

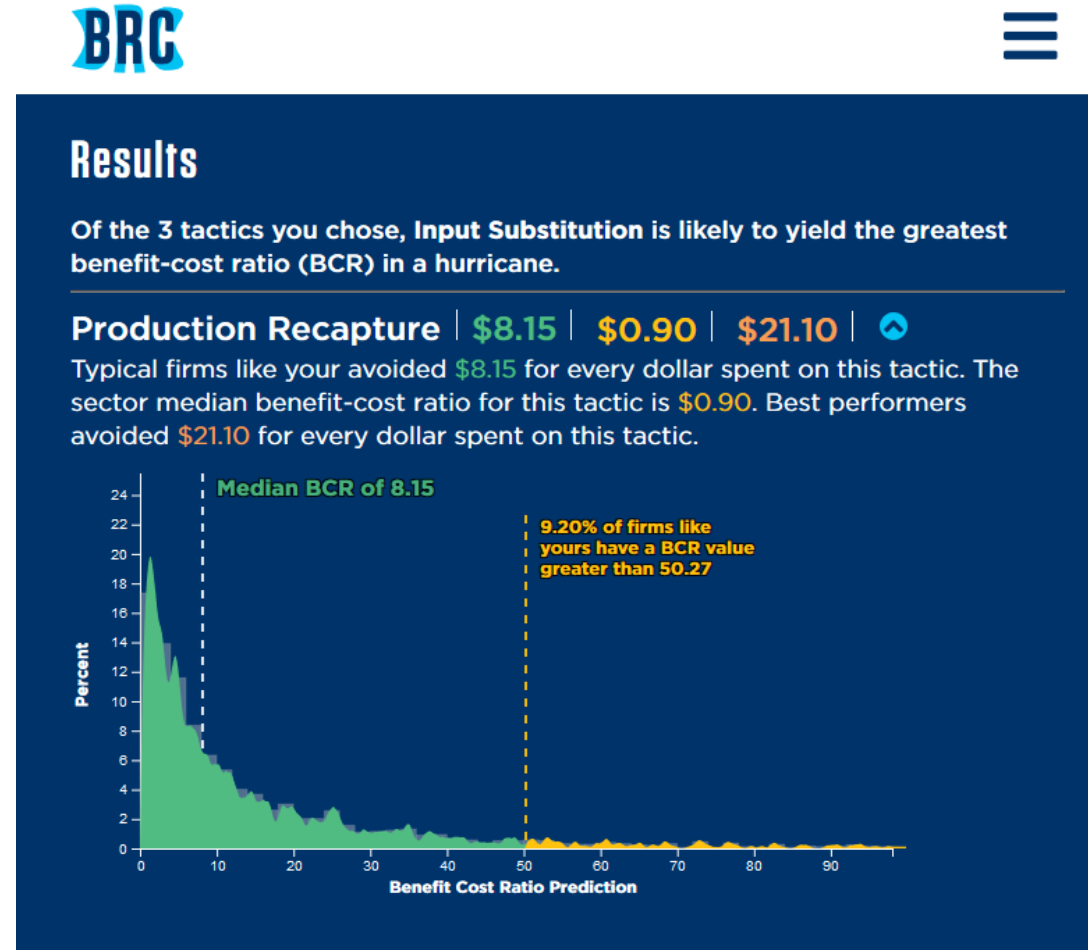
Business Resilience Calculator (BRC)

Transition Product from Measuring Business & Economic Resilience in Disasters

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Project Overview: The BRC

- ❑ What: Data-driven decision-support software tool
- ❑ Purpose: To safeguard business continuity in a cost-effective manner
- ❑ Users: private enterprises, as well as Fed government including FEMA, SBA, NIST, Emergency Managers
- ❑ Knowledge Gap: Primary data & statistical analysis for business resilience decisions



BRC Video

<https://www.youtube.com/watch?v=INd1cUetVVk>

Testing & Validation

- Transition Product (Software) Testing and Validation
 - Internal Software
 - A) Comprehensive technical review of software results/outputs; B) Developed thorough proficiency check of modeled results for pandemic-related outputs; C) Conducted secondary data analysis on proficiency check results to ensure the absence of irregularities in results; D) Model comparison and evaluation to ensure software results from 2wav match internal model results (i.e., ensure that software gets all the math right!); E) Developed file sharing and workflow platform (using Basecamp) to ensure efficient task completion and collaboration between PIs and software developers
 - User Review
 - A) Developing approach for further validating results from users in the field; B) Presented primary research at conference and to SBA representative; C) Demos and feedback platform from multiple users currently underway

