

Measuring the Impact of Innovation Intermediaries:

A Case Study of Tekes¹

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Abstract

We present a general-purpose methodology for measuring the impact of innovation intermediaries that applies across all types of intermediaries. We demonstrate the methodology by assessing the impact of the Global Access Program (GAP) program, which is made available to Finnish firms through Tekes, Finland's leading technology agency. Our findings show that the GAP program has had an impact on the performance of participating firms in terms of revenue growth, exports, new international customers, and employment growth. Consistent with our expectation that impacts on firm performance are a consequence of earlier impacts on firm resources and capabilities, we find a statistically significant relationship between the immediate impact of strategic information and advice, and information and advice on new markets, and longer term impact on firm performance.

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Introduction

Innovation intermediaries are organizations or groups within organizations that work to enable innovation, either directly by enabling the innovativeness of one or more firms, or indirectly by enhancing national, regional, or sectoral innovative capacity (Dalziel 2010; Howells 2006). Such organizations include industry associations, economic development agencies, chambers of commerce, science, technology or business parks, business incubators, research consortia and networks, research institutes, and university technology transfer offices.

According to Inkinen and Suorsa (2010) intermediary organizations perform three innovation system functions: funding support, networking and collaboration, and other supportive functions. In the Finnish case, intermediary organizations are predominantly understood to be publicly owned or semi-public regional companies, non-profit organizations (Koskenlinna et al. 2005) or privately owned firms (Suvinen et al. 2008). It has been estimated in Finland that there are approximately 80 regional development companies, 22 technology centres, 70 incubator organizations and 40 other innovation-supporting organizations (Koskenlinna et al. 2005). Despite the growing importance of intermediary organizations in the Finnish innovation system, such organizations have been studied to a lesser degree. One of the reasons for this might be that the impact of intermediary organizations is difficult to measure (Howells 2006).

While there are general-purpose indicators for measuring the performance of firms and universities, there are no such indicators for measuring the performance of innovation intermediaries. As a consequence, past studies of intermediary performance have used a range of performance indicators that vary according to intermediary objectives, the nature of participating firms, and the availability of data. For example, researchers have measured the performance, or effect of the activities of the US Advanced Technology Program using patents (Sakakibara & Branstetter 2003) and the likelihood of raising additional financing (Feldman & Kelley 2006); Chinese science parks using park-level revenues and exports (Yu & Heshmati 2007), and Swedish science parks using firm-level revenues, employment, and profits (Löfsten & Lindelöf 2002), US regional institutes using pollution prevention and quality management capabilities (McEvily & Zaheer 1999), Canadian industry associations using frequency of citation as a collaborator or as a source of ideas (Dalziel, 2006), the Responsible Care program of the US Chemical Manufacturer's Association using environmental performance (King & Lenox 2000), US technology transfer offices using the innovativeness of new products (Kaufmann & Todtling, 2001), the number of startups (Di Gregorio & Shane 2003; Markham et al., 2005), and licensing agreements and revenues (Siegel et al. 2003), and the US Small Business Innovation Research program using revenues (Audretsch et al. 2002).

In this paper we present a general-purpose methodology for measuring the impact of innovation intermediaries that applies across all types of innovation intermediaries. The methodology was developed by the lead author and Brian Barge of The Evidence Network, and is being used for research purposes by the former and commercialized by The Evidence Network². We demonstrate the methodology on a program made available to Finnish firms through Tekes, Finland's leading technology agency. The Global Access Program (GAP) is offered to non-US firms by the Anderson School of Management at the University of California at Los Angeles. Through Tekes, over 100 Finnish firms have participated in the GAP program since 1999.

In the next section we present the theory that underlies the measurement methodology. We then describe our sample, measures, and results. Our results show that the GAP program has had an impact both on the resources and capabilities of participating firms and on their performance in the market in terms of increased revenues, exports, new international customers, and employment. Furthermore, we are able to show a statistically significant relationship between impact on firm resources and capabilities, and firm performance in the market. These findings give testimony to the merits of both the Global Access Program and the impact assessment methodology.

Theory

The basic premise is that innovation intermediaries, despite their diversity, can be described as an overarching class of organizations whose members share common goals. Despite their diversity, innovation intermediaries, ranging from small economic development organizations to large and sophisticated research institutes, seek to enhance the innovative capacity of the regions, nations, or sectors of which they are members (Furman et al. 2002). While innovation intermediaries may impact a variety of actors, ranging from firms to university researchers, hospitals, and government policy makers, their primary target is typically firms. Accordingly, we focus on the efforts of innovation intermediaries to enhance the innovativeness of their client or member firms, in the interests of facilitating increases in their viability, growth, or profitability. We use a logic model approach to link intermediary purpose to intermediary outputs and impacts on participating firms.

