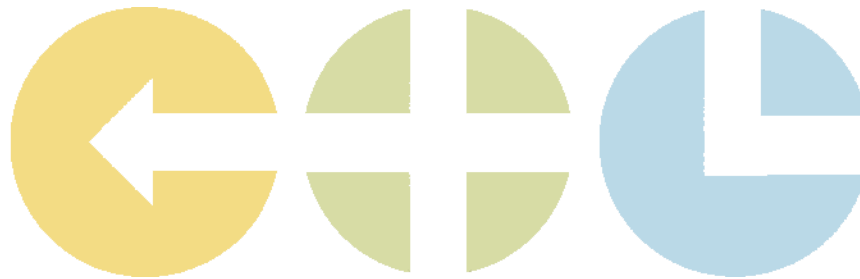


Supply Chain Resilience Evaluation And Mitigation



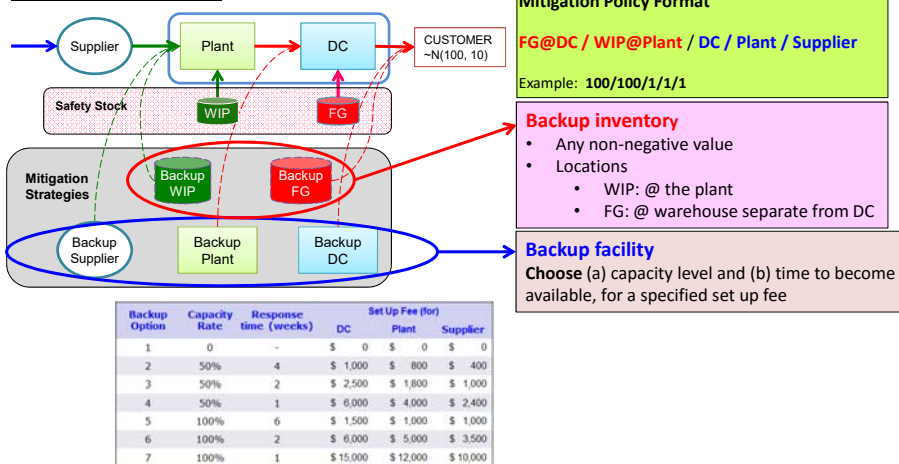
Dr. Josué C. Velázquez Martínez
Director, SCALE Latin America
josue@mit.edu
<http://josuevelazquezmartinez.com>

January 19, 2017
MIT Center for Transportation & Logistics
Cambridge, MA



SCREAM Game

Objective: Design a robust risk mitigation strategy to minimize the total supply chain cost while maximizing the order fill rate over an uncertain future.



What is the policy for building resilience in SCs?

- A. Safety stock only
- B. Safety stock + Backup Inventory
- C. Safety stock + Backup Facility
- D. Safety stock + Backup Inventory + Backup Facility



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What is the most important for developing mitigation policy? Least important?

- A. Supplier Disruption
- B. Plant Disruption
- C. DC Disruption



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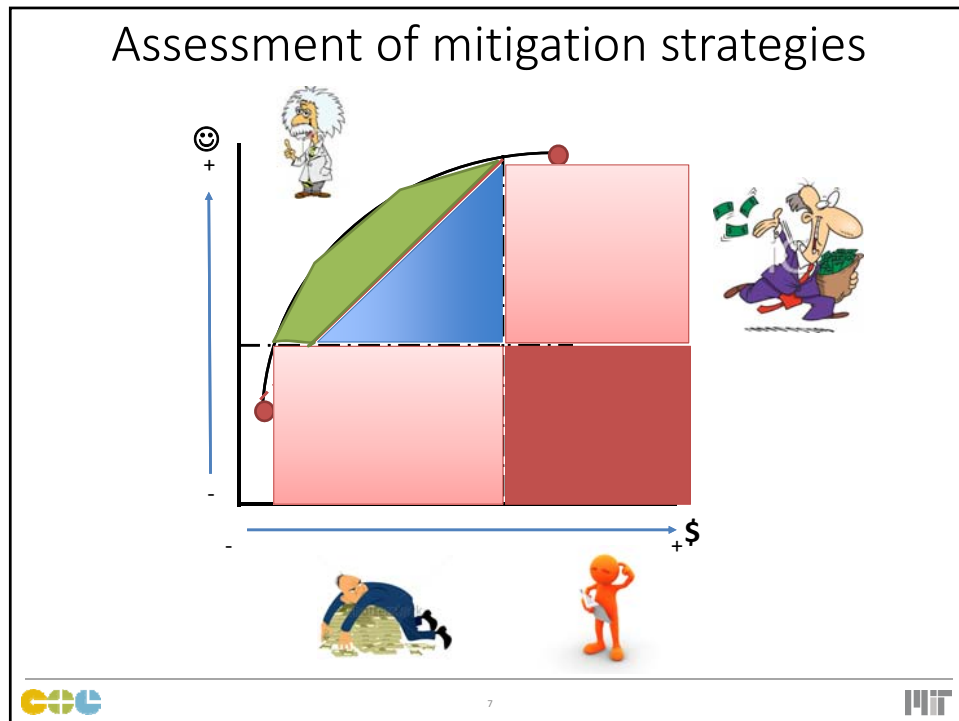

How do we assess the mitigation strategies?



