A BUSINESS CASE FOR CONSTRAINTS AND THE IMPACT TO THE "BOTTOM LINE"

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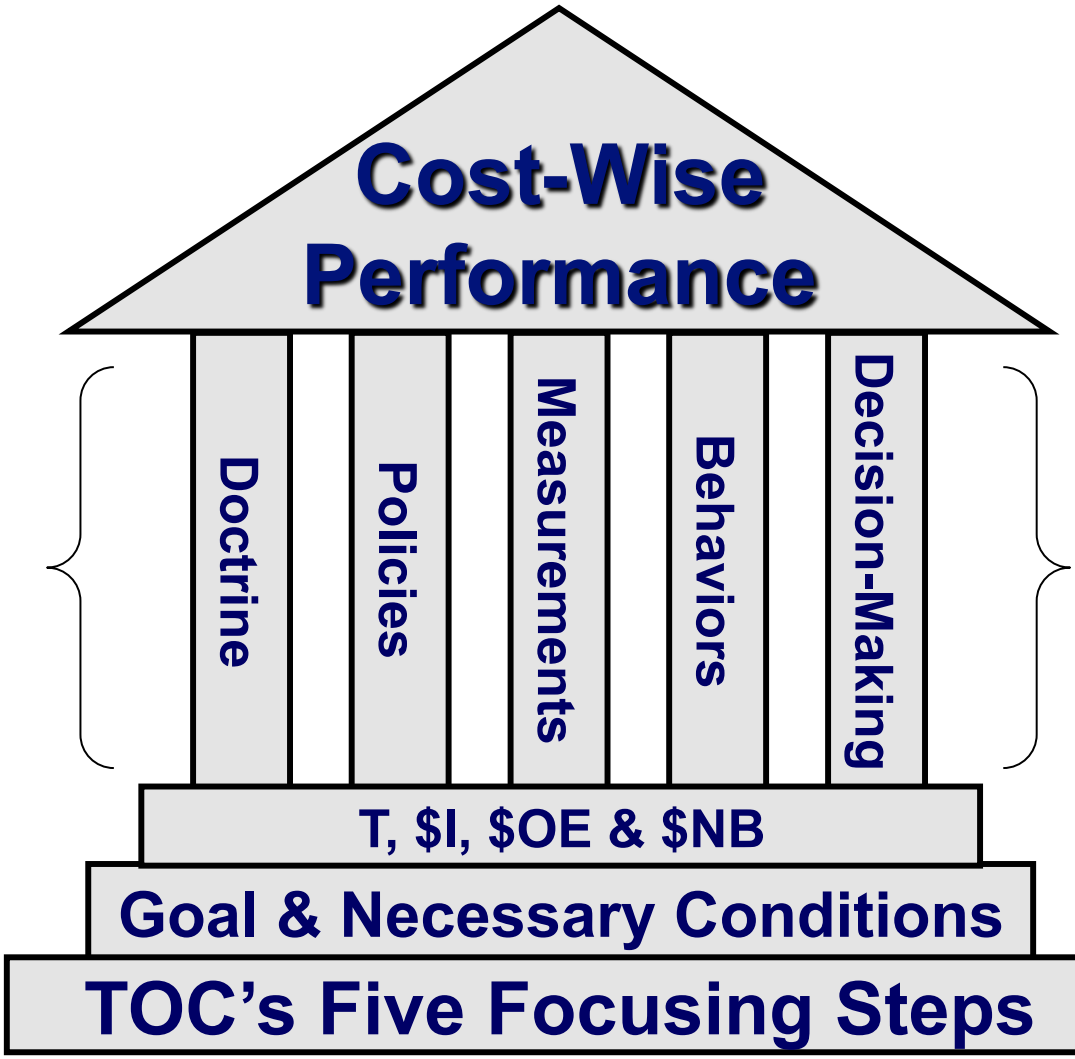
TOC's Enterprise Architecture



Acknowledging, understanding and managing:

- Interdependencies
- Constraints
- Variability

Pop Quiz

The primary focus of ***Lean*** is…elimination of waste where waste is relative to customer value.

