Economic Impacts through Broadband

A model for estimating economic impacts generated from increasing the meaningful use of broadband by businesses

Overview

Many organizations at the state, regional, or local level are eager to leverage broadband to stimulate economic growth and need to better understand how investments in broadband can lead to economic benefits. Through Strategic Networks Group's (SNG) extensive research on how businesses utilize and benefit from broadband these economic impacts can now be modeled for different adoption scenarios.

SNG's research of over 30,000 businesses provides estimates of the financial impacts to businesses from their use of online business practices (esolutions) in terms of additional annual revenues and cost savings. These financial impacts vary depending on the online practice, the industry, and the employment size of the business. The **Broadband Economic Impact Model** allows these direct financial impacts to be aggregated across a selected region based on an assumed increase in adoption of selected online business practices applied to that region's business profile.

These aggregate direct impacts are then used to derive economic impacts in terms of incremental annual GDP, incremental annual taxes, and additional jobs driven from business growth … all vital information for understanding the return on efforts to stimulate meaningful use of broadband.

The economic impact model is intended to enable quick analysis of different scenarios in order to provide guidance on the scale of economic impacts that may be achieved and for evaluating return on investment on initiatives to stimulate broadband use.

Why does Meaningful Use of Broadband Matter?

SNG's extensive research of business use of broadband and the benefits resulting from that use reveals some important facts:

1. **The more that businesses use online business practices the more these practices result in direct financial benefits to those businesses.**

   Businesses with high utilization of online practices, such as selling online, having a website, emarketing, online customer service, etc., report a higher proportion of their revenues and

greater cost savings compared to businesses with low utilization of such practices. We call these online business practices "esolutions" and we measure the overall utilization of esolutions using the Digital Economy index (DEi).

The DEi is an index on a scale of 0 to 10 that is based on the utilization of 17 different esolutions. The esolutions are typical business practices that can be implemented through online methods that give businesses the opportunity to be more competitive and productive in a global digital economy.

2. **Half of all businesses in a community are underutilizing broadband.**

   This means that half of existing businesses in a community could be doing more online and achieving the increased financial benefits experienced by their peers. The median DEi score is 7 (out of 10) and, in fact, the greatest financial benefits occur for businesses with a DEi score above 7. Those businesses with DEi scores below 7 are potentially underperforming relative to their peers when it comes to benefiting from online business practices. This is especially the case for smaller businesses with fewer than 20 employees, which typically makes up more than 80% of businesses in a community.

Increasing meaningful use of broadband by underutilizing businesses provides the opportunity for improving their competitiveness and productivity resulting in increased or accelerated growth for those businesses. This translates into increases in direct output (by those businesses) as well as indirect economic growth, including new jobs being created in the local economy. These effects have a truly meaningful impact on communities – in new jobs, increased household income and spending, as well as bolstering local taxes.

Just how much difference can increasing meaningful use make? This is exactly what the economic impact calculator can reveal, and it does not require a large number of existing businesses increasing their use of online business practices to make a significant impact.

The reality is that in general half of the existing businesses are doing just fine online and will not be looking to do more. Of the half that is underutilizing many will not be motivated to do more online for a variety of reasons. However, you do not need a large percentage of businesses to adopt new online practices to make a significant impact on the community. If only 10% of those underutilizing businesses (5% of the total businesses) increase their meaningful use of broadband a community with, for example, 3,000 businesses could increase their annual GDP by over $6M, create 100 new jobs, and generate more than $250K per year in additional tax revenues.

In any community it is reasonable to expect that there is at least 10% of existing businesses, and probably more, that want to do more online if it improves their growth and that would be motivated to do something about it if they only knew how. Many smaller businesses lack the time, resources, and

knowledge to figure out what they should be doing or if it is worth doing. Similarly, many communities are not armed with information on why it is worthwhile to assist those businesses in doing more online. The economic impact calculator can assist communities with this information to better understand how and why assisting local businesses toward greater use of broadband is good for them and good for the community.