Building “Scenarios”

Scenario	DC disruption			Plant disruption			Supplier disruption		
	Start	Duratr	Online	Start	Duratr	Online	Start	Duratr	Online
1	1	0	1	1	0	1	1	0	1
2	1	12	13	14	12	26	27	12	39
3	26	12	38	26	12	38	26	12	38
4	1	0	1	12	36	48	1	0	1
5	12	36	48	1	0	1	1	0	1
6	1	0	1	1	0	1	12	36	48
7	26	4	30	26	4	30	26	4	30
8	40	4	44	15	4	19	1	4	5
9	1	52	53	1	0	1	1	0	1
10	1	0	1	1	52	53	1	0	1

Scenarios									
Sunny Day	100%	0%	0%	0%	0%	0%	0%	0%	0%
Partly Sunny	82%	2%	2%	2%	2%	2%	2%	2%	2%
Slightly Sunny	55%	5%	5%	5%	5%	5%	5%	5%	5%
Slightly Cloudy	37%	7%	7%	7%	7%	7%	7%	7%	7%
Very Cloudy	19%	9%	9%	9%	9%	9%	9%	9%	9%
Nightmare	0%	11%	11%	11%	11%	11%	11%	11%	12%
Short Overlapping	0%	0%	0%	0%	0%	0%	100%	0%	0%
Supplier Down Longterm	0%	0%	0%	0%	0%	100%	0%	0%	0%
DC Down Longterm	0%	0%	0%	0%	100%	0%	0%	0%	0%
Even Probability	10%	10%	10%	10%	10%	10%	10%	10%	10%



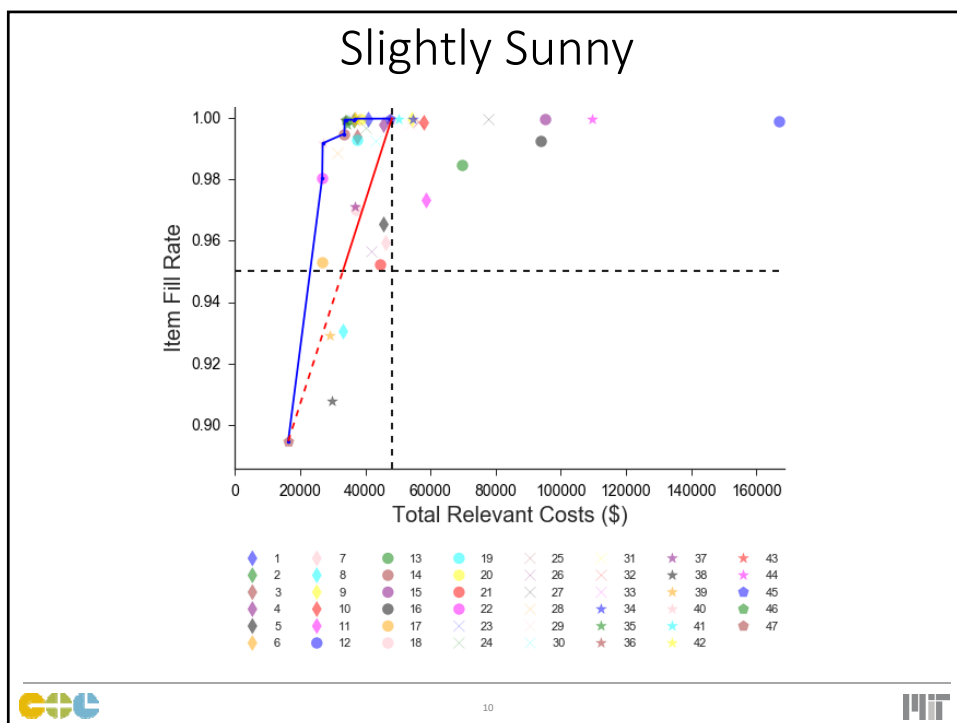
Supply Chain Resilience Evaluation And Mitigation