Transition Approach

- Gather feedback from users on Covid-19 Pre-release
- Collaborate with CIRI and software partner (2way) on gathering user information and data
- Conduct customer and user interviews from interested agencies (e.g., SBA, NIST)
- Develop guidance for improving business resilience
- Incorporate user input into software updates/revisions
- Develop corporate spin-off strategy



NATIONAL CENTER FOR
THE MIDDLE MARKET

Major Milestones & Accomplishments

- ❑ Theoretical Foundation for BRC → Done
 - ❑ Published in Leading Peer-reviewed Journal
- ❑ Designed & Administered Large-Area Resilience Surveys → Done
 - ❑ NY & NJ (SuperStorm Sandy) & TX (Hurricane Harvey)
- ❑ Developed Data-Driven Predictive Analytics → Done
 - ❑ Formal Econometric Models for BRC
- ❑ Developed Software Minimum Viable Product → Done
- ❑ Wide Release Covid-19 Special Application Module → + 1 Week
- ❑ Develop Remaining Module & Metrics → + 9 Months
- ❑ Develop Optimization Learning Algorithm → + 9 Months

Project Impact

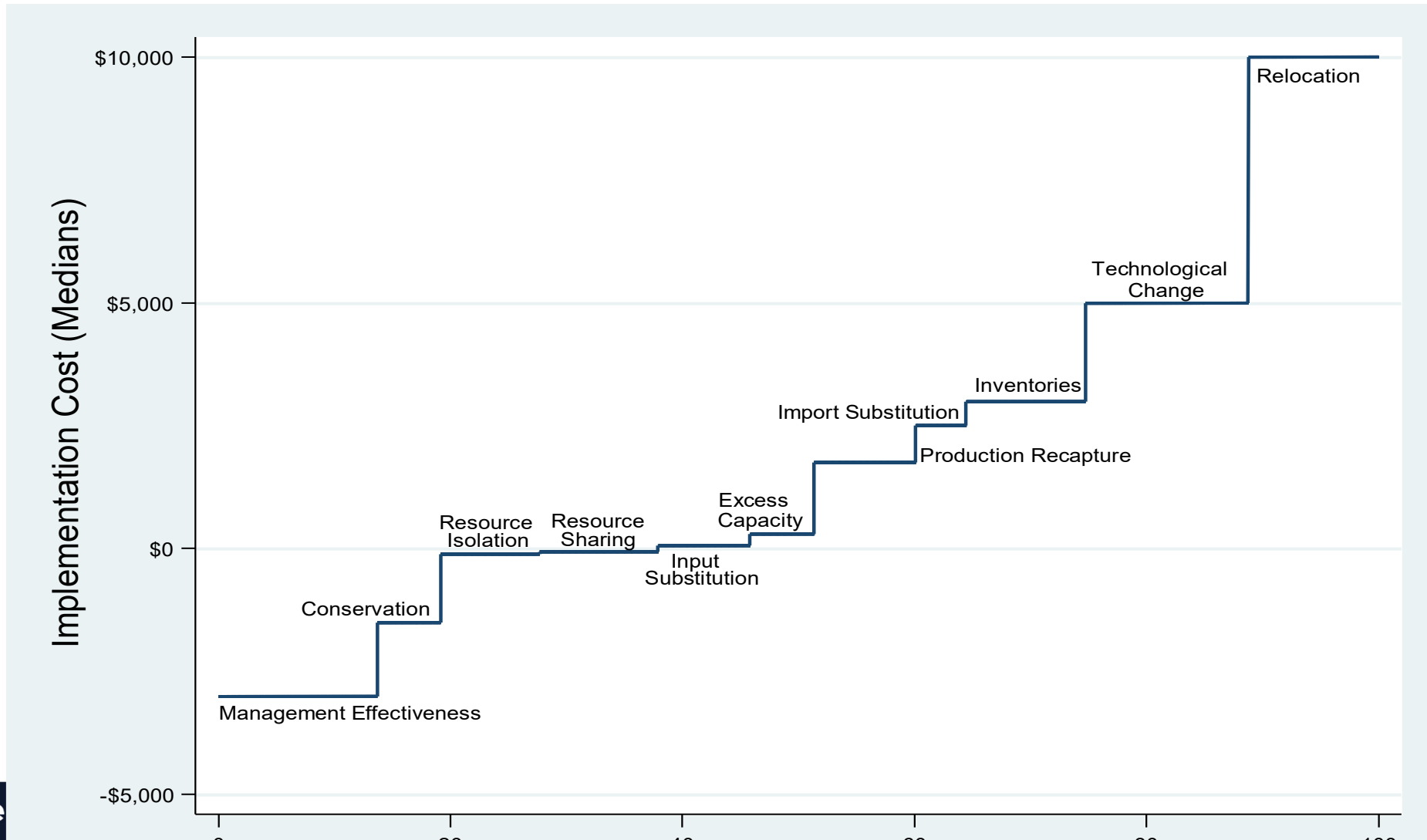
- ❑ Built decision-support tool to promote cost-effective individual business continuity
- ❑ Represents a key component of community resilience
- ❑ Reduces need for federal funding of disaster recovery (e.g., FEMA, SBA)
- ❑ Collected immense primary data set through surveys and business self-reporting
- ❑ Sound modeling approach validated by peer-review & statistical goodness-of-fit
- ❑ Trained PhD students and post-docs working on homeland security