First used in the 1970s, logic models are narrative or graphical depictions of processes in real life that communicate the assumptions that underlie the expectation

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that an activity will lead to a specific result. Logic models illustrate a sequence of cause-and-effect relationships—a systems approach to communicating the path toward a desired result (Millar et al. 2001; Renger & Titcomb 2002.) Logic models serve numerous functions, one of which is the identification of a set of performance indicators that may be used to monitor and summarize performance for funders and decision makers (McLaughlin & Jordan 1999; Rogers 2005).

Table 1, below, is a general logic model for innovation intermediaries that focuses on their impacts on the firms that are their clients or members. It illustrates how innovation intermediaries work to fulfill their missions, and how their impact can be measured. As shown in the leftmost column, innovation intermediaries express their purpose in terms such as national competitiveness, regional economic development, industry strength, or viable new ventures. Using inputs including knowledgeable people and relationships with external individuals and organizations, they conduct activities that result in outputs such as business, scientific, and technological knowledge, equipment, and facilities; design, testing, prototyping, scale-up, intellectual property management, and licensing services; and events, conferences, seminars, and meetings.

They conduct activities in the interests of achieving immediate and intermediate impacts on the firms that are their members or clients, and long-term impacts in the form of socio-economic benefits. The immediate impacts of innovation intermediaries are improvements in the resources or capabilities of client or member firms, intermediate impacts are improvements in the performance of client or member firms, and long-term impacts affect communities, industries, economies, societies, and the environment.

Working backwards, from right to left, shows *how* different types of impact are achieved. The achievement of long-term impact depends on the achievement of intermediate impact, which in turn depends on the achievement of immediate impact. So, for example, an innovation intermediary that seeks to create economic growth in a region (its purpose and desired long-term impact) does so by facilitating improvements in the performance of local firms (its desired intermediate impact), either by facilitating firm growth or the creation of new ventures. It facilitates firm growth and the creation of new ventures by facilitating improvements in the resources and capabilities of local firms (its desired immediate impact). The fundamental insight is that innovation intermediaries achieve their desired intermediate and long-term impacts indirectly by affecting the resources and capabilities of the firms with which they work.

Table 1: General Logic Model for Innovation Intermediaries

Purposes	Inputs	Outputs	Impacts		
			Immediate Im- pacts	Intermediate Impacts	Ultimate Im- pacts
			Firms with in- creased re- sources or ca- pabilities	Firms with im- proved per- formance	Socio-economic benefits
<ul style="list-style-type: none"> •National com- petitiveness •Community, re- gional economic development •Industry strength •Viable new ven- tures 	<ul style="list-style-type: none"> •Knowledgeable people •Relationships •Equipment, fa- cilities •Funding 	<ul style="list-style-type: none"> • Business, scientific and technological knowledge, re- lationships, equipment, fa- cilities •Design, test- ing, prototyp- ing, intellec- tual property management, licensing serv- ices •Plans, pro- posals, pro- jects •Events, con- ferences, seminars, meetings •Websites, blogs, reports, directories, newsletters •Access to fi- nancing 	<ul style="list-style-type: none"> •Information, advice •Opportunities for promotion, influence •Business link- ages •Research link- ages •Technology services •Access to fi- nancing •Complementary business inputs 	<ul style="list-style-type: none"> •Increased revenues •Increased em- ployment •New products, services •Faster time to market •Increased market share •Reduced envi- ronmental im- pact •Increased valuation •Increased in- vestment 	<ul style="list-style-type: none"> •Sustainable wealth and jobs •Environmental and health care improvements •Increased community, re- gional, national economic and social wellness

Innovation intermediaries hope to have long-term impacts that correspond to their missions. But the measurement of long-term impact is difficult because changes in the economy, the environment, or society are brought about by the collective action of many players. So it is difficult to attribute such changes to the activities of a single organization. But as long-term impact is facilitated by the achievement of intermediate impact, evidence of intermediate impact is suggestive of possible long-term effects.