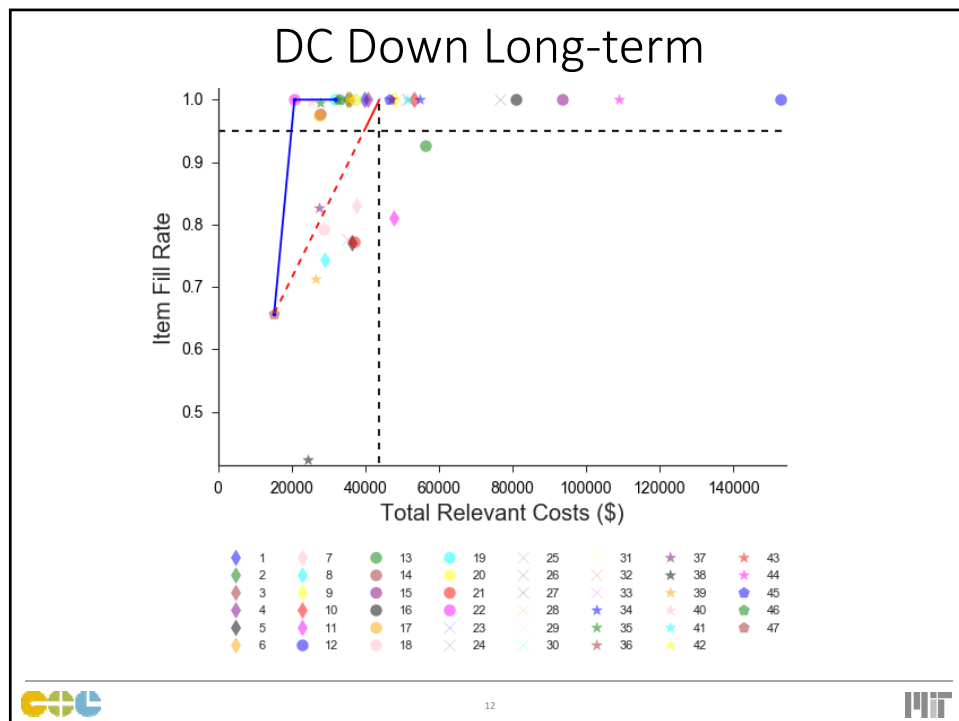
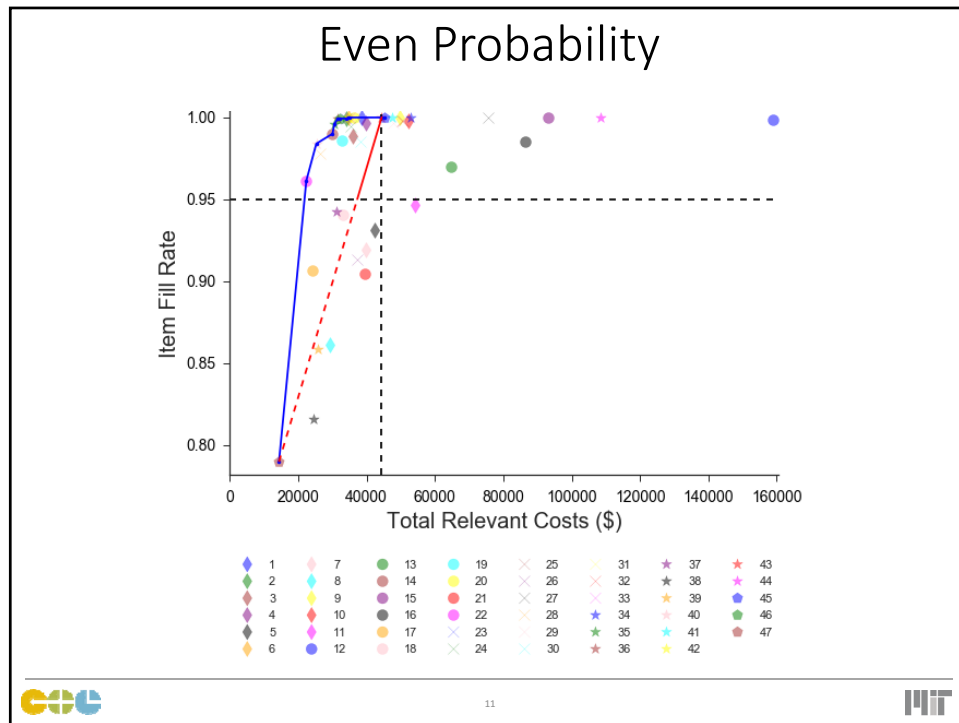
Analysis of Results

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How did the charts look in SC3x?






How do the charts look now?...



