# Benchmarking Analysis of Business Incubators and Accelerators

June 29, 2016

The Evidence Network

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# Executive Summary

This report sheds light on the challenging question of how policymakers can best support innovation and economic development through venture support programs. We address this question by analysing: 1) the relative performance of business incubators and accelerators (BIAs), hybrid programs, and other forms of venture support; 2) the factors that explain the impact of BIAs and other venture support programs on a general level, and; 3) the potential implications of our conclusions for policymakers.

In this analysis, we have defined the following types of venture support programs:

- Incubator: We define a business incubator as a venture support program that provides dedicated office space to all of its client companies.
- Accelerator: We define a business accelerator as a venture support program that provides funding to all of its client companies.
- Hybrid: We define a hybrid venture support program as a venture support program that provides both space to some companies and funding to some companies.

We use three separate analytical approaches: Section 3 is a comparative analysis of the performance of different types of venture support programs; Section 4 groups the subset of business incubators and accelerators into high- and low-performing groups, then analyses the observed differences in program characteristics; Section 5 is a multivariate regression analysis of the mechanisms of impact, and which factors contribute to the effectiveness of programs.

Our objective is to answer three questions:

### 1) How do international incubator and accelerator programs perform compared to other venture support programs?

The examination of the 43 venture support programs in our dataset in Section 3, shows that business accelerators tend to achieve greater impact than other types of venture support programs. All seven of the business accelerators in our dataset are high-performing, and all the programs in the low-performing group were classified as hybrids.

### 2) What factors explain the impact of BIAs and venture support programs on a general level?

The comparisons of low- and high-performing BIAs in Section 4 suggest BIA performance is inversely related to program maturity. Section 4 identifies other common characteristics of high-performing venture support programs, including the provision of funding, smaller program size (fewer client companies), and the selection of smaller client firms. The finding that company size is inversely proportional to impact likely reflects the greater needs of early stage ventures for assistance.

The multivariate analysis in Section 5 shows that both the provision of financial support and the higher intensity of use of BIA support services are significantly associated with venture support program impact on companies' annual revenues and employment.

### 3) What are the implications of the above analyses for policymakers?

Our finding that BIA performance is inversely related to program maturity suggests that funders and program managers may wish to consider experimenting with new programs, and closing programs that are found to be ineffective. This implies measuring program effectiveness to determine which programs are high-performing and which are not.

Our finding that high-performing BIAs tend to combine the provision of knowledge-based services with the provision of funding suggests that the combination of services and funding together is more impactful than either alone. Of course the funding provided to ventures should be proportional to their stage of development, their potential for growth, and their requirement for funding.

Our finding that both the provision of financial support and the higher intensity use of BIA support services are significantly associated with venture support program impact on companies' annual revenues and employment provides further evidence that combining knowledge-based and financial support may be more effective than either type of support alone.

Finally, our finding that smaller programs tend to have greater impact suggests that a greater number of small programs may be more effective than a smaller number of programs that serve many clients. Small programs can be customized to service specific types of ventures: early stage, R&D intensive, high growth, etc.

# 1. Introduction

The purpose of this report is to provide data and analysis to support an effective, evidence-based policy framework to enable Finland's support of innovation-enabling Business Incubators and Accelerators (BIAs). To this end, we present an analysis of venture support programs' impact on companies' resources and capabilities, and performance, based on a meta-analysis of international programs.

The report is structured to answer the following three research questions:

- How do international incubator and accelerator programs perform compared to other venture support programs?
- What factors explain the impact of BIAs and venture support programs on a general level?
- What are the implications of the above analyses for policymakers?

The report draws on an in-depth analysis of data from 43 venture support programs. This data was collected and analyzed by The Evidence Network Inc. (TEN), a provider of evaluations and impact assessments for innovation-enabling organizations. Since 2009, TEN has provided evaluations of more than seventy organizations and programs including business incubators and accelerators, economic development organizations, research institutes, innovation funding programs, and technology transfer and commercialization organizations. The result is a rich database of venture support program characteristics and impacts on clients, which we've leveraged to create original and unique insights on the factors that explain the success of BIAs. Additional background regarding the data, sample characteristics, definitions of program types, and TEN's approach to impact assessment can be found in Section 2.

We have taken three approaches in our analysis of this data, each of which sheds light on an overlapping set of questions relevant to the design and implementation of BIA venture support programs. Section 3 presents findings from our benchmarking of business accelerators and incubator/accelerator hybrids relative to other venture support programs. This benchmarking analysis explores the relative performance of BIAs and other venture support programs, segmented by program type, with the goal of drawing conclusions regarding which program types are most impactful within the broad category of venture support programs. Section 4 presents findings from an analysis of the common characteristics of high-performing BIAs, using independent T-tests to identify program characteristics that are most commonly present in BIAs that achieve above-average impacts on their clients, with the goal of identifying the traits of impactful BIAs. Section 5 presents a linear regression model of program characteristics and impact measures on average performance of client firms, with the goal of modeling the explanatory factors that contribute to the success of BIAs, with a particular focus on identifying the impacts on resources and capabilities that are most likely to correlate with BIA client firm performance.

Our findings suggest that business accelerators are a particularly effective model for venture support programs, and that successful programs tend to exhibit common characteristics: program maturity, provision of funding, smaller program size, and the selection of smaller client firms. Section 6 offers further detail and actionable next steps for policymakers, with the goal of

empowering governments and program managers with the tools to build effective and innovative venture support programs.

# 2. Methodology

## Sample and Definitions

Our sample is composed of 43 venture support programs, defined as programs that provide knowledge-based services and possibly space or funding to ventures. Ventures are characterized as being relatively young companies. We have therefore limited the sample to programs whose clients have an average age of less than ten years. The sample has been drawn from programs in Canada, Finland, and China, with data from more than 4,000 client companies in total. Twenty programs were hosted by independent non-profit organizations, 19 were hosted by governments, 3 were hosted by universities, and 1 was hosted by private venture capitalists. In our sample, the newest programs have only been in existence for one year, while the oldest programs have been in existence for more than 30 years. Regarding number of clients, smaller programs have less than 50 client companies, while larger programs have more than 500 client companies.

