

# Capital Ecosystem Landscape Report

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## GO VIRGINIA REGION 2

MARCH 2019



Valleys Innovation Council gratefully acknowledges funding and in-kind support provided by:



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## Executive Summary

This regional capital landscape study examines the availability of and access to the types of grant and equity funding necessary to support start-ups and early stage technology companies. Specifically focused on funding activity in regional companies stemming from grants, angel investment and venture capital for the period 2011 – 2018, it analyzes how Region 2, as defined by the GO Virginia initiative, compares with peer areas such as Charlottesville, Virginia; Chattanooga, Tennessee; Greenville, South Carolina; and Birmingham, Alabama.

Results show that Region 2 companies have been very successful in winning support from SBIR and STTR grant programs to advance product research and development. Approximately \$104 million was infused into thirty-one (31) Region 2 companies between 2014-2017 from these sources. However, Region 2 companies raised far less investment capital from angel, seed, and venture capital sources between 2015-2018, approximately \$37 million in total, as compared to peer areas such as Charlottesville (\$202 million), Chattanooga (\$190 million), and Birmingham (\$136 million) as illustrated in the “Risk Capital Investment” table below.

### ***Risk Capital Investment (2015-2018)***

	Charlottesville	Chattanooga	Birmingham	Greenville	Region 2
<b>TOTAL \$'s</b>	<b>\$276M</b>	<b>\$196M</b>	<b>\$147M</b>	<b>\$55M</b>	<b>\$141M</b>
<b>Venture Capital</b>	<b>\$138M</b> (23)	<b>\$167M</b> (21)	<b>\$93M</b> (11)	<b>\$30M</b> (15)	<b>\$32M</b> (7)
<b>Seed</b>	<b>\$9M</b> (7)	<b>\$12M</b> (5)	<b>\$5M</b> (5)	<b>\$0.4M</b> (1)	<b>\$0.2M</b> (1)
<b>Angel Investors</b>	<b>\$55M</b> (14)	<b>\$11M</b> (9)	<b>\$38M</b> (18)	<b>\$14M</b> (7)	<b>\$5M</b> (10)
<b>SBIR/STTR Grants</b>	<b>\$74M</b> (33)	<b>\$6.3M</b> (8)	<b>\$11M</b> (10)	<b>\$11M</b> (6)	<b>\$104M</b> (31)
<b>Acceleration</b>	<b>15</b>	<b>31</b>	<b>38</b>	<b>12</b>	<b>15</b>

- Cell color denotes the relative amount of capital deployed; green=high, yellow=medium, red=low
- The \$ amount is noted followed by the number of companies receiving financing in parentheses
- Data includes Angel Investors, Seed and Venture Capital equity investments between 2015-2018 (Source: PitchBook)
- Due to data availability, SBIR/STTR grant awards are 2014-2017 (Source: SBIR.gov)
- Acceleration is the number of companies participating in an incubator/accelerator program between 2015-2018; includes programs in and out of each region (Source: PitchBook)

Region 2's relatively low level of angel and venture capital investment seems incongruent given the higher level of SBIR/STTR funding in Region 2 compared to these peers. Sorting out all of the reasons for the funding differential is beyond the scope of this study; however, surface evidence suggests:

- Some of the higher-performing peer areas have greater angel investment infrastructure and seed fund access;
- Some Region 2 start-ups may not be ready for, interested in, or aware of outside equity investment opportunities.

Survey respondents were generally optimistic that access to capital is improving. The recent announcement of the formation of the \$7 million VTC Seed Fund, the existence of the \$15 million VTC Innovation Fund, and the Valleys Innovation Council workshops held in late 2018 on angel investing are all seen as positive developments.

## Study Take-Aways

### *Venture Capital Investing*

- Low amount of VC investing in Region 2
- 3-5 times more VC investments each in Charlottesville, Chattanooga & Birmingham than Region 2

### *Angel Investing*

- 3-11 times more angel investments in peer regions than Region 2
- No trend over time in Region 2 in angel investing
- 10 companies raised \$5 million between 2015-2018
- Region 2 had no managed angel group during the study period

### *Federal Grants (SBIR/STTR)*

- Region 2 significantly outperforms peer regions in grant funding

## Recommendations

Based on the results of the study, several recommendations are being advanced as a call to action in order to improve capital access for Region 2 technology start-ups and early-stage companies:

- 1** Organize and sustain a managed angel investing group to systematically connect founders and investors to complement the VTC Seed Fund.
- 2** Leverage federal early-stage commercialization grant funding (SBIR/STTR) with additional commercialization programming (such as I-Corps) to foster firm development.
- 3** Increase linkages and connections between angel groups, venture capital sources and fundable firms, regionally and nationally.
- 4** Task Valleys Innovation Council to monitor capital access issues for high-growth start-ups in Region 2, develop strategies to assure access to the continuum of capital sources, and consider further research into the sustainability of the regional capital ecosystem.

The report establishes a baseline for understanding strengths, weaknesses and voids within the regional capital landscape. It is intended to be used as a tool to set strategies for improving capital access issues and building on our strengths. The study also provides baseline measurements from which we can measure and monitor progress in future years.

# Introduction and Background

In order to create and sustain a vibrant start-up community in Region 2 and across Virginia, access to risk capital to support research, development, and commercialization of innovative technologies is necessary. With funding from the GO Virginia Region 2 Council and match partners from within the region, Valleys Innovation Council prepared this regional capital landscape study to examine the availability of, ease of access to and recent historic activity levels of funding within Region 2, as defined by GO Virginia.

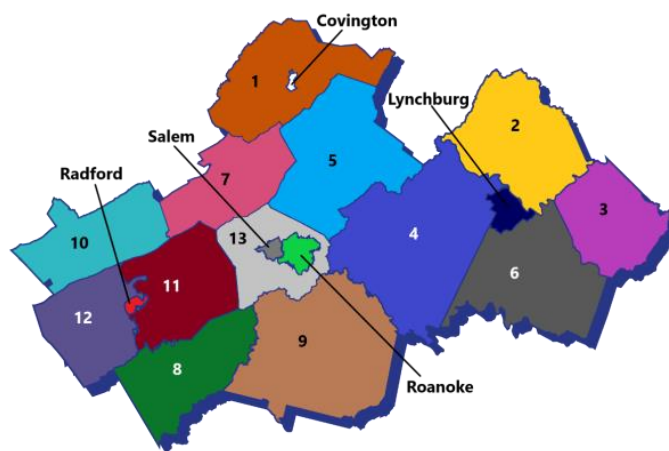
## GO Virginia Region 2

In December 2016 the Virginia Initiative for Growth & Opportunity in Each Region (“GO Virginia”) established nine regions across the Commonwealth as part of a new approach to regional innovation-based economic development. Each region has its own Regional Council and Growth & Diversification Plan to set regional priorities and identify opportunities for action and collaboration. GO Virginia Region 2 (“Region 2”) encompasses the Alleghany Highlands, Greater Lynchburg, New River Valley, and the Roanoke Valley. The region spans rural areas, small towns, and cities in three planning districts: the New River Valley, the Roanoke Valley-Alleghany Highlands, and Region 2000 (Lynchburg). GO Virginia estimates the total regional population at 777,919 primarily concentrated in three Metropolitan Statistical Areas: Lynchburg (258,062), Blacksburg/Christiansburg/Radford (181,288), and Roanoke (312,891).

Region 2 is also home to a number of higher education institutions from community colleges (Dabney S. Lancaster Community College, New River Community College, Virginia Western Community College, and Central Virginia Community College), private colleges (Ferrum College, Hollins University, Liberty University, Randolph College, Roanoke College, Sweet Briar College, and University of Lynchburg), and public universities (Radford University and Virginia Polytechnic Institute and State University). Both public universities have primary campuses in the New River Valley and a growing presence in the Roanoke area with a focus on the health sciences through Radford University’s recent acquisition of Jefferson College of Health Sciences and Virginia Tech’s partnership with Carilion Clinic for the development of the Fralin Biomedical Research Institute at VTC and the Virginia Tech Carilion School of Medicine.

