



**Third International TOCPA Conference
24-25 November 2012, Moscow**



Using modeling in MTA for combination of Long Lead Time Supplier and Short Lead Time Supplier

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Emanuele Strada

Emanuele is an expert in process modeling with a longstanding experience as an engineer and IT expert, and more than 20 years at a worldwide leader manufacturing company, involved in different areas and responsibilities, with strong focus on process re-engineering and problem solving. With proven experience in managing complex turn-around project at international level and Global Company award obtained for different projects.



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Emanuele developed a special simulator to demonstrate the power of the solution in the reality of these plants that was used in order to communicate the solution and persuade management to adopt the solutions.



Contents

► Process Model

- VSM & Process Model (how it looks like)
- System XYZ - example

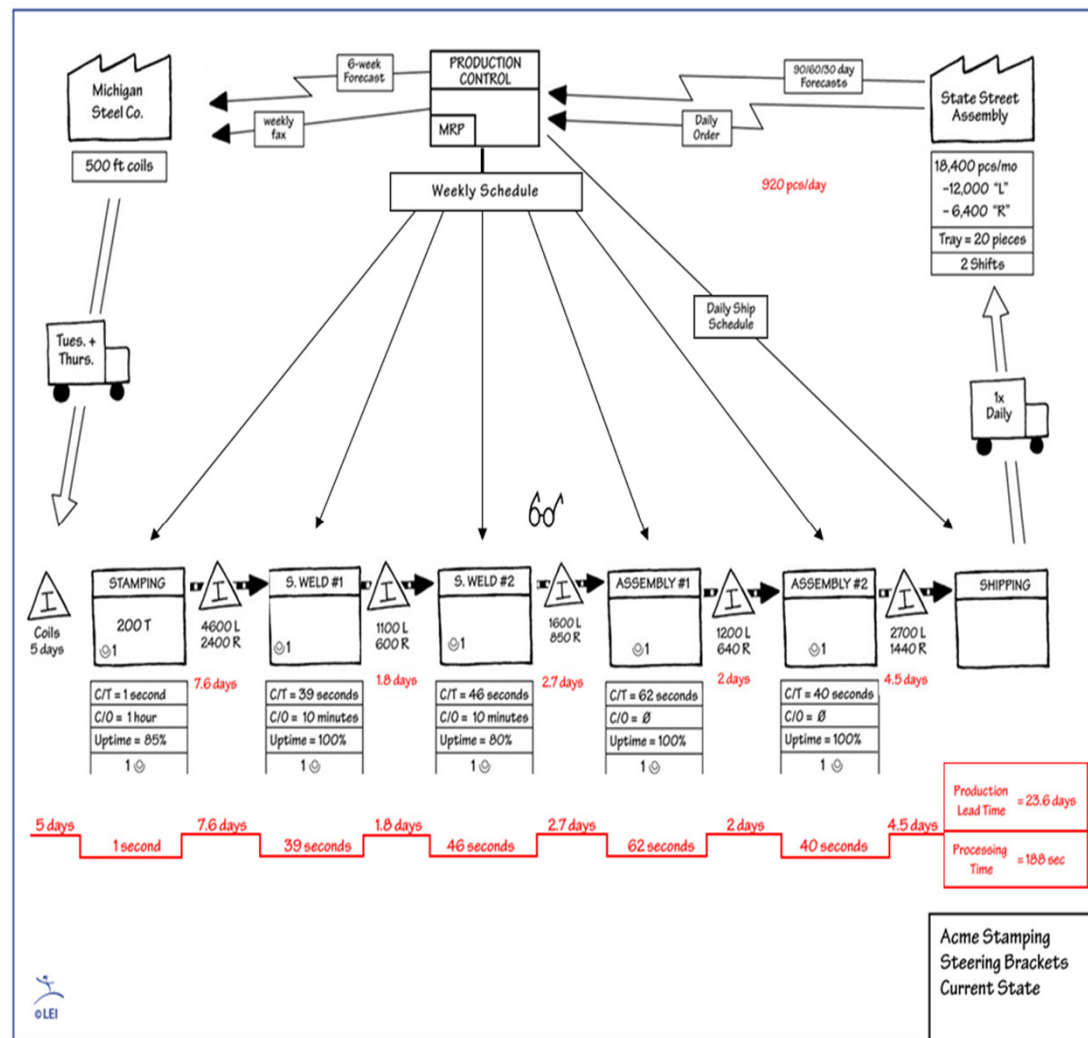
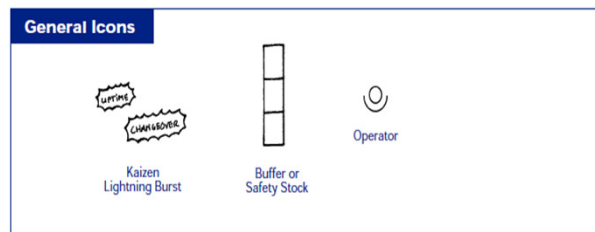
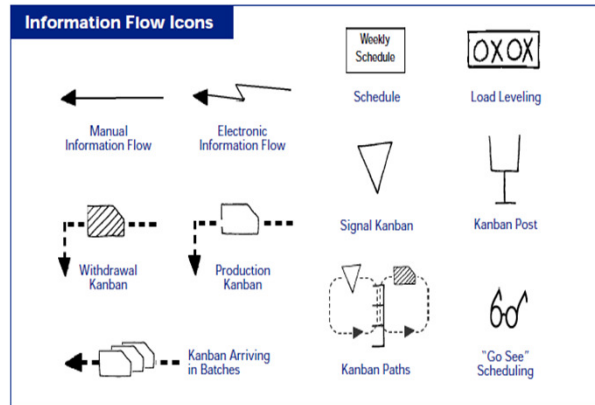
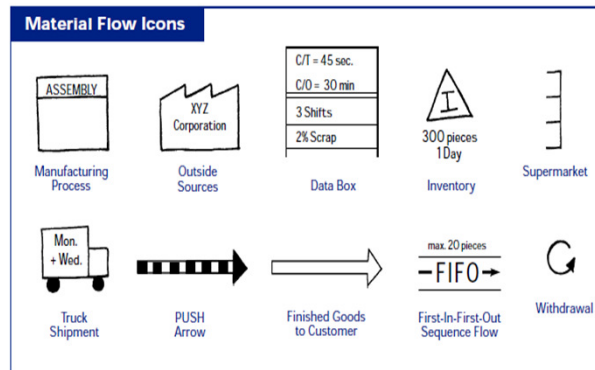
► Turning the Theory into the Real Life

- How to set the replenishment of MTA buffers for the combination of Short Lead Time Supplier (SLS) & Long Lead Time Supplier (LLS)
- Process Model example

► Key Learning



Value Stream Map ...how it looks like



VSM...

10 Steps of mapping the current state

Select Value Stream

- Review product families
- Review customer demand profile

1. Map Overall Process Flow
2. Identify Key Metrics
3. Complete Data Boxes
4. Draw Inventory and Days' Supply
5. Fill in Timeline
6. Calculate Value Added Ratio
7. Draw Raw Material Supply
8. Draw Information Flow
9. Draw Kaizen Bursts