In the forthcoming analysis, each program has been classified as an incubator, accelerator, hybrid, or other venture support program. The definitions used for program type classifications are as follows:

### Business Incubators (n=1)

A business incubator is defined as a venture support program that provides dedicated office space to all of its client companies. Business incubators typically also provide a targeted array of resources and services, such as: business services, training, advice, mentoring, and networking opportunities. While there were many programs in our sample that offered space to some clients, there was only one program that offered space to all its clients.

### Business Accelerators (n=7)

A business accelerator is defined as a venture support program that provides significant funding to all of its client companies. In contrast to business incubators, business accelerators typically share the following characteristics:

- A highly competitive selection process, with acceptance rates of 1-3% in the most prestigious accelerators
- Cohort-based, i.e. there are terms in which new classes enter, pass through the program, and then graduate with a final pitch or demo
- Tend to focus on teams rather than individual founders.[1]

[1] This definition is consistent with Miller and Bound, 2011 (Miller, Paul, and Kirsten Bound. The Startup Factories: The rise of accelerator programmes to support new technology ventures. NESTA, 2011.)

### Hybrids (n=7)

A hybrid venture support program is defined as a venture support program that provides space to some companies and funding to some companies.

### Other venture support programs (n=28)

Our sample includes a variety of innovation-enabling venture support programs which are not business incubators, accelerators, or hybrids. These programs all aspire to support business innovation, but do so using different models of program delivery. We have grouped these programs into a single category, in order to focus our analysis on the efficacy of business incubation and business acceleration models relative to alternatives.

## Impact Measures

The fundamental logic of venture support programs is that short-term impacts on client firms' resources and capabilities lead to long-term impacts on firm performance. Venture support programs have a direct impact on client firms by improving client firms' resources and capabilities. These impacts on firm resources and capabilities occur in the short term, typically less than one year. Impact on performance occurs in the longer term, typically within one to three years, and occurs as a result of improvements to resources and capabilities. Performance impact measures are essential indicators of programs' long-term success, while resources and capabilities impact measures provide timely data on the immediate and actual impact of programs' activities. A fulsome understanding of the impact and effectiveness of venture support programs requires a careful consideration of both categories of impacts, as shown in the figure below:

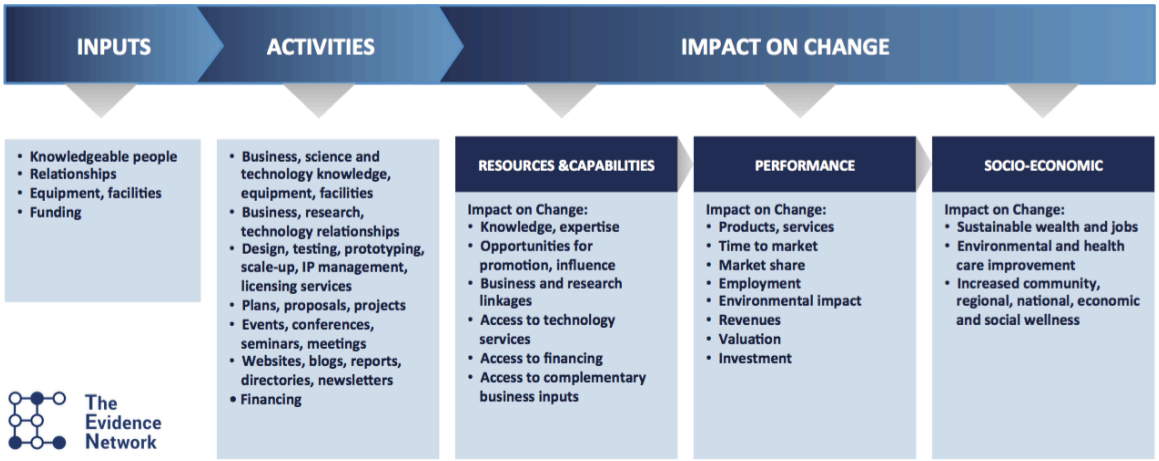



*Figure 1*

Consistent with the logic model shown above, and with the goal of achieving a more complete understanding of how venture support programs achieve their goals, our analysis considers eight measures of impact. These impact measures are categorized as either 1) Impacts on Resources and Capabilities, or 2) Impacts on Performance. We also consider average impact measures to assess and benchmark the programs' impact on client companies.

# 3. Comparison of business incubators and accelerators to other venture support programs

This section presents a comparative analysis of business incubators' and accelerators' impacts on client firms, relative to each other and to other forms of business support. Our goal is to analyze trends in the performance of different classes of venture support programs, and draw conclusions regarding which programs represent the best investment from an economic and public policy perspective.

## Impact on Resources and Capabilities

Our analysis of venture support program impacts on resources and capabilities considers four impact measures:

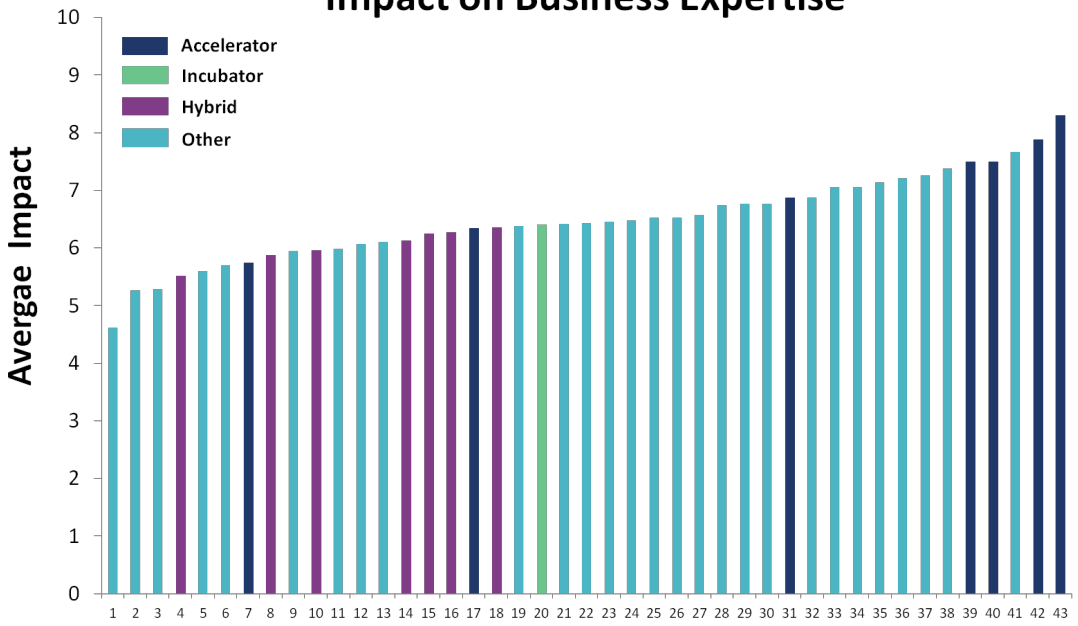
> *Impact on Business Expertise:* Expertise related to developing or improving business models, business plans, changes in business approach, marketing and sales, human resources, finance, intellectual property management, company operations, or project management.
>
> *Impact on Business Linkages:* Facilitation of relationships with corporate partners, customers, suppliers, service providers, or channel partners through collaborative projects, conferences, workshops, lectures, networking events, or other relationship-brokering activities.
>
> *Impact on Financial Linkages:* Facilitation of funding or financing by other equity investors such as financial angels, other groups providing grants, loans or tax benefits, as well as project-related funding from private or governmental sources.
>
> *Impact on Promotion:* Corporate exposure through participation in intermediary-supported projects, websites, participation in events such as national or international trade shows, engagements with strategic funders, conferences, or other outreach activities.