Backup Slides

Testing & Validation

- ❑ Testing and Validation of Basic/Primary Research
 - ❑ Peer-reviewed/published on underlying theory in leading journal
 - ❑ Rigorous survey/sampling approach
 - ❑ A) GIS/satellite imaging; B) Professional survey administration; C) Rigorous programming of internal validity checks; D) Thorough qualification instruments within survey; E) Stratified random sampling ensuring balanced sample
 - ❑ Rigorous data evaluation and “cleaning”
 - ❑ A) Extensive review of survey responses; B) Targeted location evaluation; C) Detailed review of use of resilience tactics, disruptions, and other key variables
 - ❑ Comprehensive statistical/econometric approach to data analysis & projection
 - ❑ A) Extensive exploratory analysis to ensure model appropriateness; B) Rigorous evaluation of model results; C) Designed testing and evaluation software to validate results; D) Secondary data analysis on modeling results to ensure robustness and validity; E) Customized algorithm for construction of standard errors and confidence intervals

Resilience Tactics (Cost Curve)



Resilience Tactics (Actions)

Resilience Tactic	Definition (Activities Involved)
Conservation	Maintaining intended production using lower amounts of an input or inputs
Resource Isolation	Modifying a portion of business operations to run without a critical input
Input Substitution	Replacing a production input in short supply with another
Inventories	Continuing business operations using emergency and ordinary stockpiles
Excess Capacity	Using idle plant or equipment idle in place of a damaged ones
Relocation	Moving some or all of the business activity to a new location
Management Effectiveness	Improving the efficiency of business operations in the aftermath of a disaster
Import Substitution	Importing needed production inputs when not available from local suppliers
Technological Change	Improvising the production process without requiring a major investment
Production Recapture	Making up for lost production by working overtime or extra shifts.
Resource Pooling/Sharing	Recontracting, selective exchange of resources, creating new partnerships

Evaluative (Retrospective) Module

Enables firms to evaluate their performance relative to other similarly-situated businesses

Provides three resilience metrics to gauge their own performance

- Benefit-Cost Ratio (BCR)
- Resilience Metric (RM)
- Relative Cost-Effectiveness (RCE)

Users provided with checklist and reference points

- Default
- Best practices

Matched with comparable firms

- Same industrial sector (NAICS codes)
- Same firm size (# of employees)

Scenario event planning

- Level of property damage (dollars)
- Type(s) and levels of infrastructure disruption

Planning (Prospective) Module

Enables firms to make cost-effective resilience planning decisions

Provides three resilience metrics (with ranges)

- Benefit-Cost Ratio (BCR)
- Resilience Metric (RM)
- Relative Cost-Effectiveness (RCE)