The researchers identified a set of regions to use as peers in this study: Birmingham, Alabama; Chattanooga, Tennessee; Greenville, South Carolina; and Charlottesville, Virginia. The first three were identified as possible peer regions in the [GO Virginia Region 2 Growth & Diversification Plan](#) (p. 49) due to similarities with one or more aspects of Region 2, such as ties to a research institution with a growing focus on life sciences, history as a manufacturing area, or an increasing emphasis on support for entrepreneurship. Charlottesville, VA was selected due to its proximity to Region 2 and similarities in terms of state environment, connection to a public institution, the presence of a large healthcare system, and growing emphasis on entrepreneurship in that area.

GO Virginia Region 2



The study employs several types of data from multiple sources:

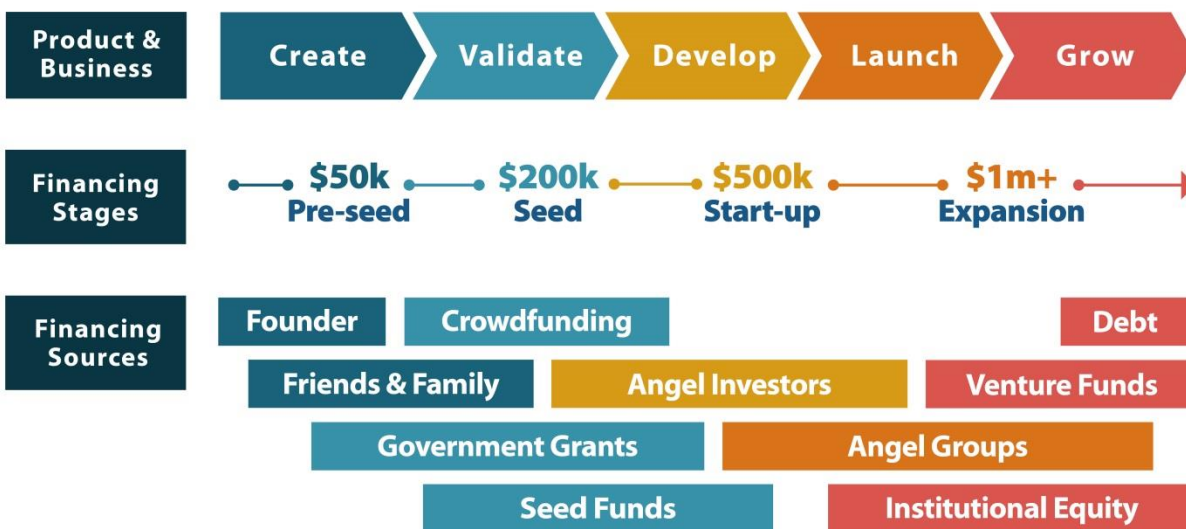
- The primary source of equity investment data for this report is PitchBook, which includes publicly-available information as well as proprietary investment data.
- SBIR/STTR grant data are from the sbir.gov website.
- Virginia grant and investment data are from each funding entity.
- Perception data are from a survey of members of the region's ecosystem.

## High-Growth Companies and Capital

A high-growth start-up company typically requires outside financing to scale and has an exit strategy to provide returns to shareholders. These companies are generally less than 5 years old, have a greater than 20% annual revenue growth rate, and have potential high profit margins. Because many of these start-ups sell products/services into large markets (greater than \$500 million), they require significant capital to implement go-to-market plans and to compete with larger established companies. Sources of capital for high growth start-ups vary, but typically include initial financing from founders, friends and family, non-dilutive grants, followed by outside equity investors (angels) and then institutional investors (VCs).

Equity financing is often leveraged with reinvestment of profits and grant awards. While debt financing may also be used by high-growth companies, those companies must reach a maturation point with stabilized cash flow to repay the interest and principal on the debt.

### Financing of Products & Businesses



*Adapted from Angel Resources Institute*



## Capital Stack

Although capital ecosystems are inherently complex and vary for each region, in general, the components can be described as a capital stack with multiple sources providing different amounts and types of capital based on the stage of company development to finance high-growth companies. In a thriving capital ecosystem, this diversity of financing sources enables high-growth, science and technology (S&T) companies to secure the capital required to accomplish initial product/business development, which then lays the groundwork to move up to the next stage of available capital.

### Best Practice Capital Stack



# Venture Capital Investing

## Broad Trends

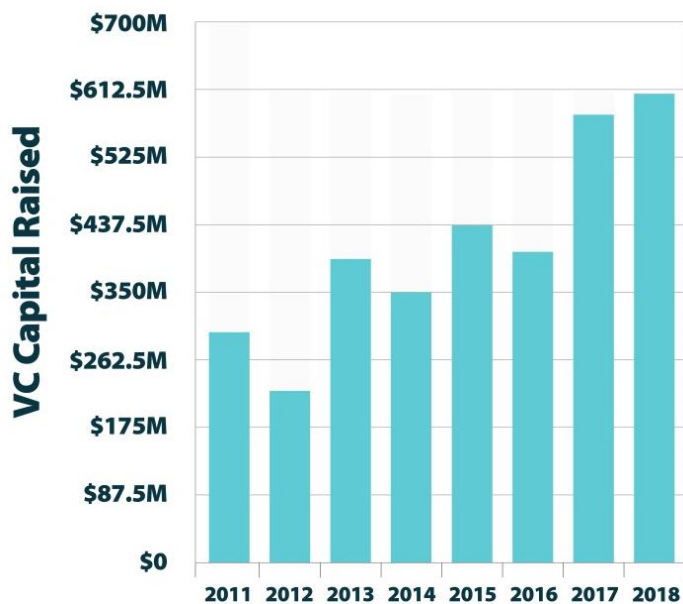
A major trend in venture capital (VC) investing across the US has been an increase in the total amount of investment dollars deployed while the number of deals has been decreasing. According to the [National Venture Capital Association](#), the venture industry deployed a record \$130 billion in 2018 surpassing the all-time high set in 2000. This record level of investing was strongly influenced by large mega rounds (184 rounds >\$100 million) and the increasing median size of venture funds which reached a ten-year high of \$82 million. This move to a smaller number of companies, but larger investment amounts per deal, reflects the continuing trend toward investing in later-stage opportunities. Consequently, there has been a decrease of seed and early stage funding, which continued to decline as a percentage of deals (25% in 2018, [PWC MoneyTree Report](#)). Geographically, several regions continued to see the highest concentration of investment with both San Francisco and New York Metro setting all-time VC funding records in 2018 with \$38 billion and \$13 billion, respectively.

### VENTURE CAPITAL TRENDS

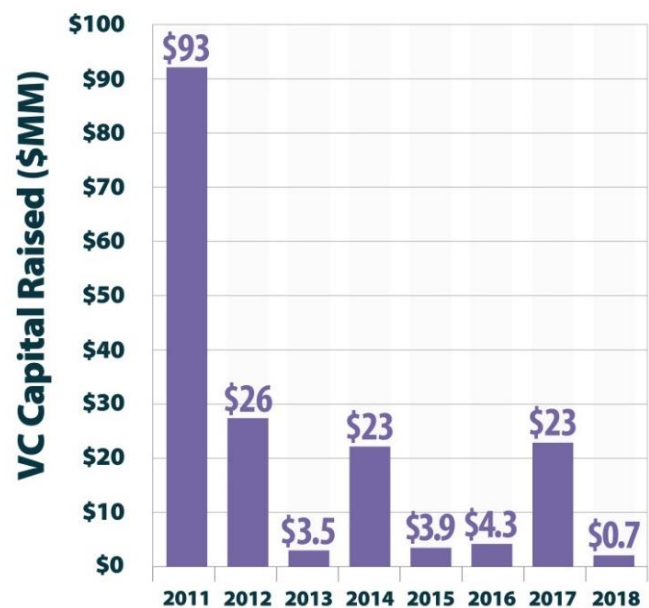
- Record setting amounts of capital deployed
- Larger rounds at later stages
- Growing geographic concentration of VC investing

In Virginia, the trend for VC investments has continued with steady annual increases finishing 2018 with \$613 million of VC capital deployed (PitchBook). However, this represents only about 0.5% of the national total for VC investments. It should be noted that the Washington-Arlington-Alexandria MSA and the greater Washington DC region is recognized for its technology economy and receives the largest share of VC investments in Virginia.

