Our Experience With Protective Capacity

Konrad Bartel, OpsLogik Solutions, South Africa

Chris Gray, Logo Print, South Africa

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Konrad Bartel

Konrad Bartel studied Industrial Engineering, has 20 years experience as Production Manager / Director in the manufacturing environment and 12 years TOC Consulting experience in Marketing & Sales, Supply Chain, Manufacturing and CCPM Implementation. He worked with Goldratt Consulting on Viable Vision Projects. Konrad is also an Ontological Business Coach an implements TOC at organizations throughout South Africa and recently also in Saudi Arabia.

Office: +27 21 843 3103
Mobile: +27 83 262 0062
konrad.bartel@opslogik.com

Chris Gray

Chris studied Industrial Engineering, and has 17 years experience in Quality Assurance, Production and Operations Management, as well as Industrial Engineering consulting. In 2010, Chris joined Logo Print, and this was his first contact with TOC. Since then it has been a rollercoaster ride of unlearning ‘ old-school ’ cost-world and efficiency (line-balancing) thinking, and coming to grips with the TOC Way.

Office: +27 21 593 0250
Mobile: + 27 84 563 4314
chris@logoprint.co.za

Why is **Protective Capacity** Important?

Introduction

In a recent article by Debra Smith and Chad Smith they highlighted the Primary Assumption of "traditional / conventional" management vs TOC:

Unit cost reduction = Increased Return on Investment

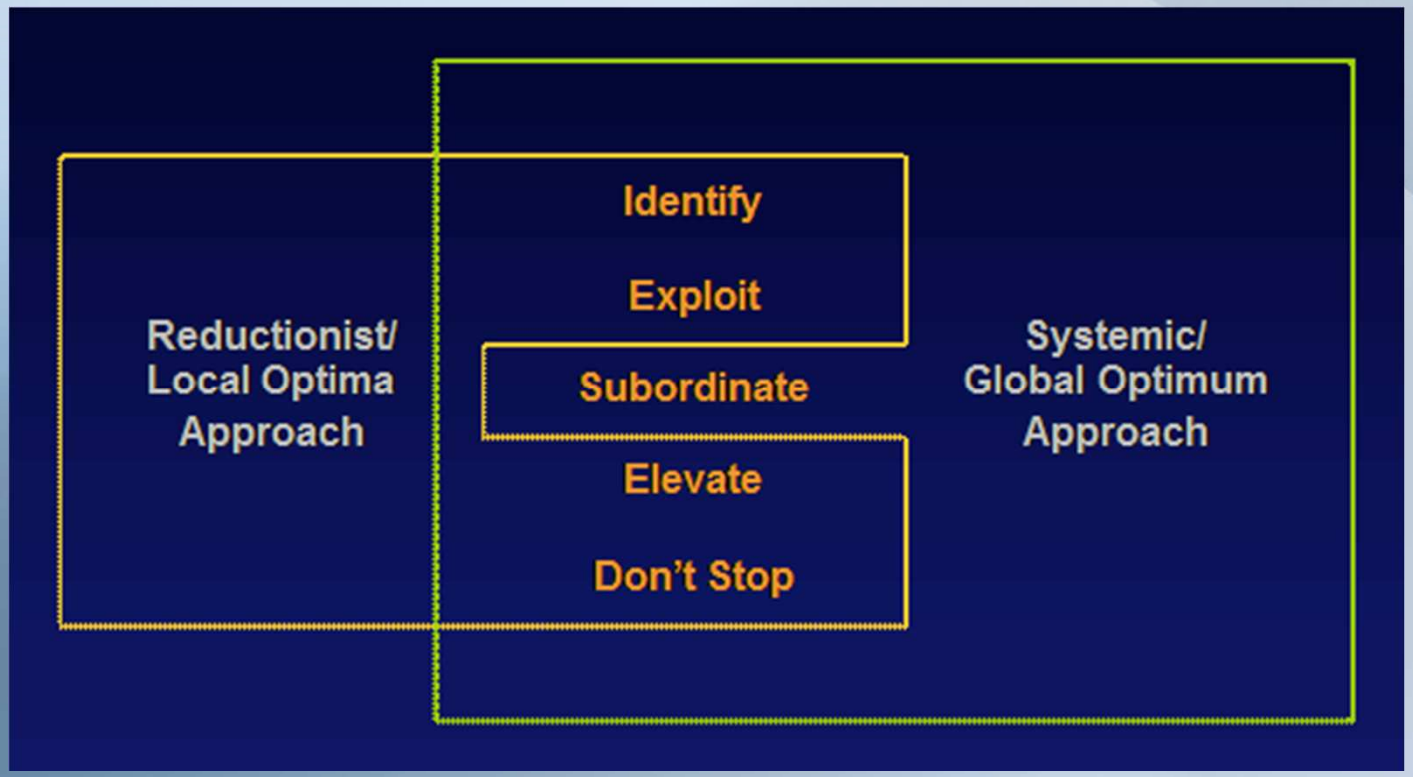
Protection and increase of flow (of relevant information and materials) = Increased Return on Investment

Reductionist/Local Optima Approach

Systemic/Global Optima Approach

Introduction

- On the definitive website of Kevin Youngman he describes that the presence of Subordination is making the critical difference



Kevin Youngman: http://www.dbrmfg.co.nz

Protective Capacity

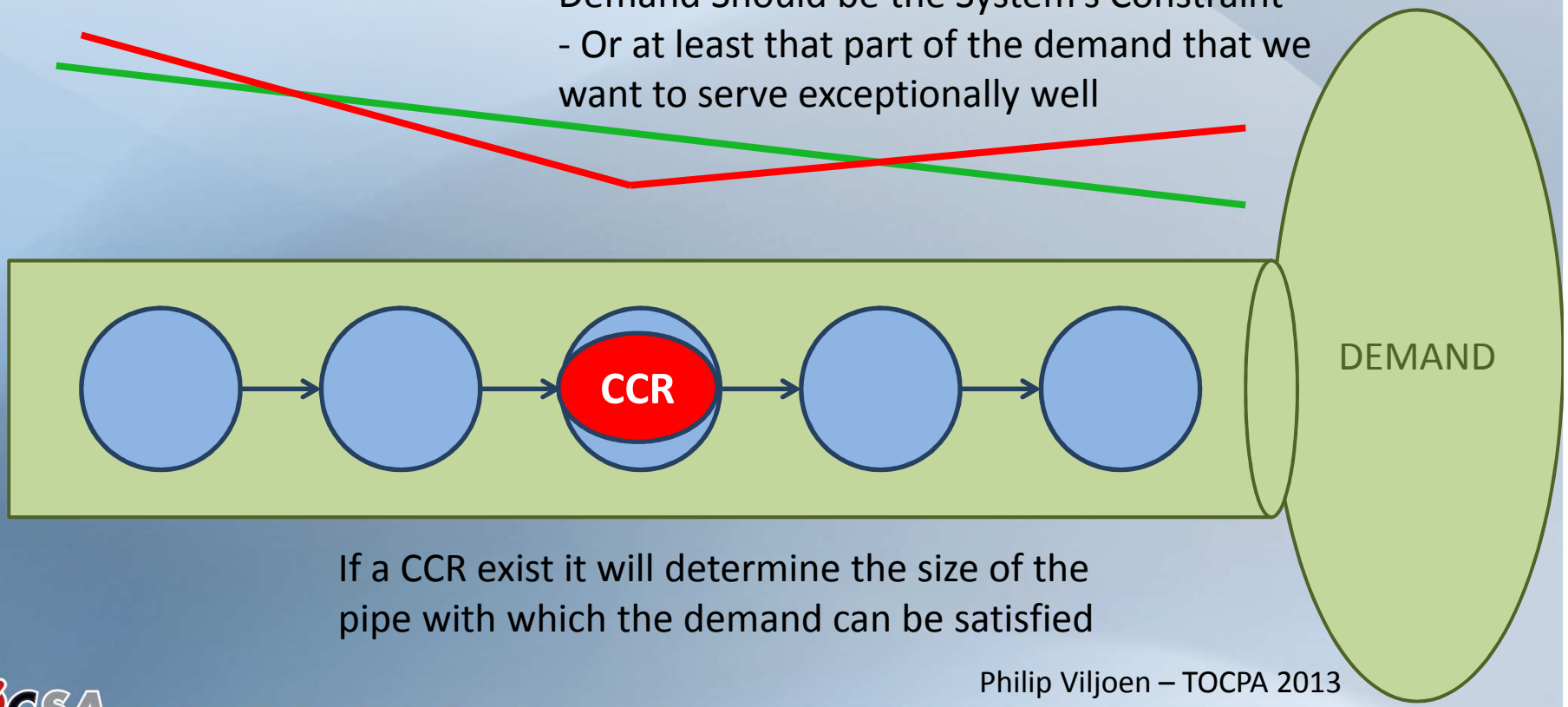
Is a controlled excess capacity aimed at protecting the flow of goal units through the system

… and is THE way to SUBORDINATE "everything else"

Protective Capacity in Simplified Drum Buffer Rope

One of the key aspects of implementing S-DBR (or DBR) in a manufacturing (or service) environment is to ensure the correct Capacity Profile of the facility

Demand Should be the System's Constraint
- Or at least that part of the demand that we want to serve exceptionally well



If a CCR exist it will determine the size of the pipe with which the demand can be satisfied