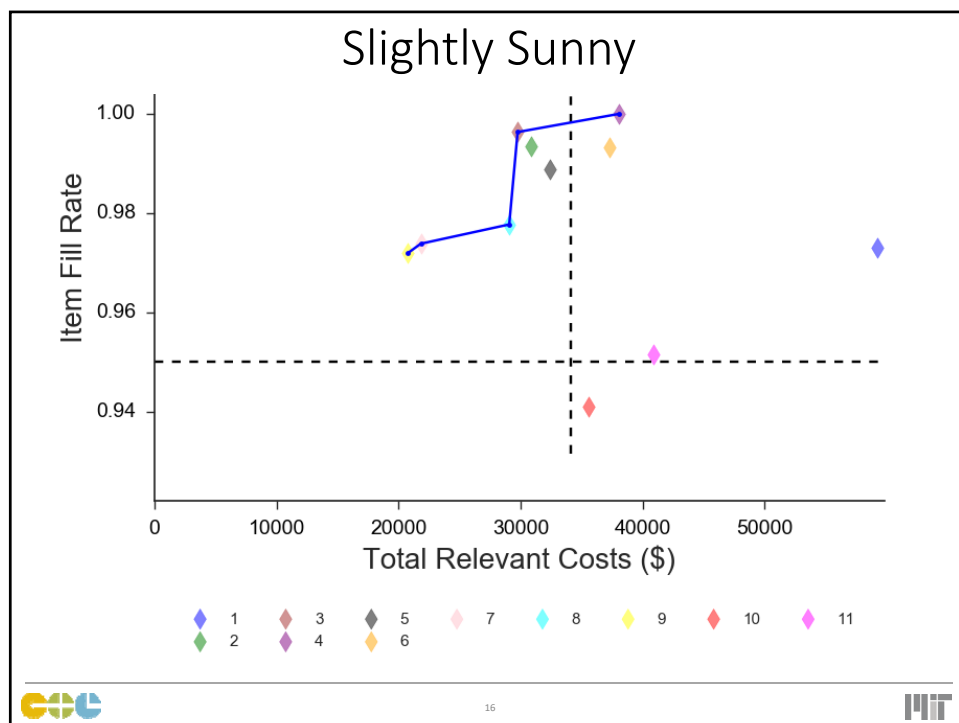
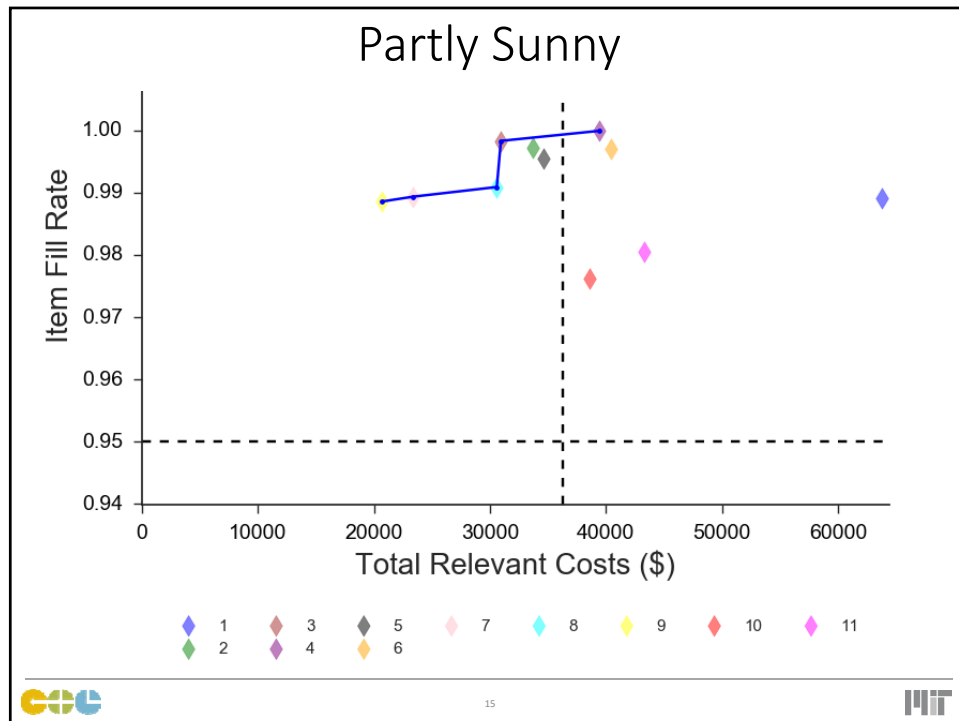
Participants