### Virginia Companies



### VC Investments: Region 2





## VC Investing in Region 2

Between 2011 and 2018, 13 companies located in Region 2 received \$178 million in VC investments, approximately 5% of the \$3.4 billion Virginia VC investments over the same period. Three companies received the majority (75%) of the regional investments (\$132 million of \$178 million total). These three companies received \$93 million of VC investments in 2011, three times the amount of the next highest year (2012 with \$26 million). Between 1 and 4 companies per year received VC investments during this period. As shown in the graphs on the previous page, the Commonwealth overall had a positive trend of increasing VC investments over the eight-year period, but Region 2 had no trend of either the amount or number of investments.

## Comparison with Peers

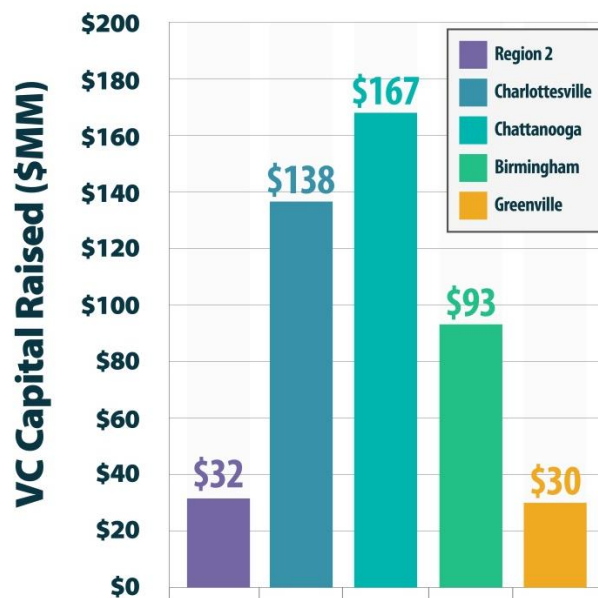
For peer region comparison, investment data were collected from PitchBook for 2015 – 2018. This period was selected to provide a recent but multi-year overview of investment activity. This also provides a baseline for future peer region comparisons.

### VENTURE CAPITAL TAKE-AWAY

Companies in Charlottesville, Chattanooga, and Birmingham raised 3 to 5 times more venture capital investments than Region 2 companies

Region 2 and Greenville had similar amounts of VC investments (\$32 million and \$30 million, respectively) while Birmingham, Charlottesville, and Chattanooga had significantly greater amounts of VC investment. Chattanooga had the highest level of venture capital investments with more than 5 times the amount of VC investments as Region 2 (\$167 million vs \$32 million).

*Comparison of VC Investments (2015 - 2018)*



# Angel Investing

## Broad Trends

With the shift of VC investors toward later-stage opportunities, angel investing has continued to expand filling part of the void in seed and early-stage investment as institutional venture firms migrate toward later rounds and expansion stage funding. Angels continue to represent the first source of outside equity capital for many startups (90% of investments by angels are “first money in”), as was noted in the most recent [2017 Halo Report](#) and the [2018 ACA Angel Funders Report](#). However, angel investors and angel groups are more frequently syndicating rounds with other angel groups (73% of deals, [ACA](#)). In 2017, the median angel group investment was \$200k with a median round size of \$270k. The HALO Report indicated that 280 deals were shopped around by angel groups to complete the round of financing and provide enough capital to budding entrepreneurs.

### ANGEL TRENDS

- Angels fill seed and early-stage funding gaps
- Syndication of rounds is increasing
- Geography becoming less important

With increasing syndication among angel groups, angel investing is becoming less geographically focused. In 2008, 65% of angel investors surveyed by the ACA preferred investing at “home” which is contrasted with results from the 2015 survey in which 54% of angel investors indicated no geographic preference or were interested in investing in opportunities regionally (spanning multiple states). While angel investing tends to concentrate geographically, the degree of concentration is not as pronounced as VC investing. For example, VC investments in the West Coast accounted for 62% of all VC investments in the US (2018; [Venture Monitor](#)) while only 27% of angel investments were into West Coast companies ([Halo Report](#)).

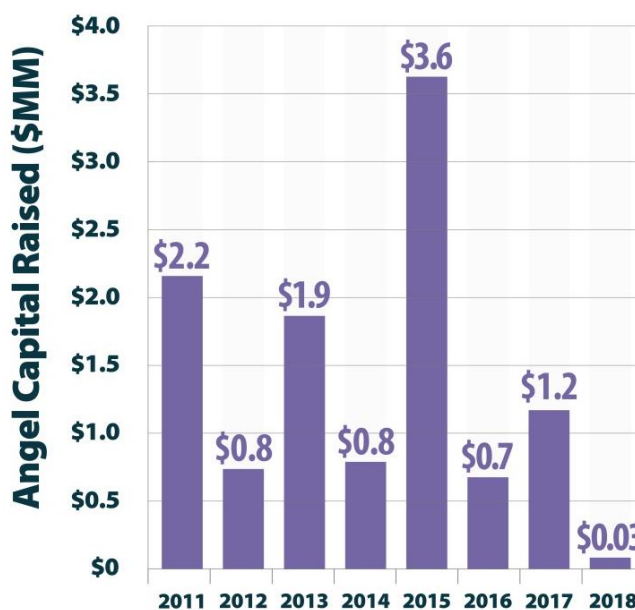
## Angel Investing in Region 2

Angel investments are generally not publically disclosed, which makes obtaining accurate angel investing data a challenge. However, PitchBook is a well-recognized source for both public and proprietary investment data. Between 2011 and 2018, a total of 17 companies located in Region 2 raised \$11 million of angel investments. As can be seen in the chart to the right, there was no trend in the amount of angel investing over the time period studied. The number of angel investing rounds ranged from a low of 1 in 2018 to a high of 6 in 2015, with a median of 4.

### Angel Investing Take-Aways

- No trend over time in Region 2
- 17 companies raised \$11 million in 8 years
- Region 2 had no managed angel group during the study period

### Angel Investments: Region 2



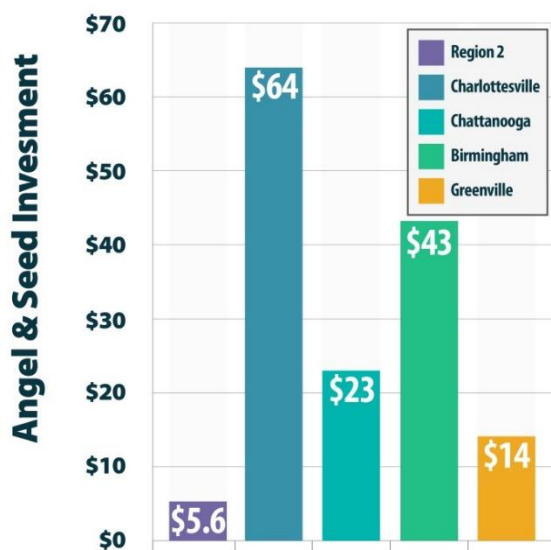
## Comparison with Peers

When comparing angel and seed investments in Region 2 to peers, the difference was striking. Companies in Charlottesville raised more than 11 times the angel investment than Region 2 companies, while Chattanooga, Birmingham, and Greenville raised 4 times, 8 times, and 3 times more than Region 2, respectively. The “Comparison of Angel & Seed Investments” chart below demonstrates the regional differences in funding at this stage.

### Angel Investing Take-Away

Companies in peer regions raised 3-11 times more angel investments than companies in Region 2.

