across the seven clusters, 462 small businesses were reported to have received an estimated total of 13,359 counseling hours during the third year of SBA’s Initiative, averaging 29 hours of counseling per recipient small business.²⁷

The distribution of counseling hours across clusters and across small businesses within a cluster was quite varied (see Exhibit 17). The average number of hours of counseling per small business in a given cluster ranged from 6.6 to 157 (the Advanced Power Cluster and the Geospatial Cluster, respectively). Three clusters reported providing counseling to one or several small businesses in excess of 100 hours each while providing significantly fewer hours to other small businesses (e.g., the San Diego Defense Cluster). In other clusters, the average and median numbers of hours provided were quite close, indicating a relatively uniform distribution of counseling across all member small businesses in those clusters (e.g., the Energy Storage Cluster and FlexMatters). Unlike in Year 2, the relationship between the number of small businesses receiving counseling and the average number of hours of counseling provided to businesses in that cluster was slightly negative.^{28, 29}

A comparison of the figures in Exhibit 17 with those reported for Year 2 reinforces the notion discussed earlier—that several clusters made significant adjustments in their service mix. Three clusters—the Geospatial Cluster, TechRich, and the San Diego Defense Cluster—reported a two-, eight-, and three-fold increase in total hours provided, respectively.

Exhibit 17. Summary information regarding one-on-one counseling provided

Cluster	Total recipient small businesses	Total hours provided	Average hours per recipient small business	Median hours	Maximum hours reported
Advanced Power Cluster	81	532	6.6	3.0	75

²⁷ These figures cannot be directly compared with those obtained for Year 2 of the Initiative because Smart Grid had not provided counseling data. However, the average number of hours of counseling per recipient small business is significantly higher than it was in Year 2 (29 hours in Year 3 versus 21 hours in Year 2).

²⁸ The correlation coefficient (Pearson’s R) for the relationship between number of small businesses counseled and number of hours of counseling provided is -0.1916.

²⁹ For example, of two clusters that counseled an above-average number of small businesses, one provided an above-average number of hours of counseling, while the other provided an average number of hours. On the other hand, among clusters that served a smaller-than-average number of businesses, some reported higher hours of counseling per business, while others did not (Exhibit 17).

Cluster	Total recipient small businesses	Total hours provided	Average hours per recipient small business	Median hours	Maximum hours reported
Geospatial Cluster	46	7,211	156.7	180.0	385
FlexMatters	24	818	34.1	29	85
TechRich	107	978	9.1	3.0	82
Smart Grid	35	1,252	35.8	20	200
Energy Storage Cluster	141	1,286	9.12	8.0	90
San Diego Defense Cluster	28	1,282	45.8	27.5	300
All clusters	462	13,359	28.9	8.0	385

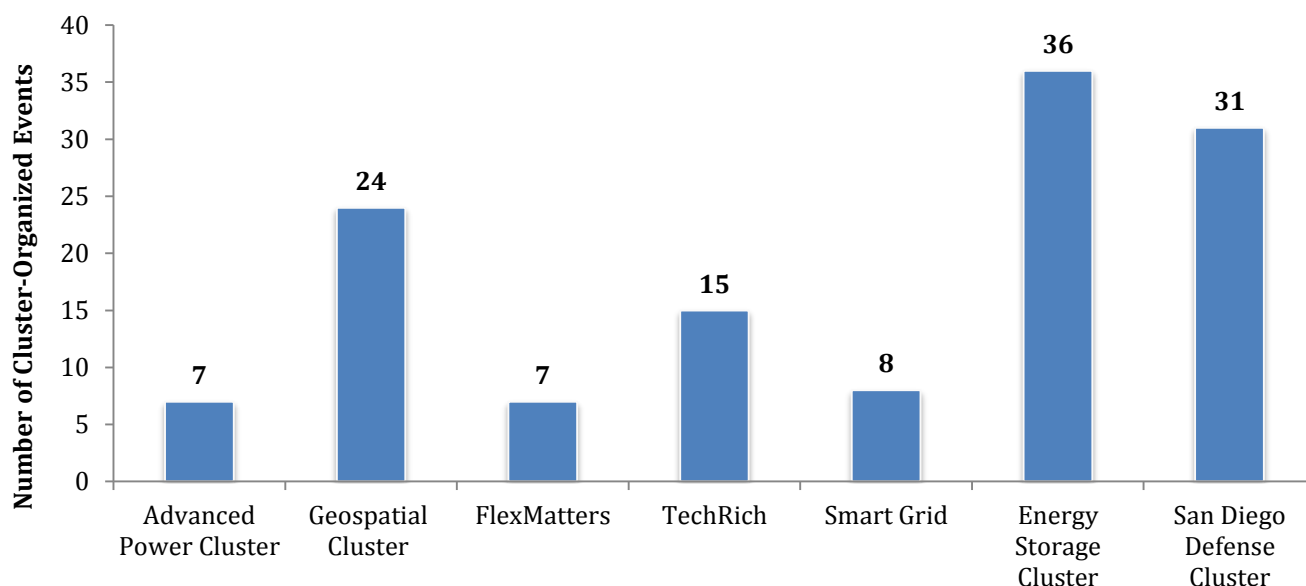
Source: Data reported by cluster administrators for each small business participant present on their clusters' rosters that received any one-on-one counseling.

These increases in total hours provided were generally not linked to an increase in the number of recipient small businesses, except in the case of TechRich, which reported a two-fold increase. However, this increase is significantly outpaced by the growth in hours of one-on-one counseling. The median number of hours provided by both the San Diego Defense Cluster and the Geospatial Cluster increased sharply, suggesting that the increase in total hours was widely distributed among recipients. On the other hand, the median value of TechRich did not grow as significantly, suggesting that a significant proportion of the growth in total hours was allocated to a subset of participants. FlexMatters reported a decrease in total hours provided, but it also saw a decrease in the number of recipients, leading to a similar number of hours allocated to these recipients across both years. Inversely, the Energy Storage Cluster reported a two-fold increase in the number of recipients, yet its total hours remained relatively unchanged, leading to a decrease in the average number of hours per recipient. However, the median rose, suggesting that counseling hours were more evenly distributed across recipients. The Advanced Power Cluster reported figures very similar to those reported in Year 2 across the board.

Clusters provided information about their methods of delivery for one-on-one counseling, revealing that the bulk of one-on-one interactions took place in-person (81%). Only 10% of these interactions took place via telephone, while e-mail messages were in third place at slightly less than 6% and video conferences were used for 3% of interactions.^{30, 31} These figures have not materially changed between Year 2 and Year 3.

³⁰ No cluster opted to specify any other modes of communication.

The seven clusters organized four major types of group events: *matchmaking events* provide cluster members with the ability to connect with large businesses, prime contractors, or other cluster members to with the explicit intention of creating competitive teams able to respond to opportunities; *networking events* enable cluster members to meet potential customers; *showcasing events* provide members with the opportunity to display, demonstrate, or market their products or services to potential customers; and, *training events* include workshops on topics of interest for cluster members. (More detailed definitions of cluster-sponsored events are provided in the methodological appendix, Section A.2.). During the third year of the Initiative, the seven clusters reported a total of 108 such discrete events, or slightly more than half the number reported during Year 2. This difference seems to be driven in part by less-complete reporting of group events by certain clusters and a greater focus on one-on-one counseling due to more advanced and idiosyncratic needs. Of the events reported, 32 were classified as possessing a networking component, 49 a workshop component, 32 a showcasing component, and 15 a matchmaking component.³² As was the case in Year 2, three clusters—the Geospatial Cluster, the Energy Storage Cluster, and the San Diego Defense Cluster—sponsored nearly three-fourths of all group events in Year 3, while other clusters hosted fewer events (see Exhibit 18).



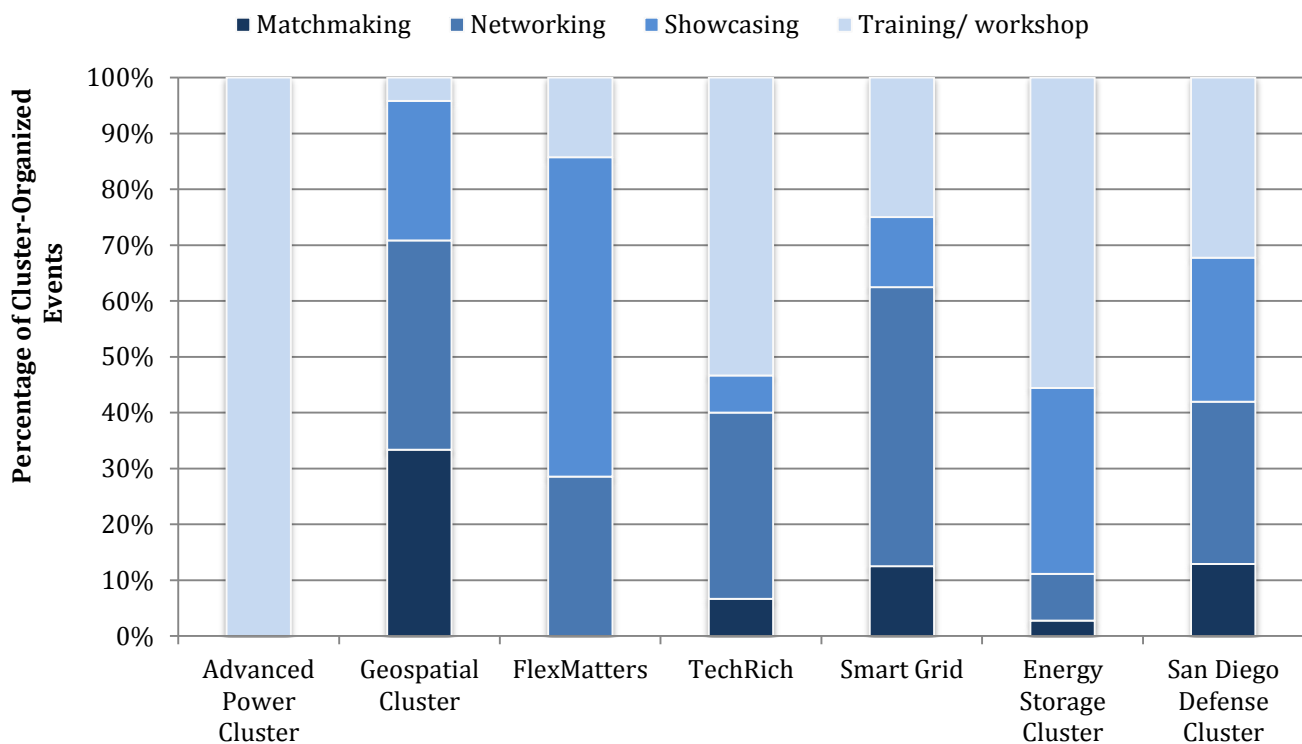
Source: RIC cluster administrator survey

Exhibit 18. Number of cluster-sponsored group events

³¹ In contrast to the other clusters, the San Diego Defense Cluster reported doing about one-third of its one-on-one counseling primarily via e-mail, while the Advanced Power Cluster reported conducting one-third of its counseling by telephone.

³² The sum of these values is greater than the 108 events reported because 12 events were identified as belonging in more than a single event type category. For example, a symposium may be composed of a showcase session, one or several workshops, and one or several networking sessions.

There was significant variation with regard to the types of events organized by the seven clusters. For example, the Advanced Power Cluster reported organizing training and workshops events exclusively, while FlexMatters concentrated on showcasing events (see Exhibit 19). The distribution of event types by clusters across years reinforces the notion that several made adjustments to their service mix, but at the same time, a close look at the data across years suggests that there may be inconsistencies in what certain clusters report, which limits the usefulness of a thorough comparison. However, it is nonetheless possible to note that Smart Grid focused significantly more on networking events in Year 3, while the Energy Storage Cluster focused on training and showcasing to a greater extent.



Source: RIC cluster administrator survey

Exhibit 19. Percentage of cluster-sponsored group events, by event type and cluster

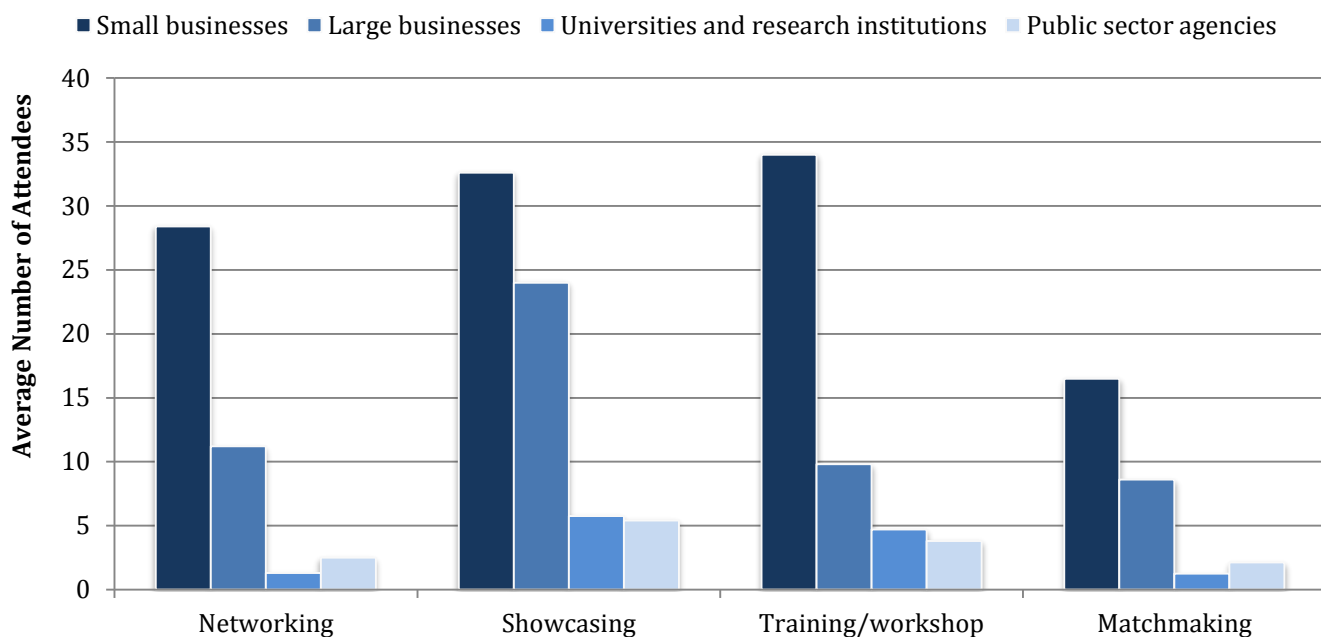
The attendance profile varied significantly by type of event. As might be expected, small businesses were far more likely than other types of organizations to attend every type of cluster event, but they were particularly numerous at training and workshop events as well as showcasing events (see Exhibit 20). The latter is likely tied to the fact that showcasing events were often included as part of a larger event, such as a symposium or a trade show. In these cases, a significant number of cluster participants may have had an opportunity to showcase their products at their own booth, at a cluster-sponsored booth, or through scheduled demonstrations. However, a median of 11.5 small businesses per showcase event, significantly below the average of 32.5, suggests that many of these events were also

smaller and more focused on a specific subset of small business participants with capabilities particularly relevant to those organizations in attendance. Nonetheless, small business participation to showcase events rose markedly between Year 2 and Year 3, from a median of 3.0 to a median of 11.5.

Large companies were particularly present at showcasing and networking events, as they are often the primary target group to be courted through these efforts. Universities and public-sector organizations were most prevalent at showcasing events, as they represent potential sources of innovation and potential customers, respectively, but they were also well represented at training and workshop events, in part because they were often involved in providing some of or all the events' content. Similarly, large businesses were often involved in training and workshop events, where they provided insight about current and upcoming needs, working with a large firm, developing successful proposals, and capturing clients, for example.

An average of 11 and a median of 4 large organizations per matchmaking event suggests that many of these events were organized around a limited number of large organizations chosen on the basis of their relevance to the clusters' small businesses. Whereas in Year 2, 75% of matchmaking events included five or fewer small businesses, this value was only 33% in Year 3, suggesting that certain clusters organized larger matchmaking sessions than in the past. This theory is borne out by reports from various clusters of matchmaking events where numerous small businesses came together to learn about newly released requirements, with the goal of forming competitive teams to pursue them. In addition, a significant portion of matchmaking took place when the clusters connected or referred a specific member to other organizations, which was often accounted for as part of one-on-one counseling and mentoring.

A comparison of the average number of attendees at various events types between Year 2 and Year 3 suggests that a much greater number of small businesses attended all event types than in the past. The average number of small businesses at training events in Year 2 was 17, whereas this value was 34 in Year 3. The same pattern held true for large businesses and was particularly pronounced for showcasing and matchmaking events. Attendance by universities and public-sector organizations also rose across the event types, but the increase was less pronounced.



Source: RIC cluster administrator survey

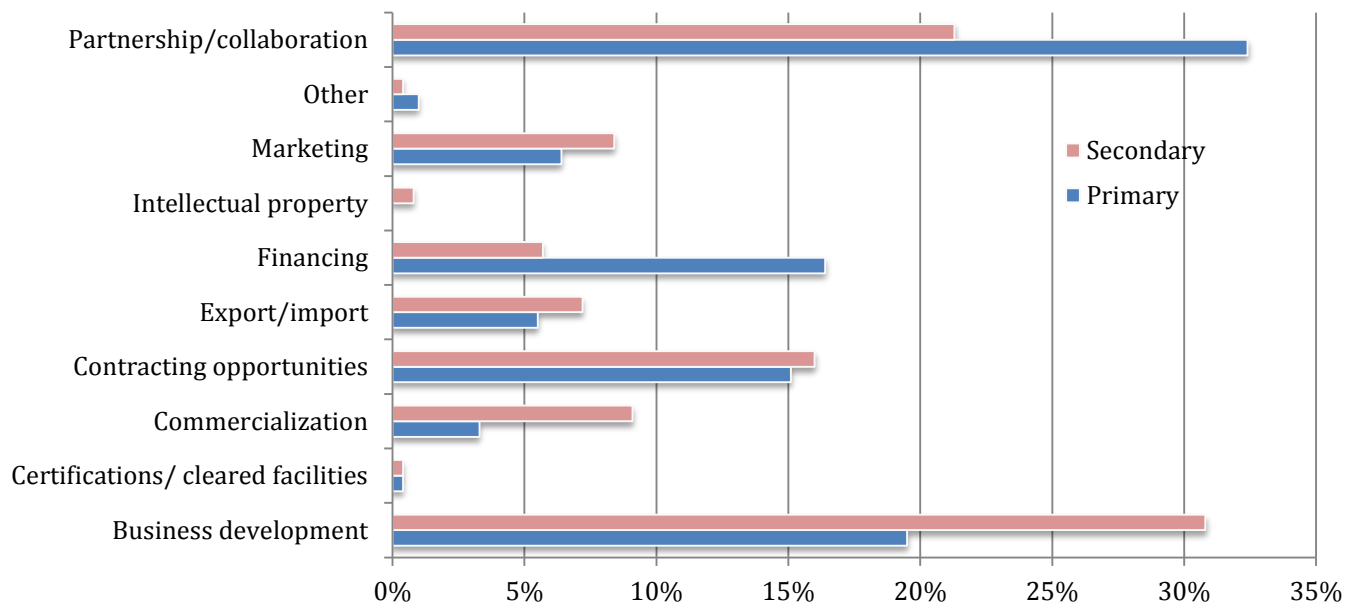
Exhibit 20. Average number of attendees at cluster events, by type of event and type of attendee

Counseling in addition to training and workshop events held during the third year of SBA's Initiative covered a range of topics (see Exhibits 21 and 22).³³ Across the seven clusters, the most common primary topic area for one-on-one counseling was partnerships, alliances, and collaboration (32%), followed by business development (20%); financing and contracting opportunities were third and fourth, respectively, at 16% and 15%. These topics were also the most commonly identified as a secondary topic area, with the exception of financing, which was relatively rare as a secondary topic. Intellectual property and certifications were never selected as a primary topic area, while commercialization was also infrequently selected. The principal differences between Year 2 and Year 3 included a 12 percentage point decrease in marketing as a primary topic area for one-on-one counseling and a 10 percentage point increase in partnerships, alliances, and collaboration. Somewhat smaller increases were also noted for business development and exports/imports, which both rose by 5 percentage points.

Among training and workshop events, business development was by far the most common primary topic area (47%), followed by marketing (12%), and partnerships, alliances, and collaboration

³³ For the 461 small businesses reported as having received one-on-one counseling sessions, cluster administrators provided primary topic areas for 457, secondary topic areas for 263, and tertiary topic areas for 190. This progressive decrease in the number of instances for which a topic area was specified between primary and tertiary topic areas is explained by the fact that not every instance of one-on-one counseling or training and workshop event covered multiple topic areas.

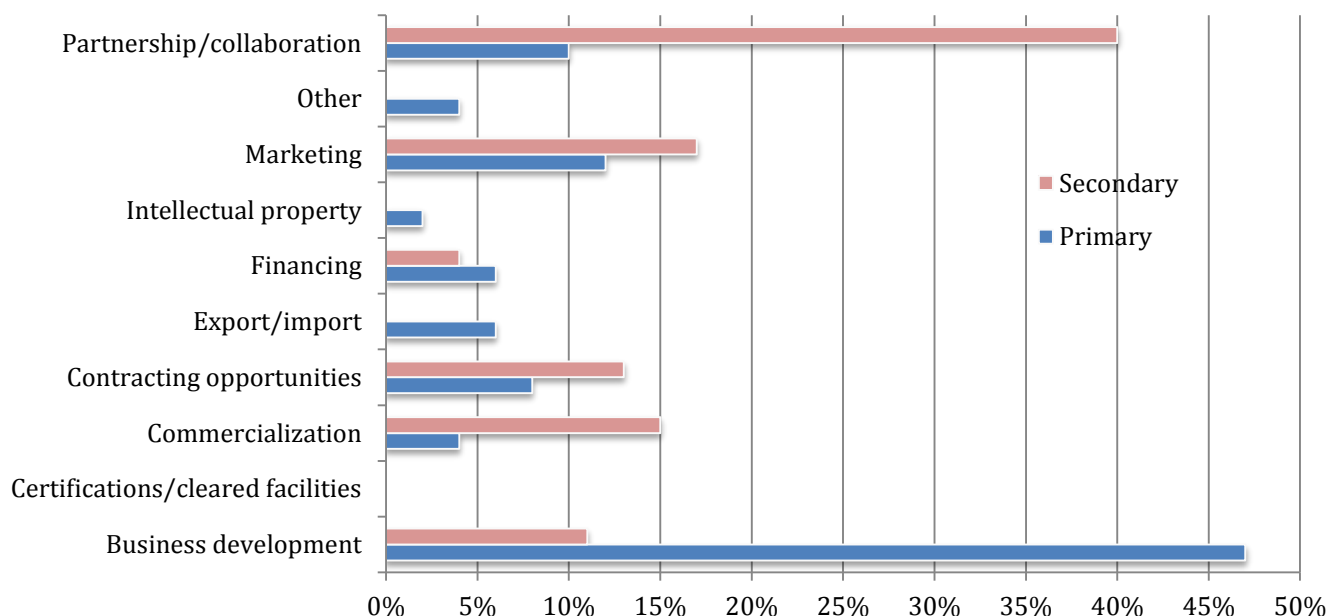
(10%).³⁴ The most commonly identified secondary topic areas for training and workshop events included partnerships, alliances, and collaboration (40%); marketing (17%); and commercialization (15%). Compared to Year 2, there was a 14 percentage point decrease in events covering contracting opportunities as a primary topic area, while the number of those labeled as covering business development increased by 25 percentage points. This change may reflect the fact that the third year of the Initiative was particularly difficult for those clusters and their members focused on government contracts, due to sequestration and the government shutdown. A shift from contracting opportunities to business development as a primary topic area between Year 2 and Year 3 for the three defense-focused clusters along with the Geospatial Cluster, whose membership also targets government agencies as major buyers of geospatial technology, suggests this hypothesis to be true.



Source: RIC cluster administrator survey

Exhibit 21. Percentage of one-on-one counseling, by primary and secondary topic areas

³⁴ Cluster administrators reported primary topic areas for all 49 training and workshop events offered during the third year of the Initiative, secondary topic areas for 47 such events, and tertiary topic areas for 27.



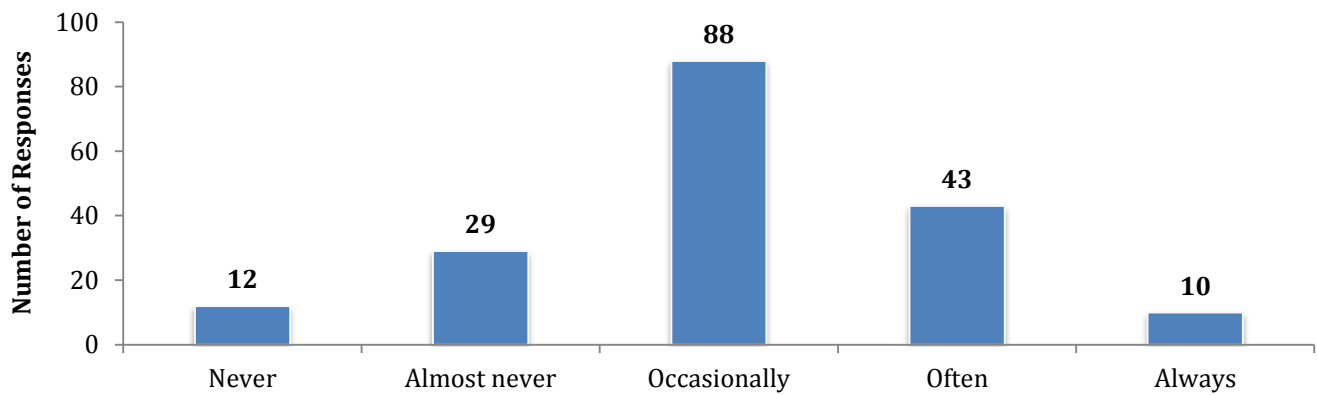
Source: RIC cluster administrator survey

Exhibit 22. Percentage of training and workshop events, by primary and secondary topic area

3.4.3. Frequency of Participation in Cluster Services and Activities

Small businesses and large organizations reported being active participants in cluster services/activities and events.³⁵ Among small businesses reporting, 77% indicated that they participated in cluster-sponsored events, such as networking and showcase events, at least occasionally, and 29% indicated that they participated in cluster-sponsored events often or always (see Exhibit 23). Three-quarters of the small businesses reporting responded that they participated in cluster services and activities, such as counseling or training sessions, at least once every 6 months. About one-third responded that they participated in these services and activities at least once every 3 months (see Exhibit 24).

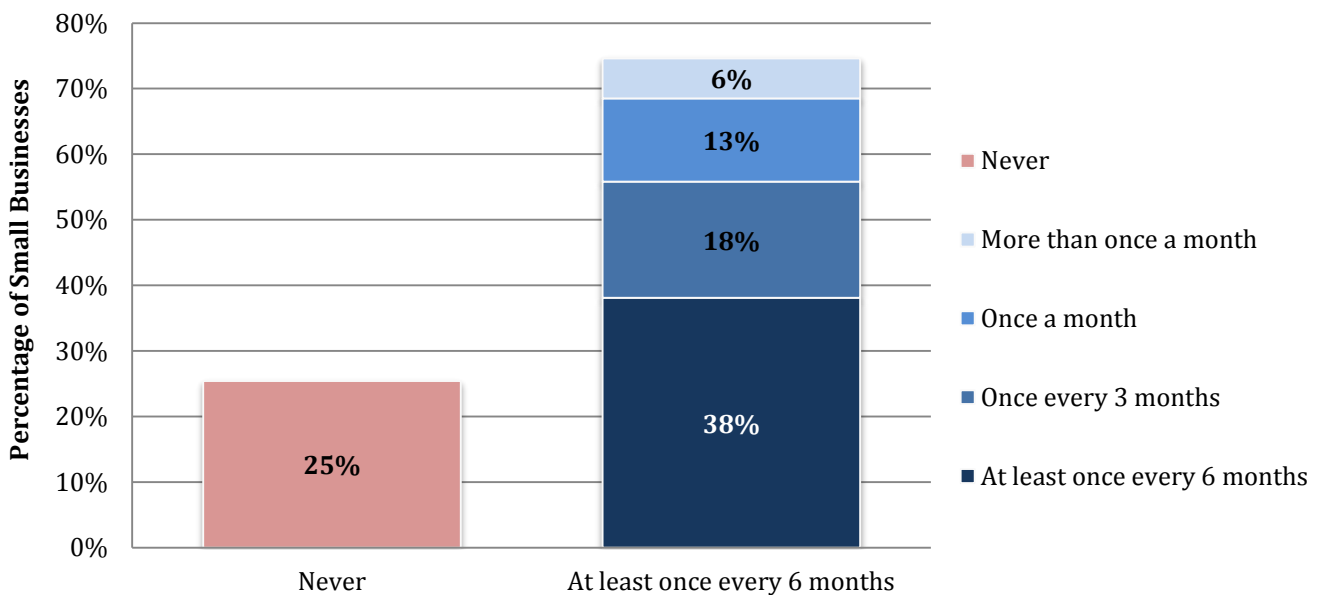
³⁵ These results are based on surveys completed by 184 small businesses and 63 large organizations participating in clusters. Cluster participants who completed the surveys can generally be expected to be more active cluster participants than those who did not complete the surveys. This limitation is discussed in more detail in the Methodology Appendix.



Source: RIC small business survey

Exhibit 23. Small business attendance frequency at cluster events

Overall, these values were consistent with those reported for the first 2 years of the Initiative, with a few small exceptions. First, the proportion of small businesses reporting participating “occasionally” in cluster-sponsored events climbed somewhat in the third year, mostly at the detriment of the top two answers (“often” and “always”). Second, the proportion of small businesses reporting never participating in cluster services and activities decreased slightly, while those reporting participating at least every 6 months climbed by the same amount.

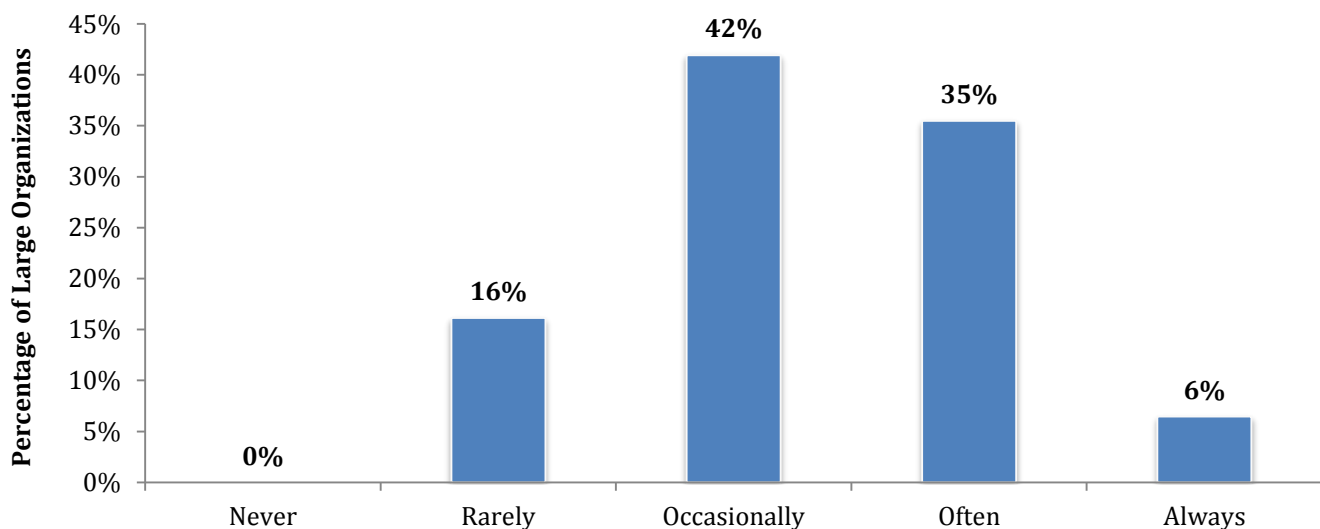


Source: RIC small business survey

Exhibit 24. Small business participation frequency for cluster services and activities

Among large organizations reporting, 42% reported that they often or always participated in cluster-organized events; 42% indicated that they occasionally participated (see Exhibit 25). A smaller number reported that they rarely participated in cluster events during the third year (16%), whereas no

large organization reported never participating. Overall, this distribution of attendance was comparable to what large organizations reported during the first 2 years of SBA’s Initiative. As noted for small businesses, the trend appears to be toward an increase in the middle of the distribution at the expense of the two extremes. In particular, the most striking differences between Year 2 and Year 3 is that significantly fewer large organizations reported “always” attending cluster events and that none reported “never” attending. This general trend toward the center of the distribution may be linked to large organizations’ and small businesses’ having a better understanding of their needs and the services offered by their clusters based on past participation. Alternatively, it could be linked to clusters’ better targeting their promotion of events and activities toward those most likely to benefit.



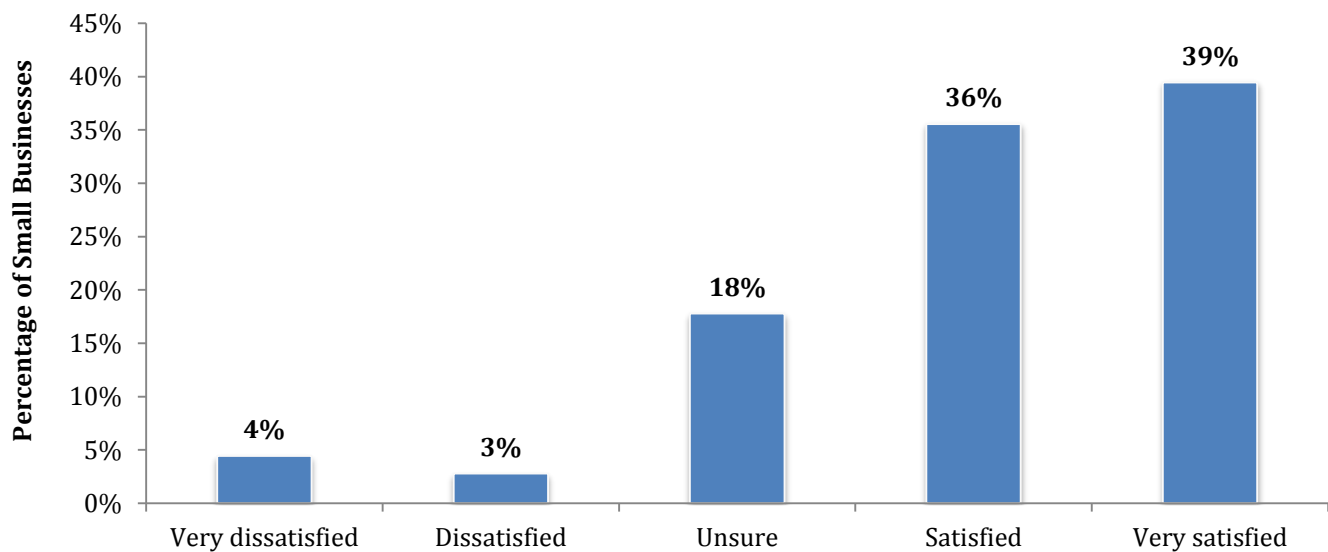
Source: RIC large organization survey

Exhibit 25. Large organization frequency of participation in cluster events

3.4.4. Participants’ Satisfaction With Cluster Services and Activities

The majority of small business participants (75%) were either satisfied or very satisfied with cluster services and activities (see Exhibit 26). This pattern held across most of the seven clusters, although fewer participants in TechRich and the Smart Grid cluster reported being satisfied or very satisfied (50% and 59%, respectively) than the average. Participants in these two clusters instead reported being unsure about their satisfaction (39% and 29%, respectively), significantly more often than for the other five clusters. Although this result may be coincidental, both Smart Grid and TechRich experienced slight disruptions in their operations during the third year of the Initiative. For the former, these disruptions were the result of the inclusion of the Energy Foundry as a major partner and tactical (and to a lesser extent, strategic) adjustments to better leverage the passing of the Smart Grid legislation, while the latter sustained the departure of key personnel at the cluster management level.

Regardless, the overall satisfaction level remained stable compared with the survey results of the second year, and both were slightly less positive than the figure reported for the first year of the Initiative. The distribution of answers has also remained constant across both the second and third years, whereas a somewhat smaller percentage of respondents reported being unsure in the first year survey (12% in Year 1 versus approximately 19% in Year 2 and Year 3). The greater number of small businesses reporting being unsure about their satisfaction during the second and third years could be tied to the fact that all cluster participants were surveyed for these 2 years, including some exhibiting lower levels of engagement.³⁶ Overall, this sustained level of satisfaction with cluster services and activities suggests that clusters were generally successful in delivering services in line with small business participants' needs and expectations but that a share of participating small businesses had yet to decide how they perceived the value of cluster participation.