Table 3.1 shows The Evidence Network's analysis of venture support programs' impact on the resources and capabilities of their client firms. The charts that follow show the average impact for the selected measures on firms across all support programs.

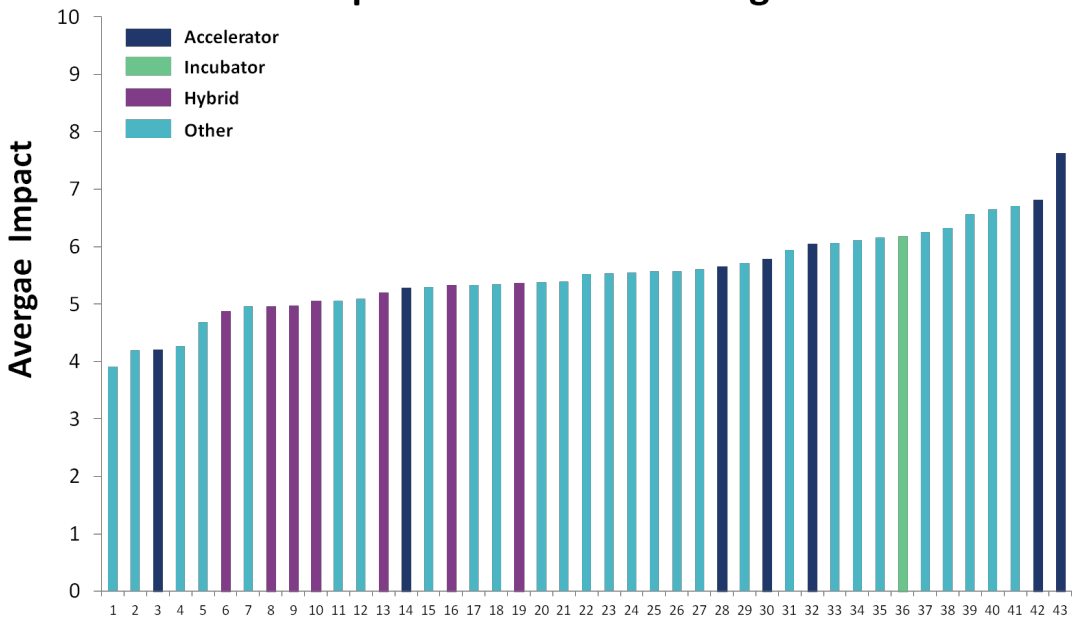
**Table 3.1: BIAs' Impact on Resources and Capabilities**

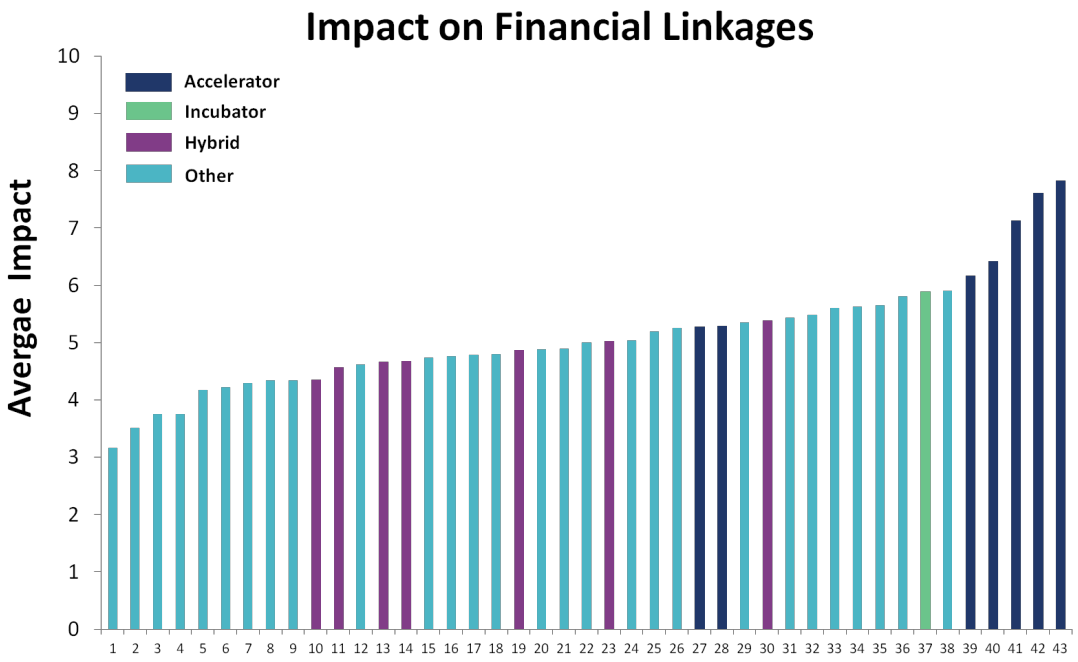
| Impact Measure | Program Type | |
|---|---|---|
| | Accelerators | Hybrids |
| Business expertise | Significant effect | Slight effect |
| Business linkages | Moderate effect | Slight effect |
| Financial linkages | Very significant effect | Slight effect |
| Promotion | Moderate effect | Slight effect |