How it works

The economic impact model allows for the selection of input variables to generate associated estimates of economic impacts. The input variables include:

Input Variable	Description
State	Select any of 50 states
County	Select any county[1] presented for the selected state, or select multiple counties. Leaving this selection blank runs the model for the entire state.
Industries	Select up to 10 industries[2] defined using NAICS[3] categories. The number of business establishments for each industry for the selected geography is shown for reference to aid in selection.
Employment Ranges	Select the desired business sizes for consideration based on standard employment size ranges. The percentage of businesses in each size range for the selected geography is shown for reference.
eSolutions	Select up to 5 esolutions for increased adoption by the target industries. These may be automatically selected, based on the most impactful esolutions, or manually selected based on areas of interest.
Adoption Increase	Enter the target percentage increase in adoption of the selected esolutions. This can be set once for automatically selected esolutions, or individually for manually selected esolutions.

Once the inputs are selected the outputs are automatically derived for the selected geography. The outputs include:

Scenario Outputs	Description
Number of adopting businesses	The number of businesses estimated to adopt one or more of the selected esolutions.
Total Incremental Direct Impact	The total of additional annual revenues and cost savings estimated from the new adoptions of esolutions (both new revenues and cost savings are presented).
Total Incremental Output	The additional annual output stimulated by the direct impacts, including direct output from the selected industries as well as the indirect and induced output through all industries.

[1] It is recommended that the elected geography and target profile have at least 1,500 businesses to provide a statistically relevant sample for analysis.
[2] The top 10 industries in most regions typically covers 70-80% of all businesses.
[3] North American Industry Classification System

Scenario Outputs	Description
Total Job Creation	The additional jobs estimated to be created from the additional business activity, including direct jobs as well as indirect and induced jobs across the selected region.
Incremental GDP	The addition to annual GDP resulting from the direct, indirect, and induced impacts from the increased adoption of esolutions.
Incremental Taxes	The addition to annual taxes – state, local, and federal - resulting from the direct, indirect, and induced impacts from the increased adoption of esolutions.
Incremental Household Earnings	The addition to annual household earnings resulting from the direct, indirect, and induced effects from the increased adoption of esolutions.

Additional metrics and ratios are provided to aid in evaluating the economic impacts for the selected region.

"Under the hood" … an overview of the modeling methodology

Data Sources

SNG's research of businesses provides three critical types of information used in the modeling. For each industry and employment range the research provides statistics on:

1. The percentage of businesses[4] not currently using each esolution, which forms the base for increasing adoption, and,
2. The percentage impact of adopting each esolution on increasing annual revenues and achieving annual cost savings[5].
3. The median annual revenues and operating expenses.

Example: For businesses in the Professional and Technical Services industry with fewer than 5 employees, 50.4% do not currently have a website. Research estimates that having a website increases annual revenues by 7.8% and the median annual revenue for this segment is $150,000. Adopting a website would add on average $11,700 in annual revenue.

In addition to SNG research, the model also incorporates US Census Bureau data[6] to provide the business profiles for every state and county. The business profile consists of the number of business establishments by industry and employment range for each county. The number of households for each state and county is also sourced from US Census Bureau data.

[4] Data collected since 2012 from 16,000 businesses using broadband and with fewer than 250 employees.
[5] Data collected from
[6] USCB County Business Patterns data

The Input-Output (I-O) model uses a nominal set of RIMS II economic factors sourced from the Bureau of Economic Analysis[7] (BEA) to estimate typical direct, indirect, and induced economic impacts. This is a set of factors that describe the economic relationship among all industries to model the effects of each industry on all other affected industries. This is the source of estimating the indirect and induced effects.

Data sources can be updated to maintain currency of analysis.