Source: RIC small business survey

Exhibit 26. Small business level of satisfaction with cluster services and activities

A majority of small businesses reporting (56%) indicated that they could not have received the services provided by their clusters elsewhere, while 32% responded that they did not know whether they could. With only 12% reporting that similar services could be obtained from other providers (at least from the perspective of small businesses), cluster services appeared to be unique and filled a void in service provision (see Exhibit 27). The proportion of small businesses reporting that comparable services could not be received elsewhere increased by 7 percentage points compared with the figure obtained in Year 2. Correspondingly, 6% fewer small businesses reported not knowing whether similar services were available elsewhere. As in past years, the distribution of answers across clusters varied significantly.

³⁶ The criteria for survey participation are discussed in more detail in the Methodology Appendix.

Some respondents provided brief explanations for their answers. The most common theme was that clusters were highly specialized in their industry and therefore able to provide a wide range of in-depth support not commonly available elsewhere. Other recurring themes included that clusters were better at creating relevant connections than other organizations or that they provided a higher quality of services. These themes aligned closely with the comments made by participants in past years.

Exhibit 27. Percentage of small businesses reporting whether the same services were available elsewhere

Cluster	No, could not have received same or comparable services elsewhere	Yes, could have received same or comparable services elsewhere	Don't know
Advanced Power Cluster	69%	13%	19%
Geospatial Cluster	62%	3%	34%
FlexMatters	57%	14%	29%
TechRich	36%	14%	50%
Smart Grid	33%	22%	44%
Energy Storage Cluster	56%	16%	28%
San Diego Defense Cluster	76%	5%	19%
All clusters	56%	12%	32%

Source: RIC small business survey

The question of whether the same services or comparable activities could be found elsewhere can be put in context by also looking at how many small businesses responded that they participated in one or more other business-support organizations not affiliated with their clusters during Year 3. Of the small businesses reporting, 53% participated in such an organization, the same figure as in Year 2. Commonly mentioned organizations included the regional SBDC, WBC, or Procurement Technical Assistance Centers (PTAC); regional economic development and sectorial innovation organizations; local or regional chambers of commerce; and various regional business incubators or technology parks. Other affiliations included professional organizations and industry associations. Several small businesses mentioned organizations that were cluster partners or service providers, illustrating that some may not have been fully aware of the cluster stakeholders' identities.

Large organizations were asked whether benefits that they had expected from cluster participation had materialized; 60% of respondents reported that this was “absolutely” or “significantly” the case (31% and 29%, respectively), whereas 24% reported that these benefits had “somewhat” materialized. A mere 2% reported that expected benefits from cluster participation had not materialized at all, and 14% suggested that it was too early to tell. These results compared favorably with those obtained in Year 2, particularly with regard to the share of respondents reporting that the benefits of cluster participation materialized “absolutely” or “significantly,” which rose by 18 percentage point. The increase in these two categories contributed to a decrease of 21 percentage points in the number of respondents responding “somewhat,” suggesting that large organizations increasingly found that their clusters delivered the value they had been expecting. Alternatively, this number could indicate that these organizations have progressively lowered their expectations about the benefits of cluster participation, effectively making it easier for clusters to meet these expectations. However, this second hypothesis does not fit with the across-the-board rise in reasons cited for cluster participation (see Exhibit 12), which suggests that large organizations have broader and likely higher expectations from cluster participation than in Year 2.

4. Outcomes of the Regional Innovation Cluster Initiative

4.1. Overview

This section provides a detailed description of outcomes experienced by organizations participating in regional clusters during the first 3 years of SBA's Cluster Initiative. This analysis examines both the short- and intermediate-term outcomes that are relatively direct measures of the success of cluster activities and services (e.g., development of alliances among cluster participants, commercialization of new technologies, and improved export marketing strategies) as well as longer-term outcomes likely to be indicative of sustained economic development among cluster organizations (e.g., employment and payroll growth, business revenue growth, and new business formation).

Short-, Intermediate-, and Long-Term Outcomes of the Regional Innovation Cluster Initiative

The outcomes of the Regional Innovation Cluster Initiative can be divided into two categories based on time frame: (1) short- and intermediate-term outcomes and (2) long-term outcomes. Short- and intermediate-term outcomes are directly and immediately linked to cluster services, activities, and events, and thus are expected to be observed during the period of SBA's Initiative and soon thereafter. These are the outcomes that cluster services directly aim at improving, such as the success of small businesses in obtaining capital and increasing exports. In contrast, long-term outcomes, such as increased revenue and total payroll, are expected to be observed in subsequent time periods. Exhibit 28 illustrates the short-, intermediate-, and long-term outcomes evaluated in this study, showing the linkages between cluster services and these outcomes as well as the metrics used to assess them. In particular, it portrays the chain of events that starts with services provided by the clusters to small businesses, which are designed to directly influence the short- and intermediate-term outcomes. As the small businesses attain the short- and intermediate-term outcomes, long-term outcomes are expected to materialize at both the business and regional levels. Thus, the achievement of long-term outcomes is partially dependent on the achievement of the short- and intermediate-term outcomes.

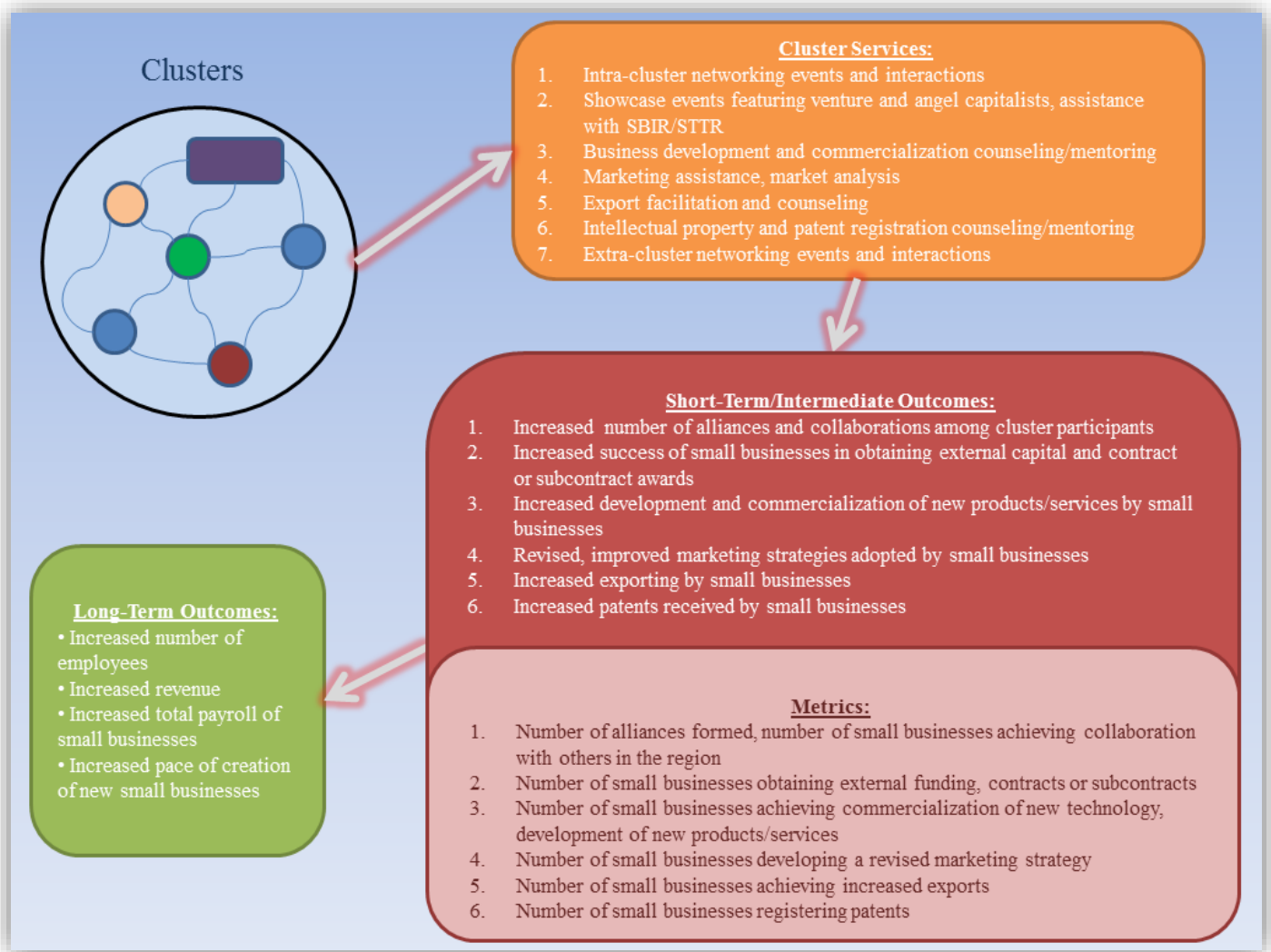


Exhibit 28. The outcomes of SBA's Regional Innovation Cluster Initiative

4.2. Short-Term/Intermediate-Term Outcomes

The short-term/intermediate-term outcomes of SBA's Initiative evaluation are expected to directly and immediately result from the services and events offered by the clusters to their participating small businesses, manifesting themselves during the period of the Initiative or soon thereafter. The following short- and intermediate-term outcomes are reported here and discussed in turn below:

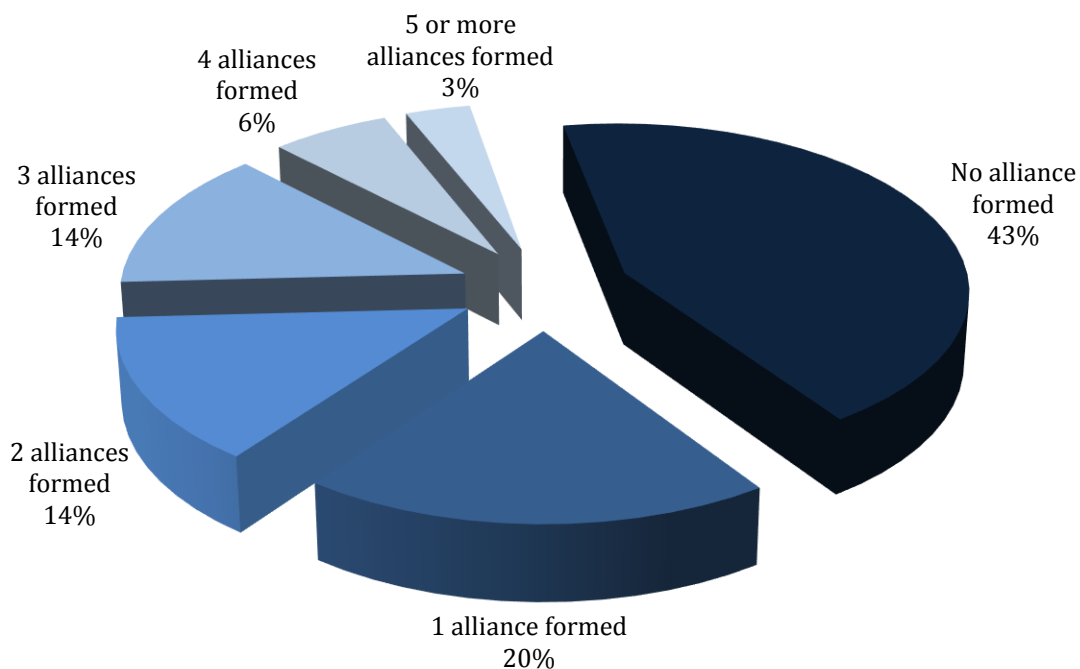
- Alliances and collaborations among cluster participants
- Small businesses' access to capital
- Small businesses' contract and subcontract awards
- The development of new products and the commercialization of new technologies
- Assistance regarding intellectual property issues and patent applications
- Assistance with small businesses' marketing strategies

- Assistance with increasing exports
- Assistance gaining access to cleared secure facilities and integration into the industry supply chain

4.2.1. Alliances and Collaborations Among Cluster Participants

Clusters organized networking events and activities focused on forming alliances among small businesses and connecting small businesses with large businesses or organizations. The short- and intermediate-term outcome associated with these services and activities was an increased number of alliances formed by small businesses participating in clusters.³⁷ This information was collected via surveys of small businesses and large organizations participating in clusters.

Alliances that formed between small businesses and other entities could take the form of project collaboration, joint product development and sales activities, sourcing agreements and licensing, and joint ventures. Of the 178 small businesses reporting, 57% indicated having formed *at least* one alliance as a result of cluster participation during the third year of SBA's Initiative; 37% reported that their clusters helped them forge two or more alliances during the previous year (see Exhibit 29).

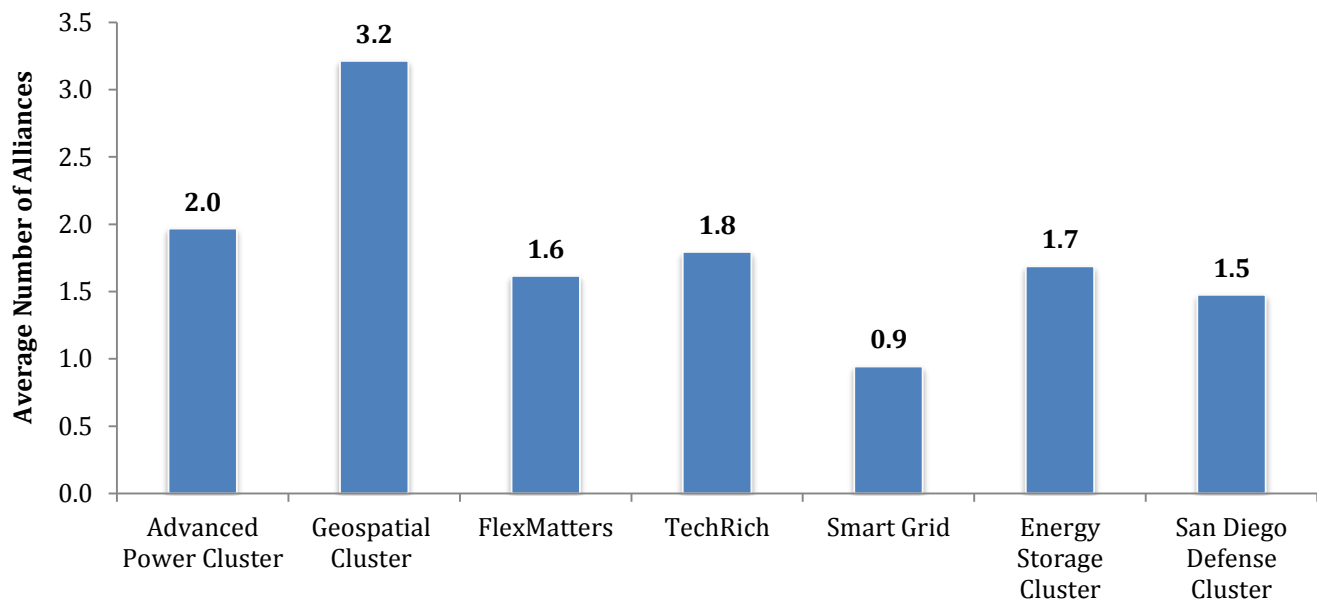


Source: RIC small business survey

Exhibit 29. Number of alliances formed by small businesses as a result of cluster participation

³⁷ An alliance is defined here as an ongoing business relationship between two or more independent organizations that strive to achieve common goals. Alliances include a wide spectrum of relationships, from information-sourcing agreements and licensing to acquisition.

Small businesses reported forging an average of 1.9 new strategic alliances during the third year of SBA’s Initiative; the average number of new alliances ranged from 0.9 to 3.2 per cluster (see Exhibit 30).³⁸ Among new alliances reported by small businesses, 50% were with other small businesses, 20% were with large businesses, and the remainder was with universities, research organizations, or other types of organizations affiliated with the clusters (see Exhibit 31).³⁹ These values remained very much in line with those reported in Year 2.

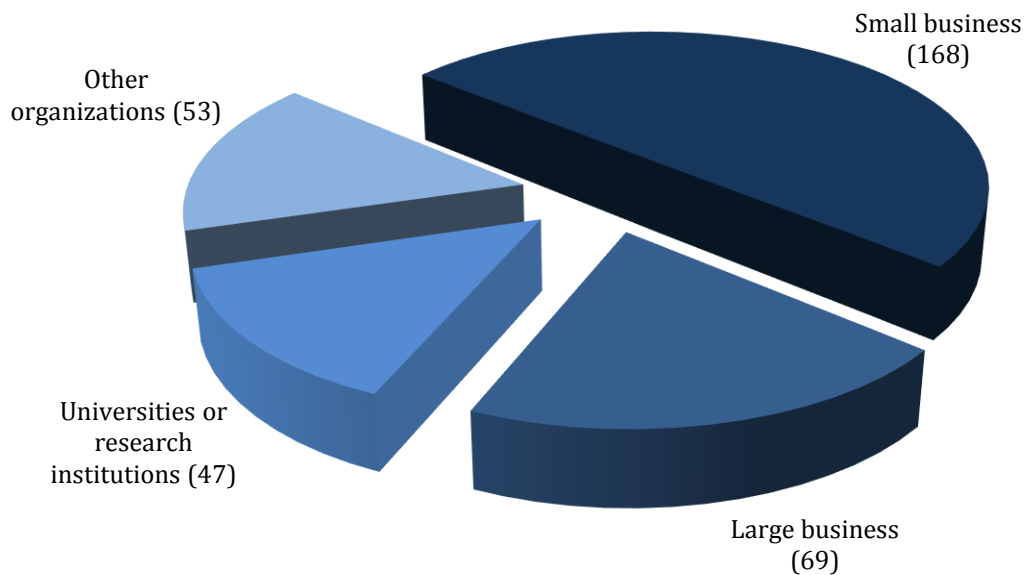


Source: RIC small business survey

Exhibit 30. Average number of alliances formed by cluster small businesses

³⁸ These values were computed after excluding an apparent outlier reporting a total of 100 alliances with other organizations, an unlikely yet possible value. If this value is not excluded, the average number of alliances forged by small businesses across clusters is 2.4, while the average number of alliances for the Advanced Power Cluster increases to 5.

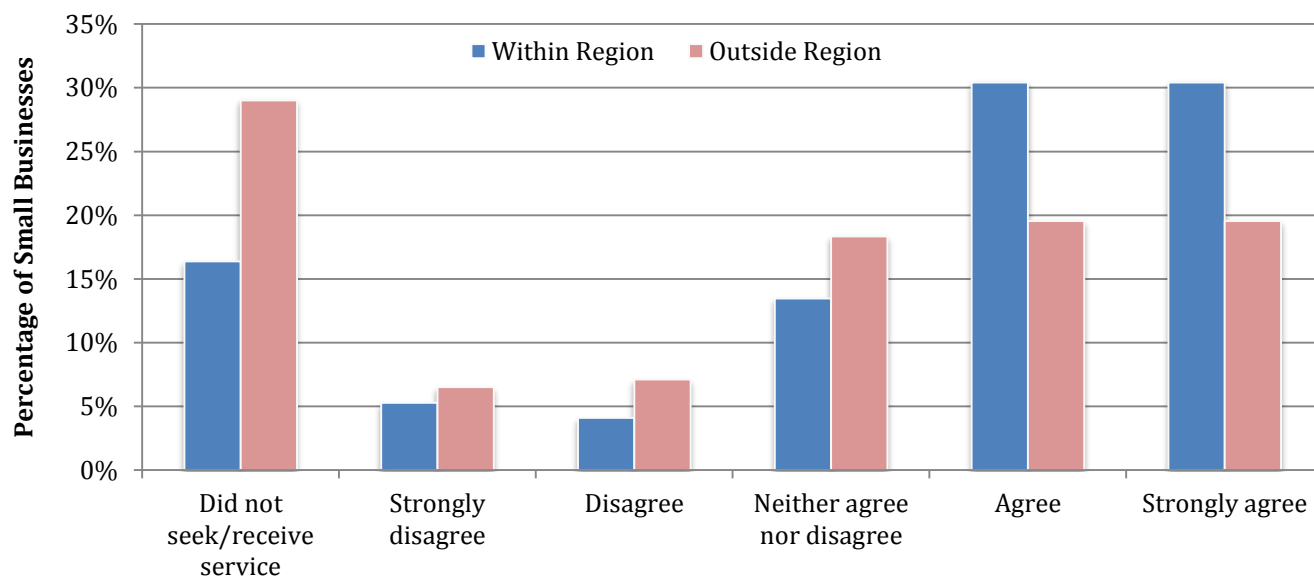
³⁹ The outlier mentioned in the prior footnote was also removed prior to computing these figures and those shown in Exhibit 31.



Source: RIC small business survey

Exhibit 31. Number of new alliances reported by small businesses, by type of allied organization

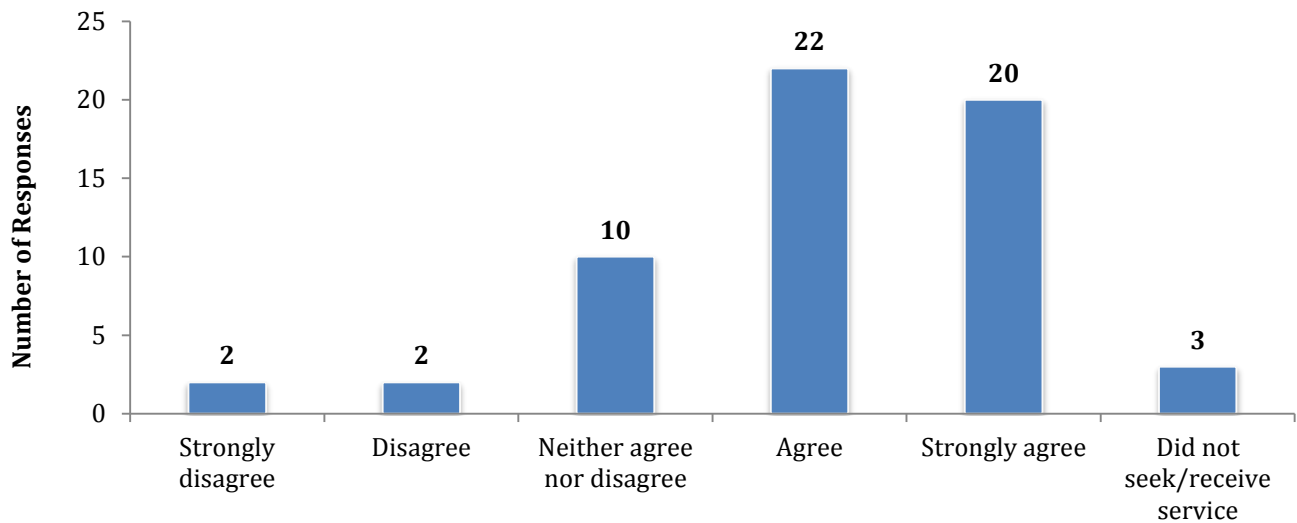
Among responding small businesses that sought or received relevant cluster services, 73% either “agreed” or “strongly agreed” that cluster participation resulted in collaborations with other businesses and/or organizations *within their regions of operation* (see Exhibit 32). This percentage varied significantly across clusters, ranging from a high of 88% for the Energy Storage Cluster to a low of 57% in Smart Grid. In addition, 55% of small businesses reported that they “agreed” or “strongly agreed” that cluster participation resulted in collaborations *outside their regions of operation* (see Exhibit 32). Answers to this question varied across the seven clusters to an even greater extent than in the prior question; 88% of Advanced Power Cluster participants agreed or strongly agreed with this statement, whereas only 8% did so in Smart Grid. These answers are consistent with the discussion of cluster geographic scope in Section 2, where it is noted that Smart Grid, for example, maintains a precisely defined geographic scope, whereas the Advanced Power Cluster regroups participants in 30 states. Thus it is somewhat expected that a smaller share of Smart Grid respondents found the cluster helpful in that regard. Also important is that comparatively fewer respondents sought extra-regional collaborations (about 70% compared to 84% that sought assistance with regional collaboration), and many more were neutral regarding this assistance.



Source: RIC small business survey

Exhibit 32. Cluster participation resulting in collaborations within or outside small businesses' regions of operation

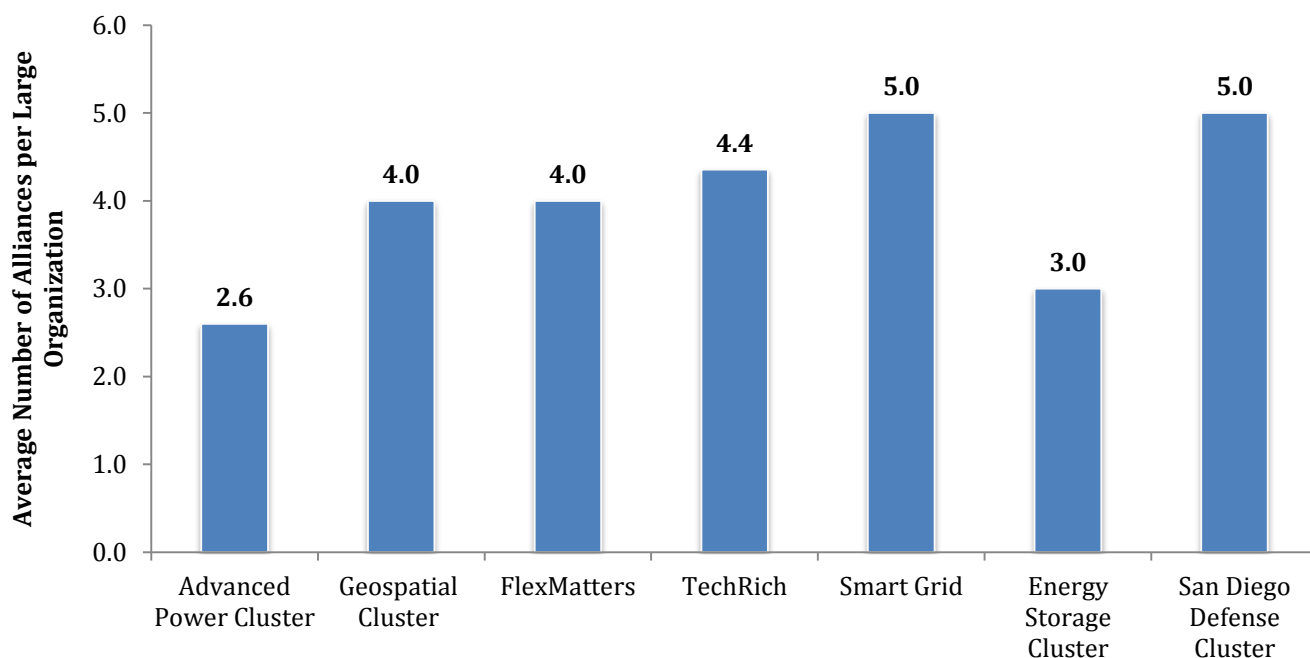
Cluster partners other than small businesses, including large businesses, universities, research institutions, public-sector agencies, foundations, and nonprofit organizations (collectively referred to here as “large organizations”), were also surveyed about their experience with collaboration and alliance-building in the cluster. Forty-two large organizations, 75% of those having sought the service, reported that cluster participation helped create connections (as distinct from collaborations) with companies and organizations located *outside their regions of operation* (see Exhibit 33). Interestingly, the proportion of large organizations that did not seek or receive the service was very low, suggesting that this was an area of particular interest for them.



Source: RIC large organization survey

Exhibit 33. Cluster participation helping create connections outside large organizations' regions of operation

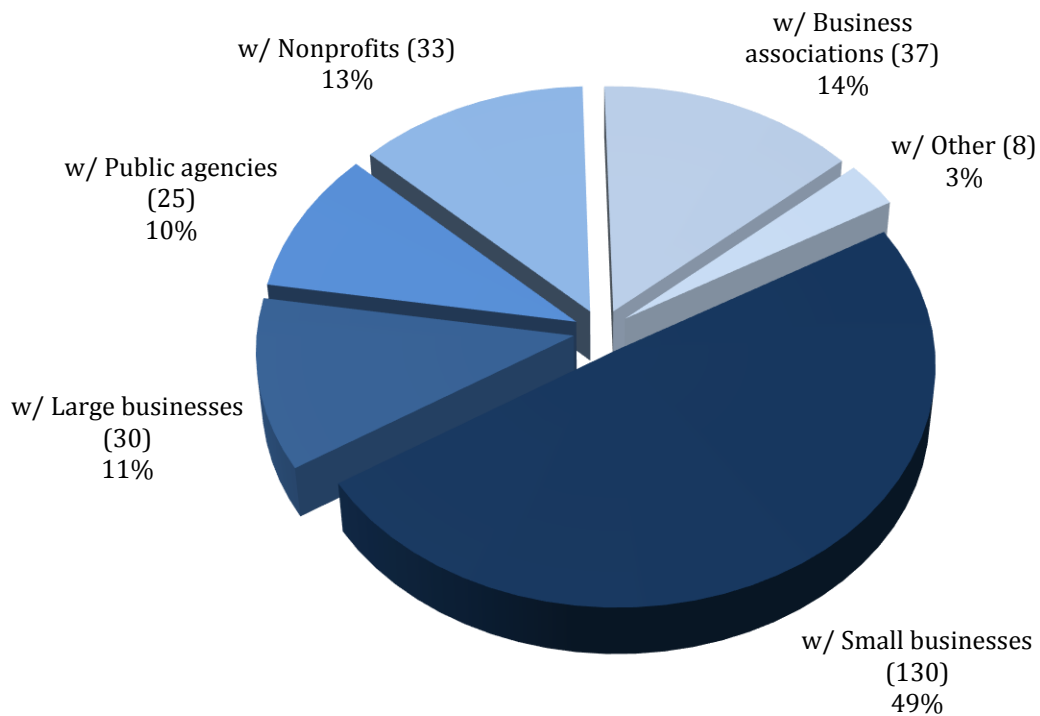
The clusters were instrumental in facilitating new alliances among large organizations. Of the 63 large organizations reporting, 38 (61%) formed a total of 263 new alliances with other organizations or businesses as a result of cluster participation. Some clusters were stronger at supporting alliances broadly among large organizations, while others were stronger at supporting a large number of alliances but among fewer organizations. Large organizations affiliated with Smart Grid and TechRich in particular reported a large number of new alliances, averaging five alliances across the 14 large organizations reporting in those clusters (see Exhibit 34). The Geospatial Cluster and FlexMatters had larger percentages of their 21 affiliated organizations report new alliances (78% and 67%, respectively). Among the 263 new alliances reported by large organizations, 49% were with small businesses, with the remainder spread across other types of organizations affiliated with the clusters (see Exhibit 35).



Source: RIC large organization survey

Exhibit 34. Average number of new alliances reported by large organizations

Results reported in Exhibit 34 differ significantly from those reported in Year 2. In particular, large organizations in several clusters reported an important increase in the number of new alliances they formed. For example, the Advanced Energy Cluster and the Energy Storage Cluster both had an average number of alliances below 0.5 in Year 2. Even less extreme cases abound, such as Smart Grid and the San Diego Defense Cluster, which both displayed much improved averages. As a result, the range of averages reported in Exhibit 35 is significantly more compact in Year 3 than in Year 2. This fact, in combination with the largely stable intensity of alliances among cluster participants, could suggest that all seven clusters have implemented effective approaches of fostering relationships among large organizations. However, because the clusters reported relatively few changes in these approaches during Year 3, this information suggests instead that large organizations may require more time to develop alliances than small businesses.



Source: RIC large organization survey

Exhibit 35. Number of new alliances reported by large organizations, by type of allied organization

Questions in the large organization and small business surveys also inquired about joint ventures, a more formal type of alliance defined as a formal business agreement between two or more organizations to develop a new entity and new assets, generally for a finite time frame. Cluster small businesses indicated their involvement in a total of 67 joint ventures during the third year of the Initiative. Sixteen small businesses reported more than one joint venture each, with one small business (in the Advanced Power Cluster) reporting its involvement in five. Smart Grid and the Advanced Power Cluster participants reported the highest average number of joint ventures, whereas the Energy Storage Cluster had the lowest average. Large organizations were asked to report on their involvement in joint ventures specifically with small businesses, and five large organizations reported entering into such agreements with one or more small businesses.

Success Story #1

This small business specializes in geospatial technology solutions and is a founding member of its cluster. The firm demonstrated a remarkable ability to incorporate other members in its contract awards, with the cluster's help. In 2011, the company was contracted by the U.S. Army Corps of Engineers and subcontracted a portion of the work to another business in the cluster. In 2012, the company was awarded a \$3-million multiyear contract with the U.S. Navy and included yet another cluster member as a subcontractor. The company further teamed up with a large prime contractor and two cluster small businesses to provide technical services to the National Oceanic and Atmospheric Administration (NOAA) at the Data Buoy Center. The two cluster small businesses will receive 25% of the multiyear contract initially worth \$250 million. Also in 2012, the company teamed up with two cluster members to perform engineering and geospatial services for the U.S. Naval Observatory, a contract valued at more than \$6 million. These successful teaming efforts were complemented by multiple contract awards to the company from organizations including NASA and the National Geospatial Intelligence Agency.

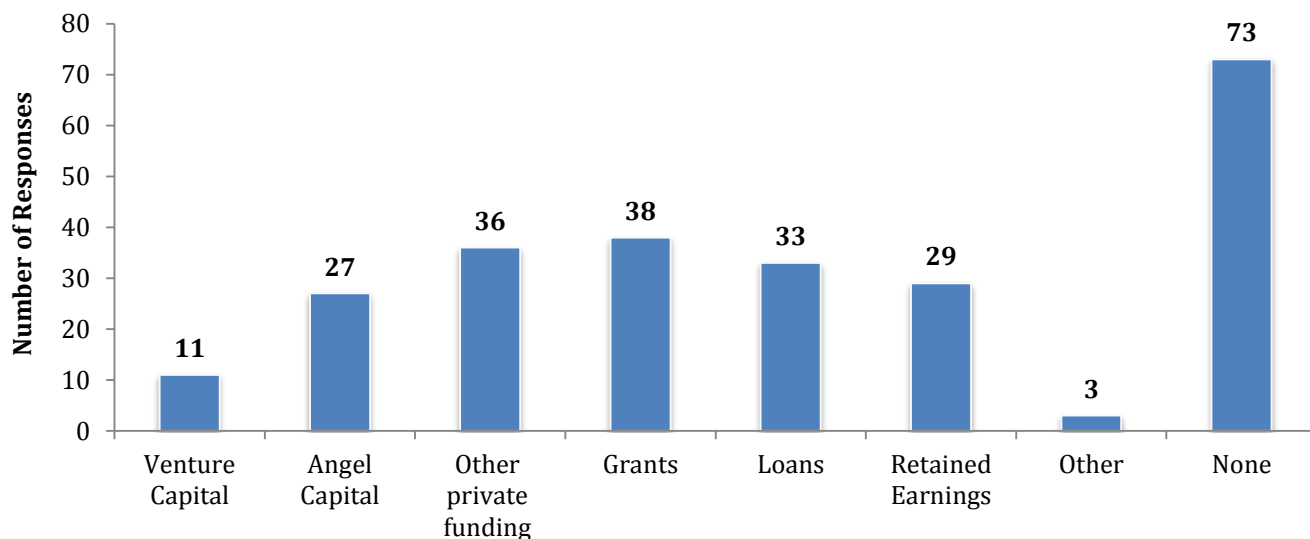
In early 2013, the company acquired an engineering facility belonging to a large business specializing in maritime engineering. The acquisition included transitioning key staff members and equipment in the facility, saving jobs in the region. Another cluster member is exploring a partnership agreement with this company to produce its hurricane-resistant cameras at the facility instead of relying upon an out-of-state manufacturing firm. The company was also a key participant in the export mission organized in mid-2013 by its cluster and sponsored by the federal and the state government. Prior to the trip, the company entered into a strategic agreement with a small business in the visited country and received cluster assistance with obtaining ITAR certification and identifying other opportunities in the country. The trade mission allowed the company to meet with several other businesses seeking similar expertise. The company is now focused on identifying technologies developed under SBIR and NASA Dual Use to bring to the market.

4.2.2. Small Business Access to Capital

Access to external financing and capital was a small business need that many cluster participants identified as important. Clusters in SBA's Initiative facilitated small businesses' access to capital in three different ways: (1) by disseminating information on funding opportunities that were relevant to cluster participants; (2) by providing technical assistance, including mentoring and assistance in writing applications, for various funding opportunities; and (3) by holding matchmaking and networking activities, ranging from assisting small businesses in finding partners to improve the strength of their funding applications to actively seeking investors, such as venture capital firms.