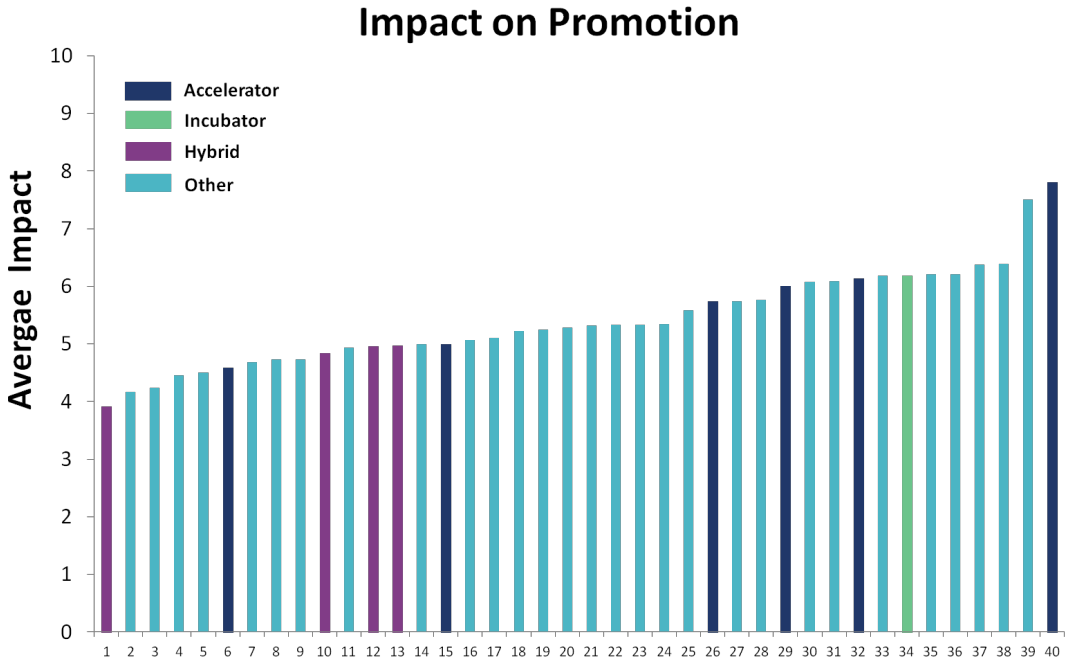
## Impact on Business Expertise




## Impact on Business Linkages






## Summary of Results

Business accelerators were, on average, very significantly effective in improving companies' financial linkages, significantly effective in improving companies' business expertise, and moderately effective in improving companies' business linkages and promotion capabilities.

Hybrid programs were slightly effective in improving companies' business expertise, business linkages, financial linkages, and promotion capabilities.

In terms of impact on capabilities and resources measures, business accelerators had the strongest impact among venture support programs in our sample; hybrid programs had lower impact.

## Impact on Performance

Our analysis of venture support program impacts on performance considers four impact measures:

- Impact in Investments Received
- Impact on Employment
- Impact on Annual Revenues
- Impact on Innovation[2]

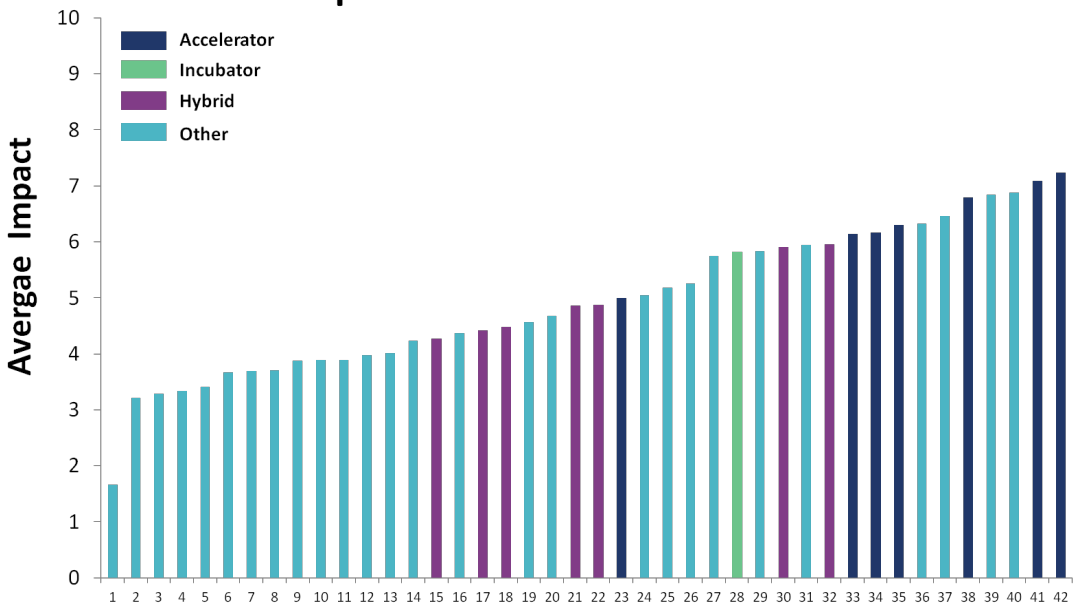
Table 3.2 summarizes The Evidence Network Inc.'s analysis of venture support programs' impact on company performance. The diagrams that follow show the average impact for the selected measures on firms across all support programs.