*Comparison of Angel & Seed Investments*



Unlike its peer regions, Region 2 lacked either an organized seed fund or a managed angel group during the 2015-2018 period of analysis. A new Virginia Tech Carilion Seed Fund was announced in December 2018, and Valleys Innovation Council hosted a series of angel investing seminars in the region in the fall of 2018 to educate and gauge regional interest in the creation of a new managed angel investor group.

With a standout \$64 million in angel and seed fund investments, Charlottesville is home to two angel groups, the Charlottesville Angel Network and CAV Angels, plus a university-based seed fund launched in 2015 to support new ventures emerging from research, the UVA Licensing and Ventures Group (LVG) Seed Fund. The National Venture Capital Association named Charlottesville the fastest-growing venture capital ecosystem in 2016.

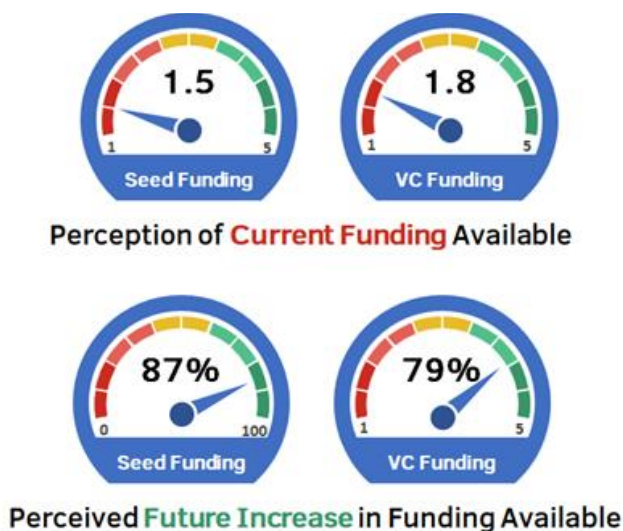
## Survey Findings: Regional Perceptions

In the Fall of 2018, Valleys Innovation Council and Virginia Tech Pamplin College of Business conducted a survey of entrepreneurs, investors, professional services providers, and entrepreneurial support organizations to gauge their perceptions of the strength of the regional capital ecosystem to support innovation-based, early-stage companies. The survey asked respondents for their perceptions of the current entrepreneurial activities and state of risk capital from seed through venture capital in the region, as well as their projections for how these activities and funding would change over the next three years (2019-2021). For a copy of the survey instrument, please email the Capital Ecosystem Development Project Team ([capeco@valleysinnovation.org](mailto:capeco@valleysinnovation.org)).

Forty (40) participants provided responses to the survey with several respondents having experience in multiple roles in the regional ecosystem. For more details on their responses and other materials related to this study, visit the Valleys Innovation Capital Ecosystem Development site at [www.valleysinnovation.org/project-capeco](http://www.valleysinnovation.org/project-capeco)

When asked to assess seed funding and venture capital availability in the region, respondents consistently felt that there were less than adequate amounts of both. These perceptions of the current regional capital landscape for seed and venture capital funding, as shown in the figure below, align with this study's quantitative findings.

### Survey Respondents' Perceptions of Funding Available in Region 2



Interestingly, however, respondents were uniformly optimistic with a positive forecast for the availability of future seed and VC funding in the region. This optimism was also reflected in a general sense that the broader entrepreneurial ecosystem is moving into an upswing with more investable companies emerging and increasing early-stage fund availability for innovation-based startups.

As a note, the survey was conducted around the same time as Valleys Innovation Council hosted a series of angel investing seminars and the new VTC Seed Fund was announced in late 2018. This may have led to increased optimism on the part of survey participants in their future-focused responses.

# Public Sector Support Programs: Federal and State

The earliest stages of innovation are considered the riskiest to private investors as technologies are still under development and markets may be emerging rather than legacy markets. In the United States, this stage of development is often supported by government grant programs that subsidize the costs of initial research and commercialization work outside of research institutions such as higher education or federal laboratories. These programs are particularly attractive to companies at this stage of development because they do not have to be repaid and are nondilutive forms of capital, meaning they do not take equity ownership in the startups. This section provides an overview of and insights into these programs, including the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs that are collectively referred to as “America’s Seed Fund.” State-level programs, largely affiliated with Virginia’s Center for Innovative Technology (CIT), are also covered in this section.

## SBIR & STTR Grants

The U.S. Small Business Administration’s Office of Investment and Innovation coordinates federal government support for technology commercialization in fields with identified needs for research and development through the SBIR and STTR grant programs. To receive funding through these highly competitive programs, firms must be for-profit, U.S.-owned and operated enterprises with fewer than 500 employees. Over \$40 billion has been invested since the SBIR program began in 1982 and the establishment of STTR in 1992, and numerous success stories include such recognizable names as iRobot, Qualcomm, and Symantec.

### SBIR/STTR Firm Eligibility

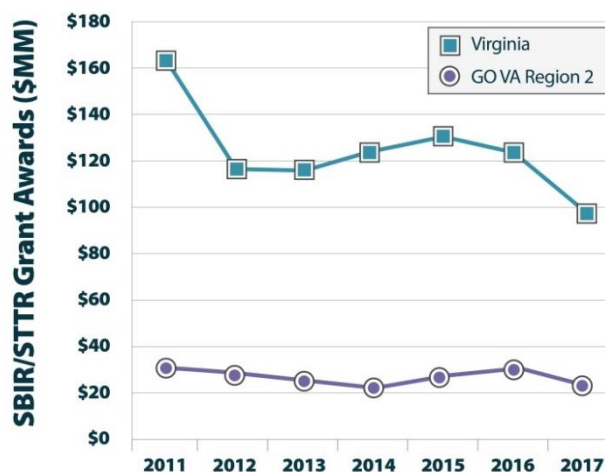
- ✓ For-profit entity
- ✓ US-owned and -operated enterprise
- ✓ <500 employees at time of award

The additional capital available through SBIR/STTR grants enables companies to demonstrate technology proof of concept and preliminary product development critical to de-risking the investment proposition. Once a company has successfully completed this phase, other funding sources ranging from angel investments to product sales are much more likely. Additionally, the peer review and technical diligence of the SBIR/STTR program provides a valuable “endorsement” of a product’s technical readiness that many investors prefer. These programs’ budgets are a direct percentage of each participating federal agency’s research and development budget and vary annually. As the federal research budget has contracted over time, so has funding for these programs.

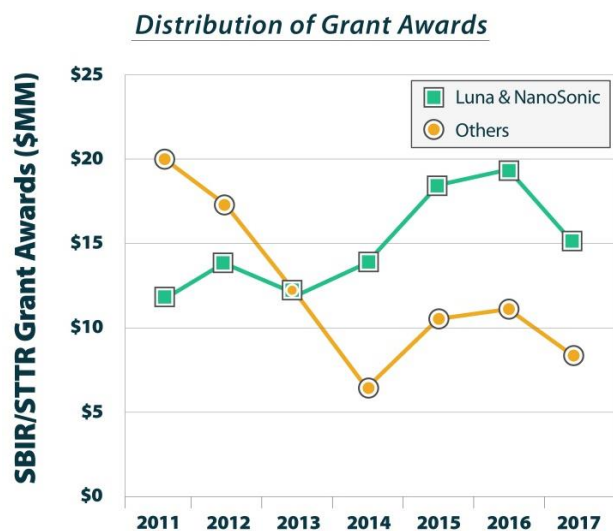
## Trends in Virginia and Region 2

Region 2 had the strongest showing for this category of funding support of all levels of risk capital investigated for this study. Companies in Region 2 have been very successful in winning SBIR/STTR grants over the years, enabling many promising products and early-stage businesses to advance toward commercialization, including Meridium, TechLab, and Synchrony. In 2017, Region 2 was home to companies receiving 22% of all SBIR/STTR grant dollars awarded in Virginia. With fluctuations in SBIR/STTR program funding over the period 2011-2017, Region 2 experienced a smaller decline in grant dollars (28%) relative

*Region 2 Comparison with Virginia*



to the commonwealth overall (40% decline) as shown in the “Region 2 Comparison with Virginia” chart. During this time frame, Region 2 companies were awarded \$193,389,834 of the \$877,451,439 total SBIR/STTR funds awarded to Virginia companies.