Philip Viljoen – TOCPA 2013

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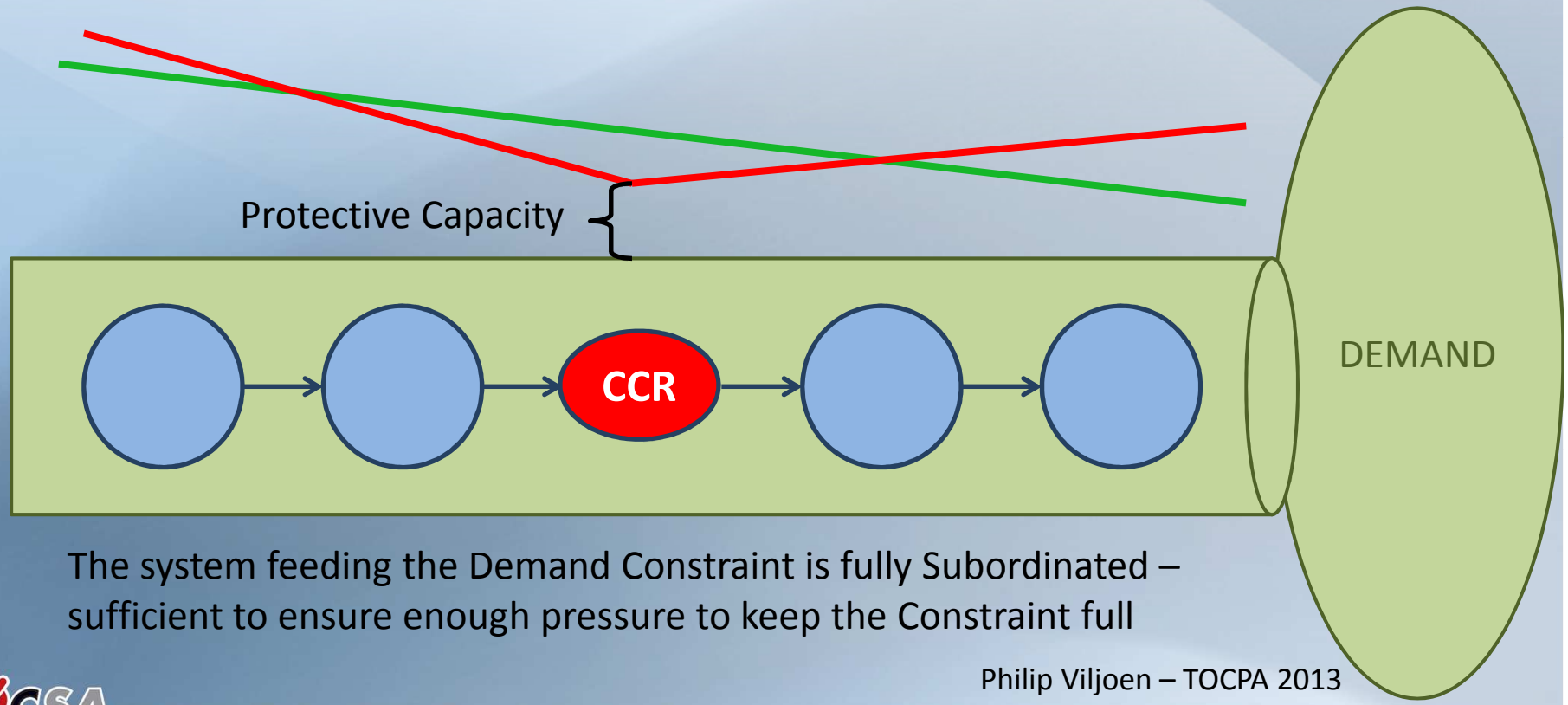


The system feeding the Demand Constraint is fully Subordinated – sufficient to ensure enough pressure to keep the Constraint full

Philip Viljoen – TOCPA 2013

Current Reality

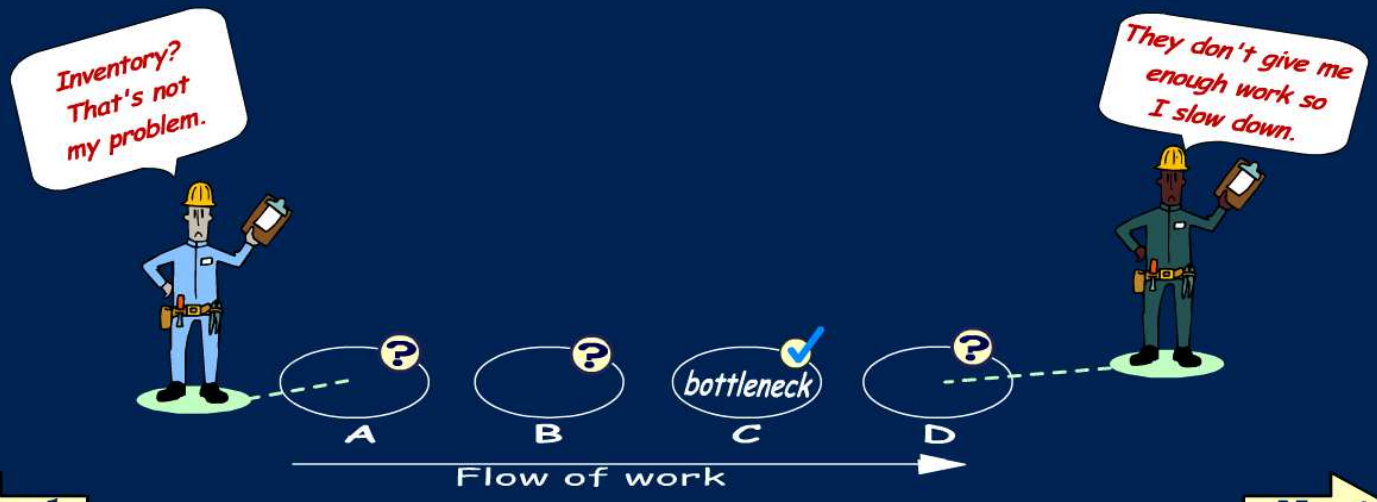
TOC Insights into Operations - Goldratt's Marketing Group

File Go To ?

Skip

Current work ethic: Look busy!

Following the current work ethic, all resources should work as much as possible. Upstream resources produce high levels of unneeded inventory, downstream resources are unjustly accused of not working enough. The current work ethic is appropriate only for the bottleneck.



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Next

The New Requirement

TOC Insights into Operations - Goldratt's Marketing Group

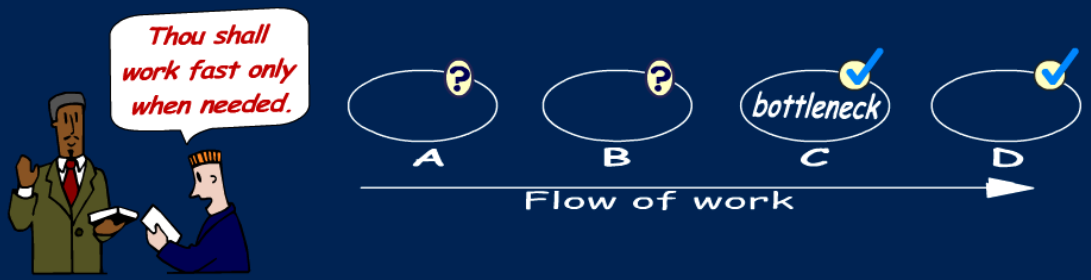
File Go To ?

Skip

A new work ethic: The Roadrunner rule.

When you have work - work as fast as you can.
Otherwise, wait for work.

The new work ethic removes the conflict for the downstream resources. But what will prevent upstream resources from building too much inventory?



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Next

The Problem

But What is the Problem?

- In most manufacturing environments two things are deeply entrenched:
  - Everybody must work all the time
  - Over time a "balanced line" was established
- Measurement systems (mainly targets) and Incentives drive this home
- Worker culture

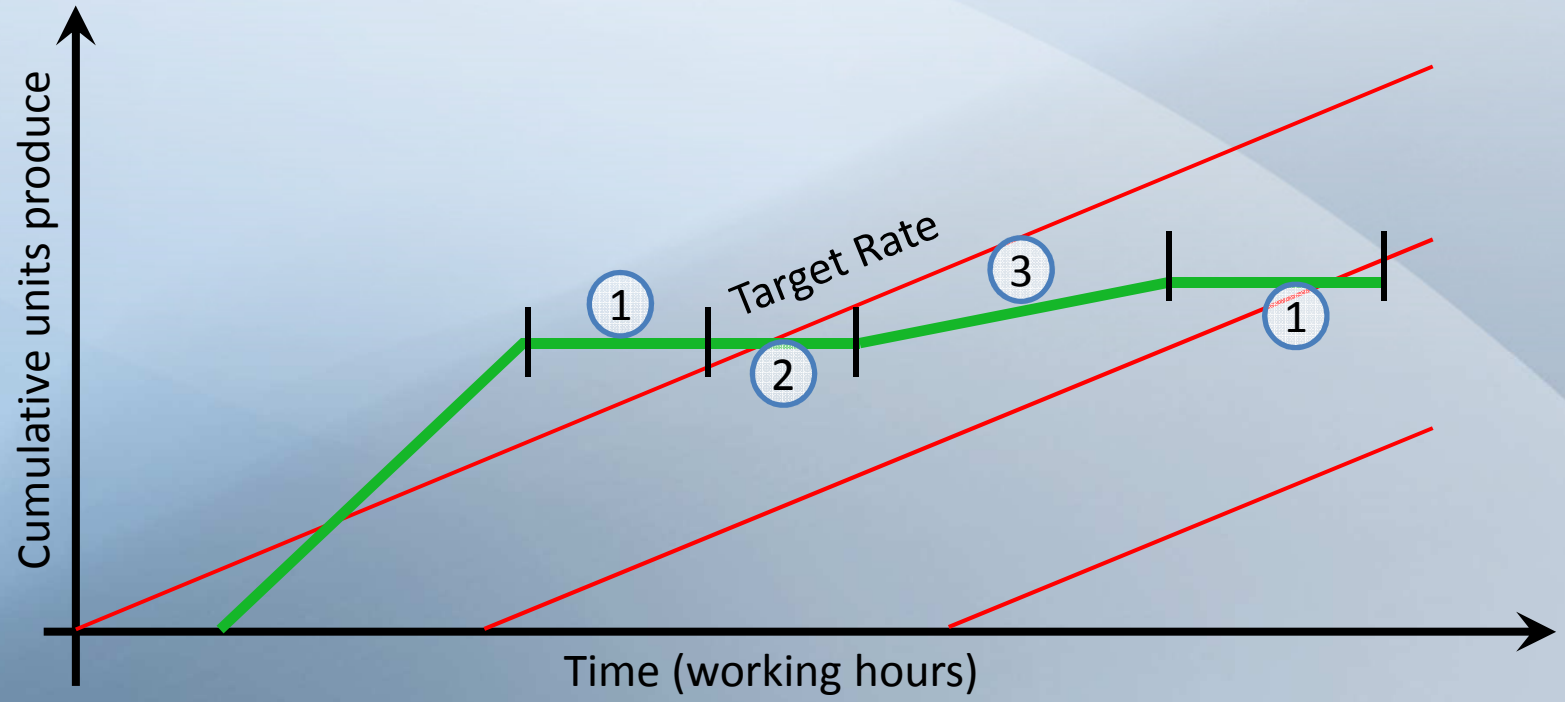
Direction of the Solution:

Can we devise a system that?:

- Can provide a new clear measurement
- Will refocus workers / shop floor attention
- Is simple to use
- Will empower workers to be part of the POOGI process
- Will result in the correct Capacity Profile to become "built in"

The Solution – the Protective Capacity Graph

- Implement a Protective Capacity Graph



Reason Analysis	
1: Hours protective Capacity Revealed	
2: Reasons for Standing time	
3: Reasons for Not achieving Target Rate	

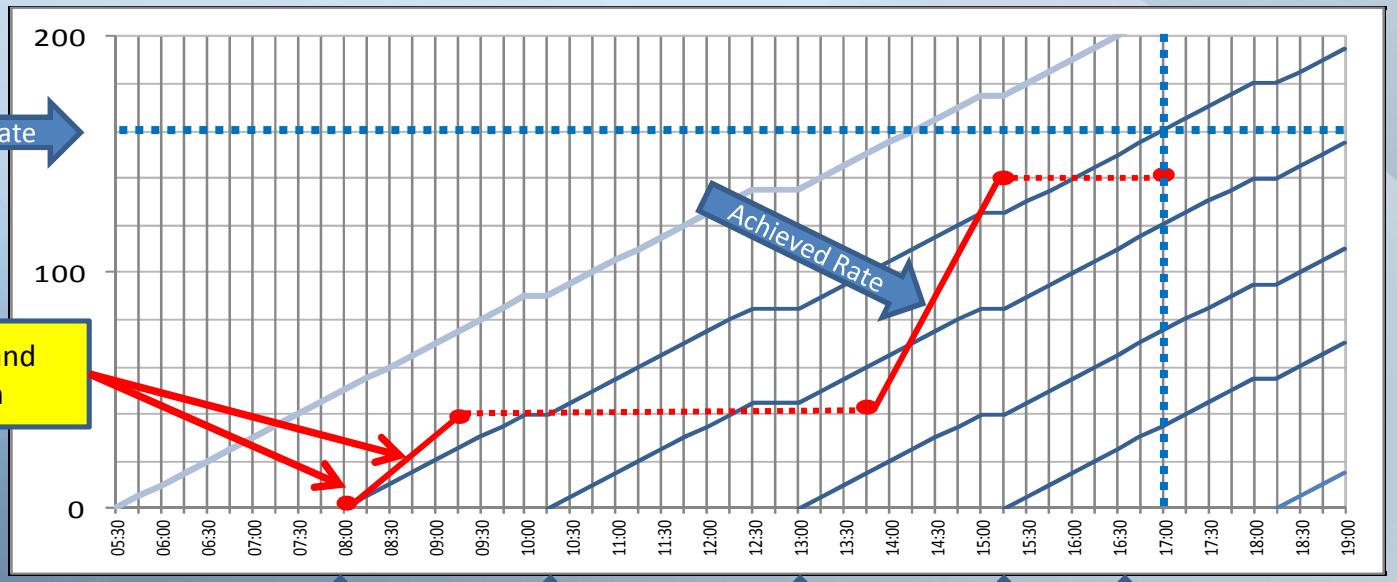
The Solution – the Protective Capacity Graph

To be completed

Cell Name: Test 1

Date:

PC Hrs revealed: **2 hrs** parts/day



Fill in points and draw graph

To be completed every measurement period

Moved:	Moved:	Moved:	Moved:	Moved:
Headcount:	Headcount:	Headcount:	Headcount:	Headcount:

Specify disruptions & reasons for not achieving rate

Notes: .....

.....

Primary Focus

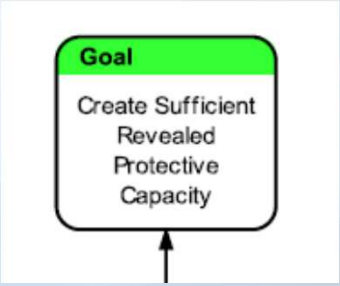
- Reveal Protective Capacity
  - Primary focus of the process is to support the change of behavior from always being busy to reveal the protective capacity
  - Effectively subordinate every work center, cell, resource to the system constraint
  - Provide a “local” measurement that is globally subordinated

Recording and Analizing the data

On a daily basis Production workers record:

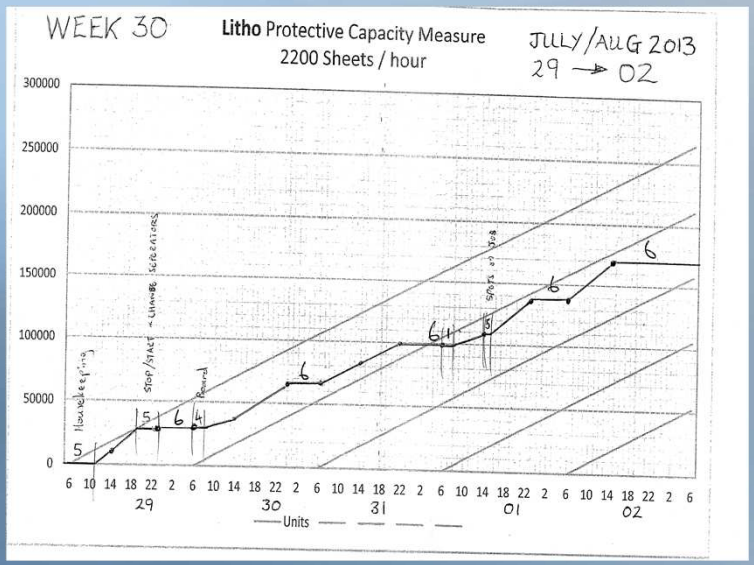
- Reasons for not Achieving the Rate
- Reasons for "other" standing times (non protective capacity time)
- Amount of protective capacity revealed
- Recorded for a month
- Analise for main reasons
- Develop Improvement projects or initiatives to increase protective capacity

Creating Sufficient Revealed Protective Capacity

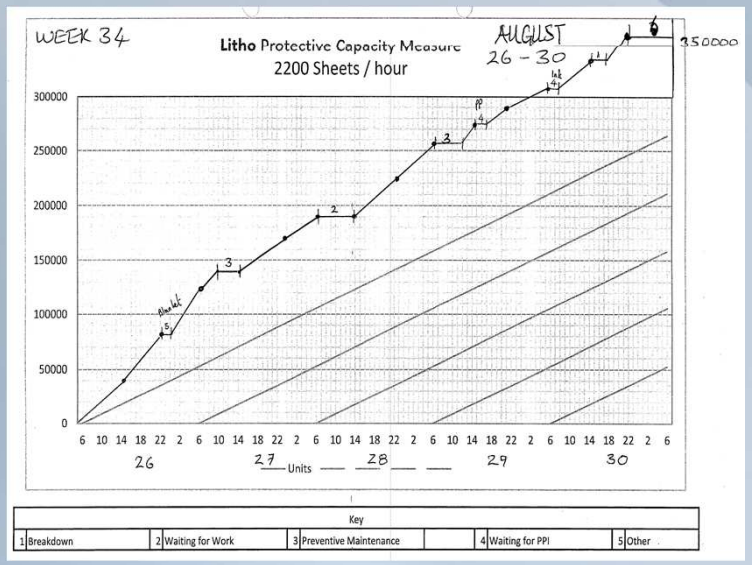


Or alternatively, how to turn

this



into this



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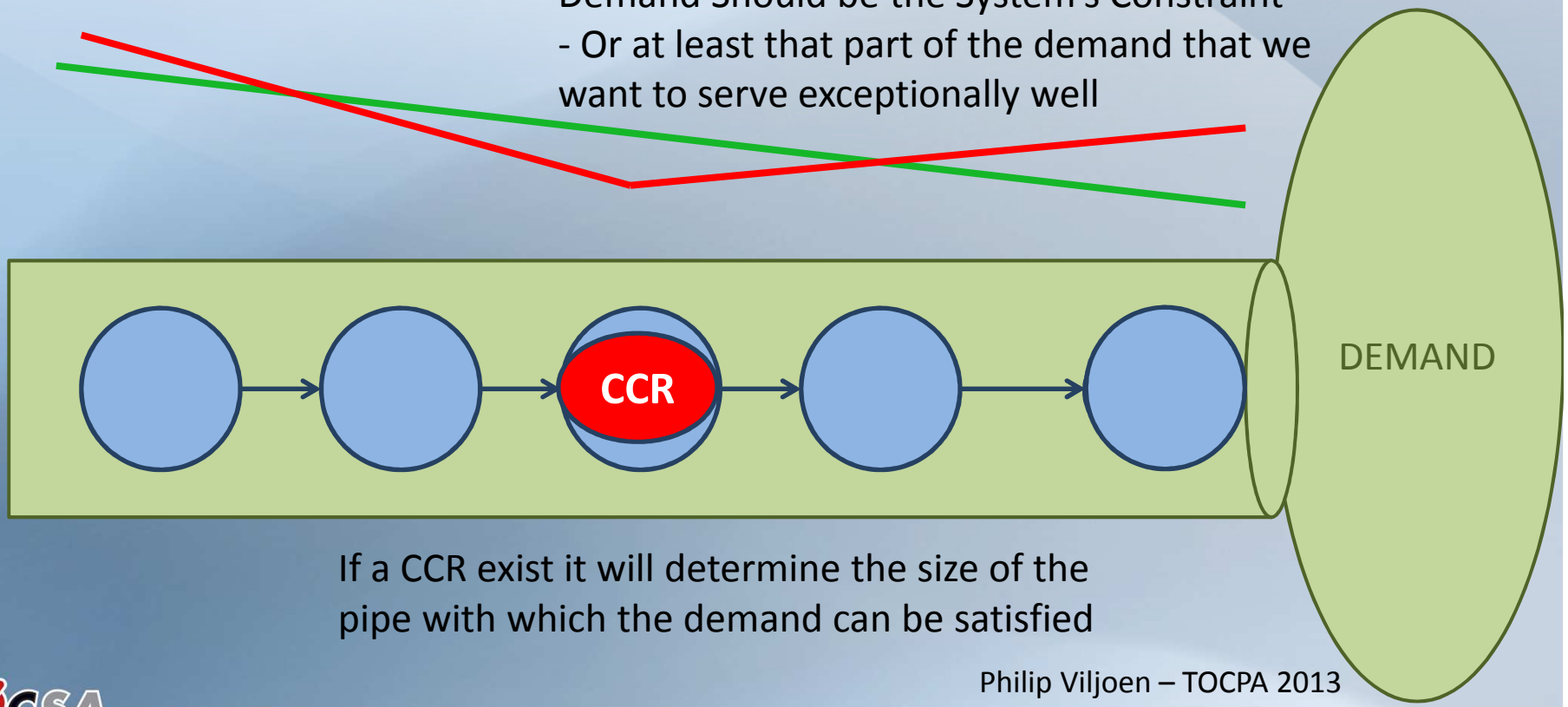