**Table 3.2: BIAs Impact on Performance**

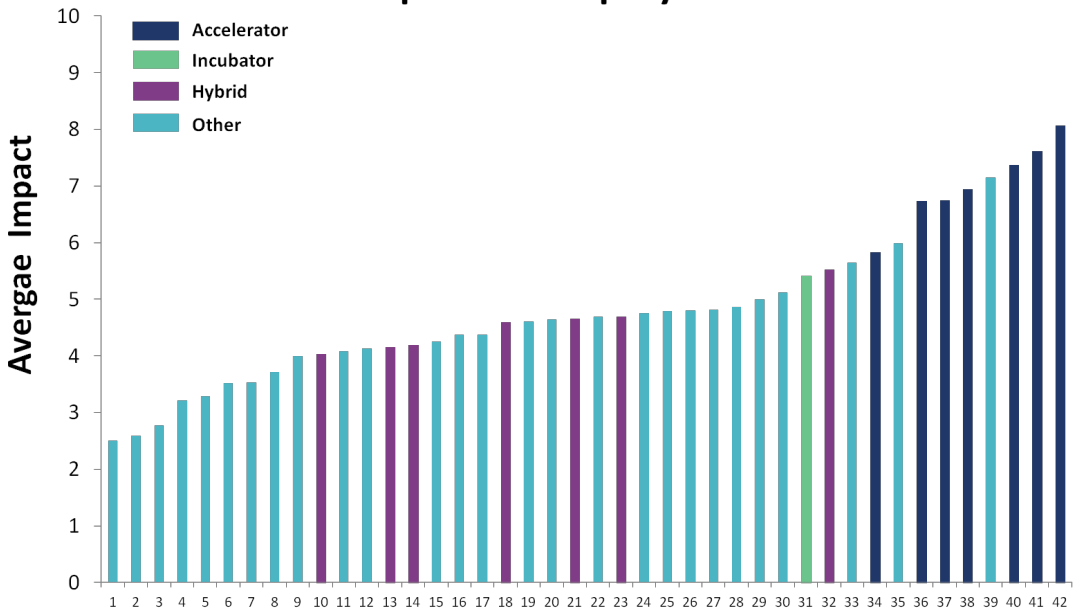
| Impact Measure | Program Type | |
|---|---|---|
| | Accelerators | Hybrids |
| Investments received | Very significant effect | Moderate effect |
| Employment | Very significant effect | Moderate effect |
| Annual revenues | Very significant effect | Slight effect |
| Innovation | Very significant effect | Slight effect |

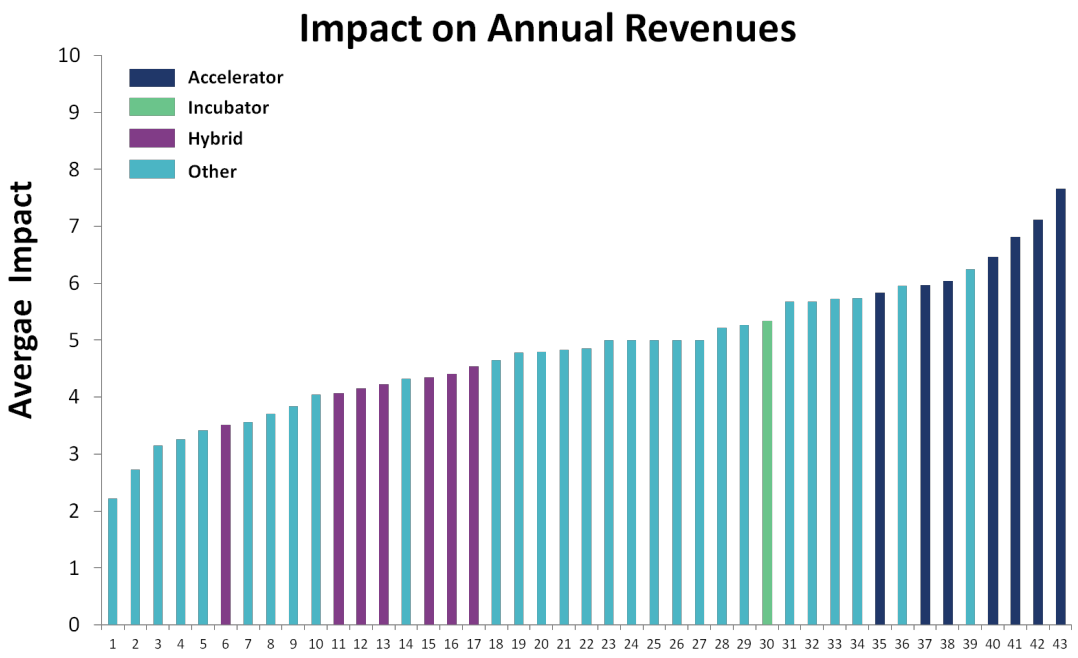
[2] Proportion of company revenues attributed to new or improved products, processes, or services.

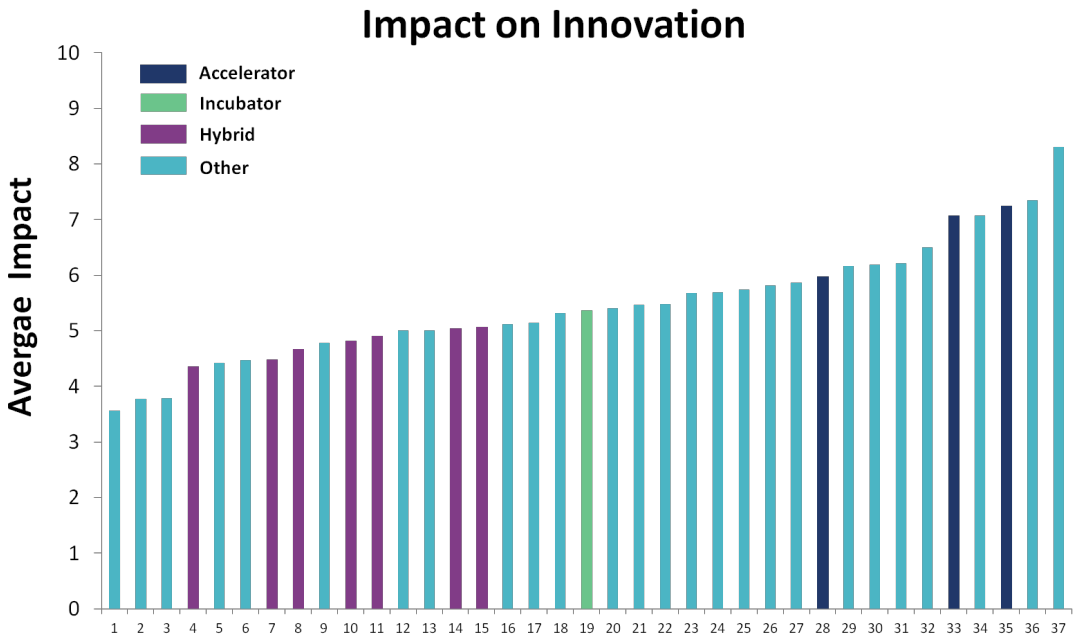
## Impact on Investments Received




## Impact on Employment






## Summary of Results

Business accelerators consistently outperformed other program types in this sample. This was true for impacts on performance, and impacts on resources and capabilities. These findings suggest that the business accelerator model of venture support is a more effective means of venture support than other program types.