Users are provided with metrics for tactics applicable to their own business

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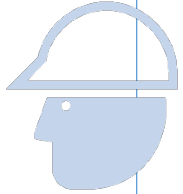
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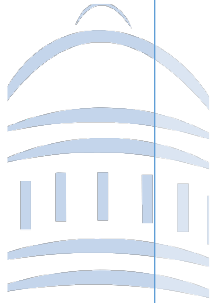
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BRC Intended Users



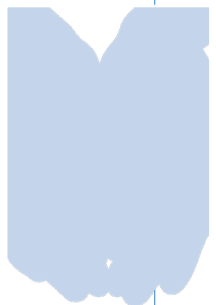
Industry

- Private-sector firms prospectively planning for resilience to build resilience capacity
- Private-sector firms retrospectively evaluating their own resilience in recovering from a disaster, comparison to other similar firms



Government

- Supporting regional economic development, and building regional community resilience
- Supporting individual firms/sectors in planning for, and preparing for catastrophic events and building resilience capacity



Insurers & Reinsurers

- Gauging and calculating resilience capacity of insured
- Setting risk premia and actuarial assessment

The robust growth of the resilience market shows opportunities for BRC to enter the market

Disruptions (2000-2018)

- Terrorism: 9/11 attacks (2001)
- Power Outage: Northeast Blackout (2003)
- Financial Crisis (2008)
- Natural Disasters: Hurricane Katrina (2005), Hurricane Sandy (2012), California Wildfire (2018)

Business Continuity and Disaster Recovery (BC&DR)

- Processes that help organizations to **prepare** for and **respond** to disruptive events
- The combination of BC and DR results from the industry recognition of enhancing the **collaboration** between business and technology executives

Drivers for Growth



Environment become the most important risk (World Economic Forum 2018)



>75% of businesses fail within three years after a major disaster



Research shows that companies with resilience plans recover faster following an emergency

28 Billion Dollars

U.S. Business Continuity and Disaster Recovery Market by 2023



Microsoft

Gremlin

The increasing number of disruptions faced by companies lead to the robust growth of the resilience market and enable BRC to enter the market

Successful academic spin-offs utilize niche industries and markets to successfully launch

Compare with BRC:

	BRC	KR	SUQ
Resilience score	✓		
Potential solutions	✓	✓	
Cost-effect analysis	✓		
Impact to resilience	✓		
Threat specific analysis	✓	✓	
Business cont. plan		✓	
Database of info		✓	
Industry-specific		✓	✓

Kuali Ready

- Business continuity planning web application
- Delivered software-as-a-service with subscription based model



Market reach:

- 70+ international colleges/universities
- KualiCo \$9.22M in sales

Utilized **testbed markets** to **develop software** and **identify the customer** before hitting the international market



- SmartUQ specializes in data analytics
- Successfully spun-off into a standalone company in 2012

Market reach:

- SmartUQ \$138K in sales

Differentiated to **target 12 industries** with specific data analytics challenges

Academic spinoffs have formed standalone companies and been acquired by larger organizations, however, having a targeted industry is instrumental to differentiating and marketing the product

Industry competitors focus on general solutions based on appropriate industry best practices

Products/Criteria	BR C	ROne	Catalyst	Fusion
Resilience score	✓			
Efficacy of solutions	✓			
Cost/benefit analysis	✓			
Business continuity plan	✓	✓	✓	✓
Threat-specific analysis	✓	✓	✓	✓
Dependency mapping		✓		✓
Annual sales	—	\$1.3M	\$3.6M	\$9.0M

Competitor Analysis

- Identified **leading competitors** (as ranked by Gartner)
- Do not target a particular industry, but identified at least 5% of customers in manufacturing or construction
- In general, their products **identify threats** and recommend **best practices** to address them
- Lack of competitors targeting specifically manufacturing or construction



BRC Advantage

BRC benefits from **increased credibility** via survey data that informs which tactics are **proven to be effective** paired with a cost/benefit analysis that helps companies make **informed decisions** and take the most **efficient course of action**

While many broad resilience software solutions are available, the BRC can leverage its proven efficacy of recommended tactics, cost-benefit analysis, and efficient approach to differentiate