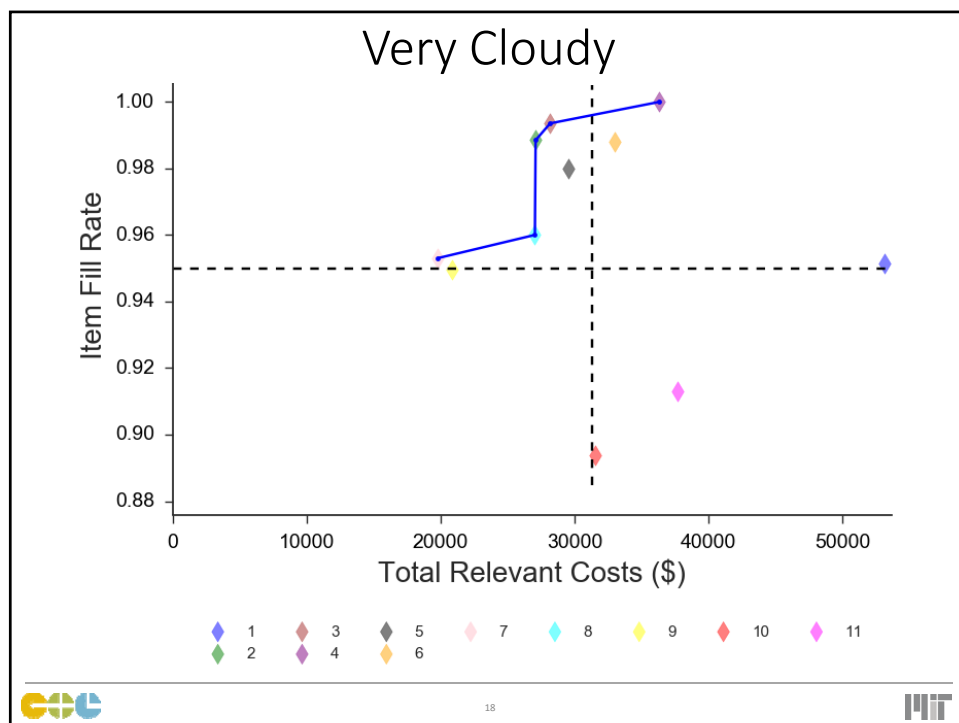
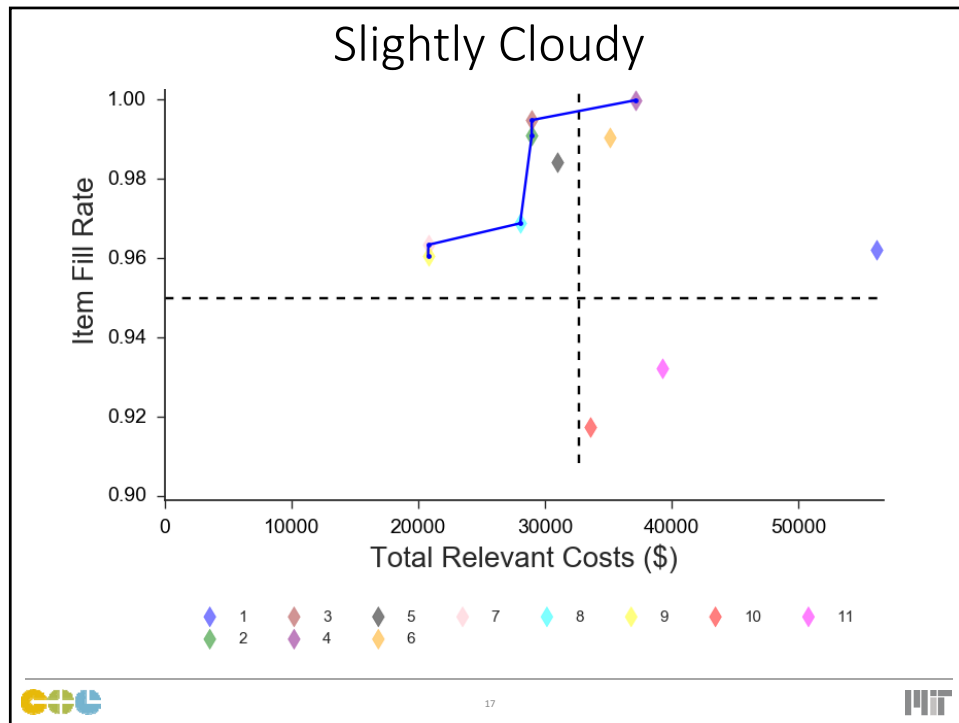
ID	Team Name	FG Inventory	WIP Inventory	DC	Plant	Supplier
1	The Almighty Guess	1500	1000	2	3	2
2	TPJ	725	265	5	5	6
3	Kimberly_Eswar_Andreas	325	150	6	6	6
4	Ashley-Catalina-Sara	500	360	6	6	6
5	Steve, Mamoru and Kimberly	500	500	5	6	5
6	Boston Brains	1000	400	5	5	5
7	410_0_6_5_5	410	0	6	5	5
8	JohnGeorgeJes	300	300	6	6	3
9	Kosh-Zhu-Lacen	0	0	6	6	6
10	# 1	650	650	3	3	3
11	The internationals T	600	300	4	3	7