If a CCR exist it will determine the size of the pipe with which the demand can be satisfied

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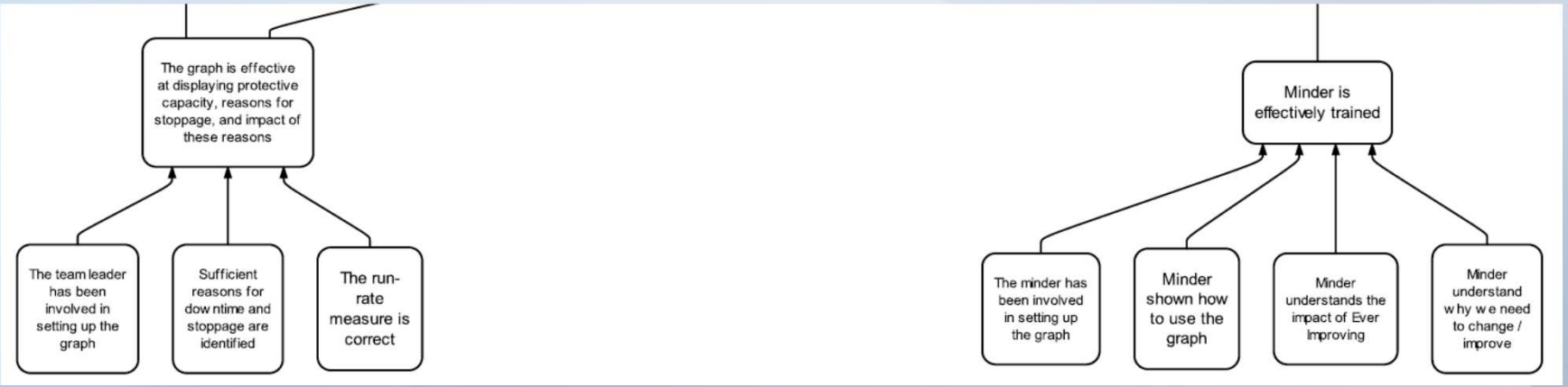
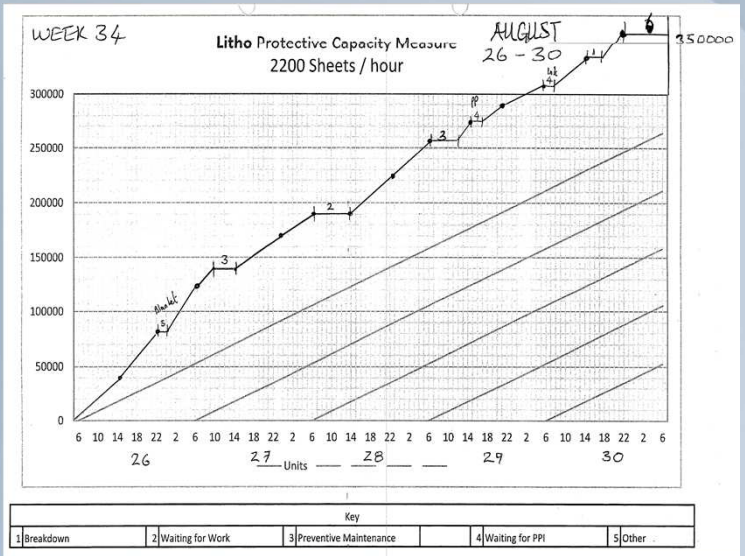
The new requirement

The challenge was to get buy-in from the shop-floor



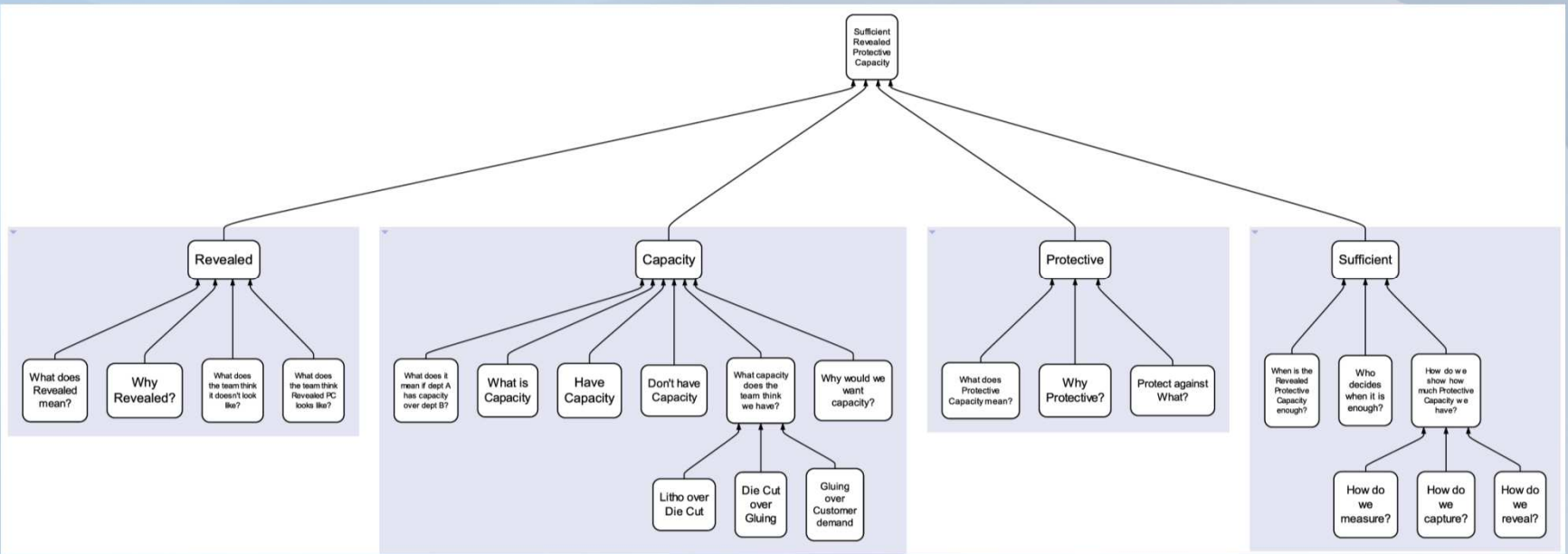
We used 3-month data to create averaged target and graph, and reviewed common reasons listed on time sheets to create groups for stoppage

We then went through a process of meeting with the various teams to explain the graphs, and more importantly, the 'road-runner' concept



Overcoming The Problem through involvement

To get buy-in, the management team went through an exercise of verbalising what Sufficient Revealed Protective Capacity means for us, and then turned this into a worksheet to form the basis for team meetings and discussions



Overcoming The Problem through involvement

Sufficient Revealed Protective Capacity

What is capacity?

Capacity is the amount something can take on successfully.
Amount of shifts available (shifts/hours)
Amount of work load in factory
Amount of work done effectively
Capacity (amount) of people in the factory.

How much capacity should be in department A, B & C

	Department			
	Department A	Department B	Department C	Customer
Output Capacity	150	140	130	100

Who has heard of Murphy?

All

What do we see when Murphy arrives?

Chaos, problems, solutions, people losing overall focus. Increased demand & increased pressure.
Uncontrolled actions , waste
Trouble, overtime, spoils, breakdowns, things not going as planned

How does Murphy affect Capacity?

Causes you to lose focus, disturbs overall planning, causes a backlog in work, time consuming. Disrupts / interrupts tasks at hand, backlog leaving room for forgetting, misplacing duplicating, causes incorrect copy and paste procedure.
It makes starting totals less. Puts stress on workers.
It causes workers to be stressed and get sick, the 5 whys investigation is started. Requirements and deadlines are not met. Communication problems arise and staff get no leave.

Overcoming The Problem through involvement

How much more (protective) capacity do we need for Murphy?

	Department			
	Department A	Department B	Department C	Customer
Output Capacity	100	100	100	100
For Murphy	50	40	30	
Total	150	140	130	

How big is Murphy a % of A, B, C?

Percentage	50%	40%	30%

How many days will it take to recover when Murphy hits?

	Department			
	Department A	Department B	Department C	Customer
Output Capacity	100	100	100	100
For Murphy	50	40	30	
Total	150	140	130	
No of days	2	2.5	3.3	

Overcoming The Problem through involvement

How long is the customer prepared to wait?

1 Day

	Department			
	Department A	Department B	Department C	Customer
Output Capacity	100	100	100	100
Sufficient time for Murphy	100	100	100	
Total	200	200	200	
No of days customer prepared to wait	1	1	1	

Overcoming The Problem through involvement

Convert to hours:

	Department			
	Department A	Department B	Department C	Customer
Working on what the customer wants	20	20	20	☺
Down-Time	10	10	12	
Waiting for work	10	10	8	
Total	40	40	40	40

What does waiting on work look like (how is it revealed)?

Positive:
Clean up, Maintenance
Housekeeping, Preventative maintenance, sitting around machine waiting for work.
Opportunity to cross train, opportunity for workshops, Logo's got talent, clean work stations.

Negative:
Empty work stations , staff on short time.
Extended breaks, problems occurring due to lack of focus.
Smoking more, visiting other departments, on cell phones, reading the newspaper.

Overcoming The Problem through involvement

What are the down sides of what waiting for work looks like?

Negative thoughts, losing focus, want to bypass processes, playing around (horse play).
Paranoia – thinking the company might close, feeling useless, job insecurity, waste of leave days.
Negative thinking – short time or company closing, staff looking unproductive to the boss, the staff look "Lazy"

What are the pluses of what waiting for work looks like?