Although Region 2 received considerable SBIR/STTR grant funding, it is worth noting that two companies, [Luna Innovations, Inc.](#) and [NanoSonic, Inc.](#), received the majority of the SBIR/STTR awards and grant dollars during the study period. Over the last four years, Luna Innovations and NanoSonic received 64% (\$67 million) of the \$104 million in SBIR/STTR grant dollars for this region. To provide a more nuanced understanding of the region’s SBIR/STTR funding, it is beneficial to separate these two companies from other companies receiving SBIR/STTR grants as shown on left in the “Distribution of Grant Awards” chart. When the number, amount, and diversity of SBIR/STTR grants to companies other than Luna and NanoSonic are considered, a definite trend over time is observed. Since 2011, both

companies have increased their success in securing SBIR/STTR grant funding, while other Region 2 companies have had a significant decrease in SBIR/STTR grant awards.

## Peer Comparison

Region 2 significantly outperforms peer regions for SBIR/STTR grant funding with \$67 million in SBIR/STTR grants to the two companies noted above and \$37 million awarded to 29 other companies. The combined \$104 million in SBIR/STTR grant awards is \$30 million above the next closest region, Charlottesville, and nearly 10 times more than the other three regions as noted in the “Comparison of SBIR/STTR Grant Awards (2014-2017)” chart on the right. A similar number of Region 2 companies receive SBIR/STTR grants as Charlottesville, and both have a significantly higher number of SBIR/STTR recipient companies than any of the other peer regions (3-5 times higher).

### Federal Grants Take-Away

Region 2 significantly outperforms peer regions in SBIR/STTR grant funding.

**Comparison of SBIR/STTR Grant Awards (2014-2017)**



## Virginia Programs

The Commonwealth of Virginia has a number of programs to support and assist early-stage companies. These programs focus on companies during the startup stage by providing financial support through both grants and equity. Most of these programs are through the state-run [Center for Innovative Technology](#) (CIT), a non-profit Virginia



corporation that creates technology-based economic development strategies to accelerate innovation, imagination and the next generation of technology and technology companies.

### CIT GAP Fund

The CIT GAP Fund is a family of seed and early-stage investment funds placing convertible debt and equity investments in Virginia-based technology, life science, and cleantech companies with a high potential for rapid growth

and significant economic return for entrepreneurs, co-investors and the Commonwealth of Virginia. Since the first CIT GAP Fund was launched in 2007, approximately \$29 million has been invested into 210 Virginia companies. Between 2011 and 2018, eight companies located in Region 2 received funding through the CIT GAP Fund, bringing the total funding since program inception to \$1.3 million (4.5% of total GAP Funds deployed in Virginia).

Region 2 Companies CIT GAP Fund Investments (2011-2018)	
Number of Companies	Amount Invested
8	\$1,004,912

### Virginia Founders Fund

A new fund (2018) in the CIT family of GAP funds, the purpose of the [Virginia Founders Fund](#) is to support minorities, women, veterans, and entrepreneurs located in regions outside of Northern Virginia with startups in the software, hardware, life science, cleantech, and technology-enabled services sectors.

### Commonwealth Research Commercialization Fund

Administered by CIT, [the Commonwealth Research Commercialization Fund](#) is intended to accelerate innovation and economic growth in Virginia by advancing solutions to important state, national, and international problems through technology research, development, and commercialization. Commercialization grants of \$50,000 are available to companies to assist with technology development (proof-of-concept or prototype development). Since the CRCF was started in 2012, 306 grant awards totaling \$25,278,666 have been made through a variety of grant programs. Private companies are eligible for some programs while some programs target university and research entities. The CRCF also supports companies' applied and translational research through SBIR/STTR training and educational programs as well as an SBIR matching fund grant program.

CRCF Grants to Region 2 Companies (FY2012 – 2018)		
	Number	Amount
<b>Commercialization Grants</b>	13	\$627,125
<b>SBIR Matching Grants</b>	12	\$599,774
<b>TOTAL</b>	<b>25</b>	<b>\$1,226,899</b>

Since the fund's inception in FY2012, \$6,732,509 Commercialization grant awards have been made to 92 Virginia companies while \$4,175,316 SBIR/STTR Matching grant awards have been made to 82 companies. During this period, Region 2 companies received 9.3% (\$627,125) of the Commercialization grants and 14.6% (\$599,774) of the SBIR/STTR Matching grants.

CRCF also supports applied and translational research at institutions of higher education. The Eminent Researcher Recruitment program awards grants of \$250,000 to assist in the attraction of top research faculty. The Matching Funds program provides grants of \$100,000 to leverage federal,

CRCF Grants to Region 2 Universities (FY2012 – 2018)		
	Number	Amount
<b>Eminent Researcher Recruitment</b>	4	\$1,000,000
<b>Matching Funds</b>	20	\$1,962,068
<b>TOTAL</b>	<b>24</b>	<b>\$2,962,068</b>

private, and non-Commonwealth of Virginia funds designated for commercialization. Since the CRCF was established in 2012, \$13,870,841 has been awarded across the Commonwealth. Twenty-one percent of these grant dollars, or approximately \$3 million, have been awarded to universities located in Region 2.

### Virginia Catalyst

Virginia Catalyst is a competitive grant funding program that awards grants ranging \$200k to \$800k to further life science commercialization projects through university-industry collaborations. Since the Virginia Catalyst program started in 2014, grant awards of \$13.89 million have been made to collaborations among Virginia universities and life science companies. Six of the grants awarded (\$4.44 million) were made to collaborations with companies located in Region 2 (32% of the total).

### Virginia Angel Investor Tax Credit

Along with approximately 20 other states, Virginia provides a tax credit to Virginia taxpayers who make angel investments in Virginia companies. One reason for the popularity of these tax credit programs is that the state's "investment" is made after an individual angel has made their decision thereby leveraging the private sector's investment.

<b>Virginia Angel Investor Tax Credit (2011-2017)</b>		
<b>Tax Year</b>	<b>Number of Returns</b>	<b>Amount of Credit</b>
<b>2011</b>	183	\$ 1,616,988
<b>2012</b>	190	\$ 2,062,140
<b>2013</b>	234	\$ 1,932,017
<b>2014</b>	254	\$ 2,361,657
<b>2015</b>	241	\$ 2,096,539
<b>2016</b>	218	\$ 2,382,504
<b>2017</b>	247	\$ 2,183,736
<b>TOTAL</b>	<b>1,567</b>	<b>\$14,635,580</b>

The tax credit offers as much as 50% of the amount of the individual investment up to an annual limit of \$50k/year that can be carried forward over a 15-year period. After an investment is made, the individual applies to the Virginia Department of Taxation for the credit. The credit is awarded based on the number of applicants, the total amount requested, and the overall amount available in the program. The amount appropriated by the Commonwealth to this program has varied over the years, but in general, has provided tax credits in the 30-50% range. Virginia granted approximately \$14.6 million between 2011-2017 to leverage individual angel investments.

## Summary and Recommendations

The success of high-growth companies depends on them having adequate access to multiple sources and different types of capital appropriate for each stage of growth. Accessibility to the entire continuum of early-stage financing sources is critical for the success of promising high-growth companies.