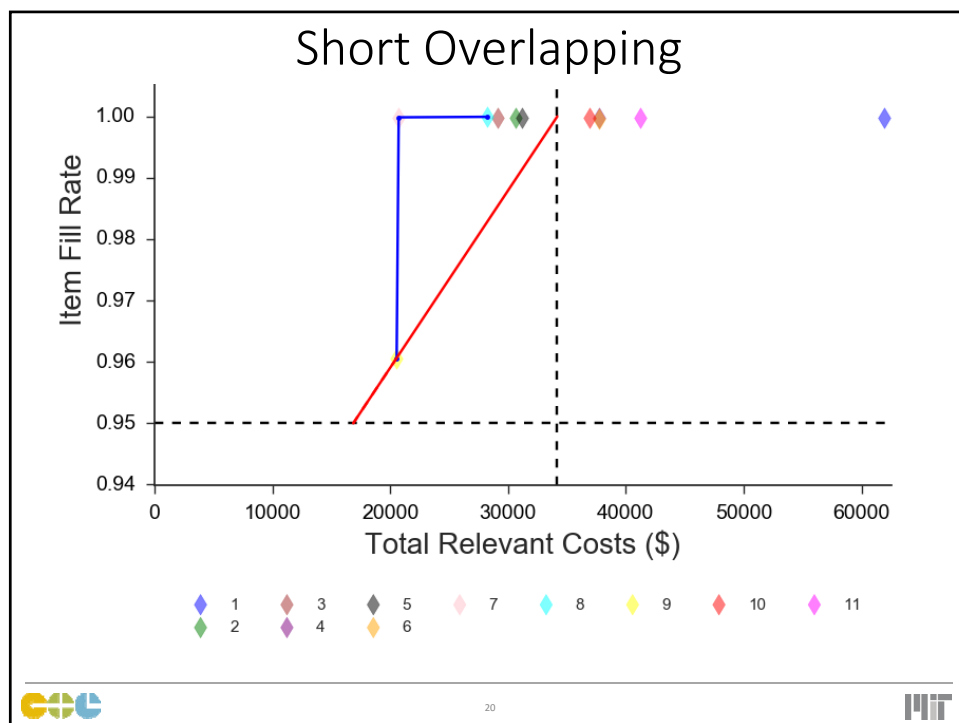
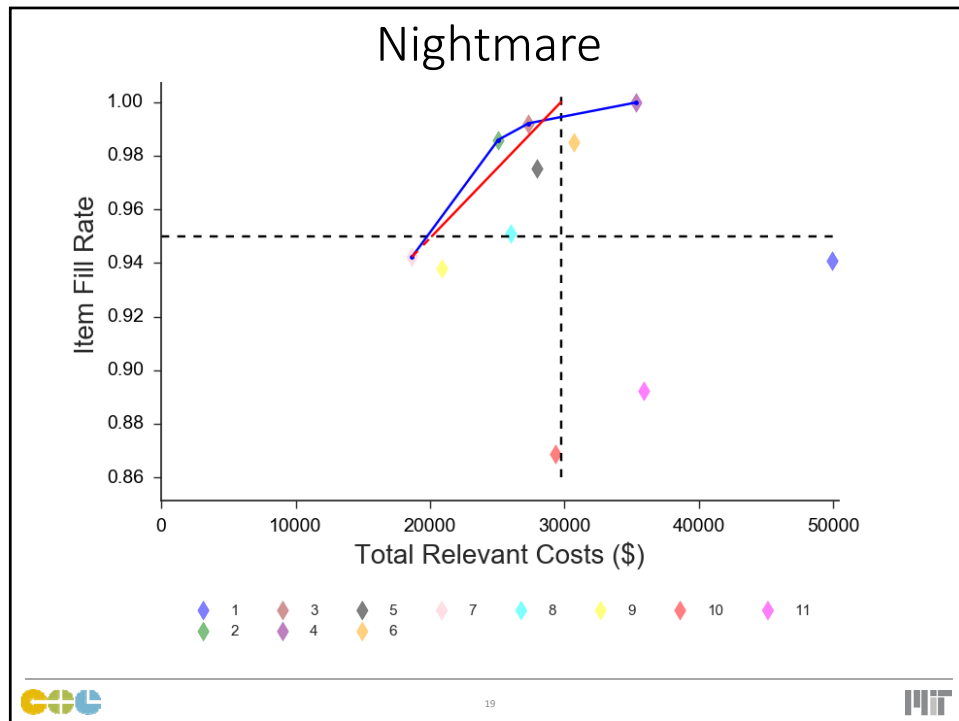