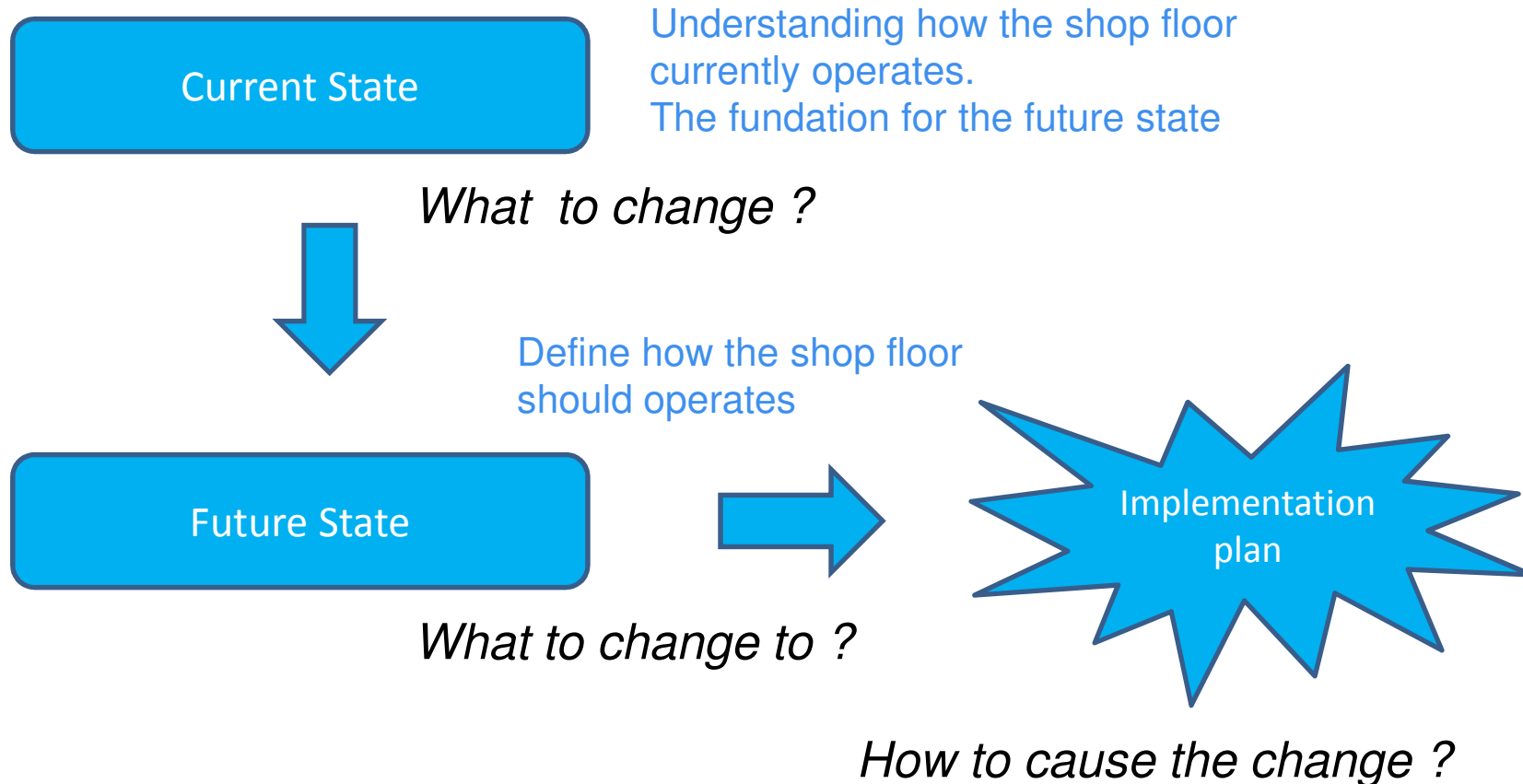
Step 3 – Identify key metrics

- Operator Cycle Time (OCT)
- Auto Time
- Value Added (VA) Time
- Changeover Time (C/O)
- % Uptime (%Up)
- Quality (e.g. FPY, RTY)
- Productivity (pcs/person/hour)
- Space
- Value Added Space
- People Travel
- Product Travel
- Shifts
- Inventory before
- Inventory after

Heat Treat
Q3
Total C/T = 160 secs.
Defect = 26%
NVA = 39160 secs.
C/O = 60 mins.
Uptime = 90%
Automatic C/T: 54000 secs.



Using the Value Stream Mapping Tool





Where & How Improve the process

yes... but... yes... **but...**

...if we need to evaluate the
impact of the “future state” on
the actual system ?

...in different scenarios (“what if...”)

Is the VSM enough ?





Where & How Improve the process

...if we want to improve the system, we should take a decision
...if we should take a decision, we should have “right” information

**...very often the data that we are considering in order to get information is
constant / snapshot / average estimation ...**

...but, is the reality “constant reality” / “snapshot reality” / “average reality” ?

...or it is a Dynamic System

...if we want to improve the system, we should take a decision
...if we should take a decision, we should have “right” information