Tekes and the Global Access Program

Tekes – the Finnish Funding Agency for Technology and Innovation

Tekes is the most important publicly funded expert organization for financing research, development and innovation in Finland (Inkinen & Suorsa 2010). Tekes was founded primarily to assist Finland in the economic recession of the 1970's. In 1984, Tekes began to operate both nationally and internationally. Tekes experienced a dramatic growth in the late 1990s as a result of a marked increase in public technology funding. In turn, Tekes was granted the responsibility for finding the optimum ways to invest these funds. Tekes now supports wide-ranging innovation activities in research communities, industry and service sectors. Every year, Tekes finances some 1,500 business research and development projects, and almost 600 public research projects at universities, research institutes and polytechnics. For example in year 2009 Tekes funded 2, 329 enterprises (Tekes Annual Review 2009). Research, development and innovation funding is targeted to projects that create the greatest long-term benefits for the economy and society.

The Global Access Program (GAP)

The Global Access Program (GAP) at the University of California at Los Angeles (UCLA) Anderson School of Management is designed to provide low cost management consulting services to non-US companies seeking strategic advice, particularly concerning operating in and selling to international markets. The GAP program is an educational program that matches a team of students from the Fully Employed MBA program with existing international technology companies to develop a business strategy that enables the companies to move to the next stage of their corporate development. The students work with key members of the organization to address strategic business issues and to develop a comprehensive and independent business plan. The plan typically involves launching a new product into an existing market, launching an existing product into a new geographical market, offering an existing product into a new market segment, developing a new product for a specific market segment, or leveraging existing intellectual property into new products and new markets.

The GAP program works with foreign organizations throughout the world to assist their technology companies in developing a global strategy. The partners are GAP-sponsoring organizations located abroad with the mission of enhancing their country's economic development and technological innovation. Tekes entered the Global Access Program in 1999. Since then over 100 Finnish companies have participated the GAP program with help of Tekes funding. The GAP program is tar-

geted to Tekes clients that are independent business or a small business unit within a larger corporation. To be able to take part in the GAP program the company should have business based on innovative product idea, adequate technological knowhow, paying clientele, sustainable competitive advantage, adequate funding or positive cash flow for two years ahead and a web site in English.

The purpose of the GAP program is accelerated business growth (see the GAP program logic model shown in Table 2, below). As shown in Table 2, the outputs of participation in the GAP program consist of a comprehensive, independent assessment and evaluation of company's current business plans, corporate growth strategies and market opportunities, extensive primary and secondary market research and analysis, an investment-quality, professional business plan with full financial projections, application of state-of-the-art management frameworks and analysis techniques, specific recommendations to accelerate the company's growth, final plan review and constructive feedback from outside executives including attorneys, accountants, technology experts, angel investors and venture capital professionals, and access to UCLA Anderson's extensive business network of students, alumni, faculty and consultants. The immediate impacts of the GAP program are increased resources or capabilities of participating firms which can be categorized to information and advice, business linkages and complementary business inputs. Intermediate impacts of the GAP program include increased revenues, employment, market share and investment. The socio-economic benefits of the GAP program are sustainable wealth and jobs, environmental and health care improvements and increased social wellness.

Measuring the Impact of the Global Access Program

Sample

A total of 60 Finnish firms participated in the GAP program between 2004 and 2009 inclusive. Fifty-three of these firms were asked to respond to the survey, the remaining firms had either closed, been acquired, or no longer employed the executive who had engaged with the GAP program. After two email reminders and telephone calls to non-respondents, 33 firms responded to the survey for a response rate of 62%.

Table 2. GAP Logic Model

Purposes	Inputs	Outputs	Impacts		
			Immediate Im- pacts	Intermediate Impacts	Ultimate Im- pacts
			Firms with in- creased re- sources or ca- pabilities	Firms with im- proved per- formance	Socio-economic benefits
•Accelerated business growth	•Participation of Finnish company executives •UCLA MBA stu- dents •UCLA faculty and staff •Tekes personnel and funding	•Primary re- search (100+ interviews) •Interpretation and analysis of research find- ings •Executive education •Business and consultancy contacts	•Information and advice: -Strategic -Feedback on products, serv- ices -On selling in new markets -On operating in new markets -On raising capi- tal •Business link- ages -With service providers •Complementary business inputs -Business plan- ning services -Executive edu- cation services	•Increased revenues -Change in revenues -Export sales •Increased em- ployment -Change in em- ployment •Increased market share -New interna- tional custom- ers •Increased in- vestment -Financing	•Sustainable wealth and jobs •Environmental and health care improvements •Increased community, re- gional, national economic and social wellness

The multiple-choice questionnaire consisted of 29 questions as follows:

- four questions regarding the importance of GAP offerings (out-puts)
- eight questions regarding immediate impact
- five question pairs regarding firm outcomes and intermediate impacts on firm outcomes
- four questions regarding firm attributes
- three questions regarding the year of participation and satisfaction with GAP.