The primary focus of ***Six-Sigma*** is…elimination of variability to better match the voice of the process to the voice of the customer.

The primary focus of ***TOC*** is…creation of cost-wise performance to meet an organizations Goal or Mission by acknowledging, understanding and managing - then eliminating - interdependencies, variability and constraints.

Is it possible that these methodologies can work together?

Common Ground

1. All three methodologies require an understanding of the system to be improved.

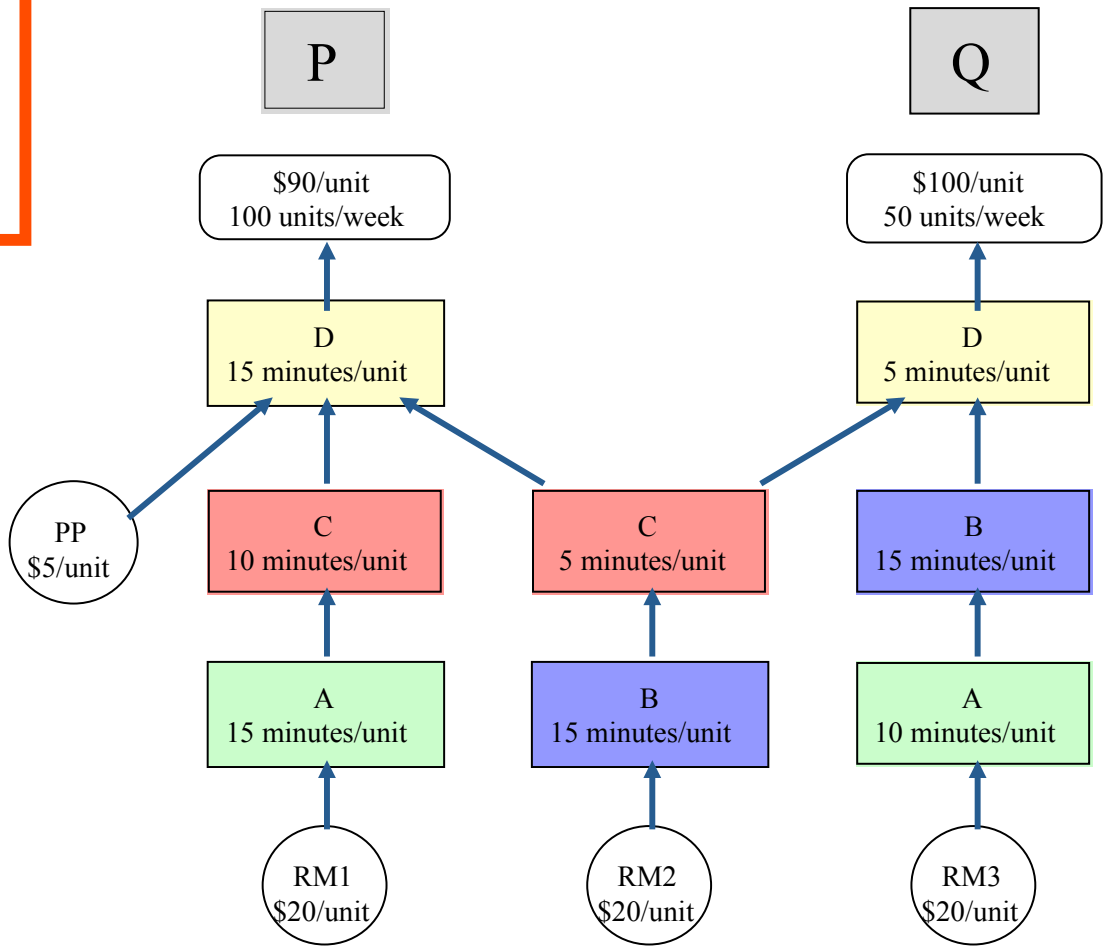
2. All three methodologies recognize that systems involve interdependencies.

3. All three methodologies are working to achieve continuous improvement.

They may differ in…

…where to start and where to focus.

How should we improve this business?