**...that means we should consider “something” that can represent the reality
(dynamically)**

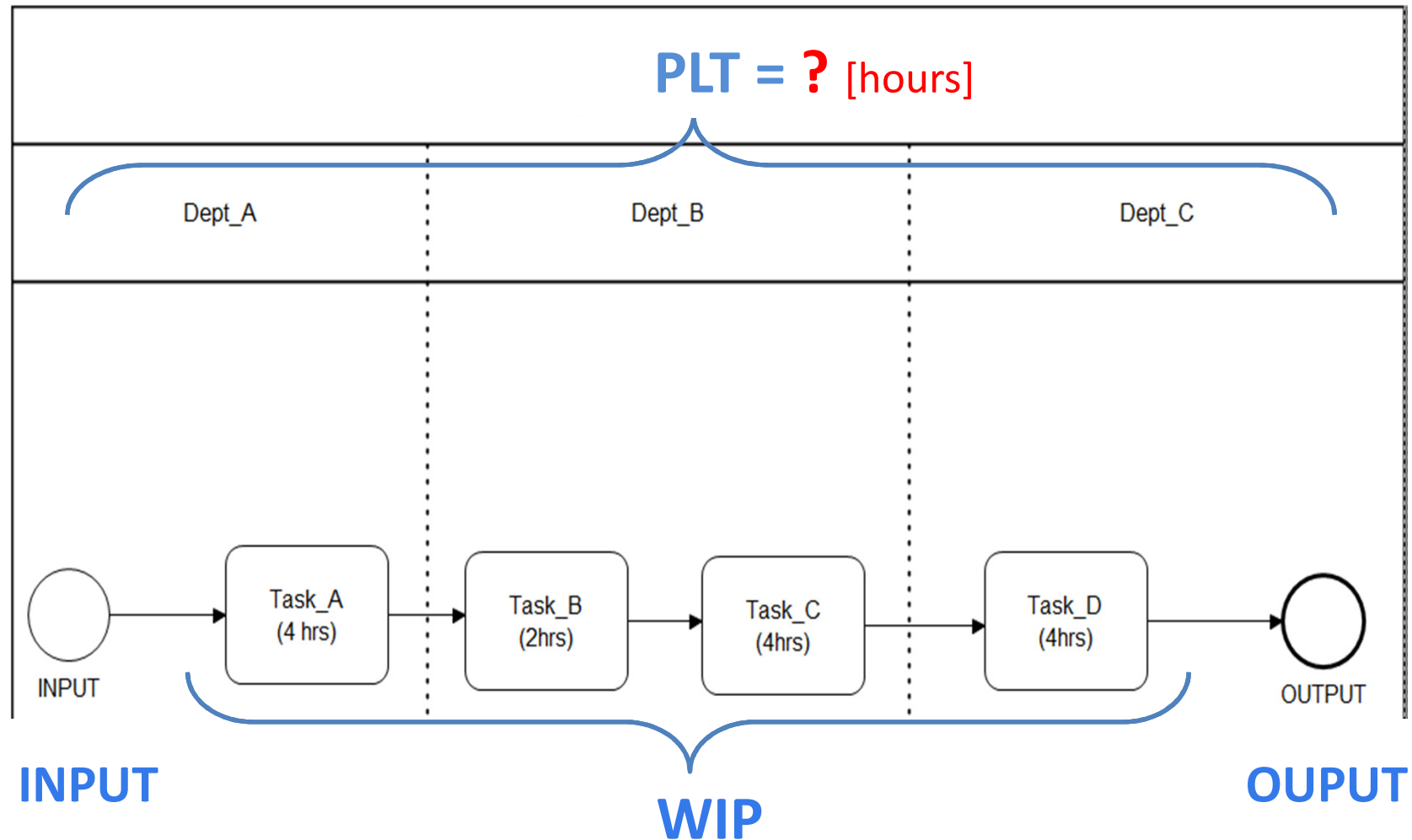
...in order to get “right” information

...than better decision

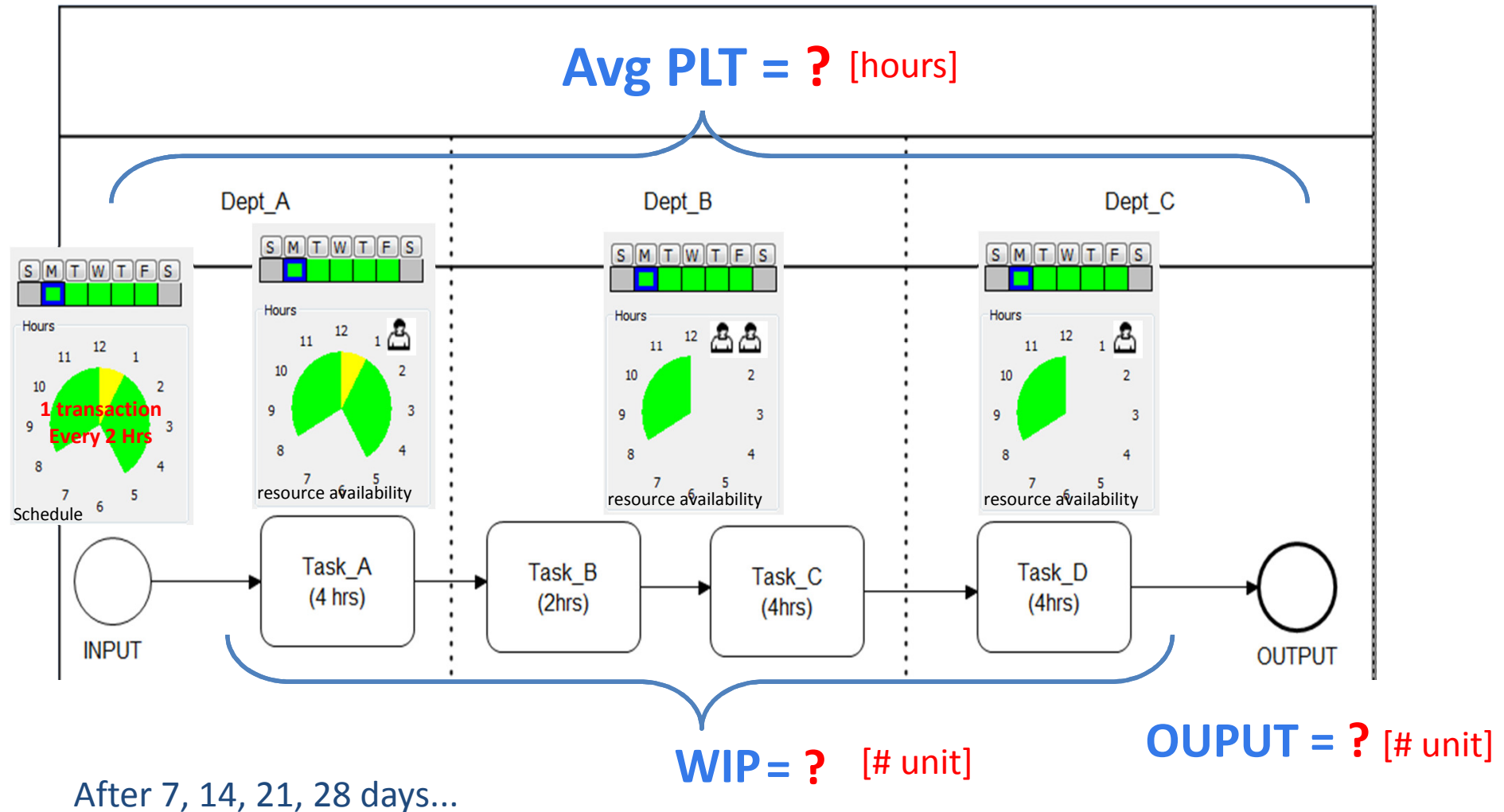


Let's have a look how Process Model looks like...

is it a "complicated" system ?



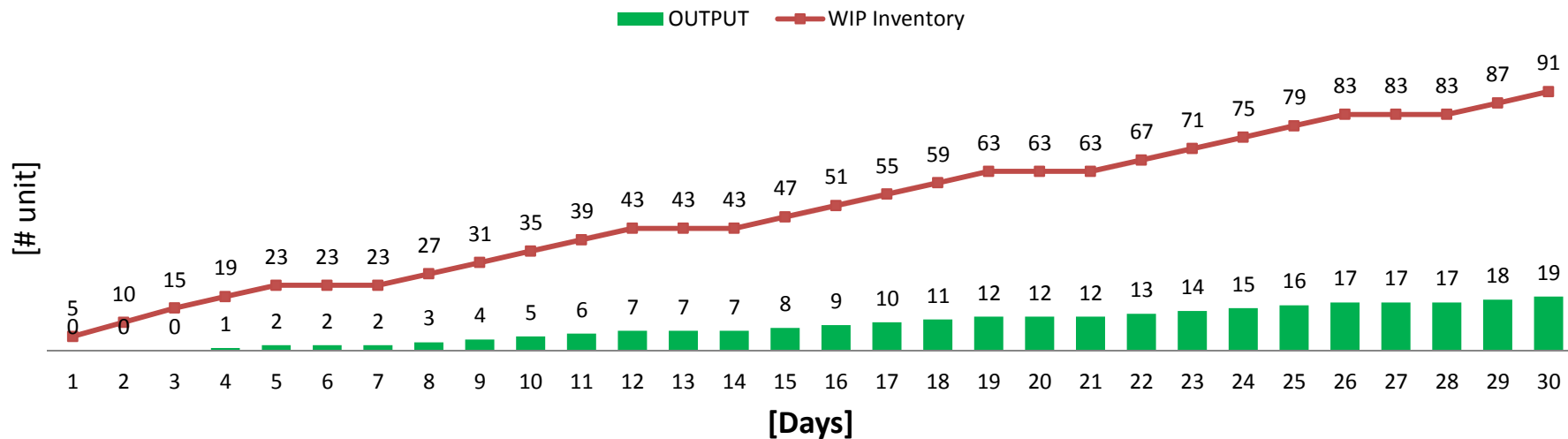
Simulation time: 30 days starting from Monday @ 8:00am



Simulation time: 30 days starting from Monday @ 8:00am

Model outcome (daily snapshot @ 8:00am)

OUTPUT & WIP Inventory (INPUT: PUSH every 2 hrs) & Resource time consumption = constant = Task Time