### *Risk Capital Investment (2015-2018)*

	Charlottesville	Chattanooga	Birmingham	Greenville	Region 2
<b>TOTAL \$'s</b>	<b>\$276M</b>	<b>\$196M</b>	<b>\$147M</b>	<b>\$55M</b>	<b>\$141M</b>
<b>Venture Capital</b>	<b>\$138M</b> (23)	<b>\$167M</b> (21)	<b>\$93M</b> (11)	<b>\$30M</b> (15)	<b>\$32M</b> (7)
<b>Seed</b>	<b>\$9M</b> (7)	<b>\$12M</b> (5)	<b>\$5M</b> (5)	<b>\$0.4M</b> (1)	<b>\$0.2M</b> (1)
<b>Angel Investors</b>	<b>\$55M</b> (14)	<b>\$11M</b> (9)	<b>\$38M</b> (18)	<b>\$14M</b> (7)	<b>\$5M</b> (10)
<b>SBIR/STTR Grants</b>	<b>\$74M</b> (33)	<b>\$6.3M</b> (8)	<b>\$11M</b> (10)	<b>\$11M</b> (6)	<b>\$104M</b> (31)
<b>Acceleration</b>	<b>15</b>	<b>31</b>	<b>38</b>	<b>12</b>	<b>15</b>

- Cell color denotes the relative amount of capital deployed; green=high, yellow=medium, red=low
- The \$ amount is noted followed by the number of companies receiving financing in parentheses
- Data includes Angel Investors, Seed and Venture Capital equity investments between 2015-2018 (Source: PitchBook)
- Due to data availability, SBIR/STTR grant awards are 2014-2017 (Source: SBIR.gov)
- Acceleration is the number of companies participating in an incubator/accelerator program between 2015-2018; includes programs in and out of each region (Source: PitchBook)

When Region 2 is compared with other peer regions across the types of financing, companies in Region 2 clearly lag their counterparts in raising equity investments (angel, seed, and VC). As noted in the Risk Capital Investment figure, the relative strength of each category is color-coded with green indicating a high level of capital, yellow indicating medium, and red indicating a low amount of capital. An area of strength for Region 2 is the significant amount of SBIR/STTR funding received by companies. However, the success in securing SBIR/STTR grants does not appear to translate into equity investments as companies progress from product development into initial commercialization. A review of the Region 2 Capital Stack shown in the following table, "Scan of Region 2 Capital Stack," identifies several areas of weakness and gaps in the types of capital available.

## **Scan of Region 2 Capital Stack**

<b>Venture Funds</b>	Limited; Series A Fund in region includes VTC Innovation Fund
<b>Formal Angel Groups</b>	Not present in region; in development
<b>Individual Angels &amp; ad hoc Angel Groups</b>	Limited; Apex CIE has a network of alumni who invest in Virginia Tech-affiliated startups and Common Wealth Growth Group leads Series A rounds with angel co-investors.
<b>Commercialization Seed Funds</b>	Limited state support: CIT GAP Fund; New VTC Seed Fund started
<b>Grants for Science &amp; Tech Companies</b>	Limited state support: CIT CRCF; CIT SBIR Matching Program; Virginia Catalyst Program.
<b>Pitch Competitions &amp; Acceleration</b>	RAMP provides acceleration mentoring. Gauntlet awards cash/in-kind prizes through competition, open to all business types. Virginia Tech and Liberty University run student pitch programs with cash prizes. StarTank is a community-based annual pitch program.
<b>Applied &amp; Translational Research</b>	State support of programs for commercially-oriented university research is limited; CRCF Eminent Research & Matching Fund Programs

Based on the weaknesses and gaps identified in the Scan as well as the results of the landscape study, several recommendations to strengthen the capital ecosystem are put forward for consideration.

## Recommendations

### **1 Organize and sustain a managed angel investing group to systematically connect founders and investors to complement the VTC Seed Fund.**

Because there is currently no managed angel investor group in Region 2, there is limited angel investing. By contrast, Charlottesville, Birmingham, and Chattanooga have multiple angel groups. This study recommends that Region 2 launch a professionally-staffed angel group. This recommendation is in line with prevailing best practices for angel groups, the expressed preferences of angel seminar attendees from a December 2018 session, and the recognition that volunteer-led angel groups often have sustainability challenges.

Managed angel investor groups actively vet investment opportunities to identify those companies that are likely to be a fit for the angel investors. By vetting multiple companies for a large number of angel investors, the “matchmaking” process is improved and results in a better fit between investors and companies. This active facilitation and structured process provides significant benefits to angel investors, the companies, and the entrepreneurial ecosystem.

Another critical role that angel groups play in an ecosystem is to serve as an onramp for companies to access follow-on investment from capital sources outside the immediate region. Seventy-three percent (73%) of angel group investments include other angel groups or VCs as co-investors in the round ([ACA](#)). By diversifying the capital sources supporting companies, companies' financing risk is decreased as is the risk for their investors.

Lastly, a fundamental tenet of angel investing best practices is to approach investing with the goal of developing a diverse portfolio consisting of multiple investments. Studies examining angel investment returns have shown this risk-mitigation strategy to be a successful approach ([Wiltbank & Brooks](#), [ACA TAA](#)). Angels with 12 investments over a period of five years or more have a 75% chance of a 2.6 times return on their investment dollars ([ARI Angel Returns Study](#)). By investing as part of a group, angel investors are able to more quickly build a diversified portfolio thereby increasing the likelihood of successful returns. This diversified portfolio approach helps investors avoid large losses on single or relatively few investments.

### **1a Leverage and support the new VTC Seed Fund.**

Many capital ecosystems have seed funds to help bridge the financing gap for companies that may still be developing a product or may be in the early-stage of customer engagement such as product beta testing. For example, in the peer region of Charlottesville, the University of Virginia launched a \$10 million Seed Fund in 2015 for UVA startups. In Region 2, the new \$7 million [Virginia Tech Carilion Seed Fund](#) was announced in December 2018 and is likely to play an important role in Region 2's capital stack. It is typical for seed funds, individual angel investors, and angel groups to co-invest as part of a round of early-stage financing. With multiple funding partners, a larger aggregate amount of investment can be raised by a company to achieve the next commercially-relevant milestone. As a company progresses, they become a better fit for additional types of financing, such as venture capital. Seed funds typically have relationships with later-stage investing partners, such as VCs, which provide productive formal introductions.

### **1b Provide regular education/information sessions on angel investing best practices for investors, entrepreneurs, and the broader entrepreneurial ecosystem.**

These types of sessions can help build a stronger early-stage investor community and attract new angel investors to the network, which will have natural ebbs and flows in membership. These may also help entrepreneurs to identify the type of financing that is most appropriate for their company.

## **2 Leverage federal early-stage commercialization grant funding (SBIR/STTR) with additional commercialization programming (such as I-Corps) to foster firm development.**

Region 2 receives significant SBIR/STTR grant funding which helps companies to accomplish preliminary product development and demonstrate technology proof of concept. However, transitioning into commercial product development is complex and sometimes requires significant capital and often domain expertise to bring new technology products to market. Fortunately, there are a number of existing programs designed to assist technology companies with customer-discovery and lean startup approaches. Initially designed for National Science Foundation sponsored investigators, the successful [I-Corps program](#) has expanded and is now offered by other federal research funding agencies to assist their investigators as well. Virginia Tech is a member of the

Washington, DC node of I-Corps and provides regular programs in addition to individual counseling. A similar program, the [Innovation Commercialization Assistance Program](#) (ICAP, through the Virginia Small Business Development Center), helps inventors and entrepreneurs to bring new technologies and innovations to market through short-courses offered across Virginia and ongoing mentoring/advising.

As described earlier, Virginia, like most states, provides educational/training sessions on the SBIR/STTR program and some matching funds. In addition to these programs, twenty states also provide support services that assist first-time applicants to secure SBIR funding and to help companies strengthen commercialization plans for Phase II grant proposals. Since companies in Region 2 are successfully winning SBIR/STTR grants, new programs to strengthen commercialization plans should be considered such as piloting an “SBIR/STTR Acceleration Program.”

### 3

#### **Increase linkages and connections between angel groups, venture capital sources and fundable firms, regionally and nationally.**

As revealed by the study, venture capital investments in Region 2 are very low. Multiple strategies to improve connections to VCs should be pursued. As part of the early-stage investing process, attention should be dedicated to syndicating rounds of financing with investors outside of Region 2. As noted in the previous recommendations, forming an angel investing group and working closely with the new seed fund will increase connections to other investors and downstream capital sources, such as venture capital firms. Existing individual and institutional relationships to VC firms should be leveraged and strengthened by formal programs. The region will also need to forge relationships with domain-specific VC firms that align with existing and growing industry clusters.