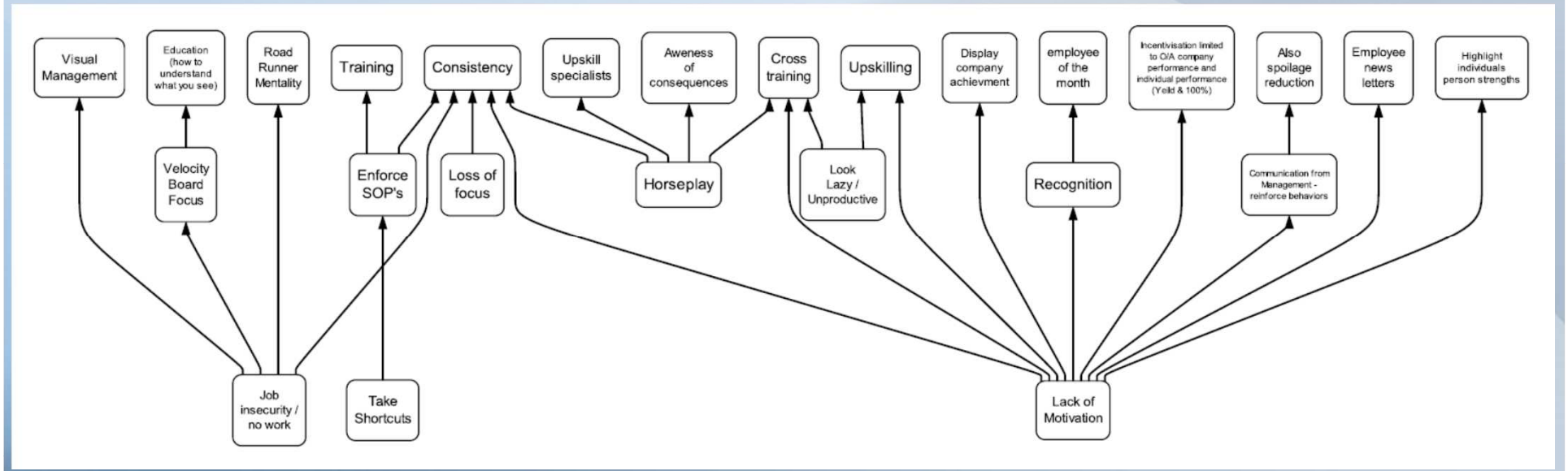
Work all on time, everything in its place and a place for everything, good team work, everybody aligned on the same page. All focused, improved customer service. Mafia Jobs, nothing to block capacity, worker ready to run with a job at any time, confidence to the sales team to get more orders, energised staff due to a lack of pressure. Excellent planning, ahead of schedule, innovative thinking

Overcoming The Problem through involvement

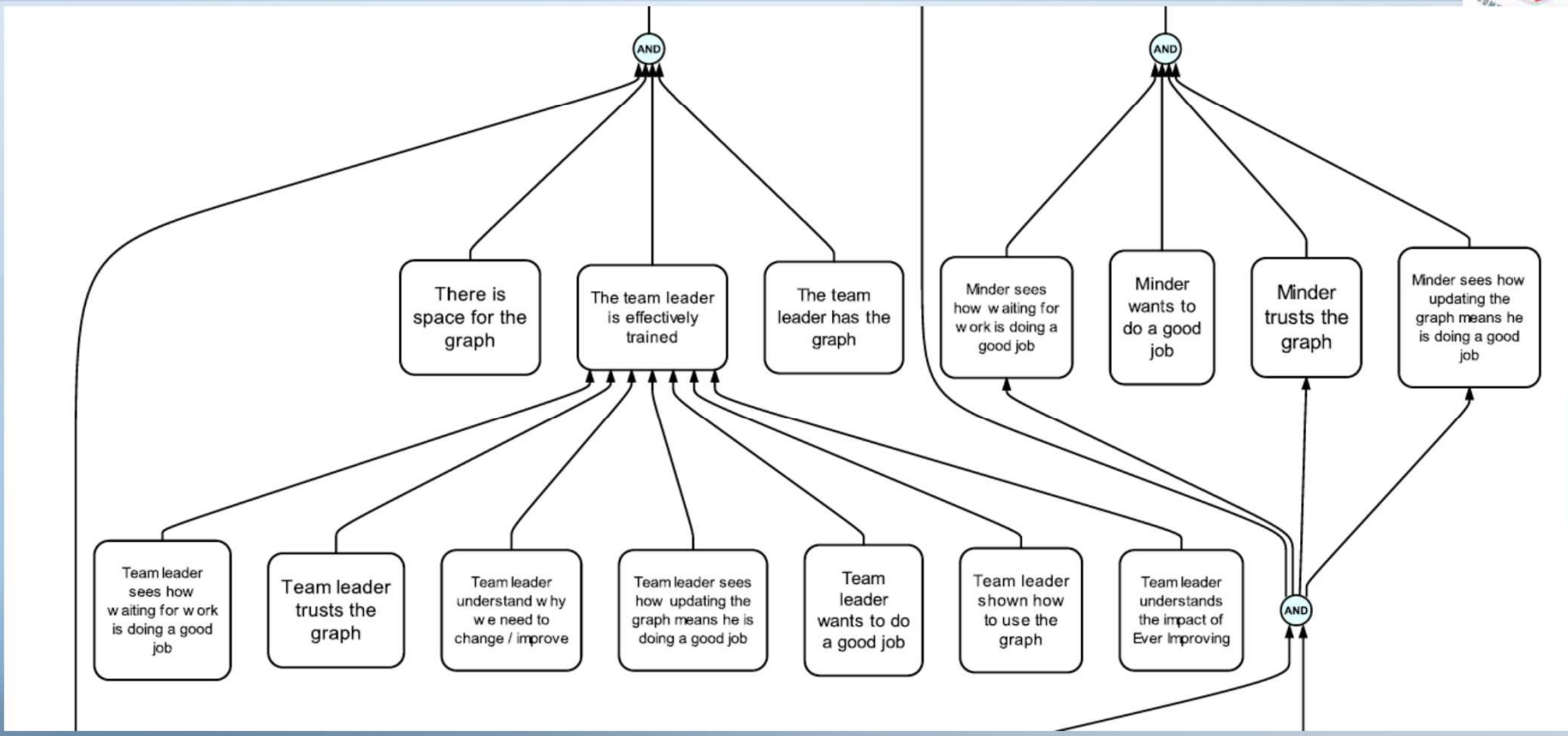
How do we overcome the Downside?

Downside	How do we overcome?
1) Job insecurity	
2) Lack of motivation	
3) No Work / company Closing	
4) Look Lazy / unproductive	
5) Loss of focus	
6) Horseplay	
7) Take Shortcuts	
8)	
9)	
10)	

Overcoming The Problem through involvement

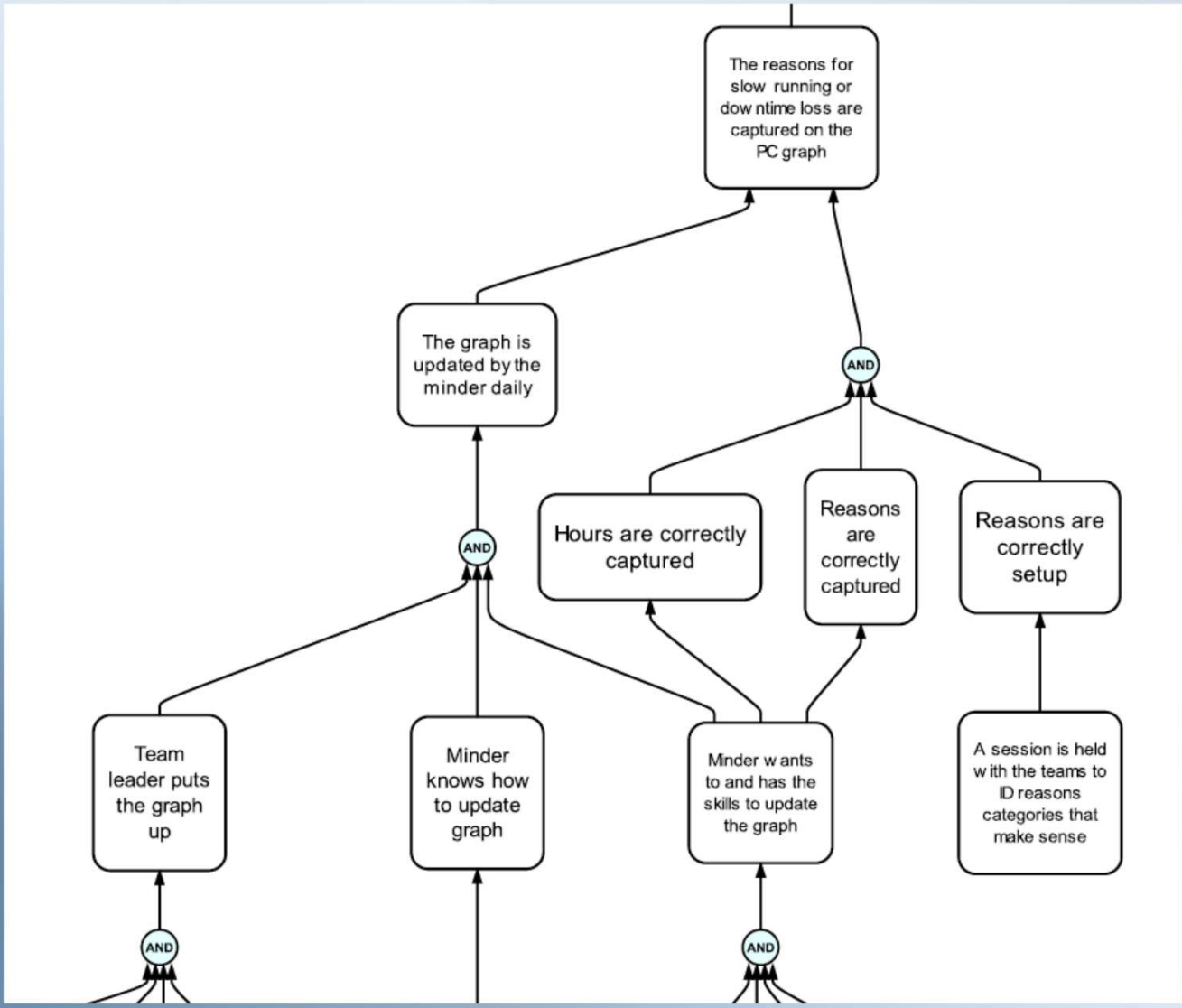


Direction of the Solution:



Meeting areas were setup in each department, with graphs being updated daily. These were collected weekly, captured into a database, and then reviewed for POOGI

Direction of the Solution:

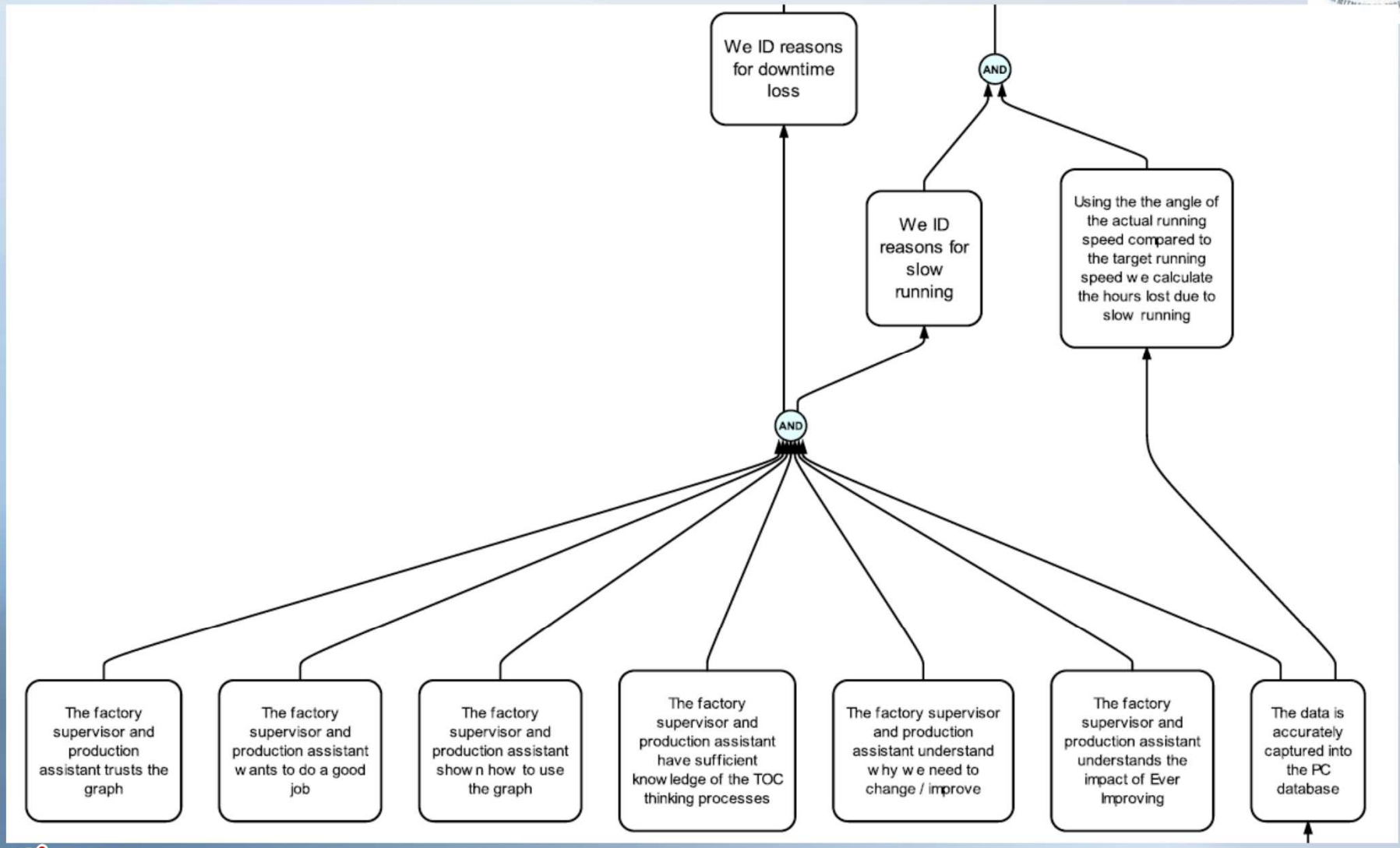


Recording and Analizing the data

Protective Capacity Measure database - Excel

Year	week	equipment	Hours avail	break-down	waiting	mainte-nance	PPI	other	no shift	sum	Hrs worked	Lost Hrs cldv worked	Total hrs cldv worked	units	Lost Hrs due to Slow Runnin	Manned Hours	Down Time Loss	DTL % of Manned Hours	Slow Running % of Manned Hours
															812	15274	1313	9%	5%
2013	30	komori	120	2	4		2	5	48	61	59	13	72	170239	-9.1	72	9	13%	-13%
2013	30	cyl 1	120						52	52	68	0	68	92000	-15.6	68	0	0%	-23%
2013	30	yawa	120	8	8			6	61	83	37	22	59	28000	13.7	59	14	24%	23%
2013	30	shh	120		7	10			64	81	39	7	46	410000	6.2	56	0	0%	11%
2013	30	bobst	120		11	8			80	99	21	11	32	240000	-10.2	40	0	0%	-25%
2013	31	komori	120		8	1	2		64	75	45	10	55	156443	-17.6	56	2	4%	-31%
2013	31	uv	120		10	7			84	101	19	10	29	50542	-3.0	36	0	0%	-8%
2013	31	cyl 1	120						64	64	56	0	56	88000	-24.0	56	0	0%	-43%
2013	31	yawa	120						80	80	40	0	40	44000	3.3	40	0	0%	8%
2013	31	shh	120		17				88	105	15	17	32	270000	-6.6	32	0	0%	-21%
2013	31	bobst	120		17				88	105	15	17	32	165000	-6.4	32	0	0%	-20%
2013	32	komori	120	6	8		1	7	8	30	90	22	112	315174	-36.1	112	14	13%	-32%
2013	32	uv	120		6			9	76	91	29	15	44	70456	-1.6	44	9	20%	-4%
2013	32	cyl 1	120		8				40	48	72	8	80	76000	2.9	80	0	0%	4%
2013	32	yawa	120						96	96	24	0	24	48000	-16.0	24	0	0%	-67%
2013	32	shh	120		11				80	91	29	11	40	480000	-9.4	40	0	0%	-24%
2013	32	bobst	120		3				80	83	37	3	40	350000	-8.5	40	0	0%	-21%
2013	33	komori	120	4		3	2	10	8	27	93	16	109	347571	-46.0	112	16	14%	-41%
2013	33	uv	120	7				6	76	89	31	13	44	73125	-0.8	44	13	30%	-2%
2013	33	cyl 1	120					9	28	37	83	9	92	124000	-29.7	92	9	10%	-32%
2013	33	yawa	120					16	58	74	46	16	62	64000	-7.3	62	16	26%	-12%
2013	33	shh	120	1				4	69	74	46	5	51	560000	1.2	51	5	10%	2%
2013	33	bobst	120	3				2	54	59	61	5	66	500000	-3.9	66	5	8%	-6%
2013	34	komori	120	3	8	9	4	2	8	34	86	17	103	361311	-58.5	112	9	8%	-52%
2013	34	uv	120	9				4	76	89	31	13	44	80169	-3.9	44	13	30%	-9%
2013	34	cyl 1	120							0	120	0	120	160000	-25.5	120	0	0%	-21%
2013	34	yawa	120						64	64	56	0	56	100000	-27.3	56	0	0%	-49%
2013	34	shh	120		3	1			78	82	38	3	41	640000	-13.2	42	0	0%	-31%

Recording and Analizing the data



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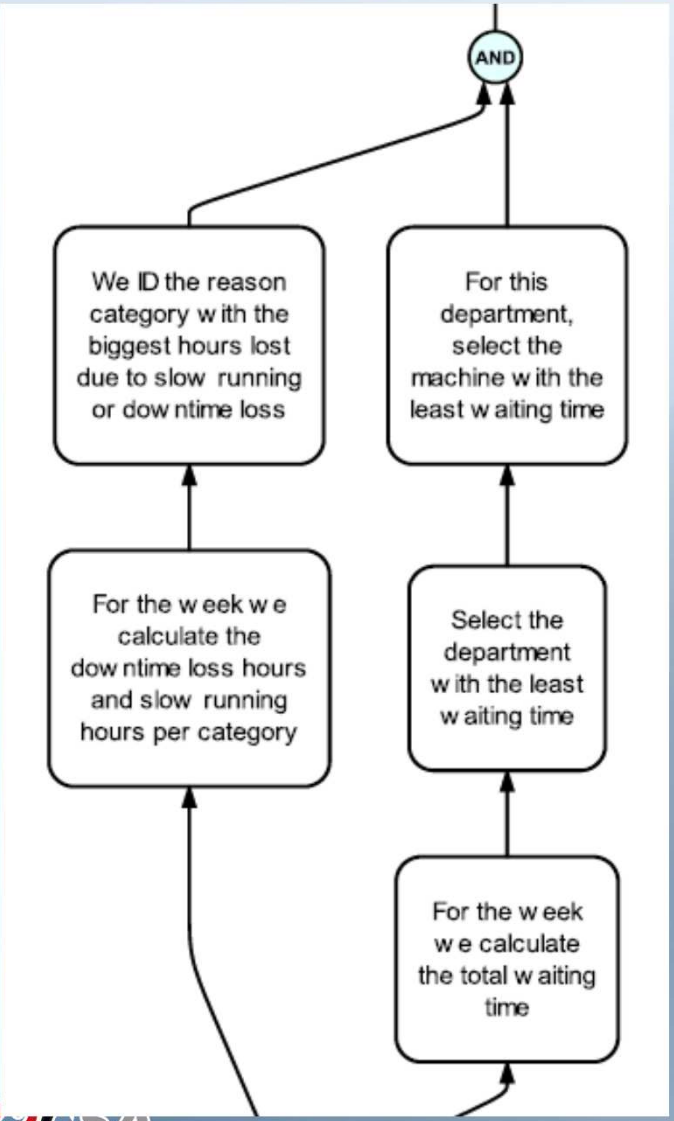