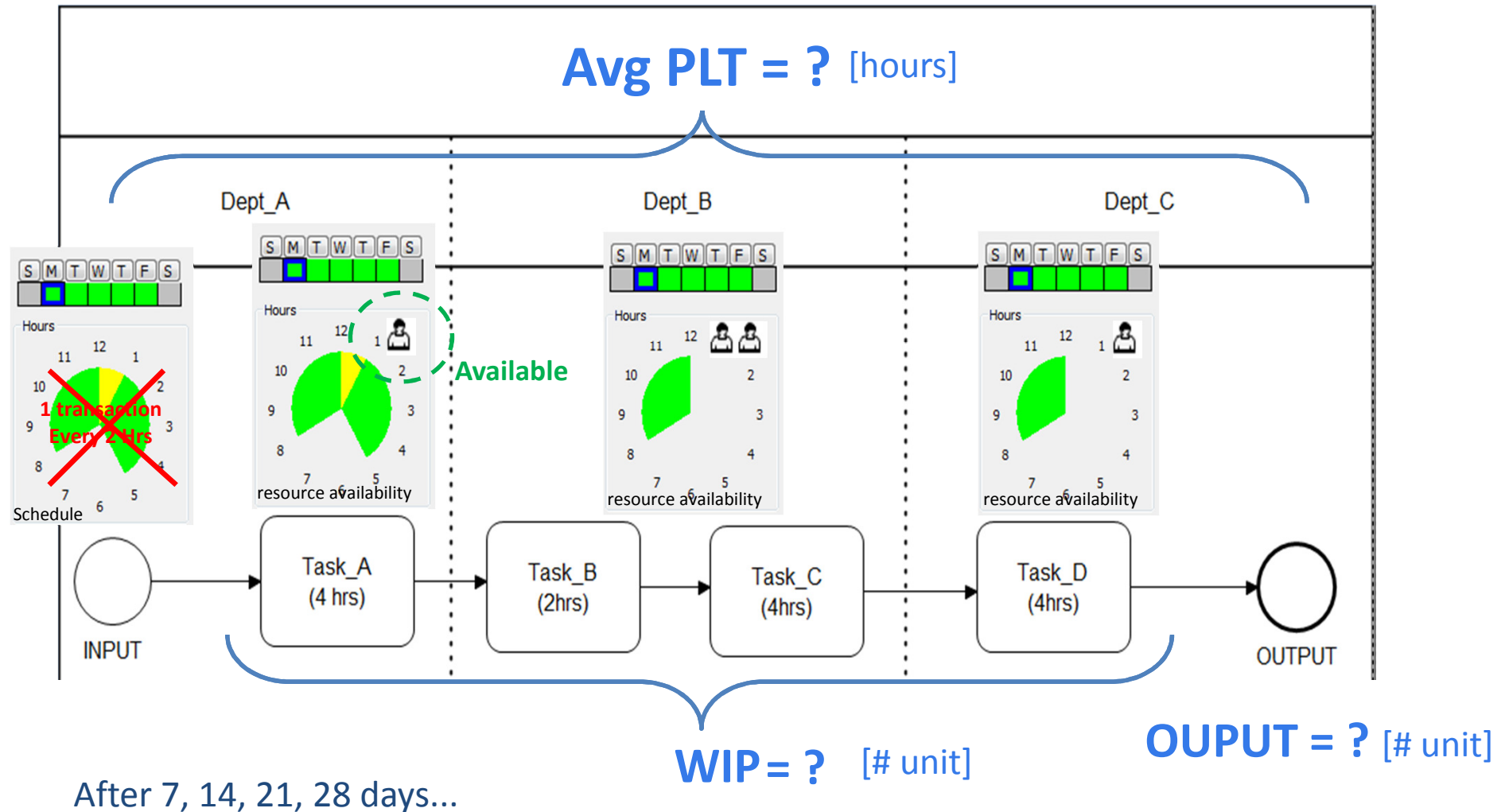


Avg Process Lead Time = 14.44 [Days]

Simulation time: 30 days starting from Monday @ 8:00am



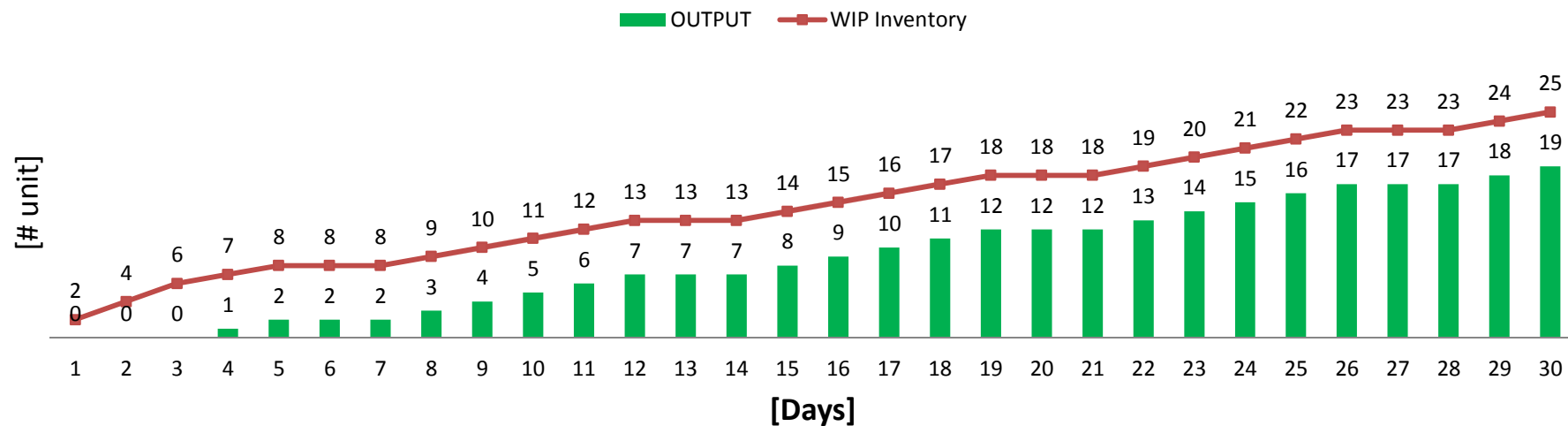
Simulation time: 30 days starting from Monday @ 8:00am



Simulation time: 30 days starting from Monday @ 8:00am

Model outcome (daily snapshot @ 8:00am)

OUTPUT & WIP Inventory snapshot @ 8:00am
(INPUT: PULL when Resource Task_A = Available)
& Resource time consumption = constant = Task Time



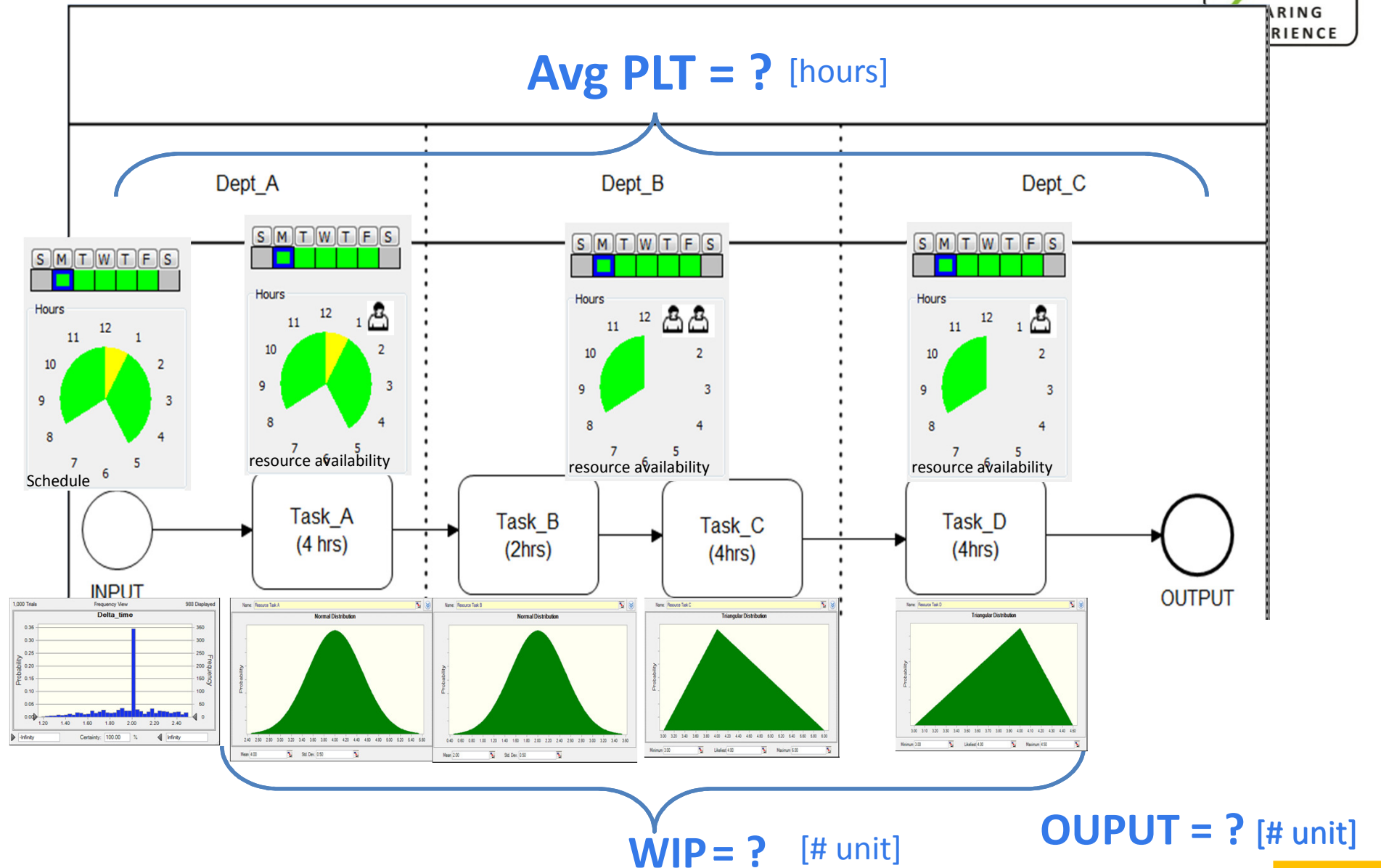
Avg Process Lead Time = 10,5 [Days]