Available resources: 1A, 1B, 1C, 1D
Each resource is available 5 days/week, 8 hours/day (2400 minutes)
Operating Expenses = $6,000 per Week

Improvement Opportunities

One Green Belt asked for $5,000 for a new tool. He claimed that it would enable him to cut the process time in one department from 15 minutes, down to 7 minutes.

Another Green Belt asked for $5,000 for a different tool. When questioned, it turned out that she wanted to use the tool to increase the time to process a high volume part from 20 minutes to 22 minutes.

What Should We Do?

First…

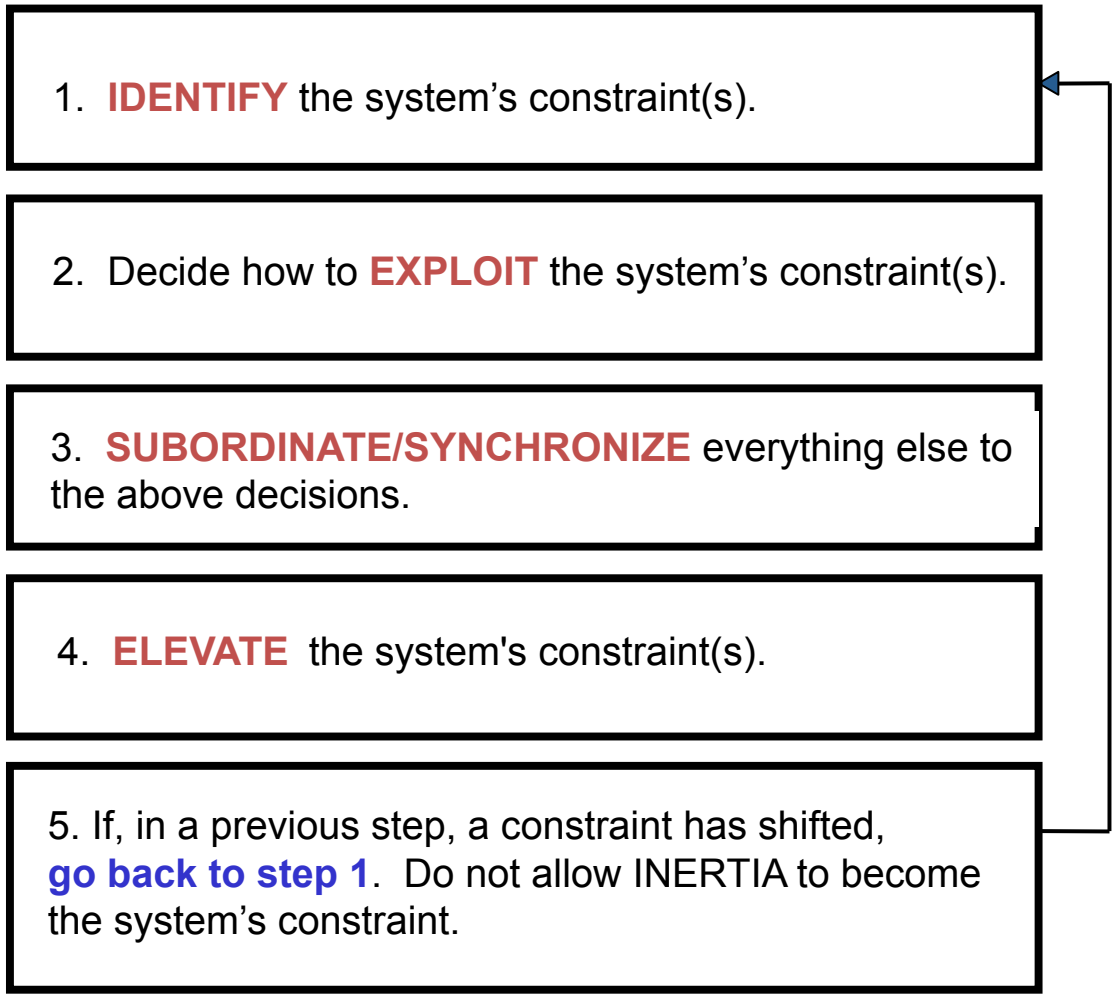
…we need to determine what this system can do in terms of its Goal to make money, *i.e.,* Net Profit?