The success of such activities can be measured in terms of improved access to financing for small businesses as well as in the types of financing obtained. Of the 184 small businesses responding, 59% reported using one or more of the following sources of financing during Year 3: angel capital, venture

capital, grants, loans, retained earnings, other sources of private funding (including crowd funding, friends and family funding, etc.), and/or other sources of financing. Furthermore, 27% reported making use of more than one of these sources of funding. The most common source of capital obtained by small businesses was grants; other private funding, such as friends and family, crowd funding, and private equity, was nearly as common (see Exhibit 36).⁴⁰ Venture capital was the least commonly reported source of financing. Overall, the distribution shown in Exhibit 36 did not change significantly between Year 2 and Year 3. Key trends included a slight increase in the proportion of small businesses reporting the use of angel capital (up 3 percentage points) and no use of external financing (up 6 percentage points).



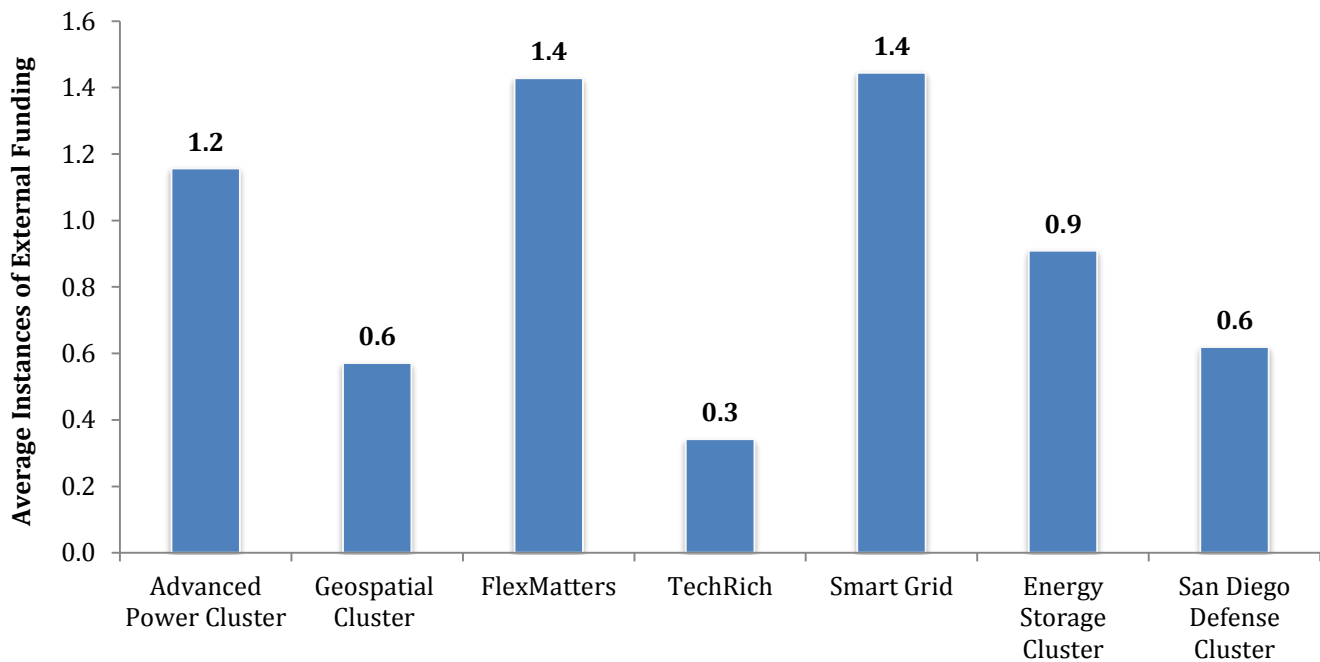
Source: RIC small business survey

Exhibit 36. Number of instances of financing reported, by type of financing, including retained earnings

Across clusters, small businesses affiliated with both the Smart Grid and FlexMatters reported the highest degree of access to external financing (excluding retained earnings). In these two clusters, 78% and 71%, respectively, of small businesses that responded to the survey indicated making use of at least one source of external funding. On the other hand, only 26% of small businesses participating in TechRich reported making use of one or more sources of external funding.

An alternate measure of the frequency with which small businesses across clusters obtained and relied upon external financing is the average instances of external funding used (see Exhibit 37). This measure reflects the fact that small businesses used more than a single form of external funding in some cases, unlike the percentages discussed in the previous paragraph.

⁴⁰ The total number of responses reported in Exhibits 36 exceeds the total number of firms surveyed because a single firm could have used multiple sources of financing.



Source: RIC small business survey

Exhibit 37. Average number of small businesses reporting access to external financing (i.e., excluding retained earnings)

Values reported in Exhibit 37 varied somewhat compared to those reported in Year 2. Overall, the average for most clusters decreased slightly, although this drop was most important for the Geospatial Cluster and the Energy Storage Cluster. On the other hand, the average for the Advanced Power Cluster rose markedly. This variance, while interesting, should not be construed to mean that the clusters were less effective at assisting small businesses in this area during Year 3. Instead, the need for and ease of access to external funding vary significantly over a business's life-cycle stages and are also affected by lending trends, ever-shifting areas of focus of angel and venture groups, and so forth. In fact, the percentage of small businesses reporting using one or more of sources of financing during Year 3 (59%) was only 6 percentage point less than the Year 2 value. The principal difference therefore seems to be the number of small businesses that obtained more than one source of financing.

Success Story #2

This small business has developed a revolutionary electric motor technology that permits the conversion of standard internal combustion vehicles into hybrid electric vehicles using electric motors built without rare earth metals. Despite its advanced technology, the company lacked a structured market approach and the capital to thrive in a highly competitive automotive market. In 2012, the cluster in which the business participates conducted a market analysis that identified a new, less-competitive market to which the small business could introduce its product. The cluster also mentored the company in preparation for several local and national competitions through which the company raised \$250,000 in seed capital. Furthermore, the company's consistent performance in competitions led to increased product exposure and additional networking opportunities. The business won a \$3-million Advanced Research Projects Agency-Energy (ARAP-E) award in collaboration with an out-of-state university and received cluster support for several SBIR/STTR applications. Most recently, it was acquired by a Silicon Valley-based Software Motor Corporation for an undisclosed amount.

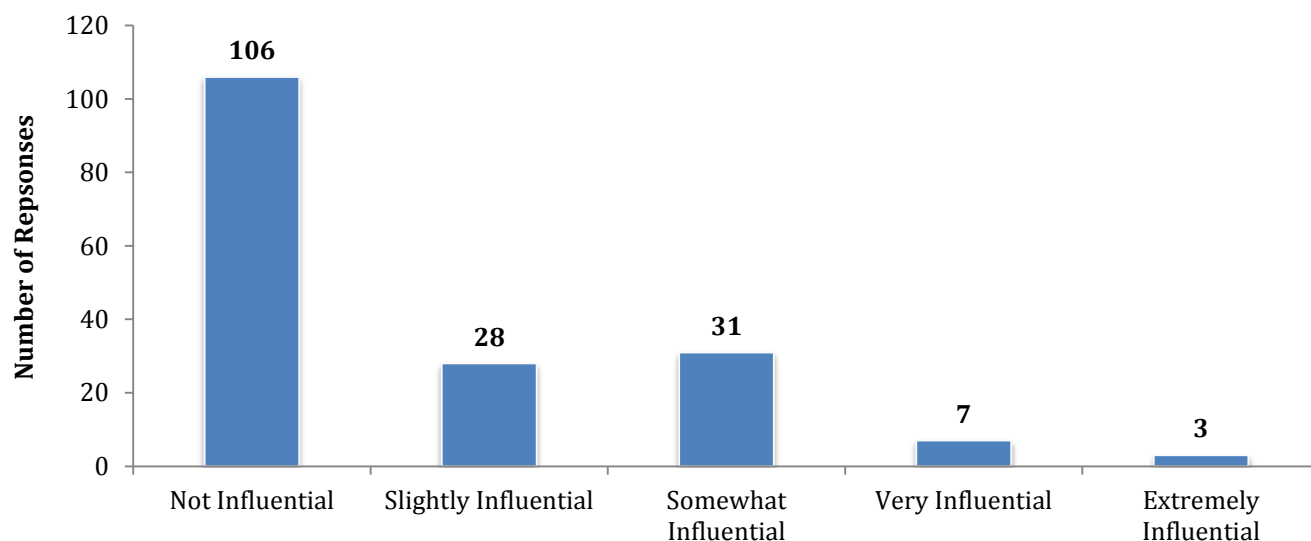
The number of businesses in each cluster reporting access to each *type* of financing is reported in Exhibit 38. The Energy Storage Cluster was home to the largest number of small businesses reporting access to grants (12), while the largest number reporting access to loans (8) came from the Advanced Power Cluster. Participants in the San Diego Defense Cluster reported the highest use of retained earnings (7). Small businesses affiliated with Smart Grid reported the highest numbers of angel and venture investments (10 and 4, respectively), which is not surprising, because the Energy Foundry, a key cluster service provider and co-administrator along with IIT, invests directly in some of its companies. Use of retained earnings was most common in the San Diego Defense Cluster.

Exhibit 38. Number of small businesses reporting access to financing, by type of financing and cluster

Cluster	None	Other private funding	Grants	Retained earnings	Loans	Angel capital	Venture capital	Other external financing	Total
Advanced Power Cluster	9	10	10	3	8	7	2	0	49
Geospatial Cluster	16	5	3	4	5	1	0	2	36
FlexMatters	3	6	5	3	3	5	0	1	26
TechRich	17	2	1	4	6	0	2	2	34
Smart Grid	2	5	3	2	3	10	4	1	30
Energy Storage Cluster	12	5	12	6	6	2	3	2	48
San Diego Defense Cluster	10	3	3	7	2	2	0	3	30
All clusters	69	36	37	29	33	27	11	11	253

Source: RIC small business survey

The small business survey also asked small businesses to rate the influence that cluster participation had on their access to financing during the third year of SBA's Initiative. Of the 184 small businesses reporting, 39% indicated that their participation in the clusters was at least slightly influential in their access to capital (see Exhibit 39), a value 8 percentage points lower than in Year 2, in large part due to fewer firms reporting that cluster participation was very or extremely influential this year. However, this percentage increased to 51% for those firms that reported obtaining one or several forms of external funding. There was significant variation across clusters with regard to the level of influence cluster participation had on access to capital. For example, 64% of FlexMatters small businesses reported that participation was at least slightly influential, whereas this value decreased to less than 20% for TechRich.



Source: RIC small business survey

Exhibit 39. Reported influence of small business cluster participation on access to financing

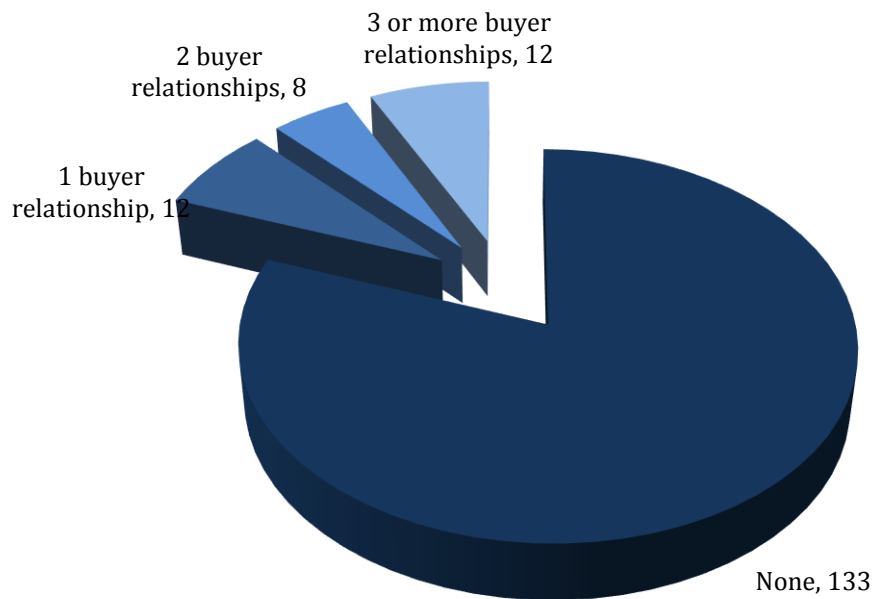
Certain types of funding can be obtained by a group of organizations. For example, certain Small Business Innovation Research/Small Business Technology Transfer Research (SBIR/STTR) solicitations are difficult to win by small businesses alone and often require multiple organizations to bring their respective areas of expertise to a project. Large organizations were asked whether they collaborated with one or several small businesses on such a joint funding application during the third year of SBA's Initiative. This was not a common occurrence; only 8 of 63 large organizations reported such collaborations.

Success Story #3

One small business specializing in the design of mixed-signal and radio-frequency parts and sensors for defense and space applications, has demonstrated a remarkable ability to win SBIR/STTR awards, often with the help of its cluster or cluster partners. The company applied for and received more than five Phase I SBIR awards, five Phase II SBIR awards, and an STTR award for Phases I and II during Years 2 and 3 of the Initiative. These awards came from a wide range of agencies, including the Missile Defense Agency, the U.S. Special Operations Command, the Defense Advanced Research Projects Agency, and the U.S. Air Force. The business received assistance from one of the cluster's service providers for several of these awards, including for commercialization and transition planning and proposal review. This service provider's assistance also played an important role in the company's signing of a CRADA with the Defense Microelectronics Activity (DMEA). Toward the end of Year 3, the business was receiving assistance from the cluster with gaining admission to the large business mentoring program and with its pursuit of a Broad Agency Announcement.

4.2.3. Small Business Contract and Subcontract Awards

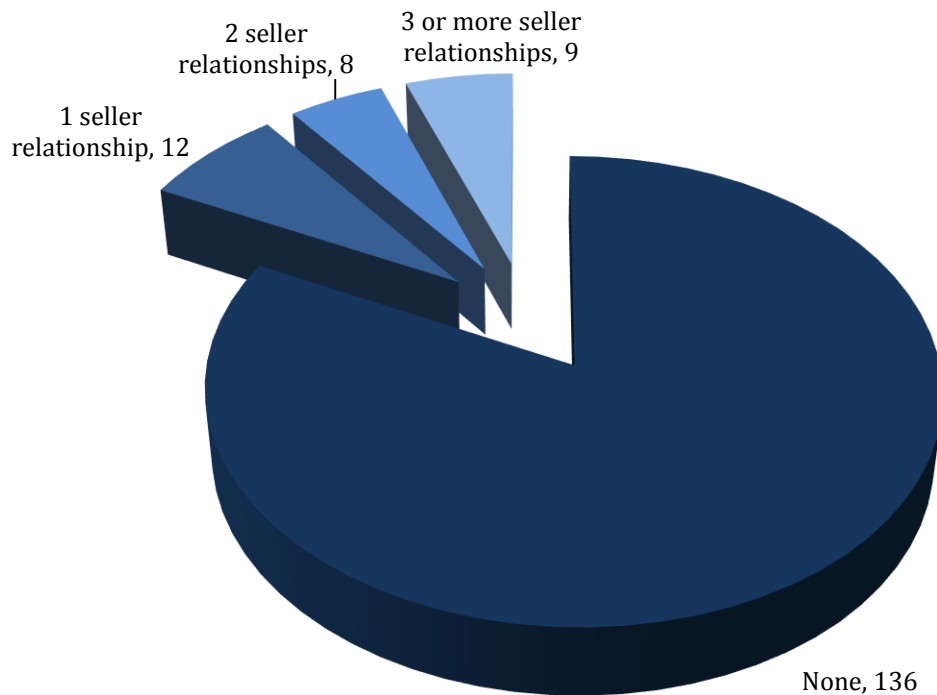
Contract awards represent an important source of business activity for cluster small businesses. The small business survey asked participating businesses several questions about business transactions with other cluster participants, both large and small, including the sale or purchase of goods or services, receipt of contracts or subcontracts, external financing (angel, venture, and other private equity), and grants and loans. Of the 165 small businesses reporting, 19% indicated buying goods and services from one or more cluster participants: 7% indicated having a buyer relationship with one cluster participant, whereas 12% indicated having a buyer relationship with two or more cluster participants (see Exhibit 40). On average, each small business had 0.53 buyer relationships within its cluster, a slightly lower figure than the 0.61 average reported for Year 2. FlexMatters and the Energy Storage Cluster were the two clusters in which the greatest percentage of small businesses reported one or more buyer relationships (42% and 32%, respectively).



Source: RIC small business survey

Exhibit 40. Number of small businesses reporting buyer relationships within their clusters

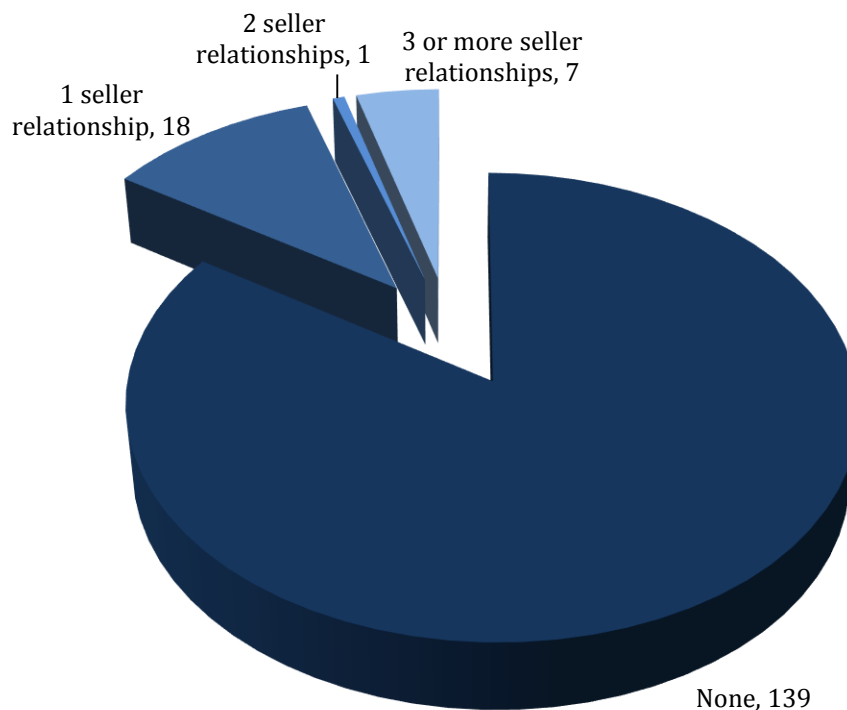
Small businesses were further asked about any seller relationships they may have had within their clusters. On average, reporting small businesses indicated having 0.5 seller relationships with other cluster small businesses and having 0.44 seller relationships with cluster large organizations. Among reporting small businesses, 18% had one or more seller relationships with other small businesses in their clusters (see Exhibit 41), a markedly lower value than the 34% reported in Year 2. More than 25% of small businesses in the Geospatial Cluster and the Energy Storage Cluster had one or more seller relationships with cluster small businesses, while this value was 0% for Smart Grid.



Source: RIC small business survey

Exhibit 41. Number of small businesses reporting seller relationships with cluster small businesses

About 16% of reporting small businesses indicated having one or more seller relationships with large organizations participating in their clusters (see Exhibit 42), approximately half the percentage reporting such a relationship in Year 2. The prevalence of these relationships varied across clusters, with 23% and 24%, respectively, of reporting small businesses in the Advanced Power Cluster and the San Diego Defense Cluster having one or more seller relationships with large organizations. Only 6% of Smart Grid's small businesses reported having a seller relationship with one or more cluster large organizations.

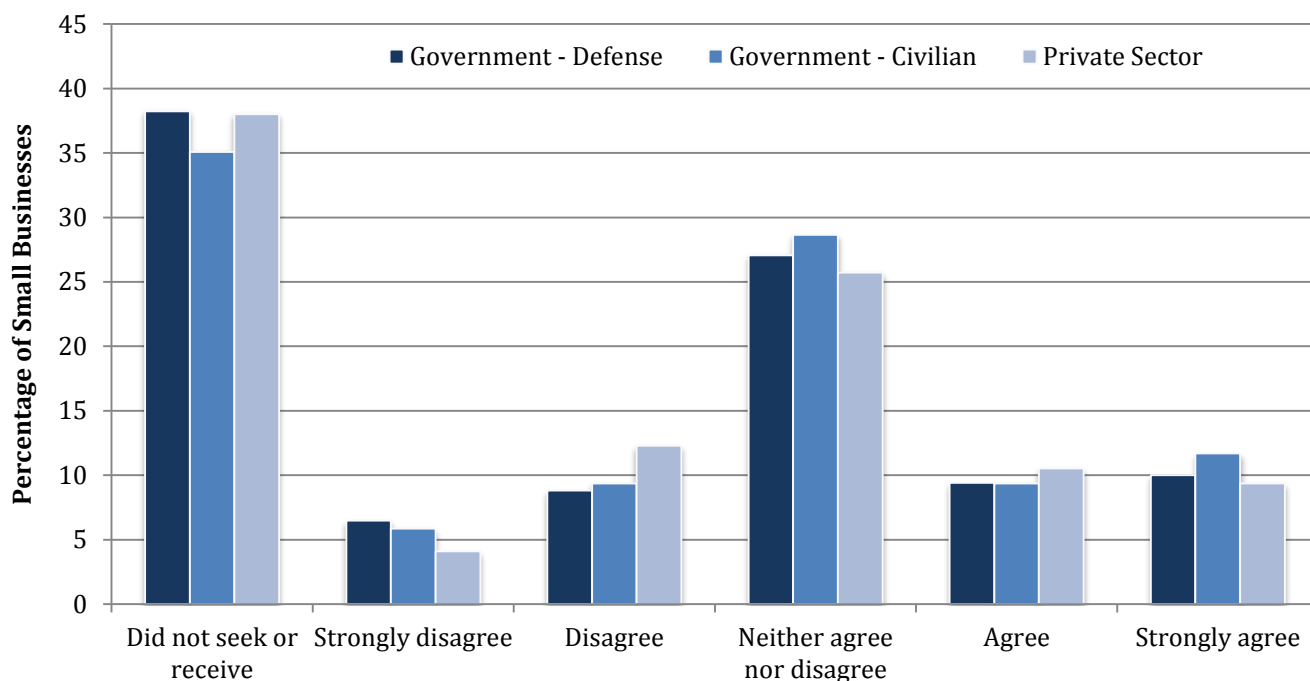


Source: RIC small business survey

Exhibit 42. Number of small businesses reporting seller relationships with cluster large organizations

Overall, the percentage of reporting small businesses indicating involvement in intracluster buyer-seller relationships ranged from 16% for seller relationships with one or several cluster large organizations to 19% for buyer relationships with one or several cluster small businesses. Large organizations were also queried regarding their involvement in joint contracts with one or several small businesses, but only 11 of 63 reported being part of such an arrangement.

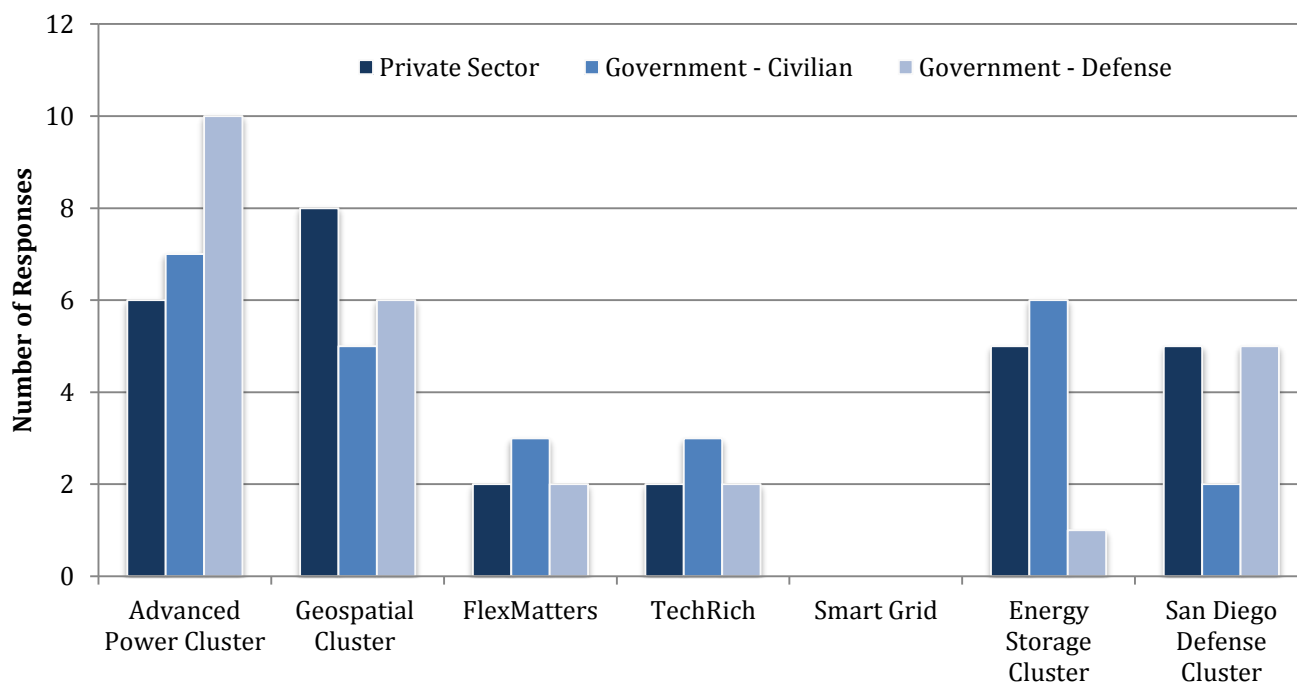
Small businesses were asked whether their participation in cluster activities had resulted in the awarding of contracts or subcontracts from private-sector organizations, civilian government agencies (federal, state, or local), or the U.S. Department of Defense (DoD). Between 35% and 38% responded that they neither sought nor received assistance with private, government, or defense contracts. About 15% responded that they either “agreed” or “strongly agreed” that cluster participation facilitated their receipt of such contracts (see Exhibit 43).



Source: RIC small business survey

Exhibit 43. Percentage of small businesses responding regarding relationship between cluster participation and receipt of a contract or subcontract award from a defense, government, or private-sector organization

All clusters except Smart Grid had at least one small business reporting that cluster participation facilitated receipt of a contract or subcontract award. Unsurprisingly, the majority of small businesses reporting that cluster participation facilitated a defense contract were in the three defense-focused clusters—the San Diego Defense Cluster, TechRich, and the Advanced Power Cluster. Some also came from the Geospatial Cluster, which can be considered “defense-focused” because a significant portion of demand for cutting-edge geospatial technology stems from various defense and other government agencies, and it was also highly successful in assisting its members with obtaining private-sector contracts (see Exhibit 44).



Source: RIC small business survey

Exhibit 44. Number of small businesses responding that cluster participation resulted in a contract or subcontract award from a defense, government, or private-sector organization

Cluster administrators reported on the value of economic activity, such as contracts and subcontracts awarded; angel, venture, and other private equity obtained; and grants and loans accruing to participating small businesses.⁴¹ These values for the third year of SBA’s Initiative are reported in Exhibit 45, according to the type of activity and funding source. The value of economic activity reported for the third year of the Initiative totaled more than \$3 billion, a figure dominated by more than \$2.92 billion in contracts and subcontracts reported by TechRich firms.⁴² It is important to note several trends when interpreting the contract figure reported by TechRich. First, the average expected duration of these contracts/subcontracts was 4.5 years, with a median of 5 years. This duration contrasts sharply with the average duration for all contracts reported across the seven clusters, where the average expected duration was 1.7 years, with a median of 1 year. This difference at least partly explains why the amount reported by this cluster was so much larger than those reported by the remaining six. However, dividing the total contract/subcontract amount reported by TechRich by the average duration reported above to obtain an

⁴¹ Cluster administrators were asked only to include economic activity for small business participants classified as “active” and for whom the cluster had at least some influence on obtaining the funding. For more information about the definition of active participant, please refer to the footnote in the Methodology Appendix.

⁴² To ensure accuracy, the firms provided by TechRich were verified to be small businesses based on information contained on each firm’s website as well as other source of information. One firm did not qualify and was removed from the calculations.

annualized amount still leads to a very impressive \$584,000,000 per year. Another important factor is that the majority of contracts/subcontracts reported by TechRich were awarded to “large” small businesses, many with more than 300 employees. This was not the case for contracts/subcontract awards reported by the other six clusters, where the distribution of awards across business size was significantly less skewed.

The remainder was largely accounted for by private equity, with the majority going to small businesses in two clusters—the Energy Storage Cluster and Smart Grid. At nearly \$43 million, private equity (including venture and angel capital) accounted for the second highest value among the financing categories. However, private-equity awards were only reported by businesses in four clusters, with the total dominated by deals awarded to Energy Storage Cluster small businesses. Economic activity reported in each of the other three financing categories (grants, loans, and SBIR/STTR) totaled between \$1.75 and \$13.5 million. SBIR/STTR awards were the most widely reported across the seven clusters, with only Smart Grid reporting no such awards. The data reported here serve only as a lower-bound estimate of the actual figures, because cluster administrators did not consistently report about financial awards from their participants—sometimes they were not informed of the value of these awards, and sometimes small businesses requested that amounts not be disclosed.⁴³

⁴³ To illustrate this point, TechRich provided the list of SBIR/STTR awards for its more active participants by searching for them in the sbir.gov database. While limitations regarding the exact month of award prevents an entirely accurate comparison with the figure for reported awards displayed in Exhibit 45 (only years are generally reported in the database, creating a mismatch with SBA’s Initiative), a conservative total from this source is approximately 40 times larger. However, this should not be construed as meaning that the cluster necessarily played even a minor role in all of these awards.

Exhibit 45: Value of external funding and contracts/subcontracts awarded to small business participants

Cluster	Contract/ subcontracts	Angel capital, venture capital, or other private equity	Grants	Loans	SBIR/STTR	
All clusters	\$3,004,719,932	\$42,433,000	\$7,260,000	\$1,750,000	\$13,483,271	\$3,004,719,932

Source: RIC cluster administrator survey

Because all clusters still active in SBA’s Initiative also reported on the value of these various financial awards last year, it is possible to compare clusters and award types over time. Contracts and subcontracts were the largest source of funds in Year 2, with TechRich again reporting the largest amount. However, this category increased more than five-fold in Year 3. Private equity and SBIR/STTR awards also increased significantly in Year 3, by a factor of more than 3 and 1.5, respectively. On the other hand, both grant and loan amounts decreased by approximately half between Year 2 and Year 3.

A comparison of the total amount reported by the seven clusters suggests that most reported somewhat lower amounts in Year 3 than in Year 2. For example, the amount reported by the San Diego Defense Cluster represented a decrease of nearly 80%, while the Geospatial Cluster reported a decrease of more than 45%. Only TechRich and Smart Grid reported values larger in Year 3 than in Year 2.

4.2.4. Development of New Products, Commercialization, and Licensing

The clusters in SBA’s Initiative assist small businesses with challenges faced in developing new products and/or commercializing and licensing new technology. This evaluation collected a number of metrics that measured cluster activity and outcomes in this area, including the following counts:

- Technologies licensed by cluster small businesses *to* other businesses
- Licensing rights obtained by cluster small businesses *from* other businesses
- Small businesses licensing new technology, developing new products or services, or commercializing new technology as a result of cluster activity
- Small businesses receiving third-party validation or evaluation of their technology and developing proof-of-principal and/or functional prototypes
- Large organizations collaborating with cluster small businesses to license new technology
- Large organizations innovating with regard to new products, processes, or markets; transitioning technologies in research or development into marketable products; and discovering or identifying unanticipated applications for technologies currently under research and development as a result of cluster activity

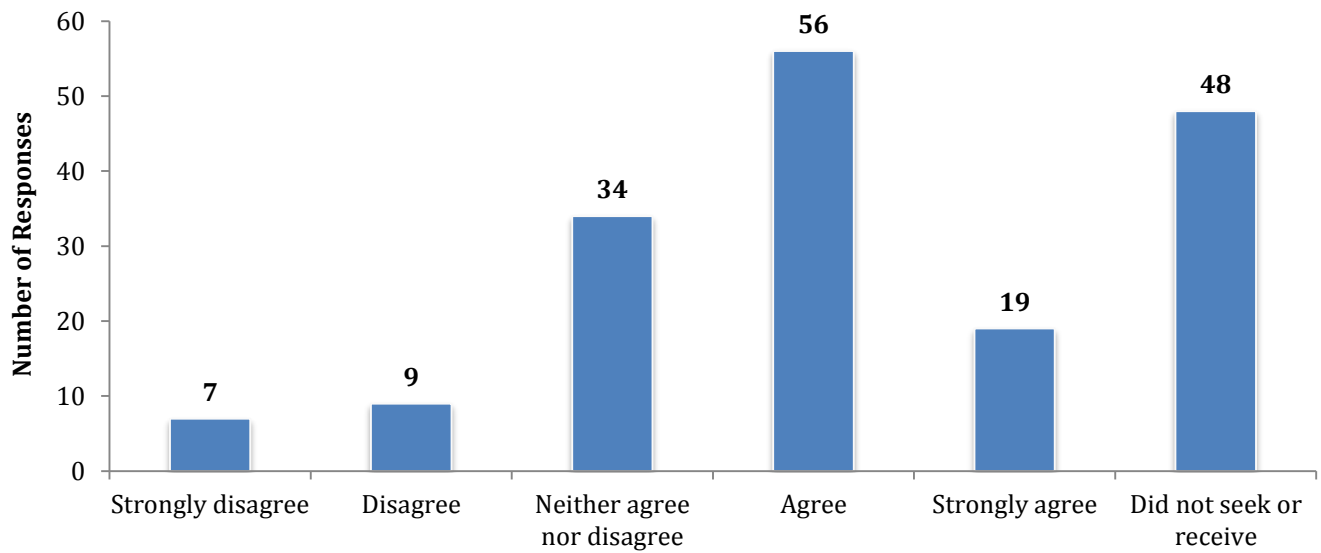
The evaluation of these items for the third year of SBA’s Initiative is discussed here. Closely related long-term outcomes, such as intellectual property issues, patent applications, and patents granted, are discussed in Section 4.2.5, below.

Among responding small businesses that sought or received assistance with the development of new products or services, 60% denoted that cluster participation had benefited them in this regard (see Exhibit 46), a level of agreement slightly higher than the level reported during the second year of the Initiative. The level of reported influence varied significantly across clusters (see Exhibit 47). In all but three clusters, at least 50% of small businesses “agreed” or “strongly agreed” that this was the case, with the figure reaching as high as 88% in the Advanced Power Cluster. Only in FlexMatters, the San Diego Defense Cluster, and Smart Grid did relatively few businesses agree that this was the case (40%, 44%, and 46%, respectively). The value reported across the clusters often changed significantly from those reported last year. The Advanced Power Cluster and Smart Grid both saw a sharp increase (26 and 32 percentage points, respectively), whereas the Geospatial Cluster, FlexMatters, and the San Diego Cluster saw a sharp decline (26, 23, and 34 percentage points, respectively).