Simulation time: 30 days starting from Monday @ 8:00am



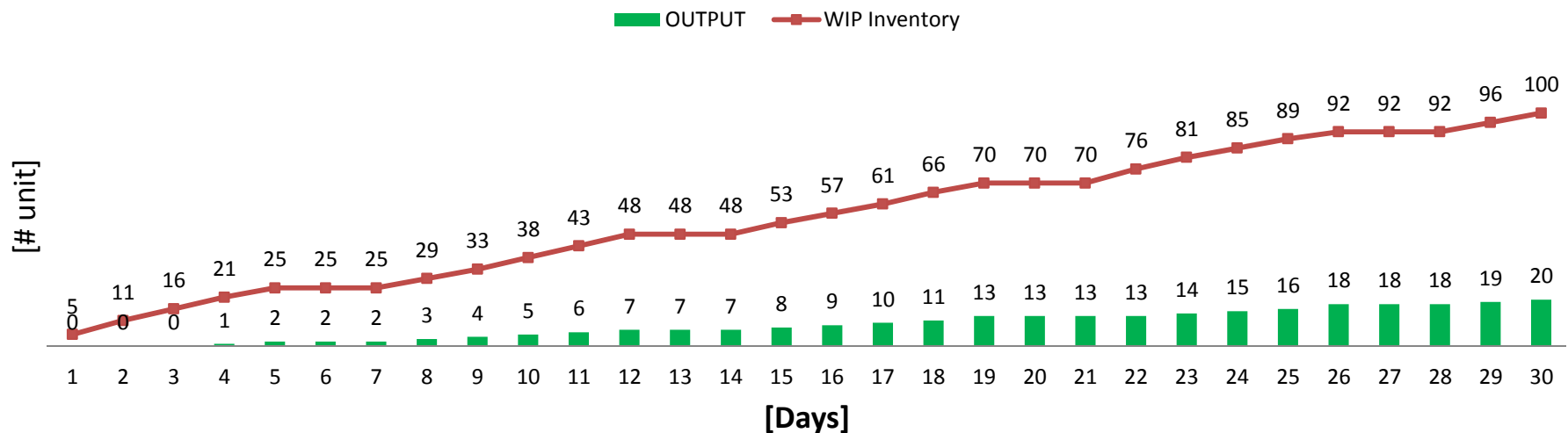
A step closer to the reality...

Simulation time: 30 days starting from Monday @ 8:00am



Model outcome (daily snapshot @ 8:00am)

OUTPUT & WIP Inventory (INPUT: PUSH with specific distribution) & Resource time consumption = from Tasks distribution

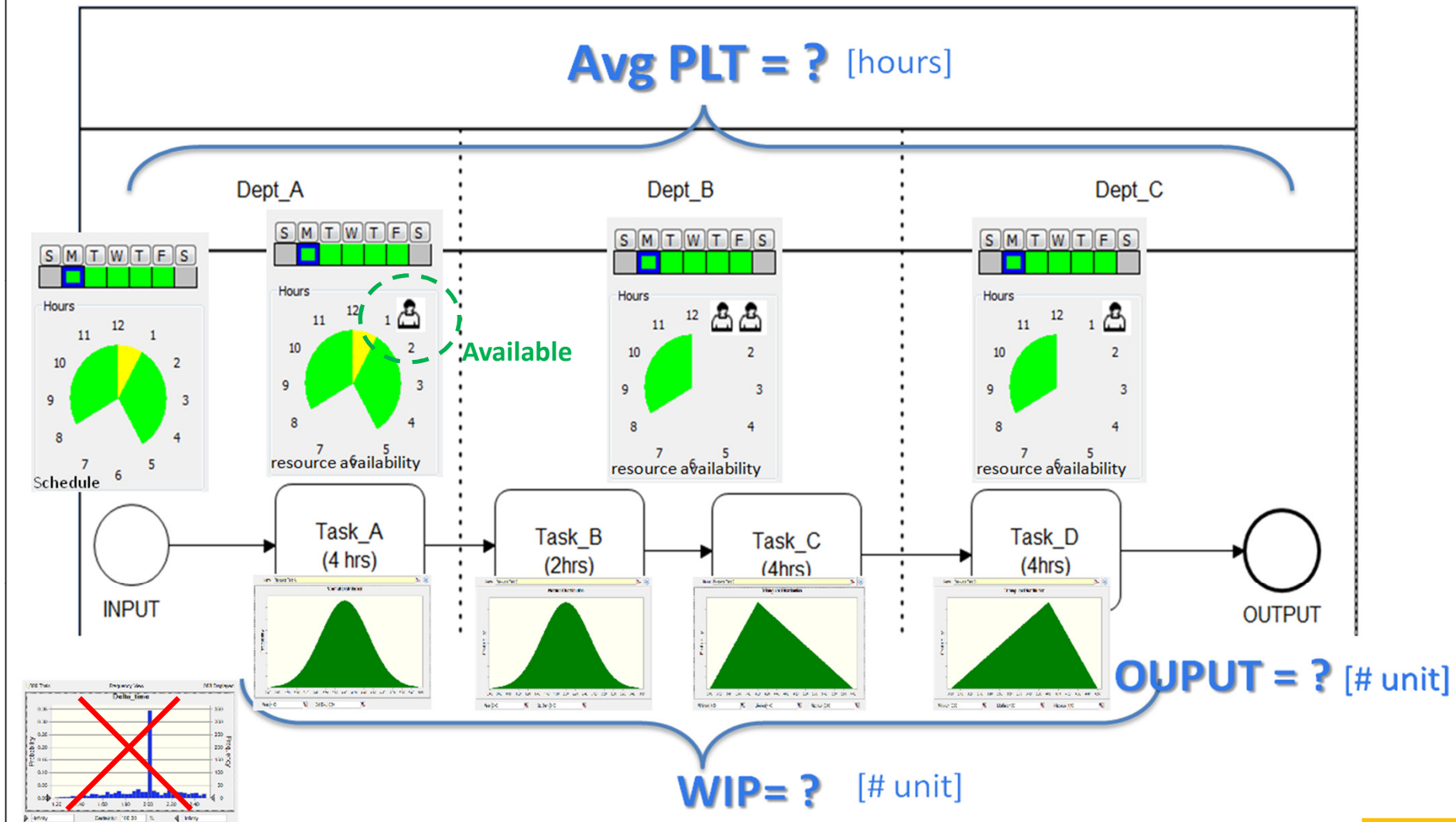


Avg Process Lead Time = **14,85 [Days]**

Simulation time: 30 days starting from Monday @ 8:00am

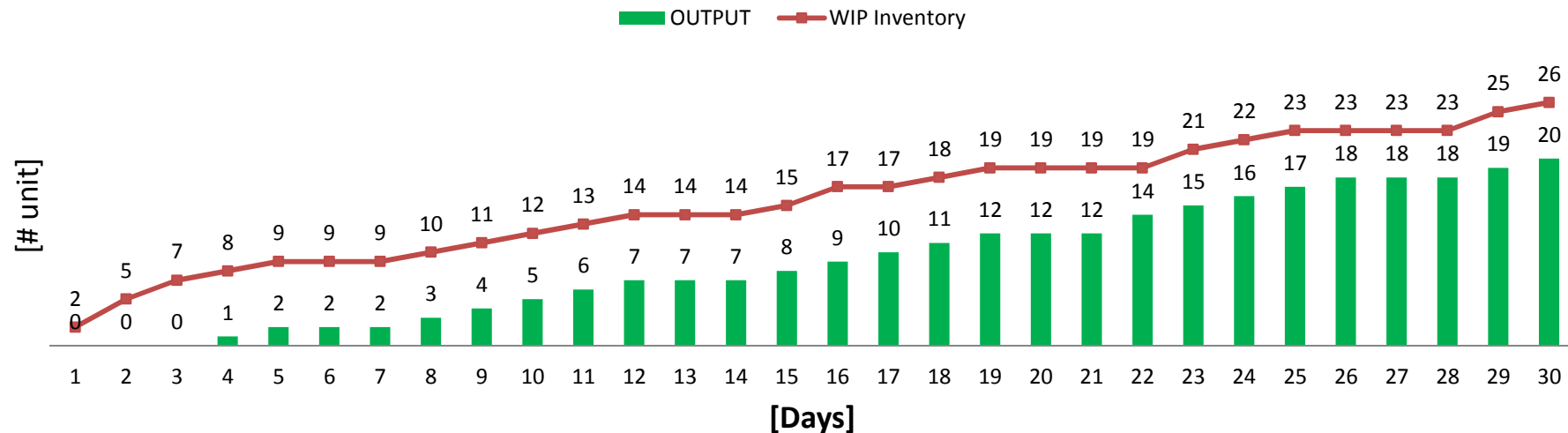


Model outcome (daily snapshot @ 8:00am)