Business accelerators were, on average, very significantly effective in facilitating investment, increasing employment, increasing annual revenues, and improving companies' ability to innovate.

Hybrid program were moderately effective in facilitating investment, increasing employment, and slightly effective in increasing companies' annual revenues, and ability to innovate.

In terms of impact on performance measures, business accelerators had the strongest impact among venture support programs in our sample; the sole business incubator in our sample had a moderate impact; hybrid programs were substandard performers.

# 4. Factors contributing to the success of venture support programs

In this section, we explore the factors that explain the difference between high- and low-performing business incubator and accelerators. For the purpose of this analysis, we identify 15 BIAs[3], with survey data from 1440 client companies. We select ten attributes that may have an influence on the program effectiveness:

### Program Inputs

- Program maturity (in years)
- Funding provided (Yes/No)
- Number of full-time employees working for the program
- Number of client companies served

### Characteristics of Enrolled Companies

- Average annual revenues of client companies
- Average employment of client companies
- Average investments received by client companies
- Average time to market of client companies
- Average growth rate[4] of client companies
- Overall satisfaction

We then segment the 15 BIAs into high-performing and low-performing groups based on their overall average impact[5]. High-performing BIAs are assigned into the High (H) group and low-performing BIAs are assigned into the Low (L) group. The high-performing group consisted of

[3] The 15 BIAs include one incubator, seven accelerators, and seven hybrids.
[4] Growth rate is calculated as 'Change in employment (%)' times 'Change in annual revenues (%)'.
[5] Average impact is weighted on a scale of 0 to 10 using the following weights: 'Negative impact' 0, 'No impact' 2.5, 'Some impact' 5.0, 'Significant impact' 7.5, 'Very significant impact' 10. Overall average impact is calculated as the average of the four impacts on resources and capabilities measures, and the four impacts on performance measures.

seven accelerators and the sole incubator, while the low-performing group consisted of seven hybrid programs.

An independent sample t-test is used to compare the means of the two groups in order to determine whether there is statistical evidence that the associated population means are significantly different. Table 4.1 presents information on the two groups.

**Table 4.1: Overall Average Impact of High- and Low-Performing Programs**

| Group | Number of BIAs | Overall Average Impact (Range) |
|---|---|---|
| High | 8 | 5.83 – 7.10 |
| Low | 7 | 4.71 – 5.26 |

We then compare the two groups based on the 10 selected attributes, as shown in Table 4.2 below:

**Table 4.2 Mean Program Characteristics in High- and Low-Performing Programs**

| Attributes | Group | Mean | Significance |
|---|---|---|---|
| Program maturity (years) | H | 4.4 | α |
| | L | 14.9 | |
| Funding (Yes/No) | H | 1.0 | *** |
| | L | .29 | |
| Number of Full-time employees | H | 10.42 | * |
| | L | 23.71 | |
| Number of Client companies | H | 99.5 | ** |
| | L | 362.42 | |
| Average revenues of client companies ($)[6] | H | 1,049,590.38 | |
| | L | 1,479,627.64 | |
| Average employment of client companies | H | 15.58 | |
| | L | 22.15 | |
| Average investments received by client companies ($) | H | 1,161,200.91 | α |
| | L | 941,280.71 | |
| Average time to market of client companies (years) | H | 1.5763 | * |
| | L | 1.6457 | |
| Average growth rate of client companies | H | .91 | * |
| | L | .22 | |
| Overall satisfaction | H | 8.51 | |
| | L | 6.90 | |

α = p < .1, * = p < .05, ** = p < .01, *** = p < .001

Below is a summary of the most significant observations:

**Program Maturity**
The average program maturity for high-performing BIAs was 4.4 years, compared to 14.9 years for low-performing BIAs (significant at the 90% confidence level).

**Funding**
Every one of the high-performing BIAs provided funding, while just two out of seven of the low-performing BIAs provided funding (significant at the 99% confidence level).

**Number of Employees**
The average number of full-time employees for high-performing BIAs was 10.42 compared to 23.71 at low-performing BIAs (significant at the 95% confidence level). This may be contrary to expectations, as some would expect that programs with more employees would be able to offer a wider range of more customized services. On the other hand, diverse programs may lose focus and achieve less impact from individual program elements.

**Number of client companies**

[6] Note that blank spaces in tables A1 and A2 indicate results that are not statistically significant (p > .1).

The average number of client companies for high-performing BIAs was 99.5, compared to 362.42 for low-performing BIAs (significant at the 99% confidence level).

**Investments received**
The average investments received of client companies for high-performing BIAs was approximately $220,000 higher than the average for low-performing BIAs (significant at the 90% confidence level).

**Time to market**
The average time to market of client companies for high-performing BIAs was about 1 month earlier than the average for low-performing BIAs (significant at the 95% confidence level).

**Client growth rate**
The average growth rate of client companies for high-performing BIAs was 69% higher than the average for low-performing BIAs (significant at the 95% confidence level).

**Other Results**
It is also noteworthy that higher-performing BIAs serve client firms which are, on average, smaller in terms of both revenues and employment. These results are not statistically significant, however a t-test of the product of these observations does yield a result that is significant at the 95% level. High-performing BIAs are also more likely to receive positive satisfaction ratings from client firms.

# 5. Mechanisms of Impact

The preceding section considered differences between high and low performing programs looking at one variable at a time. In this section we conduct a multivariate analysis to consider the question of how venture support programs achieve impact, and which factors contribute to the effectiveness of the programs.

Recall that the fundamental logic of venture support programs is as follows: Programs perform activities; which have a direct impact on client firms' resources and capabilities; which lead to an indirect impact on client firms' performance; which lead to an ultimate impact on socioeconomic outcomes.