While measuring the immediate impact of intermediary activities on firm resources and capabilities is straightforward, measuring the intermediate impact of intermediary activities on the performance of participating firms requires isolating the impact of intermediary activities from the many other factors that may impact firm performance. Studies that rely on secondary data for assessing intermediary impact typically rely on multiple years of data to control for other factors such as firm effects and effects of the business environment, and to distinguish selection effects from treatment effects (Sakakibara & Branstetter 2003). We use primary data and so are able to rely on survey respondents to judge the impact of intermediary activities on firm performance. Our approach minimizes bias in two ways. First, we ask firms to assess the impact of intermediary activities on specific dimensions of the performance (e.g. revenues, market share, employment), rather than asking a more general question. Measures that are specific, such as impact on revenues, are less likely to suffer from biased responses than measures that are general, such as impact on overall firm performance (Cote & Buckley 1987). Second, we precede each question on the impact of intermediary activities on specific dimensions of firm performance with a question on the level or change in performance on that dimension. This focuses the mind of the respondent on the specific dimension of firm performance and allows us to gather data on firm performance. For example, to determine the impact of an intermediary on the revenues of participating firms, we may first ask about changes in revenues and then ask the respondent to gauge the degree to which those changes are attributable to activities of the intermediary in question.

Measures

Firm descriptors. We control for five firm attributes that might impact the firm's assessment of the impact of the GAP program on their performance in the market (intermediate impact). Age indicates the firm's age in years when it participated in the GAP program and has an average value of 11.18 years. Respondents were asked to indicate the number of employees and the amount of annual revenues, both on four-point scales. Responses to these questions were multiplied to get an indicator of firm size that ranged from a low of one (less than 20 employees and less than 500K Euros in revenues) to a high of 16 (more than 100 employees and more than 2 million Euros in revenues). IT industry and health industry are dummy variables that are 1 if the firm is in the respective industry and 0 otherwise. Nineteen respondents indicated that their firm belonged to the information and communication technologies industry, six respondents indicated that their firm belonged to the biotechnology, health, or medical industry, and eight respondents indicated that their firm belonged to other industries. Finally, we control for firm growth as firms that are growing may be inclined to be more generous in their assessment of intermediary impact. Respondents were asked to indicate the change in employment since their firm's participation in GAP on a five point scale that

ranged from a low of ‘decreased employment’ to a high of ‘increased by more than 100%’, and to indicate the change in revenues since their participation in GAP on seven point scale that ranged from a low of ‘decreased by more than 100%’ to a high of ‘increased by more than 100%’. Responses to these questions were multiplied to get an indicator of firm growth that ranged from a low of three to a high of 35.

Measures of the importance of offerings and impact. Factor analysis was used to consolidate measures of the importance of GAP offerings and GAP impact. As shown in Table 3, the four measures of the importance of GAP offerings were reduced to two factors (custom offerings, general offerings), the seven measures of immediate impact were reduced to three factors (strategic information and advice, new markets, general assistance) and the five measures of intermediate impact were reduced to a single intermediate impact factor. All composite measures of the importance of offerings and impact are reliable as indicated by the Cronbach alphas. Descriptive statistics and correlations are reported in Table 4.

Table 3. Factor analysis

Type of measures	Measures	Factors	
Importance of offerings	Primary research	Custom offerings (Cronbach’s Alpha = .85)	
	Interpretation and analysis		
	Executive education	General offerings (Cronbach’s Alpha = .89)	
	Business and consultancy contacts		
Immediate impact	Strategic information and advice	Strategic information and advice (Cronbach’s Alpha = .90)	
	Feedback on products, services		
	Business planning services		
	Selling new markets		New markets (Cronbach’s Alpha = .81)
	Operating new markets		
	Raising capital	General assistance (Cronbach’s Alpha = .81)	
	Service provider linkages		
	Executive education		
Intermediate impact	Change in revenues	Intermediate impact (Cronbach’s Alpha = .93)	
	Change in employment		
	New international customers		
	Export sales		
	Financing		