Estimating the Impacts

The estimation methodology runs through a series of steps, summarized as follows:

Step	Description	Result
1	Selecting the **geographic region** – the state and/or one or more counties – defines the profile of business establishments by industry and employment ranges based on USCB data.	We know how many businesses exist in each category for the selected geography.
2	Selecting the target industries[8] and employment ranges[9] creates a subset of the business **profile to be analyzed** for the region.	The desired business profile counts are established
3	Selecting the esolutions and the percent increased adoption enables estimation of the **number of new esolution adoptions** for each industry and employment range. The percent adoption is applied to SNG data on the percentage of businesses NOT currently using each esolution.	The number of new adoptions for each esolution is estimated for each industry and employment range.
4	The **number of adopting businesses** is estimated using a formula based on not every business adopting all selected esolution, e.g. if 3 esolutions are selected, some businesses may adopt one, some two, some three.	We have an estimate of the number of adopting businesses for each industry and employment range.
5	For each industry and employment range the **direct financial impacts** are derived by applying the percentage impacts for each esolution to the median annual revenues and operating expenses. These incremental revenues and cost savings are aggregated up by multiplying by the number of new adoptions (step 3).	We have the aggregate direct impacts in terms of new annual revenue and cost savings for the selected industries and employment ranges.
6	The direct impacts for each industry are used as input to the I-O model, which generates the **economic impacts** for direct, indirect, and induced effects.	We have the incremental annual GDP and Taxes, plus estimates of new jo creation as a result of the new adoptions of esolutions.

[7] US Department of Commerce (bea.gov)

[8] 16 industries are included for analysis. Management of Companies, Mining, and Utilities are not included due to beings a small component of business profiles and insufficient data for analysis. Public Administration is not included as this industry is not provided as part of USCB County Business Patterns.

[9] 5 employment ranges up to 249 employees are available. Employment ranges of 250 or more are not included due to insufficient data for analysis.

In the process of going through these steps, the model also estimates the total annual revenues and annual operating expenses for the adopting businesses, based on the median values for each industry and employment range. Thus we can determine the average incremental annual revenue and cost savings for the set of adopting businesses.

Additional metrics are also provided from the results, such as the average GDP and taxes per adopting business, the average direct and indirect/induced jobs per adopting business, etc.

Example: Greene County, Ohio

The business profile for Greene County, OH, is shown at right and we have selected the top ten industries indicated in the check boxes. There are a total of 2,987 businesses for the listed industries and we have chosen five industries of specific interest. The numbers reflect the total of all employment ranges for each industry.

Select up to 10 Industries [3,4]	All Businesses [4]	Rank
☑ Accommodation & Food Services	310	5
☑ Administrative & Support Services	133	8
☐ Agriculture / Forestry / Fishing	2	16
☐ Arts, Entertainment & Recreation	41	14
☑ Construction	202	6
☐ Educational Services	51	12
☑ Finance & Insurance	186	7
☑ Health Care & Social Services	349	3
☐ Information	44	13
☑ Manufacturing / Processing	99	10
☑ Other services (exc. public admin)	344	4
☑ Professional & Technical Services	472	2
☑ Real Estate	124	9
☑ Retail Trade	504	1
☐ Transportation & Warehousing	39	15
☐ Wholesale Trade	87	11
	2,987	

In addition, we decide to select businesses with fewer than 20 employees and want to look at the impacts from the top 5 esolutions assuming a 5% increase in adoption.

The target profile for the county now looks like:

Selected Employment Range	Less than 20
Total Businesses (selected industries/sizes)	**2,240**
% of Selected Industries	82.3%
% of ALL businesses	75.0%
Total Employment of Selected Industries [2]	39,940
Selected Industries % of Total Employment	90.3%
Adoption Scenario	
Selected eSolutions (Max. of 5)	Selling goods or services Web site for organization Advertising and promotion Deliver services and content Customer service and support
Number of Selected eSolutions	5
% Increase in adoption	**5.0%**

We now have a target of 2,240 businesses in Greene County, OH, with fewer than 20 employees for the 10 industries. These businesses represent 92.3% of the selected industries – the others being in the larger employment ranges. These businesses also represent 75.0% of all businesses in Greene County, so three quarters of the business community is being considered.