First Attempt to Determine Profit

Throughput from Q	($100 - 40) x 50 = $3,000
Throughput from P	($90 - 45) x 100 = $4,500
Total Throughput	$7,500
Operating Expenses	$6,000
Net Profit	$1,500

But, … is there a conceptual mistake?

The Five Focusing Steps
Improving Organizational Performance



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Continuous System Improvement

Second Attempt

Identify the system's constraint(s)

(***Each resource can work 2400 minutes per week***)

Resource	Load	Conclusion
A	_____	_____
B	_____	_____
C	_____	_____
D	_____	_____

Second Attempt

Identify the system's constraint(s)

(***Each resource can work 2400 minutes per week***)

Resource	Load	Conclusion ?
A	P = 15 x 100 = 1500 Q =10 x 50 = 500 / **2000**	OK
B	P = 15 x 100 = 1500 Q = 30 x 50 = 1500 / **3000**	**EXPLODE B!**
C	P = 15 x 100 = 1500 Q = 5 x 50 = 250 / **1750**	OK
D	P = 15 x 100 =1500 Q = 5 x 50 = 250 / **1750**	OK

Second Attempt

Decide how to exploit the system's constraint(s)

	P	Q
Sales Price	_____	_____
Raw Material Cost	_____	_____
Labor Investment	_____	_____
Product Margin	_____	_____

Second Attempt

Decide how to exploit the system's constraints(s)

	P	Q
Sales Price	$90.00	$100.00
Raw Material Cost	45.00	40.00
Labor Investment	*60 Min.*	*50 Min.*
[$6,000/(4*2400)=$0.625/min]	37.50	31.25
Product Cost	82.50	71.25
Product Margin	$ **7.50**	**$28.75**

Conclusion: ***Sell Q!***

What happens to someone who insists on the opposite?

Second Attempt

Decide how to exploit the system's constraints(s)