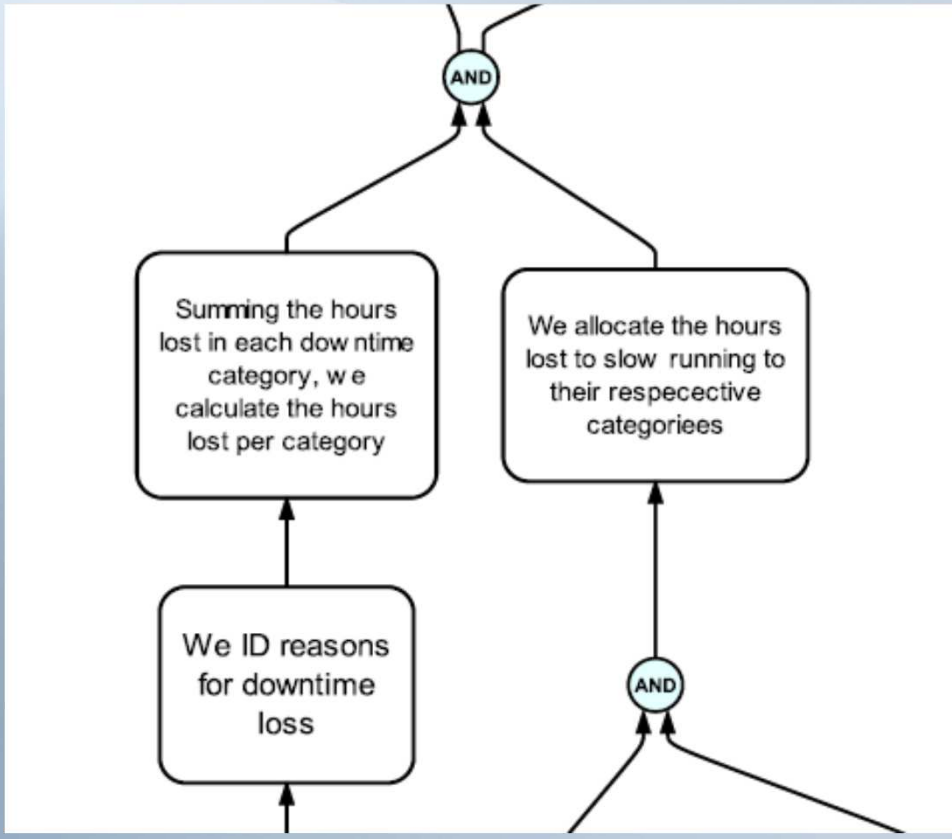

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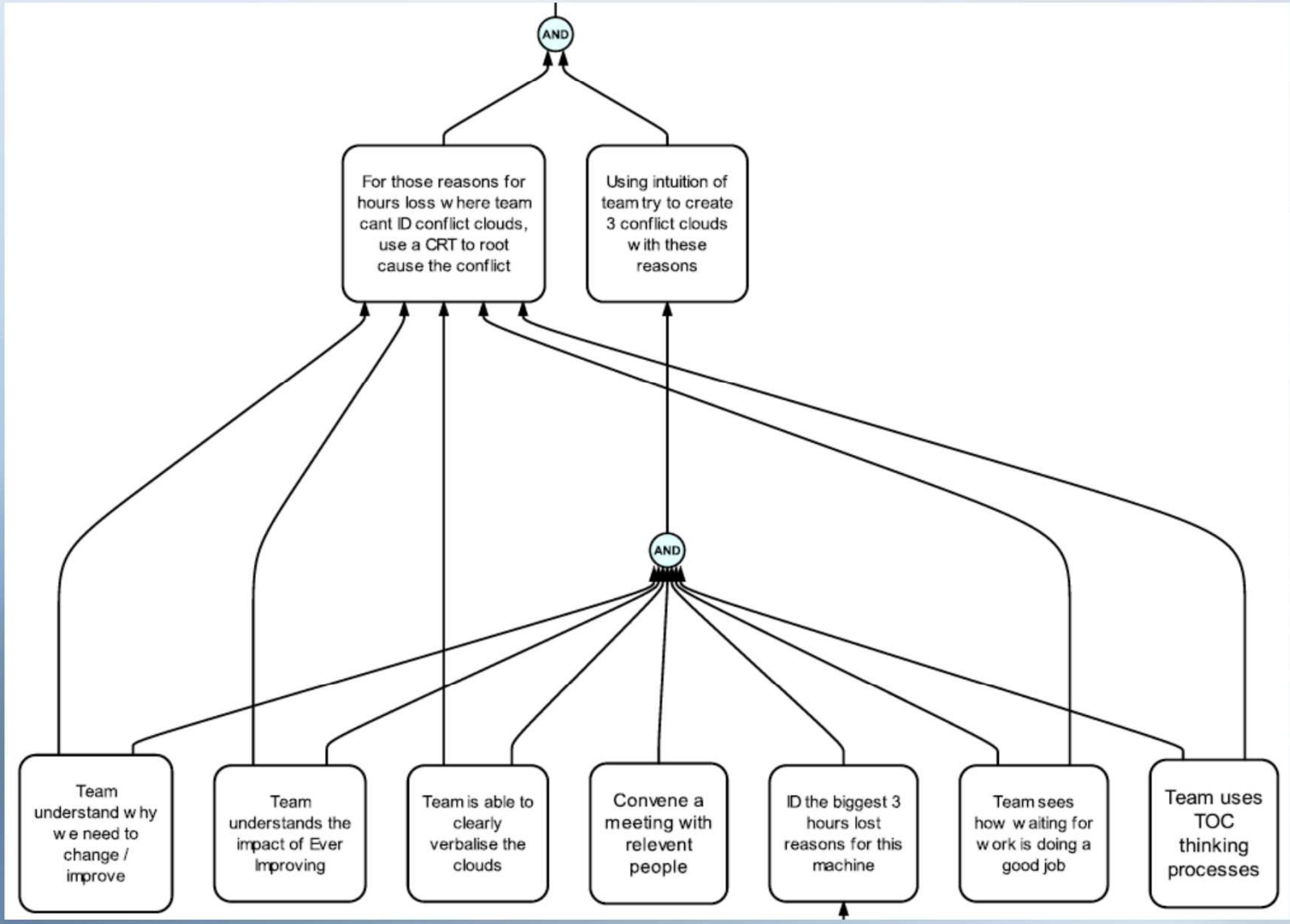
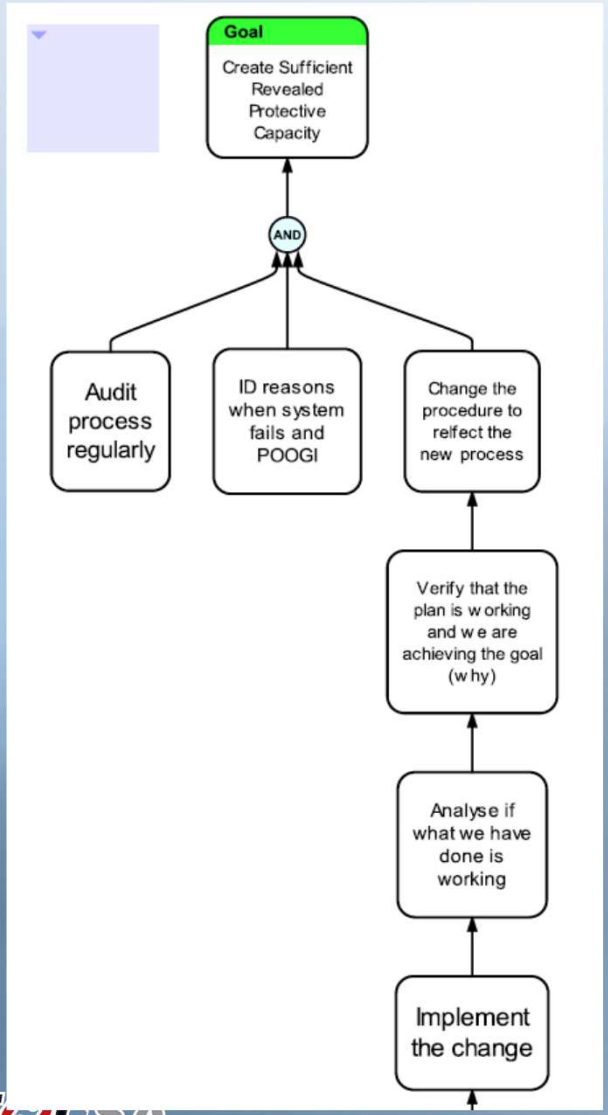
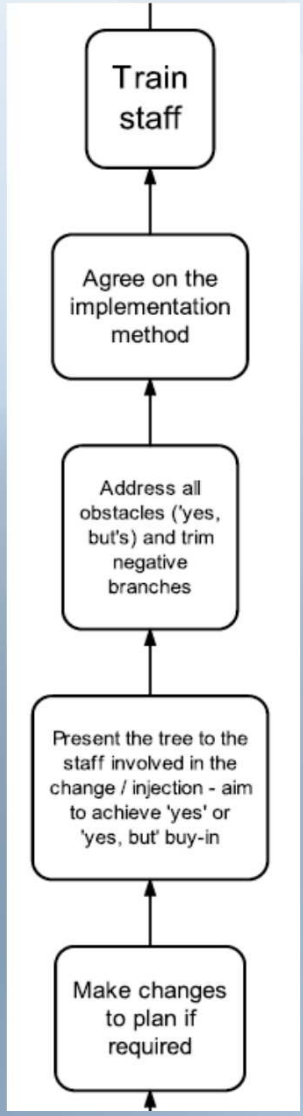
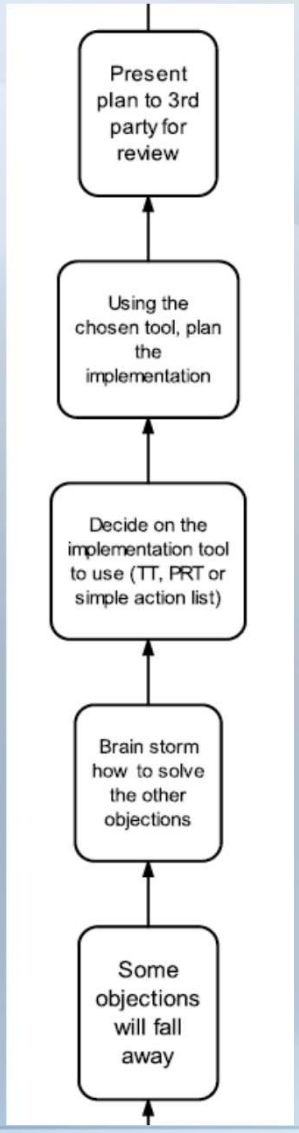
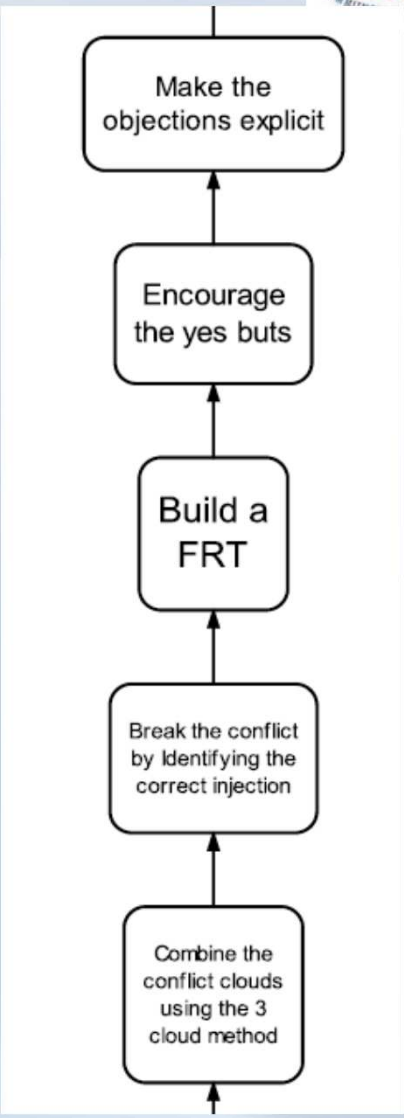