We are interested in the impacts from increasing adoption by 5% of; Selling goods or services, web site for organization, advertising and promotion, delivering services and content, and customer service and support. This scenario produces the following direct impacts:

Estimates of Direct Impacts from Adoption [5]	
Total number of businesses adopting eSolutions	97
% of Total businesses in selected industries	4.3%
Total number of new eSolutions adoptions	234
Average new eSolutions per business adopting	2.4
Total incremental Revenue from new eSolutions	$5,350,000
Total incremental Cost Savings from new eSolutions	$335,000
Total incremental Direct Impact	**$5,685,000**

We estimate that of the 2,240 target businesses, 97 will adopt a total of 2344 new esolutions, for an average of 2.4 new esolutions per adopting business. This means that 4.3% of the targeted businesses end up adopting new esolutions. Based on the profile of those adopting businesses, the total incremental annual revenue from adopting new esolutions is estimated to be $5,350,000, with a total annual cost savings of $335,000. These amounts represent a 10.4% increase in annual revenues and a 1.1% decrease in annual operating expenses.

The total direct impact of $5,685,000 is broken down by sub industry for input to the I-O model, resulting in the following incremental economic impacts:

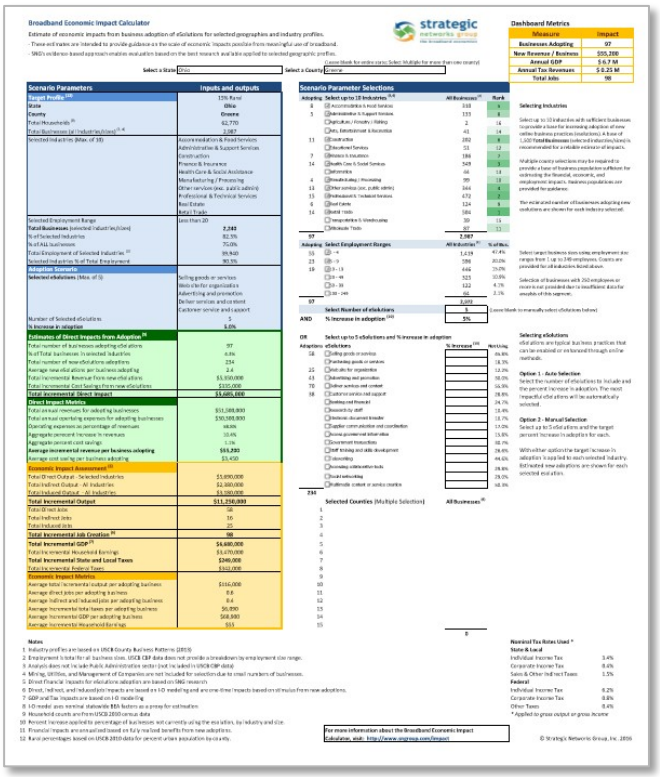
Economic Impact Assessment [8]	
Total Direct Output - Selected industries	$5,690,000
Total Indirect Output - All Industries	$2,380,000
Total Induced Output - All Industries	$3,180,000
Total Incremental Output	**$11,250,000**
Total Direct Jobs	58
Total Indirect Jobs	16
Total Induced Jobs	25
Total Incremental Job Creation [6]	**98**
Total Incremental GDP [7]	**$6,680,000**
Total Incremental Household Earnings	$3,470,000
Total Incremental State and Local Taxes	**$249,000**
Total Incremental Federal Taxes	$342,000

The total direct output from the selected industries produces an indirect output of $2,380,000 and an induced output of $3,180,000 from all other industries in the county. The total incremental output for the county is estimated to be $11,250,000 annually. In addition, the total incremental output is estimated to create an additional 98 jobs in the county – 58 direct from the adopting businesses and 40 indirect or induced by increased activity in other businesses in the county.