Other programs to attract early-stage VC firms to “get to know” Region 2 should also be considered. For example, the Founders & Funders group, an informal quarterly meeting of regional capital ecosystem stakeholders, has begun to attract investors from outside Region 2. This type of connector meeting should be encouraged, supported, and sustained. Currently, this effort is reliant on one individual with local sponsors supporting luncheon costs. Other types of successful programs used in regions include “roadshows” that assist in getting local companies in front of potential VC investors. These typically leverage existing connections in the region to VCs. Unfortunately, the cost (time and dollars) of raising capital is not always fully appreciated by early-stage companies and can result in promising companies not having sufficient financial resources to attend specific investor conferences/meetings. As part of the “roadshow” strategy, consideration should be given to programs that could support company travel to investor meetings/conferences. The development and maintenance of these connections and relationships will take time and attention to demonstrate that companies can be successfully scaled in the region.

### 4

#### **Task Valleys Innovation Council to monitor capital access issues for high-growth start-ups in Region 2, develop strategies to assure access to the continuum of capital sources, and consider further research into the sustainability of the regional capital ecosystem.**

Possible areas of research might include:

- Sustainability of current and future regional angel, seed, and venture funding sources
- Analysis of Virginia versus peer states’ tax credits and other incentive programs that encourage small business investments
- Deeper research into peer capital ecosystems with a focus on additional early-stage financing sources
- Opportunity Zone funds



# Appendix

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## Acknowledgments

### Sponsors

We express our deep appreciation to the sponsors of the Valleys Innovation Council and the Capital Ecosystem Development Project. The sponsors of VIC include Virginia Tech and Carilion Clinic. Project sponsors include GO Virginia, Roanoke County, the City of Roanoke, and the Pamplin College of Business at Virginia Tech.



We would also like to express our appreciation to following individuals and organizations for kindly providing data and for their assistance with the study and report.

Monique Adams, 757Angels	Devon Laney, Innovation Depot
Susan Austin, FIN Capital & Angel Capital Association	Robert McAden, Roanoke-Blacksburg Technology Council
Charlie Brock, formerly of LaunchTN	Kip McCoy, Central Illinois Angels
Robert Brooke, CRCF SBIR Program	Ben Pidgeon, VisionTech Angels
Nicholas Buehring, Buehring Design	Bob Stolle, CIT
Sean Collins, VT APEX Center for Entrepreneurs	Suzanne Taylor, Virginia Catalyst (VBHRC)
Cole Dudley, South Carolina Research Authority	Nancy Verona, CIT CRCF
Matt Dunbar, VentureSouth	Virginia Department of Taxation
Ross Finlay, First Angel Network & Angel Resource Institute	Jonathan Whitt, Liberty University
Jim Flowers, VT KnowledgeWorks	Tom Weithman, CIT GAP Funds

## About the Capital Ecosystem Development Project Team

**Sam English, Ph.D.** serves as VIC Practitioner-in-Residence leading the project and is a successful entrepreneur and community leader who has championed the growth of Region 2 through his startup, consulting, and non-profit activities. Working with the region's entrepreneurs, early-stage companies, and investors, he has founded and advanced multiple startup companies and worked with numerous entrepreneurs to advance their inventions through product development and commercialization helping them to secure \$9 million of early-stage financing. He has been an active part of building the region's capital ecosystem serving on the RBTC and Innovation Blueprint Access to Capital Committees and helped to organize the NewVA Fund (a regional \$15 million investment fund) and a regional angel investor group, 460Angels.

**Greg Feldmann**, one of the region's most experienced investment professionals, currently serves as Interim CEO of Valleys Innovation Council. He served as the Senior Advisor to The Launch Place for its Seed and Pre-Seed Funds and currently serves on the governing board of the Launch Place. The Launch Place, with locations in Raleigh, N.C. and Danville, Va., is a non-profit business incubator with a focus on helping entrepreneurs, existing and new business owners succeed through consulting, mentoring, training and coaching programs. In addition, Greg organized and leads the Founders & Funders meetings, a group of capital ecosystem stakeholders who meet quarterly. Greg is also President of Skyline Capital Strategies, LLC, a business advisory firm, Chairman of the City of Roanoke Pension Board, and a Director of Carter Bank and Trust company, a \$4 billion Virginia based community bank.

**Kevin Carlson, Ph.D.** is the Associate Dean for Research and Faculty Affairs at the Pamplin College of Business at Virginia Tech and leads the University's collaboration on the capital landscape study and report. His teaching interests include staffing, recruitment, training and development, turnover, productivity improvement, human capital metrics, and analytics and the effective use of technology in organizations. He is responsible for oversight of Pamplin's two centers, the Apex Systems Center for Innovation and Entrepreneurship and the Center for Business Intelligence and Analytics. His current research interests center on improving individual and organizational effectiveness.

**Meredith Hundley, Ph.D.** is the Program Director for the Valleys Innovation Council supporting the capital ecosystem project as part of VIC's broader focus on strengthening the region's innovation-based economy. She is leading the design and implementation of the Valleys Innovation Dashboard and has worked on the regional initiative to evolve the Roanoke-Blacksburg Innovation Network into the Valleys Innovation Council. Previously, she was part of a team that developed and implemented the Beyond Boundaries: Envisioning the Future of Virginia Tech presidential visioning initiative and Virginia Tech's Presidential Search and worked with community leaders on an initiative that led to the development of the Roanoke Valley Broadband Authority.

**L. Maria Ingram** served as a Research Associate early in the project conducting informational interviews with regional entrepreneurs and investors and designing the survey. She is a doctoral student at Virginia Tech.

**Pratyusha Kiran** serves as a Research Associate with Valleys Innovation Council. She created the interactive data visualization dashboards available on the Valleys Innovation website. She is a doctoral student at Virginia Tech.

**Don Chen** serves as a Valleys Innovation Council Research Assistant. He assisted with data collection and event planning on the Capital Ecosystem project. He is a Virginia Tech undergraduate student in the Pamplin Business School.

## About the Capital Ecosystem Development Survey

The survey used in this research was designed to elicit perception data supporting the transaction data included in the Capital Landscape Study. Subjects contacted to participate in this research included entrepreneurs, investors, and other ecosystem support workers and stakeholders (such as attorneys and accountants) involved in the operation and development of high-growth, technology-based companies in Region 2.

A link to a Qualtrics survey was distributed by e-mail to the Roanoke-Blacksburg Technology Council membership, the Lynchburg Business Alliance, the Entrepreneurial Coalition and key individuals of influence in the region. Links to the survey were also included as part of event registration and communications for a series of seminars and workshops around angel investing. Respondents were also encouraged to forward the survey to other individuals they know who meet the description of the target population. A total of 40 subjects provided full or partial completion of the survey. This was well below the target of 150 responses. The study team conservatively estimates the total potential of individuals in Region 2 in the target population as at least 300.

After providing consent for use of his/her responses, a subject was forwarded to the survey itself. Data were collected both voluntarily and confidentially. Only the initial question to identify participants' role(s) in the ecosystem was a required response. Participants could elect to not answer any questions. Results are released in the aggregate only and to ensure the data cannot be used to identify particular respondents.

For more information or details on the survey instrument or findings, please visit the Valleys Innovation Capital Ecosystem Development Project page at [www.valleysinnovation.com/project-capeco](http://www.valleysinnovation.com/project-capeco) or contact the project team at [capeco@valleysinnovation.org](mailto:capeco@valleysinnovation.org).

## Glossary

**Accelerator:** Fosters early-stage companies until they have the resources to function independently. Typically provides business mentorship and expert services, physical resources such as workspace and office equipment, and access to informational and research resources. Services are sometimes provided in exchange for an equity interest. A regional example is RAMP (see in this glossary).