Table 4. Descriptive Statistics and Correlations

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Age											
2. Size	-.17										
3. IT industry	.17	.09									
4. Health industry	-.33	-.11	-.55**								
5. Growth	-.32	.37*	.02	-.15							
6. Custom offerings	-.33	.11	-.12	.10	-.10						
7. General offerings	-.39	.12	.02	.14	-.11	.00					
8. Strategic info, advice	.10	-.02	.01	.15	-.13	.25	.43*				
9. New markets	-.02	.08	-.37*	.24	-.02	.20	.38*	.00			
10. General assistance	-.02	-.16	.34	-.21	.08	.03	.43*	.00	.00		
11. Intermediate impact	-.10	.27	-.07	-.03	.44*	.28	.25	.35*	.49**	.10	
Mean	11.18	7.45	.58	.18	15.45	0.00	0.00	0.00	0.00	0.00	0.00
Standard deviation	7.12	4.86	.50	.39	8.42	1.00	1.00	1.00	1.00	1.00	1.00
Minimum	2	1	0	0	3	-2.28	-1.88	-2.58	-1.88	-1.63	-1.17
Maximum	27	16	1	1	35	1.10	2.56	1.88	2.46	2.51	3.58

Results

We first present data on the importance of the GAP program offerings and the immediate and intermediate impact of the GAP program on participating firms. Figure 1 shows the average importance of the GAP program offerings as assessed by participating firms. Four types of offerings were assessed: primary research (student teams conduct over 100 interviews on behalf of their client firm), interpretation analysis of interview data and data provided by the client firm, executive education, and the provision of business and consulting contacts. As shown in Figure 1, the firm-specific primary research and interpretation of analysis activi-

ties were judged to be very important while the executive education and the provision of contacts were judged to be somewhat important.

Figure 2 provides data on the immediate impact of the GAP program on the resources and capabilities of participating firms. Three dimensions of immediate impact were considered: information and advice (strategic information and advice, feedback on products and services, and information and advice on selling in new markets, operating in new markets, and on raising capital), business linkages (linkages with service providers), and business services (business planning services and executive education). As shown in Figure 2, on average, strategic information and advice, information and advice on selling in new markets, and business planning services had the greatest immediate impact on participating firms. Information and advice on raising capital and the provision of linkages with service providers had the least impact.

Figure 3 provides data on the intermediate impact of the GAP program on the performance participating firms in the market. Four dimensions of immediate impact were considered: revenues (changes in revenues, export sales), employment (change in employment), market share (new international customers), and investment (financing). As shown in Figure 3, on average, firms report that participation in the GAP program had an impact on their revenues, export sales, and new international customers.