Throughput from Q _____

Throughput from P _____

Total Throughput _____

Operating Expenses _____

Net Profit _____

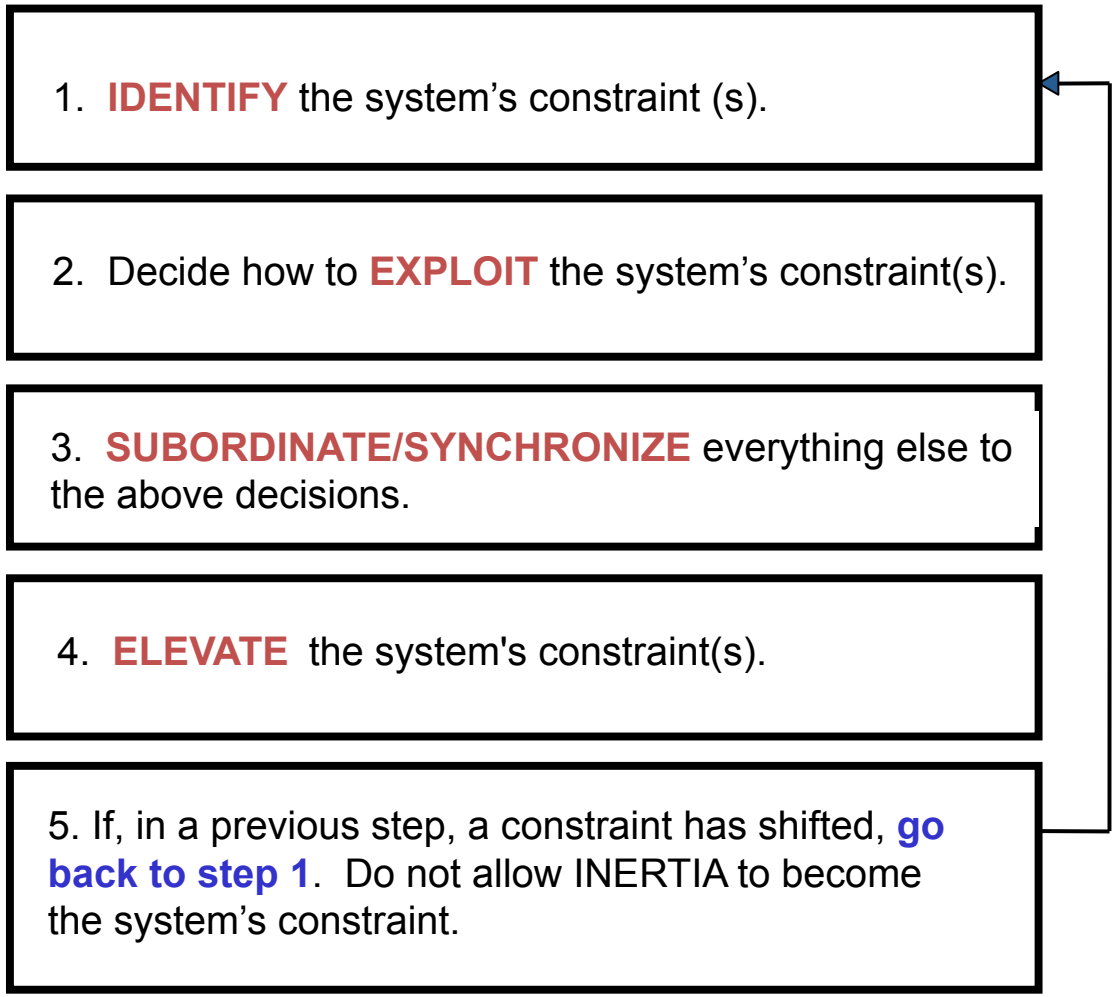
Second Attempt

Decide how to exploit the system's constraints(s)

Throughput from Q (**50**)	$3,000
Throughput from P (**60**)	$2,700
Total Throughput	$5,700
Operating Expenses	$6,000
Net Profit	($300)

Do we still have a conceptual mistake?

The Five Focusing Steps
Improving Organizational Performance



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Third Attempt

Decide how to exploit the system's constraints(s)

	P	Q
Sales Price	_____	_____
Raw Material Cost	_____	_____
Constraint Investment	_____	_____
T/ Constraint Minute	_____	_____

Third Attempt

Decide how to exploit the system's constraints(s)

	P	Q
Sales Price	$90.00	$100.00
Raw Material Cost	45.00	40.00
Constraint Investment	*15 Min.*	*30 Min.*
T/ Constraint Minute	$3.00	$2.00

Conclusion: ***Sell P!***

Third Attempt

Decide how to exploit the system's constraints(s)

Throughput from P _____

Throughput from Q _____

Total Throughput _____

Operating Expenses _____

Net Profit _____

Third Attempt

Decide how to exploit the system's constraints(s)