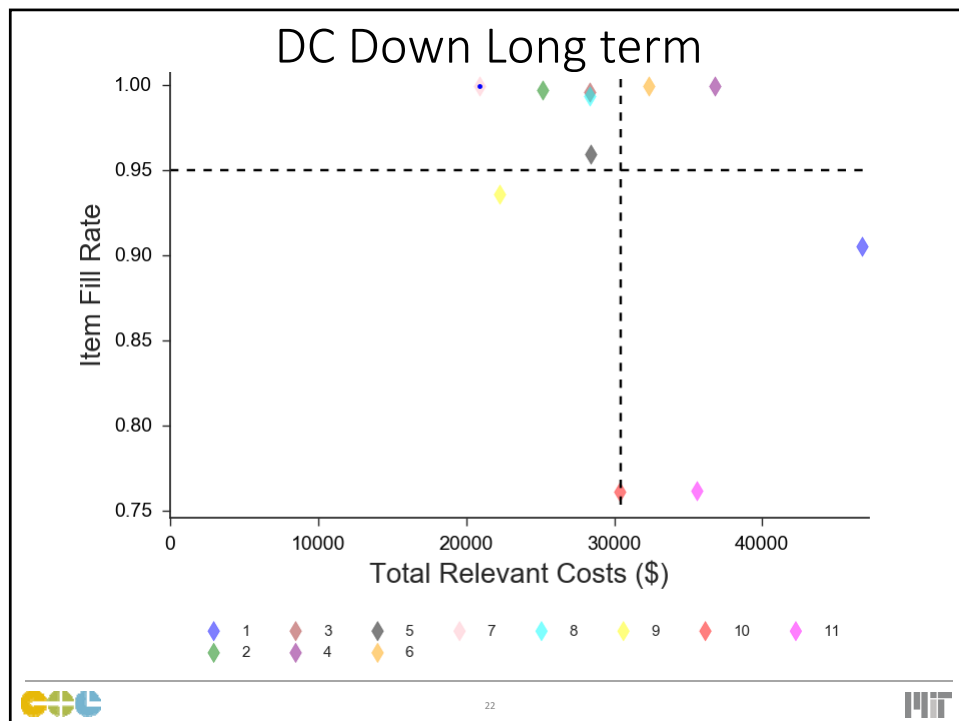
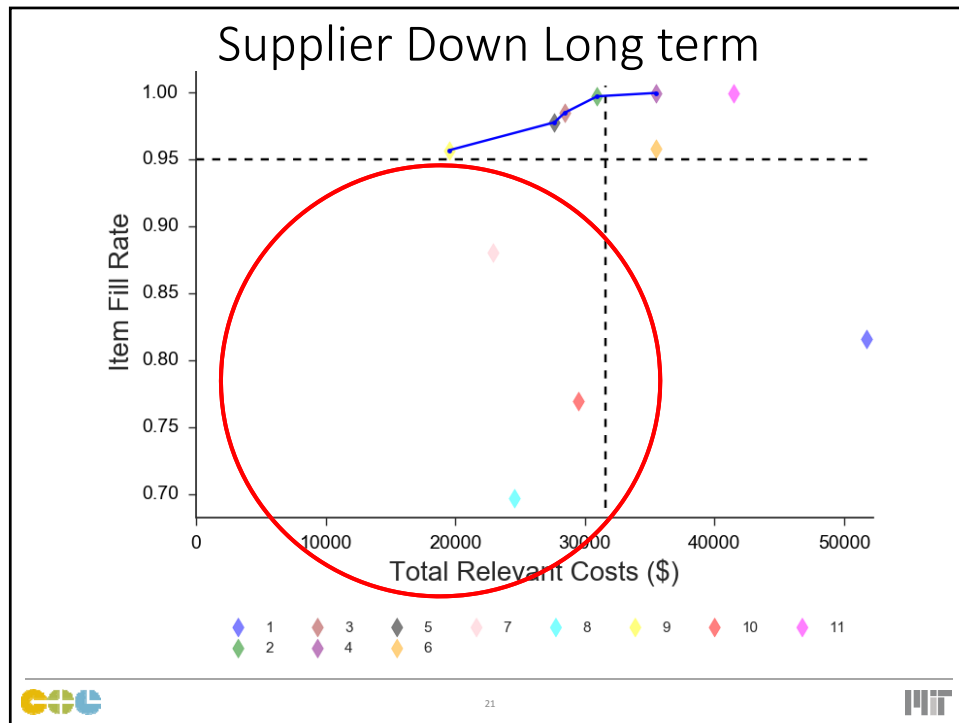
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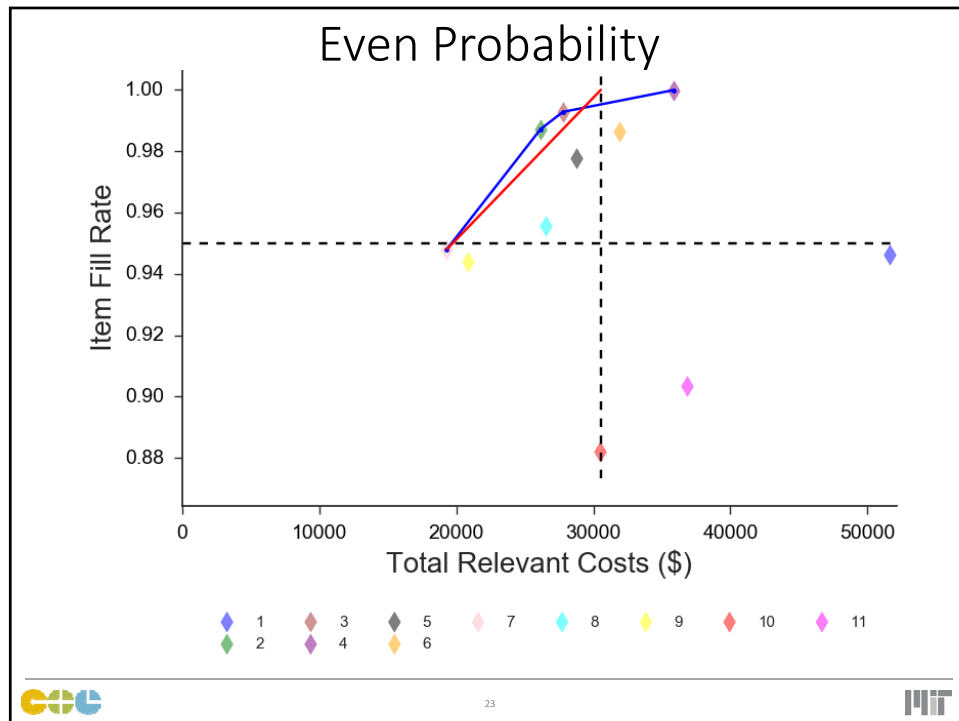