Success Story #4

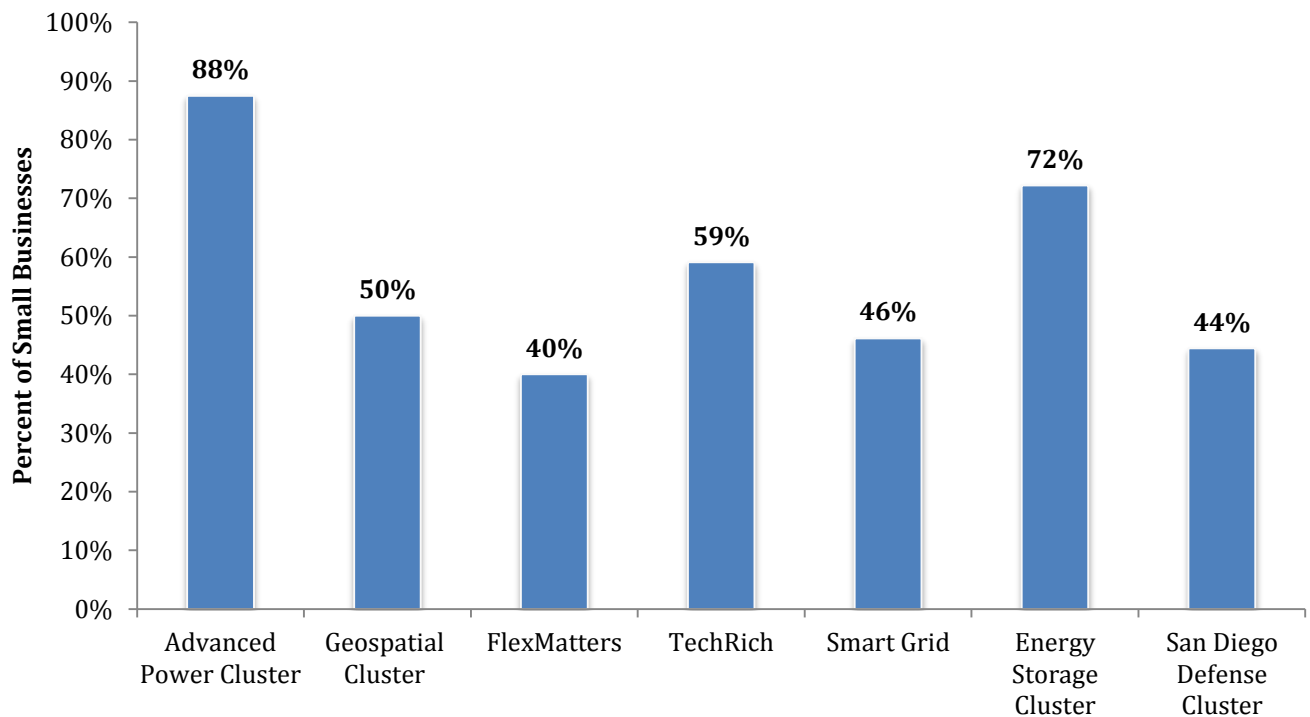
A small business participating in one of the seven clusters developed a patented technology allowing eyewear products to instantaneously adapt their tint to changing ambient light conditions. The company originally developed this technology for military applications (e.g., fighter pilot visors) and later released the technology to consumers in the motorcycle visor market with limited success. As a result, this business conducted a significant redesign of the product but faced issues with the adhesion of visor layers and the design of the electronic pod that controls the tint. These issues threatened the planned launch of the revised product at a major international motorcycle trade show in 2013. A cluster partner worked with the company to quickly redesign the prototype to address these issues. The business was able to display production-quality samples of its technology at the trade show and was approached by 10 Original Equipment Manufacturers (OEMs) interested in carrying the product.

In early 2013, the business was also one of 4 original companies to participate in its cluster’s SBIR training program. This 2-day intensive program composed of group workshops and one-on-one assistance is designed to help technology-based small businesses develop effective proposals for SBIR/STTR and small business set-asides. In exchange, participating firms have to commit the necessary resources toward drafting and submitting at least one proposal. Six months after program completion, the company had submitted an SBIR proposal to the National Institute of Health and another to the U.S. Army; it is awaiting answers for both.



Source: RIC small business survey

Exhibit 46. Small businesses developing new products or services as a result of cluster participation

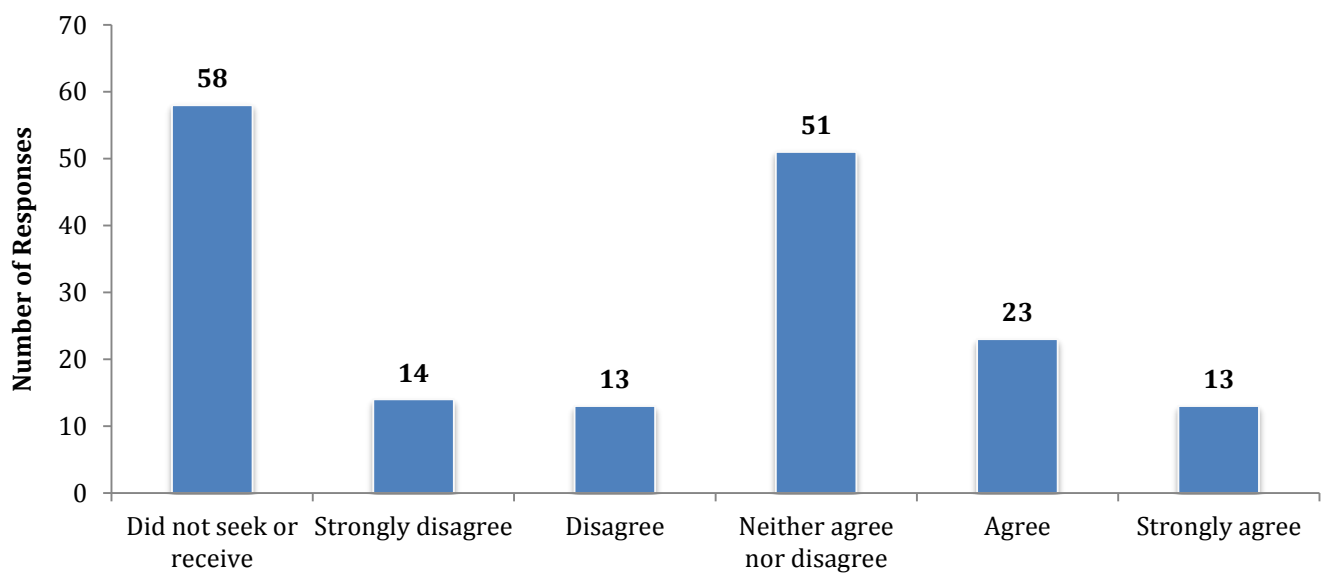


Source: RIC small business survey

Exhibit 47. Percentage of small businesses reporting new products or services developed as a result of cluster participation

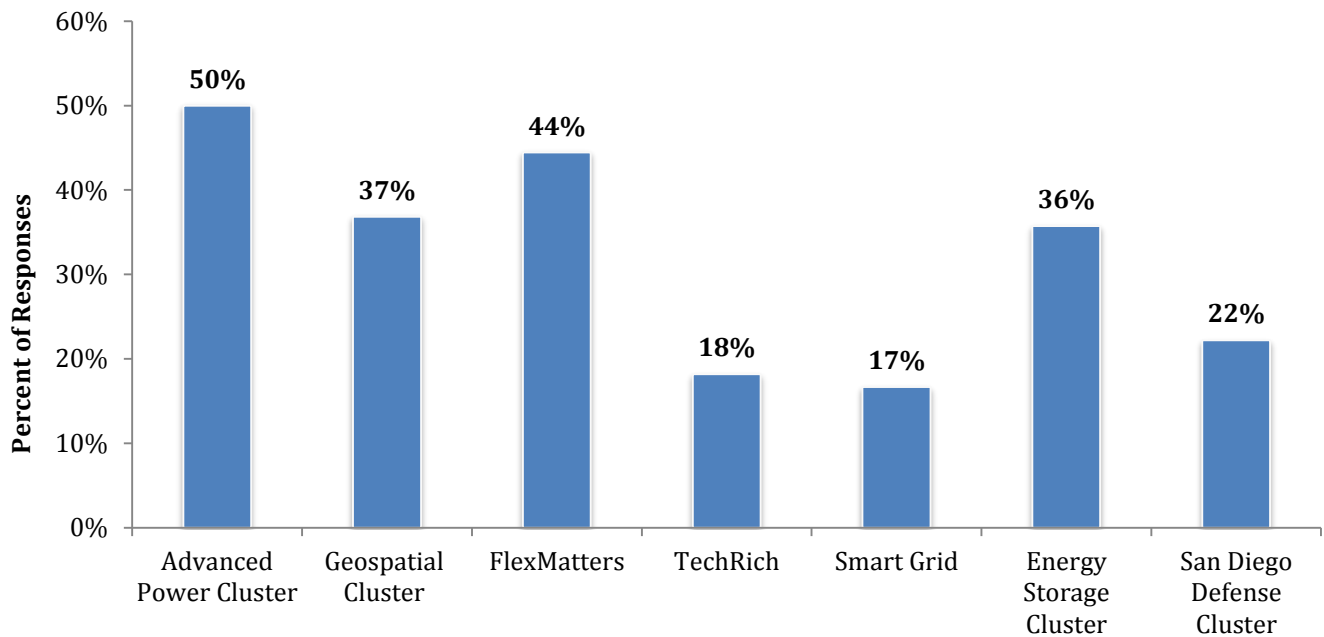
The data shown in Exhibit 48 suggest similar (if slightly dampened) results for the influence of cluster activity on commercialization and new technology development. Although 34% of respondents answered that they had neither “sought nor received” such cluster services, 32% of those remaining

“agreed” or “strongly agreed” that cluster participation had assisted them in this regard, while 24% “disagreed” or “strongly disagreed.” This level of agreement was somewhat lower than the 48% reported during the second year of SBA’s Initiative. Reported cluster influence varied, however. Among four of the seven clusters, a significant share of small businesses (36% to 50%) reported that they either “agreed” or “strongly agreed” that cluster participation had contributed to their commercialization of new technology. That share shrank substantially among the remaining three clusters (TechRich, Smart Grid, and the San Diego Defense Cluster; see Exhibit 49). Although many of the clusters had percentages of agreement similar to those in Year 2, several saw important decreases, including the Geospatial Cluster, TechRich, and the San Diego Defense Cluster (21, 29, and 28 percentage points, respectively).



Source: RIC small business survey

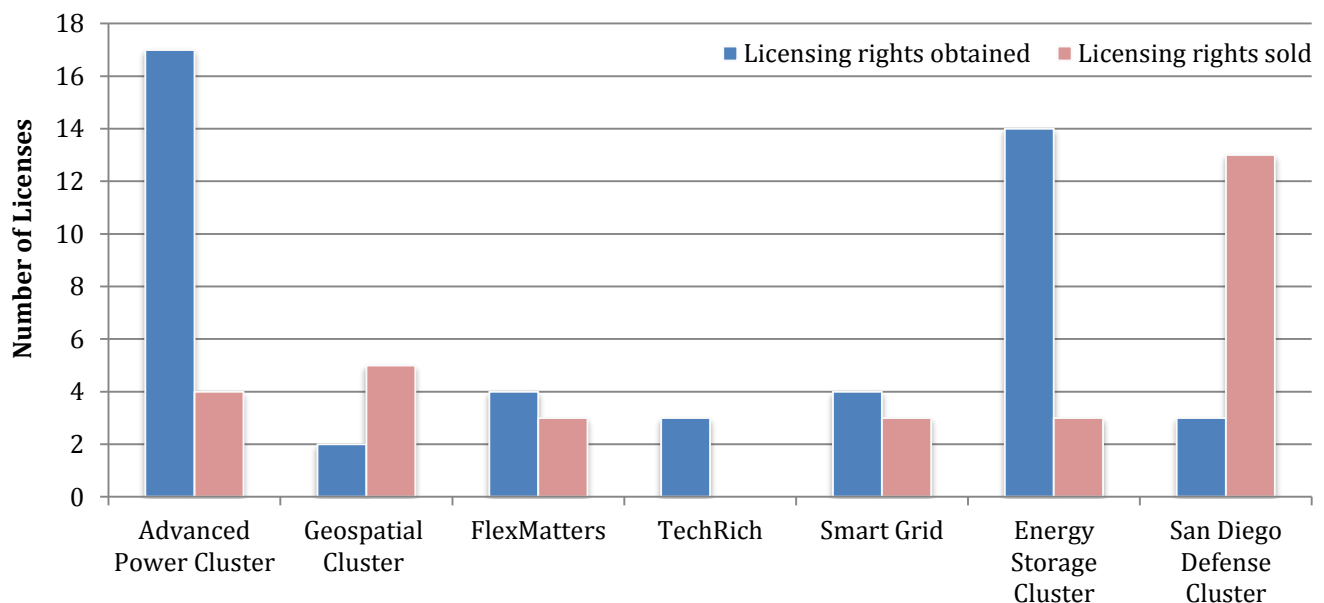
Exhibit 48. Small businesses commercializing new technology as a result of cluster participation



Source: RIC small business survey

Exhibit 49. Percentage of small businesses reporting increased commercialized new technology as a result of cluster participation

During the third year of SBA's Initiative, small businesses reported a total of 31 technologies licensed *to* other businesses and 47 technology licenses received *from* other businesses, a sharp increase compared to the figures in Year 2. These were distributed across different clusters (see Exhibit 50). Three of the seven clusters shared significantly in this licensing activity (with a total of 16 to 21 licenses reported per cluster during this year), while four clusters reported less activity in this area. Small businesses from TechRich reported only acquiring licenses *from* others and no licensing *to* others.



Source: RIC small business survey

Exhibit 50. Number of new technology licenses issued to small businesses or received from other small businesses

Commercialization and licensing of new technologies and new product development are also key outcomes for larger organizations collaborating with clusters. These organizations (primarily large businesses, nonprofit organizations, universities and research centers, and business associations) were queried regarding the extent to which they collaborated with cluster small businesses to license new technology. Of the 63 organizations responding, 24 reported that they collaborated with a cluster small business in one way or another during the third year of the Initiative, but only three organizations reported that such collaboration resulted in technology licensing. These organizations were part of the Geospatial Cluster, Smart Grid, and the Advanced Power Cluster.

Success Story #5

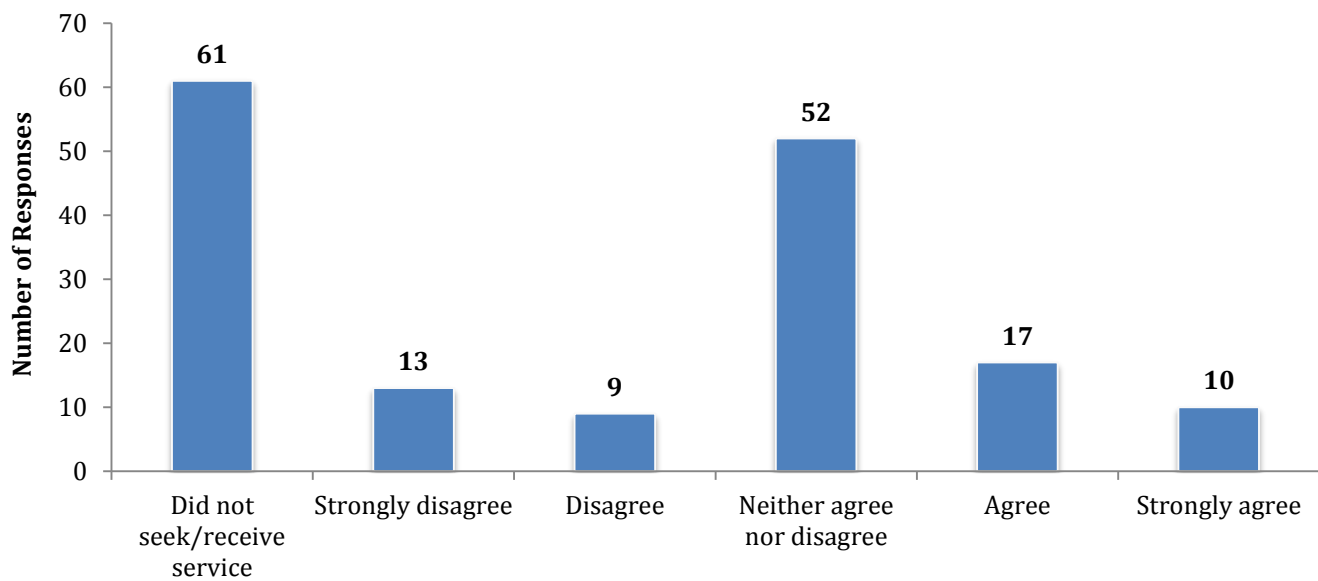
A small business that creates cutting-edge digital-signal processing solutions used in a wide range of systems including radar, signal intelligence, and electronic warfare, reached out to its cluster in March 2011. The business was diagnosed as lacking a sufficient understanding of its markets, a viable business plan, and corporate branding and strategy. In an effort to address these weaknesses, the cluster provided the company with a business advisor and a mentor who assisted in the creation of new financial and business plans. Cluster partners at a local university also conducted market research, connected the company with three of the top power-amplifier suppliers in the country, and created a new company branding strategy and website.

This assistance yielded results, as the business quickly sold a \$500,000 technology license. Furthermore, the business won a SPAWAR Systems Center Pacific Phase II SBIR contract valued at \$1.5 million, which required a DCAA audit before the funds could be authorized. As time went by, the contracting officer expressed concerns that continued delay linked to the audit was placing the funds at risk. The cluster assisted the business with applicable regulations and procedures, which led to the realization by the DCAA regional director that the audit had not been conducted in accordance with DCAA standards. Shortly thereafter, the audit was completed, as the costs questioned were deemed allowable after review. At the end of Year 3, the business entered into another licensing agreement worth \$40,000 initially (increasing payments and contract periods are expected) with an entity identified during cluster-provided market research. The marketing materials created with cluster assistance continue to support the business in its efforts to establish business relationships with power-amplifier suppliers.

Small businesses operating in high-technology sectors and moving toward commercialization of novel technology often must submit their technology or product(s) for third-party evaluation or validation—the process of testing technology in realistic operating conditions and comparing its performance with technical targets expected or known to be required for commercialization. This process provides both potential customers and investors with independent confirmation that the technology or

product performs as expected and lives up to the marketing material they were provided by the small business. In addition, it is often a required step to move along the continuum of Technology Readiness Levels (TRL) not only in the defense marketplace but also in an increasing number of industries.

Small businesses involved in the seven clusters were asked to assess whether they achieved such validation or evaluation as a result of cluster participation; 27% “agreed” or “strongly agreed” that cluster participation resulted in third-party validation, whereas 22% “disagreed” or “strongly disagreed” (see Exhibit 51). Variation across clusters is very important here, with 60% of FlexMatters participants and 40% of those from the Advanced Power Cluster and the San Diego Defense Cluster agreeing. However, TechRich had the lowest percentage of small businesses agreeing (10%) as well as the highest percentage of disagreement (50%) that cluster participation resulted in third-party validation.



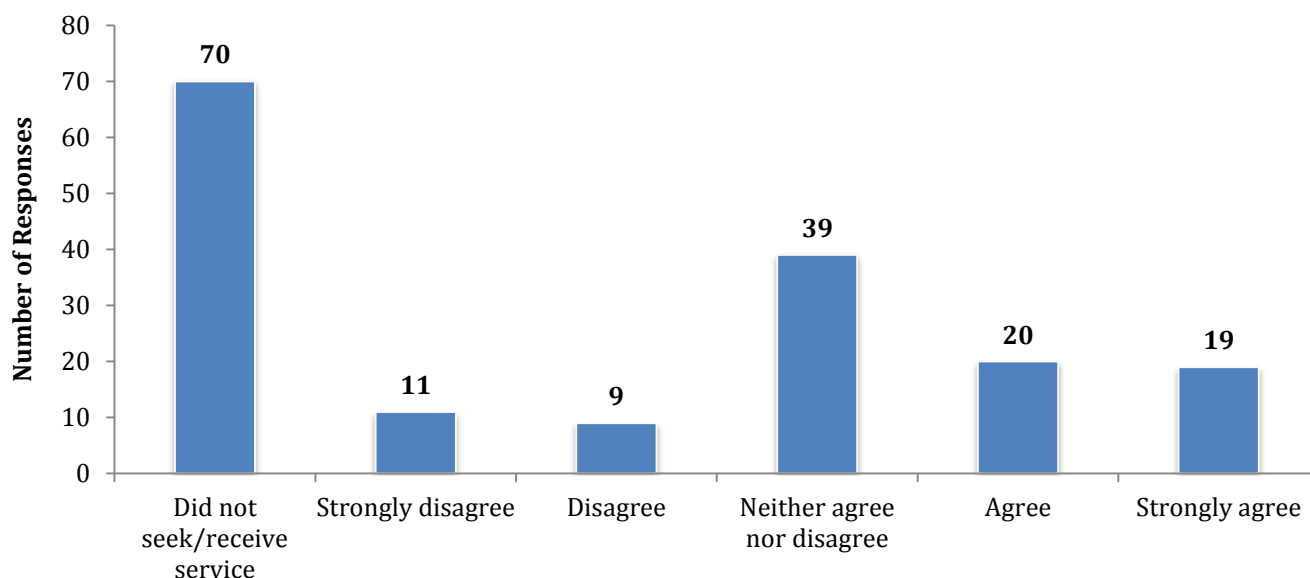
Source: RIC small business survey

Exhibit 51. Small businesses obtaining third-party technology validation as a result of cluster participation

The development of a proof-of-principal and/or a functional prototype constitutes another important milestone in the process of commercializing new technology. Prototyping is broadly defined as creating an early model of a product for the purpose of testing and improvement. Within this broad definition, a distinction can be made between a proof-of-principal prototype and a functional prototype. The former is undertaken at an earlier stage of commercialization and product development and typically only seeks to demonstrate and test functionality without attempting to reflect the final design or manufacturing process, whereas the latter typically seeks to reflect the final design, functionality, and

manufacturing process as closely as possible. Thus the functional prototype generally offers the last chance to check for design flows and make improvements before production runs begin in earnest.

Small businesses were asked to assess whether cluster participation resulted in the development of such a proof-of-principle and/or functional prototype. About 40% small businesses that indicated receiving this service reported agreeing that cluster participation resulted in such a prototype, whereas only 20% indicated disagreeing with this statement (see Exhibit 52).



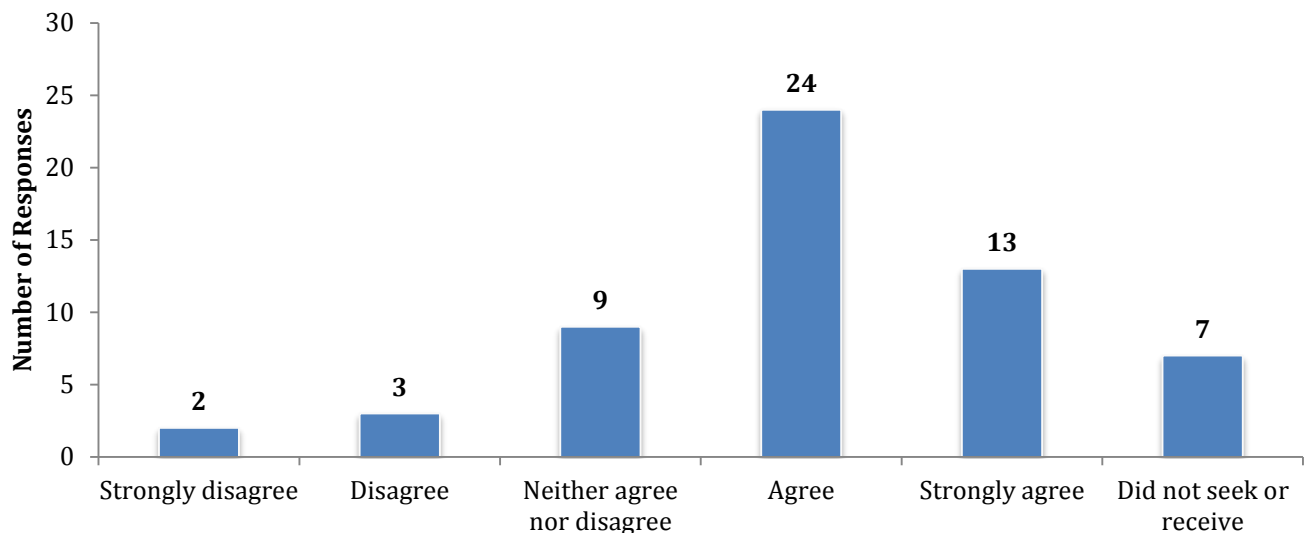
Source: RIC small business survey

Exhibit 52. Small businesses developing a proof-of-principal and/or a functional prototype as a result of cluster participation

As is typically the case, there was significant variation among the seven clusters with regard to this measure of progress toward commercialization. More than 50% of participants in three clusters in particular—FlexMatters, the Advanced Power Cluster, and the Geospatial Cluster—reported agreeing with this statement, whereas participants in Smart Grid reported the lowest level of agreement (8%).

Large organizations were also asked whether cluster participation had enhanced their ability to (1) innovate with regard to new products, processes, or the development of new markets; (2) transition technologies in research or development into marketable products; and (3) discover or identify unanticipated applications for technologies currently under research and development. Among respondents, 73% reported that they “agreed” or “strongly agreed” that cluster participation enhanced their ability to innovate with regard to new products, processes, and the development of new markets (see Exhibit 53), a markedly higher value than the one reported in Year 2. Large organizations in the

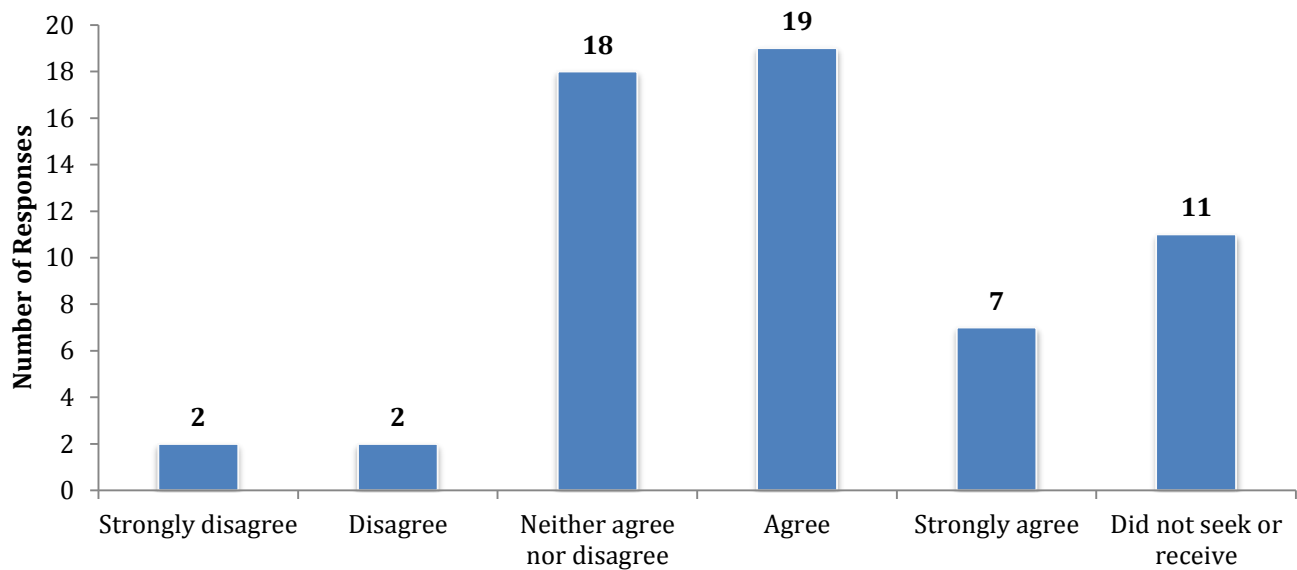
Geospatial Cluster, FlexMatters, the Advanced Power Cluster, and TechRich in particular reported a level of agreement between 75% and 100%, whereas only 50% and 60% participating in the San Diego Defense Cluster and the Energy Storage Cluster, respectively, reported that they “agreed” or “strongly agreed.”



Source: RIC large organization survey

Exhibit 53. Enhanced ability of large organizations to innovate as a result of cluster participation

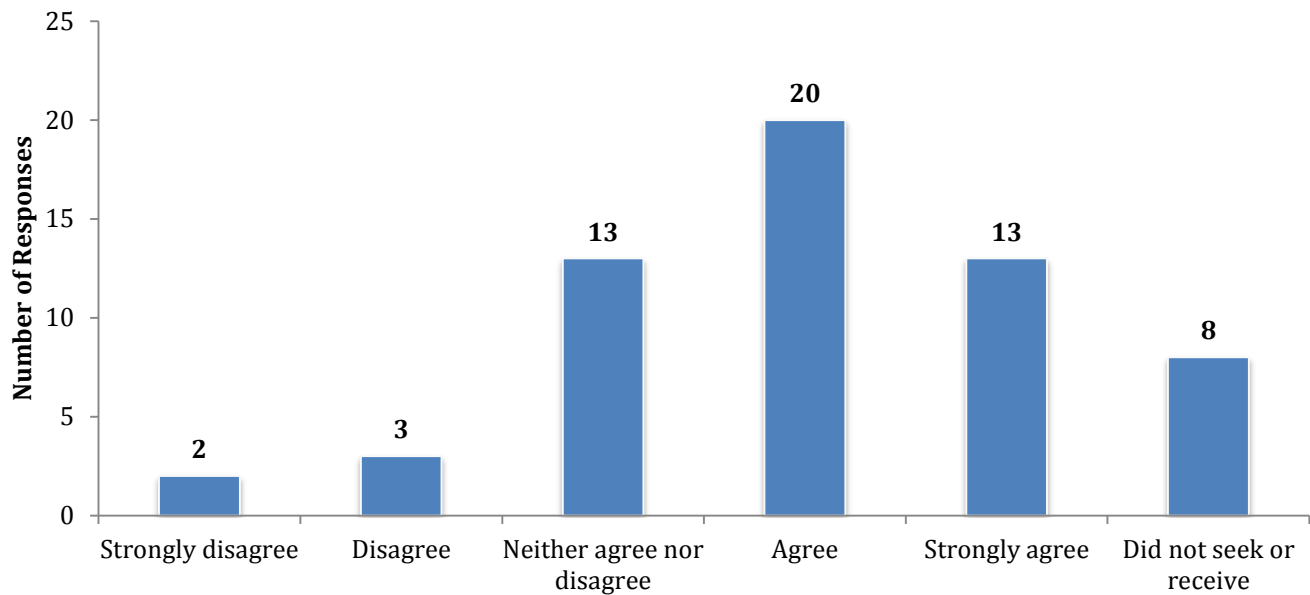
Among large organizations for which the question was applicable, 54% reported that they “agreed” or “strongly agreed” that cluster participation helped them transition technologies in research or in the early stages of development into marketable products (see Exhibit 54), a significantly higher figure than in Year 2. There was important variation among clusters, however; 100% of large organizations participating in the San Diego Defense Cluster reported they “agreed” or “strongly agreed,” whereas 47% and 20% in the Geospatial and Energy Storage Cluster, respectively, reported that they “agreed” or “strongly agreed.”



Source: RIC large organization survey

Exhibit 54. Enhanced ability of large organizations to transition technology into marketable products as a result of cluster participation

Finally, 65% of large organizations “agreed” or “strongly agreed” that cluster participation helped them identify or discover new and unanticipated applications for technologies currently under R&D (see Exhibit 55). Once again, this was a significantly higher value than reported in Year 2. Large organizations participating in TechRich reported they “agreed” or “strongly agreed” the most (86%), followed by those in the Advanced Power Cluster (75%). However, no large organization from FlexMatters “agreed” or “strongly agreed,” a surprising result given that large organizations in this cluster reported the highest level of agreement in Year 2.



Source: RIC large organization survey

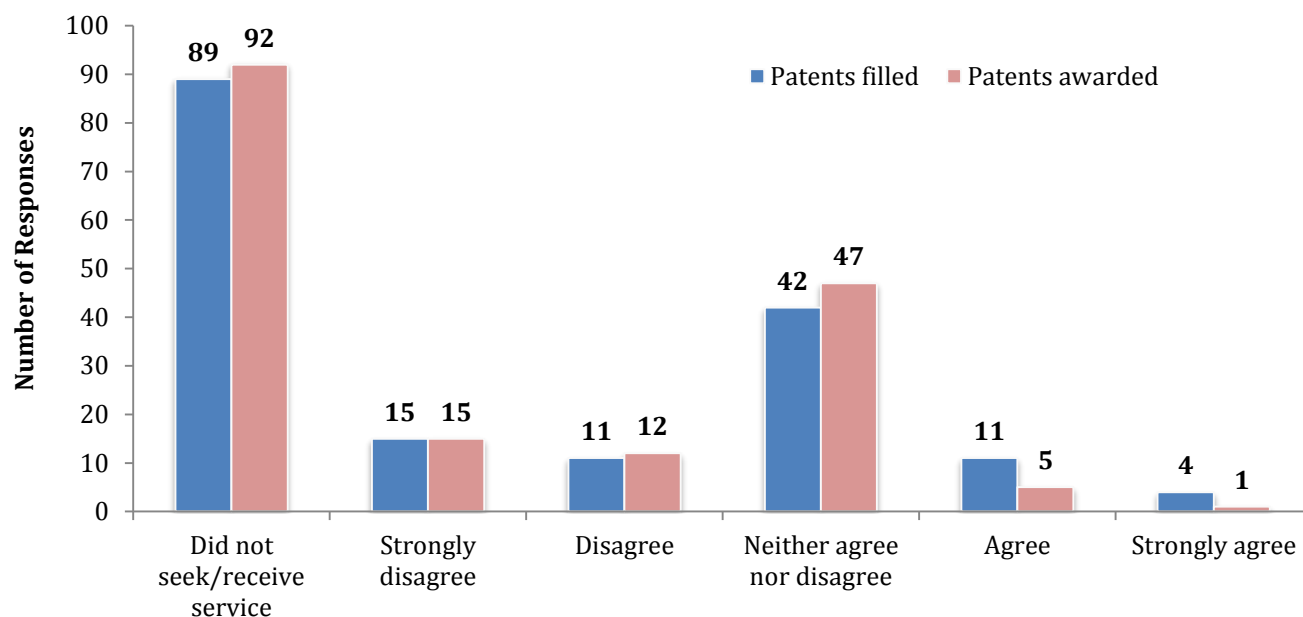
Exhibit 55. Enhanced ability of large organizations to discover unanticipated applications for technology as a result of cluster participation

4.2.5. Intellectual Property and Patent Applications

Development of intellectual property and patents both have the potential to be key outcomes of cluster activity. These aspects of business operations can be especially important for industries involving new and innovative technologies. Small businesses in SBA-supported clusters reported *filing* a total of 181 patents during the third year of the Initiative, an average of slightly more than one patent filed for each small business responding; these figures were both higher than those reported in Year 2. Eight small businesses reported filing 5 or more patents during this period, including four that reported filing more than 10 patents. The Advanced Power Cluster and the San Diego Defense Cluster had the highest number of small businesses reporting one or more patents filed. During the same period, small businesses reported *being granted* a total of 112 patents, a higher figure than in Year 2, and especially impressive given that slightly fewer small businesses responded in Year 3. Seven small businesses reported being granted five or more patents, including one that reported receiving 20 patent awards. The Advanced Power Cluster again had the highest number of small businesses reporting one or more patents granted, followed by the Energy Storage Cluster.

Of responding small businesses that sought/received services in this area, 18% indicated that their cluster participation contributed to their *filing* for patents (see Exhibit 56), a slightly higher value than reported in Year 2. Among the seven clusters, the Advanced Power Cluster had the highest number of small businesses (14 firms) that reported filing patent applications; the San Diego Defense Cluster had 9

firms, and three clusters had 8 firms each. Of those small businesses that sought/received assistance with filing patent applications, 37% reported filing one or more patents, including 14 that filed two or more patents.



Source: RIC small business survey

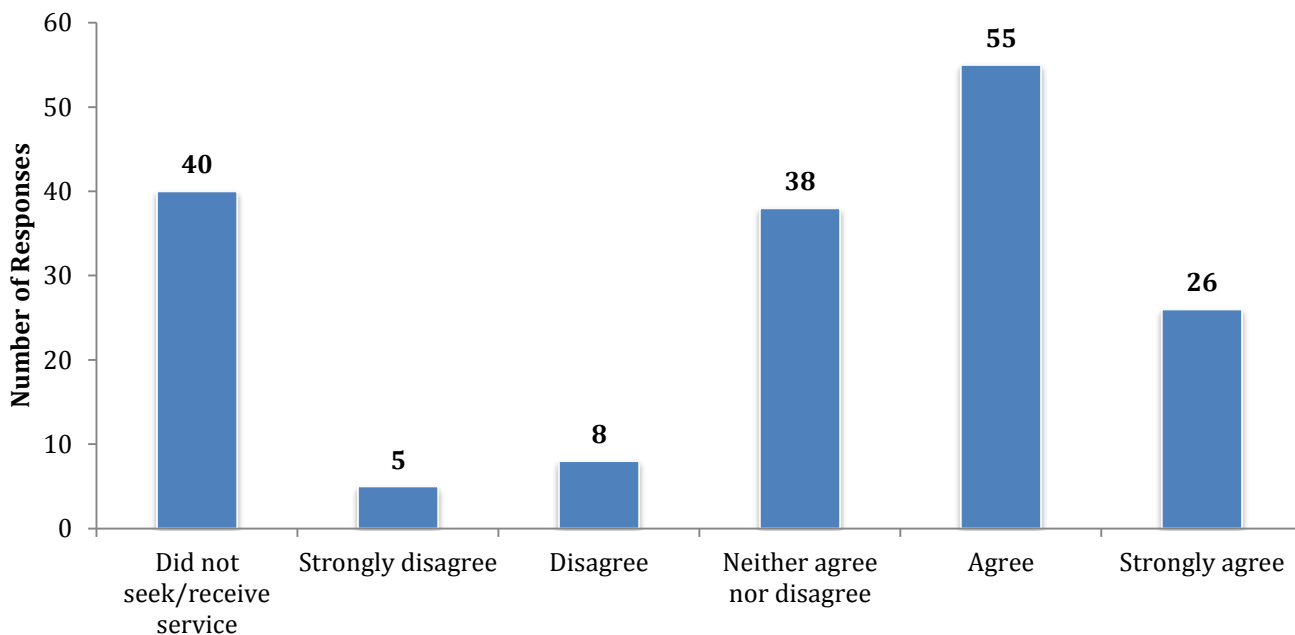
Exhibit 56. Applications for and grants of patent(s) as a result of cluster participation

Small businesses were also asked whether cluster participation helped them *receive* one or more patents. As shown in Exhibit 56, the distribution of answers was generally similar to that of the prior question about patent applications, except slightly fewer firms “agreed” or “strongly agreed”: only 8% of small businesses indicated that cluster participation helped them in their receipt of patents. Among the seven clusters, all had at least one firm that reported being granted a patent; the Advanced Power Cluster once again had the highest number of small businesses (11 firms) that reported being granted patents, followed by the Energy Storage Cluster and Smart Grid, with 7 and 6 small businesses, respectively. Among small businesses that sought/received assistance with patents, 20% reported one or several patent awards, including five that were awarded two or more patents.