**Accredited Investor:** As described in SEC in Rule 501 of Regulation D, accreditation is a requirement for angel investors. Briefly, individuals must have an annual income exceeding \$200,000, or \$300,000 for joint income, for the last two years with the expectation of earning the same or higher income in the current year, or a net worth exceeding \$1 million, either individually or jointly with a spouse.

**Angel:** A type of investor focused on funding scalable small startups in exchange for ownership equity or convertible debt. May act individually or in groups, can provide expertise and advice in addition to funding, and are often entrepreneurs themselves. Often bridge between a company's self-funding stage and traditional venture capital interest. Individual angel investments may be as small as \$5,000 to over \$100,000.

**Angel Capital Association (ACA):** North America's largest group of accredited angel investors, and the largest angel professional development organization in the world.

**Angel Group/Angel Network:** Groups of angels that meet on a regular basis and agree to specific investments; Average \$200,000/investment.

**Angel Resource Institute (ARI):** Non-profit organization that collaborates with many partners including Pitchbook and more than 250 angel groups to provide first-class educational workshops and published research.

**Applied Research/Translational Research:** University research that advances the development of a technology toward a potential product taking into account market needs and product requirements. Translational Research typically refers to biomedical technologies being developed for clinical applications.

**Benchmark:** Broadly, a standard against which the performance can be measured. Locally, an indicator of how the innovation economy in the Lynchburg-New River Valley-Roanoke Valley region compares to other similar regions.

**Bootstrap:** When a founder starts a company with little to no assets and relies solely upon personal savings, sweat equity, and revenue from the business to further business growth without outside capital investment.

**Burn rate:** The rate at which a new company expends funds on overhead before generating positive operational cash flow.

**CIT GAP Funds:** A family of seed and early-stage investment funds placing near-equity and equity investments in Virginia-based technology, life science, and cleantech companies with a high potential for rapid growth and significant economic return for entrepreneurs, co-investors and the Commonwealth of Virginia.

**Center for Innovative Technology (CIT):** A non-profit Virginia corporation that creates technology-based economic development strategies to accelerate innovation, imagination and the next generation of technology and technology companies.

**Commercialization:** The process of introducing new products or services to the general market. Includes distribution, marketing, sales, and customer support required to achieve the commercial success of the new product or service.

**Commonwealth Research Commercialization Fund (CRCF):** Administered by CIT, this fund is intended to accelerate innovation and economic growth in Virginia by advancing solutions to important state, national, and international problems through technology research, development, and commercialization.

**Convertible Note:** A debt instrument often issued by angel or seed investors looking to fund early-stage startups where initial valuation is difficult. Serves as a valuation placeholder until a more objective determination can be made, often prior to venture capital investment.

**Deal Flow:** The rate at which business proposals and investment pitches are being received by investors. It is an indicator of a capital ecosystem's health.

**Exit:** An exit is a liquidity event that enables the owners of a company, including investors, to sell their ownership. Typical exit events include mergers and acquisitions (M&A) and initial public offerings (IPO).

**Exit Strategy:** An exit strategy is an entrepreneur's strategic plan to sell his or her ownership in a company to investors or another company. An exit strategy gives a business owner a way to reduce or liquidate his stake in a business and, if the business is successful, make a substantial profit.

**Growth Potential:** A business's future ability to generate larger profits, expand its workforce and increase production. Growth potential can be gauged from an organization's planned movement into new markets, the development of new product lines, the employment of more effective marketing techniques, or other methods that grow a business from a niche market to a more volume operation. Growth potential is often a barometer for investment interest from public and private investors, venture capitalists and other stakeholders.

**Incubator:** An entity geared toward nurturing the success of startup and early-stage companies through various means of financial, mentoring, and operational support, sometimes in exchange for an equity interest. Often serve as a conduit between entrepreneurs, investors, ecosystem partners local governments or universities.

**Initial Public Offering (IPO):** The very first sale of stock issued by a company to the public. Prior to an IPO, the company is considered private, with a relatively small number of shareholders made up primarily of early investors (such as the founders, their families and friends) and professional investors (such as venture capitalists or angel investors).

**Intellectual Property:** A broad categorical description for the set of intangibles owned and legally protected by a company from outside use or implementation without consent. Intellectual property can consist of patents, trade secrets, copyrights, and trademarks or simply ideas.

**Late Stage Funding:** Capital provided after commercial manufacturing and sales but before an IPO. The product or service is in production and is commercially available. The company demonstrates significant revenue growth, but may or may not be showing a profit. It has usually been in business for more than three years.

**Mezzanine (bridge) financing:** A hybrid of debt and equity financing that gives the lender the right to convert to an equity interest in the company in case of default, generally after venture capital companies and other senior



lenders are paid. Typically offered to companies that have an industry track record, an established reputation and product, a history of profitability and a viable expansion plan for the business.

**Minimum Viable Product (MVP):** A product with only a basic set of features, but enough to capture the attention of early adopters in order to test the product and market demand as a way avoid failures and large capital losses.

**Pre-Seed:** The first stage of capital used to fund initial startup costs for a new business, often coming from the founders' personal assets, friends or family in exchange for an equity stake.

**Private Equity:** Financing by funds and investors that directly invest in private companies not listed on a public exchange which usually involves a change in ownership and/or operational control. Primarily from institutional and accredited investors, who can dedicate substantial sums of money for extended time periods.

**Proof of Concept (POC):** Evidence that a product is feasible. Providing POC is one way for startups to demonstrate that a product is capable of being developed.

**Regional Acceleration and Mentoring Program (RAMP):** A technology business accelerator program for Region 2 launched in Spring 2017. RAMP's mission is to propel high-potential startups in the region to expand and create jobs in the STEM-H fields.

**Research Commercialization:** Where government funding blends with institutionalized academic research in an attempt to produce commercial products or services that will benefit both government and educational organizations involved.

**Scalability:** Describes a company's ability to perform well and potentially expand in response to increasing demands for workload or operational scope. A scalable company is one that can maintain or improve profit margins while sales volume increases, and is, therefore, more attractive to investors.

**Seed Fund:** Equity-based investment fund of pooled capital (LLP) sometimes affiliated with an Angel Group, referred to as a "side-car"; Investment amounts vary based on fund size.

**Seed Investment:** Used to support market research and early product development and to develop an MVP (Minimum Viable Product).

**Series A Investment:** The first round of external equity financing from an investment firm (typically venture capitalists) after bootstrapping and seed capital funds have been raised.

**Series B Investment:** The second round of equity financing for a business, which generally occurs once a company has accomplished certain performance milestones.

**Small Business Innovation Research Program (SBIR):** The Small Business Innovation Research (SBIR) program is a highly competitive program that encourages domestic small businesses to engage in Federal Research/Research and Development (R/R&D) that has the potential for commercialization.

**Small Business Technology Transfer (STTR):** The Small Business Technology Transfer (STTR) is another program that expands funding opportunities in the federal innovation research and development (R&D) arena. The unique feature of the STTR program is the requirement for the small business to formally collaborate with a research

institution in Phase I and Phase II. STTR's most important role is to bridge the gap between the performance of basic science and commercialization of resulting innovations.

**Sponsored Research:** Research funded by competitive grants, usually without a commercialization focus, where a university owns any resulting intellectual property.

**Venture Capital:** Later-stage financing to small businesses with long-term growth potential, after the seed and angel-level investment stages. Typically entails higher risks (and potentially high returns) for the investor, but can result in less decisional autonomy for the entrepreneur.

**Virginia Catalyst (VBHRC):** a competitive grant funding program to further life science commercialization projects with collaborations of Virginia universities and industry.

**Virginia Founders Fund:** A new fund in the CIT family of GAP funds, the Virginia Founders Fund's purpose is to support minorities, women, veterans, and other entrepreneurs located in regions outside of Northern Virginia with startups in the software, hardware, life science, cleantech, and technology-enabled services sectors. Eligible businesses must be headquartered in Virginia.

**Virginia Tech Intellectual Properties (VTIP):** A 501(c)(3) affiliated corporation of the Virginia Tech Foundation which supports all aspects of intellectual property management and administration for Virginia Tech.