The Winner

ID	Team Name	FG Inventory	WIP Inventory	DC	Plant	Supplier	Green	Blue	Red	Final Score
2	TPJ	725	265	5	5	6	9	1	0	19
3	Kimberly_Eswar_Andreas	325	150	6	6	6	9	1	0	19
5	Steve, Mamoru and Kimberly	500	500	5	6	5	4	6	0	14
7	410_0_6_5_5	410	0	6	5	5	6	1	3	13
8	JohnGeorgeJes	300	300	6	6	3	4	5	1	13
9	Kosh-Zhu-Lacen	0	0	6	6	6	6	0	4	12
1	The Almighty Guess	1500	1000	2	3	2	0	0	10	0
4	Ashley-Catalina-Sara	500	360	6	6	6	0	0	10	0
6	Boston Brains	1000	400	5	5	5	0	0	10	0
10	# 1	650	650	3	3	3	0	0	10	0
11	The internationals T	600	300	4	3	7	0	0	10	0

and the
OSCAR
goes to...

You have to pitch 1 minute to
sell your approach
Vote here: <http://kahoot.it>

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Observations from the SCREAM Game

- Different policies do well under different scenarios
- **Combination of Redundancy & Flexibility** is typically a reasonable approach
 - Redundant inventory covers before backup capacity available
 - Flexibility (backup capacity) covers for longer term
- Understanding the **right scenario** portfolio is key
- Scenario creation is an informed process -Consider the vulnerabilities of your supply chain



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Key learnings

- ***“What is the ROI of a health insurance?”***
 - ROI is hard to assess in these type of problems –Communication of the trade-offs is key
- ***...“Nobody gets credit for solving problems that didn’t happen”*** –Repenning & Sterman (2001)
- Usually, the longer the lead time the more time you have to react/respond to disruptions
 - DC disruption might be the most dangerous
- The “optimality” condition of the SC Resilience problem – Pareto Front



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Thanks!

✉ josue@mit.edu

+1.617.253.3630

<http://josuevelazquezmartinez.com>



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