Model outcome (daily snapshot @ 8:00am)

OUTPUT & WIP Inventory (INPUT: PULL when Resource Task_A = Available) & Resource time consumption = from Tasks distribution

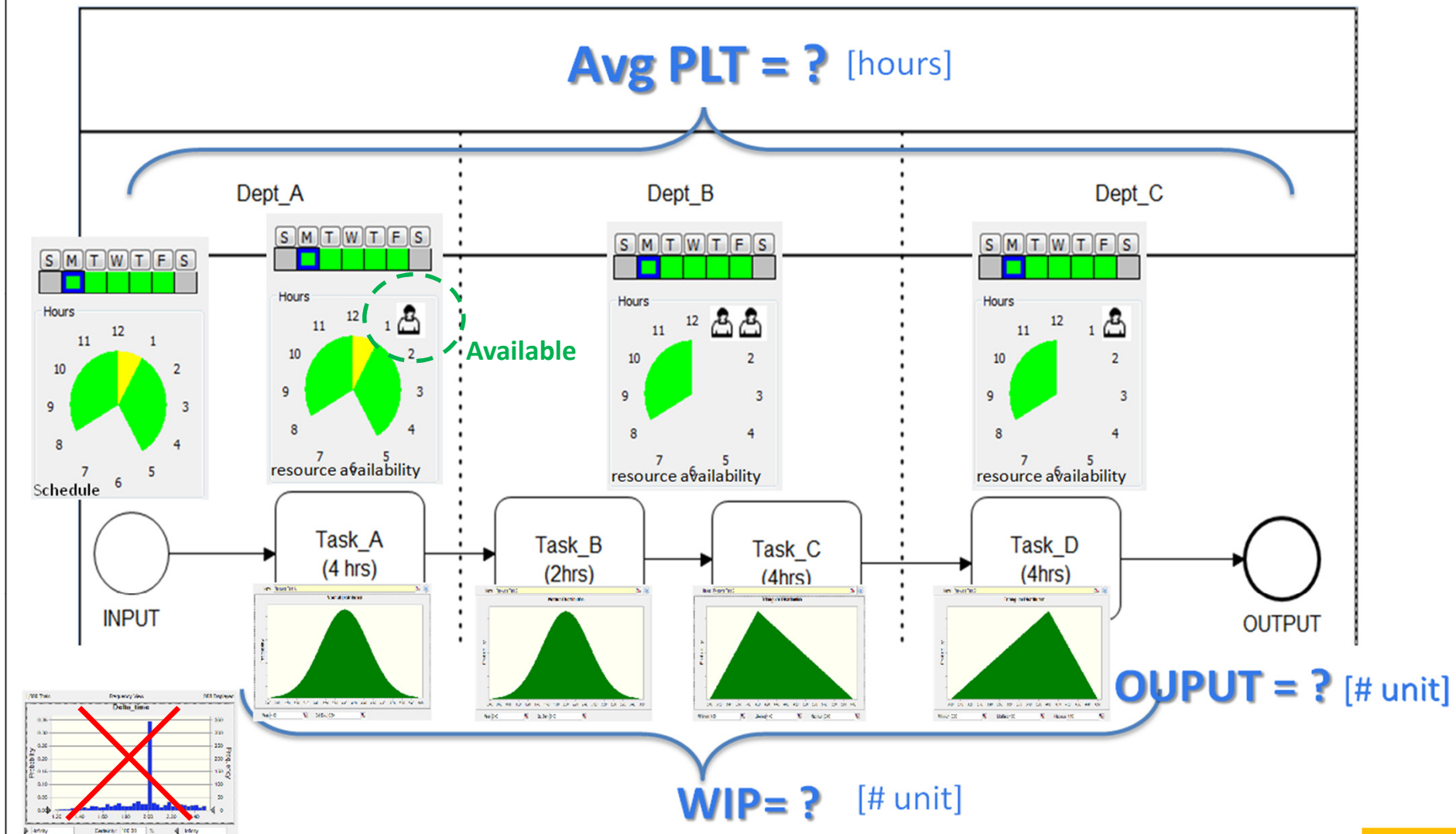


Avg Process Lead Time = 11,15 [Days]

Simulation time: 30 days starting from Monday @ 8:00am

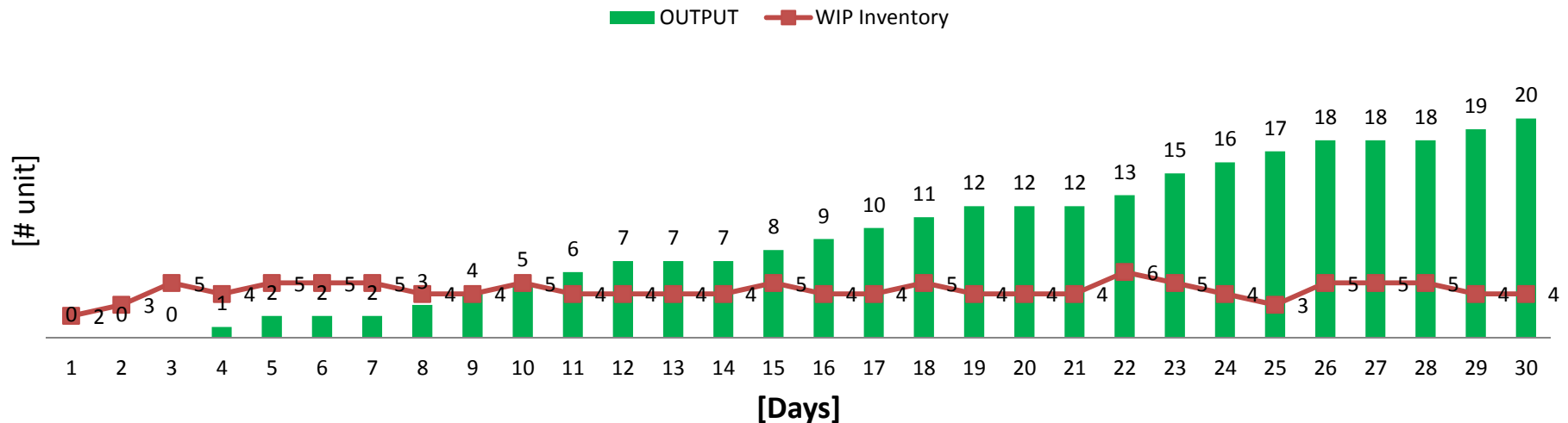


Model outcome (daily snapshot @ 8:00am)



Model outcome (daily snapshot @ 8:00am)

OUTPUT & WIP Inventory (INPUT: PULL when Resource Dep_B = Available) & Resource time consumption = from Task distribution



Avg Process Lead Time = 5,66 [Days]