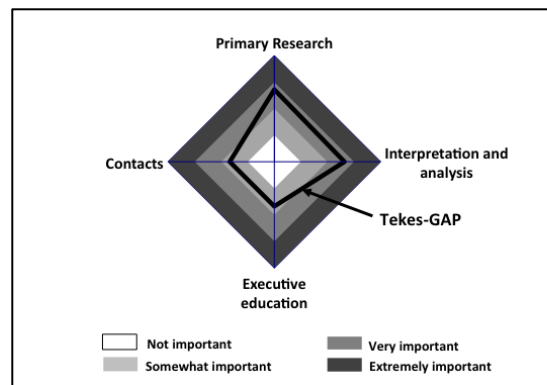


Figure 1. Average importance of GAP offerings

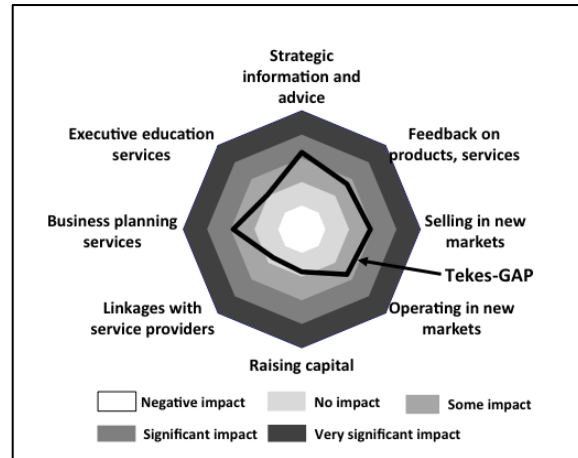


Figure 2. Average assessment of immediate impact

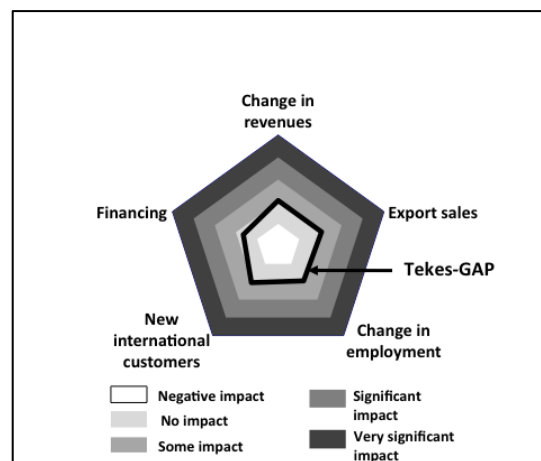


Figure 3. Average assessment of intermediate impact

As indicated by our logic model, our theory is that intermediate impact is predicted by immediate impact. Linear regression was used to test for a significant relationship between immediate impact and intermediate impact where our measure of intermediate impact is the composite measure of intermediate impact that was created by using factor analysis to combine respondents' assessments of the five measures of intermediate impact: changes in revenues, export sales, employment, new international customers, export sales, and financing.

As shown in Table 5, we test three models, Model 1, which includes only control variables, Model 2, which includes control variables and the importance of offerings variables, and Model 3, which includes control variables and the immediate impact variables. As expected, Model 1 explains a negligible amount of the variance in intermediate impact ($R^2 = .07$), although the growth variable is significant suggesting that growing firms are indeed more generous in their assessment of intermediary impact than firms that are not growing, as reported by previous studies (Inkinen & Suorsa 2010).

Model 2, which tests for a relationship between respondents' assessments of the importance of program offerings and their assessment of intermediate impact on firm performance, does not show a statistically significant relationship, but does explain a greater amount of the variance in intermediate impact than does Model 1 ($R^2 = .23$).

Model 3 tests for a relationship between respondents' assessments of immediate impacts on firm resources and capabilities, and their assessment of intermediate impact on firm performance. As per our theory, Model 3 explains a significant amount of the variance in respondents' assessments of intermediate impact ($R^2 = .48$) and shows that immediate impacts of strategic information and advice, and information on new markets, are both significant predictors of intermediate impact on firm performance ($p < .01$ in both cases).

Table 5. Linear Regression on Intermediate Impact

	Model 1 Control variables	Model 2 Program offerings	Model 3 Immediate impact
Constant	-.99 (.72)	-.97 (.75)	-.80 (.54)
Age	.01 (.03)	.01 (.03)	-.00 (.02)
Size	.03 (.04)	.01 (.04)	.01 (.03)
IT industry	-.22 (.41)	-.28 (.45)	.07 (.36)
Health industry	.05 (.57)	-.38 (.62)	-.35 (.43)
Growth	.05* (.02)	.06* (.02)	.05* (.02)
Output: Custom offerings		.32 (.18)	
Output: General offerings		.34 (.18)	
Immediate impact: Strategic information and advice			.43** (.13)
Immediate impact: New markets			.53** (.15)
Immediate impact: General assistance			.02 (.15)
Model characteristics			
n	32	29	32
F	1.44 (5 dof)	2.21 (7 dof)	4.65** (8 dof)
Adjusted R ²	.07	.23	.48

Standard errors in parentheses

dof = Degrees of freedom

* = $p < .05$, ** = $p < .01$

Conclusion

Using a novel methodology for measuring the impact of innovation intermediaries on firms, we have shown that the GAP program is having an impact on the performance of participating firms and explain how this impact on firm performance is being achieved. Participating firms reported that the GAP program had an impact on their performance in terms of revenue growth, exports, new customers, employment growth, and financing. The GAP program achieved this impact on firm outcomes by impacting firm resources and capabilities by providing strategic information and advice, information and advice on new markets, and general business assistance in terms of executive education and information and advice on financing and business services. Statistical analysis of the factors that are associated with impact on firm performance showed a statistically significant relationship between strategic information and advice and information and advice on new markets, and firm performance. Immediate impact achieved through the provision of general business assistance was not a statistically significant predictor of intermediate impact on firm performance.

This assessment of the impact of the GAP program on participating firms demonstrates the ability of the general-purpose impact assessment methodology to provide a theoretically-grounded assessment of a specific program. Our logic model expresses the *a priori* expectation that immediate impacts on firm resources and capabilities will lead to subsequent impacts on firm performance, an expectation that holds across all types of innovation intermediaries. While other researchers have shown relationships between engagement with intermediaries and firm resources and capabilities (Human & Provan 1997; McEvily & Zaheer 1999) or performance outcomes (Feldman & Kelly 2006; Sakakibara & Branstetter 2003) their approaches are specific to the types of intermediaries being studied and are not generalizable across intermediary types.

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