4.2.6. Assistance With Small Business Marketing Strategies

Many clusters assisted small business participants with their marketing strategies. A successful marketing strategy can be a key element not only in increasing sales and profit but also in attracting funding. Some 61% of responding small businesses that sought/received services indicated that they revised their marketing strategies as a result of their cluster participation (see Exhibit 57), slightly fewer than in Year 2. All seven clusters had numerous small businesses reporting that this was the case. In

particular, 77% of Advanced Power Cluster small businesses reported agreement, along with 75% to 68% of small businesses in FlexMatters and the Energy Storage. As in Year 2, only in Smart Grid did fewer than 50% of small businesses report that cluster activity assisted them with their marketing strategies.

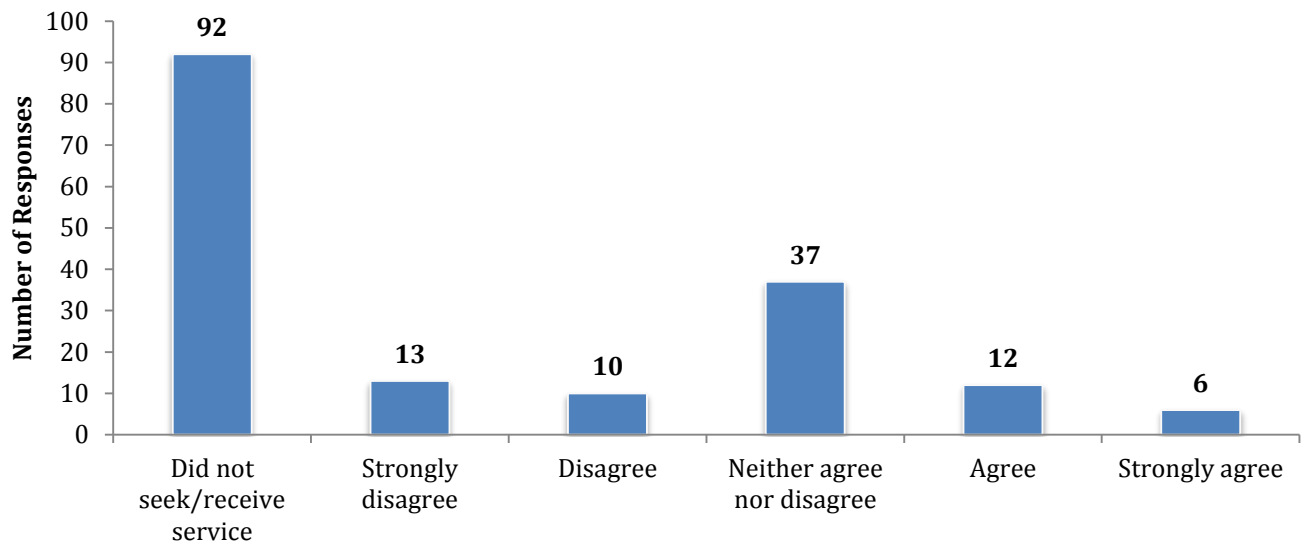


Source: RIC small business survey

Exhibit 57. Revision of marketing strategy as a result of cluster participation

4.2.7. Assistance With Increasing Exports

Some clusters provide assistance to small businesses in support of their ability to export goods and services. Nearly 23% of small businesses reported that they were able to export goods and/or services during the third year of the Initiative as a result of their cluster participation (see Exhibit 58); these small businesses were participants in five of the seven clusters. The Advanced Power Cluster and the Energy Storage Cluster had the highest percentage of small businesses reporting success with exports as a result of participation (46% and 40%, respectively). But among the small businesses that sought/received assistance, 29% reported that cluster participation did not result in additional successful exporting.



Source: RIC small business survey

Exhibit 58. Achievement of exports during the third year as a result of cluster participation

Success Story #6

A woman-owned, 8(a)-certified small business providing numerical meteorological services as well as forecasting and forensic analysis of storm surges, encountered several challenges in growing its business. Limited market knowledge and access to industry decision makers prevented the company from effectively marketing its forensic analysis capabilities and from growing its business, despite its unique expertise and ownership of the most powerful supercomputer in the region. The company also identified an opportunity to export its products and services overseas but had no prior experience in exporting potentially trade-restricted technology. The business was assisted in building credibility and in identifying and connecting with a company interested in utilizing their technology to supply flood modeling and claim-analysis support for insurance companies. The cluster also worked with the business to take advantage of recent legislation requiring federal agencies to develop capacity in settling indeterminate loss claims following hurricanes and to secure the necessary licenses and agreements to export its product overseas.

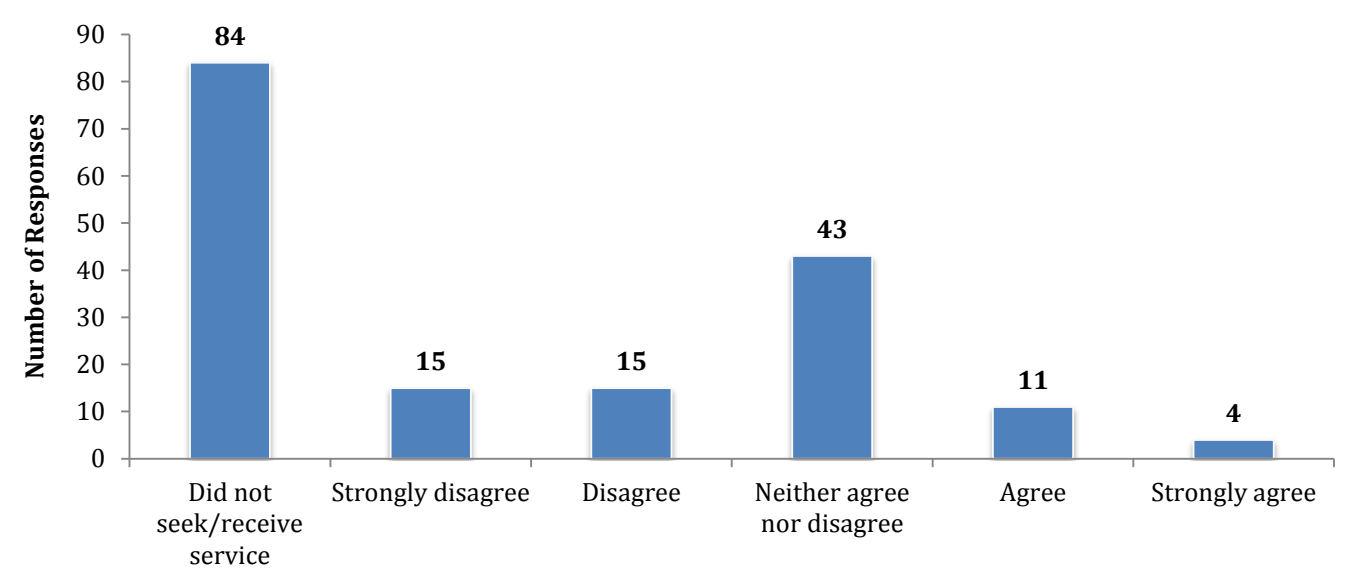
Significantly aided by long-term cluster assistance, the company has increased its revenue, has received a \$400,000 SBIR award, and remains on a path to substantial growth. As of the writing of this report, the small business is seeking to identify which technologies developed under several SBIR awards can be commercialized in the form of a smartphone application. To assist, the cluster conducted a market review of weather-related applications available in Apple and Android stores, helped in identifying a market gap, and connected the company with another cluster member. The two small businesses worked on developing a prototype and submitted a funding proposal to an existing customer of the woman-owned business that had expressed interest in the concept.

During Year 3 and with help from the cluster, the company spun off a new business, which specializes in simulating hypothetical hurricanes to help insurance companies price their coverage for home owners more accurately. Cluster assistance provided to this new entity includes guidance on the regulatory and insurance-industry landscape and preparation of a marketing pitch for various potential clients. This preparation culminated in a successful teleconference with the head of an industry-specific working group, who recognized that the modeling capabilities of this new business do not currently exist within NOAA and are therefore of great value.

4.2.8. Other Short- and Intermediate-Term Outcomes

Cluster activity may promote two other important short- and intermediate-term outcomes: the number of small businesses that gain access to cleared secure facilities as a result of their cluster participation and the number of small businesses that participate in their industry supply chains as a result of their cluster participation. Clusters identified “gaining access to cleared secure facilities” as an important step in the development of small businesses, particularly for those that worked in industries tied to defense or other highly secure applications. Among small businesses that responded and sought/received services, 23% reported having obtained access to cleared secure facilities as a result of their cluster participation (see Exhibit 59). Surprisingly, participants in the defense-focused clusters did not necessarily report the highest percentages: the Geospatial Cluster had the highest value of agreement (39%), followed by a tie between the Advanced Power Cluster and FlexMatters (20%). This result

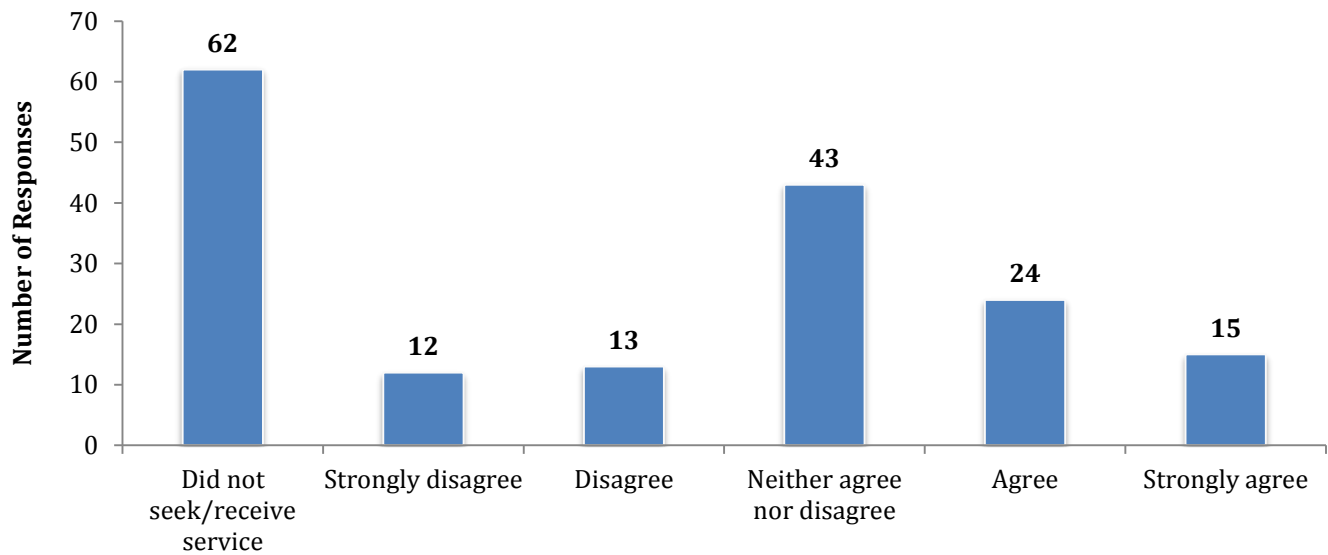
supports the earlier point that firms in clusters focused on non-defense industries are nonetheless seeking defense contracts and sales. The other two defense-focused clusters—TechRich and the San Diego Defense Cluster—had the two lowest percentages (5% and 8%, respectively). Regardless, the fact that a higher percentage of firms indicated they “disagree” or “strongly disagree” that cluster participation helped them obtain access to cleared secured facilities than the percentage in agreement suggests that the clusters, and in particular the defense-focused subset, should place a greater focus on this area of assistance.



Source: RIC small business survey

Exhibit 59. Acquisition of access to cleared secure facilities as a result of cluster participation

Several clusters focused on identifying opportunities for small businesses to become integrated into the supply chains for their industries and regions. Results from the small business survey suggested that these activities were fruitful to some degree. Some 36% of small businesses indicated that their involvement in the clusters led them to participate in their industry supply chains (see Exhibit 60), a lower figure than reported in Year 2.

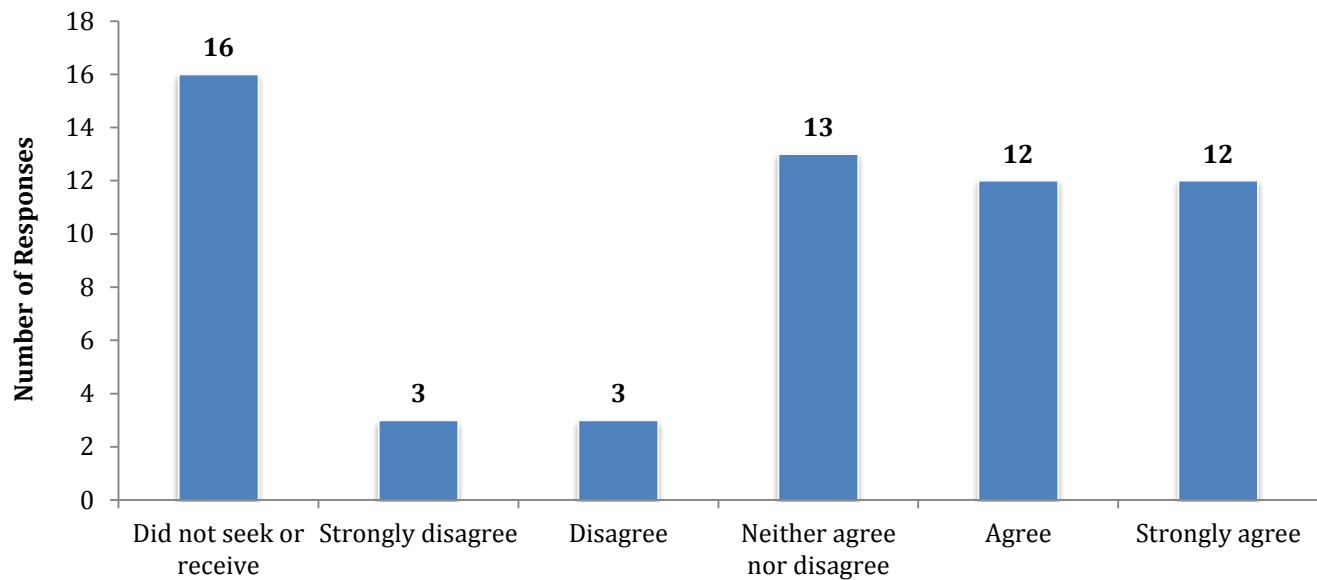


Source: RIC small business survey

Exhibit 60. Small business participation in industry supply chains as a result of cluster participation

The Advanced Power Cluster, the Energy Storage Cluster, and FlexMatters had between 56% and 62% of their small businesses reporting successful integration. Other clusters ranged from 37% for the Geospatial Cluster to 8% for Smart Grid.

Large organizations were also asked to report whether they agreed that cluster participation strengthened their supply chains. This was a somewhat different question, as it did not focus on their industries as a whole but on their specific supply chains. Among respondents, 56% indicated that cluster participation did strengthen their supply chains, while only 14% disagreed (see Exhibit 61). These were significantly better results than those reported in Year 2. In particular, 67% of large organizations in the Advanced Power Cluster and the Geospatial Cluster “agreed” or “strongly agreed.” These two clusters were closely followed by TechRich (60%). The lowest percentage was found in the Energy Storage Cluster, whereas FlexMatters had the highest percentage of large organizations disagreeing that participation strengthened their supply chains.



Source: RIC large organization survey

Exhibit 61. Large organization participation in industry supply chains as a result of cluster participation

4.3. Long-Term Outcomes

The short- and intermediate-term outcomes of SBA's Initiative largely pertain to the immediate effects of cluster activities on business activity (e.g., financing, strategies, alliances, product development, and technologies). A longer-term question is whether this business activity will result in significant economic development, as evidenced by business formation, revenue, employment, and payroll. To a large extent, it is expected that these long-term outcomes become evident only after a number of years of established cluster activity and the consolidation of its effects. Nevertheless, these outcomes are immediately tracked, if only to consider tentative short-term trends emerging as a result of the first 3 years of the Initiative. The current evaluation of SBA's Initiative focuses on these outcomes for cluster-affiliated businesses during the federal fiscal year ending September 30, 2013; on changes in these outcomes during the most recent 2 years of the Initiative (between 2011 and 2013); and on a comparison of cluster performances in these areas with the performances of benchmark (i.e., noncluster) organizations.⁴⁴

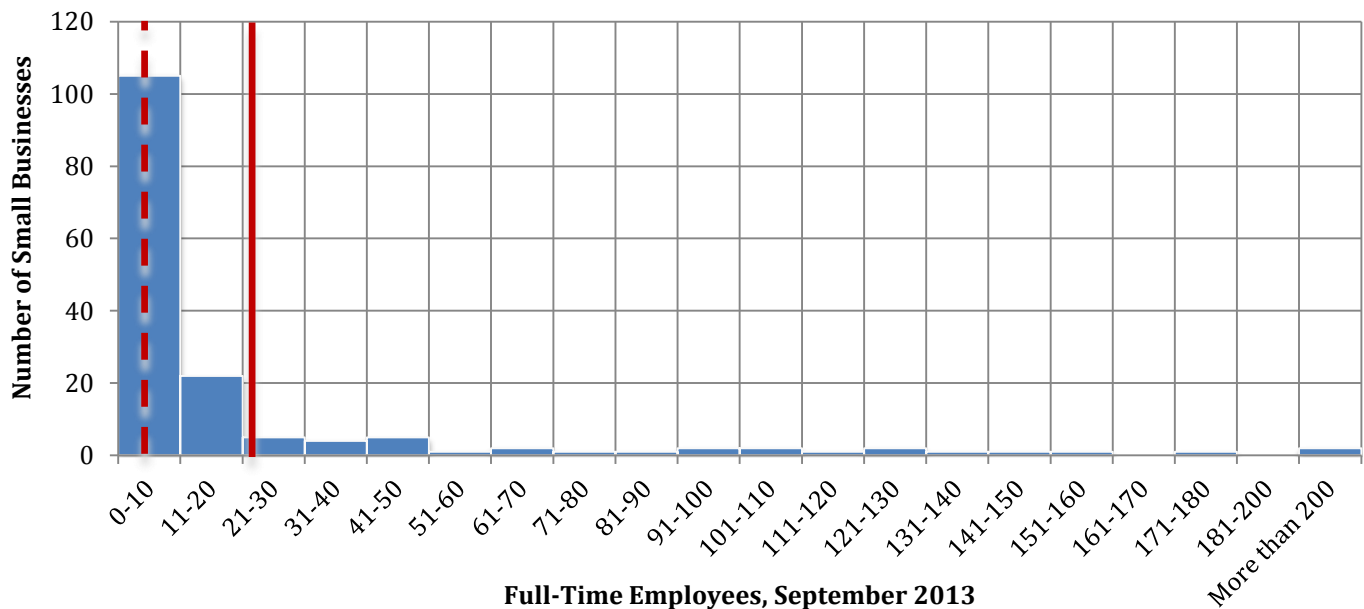
In fact, indicators of growth in cluster economic activity during the past 2 years of the SBA Initiative were generally quite robust and exceeded regional benchmarks. Average *full-time* employment in participating small businesses increased at an annualized rate of 4.4% per year, while average *total*

⁴⁴ The years covered for the long-term outcomes of SBA's Initiative do not include 2010, the baseline year, because it was deemed overly burdensome to request four years' worth of employment, revenue, and payroll data in the RIC small business survey. And while baseline data was collected, the overlap of survey respondents over time is not large enough to warrant the inclusion of that data.

employment (full- and part-time) increased at a rate of 6.9% per year. Furthermore, the annualized percent change in average total employment outpaced the two benchmarks against which cluster small businesses were compared by 7.2% and 5.3%, respectively. Revenue and average monthly payroll in these small businesses grew at annualized rates of 6.9% and 14.1% per year, respectively. Nine startups emerged, small businesses that reported being established *after* their founders became involved with one of the Initiative’s clusters. The rate of revenue growth in cluster businesses overall again exceeded its benchmark for comparable noncluster businesses; payroll growth exceeded regional benchmark measures in five out of seven clusters and by 10.9% across all seven clusters.

4.3.1. Small Business Employment

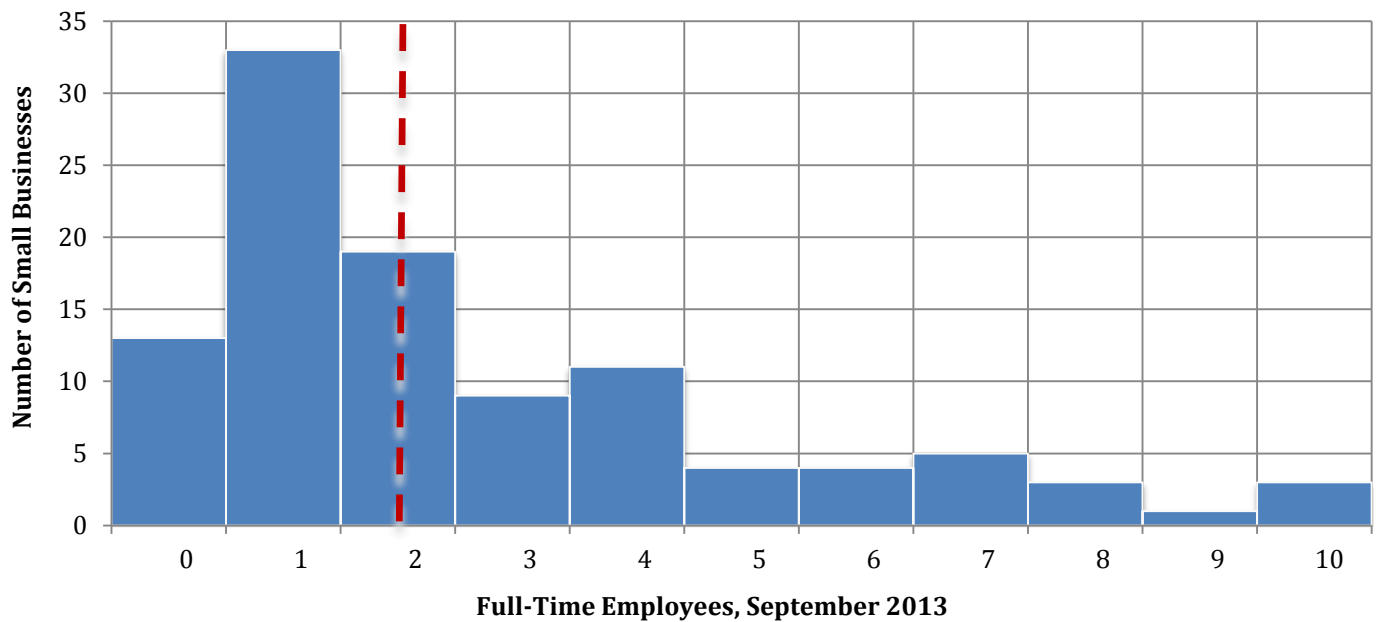
A key long-term outcome of SBA’s Initiative is increased employment within cluster small businesses. Such growth not only signals the advancement of the cluster and its small business participants but also suggests regional job growth. Cluster small businesses reporting in 2013 ranged in size from 0 to 350 full-time employees, with an average of 21.7 and a median of 4 full-time employees (see Exhibit 62).⁴⁵ Despite the presence of some larger small businesses in this group, a significant share of these businesses was quite small: 66% of those reporting had 10 or fewer full-time employees. Exhibit 63 illustrates the size distribution of these smaller firms by decomposing the 0–10 bar in Exhibit 62.



Source: RIC small business survey

Exhibit 62. Distribution of full-time employment in cluster small businesses; the solid vertical line indicates the average number of jobs, while the dashed vertical line indicates the median number of jobs.

⁴⁵ The median indicates the center of the distribution; half the firms in the sample had employment above this level, while half had lower employment levels.



Source: RIC small business survey

Exhibit 63. Distribution of full-time employment in cluster small businesses among businesses with fewer than 10 employees; the dashed vertical line indicates the median number of jobs across this subset of cluster businesses.

Across all clusters, average small business full-time employment increased by 4.4% per year in the most recent 2 years of the Initiative (rising from 23.4 in 2011 to 25.9 in 2013), a statistically significant figure.⁴⁶ Median full-time employment increased slightly (from 5 to 5.5 employees) over the same time period. Full-time employment grew over the 2-year period in all but one of the seven clusters as well, with annual growth rates ranging from a low of 2.8% (the Energy Storage Cluster) to a high of 12.3% (the Geospatial Cluster; see Exhibit 64). Although the average number of full-time employees in TechRich rose slightly (from 25.9 to 28.1), the cluster overall reported a negative annualized percent change, as a result of a few very small firms reporting a significant decline in their number of full-time employees (declining, for example, from 10 employees to 1 or from 30 to 4).⁴⁷

⁴⁶ These data were derived from the sample of small businesses completing surveys in Fall 2013. Compared to the previous exhibit, they are a subset of respondents that provided data for all three years queried in the 2013 survey. Compared to the previous evaluation reports (released in 2012 and 2013), they are a potentially overlapping, but different sample of respondents. Specifically, because survey participation rates vary from year to year, the 130 respondents reporting in fall 2013 are necessarily a different (but overlapping) sample from those reporting in Fall 2012. As such, employment figures for 2011 and 2012 were comparable to, but not exactly the same as, those reported in the previous evaluations of this Initiative. Data comparisons drawn entirely from the same sample, as presented here, however, allowed for the only valid statistical measure of changes over time in the performance of cluster businesses.

⁴⁷ In the case of either paired ttests for changes in means over time or the paired Wilcoxon signed rank test used to test changes in medians over time, the statistical test measures whether the mean or median of the changes experienced by a firm in the RCI sample between 2011 and 2013 was statistically different from zero. Note that these test results can sometimes appear to be odds with changes in the overall sample mean or medians shown here for those same two years. Two examples (one for means and one for medians) illustrate this point: First, if three firms have employment levels of 1, 3 and 5 in year 1, and levels of 2, 3

Exhibit 64. Average and median full-time employees of small businesses, 2011–2013

Cluster	Number of small businesses reporting	Average full-time employment			Annualized percent change 2011–2013	Median full-time employment		
		Sept 2011	Sept 2012	Sept 2013		Sept 2011	Sept 2012	Sept 2013
Advanced Power Cluster	25	40.5	38.8	42.1	7.8%	11.0	11.0	18.0
Geospatial Cluster	23	8.7	10.0	12.5	12.3%	3.0	3.0	3.0*
FlexMatters	10	15.0	16.9	19.3	8.6%	6.5	7.5	9.0
TechRich	19	25.9	27.0	28.1	–9.5%	10.0	10.0	3.0
Smart Grid	10	6.4	7.9	8.7	4.9%	4.5	6.5	3.5
Energy Storage Cluster	24	32.9	34.3	36.4	2.8%	4.0	6.5	6.0
San Diego Defense Cluster	19	17.4	17.0	17.7	3.7%	6.0	6.0	7.0
All clusters	130	23.4	23.9	25.9	4.4%**	5.0	6.0	5.5

Source: RIC small business survey

Asterisks indicate levels of statistical significance based on the results of a paired two-tailed *t*-test with the null-hypothesis that the 2011 and 2013 averages are equal. In the case of medians, asterisks indicate significant differences between 2011 and 2013 data based on a paired Wilcoxon signed rank test.

(***) The difference between 2011 and 2013 averages is statistically significant at the 1% level.

(**) The difference between 2011 and 2013 averages is statistically significant at the 5% level.

(*) The difference between 2011 and 2013 averages is statistically significant at the 10% level.

Part-time employment in cluster small businesses followed relatively similar patterns. In the most recent 2 years of the Initiative, average part-time employment across all firms rose by a statistically significant 8.3% per year (from 7.4 to 8.8 part-time employees), and the median number of part-time employees rose from 2 to 3 (see Exhibit 65). Part-time employment, however, was much smaller in scale than full-time employment: 28% of firms reported zero part-time employees in 2013, and another 39% reported either one or two. This smaller scale accounted, in part, for the higher percentage annual growth rates. Nevertheless, decreases in part-time employment in three clusters were indicative of a mixed picture for cluster employment growth as it relates to part-time workers, with cluster growth rates ranging from a low of –13.4% per year (TechRich) to a high of 23.7% per year (the Geospatial Cluster).

and 7 in year 2, respectively, the median employment level across firms in both years is unchanged at 3. However, for the individual firms the change in employment over time is +1, 0, and +2, respectively, so the median change is 1 (not 0). Second, suppose three firms have revenues of \$10, \$15, and \$20 in year 1, and \$0, \$20, \$30 in year 2 (in thousands). Mean revenue rises from \$15 to \$16.7 thousand. However, the percent changes in revenue for the three firms are -100%, +33.3% and +50%. The mean of these percent changes is -10%. Thus, while mean employment levels across firms rose, the mean of the firm-level percent changes was negative.

Exhibit 65. Average and median part-time employees of small businesses participating in the clusters

Cluster	Number of small businesses reporting	Average part-time employment			Annualized percent change 2011–2013	Median part-time employment		
		Sept 2011	Sept 2012	Sept 2013		Sept 2011	Sept 2012	Sept 2013
Advanced Power Cluster	15	9.6	7.4	10.2	22.7%	2.0	3.0	4.0
Geospatial Cluster	12	19.5	20.9	27.4	23.7%	2.0	2.0	2.5*
FlexMatters	6	4.0	4.3	4.7	–9.9%	4.5	5.0	5.0
TechRich	8	3.3	2.8	2.4	–13.4%	3.0	2.0	2.0
Smart Grid	7	2.9	4.0	3.6	10.0%	3.0	2.0	2.0
Energy Storage Cluster	15	2.5	2.5	2.5	–1.7%	2.0	2.0	2.0
San Diego Defense Cluster	13	5.8	5.5	6.0	9.8%	4.0	3.0	4.0
All clusters	76	7.4	7.2	8.8	8.3%*	2.0	2.0	3.0*

Source: RIC small business survey

Asterisks indicate levels of statistical significance based on the results of a paired two-tailed *t*-test with the null-hypothesis that the 2011 and 2013 averages are equal. In the case of medians, asterisks indicate significant differences between 2011 and 2013 data based on a paired Wilcoxon signed rank test.

(***) The difference between 2011 and 2013 averages is statistically significant at the 1% level.

(**) The difference between 2011 and 2013 averages is statistically significant at the 5% level.

(*) The difference between 2011 and 2013 averages is statistically significant at the 10% level.

Changes in total employment (full- and part-time) for small business cluster participants reinforced the results discussed above. Total employment rose a statistically significant average of 6.9% per year in the past 2 years, reflecting positive annual growth in six of the seven clusters. With the exception of TechRich, every participating cluster experienced at least 7% or more total employment growth per year in the past 2 years (see Exhibit 66). Annual growth rates ranged from a low of 7.3% (FlexMatters) to highs of nearly 11% (the Advanced Power Cluster and the Geospatial Cluster).

Exhibit 66. Average employment (full- and part-time) of small businesses participating in the clusters

Cluster	Number of small businesses reporting	Average employment (full- and part-time)			Annualized percent change 2011–2013	Median employment (full- and part-time)		
		Sept 2011	Sept 2012	Sept 2013		Sept 2011	Sept 2012	Sept 2013
Advanced Power Cluster	24	38.3	36.4	41.1	10.7%	9.0	8.8	10.0
Geospatial Cluster	17	8.6	10.4	12.9	10.6%	3.5	4.0	4.0
FlexMatters	9	17.7	19.6	22.3	7.3%	10.0	9.0	11.0
TechRich	14	16.9	15.9	14.7	–11.2%	7.0	7.8	3.0
Smart Grid	10	5.0	6.2	4.9	10.4%	3.8	3.8	3.8
Energy Storage Cluster	19	30.7	32.3	34.5	8.5%	6.0	10.0	8.0
San Diego Defense Cluster	17	20.1	19.6	20.6	8.5%	7.0	7.0	8.0
All Clusters	110	22.1	22.3	24.2	6.9%*	5.8	6.0	5.5

Source: RIC small business survey

Asterisks indicate levels of statistical significance based on the results of a paired two-tailed *t*-test with the null-hypothesis that the 2011 and 2013 averages are equal. In the case of medians, asterisks indicate significant differences between 2011 and 2013 data based on a paired Wilcoxon signed rank test.

(***) The difference between 2011 and 2013 averages is statistically significant at the 1% level.

(**) The difference between 2011 and 2013 averages is statistically significant at the 5% level.

(*) The difference between 2011 and 2013 averages is statistically significant at the 10% level.

Comparison With Regional Benchmarks. Although small businesses participating in SBA’s Initiative reported adding employees over the past 2 years, a remaining question concerned the size of this employment growth relative to growth in otherwise comparable firms not involved with the Initiative. Two data sources were used to compute comparison employment statistics for businesses in comparable industries and geographic areas: the Quarterly Census of Employment and Wages (QCEW) and the Dun & Bradstreet (D&B) Database. Both sets of comparison statistics corresponded to total employment—the sum of full-time and part-time employees—per firm.⁴⁸

The QCEW sample included firms that were located in the same counties and had the same industrial classifications as cluster small businesses. It suffered, however, from the limitation that it was not restricted to small businesses but rather consisted of a full range of firm sizes. To the extent that

⁴⁸ Please see Section A.3 of the Methodology Appendix for a detailed description of how comparison statistics were computed.

employment growth was higher in small firms, the percentage change in employment in the QCEW sample was expected to be lower. The QCEW sample was also restricted in not reporting data when too few establishments were in a given county and detailed industry classification (thereby not meeting data disclosure standards).⁴⁹ Thus, the industry code comparison between the QCEW sample and the sample of cluster small businesses was imperfect.^{50, 51} The D&B sample was limited to small businesses that matched the size, age, and geographic and industrial profiles of businesses in the cluster sample, but it was not without limitations.⁵²

Although the QCEW and D&B samples represented important benchmarks for businesses in SBA's Initiative, factors that affected a small business's inclusion in the cluster posed limitations when sample statistics were compared. To the extent that small businesses participating in the Initiative differed from those in the QCEW and D&B samples with respect to characteristics other than geography and industry (and size and age), these characteristics may have been responsible for observed differences between sample statistics. As indicated above, clusters varied with respect to their inclusion criteria. Some, such as TechRich, had relatively broad inclusion criteria, while others, such as the San Diego Defense Cluster, had relatively stringent guidelines. Additionally, businesses that agreed to be part of a cluster may have been systematically different in terms of their performance indicators than those that did not.

That being said, the comparison (shown in Exhibit 67) shows that small businesses across the seven clusters experienced more annualized employment growth than did comparable firms in the QCEW sample (6.9% vs. -0.3%) and in the D&B sample (1.6%). In all but one case (TechRich), this was also true at the level of the individual cluster. And in many clusters, the employment growth rate of reporting

⁴⁹ Many of these figures were successfully imputed from available data in the same counties with a slightly higher level of industry aggregation (trimming end digits from the original 6-digit NAICS codes), or in the same state at the same level of industry detail.

⁵⁰ This latter limitation will not bias the resulting employment growth measure for the QCEW sample as long as firms in missing industrial classifications did not have systematically higher or lower employment growth than those in included industrial classifications.