Simulation time: 30 days starting from Monday @ 8:00am





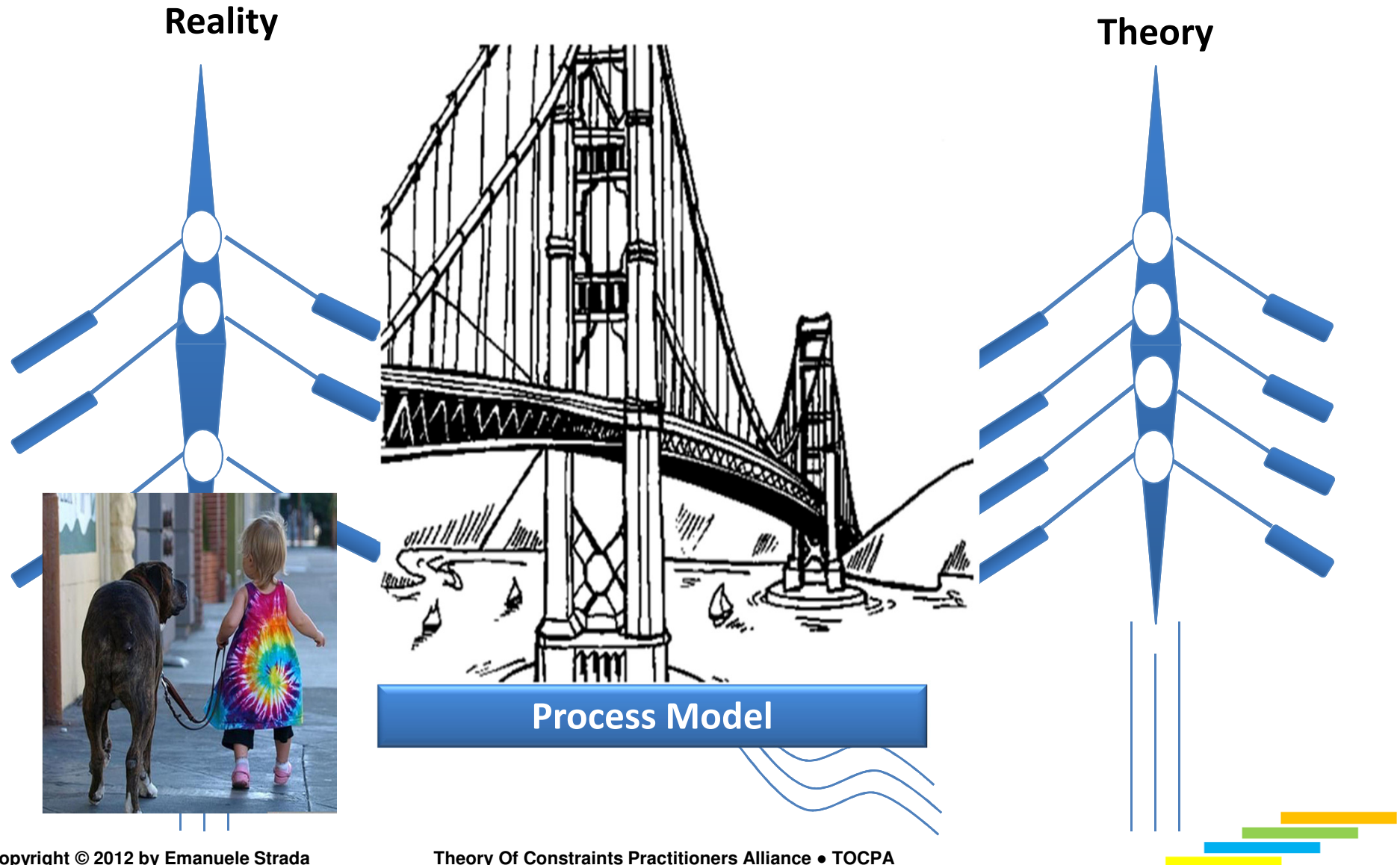
Process model outcome... recap

- In reality there is a general direction of work flow
- If there is a flow, there are dependencies
- If you have dependencies , you have the constraint and fluctuations
...plus Murphy

Process Model could help you to Analyze and Improve the impact of resource dependency coupled with statistical fluctuations



What is the Process Model ?





Turning the Theory into the Real Life

► Turning the Theory into the Real Life

- How to set the replenishment of MTA buffers for the combination of short Lead Time Supplier (SLS) & Long Lead Time Supplier (LLS)

► MTA

- Process Map Variation - Single supplier

► MTA

- Process Map Variation - Long Lead Time Supplier (LLS) & Short Lead Time Supplier (SLS)



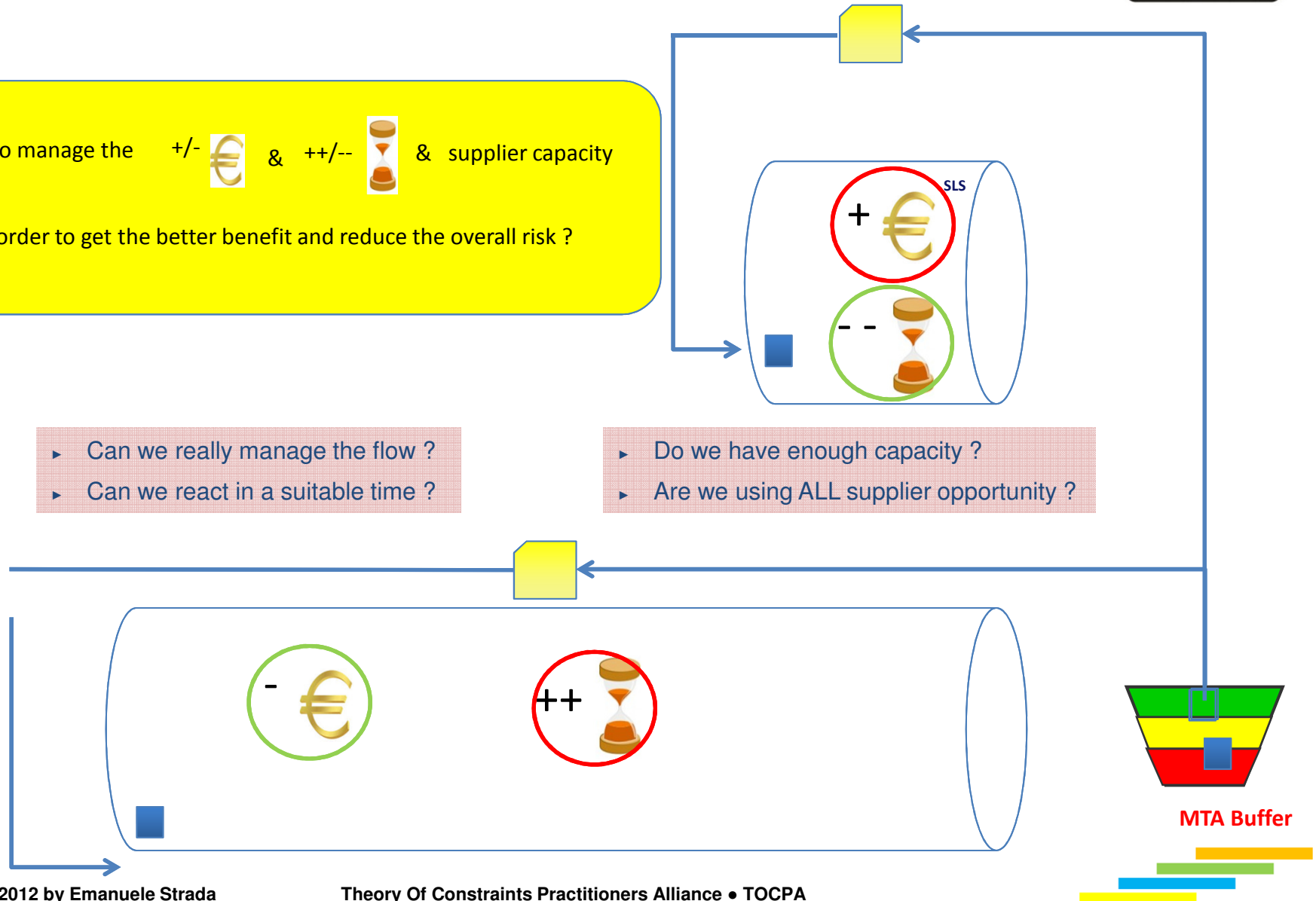
Long Lead Time Supplier (LLS) & Short Lead Time Supplier (SLS)

How to manage the +/- € & ++/-- ⌚ & supplier capacity

in order to get the better benefit and reduce the overall risk ?