Understanding these mechanisms of impact is crucial for programs seeking to identify their core competencies, weaknesses, and opportunities for new investments. From a higher-level perspective, policymakers must develop an understanding of how impact is achieved in order to design and manage effective venture support programs. The practical ability to design and manage effective venture support programs requires a fulsome understanding of their mechanisms of action – i.e., which services lead to which outcomes.

With this goal in mind, this section uses linear regression analyses to consider the relationship between program attributes, intensity of use variables, direct impacts on resources and capabilities, and indirect impacts on firm performance. Key findings are presented below, and detailed information on the regression measures and results can be found in Appendix A:

- Regression analyses indicated that impact on improvements to companies' resources and capabilities is the best predictor of the programs' impact on company performance measures (*Employment, and Annual revenues*).

- *Financial support* is strongly associated with impact on *Employment* and impact on *Annual revenues*, indicating that programs that provided more financial support to companies are more likely to be effective in increasing companies' employment and annual revenues.

- *Intensity of use of support services* is significantly associated with impact on *Employment*, and impact on *Annual revenues*, indicating that programs are more likely to be effective in increasing companies' employment and annual revenues if their client companies used support services to a higher degree.

- Intensity of use of research services is significantly associated with impact on Employment, indicating that programs that provided research services are more likely to be effective in increasing companies' employment than programs that did not provide research services.

# 6. Conclusions and Policy Recommendations

This section presents conclusions and policy recommendations derived from our analysis of The Evidence Network's database of business incubators and accelerators. Below are the most important and actionable conclusions from our analysis of TEN's database of BIAs and other venture support programs:

- The examination of the 43 venture support programs in our dataset in Section 3, shows that business accelerators tend to achieve greater impact than other types of venture support programs. All seven of the business accelerators in our dataset are high-performing, and all the programs in the low-performing group were classified as hybrids.

- The comparisons of low- and high-performing BIAs in Section 4 suggest BIA performance is inversely related to program maturity. This suggests that funders and program managers may wish to consider experimenting with new programs, and closing programs that are found to be ineffective. This implies measuring program effectiveness to determine which programs are high-performing and which are not.

- Section 4 identifies other common characteristics of high-performing venture support programs, including the provision of funding, smaller program size (fewer client companies), and the selection of smaller client firms. The finding that company size is inversely proportional to impact likely reflects the greater needs of early stage ventures for assistance.

- The multivariate analysis in Section 5 shows that both the provision of financial support and the higher intensity use of BIA support services are significantly associated with venture support program impact on companies' annual revenues and employment.
- Our finding that high-performing BIAs tend to combine the provision of knowledge-based services with the provision of funding suggests that the combination of services and funding together is more impactful than either alone. Of course the funding provided to ventures should be proportional to their stage of development, their potential for growth, and their requirement for funding.

- Our finding that both the provision of financial support and the higher intensity of use of BIA support services are significantly associated with venture support program impact on companies' annual revenues and employment provides further evidence that combining knowledge-based and financial support may be more effective than either type of support alone.

- Our finding that smaller programs tend to have greater impact suggests that a greater number of small programs may be more effective than a smaller number of programs that serve many clients. Small programs can be customized to service specific types of ventures: early stage, R&D intensive, high growth, etc.

- The performance of BIAs should be evaluated with a combination of direct and indirect impact measures, that is, direct impact on companies' capabilities and indirect impact on companies' performance.

- High-performing BIAs have a significantly greater impact on the success of client firms and the economic development of the communities they serve. Thus, it is important to implement the policy and program management practices that lead to success.

# Appendix A: Linear Regression Models: Impacts on Employment and Annual Revenues

## Regression Measures

***Control Variables – Program Attributes***

We control for five program attributes that may affect the effectiveness of venture support programs:

- **Program maturity:** Indicates the program's age in years as of the assessment year
- **Full-time employees:** Indicates the number of full-time employees working for the program
- **Client companies:** Indicates the number of client companies served by the program
- **Amount of financial support ($):** Indicates the average amount of financial support that the program provided to client companies
- **Research services:** Indicates whether or not the program provided research services to client companies

**Intensity of Use of Services**

We select three types of support services provided by programs that may be associated with, or predictive of, impact on company performance:

- *Degree of use of business services:* (Examples include: Financial advice, business growth and internationalization support, marketing and sales support, concept or product development, and human resource and succession planning advice.)
- *Degree of use of research services:* (Examples include: Facilitation of research collaboration, access to research and technology information, provision of laboratories and facilities, and ICT support)
- *Degree of use of networking services:* (Examples include: Examples include networking events and connections, conferences, symposia, and forums)

Degree of use can refer to the frequency of use, number of business representatives involved, or the duration of each use event. For example, 'Low degree of use' can mean the support initiative was used infrequently, few business representatives were involved, or little time was invested in using the service.

The three intensity of use of services measures are reduced to a single support services variable:

- **Average use of services:** It is calculated as the average of three degree of use measures: degree of use of *Business services*; degree of use of *Research services*; and degree of use of *Networking services*.

**Impact on Resources and Capabilities**

We consider four impacts on companies' resources and capabilities measures that may be associated with impacts on company performance:

- *Impact on Business Expertise:* Expertise related to developing or improving business models, business plans, changes in business approach, marketing and sales, human resources, finance, intellectual property management, company operations, or project management.
- *Impact on Business Linkages:* Facilitation of relationships with corporate partners, customers, suppliers, service providers, or channel partners through collaborative projects, conferences, workshops, lectures, networking events, or other relationship-brokering activities.
- *Impact on Financial Linkages:* Facilitation of funding or financing by other equity investors such as financial angels, other groups providing grants, loans or tax benefits, as well as project-related funding from private or governmental sources.
- *Impact on Promotion:* Corporate exposure through participation in intermediary-supported projects, websites, participation in events such as national or international trade shows, engagements with strategic funders, conferences, or other outreach activities.

The four impact on resources and capabilities measures are combined into a single direct impact variable:

- **Direct impact:** The average of impact on *Business expertise*, impact on *Business linkages*, impact on *Financial linkages*, and impact on *Promotion*.