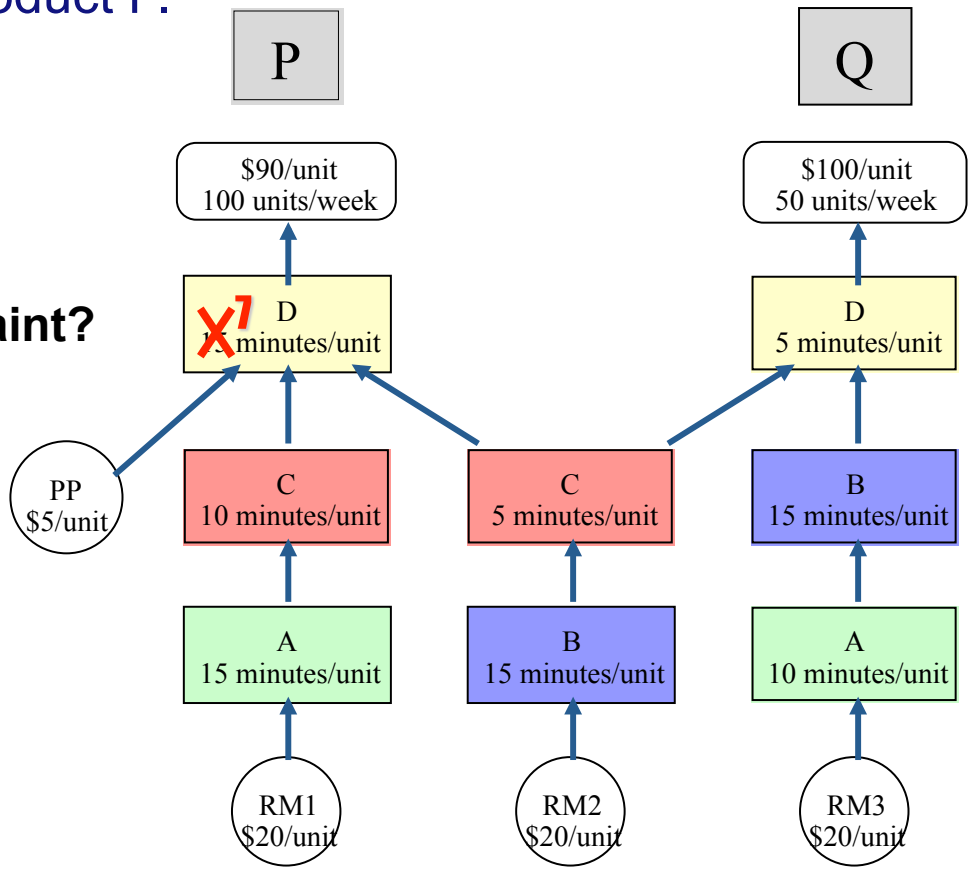
Throughput from P (**100**)	$4,500
Throughput from Q (**30**)	$1,800
Total Throughput	$6,300
Operating Expenses	$6,000
Net Profit	$300

At least it's a profit!

Improvement Opportunities

The Green Belt who asked for $5,000 to cut the process time from 15 minutes to 7 minutes was referring to the time it takes D to assemble product P.

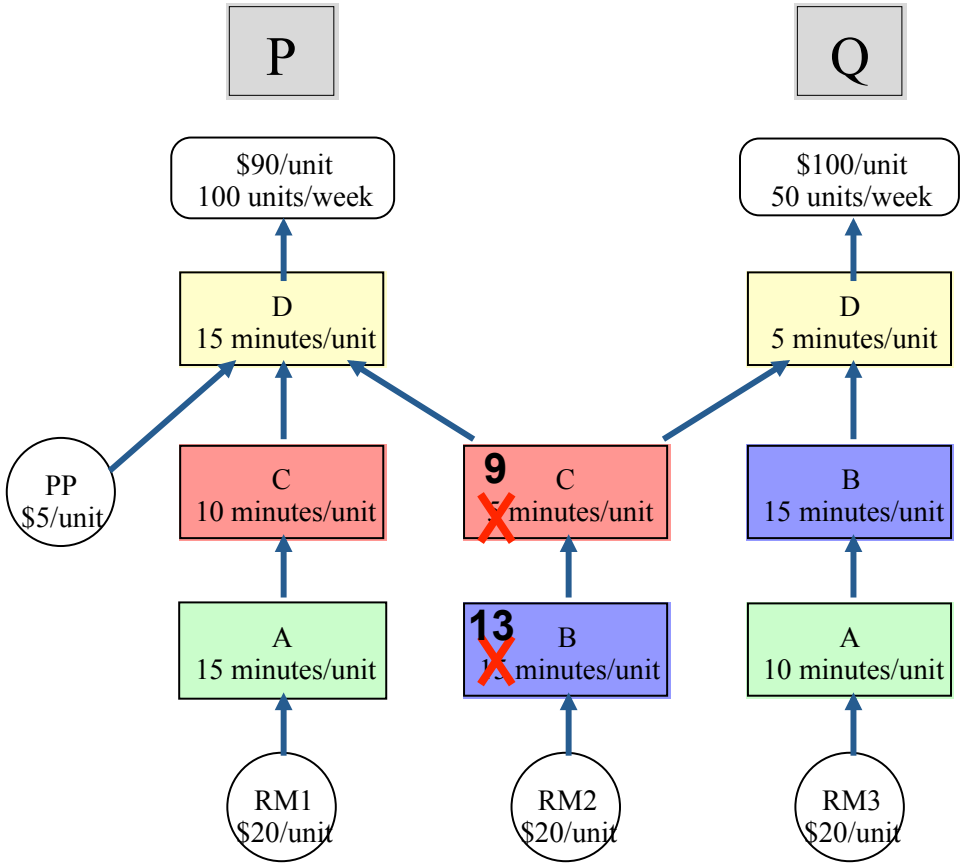
Is D a constraint?