⁵¹ An additional limitation in the QCEW comparison is that growth in this sample was computed between September 2011 and June 2013, a period that was 3 months shy of the period measured in the Regional Innovation Cluster Initiative sample. Because U.S. economic growth between July and September 2013 was comparable to growth in the preceding 21 months, the omission of this last quarter of data from the QCEW sample is not likely to introduce systematic bias. (*U.S. Bureau of Economic Analysis, Gross Domestic Product*, http://www.bea.gov/newsreleases/national/gdp/gdp_glance.htm, accessed March 23, 2014.)

⁵² D&B data covered a 3-year period, from December 2010 through December 2013. An annualized percentage change over this time period incorporated, but extended somewhat beyond, the September 2011 to September 2013 period represented in the Regional Innovation Cluster Initiative sample. The additional months in the D&B sample that preceded the Regional Innovation Cluster Initiative (December 2010–August 2011) represented a period of economic growth comparable to what followed and thus should not significantly bias the data comparison (*U.S. Bureau of Economic Analysis, Gross Domestic Product, op. cit.*).

cluster businesses was considerably higher than the rate measured for comparable firms in the QCEW or the D&B sample. Of course, as discussed in the Methodology Appendix, the limitations of these comparisons have to be considered when interpreting the statistics.

Exhibit 67. Comparison of annualized percent change in employment (full-time and part-time) across three samples, 2011–2013

Cluster	Annualized percent change in total employment, 2011–2013			Percentage point difference	
	Regional Innovation Cluster Initiative sample	QCEW sample	D&B sample	Regional Innovation Cluster Initiative <i>minus</i> QCEW	Regional Innovation Cluster Initiative <i>minus</i> D&B
Advanced Power Cluster	10.7%	–1.1%	1.3%	11.8%	9.4%
Geospatial Cluster	10.6%	2.0%	1.5%	8.5%	9.1%
FlexMatters	7.3%	–1.4%	1.3%	8.7%	6.0%
TechRich	–11.2%	–0.5%	1.8%	–10.6%	–13.0%*
Smart Grid	10.4%	0.9%	3.9%	9.5%	6.5%
Energy Storage Cluster	8.5%	–0.2%	0.6%	8.7%	7.9%
San Diego Defense Cluster	8.5%	–0.5%	1.4%	9.0%	7.1%
All Clusters	6.9%	–0.3%	1.6%	7.2%	5.3%

Source: RIC small business survey, QCEW data, and D&B data

Asterisks indicate levels of statistical significance based on the results of a paired two-tailed *t*-test with the null-hypothesis that the 2011 and 2013 averages are equal or that the annualized percent change in the Initiative sample is equal to that of the D&B or the QCEW sample.

(***) The difference between 2011 and 2013 averages is statistically significant at the 1% level.

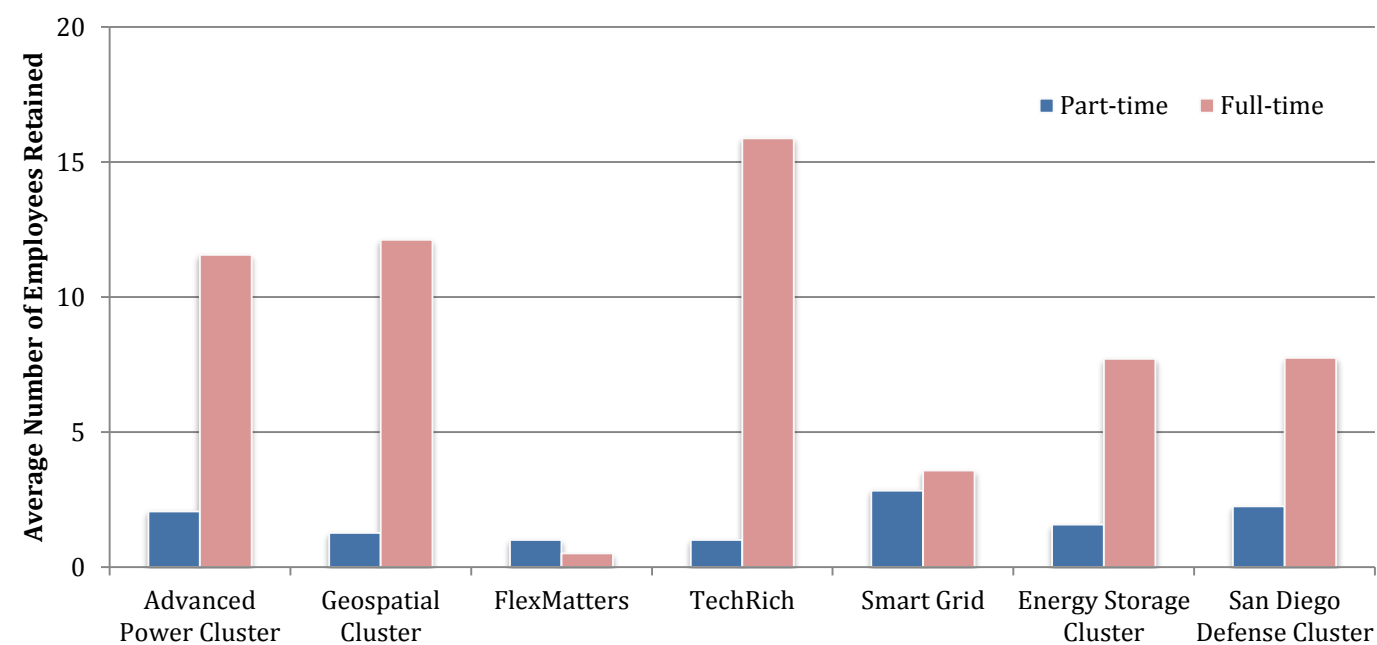
(**) The difference between 2011 and 2013 averages is statistically significant at the 5% level.

(*) The difference between 2011 and 2013 averages is statistically significant at the 10% level.

Employment Growth and Retention. The Small Businesses Survey also collected information regarding the number of employees retained during the previous 12 months and whether cluster participation influenced staff size, the change in the number of employees, or employee retention.⁵³ Cluster small businesses reported retaining an average of 9.6 full-time and 1.7 part-time employees; the average number of full-time employees retained ranged from about 1 (FlexMatters) to 16 (TechRich) across the seven clusters (see Exhibit 68). Of the 163 small businesses responding, one-third reported that cluster participation was at least slightly influential in affecting their employment changes or retention in

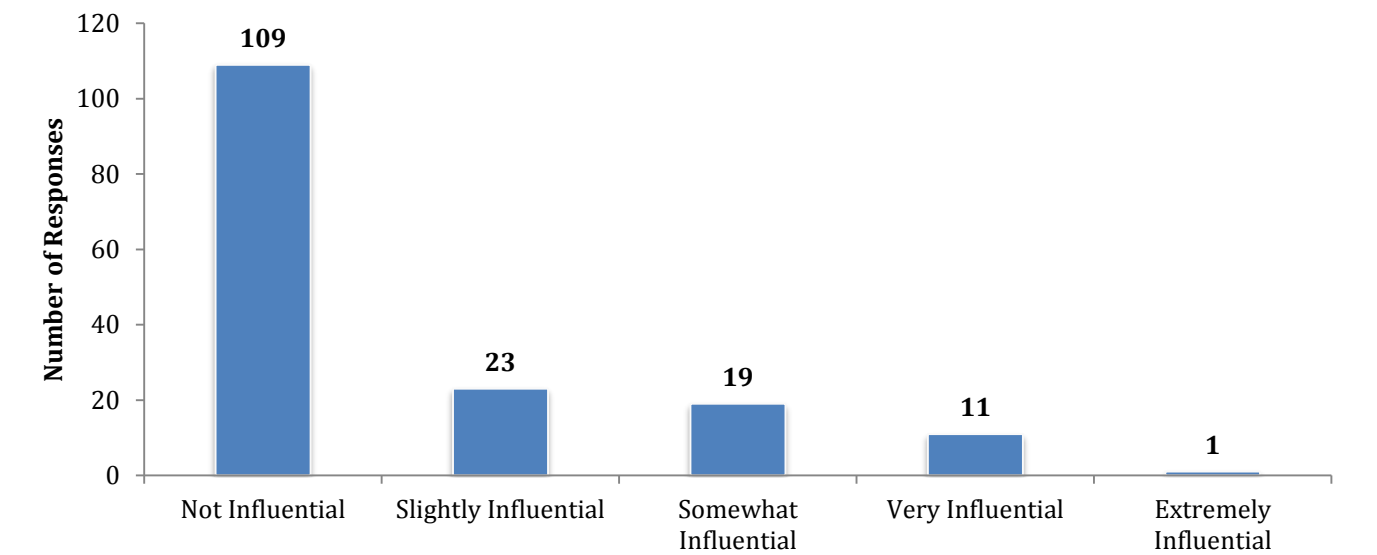
⁵³ A retained employee is a current employee whom the business initially considered laying off but then decided to keep under employment.

the previous year (see Exhibit 69). The same businesses were also queried regarding whether their cluster participation had led to increased staff size in their businesses; 22% either “agreed” or “agreed strongly” with the premise. Thus, in addition to surpassing the average growth of firms in comparable datasets, cluster activity seemed to be supportive of employment growth and retention, at least among some cluster small businesses.



Source: RIC small business survey

Exhibit 68. Average number of full- and part-time employees retained by small businesses participating in clusters



Source: RIC small business survey

Exhibit 69. Reported influence of small business cluster participation on employment change and retention

Estimated Number of Jobs Created During Third Year of the Initiative. The data discussed so far with regard to employment levels, growth, and retention relied on data collected in the small business survey. These data enable an analysis of the change in the average and median number of positions per small business along with a comparison to changes in a larger group of businesses. Yet, because the survey was not completed by all cluster small businesses, these data do not permit an accurate estimation of the total number of jobs created within the seven clusters.⁵⁴ To this end, cluster administrators reported data in their quarterly reports regarding the total number of jobs created within their cluster (see Exhibit 70).

Exhibit 70. Reported number of jobs created during the third year of the Initiative

Cluster	Number of jobs created during the third year of the Initiative
Advanced Power Cluster	Confirmed: 53, Estimated: 710 [^]
Geospatial Cluster	185
FlexMatters	78
TechRich	*
Smart Grid	*
Energy Storage Cluster	*
San Diego Defense Cluster	20
All clusters	993

Source: Cluster quarterly reports

* No data reported

[^] The Advanced Power Cluster reported an estimated number of jobs created based on the Defense Logistics Agency (DLA) technology-based economic development metric: every \$50,000 in contract awards creates one estimated job.

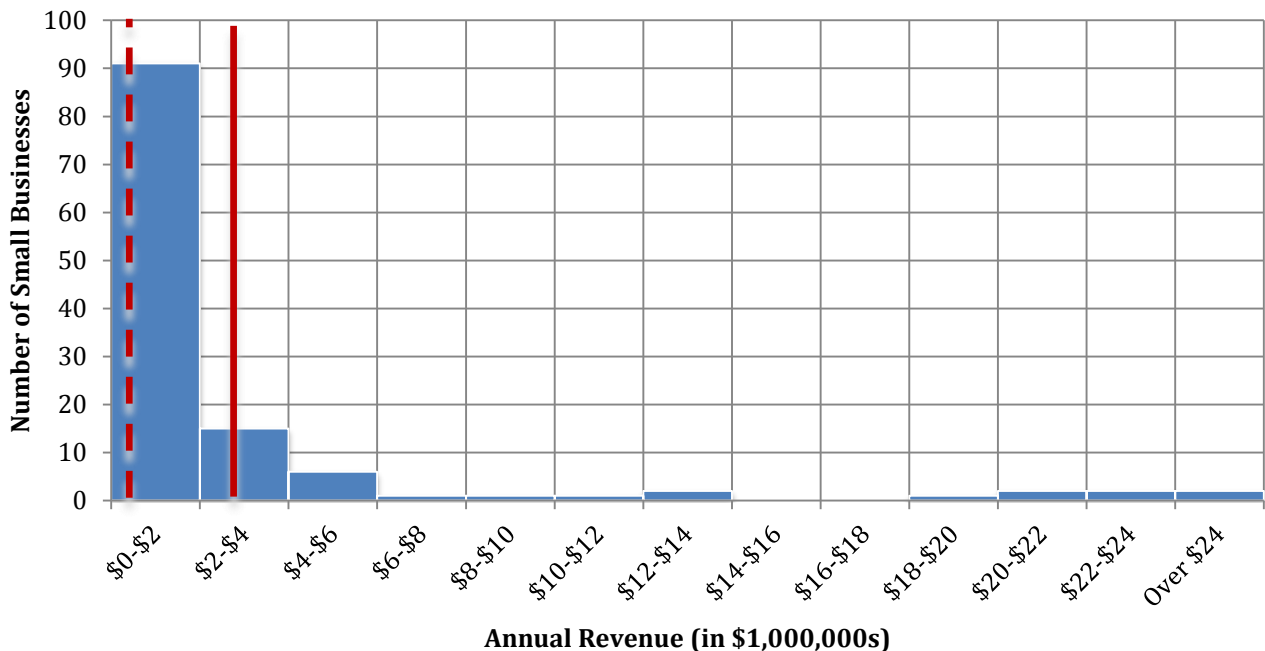
Most cluster administrators based the data reported in Exhibit 70 on information collected during their interactions with cluster small businesses. Unfortunately, significant discrepancies exist across clusters regarding how “jobs created” is defined, rendering a comparison across clusters challenging. Most cluster administrators did not specify whether the values they provided were only full-time positions or the result of combining full-time and part-time positions. Additionally, it was generally not clear whether jobs created outside the cluster’s region of focus by companies with multiple sites were included

⁵⁴ Any method used to extrapolate the total number of jobs created during the third year from survey data requires the assumption that the subset of cluster small businesses that responded to the Small Business Survey is representative of those that did not respond, an unverifiable assumption.

in reported numbers. Despite these limitations, the values provided in Exhibit 70 should be viewed as a lower-bound estimate of the actual number of jobs created, because the vast majority of cluster administrators reported job numbers from companies with which they interacted or received updates, not the full set of cluster small businesses. In addition, several clusters did not report a total number of jobs created.

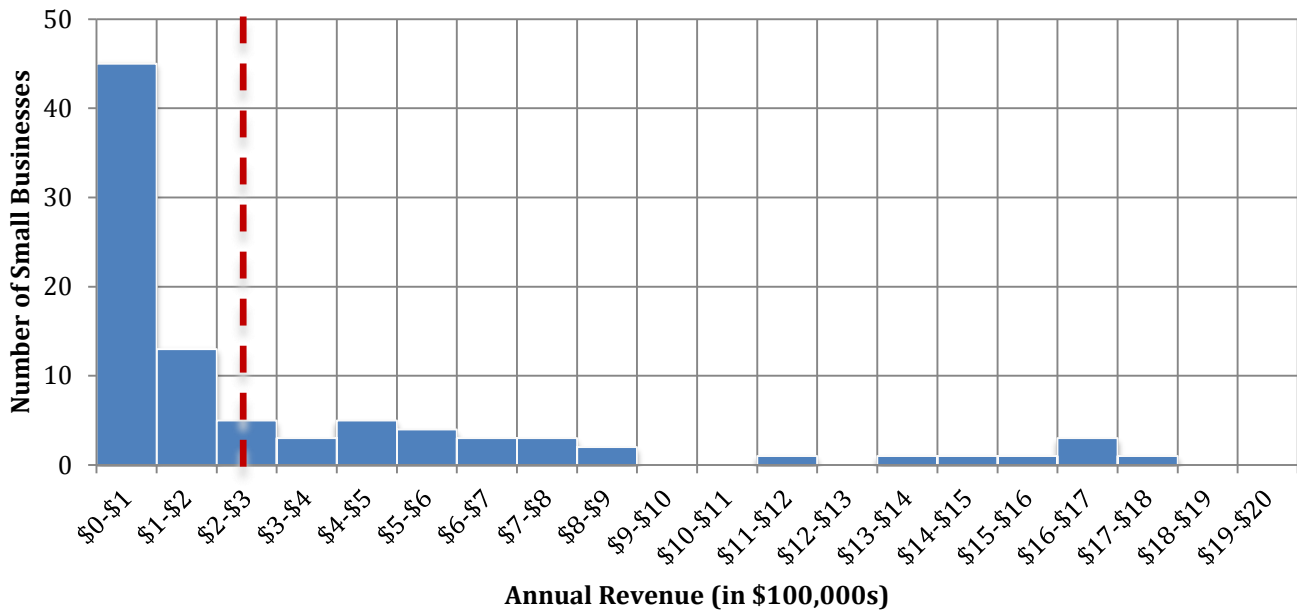
4.3.2. Small Business Revenue

A second important long-term outcome of SBA’s Initiative is business revenue growth, because robust increases in revenue are usually accompanied by increases in employment and production. In 2013, cluster small businesses reported annual revenue averaging slightly less than \$2.7 million per business, with a median value of \$250,000 (see Exhibit 71). Of 124 small businesses reporting, 19 indicated \$0 in revenue, while the very largest reported annual revenue of \$50 million. Nearly three-quarters of small businesses participating in the seven clusters had revenue of less than \$2 million per year. Variation in annual revenue among these smaller businesses is illustrated in Exhibit 72.



Source: RIC small business survey

Exhibit 71. Distribution of annual revenue of cluster small businesses for the year ending in September 2013; the dashed vertical line represents the median revenue.



Source: RIC small business survey

Exhibit 72. Distribution of annual revenue for the year, ending in September 2013, among cluster small businesses with annual revenue less than \$2 million; the dashed vertical line represents the median revenue across this subset of cluster businesses.

Annual revenue among small businesses participating in the seven clusters increased an average of 6.9% per year during the most recent 2 years of SBA’s Initiative (see Exhibit 73).⁵⁵ Increases were observed in all but three of the seven clusters (Advanced Power Cluster, FlexMatters, and TechRich). On average, small businesses in the Smart Grid, the Geospatial Cluster, San Diego Defense Cluster, and the Energy Storage Cluster reported higher than average revenue growth during this time period.

⁵⁵ This growth rate is measured only for small businesses that reported revenue for the 3 years queried in the fall 2013 survey (fiscal years 2011, 2012 and 2013).

Exhibit 73. Average and median annual revenue and percent change in revenue of cluster small businesses, 2011–2013

Cluster	Number of small businesses reporting	Average annual revenue, year ending Sept 30			Annualized percent change 2011–2013	Median annual revenue		
		Sept 2011	Sept 2012	Sept 2013		Sept 2011	Sept 2012	Sept 2013
Advanced Power Cluster	15	\$ 8,573,467	\$ 9,042,733	\$ 8,148,400	–1.6%	\$ 3,000,000	\$ 3,200,000	\$ 2,600,000
Geospatial Cluster	20	\$ 1,633,184	\$ 1,182,613	\$ 1,396,412	13.5%	\$ 450,000	\$ 641,500	\$ 712,654*
FlexMatters	3	\$ 1,930,806	\$ 1,942,204	\$ 1,812,495	–1.9%	\$ 2,596,000	\$ 2,490,000	\$ 2,568,000
TechRich	10	\$ 2,849,313	\$ 3,376,378	\$ 3,494,751	–11.7%	\$ 164,067	\$ 236,889	\$ 71,255
Smart Grid	3	\$ 944,375	\$ 790,612	\$ 976,667	38.5%	\$ 600,000	\$ 1,000,000	\$ 780,001
Energy Storage Cluster	14	\$ 4,893,888	\$ 10,438,525	\$ 5,327,526	9.1%	\$ 1,722,414	\$ 2,093,952	\$ 2,251,580
San Diego Defense Cluster	17	\$ 3,228,519	\$ 3,214,281	\$ 3,235,406	12.1%	\$ 800,000	\$ 1,030,249	\$ 1,366,630
All Clusters	82	\$ 3,924,190	\$ 4,902,898	\$ 3,939,713	6.9%	\$ 775,000	\$ 925,000	\$ 790,000

Source: RIC small business survey

Asterisks indicate levels of statistical significance based on the results of a paired two-tailed *t*-test with the null-hypothesis that the 2011 and 2013 averages are equal. In the case of medians, asterisks indicate significant differences between 2011 and 2013 data based on a paired Wilcoxon signed rank test.

(***) The difference between 2011 and 2013 averages is statistically significant at the 1% level.

(**) The difference between 2011 and 2013 averages is statistically significant at the 5% level.

(*) The difference between 2011 and 2013 averages is statistically significant at the 10% level.

The overall annualized revenue growth reported among cluster small businesses exceeded that measured in the D&B sample (3.5%) by 3.4%. Individually, revenue growth in four out of seven clusters exceeded the comparable D&B benchmark growth rate, while the remaining three clusters (the Advanced Power Cluster, FlexMatters, TechRich) fell short (see Exhibit 74).

Exhibit 74. Percentage change in revenue among small businesses participating in the seven clusters, compared to the percentage change in revenue in the D&B sample

Cluster	Annualized percent change in average firm revenue, 2011–2013		Percentage point difference (Regional Innovation Cluster Initiative <i>minus</i> D&B)
	Regional Innovation Cluster Initiative sample	D&B sample	
Advanced Power Cluster	–1.6%	3.1%	–4.7%
Geospatial Cluster	13.5%	2.4%	11.1%
FlexMatters	–1.9%	3.0%	–4.9%
TechRich	–11.7%	3.3%	–15.0%*
Smart Grid	38.5%	6.7%	31.8%
Energy Storage Cluster	9.1%	3.4%	5.7%
San Diego Defense Cluster	12.1%	3.5%	8.6%
All Clusters	6.9%	3.5%	3.4%

Source: RIC small business survey, D&B data

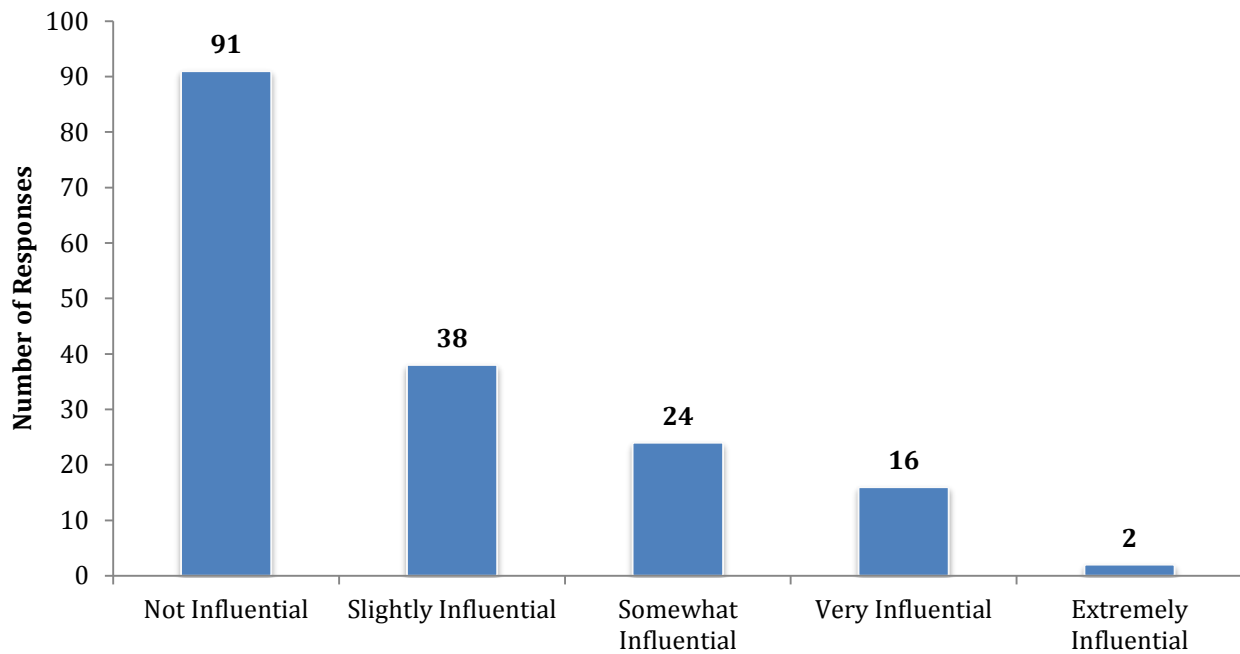
Asterisks indicate levels of statistical significance based on the results of a paired two-tailed *t*-test with the null-hypothesis that the 2011 and 2013 averages are equal or that the annualized percent change in the Initiative sample is equal to that of the D&B sample.

(***) The difference between 2011 and 2013 averages is statistically significant at the 1% level.

(**) The difference between 2011 and 2013 averages is statistically significant at the 5% level.

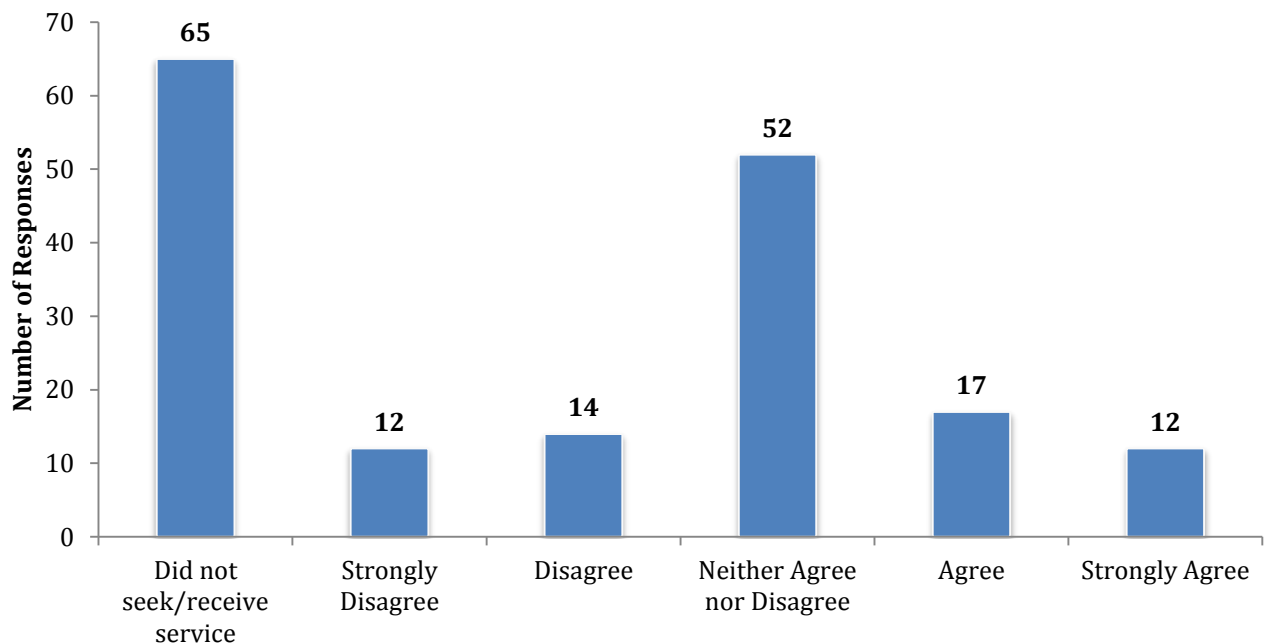
(*) The difference between 2011 and 2013 averages is statistically significant at the 10% level.

Small businesses were queried regarding the extent to which their participation in clusters influenced their revenue during the third year of the Initiative and how they perceived the impact of cluster participation on their profit margins. Among respondents, 47% reported that their participation in cluster activities and services at least slightly influenced their revenue (see Exhibit 75), and 27% reported that they “agreed” or “strongly agreed” that increased profit margins resulted from cluster participation (see Exhibit 76).



Source: RIC small business survey

Exhibit 75. Influence of cluster participation on small business revenue



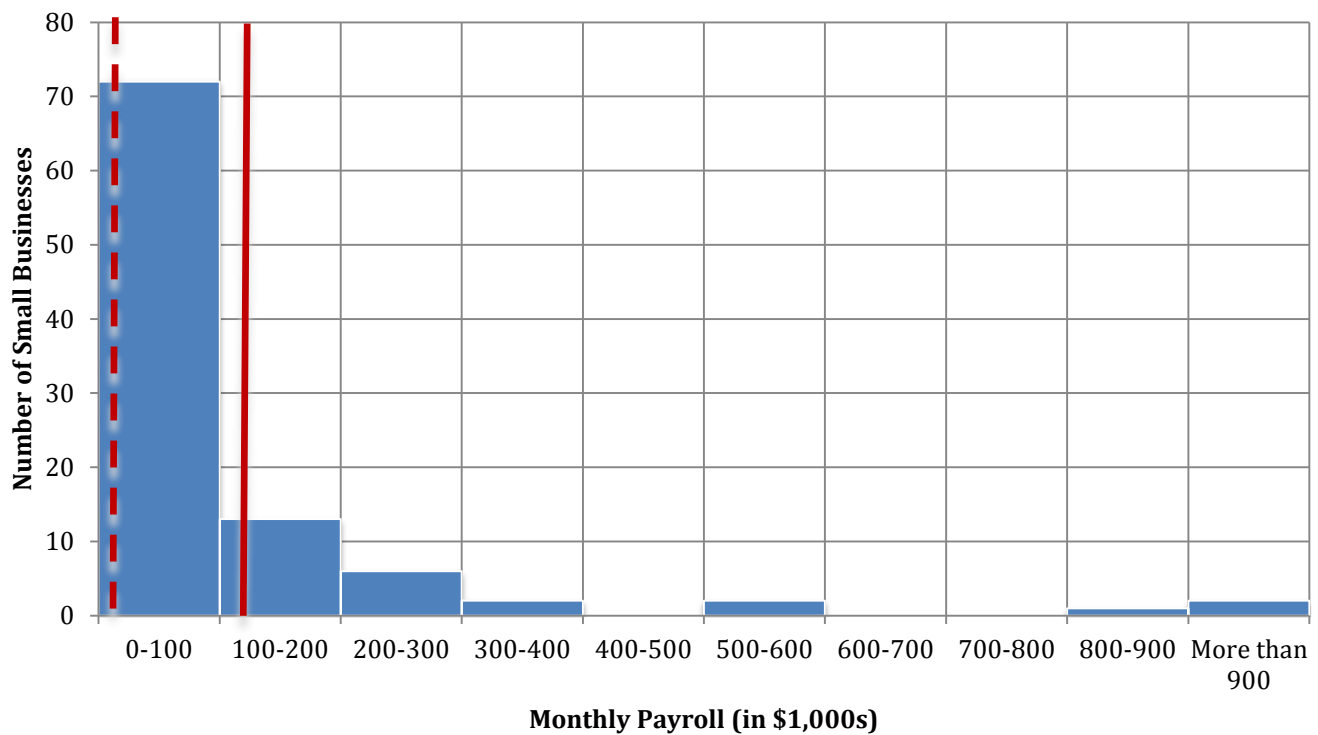
Source: RIC small business survey

Exhibit 76. Increased profit margin as a result of cluster participation

4.3.3. Small Business Payroll

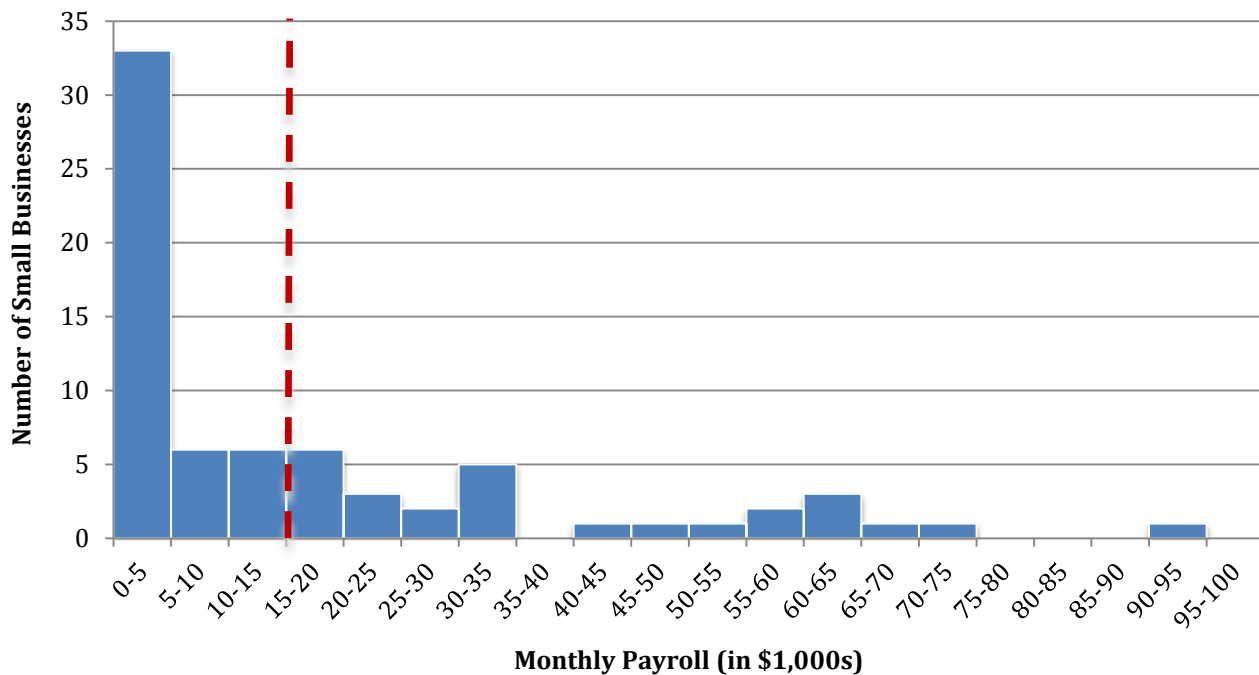
A potentially important long-term outcome of SBA's Initiative is increased small business payroll. Including fringe benefits and bonuses, total payroll represents the total compensation paid by a firm to its

employees and serves as an additional indicator of business size and production levels. One-month payroll among cluster small businesses in 2013 ranged between \$0 and \$4 million across the 98 businesses reporting, averaging \$123,197 (see Exhibit 77). The typical, or median, monthly payroll for participants was considerably less, at \$17,000. Indeed, nearly three-quarters of cluster-participating small businesses had payrolls of less than \$100,000 in 2013 (see Exhibit 78).



Source: RIC small business survey

Exhibit 77. Distribution of monthly payroll of small businesses in September 2013; the plain vertical line indicates the average payroll, while the dashed vertical line indicates the median monthly payroll.



Source: RIC small business survey

Exhibit 78. Distribution of monthly payroll in September 2013 in small businesses with monthly payroll less than \$100,000; the dashed vertical line indicates the median monthly payroll.

Average monthly payroll grew 14.1% per year during the most recent 2 years of SBA’s Initiative, while median monthly payroll increased even more, by 17.3% per year, suggesting that payroll increases were experienced by businesses across the size spectrum.⁵⁶ At the cluster level, payroll increased over this time period in five out of seven clusters (see Exhibit 79). The most rapid increase was observed in Smart Grid, where average payrolls more than doubled during the past 2 years.

⁵⁶ This growth rate is measured only for small businesses that reported revenue for the 3 years queried in the fall 2013 survey (fiscal years 2011, 2012, and 2013).

Exhibit 79. Monthly payroll of small businesses participating in the clusters, 2011–2013

Cluster	Number of small businesses reporting	Average monthly payroll			Annualized percent change 2011–2013	Median monthly payroll		
		Sept 2011	Sept 2012	Sept 2013		Sept 2011	Sept 2012	Sept 2013
Advanced Power Cluster	7	\$ 444,064	\$ 310,350	\$ 806,729	25.4%	\$ 157,000	\$ 151,000	\$ 155,000
Geospatial Cluster	19	\$ 65,398	\$ 72,208	\$ 102,205	22.7%	\$ 30,000	\$ 30,000	\$ 34,700
FlexMatters	3	\$ 81,180	\$ 85,906	\$ 79,666	–0.6%	\$ 121,439	\$ 115,467	\$ 117,776
TechRich	5	\$ 163,609	\$ 174,201	\$ 174,929	–17.2%	\$ 5,000	\$ 6,907	\$ 2,300
Smart Grid	4	\$ 20,903	\$ 32,710	\$ 46,570	31.4%	\$ 13,800	\$ 24,000	\$ 17,050
Energy Storage Cluster	12	\$ 99,117	\$ 99,236	\$ 105,404	5.2%	\$ 55,000	\$ 43,414	\$ 57,000
San Diego Defense Cluster	11	\$ 85,051	\$ 88,867	\$ 118,252	12.8%*	\$ 41,110	\$ 40,000	\$ 60,000
All Clusters	61	\$ 124,937	\$ 114,301	\$ 187,779	14.1%	\$ 40,000	\$ 40,000	\$ 55,000**

Source: RIC small business survey

Asterisks indicate levels of statistical significance based on the results of a paired two-tailed *t*-test with the null-hypothesis that the 2011 and 2013 averages are equal. In the case of sample medians, asterisks indicate significant differences between 2011 and 2013 data based on a paired Wilcoxon signed rank test.