Goal
Create Sufficient Revealed Protective Capacity
AND
Audit process regularly
ID reasons when system fails and POOGI
Change the procedure to relfect the new process
Verify that the plan is w orking and w e are achieving the goal (w hy)
Analyse if what we have done is working
Implement the change


Train staff
Agree on the implementation method
Address all obstacles ('yes, but's) and trim negative branches
Present the tree to the staff involved in the change / injection - aim to achieve 'yes' or 'yes, but' buy-in
Make changes to plan if required

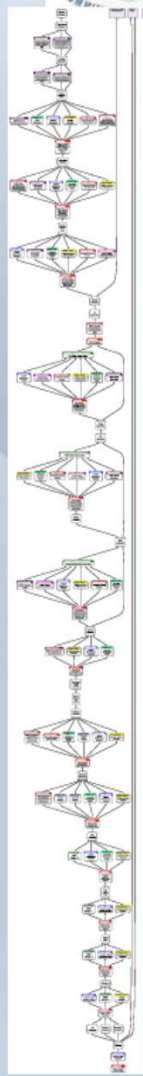

Present plan to 3rd party for review
Using the chosen tool, plan the implementation
Decide on the implementation tool to use (TT, PRT or simple action list)
Brain storm how to solve the other objections
Some objections will fall away


Make the objections explicit
Encourage the yes buts
Build a FRT
Break the conflict by Identifying the correct injection
Combine the conflict clouds using the 3 cloud method

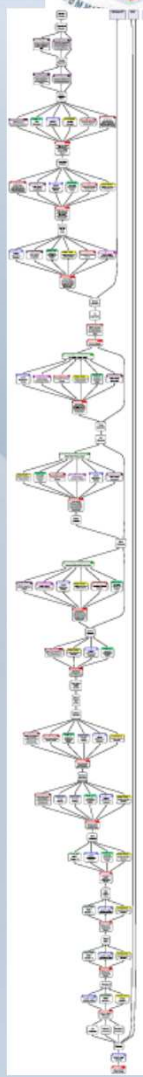
So, what's gone wrong…

1.Staffing

- As an industry, we are struggling to find suitably trained and experienced employees. This makes it difficult to replace staff with equally-experienced people
- We can't renege on quality, so underperforming staff have had to be promoted to work for our competitors, regardless of the above
- This has led to an impact on our ability to maintain Protective Capacity – new staff need time to come up to speed on the machines, as well as be re-trained in the TOC Way (road-runner).. People that have left, have taken 1-2 years of TOC implementation with them, it takes time to ingrain these habits into new staff
- With the above being what we experienced, the tendency was for factory staff to 'take a step back' each time someone left (i.e. supervisor would go back onto the machine, to replace the operator who left). As the impact of the above became more and more apparent, Konrad came to us with a potential direction for a solution, the HR aspect of protective capacity, what we have called our Advancement Tree

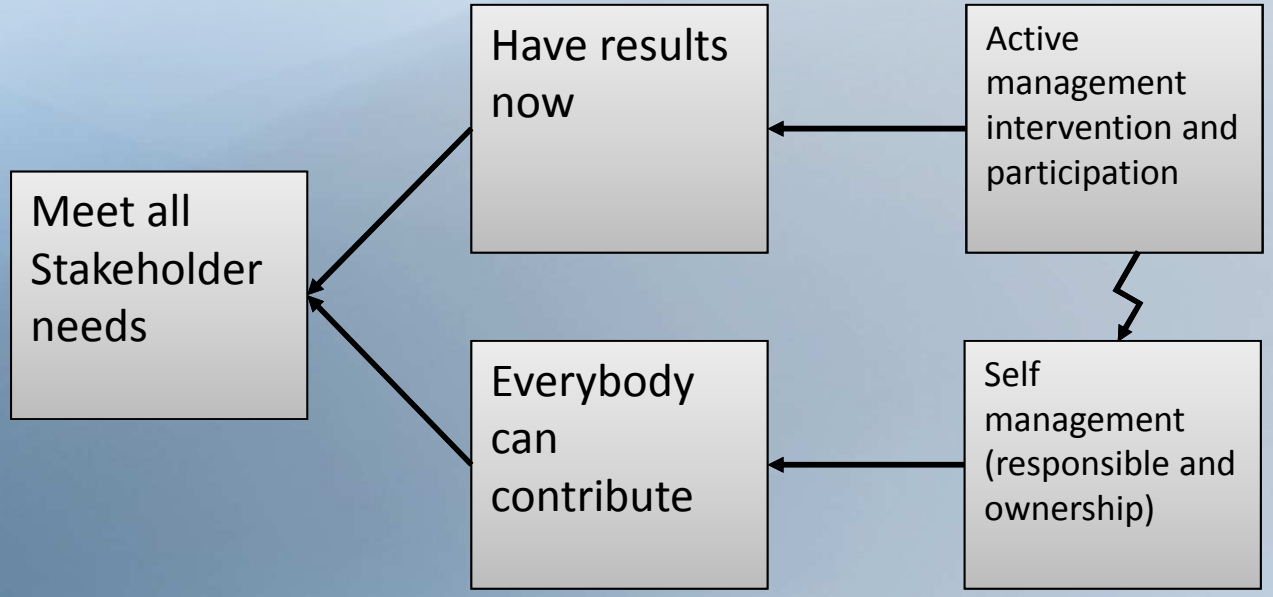


- In essence, it's the route of positions and training a staff member would need to go through, in order to move from being initially employed as the cleaner, to one day being the Factory Supervisor, and potentially the Operations Manager or GM
- A big building block of the system, is that staff are trained pre-emptively (during periods of Protective Capacity) on the next machine or process, creating the potential for them to 'step forward' should that operator leave
- Once initial work was completed on setting up the tree, we made contact with various training bodies (PIFSA, USB, CPUT, FPMSETA, Northlink College) to assist us with formalising both the training required (for external accreditation) as well as advising where funding would be available
- Where necessary, internal testing and certificates will be issued (if no external accreditation is possible)
- At the moment, we are closing the initial gap to ensure consistency of production should any current staff member leave, be it for sick, annual, maternity, or permanent
- Once we have done this, we will proceed with putting together the bigger framework to afford all staff the opportunity to be trained.



Success is spelled F-O-C-U-S

2. Consistency, or rather, Management Focus



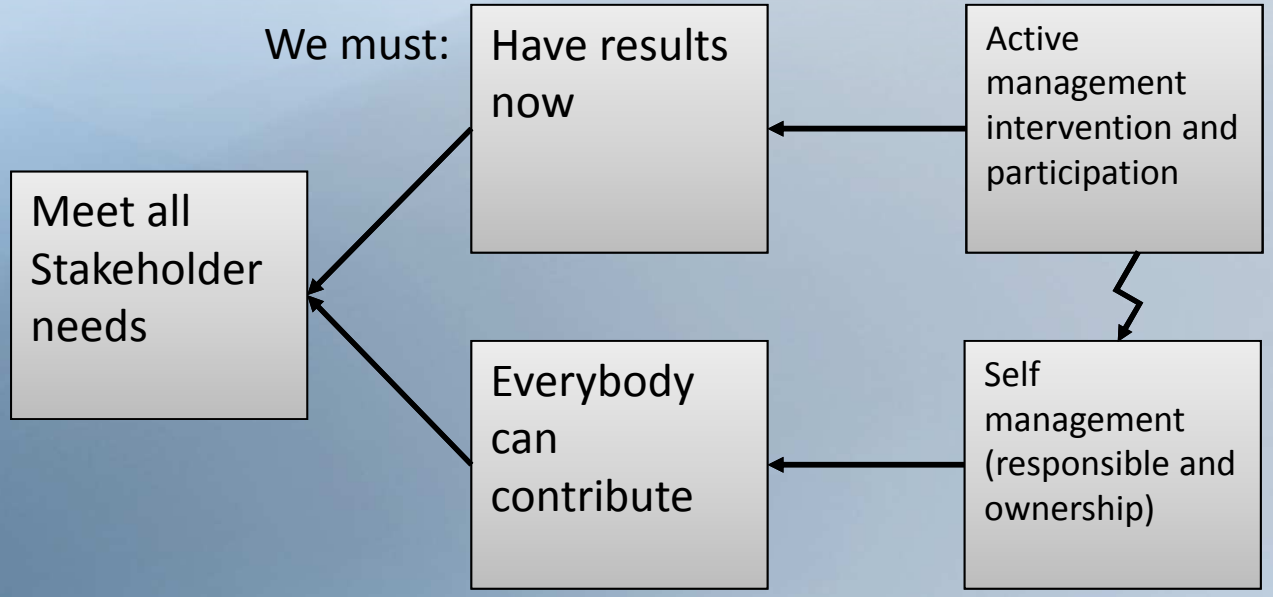
Success is spelled F-O-C-U-S

2. Consistency, or rather, Management Focus

Because: the staff do not see the impact and importance of doing the correct actions

We must:

In order to:



Questions