What will result from spending the money?

Improvement Opportunities

The second Green Belt is proposing to increase the time it takes to make the middle part - the part that is used by both P and Q.



This would actually REDUCE the number of P's and Q's that could be produced…right?

Are you sure?

What if we are able to off-load 2 minutes from the middle B operation to the middle C operation at a cost of an additional 4 minutes processing on C?

Now what do you think?

Net Profit?

The middle part now takes 2 minutes less B-time to build. (It also requires more time from C … but we have *plenty* of capacity there.)

This means, we need 260 less B-minutes to build 100 P and 30 Q.

We can use them to build even *more* Q!

260 / 28 = about 9 more Q!

Results

Throughput from P (**100**)	$4,500
Throughput from Q (**39**)	$2,340
Total Throughput	$6,840
Operating Expenses	$6,000
Net Profit	$840

Profits nearly triple !!!

Oops ...

we forgot to check the ***payback period*** on the $5,000 we invested ….

…$5,000 / $540 **= 9 weeks!**

Make Sense?

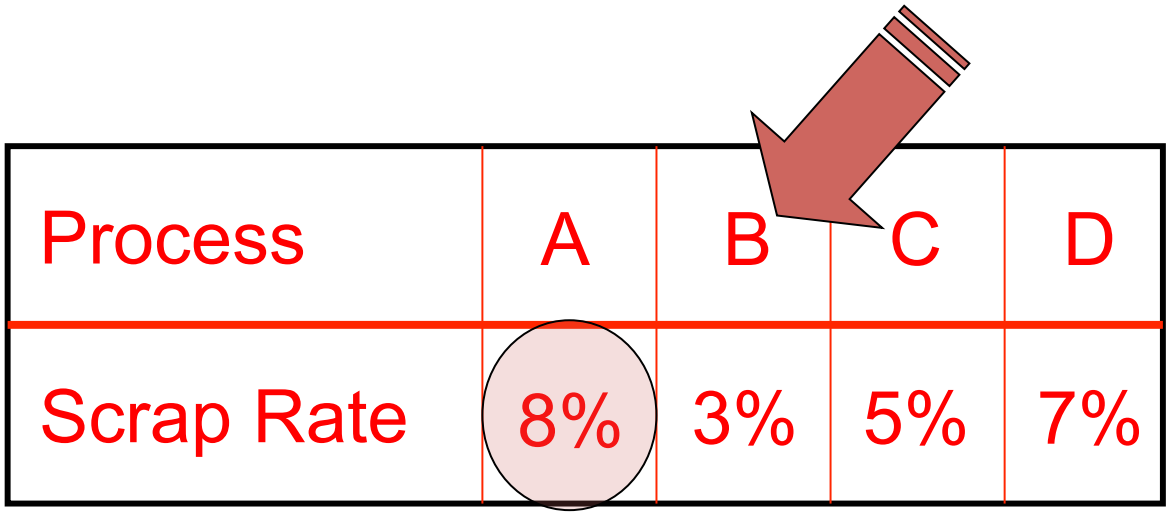
One more question…

Suppose that before our analysis someone came to you with the following data from a 3 month study…

Waste

Process	A	B	C	D
Scrap Rate	8%	3%	5%	7%

Waste



Pareto Analysis would direct waste reduction efforts at Process A.

Constraint Analysis showed that this process actually had about 25% protective capacity – enough time to make up the 8% without impacting the B resource, the **Constraint**.

The 3% scrap rate on the constraint process (B) and the impact of the C and D operations on parts that have been processed by the constraint are much higher priorities than A!

Constraint-Based Decision Making:

Anyone can swing a hammer…

…the trick is knowing exactly where to hit and how hard.

Questions?