(***) The difference between 2011 and 2013 averages is statistically significant at the 1% level.

(**) The difference between 2011 and 2013 averages is statistically significant at the 5% level.

(*) The difference between 2011 and 2013 averages is statistically significant at the 10% level.

The State Personal Income Accounts' quarterly data on total compensation of employees by industry from the Bureau of Economic Analysis (BEA) were used as a benchmark for the cluster payroll growth reported here. The BEA data are aggregate statistics computed at the state level and collected on all businesses, small and large (as compared to firm-level statistics on small businesses only in the Regional Innovation Cluster Initiative sample). The selection issues discussed previously also apply in this case. Differences other than industry and geographic scope may account for the differences observed between cluster and BEA data.

Exhibit 80. Percentage change in payroll among the small businesses participating in the clusters compared to the percentage change in payroll computed using the BEA State Personal Income Accounts

Cluster	Annualized percent change, 2011–2013		Percentage point difference (Regional Innovation Cluster Initiative <i>minus</i> BEA)
	Regional Innovation Cluster Initiative sample	BEA regional sample	
Advanced Power Cluster	25.4%	3.5%	21.9%
Geospatial Cluster	22.7%	2.9%	19.7%
FlexMatters	–0.6%	2.4%	–3.1%
TechRich	–17.2%	2.2%	–19.4%
Smart Grid	31.4%	3.2%	28.2%
Energy Storage Cluster	5.2%	3.4%	1.8%
San Diego Defense Cluster	12.8%	4.7%	8.1%
All Clusters	14.1%	3.2%	10.9%

Source: RIC small business survey

^a Statistical significance of the differences presented in this column could not be determined due to insufficient information.

Asterisks indicate levels of statistical significance based on the results of a paired two-tailed *t*-test with the null-hypothesis that the 2011 and 2013 averages are equal or that the annualized percent change in the Initiative sample is equal to that of the BEA sample.

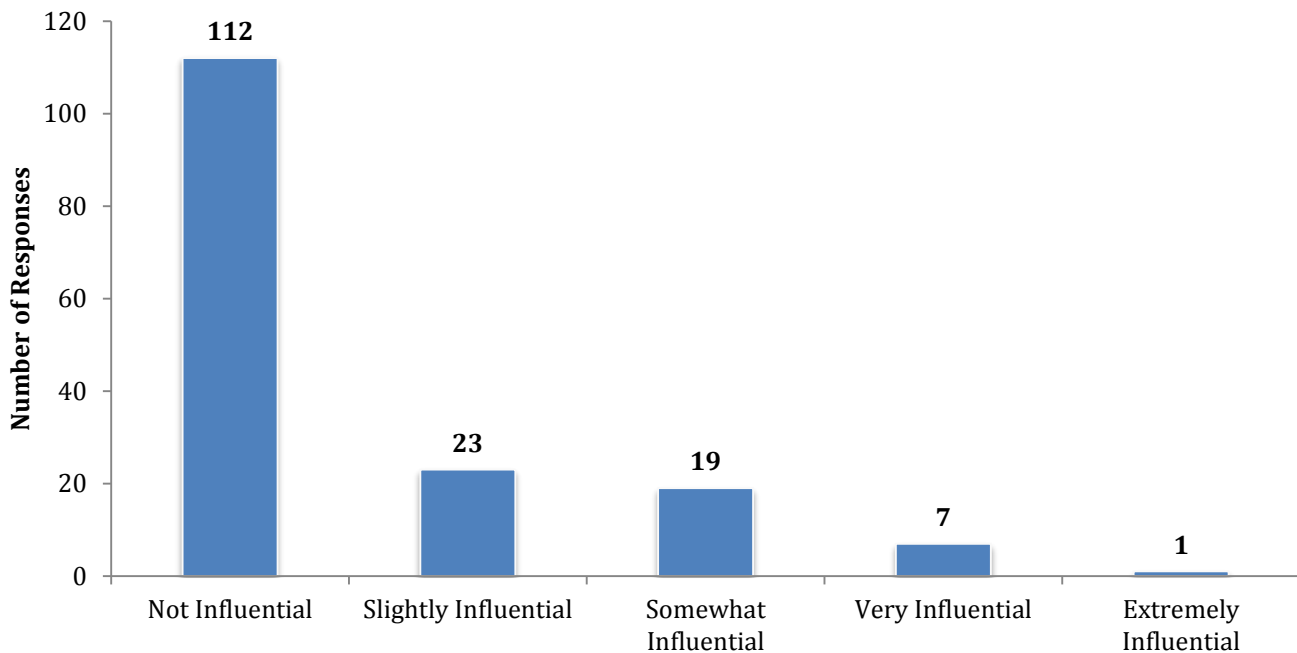
(***) The difference between 2011 and 2013 averages is statistically significant at the 1% level.

(**) The difference between 2011 and 2013 averages is statistically significant at the 5% level.

(*) The difference between 2011 and 2013 averages is statistically significant at the 10% level.

Average payroll growth in five out of seven clusters exceeded the BEA regional benchmarks for this time period (see Exhibit 80).⁵⁷ Businesses in FlexMatters reported a slight decline in average payroll (dropping 0.6% per year). TechRich businesses reported more significant decreases (averaging a drop of 17% per year). Regional benchmarks for both these clusters showed close to average rates of growth. Nevertheless, the growth rate in payroll across all clusters (14.1%) came in well above the overall regional benchmark (3.2%).

Cluster small businesses were queried regarding the extent to which their cluster participation influenced their payroll growth during the third year of SBA's Initiative. Among these businesses, 31% indicated that cluster participation had at least slightly influenced payrolls over the past 12 months (see Exhibit 81).



Source: RIC small business survey

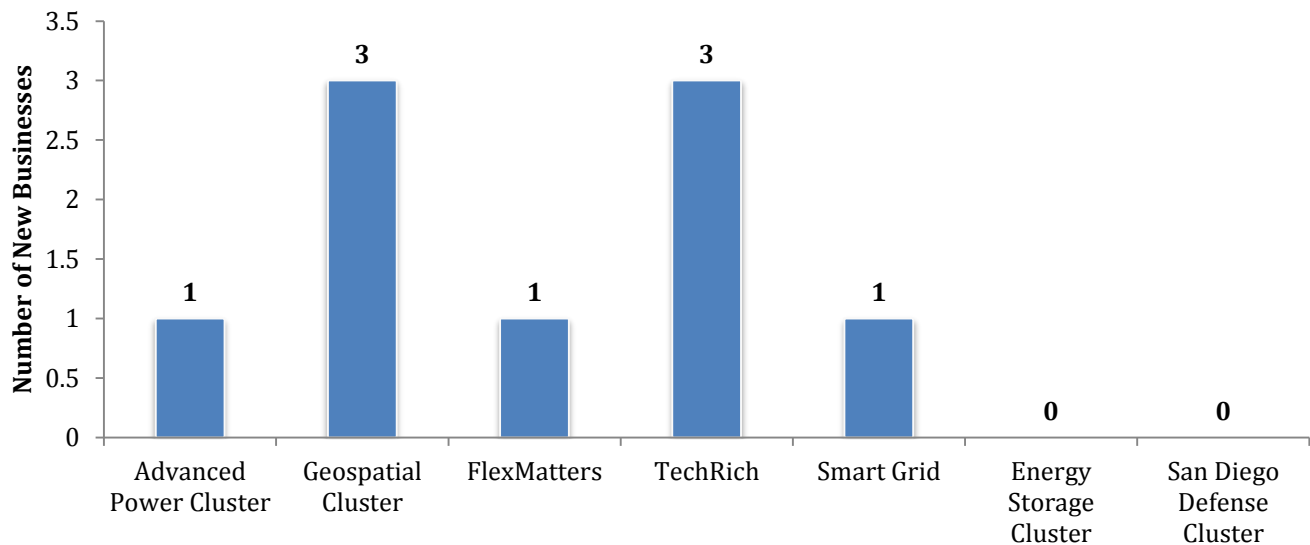
Exhibit 81. Reported influence of small business cluster participation on payroll during the third year of SBA's Initiative

4.3.4. Creation of New Businesses Within the Clusters

The small business survey also collected information on whether businesses were established before or after they started participating in the clusters. Of the 180 businesses that responded, 9 reported

⁵⁷ For clusters that span multiple states, a weighted average across the states was computed based on the number of small businesses that the clusters had in each state.

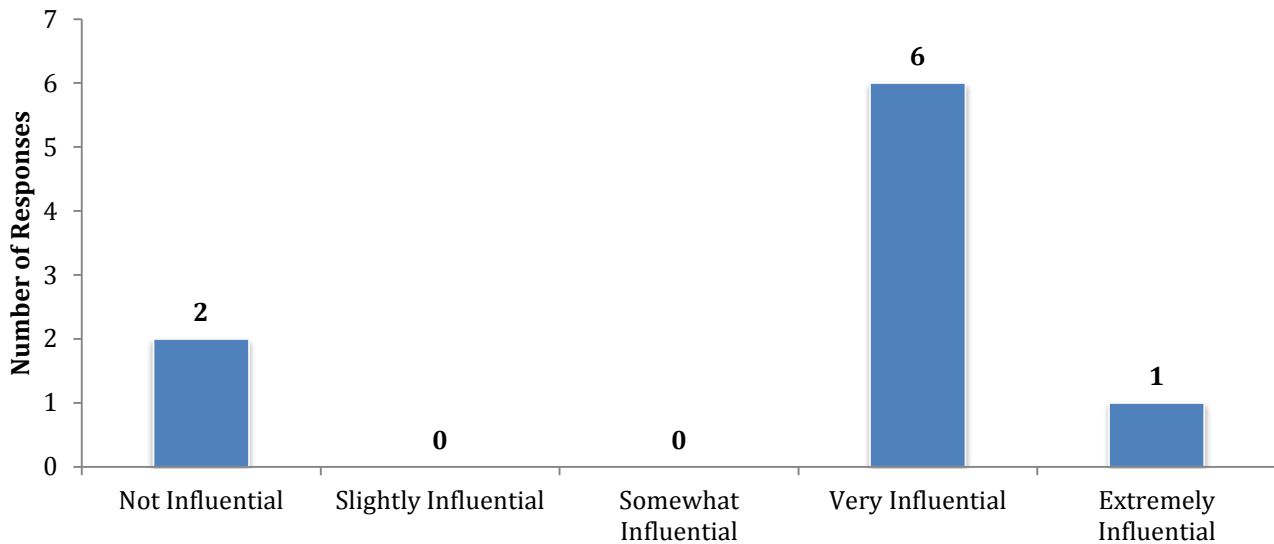
that they were established after their founders became involved with their clusters.⁵⁸ All but two reported a date of establishment within Year 3, and these two were not survey respondents in past years and were therefore not counted in past reports. The distribution of these businesses across clusters is shown in Exhibit 82. Three of these businesses were affiliated with the Geospatial Cluster, and three with TechRich. The Advanced Power Cluster, FlexMatters, and Smart Grid each had one new business established during the first 3 years of the Initiative. Seven of these businesses indicated that their cluster participation was at least “slightly influential” in their being founded (see Exhibit 83). Year 3 data increased the total number of new businesses started after their founders first participated in the clusters to 27 since the start of SBA’s Initiative.



Source: RIC small business survey

Exhibit 82. Number of new businesses that were established after their founders’ first cluster participation

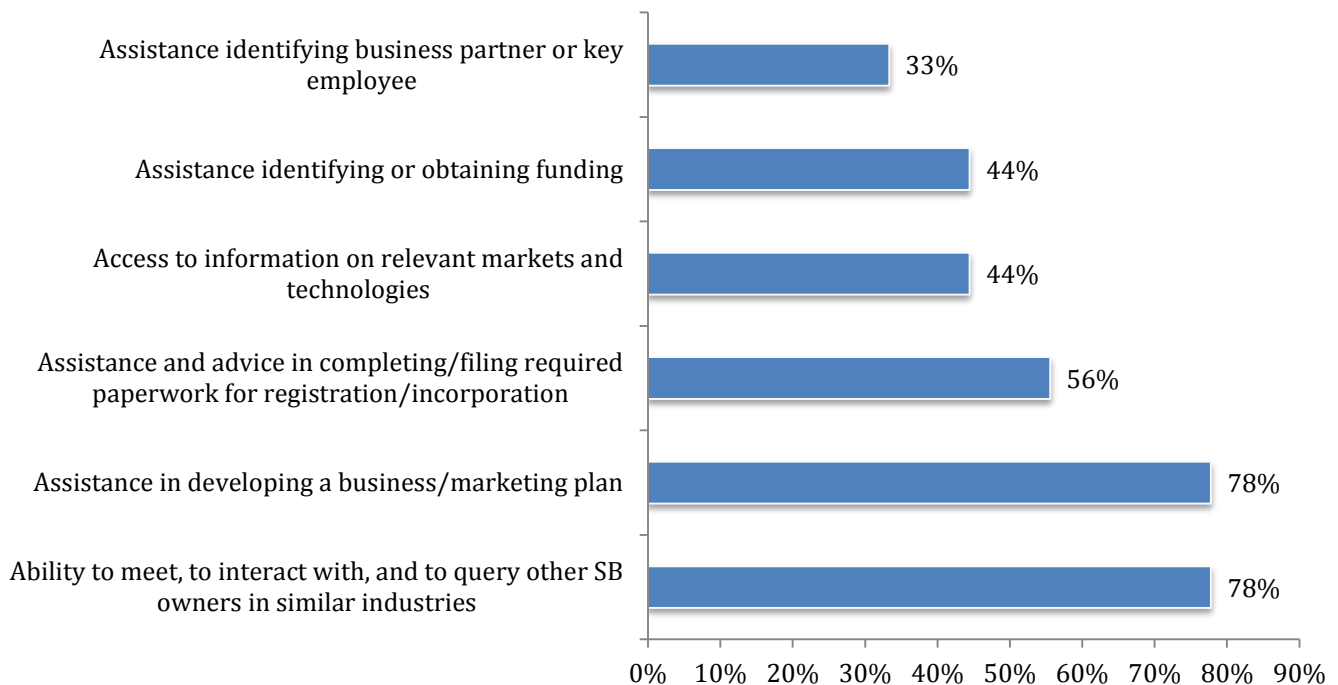
⁵⁸ 14 small businesses reported that they were established after their founders became involved with their clusters. However, upon review of their establishment date and information on their website, 5 were excluded because their establishment date was prior to September 2010.



Source: RIC small business survey

Exhibit 83. Reported influence of cluster participation on starting a business

When the same businesses' founders were asked which aspects of cluster participation were instrumental in the formation of their businesses, they were most likely to point to the ability to meet and interact with other small business owners and to receive assistance in developing a business or marketing plan (both at 78%; see Exhibit 84). Other aspects of cluster participation were important as well, such as receiving advice with regard to filing required paperwork for registration/incorporation (56%).



Source: RIC small business survey

Exhibit 84. Aspects of cluster participation influential in starting a business

5. Lessons Learned in Cluster Operations

During the 3 years of SBA's Initiative, the clusters reported a significant number of "lessons learned." These lessons varied across clusters due to the different challenges each faced, their individual expectations, and the use of resources reported by the cluster management teams. The different challenges that led to these lessons learned can in turn be partially attributed to the different developmental stages of the clusters and the idiosyncrasies of the different industries in which they operate.

A compilation of the lessons learned is presented below. The sources for this compilation were the clusters' quarterly reports and the quarterly interviews and annual in-depth interviews of cluster administration teams. Some of the lessons learned were identified by cluster administration teams as they faced challenges related to administrative or service-delivery activities. Others resulted from the cluster management's observation of gaps between the needs of small businesses and the resources available to them.

5.1. Cluster Promotion and Recruitment in the Region

The lessons learned in Subsection 5.1 cover the following concepts related to cluster promotion and recruitment:

1. Effective promotion and marketing to create a cluster identity, both internal and external, takes dedicated effort.
2. Do not undervalue the importance of a clear, concise, and compelling value proposition.
3. Membership fees and event fees affect participation and commitment levels.
4. Know your industry's value chain and supply chain to strengthen cluster development and recruiting.

Each of these four topics is explained in detail with examples below.

1. Effective promotion and marketing to create a cluster identity, both internal and external, takes dedicated effort.

Several clusters in SBA's Initiative reported difficulties with their initial cluster marketing and branding and with the more sustained process of creating a cluster identity, both internal and external. These two related concepts influence how effectively clusters can recruit new participants, and cluster identity is especially relevant to sustaining engagement with current participants. Marketing and branding appear to be of particular importance early on but are also important elements upon which clusters build their identity, which remains relevant throughout their life spans. A cluster's identity can be viewed as a

combination of its brand, reputation, credibility, and, to some degree, its value proposition. Such an identity can be challenging to develop for several reasons:

- Primary and secondary service providers exist independently of the clusters and may have operated for a significantly longer period of time than the clusters themselves.
- Cluster participants may interact with primary or secondary service providers on a significantly more frequent basis than with the cluster administration team, depending on the cluster structure and participants' needs.
- Clusters are part of the greater innovation and business support ecosystem but are very focused from a geography and industry standpoint, making them relevant for a relatively small subset of all businesses and organizations.

Difficulties encountered by the clusters tend to revolve around allocating limited resources toward these activities to the detriment of their bandwidth for services and other cluster operations. To mitigate this situation, the clusters in SBA's Initiative have utilized several strategies:

- **Creative promotion methods with minimal costs.** Clusters identified and implemented methods to promote themselves with minimal costs, including the following:
 - Informal cross-promotion agreements with other organizations in the innovation and business support ecosystem in their region or industry of focus, or provision of services to these organizations in exchange for promotion—in both cases, these arrangements were mutually beneficial, generating good will and reinforcing networks
 - Effective use of social media to promote the cluster and the accomplishments of participants (e.g., the Geospatial Cluster) and the creation of websites that incorporated useful tools, such as databases of service providers in the region (e.g., the Energy Storage Cluster and FlexMatters)
- **Presence at industry events.** Clusters attended or organized a variety of industry events to raise their profile both regionally and globally. For example, the Energy Storage Cluster traveled to the Hanover Messe in Germany annually, and Smart Grid organized the annual Great Lakes Symposium, where policymakers, power companies, and various nonprofit groups discuss key topics in smart-grid innovation.
- **Cluster-centric networking events.** Most clusters in SBA's Initiative held networking events that also served to build up awareness of the cluster as an entity among participants who might not be aware that the services they received were coordinated by the cluster. These events also allowed

the cluster to discuss upcoming workshops and opportunities and to receive some feedback from participants.

It is worth noting that devising a cluster identity can be more difficult for clusters with complex structures, even after several years of operations. The Energy Storage Cluster encountered such difficulties due to its organizational form, which brought together state-based organizations under a larger umbrella while ensuring that these organizations retained a large degree of independence. The cluster's identity has strengthened somewhat over time, and the inclusion of these state-based organizations into a formalized governance structure in Year 3 is an encouraging sign that greater integration will bring an even stronger cluster identity.

2. Do not undervalue the importance of a clear, concise, and compelling value proposition.

Several clusters underscored the importance of devising a clear, concise, and compelling value proposition for small businesses, another important factor in cluster recruitment and participant retention. A cluster's value proposition can be defined as a short, easily understood statement that outlines the benefits tied to cluster participation, why the cluster is uniquely qualified and capable to deliver them, and to whom. Clusters in SBA's Initiative made adjustments to their value propositions over time, sometimes to resolve issues with the current versions, and other times to reflect the evolution of the cluster itself. For example, the San Diego Defense Cluster adjusted its value proposition in the first year of SBA's Initiative after being disappointed by the low number of applicants. The adjustments better identified the benefits of participation and the cluster's technology focus areas and incorporated a new, broader area of focus: Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR). In combination with an open and streamlined application process and reliance on an expanded number of channels for recruitment, this resulted in a greater number of relevant applicants spanning a larger cross-section of technology-focused small businesses in the San Diego area. The Advanced Power Cluster made adjustments to its value proposition after encountering some initial reticence on the part of small businesses it approached to get involved in the cluster. A significant proportion had dealt with middlemen in defense procurement but did not get the expected value from their services. The updated value proposition of the cluster emphasized its track record in terms of business assistance and results, and the unique aspects of cluster assistance offered by the Advanced Energy Cluster.

3. Membership fees and event fees affect participation and commitment levels.

The vast majority of the clusters reported making use of event-specific fees in a variety of ways, such as providing event participants with food or drinks (because SBA funds cannot be used toward this

end) or defraying the costs of high-profile events, such as the Great Lakes Symposium organized by Smart Grid. However, these fees were used sparingly and sometimes in creative ways. For example, TechRich, Smart Grid, and the Geospatial Cluster reported making use of regional catering companies and microbreweries to provide food and drinks at their events, an opportunity for these companies to gain exposure among business clients. In many cases, these companies donated food, but at other times the cluster charged a small fee. On the other hand, nearly all clusters defrayed all or a portion of participation fees their small businesses paid to attend certain large events or specialized workshops held outside the cluster or by cluster partner organizations. This financial assistance encouraged them to attend and present or showcase their capabilities; several clusters even sponsored the attendance of their small businesses at external events that represented important opportunities for them. Finally, the Energy Storage Cluster and the San Diego Defense Cluster reported that requiring a small registration or participation fee to defray the costs of food or guest speakers was beneficial; according to the Energy Storage Cluster, when an event is marketed as “free,” potential participants may not see it as valuable. In some cases, the cluster promoted its free events by saying they were, for example, “a \$100 value, sponsored by the SBA and DoE” to counteract this perception. The San Diego Defense Cluster recognized a somewhat different phenomenon: charging a small registration fee for workshops did not reduce the number of participants compared with similar workshops held in the past, but it did decrease the number of individuals who registered but did not actually attend by 35 percentage points.

Unlike event fees, views about the role and impact of membership fees in outreach, recruitment, and sustaining commitment differed quite significantly among the clusters in SBA’s Initiative. FlexMatters cautioned that charging membership fees could create the perception that the cluster was not being an honest broker and was only offering assistance for money. Other clusters similarly expressed caution about and limited interest in collecting membership fees, only reporting they may consider them as an option for sustainability should SBA funding end. However, two clusters that participated in SBA’s Initiative during the first and second year—the Carolinas’ Nuclear Cluster and the Upper Michigan Green Aviation Cluster—implemented membership fees. The former implemented these fees prior to its involvement in the Initiative and continued to do so after participating, reporting that a small membership fee acted as a type of screening process because it required small businesses to commit funds that would be wasted if the businesses were not proactive or seriously willing to become engaged in the cluster. The latter devised and implemented a membership-fee structure based on the type of organization seeking membership, knowing that it would not receive SBA funding in the third year. However, this transition was not always perceived positively, with one of the cluster’s large businesses reporting that the value

proposition of the cluster was not strong enough, while a small business and a university believed they could not afford the fee.

4. Know your industry's value chain and supply chain to strengthen cluster development and recruiting.

Understanding the value chain and supply chain of the cluster's industry of focus is important in recruiting high-impact participants, particularly large organizations and service providers. All clusters reported conducting targeted outreach and recruitment to fill capacity and diversity gaps, but few provided a narrative as detailed as that of FlexMatters. The cluster conducted an assessment of the flexible electronics value chain and identified two specific types of capabilities that would greatly strengthen the cluster and its participants: (1) providing prototyping services that many cluster members were seeking, and (2) assisting flexible electronics companies with getting their products to market. To fill these gaps, the cluster utilized a two-pronged approach. First, the cluster actively targeted the top of the value chain, recruiting Electronics Manufacturing Services (EMS) companies and design houses outside its geographic scope. EMS companies used to be focused on placing electronic components on circuit boards for Original Equipment Manufacturers (OEMs) but now provide value-added services, including design, prototyping, testing, and custom production, whereas design houses specialize in inventing new products, devising a market strategy for them, and developing the design, engineering, structural packaging, and prototyping before handling production aspects, such as quality control and global sourcing. In addition, FlexMatters categorized, documented, and leveraged the prototyping resources available at these design houses and EMS companies to fulfill its members' needs for certain types of prototyping services that could not be met via the sharing of regional and intracluster facilities, machinery, and expertise. Second, FlexMatters assisted regional businesses with expanding their portfolio of capabilities to help them capture a greater portion of the value chain, which mitigated the capability gaps identified. The cluster also researched ways to subsidize these prototyping services or use such strategies as group orders to reduce costs.

5.2. Small Business Funding and Sales

The lessons learned in Subsection 5.2 cover the following topics related to small business funding and sales:

1. Promote a broad range of funding options to small businesses participating in your cluster.
2. Understand the importance of proof-of-concept funding and third-party technology validation capabilities in enabling small businesses to grow.
3. Go beyond disseminating information about opportunities by actively marketing them.

4. Recognize the difficulty for small businesses to respond in a timely manner to DoD and government procurement requests.
5. Sustain the interest and motivation of small businesses for the SBIR/STTR award process.

Each of the five topics is explained in detail with examples below.

1. Promote a broad range of funding options to small businesses participating in your cluster.

Clusters have to be mindful and aware that, although small businesses are frequently seeking funding to support their growth and the commercialization process, they have diverse preferences about the terms and conditions attached to this funding. For example, FlexMatters implemented workshops on venture and angel capital after identifying its members' high demand for funding opportunities. Through organizing these workshops, FlexMatters found that many small businesses were hesitant to consider venture and angel capital because they worried it could result in loss of control over their companies through dilution of equity. As a result, the cluster worked to inform businesses of the advantages venture and angel capital offered, such as expert business guidance and expanded connections to ensure small businesses could make a more informed choice. The cluster also incorporated other sources of funding in its workshops, including a regional bank to provide loan opportunities and to discuss small business loans available from SBA. Other clusters have similarly developed capacity across the range of funding options available to small businesses in their industry. Combined with knowledge of each small business' needs, they can provide targeted introductions and tailored assistance to secure funding that is best-suited to a given small business.

2. Understand the importance of proof-of-concept funding and third-party technology validation capabilities in enabling small businesses to grow.

Smart Grid reported that the lack of proof-of-concept funds available to small businesses involved in the smart-grid industry has prevented most of them from obtaining subsequent private capital, especially venture or angel funds. The cluster worked actively to resolve the funding gap through a cluster partner, Clean Energy Trust. This issue has become somewhat less significant during Year 3 of SBA's Initiative due to the Energy Infrastructure Modernization Act passed by Illinois, which allocates \$22.5 million in funding to support high-technology energy businesses in the state. Similarly, FlexMatters placed greater emphasis on services in support of functional prototyping, a more comprehensive and advanced form of proof-of-concept, as a way to attract investors, partners, and customers. These services

included a searchable database of regional organizations that can assist in the development of functional prototypes.

Third-party technology validation—the process of testing technology in realistic operating conditions and comparing its performance with technical targets expected or known to be required for commercialization—is a step subsequent to the development of a proof-of-concept and functional prototype in the technology commercialization process. Several clusters cited this step as having crucial importance for small businesses commercializing new technology. Chip Laingen of the Advanced Power Cluster identified third-party technology validation as one of the services frequently requested by his cluster’s participants; in fact, it is a requirement to become a candidate for DoD procurement. The Advanced Power Cluster already provided technology validation and testing services through some of its partner organizations. Smart Grid may have implemented the most complete approach to assisting small businesses with technology validation. Based on an understanding that smart-grid technology needs to be proven on systems progressively closer to a large-scale electrical grid to gain interest from utilities and other customers, Smart Grid provided its small businesses with access to as many as four different test beds offering different scales, specializations, and degrees of similarity to the actual grid system on which devices and applications in development will be operating. They ranged from a microgrid covering the Illinois Institute of Technology’s main campus to a test bed focused on cybersecurity on the electric grid, to a large-scale test bed composed of portions of nine municipalities in the Chicago area that maintains characteristics similar to the entire Commonwealth Edison grid with respect to its composition of residential, commercial, and industrial customers.

3. Go beyond disseminating information about opportunities by actively marketing them.

At least two clusters recognized that simply disseminating information about contract and award opportunities to cluster small businesses via traditional means, such as newsletters and the clusters’ websites (termed “passive marketing”), did not yield the expected level of engagement. Despite posting searchable opportunities on its website, FlexMatters found that many small businesses did not have the time to look through them and identify the most relevant entries. As a result, FlexMatters hired flexible electronics consultants to work directly with small businesses to help them select applicable opportunities and to offer one-on-one assistance to identify federal grants (e.g., SBIR). This choice, combined with the supply-chain mapping and such programs as the ACE Academy that trains small businesses to identify and engage regional anchor customers, was validated during the second and third years of SBA’s Initiative, when more small businesses successfully engaged large companies and made progress toward commercialization. The Advanced Power Cluster diagnosed a similar problem during the second year of

the Initiative: passive marketing of DoD collaboration opportunities and SBIR/STTR grant solicitations were met with limited success. As a result, the cluster elected to shift its focus to active marketing (i.e., directly pitching specifically relevant opportunities by the cluster and its partners to some or one of its small businesses). The cluster noted that this strategy was effective only when a cluster and its partners knew members' capabilities and when small businesses trusted the cluster.

4. Recognize the difficulty for small businesses to respond in a timely manner to DoD and government procurement requests.

TechRich indicated that one of the challenges facing small businesses focused on defense is the difficulty of responding to DoD or government procurement requirements in a timely fashion. According to this cluster, the problem stems from two sources. First, small businesses may have difficulty understanding the needs and specifications stated in various requests for procurement by government agencies. Second, in many instances, small businesses have developed technologies with characteristics that are similar to but not exactly matching the specifications demanded in the procurement request, which causes hesitation among small businesses about moving forward with an application. TechRich believes that government procurement officers should appraise such businesses on the basis of the capabilities that would enable them to develop a near-match product. The cluster worked to mitigate these challenges, according to Markeeva Morgan, the cluster administrator during the first year of the Initiative, who advises DoD agency personnel to “engage that company and explain to them what you actually need, so that they can employ the same capabilities to develop widget B that you actually need. And we’re starting to have those conversations with federal government persons that, hey, these guys don’t know what you want; if you vector them in the right direction, they probably can give it to you.” Despite the fact that other defense-focused clusters have not directly raised this issue, their pattern and volume of services geared toward addressing government procurement suggest that this is an area where small businesses need particular attention, and even more so when partnerships and teaming are involved.

5. Sustain the interest and motivation of small businesses for the SBIR/STTR award process.

Several clusters, including TechRich, Smart Grid, and the Advanced Power Cluster, have reported that their small businesses expressed discouragement or a limited sustained interest in a more specific area of government procurement: SBIR/STTR solicitations. One common issue identified by these clusters and others was the cumbersome application process, especially challenging for first-time applicants, as well as new compliance and reporting requirements tied to recently mandated fraud, waste, and abuse scrutiny (e.g., strengthened time-keeping, documenting, and accounting requirements). These issues, combined

with an overall lack of familiarity and realistic expectations, can quickly discourage even qualified and motivated small businesses. Consequently, the clusters implemented a variety of workshops, presentations, and webinars to outline the application process and performance expectations as well as to explain the implication of added scrutiny at both the application and performance stages. Clusters also encouraged small businesses to obtain one-on-one counseling on these topics, because many companies were more comfortable discussing performance and compliance challenges in a more private environment. These efforts allowed the clusters to adjust the expectations and increase the motivation of small businesses toward this important source of R&D funding specifically set aside for them. TechRich also noted that these efforts were particularly important in cases where several small businesses were partnering to submit a response, because this scenario implied added complexity and pitfalls for applicants.

5.3. Cluster Development

The lessons learned in Subsection 5.3 cover the following topics related to cluster development:

1. Ensure the initial buy-in and, subsequently, the sustained participation of various cluster stakeholders.
2. Act as an impartial broker and foster effective and sustained communication among cluster participants.
3. Utilize data systems to store and process data related to cluster services and participants.

Each of the three topics is explained in detail with examples below.

1. Ensure the initial buy-in and, subsequently, the sustained participation of various cluster stakeholders.

A major concern of clusters is ensuring the buy-in and sustained participation of various stakeholders. Causes for limited buy-in and sustained participation identified by clusters included a perceived lack of ability by cluster participants to suggest and drive cluster development, a disconnect between the way clusters operated and the corporate and industry culture of their participants, and the organization of events that were not aligned with what participants could realistically support. To address a perceived lack of influence over cluster development, nearly all clusters developed governance structures that included a significant number of small businesses, thus providing this class of participants with a forum to discuss their concerns and make constructive suggestions on the cluster development strategy and improvements to cluster services. In addition, most clusters completed regular strategic planning via their governance structure, nearly always via a participatory process that included

representatives of each cluster stakeholder class. The result of these efforts ranged from the formulation of a relatively simple set of guiding ideas that were implemented by the administration team to highly detailed roadmaps, such as those developed and regularly updated by FlexMatters and the Energy Storage Cluster. These roadmaps qualitatively and quantitatively assessed the relevant trends in the industry and region of focus, the position of the cluster given these environmental shifts, and the most suitable development strategy in coming years. The issue of sensitivity to the corporate and industry culture of participants has not emerged among the seven clusters, likely because each cluster is led by a team of individuals with deep knowledge of their region and industry of focus and who share the corporate and cultural mores of their participants. However, it was mentioned as an important element to take into account by new clusters and less-experienced administration teams. The issue of organizing events that were difficult for participants to attend was reported by the Geospatial Cluster and TechRich in the first year of the Initiative. In particular, both clusters quickly realized that attending full-day events was not realistic for most small businesses. Clusters in SBA's Initiative also reported that they identified two features that appeared to be effective in ensuring the buy-in and sustained participation of various stakeholders—the unwavering neutrality of cluster teams and service providers, and the fostering of effective communication between the cluster team and cluster participants and among cluster participants themselves.

2. Act as an impartial broker and foster effective and sustained communication among cluster participants.

In addition, several clusters, including TechRich and the Energy Storage Cluster, raised the importance of building trust among cluster participants through unwavering neutrality in interactions and the provision of counseling to cluster participants and through demonstrated expertise in the cluster's industry of focus. This highlights the importance for clusters to be honest and unbiased brokers in facts and in perception and to minimize and disarm potential conflicts among participants. Even more frequently reported was the need to foster effective communication between the cluster and its participants and among the participants themselves. Effective communication between the cluster team and its participants was broken down into two equally important components: (1) the cluster team listening to the participants and remaining readily accessible to them, and (2) the cluster team staying in touch with cluster stakeholders and small businesses through regular communication that clearly provided value for the participants. This communication allowed the clusters to know each one of them, including their strengths, weaknesses, and goals, which greatly enhanced the capabilities of clusters to make effective referrals, teaming connections, and provision of tailored assistance. For example, the Geospatial

Cluster started holding monthly networking receptions and making bi-monthly calls to get updates on its participants' progress and feedback on cluster services and to offer tailored suggestions for events and business opportunities. Fostering effective communication among participants is beneficial to the exchange of tacit knowledge among them while also reducing the need for the cluster team to intervene or expand resources. This tacit knowledge includes the needs and capabilities of other participants, where others fit in the supply and value chain of the regional industry, and the challenges that these participants face and how they have overcome them. Armed with this knowledge, participants are more likely to find teaming partners for opportunities and to resolve issues with less cluster assistance, which is expected to increase the sustainability of the cluster.

3. Utilize data systems to store and process data related to cluster services and participants.

Over time, the seven clusters involved in SBA's Initiative have reported an evolution in their view about the need to collect quantitative data and the types of systems they utilize to keep track of their participants and the services they provide them. During the first year of the Initiative, all seven clusters collected information from participants on an anecdotal basis during phone calls or one-on-one interactions, and the majority also conducted short surveys after events to obtain feedback about what could be improved and whether the event was perceived as valuable. Only two clusters, FlexMatters and the San Diego Defense Cluster, systematically collected quantitative metrics from their participants on a regular basis. However, several clusters have increased their data-collection efforts over the duration of SBA's Initiative. In the case of Smart Grid, this was correlated with the inclusion of the Energy Foundry and the need to undertake due diligence for participants seeking direct investment by the organization. In other cases, it was prompted by the need to provide data for this evaluation of SBA's Initiative. In fact, the Advanced Power Cluster reported making use of the cluster administrator survey as a basis for its data-collection effort, while other clusters, including the Energy Storage Cluster, adopted some of the key indicators used by the evaluation team. Some clusters, such as TechRich, also designed reporting templates for its service providers to use.