The net incremental GDP is estimated at $6,680,000 annually, with additional state and local taxes[10] of $249,000 per year. Total incremental household earnings also increase by a total of $3,470,000 per year, largely from new employment. In summary, **the impact of a 5% increase in adoption of the five esoltuions** for businesses with fewer that 20 employees in these ten industries is;

Dashboard Metrics

Measure	Impact
Businesses Adopting	97
New Revenue / Business	$55,200
Annual GDP	$ 6.7 M
Annual Tax Revenues	$ 0.25 M
Total Jobs	98



A relatively modest increase of 5% in overall adoption of five meaningful online business practices results in a significant impact for the county.

With only 97 small businesses adopting – just 4.3% of the targeted businesses - a total of 98 new jobs can be expected with an annual addition of $6.7M in local GDP and an annual tax revenue increase of $249,000 per year. The financial impacts are annualized, which means that these additions to GDP and taxes should persist year over year.

These results and others are provided in a detailed one-page PDF report.

[10] Nominal rates are used for modeling. State and local tax rates can vary and also change over time. These values should be used to indicate the scale of what is possible and should be adjusted up or down based on local rates.

Deriving the economic impacts

The economic impacts are derived using a proprietary Input-Output (I-O) model[11] that uses the direct output (D) as the source of inputs for each industry. The I-O model incorporates RIMS II factors available from BEA as well as tax factors for estimating incremental tax impacts. Essentially, the I-O model applies these factors to estimate the impacts of increased direct economic activity that flow through other industries. The increased activity in any one industry, as represented by the direct impact for that industry, affects other industries as modeled by the RIMS II factors. Thus, the direct impact creates indirect and induced impacts from other industries.

Formulas for the I-O model are not presented here. However, the direct impacts derived from modeling the incremental adoption of esolutions is broken down by sub-industry at the 3-difgit NAICS level as required by the I-O model. In other words, the values for $\mathbf{D}_i$ are allocated to the associated 3-digit NAICS sub-industries.

This allocation is based on using the direct output ($\mathbf{D}_i$) per industry and apportioning it to the needed sub-industries based on the relative representation of each sub-industry for the selected state using USCB County Business Patterns data. The proportional representation is based on the annual payroll of each sub-industry within the 2-digit NAICS industry. Annual payroll is used as a proxy to estimate the relative level of economic activity of each sub-industry since annual revenues are not provided by USCB.

The I-O model uses the allocated direct impacts as input to generate estimates of:

- **Direct Output** = Total of direct impacts used as input
- Total **Indirect Output**[12]
- Total **Induced Output**[13]
- Incremental **GDP**[14] (Gross Domestic Product)
- Total Incremental **Household Earnings**
- Total Incremental **Taxes** (State/Local and Federal)
- Total **Direct Jobs** created (from adopting businesses in selected industries)
- Total **Indirect** and **Induced Jobs** created from increased economic activity in other industries

[11] For a detailed description of I-O modeling, please refer to the article from US BEA "**Input-Output Models for Impact Analysis: Suggestions for Practitioners Using RIMS II Multipliers**" (2011) http://www.bea.gov/papers/pdf/wp_iomia_rimsii_020612.pdf

[12] Indirect effects are the changes in sales, income or jobs in sectors within the region that supply goods and services to the sector.

[13] Induced effects are the increased sales within the region from household spending of the income earned in the directly and indirectly affected sectors.

[14] Estimates of changes in total gross output is a duplicated total - gross output counts goods and services multiple times if they are used in the production of other goods and services. GDP measures final demand expenditures and is an unduplicated total. Gross output will usually be higher than GDP for this reason.

Since the direct impacts are based on changes to annual revenues and annual operating expenses, these impacts and the resulting **economic impacts are treated as annualized impacts**, i.e. once these impacts are realised they will persist year over year, everything else being equal.

Job impacts would be expected to occur one time based on the initial stimulus from the direct impacts, i.e. the **new job creation happens once**, but is expected to persist over time.

It must also be recognized that impacts from adopting esolutions to not occur instantaneously. It can take time for incremental revenues and cost savings to fully materialize and for job creation, driven by business growth and operational needs, to occur.