***Dependent Variables***

We selected two measures of impact on company performance as the dependent variables:

- **Impact on Employment**
- **Impact on Annual revenues**

## Impact on Employment

Models 1, 2, and 3 regress control variables, degree of use of support services, and the impact on resources and capabilities variable against Impact on *Employment.* Details on the three models may be found in Table A1.

Model 1, which includes only the control variables, explains 60% of the variance in the dependent variable, impact on *Employment*. *Financial support* is strongly associated with impact on *Employment* (significant at the 99.9% confidence level), indicating that programs which provide more financial support to companies are more likely to be effective in increasing companies' employment. Also, *Research services* is significantly associated with impact on *Employment* (significant at the 95% confidence level), indicating that programs that provided research services are more likely to be effective in increasing companies' employment than programs that did not provide research services.

Model 2, which includes both control variables and degree of use variable, explains 71% of the variance in the dependent variable, impact on *Employment*. Model 2 shows that the degree of use variable is significantly associated with impact on *Employment* (significant at the 99% confidence level), indicating that programs are more likely to be effective in increasing companies' employment if companies used support services offered by the programs to a higher degree. Of the control variables, *Financial support* is strongly associated with impact on *Employment* (significant at the 99.9% confidence level), indicating that programs that provided more financial support to companies are more likely to be effective in increasing companies' employment. Again, *Research services* is significantly associated with impact on *Employment* (significant at the 90% confidence level), indicating that programs that provided research services are more likely to be effective in increasing companies' employment than programs that did not provide research services.

Model 3, which includes control variables, the degree of use variable, and the impact on resources and capabilities variable, is an improvement over Model 1 and Model 2 as it explains 83% of the variance in the dependent variable, impact on *Employment*. Model 3 shows that the impact on companies' *resources and capabilities* is strongly associated with impact on *Employment* (significant at the 99.9% confidence level), indicating that programs that achieved higher impact on companies' resources and capabilities are more likely to be effective in increasing companies' employment. Again, the degree of use variable is significantly associated with impact on *Employment* (significant at the 95% confidence level), indicating that programs are more likely to be effective in increasing companies' employment if companies used support services offered by the programs to a higher degree. Among the control variables, *Financial support* is strongly associated with impact on *Employment* (significant at the 99.9% confidence level), indicating that programs that provided more financial support to companies are more likely to be effective in increasing companies' employment. Again, *Research services* is significantly associated with impact on *Employment* (significant at the 99% confidence level), indicating that programs that provided research services are more likely to be effective in increasing companies' employment than programs that did not provide research services.

**Table A1: Linear Regression Against Impact on Employment**

| | Model 1<br>Control Variables | Model 2<br>Degree of Use | Model 3<br>Capabilities Impact |
|---|---|---|---|
| Constant[7] | | | |
| Program maturity | | | |
| Full-time employees | | | |
| Client companies | | | |
| Financial support ($) | + *** | + *** | + *** |
| Research services | + * | + α | + ** |
| Degree of use of support services | | + ** | + * |
| Impact on resources and capabilities | | | + *** |
| **Model characteristics** | | | |
| N | 33 | 33 | 33 |
| F | 10.59*** (5 dof) | 14.16*** (6 dof) | 22.70*** (7 dof) |
| Adjusted $R^2$ | .60 | .71 | .83 |

Coefficients are t values; dof = Degrees of freedom  α = p < .1, * = p < .05, ** = p < .01, *** = p < .001

## Impact on Annual Revenues

Models 4, 5, and 6 regress control variables, degree of use of the support services, and the impact on resources and capabilities variable against impact on *Annual revenues.* Details on the three models may be found in Table A2.

Model 4, which includes only the control variables, explains 25% of the variance in the dependent variable, impact on *Annual revenues*. *Financial support* is strongly associated with impact on *Annual revenues* (significant at the 99% confidence level), indicating that programs that provided more financial support to companies are more likely to be effective in increasing companies' annual revenues.

Model 5, which includes both control variables and degree of use variable, explains 58% of the variance in the dependent variable, impact on *Annual revenues.* Model 5 shows that the degree of use variable is significantly associated with impact on *Annual revenues* (significant at the 99% confidence level), indicating that programs are more likely to be effective in increasing

[7] Note that blank spaces in tables A1 and A2 indicate results that are not statistically significant (p > .1).

companies' annual revenues if companies used support services offered by the programs to a higher degree. Of the control variables, *Financial support* is strongly associated with impact on *Annual revenues* (significant at the 99.9% confidence level), indicating that programs that provided more financial support to companies are more likely to be effective in increasing companies' annual revenues.

Model 6 includes control variables, the degree of use variable, and the impact on resources and capabilities variable. It is an improvement over Model 4 and Model 5 as it explains 80% of the variance in the dependent variable, impact on *Annual revenues*. Model 6 shows that the impact on companies' *resources and capabilities* is strongly associated with impact on *Annual revenues* (significant at the 99.9% confidence level), indicating that programs that achieved higher impact on companies' resources and capabilities are more likely to be effective in increasing companies' annual revenues. Again, the degree of use variable is significantly associated with impact on *Annual revenues* (significant at the 99% confidence level), indicating that programs are more likely to be effective in increasing companies' annual revenues if companies used support services offered by the programs to a higher degree. Of the control variables, *Financial support* is significantly associated with impact on *Annual revenues* (significant at the 95% confidence level), indicating that programs that provided more financial support to companies are more likely to be effective in increasing companies' annual revenues.

**Table A2: Linear Regression Against Impact on Annual Revenues**

| | Model 4<br>Control Variables | Model 5<br>Degree of Use | Model 6<br>Impact Variable |
|---|---|---|---|
| Constant | | | |
| Program maturity | | | |
| Full-time employees | | | |
| Client companies | | | |
| Financial support ($) | + ** | + *** | + * |
| Research services | | | |
| Degree of use of support services | | + *** | + ** |
| Impact on resources and capabilities | | | + *** |
| **Model characteristics** | | | |
| N | 33 | 33 | 33 |
| F | 3.16* (5 dof) | 8.32*** (6 dof) | 18.97*** (7 dof) |
| Adjusted $R^2$ | .25 | .58 | .80 |

Coefficients are t values; dof = Degrees of freedom  $\alpha$ = p < .1, * = p < .05, ** = p < .01, *** = p < .001