One area that has changed even more dramatically over the duration of SBA's Initiative is the adoption of data storage and analysis tools by the clusters. Several clusters, including TechRich and Smart Grid, initially used spreadsheets to track participation and services. However, most eventually transitioned to more sophisticated tools, including such databases as Microsoft Access (the San Diego Defense Cluster) or custom-designed Customer Relationship Management (CRM) tools (the Advanced Power Cluster and the Geospatial Cluster). The rest began using cloud-based CRM tools, such as Salesforce.com, and the majority of those that have not yet made the transition to such a system are in the

process of assessing whether to transition to these tools as well. This progression toward more sophisticated data management and analysis tools was triggered by the realization that these tools could deliver powerful, statistics-based insight about how resources are used that would allow clusters to improve their services and better allocate resources. In addition, they reduced the effort required to comply with the evaluation. By the end of the third year, a few clusters, including the Energy Storage Cluster, were looking to go one step further and were inquiring about business-intelligence tools that would make analysis and insight easier to obtain while also generating visually compelling charts.

5.4. Teaming and Collaboration

The lessons learned in Subsection 5.4 cover the following topics related to small business teaming and collaboration:

1. Overcome preconceived ideas about the role of small businesses in government procurement with effective teaming strategies.
2. Do not forget the importance of large “prime” contractors in teaming and partnerships.
3. Monitor the success of existing approaches to collaboration and execute significant course corrections as needed.

Each of the three topics is explained in detail with examples below.

1. Overcome preconceived ideas about the role of small businesses in government procurement with effective teaming strategies.

TechRich mentioned that in government procurement, it was commonly assumed that large companies should automatically be the prime contractors in partnerships or collaborations with small businesses. The cluster noted that this mind-set was also pervasive among the small businesses themselves. The cluster implemented an alternative approach in which small businesses would partner with each other to pursue larger government contracting opportunities instead of pursuing only small business-specific opportunities or accepting a subcontractor role by default. Markeeva Morgan, TechRich administrator during the first year of the Initiative, encouraged these collaborations: “We’ve identified cases where integration between two or more small businesses enables them to provide a fairly unique, high-quality solution, and those businesses had never talked to one another before, had never considered doing business together.” Such integration between small businesses not only allowed them to pursue larger opportunities at DoD but also provided them with valuable experience in dealing with DoD agencies. This experience was commonly echoed by the majority of the seven clusters in SBA’s Initiative, which tackled this issue via a variety of activities, some fostering organic teaming around specific

opportunities and others where clusters took the lead to select and convene certain small businesses based on their joint ability to meet the relevant requirements.

2. Do not forget the importance of large “prime” contractors in teaming and partnerships.

Chip Laingen, the Advanced Power Cluster administrator, explained that large contractors tended to have an inherent advantage in bridging the gap between small businesses and DoD agencies, largely due to their extensive experience, specialization, and resources in dealing with DoD agencies. For example, major contractors could utilize their vast network of DoD contacts as well as their small-business liaison staff to identify small businesses that were most relevant to DoD contract needs. This informational advantage of the large contractors was also noted by Mr. Morgan, who reported that the same large contractors could be found at all the large DoD conferences, whereas the small businesses that were present were rarely consistent from one conference to the other. As a result, clusters—particularly those focused on defense—continued to connect small businesses with large contractors whenever desirable or when it was clear that a given opportunity was unlikely to be executable by cluster small businesses alone.

3. Monitor the success of existing approaches to collaboration and execute significant course corrections as needed.

FlexMatters changed its approach to fostering collaboration among cluster members throughout the first 3 years of SBA’s Initiative. Initially the cluster had a top-down approach to teaming and collaboration that involved the cluster’s sourcing workshops. During these workshops, small and large businesses met and brainstormed on needs and capabilities. Several of these workshops were held, but the results did not live up to expectations. In particular, the needs listed by large companies were too broad, and concerns regarding intellectual property issues arose. Consequently, during the spring of 2011, the cluster drastically changed its approach and began focusing on smaller-scale, shorter-term projects, termed “quick hits,” for which intellectual property concerns were minimized. In parallel, the cluster reversed its previous top-down approach by assigning flexible electronics experts to cluster members. These experts helped cluster members realistically assess their capabilities, strengths, and weaknesses and identify large companies whose needs could be effectively addressed. This last approach evolved over time into series of classes, including the Market Opportunity Assessment classes and the Anchor Customer Engagement (ACE) Academy, which trained small businesses to develop and pitch their value proposition, conduct market research and due diligence, and engage and interact with anchor customers. This approach has led to more than 10 nondisclosure agreements since its implementation.

6. Conclusion

In September 2010, SBA launched the Regional Innovation Cluster Initiative, to promote and support 10 clusters—geographically concentrated groups of interconnected businesses, suppliers, service providers, and associated institutions in a particular industry or field— across the United States. Clusters act as a networking hub to connect large firms, university researchers, regional economic organizations, investors, and small businesses. They also convene a number of resources to help navigate funding, procurement, and supply-chain opportunities in a specific industry. Through technical and legal assistance, cluster networks also help innovators commercialize promising technologies needed by government and industry buyers. Recognizing the challenges that small businesses face in creating critical marketing, technical, and investor networks, SBA actively supports small business membership in emerging and mature industry clusters. The 10 clusters make up the first set of clusters to receive financial and technical assistance from SBA. They have since been joined by 30 other clusters sponsored through the Jobs and Innovation Accelerator Challenge.^{59, 60}

Starting in 2012, SBA reduced the number of clusters funded through the Regional Innovation Cluster Initiative to seven. Additionally, the amount of funds each cluster received was decreased in Year 3 compared with those of Year 1 and Year 2. The funding was provided to the organizing entities of seven clusters to increase opportunities for small business participation within them, promote innovation in their focus industries, and enhance regional economic development and growth. This report presents the findings and outcomes of an evaluation of the Initiative following its third year of operation.

The evaluation comprises two key components: (1) an implementation evaluation and (2) an outcome evaluation. The implementation evaluation focuses on how the Initiative was implemented across the seven clusters and on the services that each cluster provided to its small businesses. The outcome evaluation focuses on short- and intermediate-term outcomes linked directly to the cluster services provided as well as on longer-term economic outcomes that can be reasonably expected to result from the short- and intermediate-term outcomes achieved. The evaluation methodology includes the analysis of data from several primary sources, such as surveys, interviews, and quarterly and annual

⁵⁹ For a summary of the overall approach selected by the federal government in support of clusters, please see *Regional Innovation Clusters Begin to Add Up* by Mark Muro of the Brookings Institution at <http://www.brookings.edu/blogs/up-front/posts/2013/02/27-regional-innovation-clusters-muro>.

⁶⁰ The Jobs and Innovation Accelerator Challenge differs from the Regional Innovation Cluster Initiative in various ways, starting with its multi-agency collaborative structure. Furthermore, the Initiative focuses to a greater extent on integrating historically underserved businesses and communities in the clusters and on the implementation of a jobs training and placement program for American workers to replace foreign workers hired on H-1B visas.

reports, in addition to secondary sources, which have primarily been used for the comparison of several outcome measures.

An analysis of the seven clusters' central features suggests that there is considerable variation among them across key dimensions. Each cluster has a specific industrial focus, ranging from flexible electronics to agricultural technology. Each has a unique approach to delivering value to cluster participants, dictated in large part by the competitive advantage of the private sector in the cluster's region, the skilled labor pool, and the specializations of the research community. The seven clusters also vary in their age/length of time established, geographic scope, stage of development, and governance structures. Nonetheless, one feature that all the clusters have in common is a focus on emerging and high technology.

During Year 3, the seven clusters' key dimensions have not evolved significantly, although the trend of clusters adding participants outside their stated geographic scope has continued. The evaluation now reports the proportion of small businesses that are within each cluster's stated geographic scope, clarifying the linkage between stated and actual geographic scopes. This new analysis illustrates that, despite reporting participants in states outside their stated geographic scope, most clusters' participants remain grouped within each cluster's stated scope. Additionally, the Energy Storage Cluster formally added New Jersey to its stated geographic scope during Year 3. The industrial focus of the seven clusters has remained static since the start of SBA's Initiative. However, Smart Grid broadened its technology focus somewhat during Year 3 to include smart grid-related technologies, such as distributed generation and smart-grid technology installers. This minor evolution largely reflects the shifting boundaries of the cluster's industry of focus.

Cluster governance is an area where change was reported for Year 3. Several clusters made adjustments to the composition of their boards, including the Geospatial Cluster. In addition, the Energy Storage Cluster formalized a governance structure that included its state-based partners. The majority of clusters made adjustments to their list of primary service providers, reflecting shifting strategies and small business needs. Year 3 also marked the first year in which all clusters have now reached the mature stage of their life-cycle, as Smart Grid made impressive gains within the regional smart-grid community.

The services, activities, and events that clusters provided to small business participants during the third year focused on several key areas, ranging from facilitating targeted connections to networking with other cluster participants, getting assistance in transferring new technology or concepts into the marketplace, and getting assistance with marketing or grant and SBIR applications. Clusters reported

using more of their time to provide one-on-one counseling as well as group events, although there is important variation across clusters in terms of their service mix as well as the evolution of that mix over time. In general, collaboration, business development, and financing were the focus of one-on-one counseling provided by the seven clusters. A similar pattern holds for training events and workshops, although marketing was another popular topic. This study also finds that a majority of the clusters consistently leverage one or more of SBA's resource partners (e.g., SBDCs, WBCs, and SCORE chapters) while also utilizing the expertise of third-party organizations, such as university-based technology centers. Among the small businesses surveyed, 56% reported that the services and activities provided by their clusters were unique and could not be found elsewhere. Additionally, 75% of small businesses reported that they were either satisfied or very satisfied with cluster services and activities, a figure that has remained stable throughout the duration of SBA's Initiative.

The evaluation of the Initiative's third year reveals that the seven clusters further developed their networks across a wide spectrum of stakeholders. Participant growth remained strong for small businesses and large businesses but began to taper for other participating organizations, particularly universities, nonprofit organizations, and business associations. The underlying reason for this deceleration appears to be strategic adjustments undertaken by several clusters and normal fluctuation and variation in the strength of the relationships within clusters over time. Primary reasons for small business participation in the seven clusters have remained stable over time; the two most-often cited reasons are networking and access to cluster services. The same pattern holds for large organizations, whose most often-cited reasons include participation in regional economic development and identification of partners for technology transfer.

Among the key outcomes observed during the first 3 years of the Initiative was the establishment of 27 new businesses after their founders became involved with their clusters, including 9 during the third year alone. Over those 3 years, average full-time employment in participating small businesses increased at an annual rate of 4.4%. Average *total* employment (full-time plus part-time) grew at a rate of 6.9% per year, with six out of the seven clusters experiencing an increase in the average total employment of small business participants. The small businesses that participated in the clusters have also experienced growth in revenue and payroll over the first 3 years of the Initiative. The average revenue of small business participants increased by 6.9% per year, whereas the average payroll of small business participants also increased by 14.1%, with 8 out of 10 clusters experiencing an increase in average small business payroll over the 3 years.

Small businesses also reported that the clusters played a role in spurring innovation. Among the small businesses that indicated having sought or received cluster services, 60% reported developing new products or services as a result of their cluster participation, while 32% reported commercializing new technology as a result of cluster participation. Cluster small businesses reported filing 181 patent applications and receiving 112 patents during the third year of the Initiative.

Additionally, clusters provided services during the third year of the Initiative to assist small businesses in obtaining contracts and subcontracts, private capital and loans, SBIR/STTR awards, and other grants. Cluster administrators, who estimated the dollar value of economic activity generated by active small business participants in their cluster, reported that these small businesses obtained contracts or subcontracts totaling \$3billion in addition to external funding through private funding sources (venture capital, angel capital, loans) totaling more than \$42 million, SBIR/STTR awards totaling more than \$13 million, and grants totaling \$7.2 million.

These initial findings suggest that these clusters have indeed grown rapidly over the first 3 years of the Initiative—in membership, scale and range of services provided, and engagement with small businesses. More importantly, the clusters have managed to maintain their momentum while making adjustments based on the needs of their participants. The outcomes presented suggest that cluster participation was correlated with higher than expected levels of economic growth and new business formation and that the clusters made evident strides toward promoting innovation in their respective industries.

To conclude this discussion, Exhibit 89 below provides an overview of key SBA Initiative metrics between the end of its first year and its third year.

Exhibit 89. Summary table of the changes in key Initiative metrics between Year 1 and Year 3

Metric	End of Year 1	End of Year 2	End of Year 3	Percentage change (Year 1–Year 3)
Small business participants[^]	595	682	785	32%
Large organization participants[^]	252	422	459	82%
Contracting/subcontracting activity (\$)[^]	\$217,852,252	\$588,125,679	\$3,004,719,932.00	1,379%
Private funding (loans, venture and angel capital, private equity) (\$)[^]	\$47,826,760	\$17,830,000	\$44,183,000	-8%
SBIR/STTR awards (\$)[^]	\$6,557,966	\$8,328,410	\$13,483,271	106%
Grants (\$)[^]	\$1,700,000	\$16,484,500	\$7,260,000	327%
Total economic activity (\$)[^]	\$273,936,978	\$630,768,589	\$3,069,646,203	1,1205%

Metric	End of Year 1	End of Year 2	End of Year 3	Percentage change (Year 1–Year 3)
Average revenue	\$3,924,190	\$4,902,898	\$3,939,713	6.9%
Average payroll	\$124,937	\$114,301	\$187,779	14.1%
New businesses established	7	11	9	28.6%
Average total employment	22.1	22.3	24.2	6.9%
Estimated total jobs created[^]	198	502	993	401%

[^]The data underpinning this metric were provided by the cluster administrators.

7. Methodology Appendix

As summarized in Section 1, the evaluation design for this report is based on a mixed-method approach that uses both quantitative and qualitative data collected from cluster administrators, large organizations, and the small businesses participating in the cluster. These data have been collected from the following sources:

- A cluster administrator survey
- A small business survey
- A large organization survey
- Interviews with cluster administrators
- Clusters' proposals for SBA's Initiative, their quarterly reports, and their annual reports

The use of multiple sources of data allows for a comprehensive assessment of the cluster services provided under the Initiative as well as the performance outcomes of the small businesses. The use of various quantitative and qualitative data also allows for cross-checking among different sources of data, increasing the validity of findings and generating a stronger and more reliable evaluation. Because the qualitative data provide an understanding of each cluster's background, they are further used to guide the interpretation of the quantitative findings and to understand the variation in program outputs and outcomes across clusters. The following subsection provides a description of the data-collection activities.

A.1. Description of Data Sources

A.1.1. Survey Instruments

Most of the quantitative data were collected through the following survey instruments:

- *Cluster administrator survey:* This survey was completed by the administrator of each cluster. Its purpose was to gather information on the different cluster stakeholders, the various types of activities and events offered by the cluster to small businesses, the frequency of these events during the third year of SBA's Initiative, and the various contracts and awards received by small businesses during SBA's Initiative.
- *Small business survey:* This survey was sent to those small businesses that the cluster administrators identified as having been targeted by the cluster and having received services under SBA's Initiative from October 1, 2010, through September 30, 2013. The survey collected information on key outcomes of small businesses, including revenue, number of employees, and total compensation. It also gathered information on outcomes that were closely

linked to cluster services, such as achieving access to external capital, forming strategic alliances and collaborations, obtaining patents, and commercializing new technology. In addition, the survey included questions on small businesses' reasons for cluster participation, their satisfaction with cluster services and activities, and their assessment of the influence of their clusters' participation on their selected performance outcomes. The small business survey was sent to the 509 small businesses identified by the cluster administrators. Of these, 184 businesses completed the survey.

- *Large organization survey:* This survey was designed to collect information from a broad spectrum of large organizations participating in the clusters, including large businesses, universities, public-sector agencies, nonprofit organizations, and business associations. The survey gathered information on these organizations' reasons for cluster participation, their interactions with small businesses in the clusters, the types of partnerships they created with small businesses, and the influence of their clusters' participation on various outcomes. Due to the multitude of large organizations that were surveyed, the survey collected information on a wide spectrum of outcomes, ranging from each organization's ability to transition new research technologies into marketable products to the organization's hiring of new employees. The large organization survey was sent to 193 large organizations that were identified by the clusters as cluster participants. Of these, 63 organizations completed the survey.

The small business survey and the large organization survey were somewhat updated for the second year of SBA's Initiative compared to the instruments used in the first year of the Initiative, but these updates were conducted with a focus on maintaining compatibility of surveys across time periods to permit the comparison of results across years of the Initiative. No significant change was implemented for the third year of the evaluation, as the instruments were found to be effective in obtaining the data needed. These two surveys were provided to cluster participants as either a Web survey or an interactive PDF form, depending on the cluster administrators' preferences. The third-year surveys were administered from November 7, 2013, to December 17, 2013. Responses to the surveys were monitored regularly, and cluster administrators were provided with regular updates on their response rates and any e-mail addresses that could not be reached. Cluster administrators used this information to send reminders to participants to fill out the surveys.

A.1.2. Survey Response

The cluster administrator survey was completed by all seven of the cluster administrators participating in SBA's Initiative. The small business survey was sent to those small businesses that the cluster administrators identified as having been targeted by the cluster and that received services⁶¹ under SBA's Initiative from October 1, 2010, through September 30, 2013. Overall, the small business survey was sent to 509 small businesses identified by the cluster administrators and was completed by 184 of these businesses, yielding a response rate of 36.1%. The small business survey response rate was above 40% for five of the seven clusters, with four clusters achieving a response rate above 75%. Compared with figures reported in the Year 2 evaluation, the small business survey response rate rose somewhat (36.1% versus 21.3% in Year 2).⁶²

The large organization survey was sent to the large organizations that were identified by the clusters as cluster participants. Large organizations include large businesses, universities, public-sector agencies, nonprofit organizations, and business associations. Of the 193 large organizations that were sent the large organization survey, 63 completed the survey, generating a response rate of 32.6%. Compared with the figure reported in the Year 2 evaluation, the large organization survey response rate decreased slightly (32.6% versus 33.8% in Year 2).⁶³

Exhibit A1, below, shows the number of responses received for the small business and large organization surveys for each cluster.

⁶¹ Specifically, the survey was sent to all cluster small business participants termed "active" which is defined as a small business that (1) has either gone through the cluster intake/screening process and has become a cluster member or operates/is actively seeking to operate in the cluster's industry of focus AND (2) has received one-on-one counseling/technical assistance or attended a cluster training/networking/matchmaking/showcase opportunity at least once between October 1, 2012, and September 30, 2013.

⁶² The response rate for Year 2 identified above did not account for the three clusters that were not included in the Year 3 evaluation. Including figures for these three clusters, the Year 2 response rate rises to 29.7%, still somewhat lower than the figure for Year 3.

⁶³ See previous footnote. Including figures for the three clusters no longer included in the SBA Initiative in Year 3, the Year 2 response rate rose to 35.8%.

Exhibit A1. Survey response rate for the third year of SBA's Initiative

Cluster	Total number of surveys sent		Total number of surveys received		Response rate	
	RIC small business survey	RIC large organization survey	RIC small business survey	RIC large organization survey	RIC small business survey	RIC large organization survey
Advanced Power Cluster	70	12	32	5	45.71%	41.67%
Geospatial Cluster	35	21	28	18	80.00%	85.71%
FlexMatters	41	9	14	3	34.15%	33.33%
TechRich	269	109	38	14	14.13%	12.84%
Smart Grid	23	23	18	13	78.26%	56.52%
Energy Storage Cluster	43	9	33	5	76.74%	55.56%
San Diego Defense Cluster	28	10	21	5	75.00%	50.00%
All clusters	509	193	184	63	36.15%	32.64%

As in any analysis using survey data, limitations on inferences that are brought about by how the respondent sample is determined should be considered. In the case of the small business survey, if the set of businesses that responded to the survey differed systematically from the entire set of businesses that received cluster services, then the survey results may not be representative of the whole set of cluster small businesses' experiences.⁶⁴ For example, it is plausible that the small businesses that responded to the survey are more likely to be active and engaged in the cluster. In that case, caution should be applied in interpreting the survey results as being representative of all small businesses participating in the cluster. In other words, the results may be partially driven by the responding firms' level of engagement in the cluster and thus may not represent the experiences of an average small business participant in the cluster. This potential limitation of the analysis is considered in the discussion of the results in Sections 3 and 4.

A.1.3. Interviews

The evaluation also uses qualitative data collected through annual and intermediary interviews with the cluster administrators. The annual interviews were designed to gather information on cluster operations and small businesses' cluster participation that is difficult to capture through surveys, while the shorter intermediary interviews with cluster administrators were focused on the content of the quarterly reports provided by the cluster administrators. All annual interviews were conducted in January 2014, and the intermediary interviews were held in October 2013.

Annual interviews with cluster administrators included questions that concerned the following:

- Cluster governance
- Cluster operations
- Cluster recruitment strategies and membership
- Networking and collaboration activities
- Innovation and technology-transfer activities
- Sources of funding
- Lessons learned

The annual interview questions were designed to fill in the informational gaps that remained after reviewing cluster proposals and quarterly reports. In addition, questions served to confirm the quarterly information with cluster administrators through the intermediary interviews. The questions were provided to the cluster administrators at least 48 hours before the annual interviews. Cluster administrators were invited to include cluster service providers and partners in both annual and intermediary interviews. The

⁶⁴ The statistical bias that can be generated by the way the survey respondents are selected for the sample is referred to as "the sample selection bias."

annual interviews were conducted in a semi-structured fashion, which allowed for follow-up questions to be dynamically added during the interviews. The intermediary interviews followed a more structured approach, although they also allowed for follow-up questions. Although the core themes that were investigated remained the same across annual cluster interviews, questions were customized for each cluster to elicit the maximum amount of information within the limited interview duration. The annual interviews included questions on each cluster's configuration, business model, targets, and strategies. They lasted approximately an hour and a half for each cluster.

A.1.4. Cluster Proposals and Quarterly Reports

Cluster proposals for SBA's Initiative and the clusters' quarterly reports provided another source of qualitative data for the evaluation. They were used as sources of background information on clusters, including cluster configurations, their business models and strategies, their goals and challenges in implementing SBA's Initiative, and various other aspects of cluster governance, operations, and organizational capacity. In addition, these sources were used to gather detailed information on the clusters' activities, events, and services provided to small businesses as well as instances of small business collaboration and small businesses' grant and contract awards, complementing and adding context to the information gathered in the cluster administrator survey.

A.2. Categorization of Cluster Services

The services and activities that clusters provide to small businesses can be classified in one of six categories, which are used throughout this report as a basis for the categorization and measurement of cluster services and activities for small businesses:

- *One-on-one counseling:* The provision of one-on-one assistance and guidance to starting or growing a business, including but not limited to general business consulting, technical assistance, mentoring, business development, and guidance related to resolving specific business issues.
- *Networking events:* Events facilitated by the clusters, either alone or in collaboration with other organizations, whereby cluster members meet with program sponsors, large businesses, prime contractors, and other potential end users or providers to end users of the small businesses' products or services.
- *Training events:* Group sessions or workshops on one or more topics of interest to small businesses that are cluster participants.

- *Matchmaking events:* Events or activities facilitated by the clusters, either alone or in collaboration with other organizations; cluster participant(s) meet with large businesses, prime contractors, or among themselves to discuss contracting and award opportunities in a particular technology area selected by the clusters with the explicit intention of creating competitive teams able to respond to these opportunities. These events/activities can involve multiple small businesses or a single one. Examples include small business referral, teaming/matchmaking events, and teaming facilitation and support.
- *Showcasing events:* Events or activities facilitated by the clusters, individually or in collaboration with other organizations, whereby cluster participant(s) showcase (i.e., display, demonstrate, market) technology products or services to potential customers, including representatives of governmental agencies as well as prime and subprime contractors. Examples of showcase opportunities include giving technology and prototype demonstrations to third parties individually or at events and trade exhibitions. These events/activities can involve multiple small businesses or a single one.
- *Information dissemination:* Dissemination of information relevant to cluster participants about such topics as the supply chain, industry-relevant reports and presentations, location of specialized resources (prototyping, legal assistance, etc.), and SBIR/STTR opportunities. The dissemination can be done through newsletters, databases accessible to cluster participants or to the wider public via clusters' websites, or the creation of virtual social platforms focused on collaboration.

The above six categories of services and activities are separated on the basis of the forms these services and activities take as well as their stated goals. For an example of this distinction based on form alone, the difference between the training and workshop category and the one-on-one counseling category is the number of small businesses receiving assistance (several versus one, respectively), which is expected to translate into a different level of customization in the assistance provided. Yet the topic covered during these two services (e.g., commercialization, partnership development, intellectual property) could be the same. For example, a cluster can organize a training event focused on exporting goods and services to Canada, or it can provide one-on-one counseling to a small business particularly interested in exporting to Canada. In the second case, the assistance will likely be much more tailored to that particular small business's needs and strategy.

On the other hand, the distinction between a networking event and a matchmaking event revolves around each category of service's stated goal. Both can often take a similar form, where cluster small

businesses are placed in an environment where they are encouraged to interact with each other and often, but not necessarily, with representatives of large organizations (e.g., large businesses, government agencies) both internal and external to the cluster. However, matchmaking is differentiated from networking because it is structured around contracting and award opportunities (e.g., a new release of SBIR/STTR solicitations, specific contracting opportunities surrounding a specific large business) in a particular technology area selected by the cluster with the explicit intention of creating competitive teams able to respond to these opportunities. Networking is a more free-form activity where interactions among attendees do not revolve around a predefined set of opportunities or awards selected by the cluster.

A.3. Secondary Data Sources Used in the Analysis

The evaluation of SBA's Initiative uses secondary data sources to compute average statistics for three key outcomes: (1) revenue, (2) number of employees, and (3) total compensation. These average measures are then compared with the average outcomes experienced by the small businesses participating in the seven clusters. The following secondary datasets are also used in the evaluation:

- The Quarterly Census of Employment and Wages (from the Bureau of Labor Statistics), which provides data on the number of employees
- The State Personal Income Accounts (from the Bureau of Economic Analysis), which provides data on compensation
- The Dun and Bradstreet (D&B) Business Database, which provides data on both revenue and number of employees

These data sources vary with respect to the frequency with which they are updated, the time periods covered, type of respondents, geographic and industrial granularity, and unit of observation. Exhibit A2 summarizes the various characteristics of the secondary data sources. The data obtained from each of these sources are selected to provide the most accurate match with the time period covered by the surveys, generally ranging from October 1, 2011, to September 30, 2013.⁶⁵ This ensures that macro-level trends that vary over time are embedded in the comparison group and match as closely as possible those that may affect the small businesses in the seven clusters.

The QCEW as well as the State Personal Income Accounts data provide statistics for various industries at the county level, MSA level, or state level. In creating the benchmark from the QCEW, NAICS codes and the county distribution of small businesses participating in the clusters are used for

⁶⁵ Despite efforts to match the period covered by the surveys, a perfect match could not be achieved for two of the comparison data sources. The BLS data used covers the period of October 1, 2011 to June 30, 2013 because BLS did not release the third quarter of 2013 data as of the writing of this report. The D&B data covers calendar years without offering further temporal granularity, and therefore inherently does not exactly match the survey period.

specifying the industrial categories and geographic scope of each cluster.^{66,67} The average of the county-level data is used as the benchmark statistic for the cluster. In creating the benchmark from the State Personal Income Accounts data, industry classifications and the distribution of the seven clusters' small businesses across states are used.⁶⁸ For clusters that have small businesses from multiple states, a weighted average of the state-level statistics is calculated based on the number of firms that the cluster has in each state.

The D&B Database provides firm-level information on revenue and the number of employees; as such, it allows for a more robust comparison group. Using the D&B Database, the comparison group for each cluster is created by selecting firms with fewer than 500 employees that are located in the counties where clusters reported having participants and that have six-digit NAICS codes matching those reported by each cluster's small businesses. In addition, the comparison group is composed of three firm age categories for each cluster to better replicate each cluster's small business age structure. Due to cost considerations, a random sample of 1,000 firms that correspond to these sample restrictions is selected from the D&B Database for each cluster.

⁶⁶ BLS data at the most disaggregated level of industry and geography (6-digit NAICS codes and counties) is often flagged for non-disclosure, indicating that the data for that specific combination of NAICS and county did not meet BLS or individual states' disclosure requirements. These requirements are designed to prevent respondent businesses from being identified directly or indirectly based on public BLS data. Non-disclosure flags therefore tend to emerge when there are a small number of firms within specific combinations of geography and industry. In cases where these flags were present, a less specific (3-digit) version of the NAICS code was substituted. In cases where the flag remained after this operation, the original 6-digit NAICS code was applied to the state where the county is located. This insures that these entries are not ignored and that relevant, albeit less specific values for the various combinations of geography and industry are incorporated in the comparison group.

⁶⁷ Other criteria were also applied, including restricting the data to only private establishments and companies. A further refinement would utilize the business size codes to only include small businesses, creating an even more accurate comparison group. However, this was not possible because BLS data disaggregated by 6-digit NAICS codes and counties does not offer the size code field.

⁶⁸ The State Personal Income Accounts data does not directly follow the typical classification of industries by NAICS codes, requiring the creation of a crosswalk between the Bureau of Economic Analysis' industry codes and NAICS codes. The level of industry detail provided by the Bureau of Economic Analysis only matches NAICS codes at a 3-digit level. However, the industry classification allows for the exclusion of all non-private payroll.

Exhibit A2. Data sources for the creation of benchmarks

Data	Availability	Frequency	Respondent	NAICS code	Employment	Total compensation	Revenue	Number of establishments	Geographic granularity	Level
Quarterly Census of Employment and Wages	6-month ^a to 1-year lag	Monthly, quarterly, or yearly	Businesses covered by unemployment insurance	6 digits	X	-	-	X ^b	By state or by county	Industry
D&B Business Database	3- to 12-month lag	Quarterly or yearly	Businesses registered	6 digits	X	-	X ^c	-	ZIP codes	Individual firms
State Personal Income Accounts	3-month to 1-year lag	Quarterly or yearly	Individuals	3 digits	-	X	-	-	By state or by county	Industry

BLS = Bureau of Labor Statistics, BEA = Bureau of Economic Analysis.

^a The latest 3 months of data available are listed as preliminary but remain highly reliable because the Quarterly Census of Employment and Wages is not based on sampling but rather on a census of all establishments that report to unemployment insurance.

^b Unlike monthly employment numbers, the number of establishments is provided quarterly when selecting a statewide or countywide scope.

^c Available yearly, based on fiscal year reporting, which means a lag of 12 months based on the data-extraction schedule.

Two principal limitations should be considered when samples from these secondary data sources are used as comparison samples for the seven clusters' small businesses. First, the QCEW and the State Personal Income Accounts data provide statistics for all firms in a given industrial and geographic scope and do not provide statistics by firm size or age within industrial and geographic categories. As a result, part of the difference between the benchmark outcomes and outcomes of the clusters' small businesses may be due to the difference in firm size or age across the two groups. The comparison sample from the D&B data is restricted to those firms with fewer than 500 employees and is constructed to reflect a simplified age distribution of each cluster. Yet still, the distribution of the firm sizes in the D&B sample may be different than the distribution of firm sizes among the clusters' small businesses. Second, the small businesses participating in the seven clusters may not be a representative sample of small businesses operating in the United States. It is plausible that these firms have certain characteristics that make them more likely to participate in the cluster. To the extent that these characteristics are correlated with the business performance outcomes, they may partially drive the differences between the outcomes of the benchmark samples and those of the clusters' small businesses.

An important limitation noted in the Year 1 report—the mismatch in the time period during which the secondary data source benchmarks are calculated and the period of evaluation—is largely mitigated for the Year 2 and Year 3 evaluation. In this year's analysis, the QCEW and the State Personal Income Accounts data correspond quite closely to the period of evaluation, while the D&B data are a significantly better match than previously. The time frames for the comparison samples are September 2011 to June 2013 for the QCEW, the third quarter of 2011 to the third quarter of 2013 for the State Personal Income Accounts, and December 2010 to December 2013 for the D&B sample. As discussed in the text (Section 4.3), given recent patterns in recent national economic growth (U.S. gross domestic product growth), to the extent that there are differences between the evaluation time frame and the time frame of calculated benchmarks, these differences should have little effect on the relevance of the comparisons at hand.

8. Clusters Supported by SBA

This appendix provides an overview of the various cluster initiatives supported by SBA.

Represented in Exhibit B1 are the 10 clusters that were or are still in the Regional Innovation Cluster Initiative (numbers 1 through 10 make up the full original list, but numbers 1, 7, and 2 are no longer part of the Initiative starting in Year 3), the 20 clusters involved in the innovation and high-technology component of the Jobs and Innovation Accelerator Challenge (numbers 21 to 40), the 10 clusters involved in the advanced manufacturing component of the Jobs and Innovation Accelerator Challenge (numbers 11 to 20), and clusters supported through other initiatives.⁶⁹

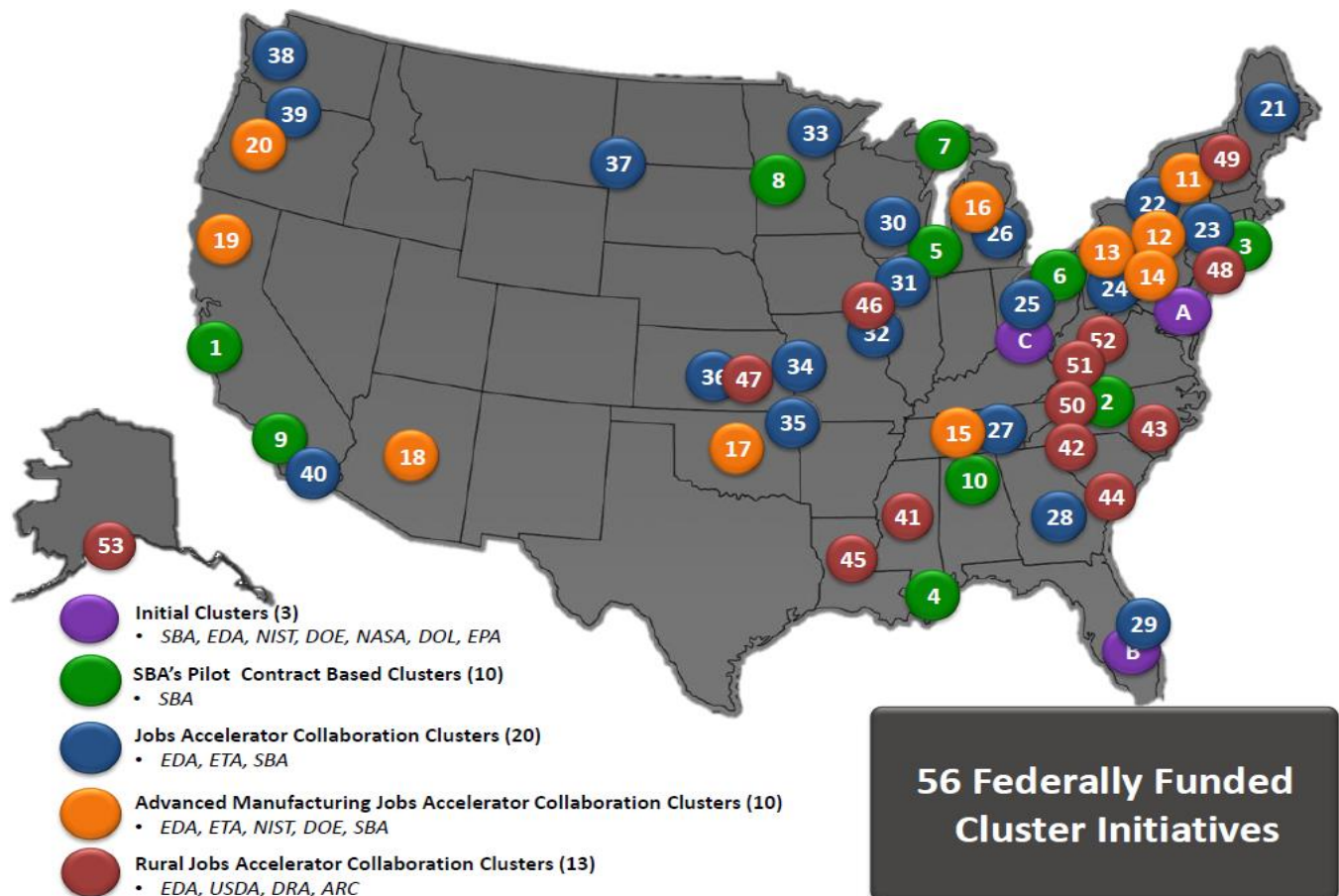


Exhibit B1. Map of the clusters supported by SBA around the United States

⁶⁹ An interactive map of all the clusters supported by SBA as well as the hyperlink for each cluster's website can be found at <http://www.sba.gov/sba-clusters>.