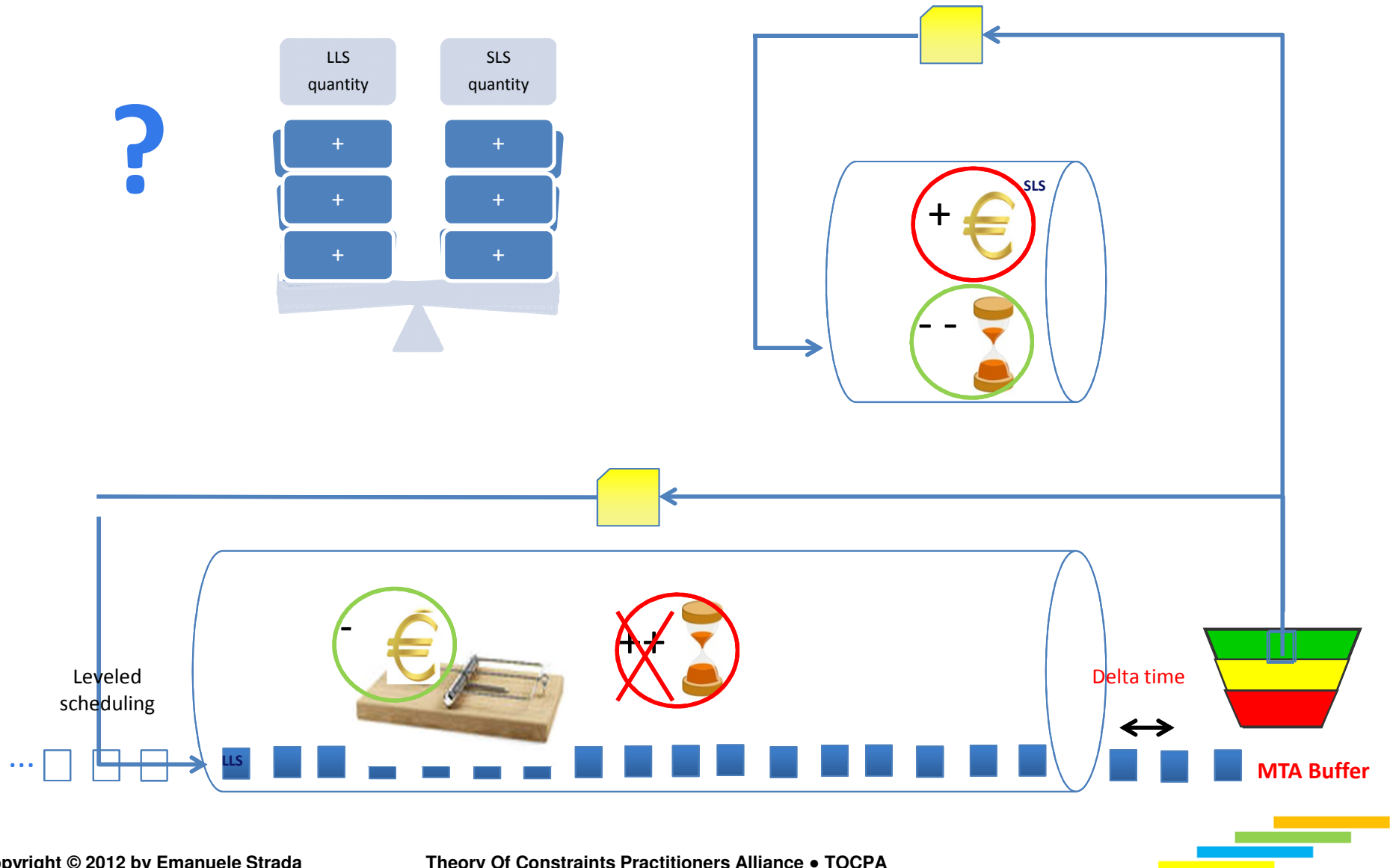
- ▶ Can we really manage the flow ?
- ▶ Can we react in a suitable time ?

- ▶ Do we have enough capacity ?
- ▶ Are we using ALL supplier opportunity ?



Why not leveled scheduling...

yes, But...





Why not leveled scheduling...

yes, But...

LLS Quantity Vs SLS Quantity (design decision)	Customer Demand (actual Vs forecast)	Actual MTA buffer performance snapshot
+ Vs -	+ Vs -	I'm lucky
+ Vs -	- Vs +	"disaster"
- Vs +	+ Vs -	missed opportunity
- Vs +	- Vs +	I'm lucky





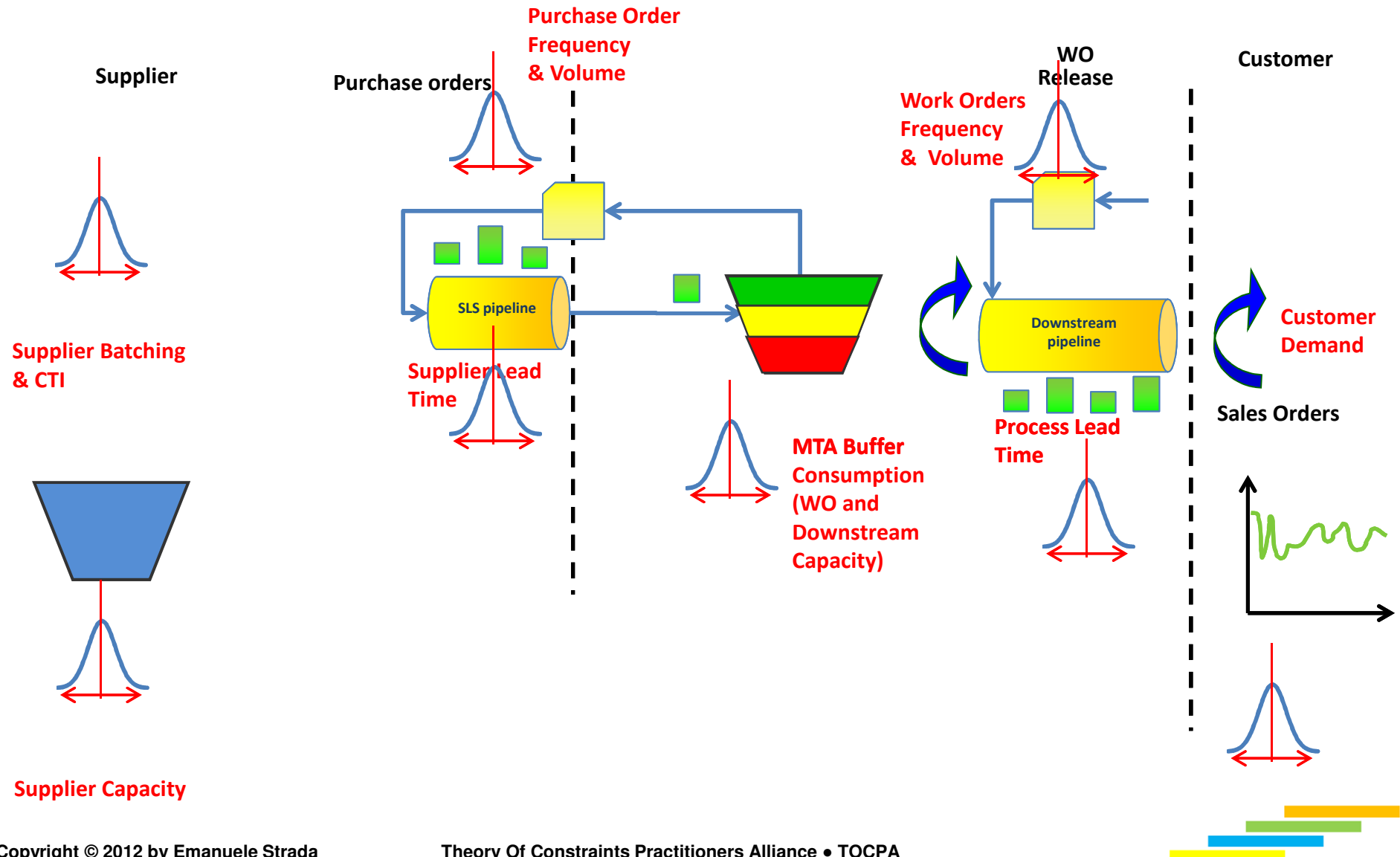
How does the system look

yes, But...

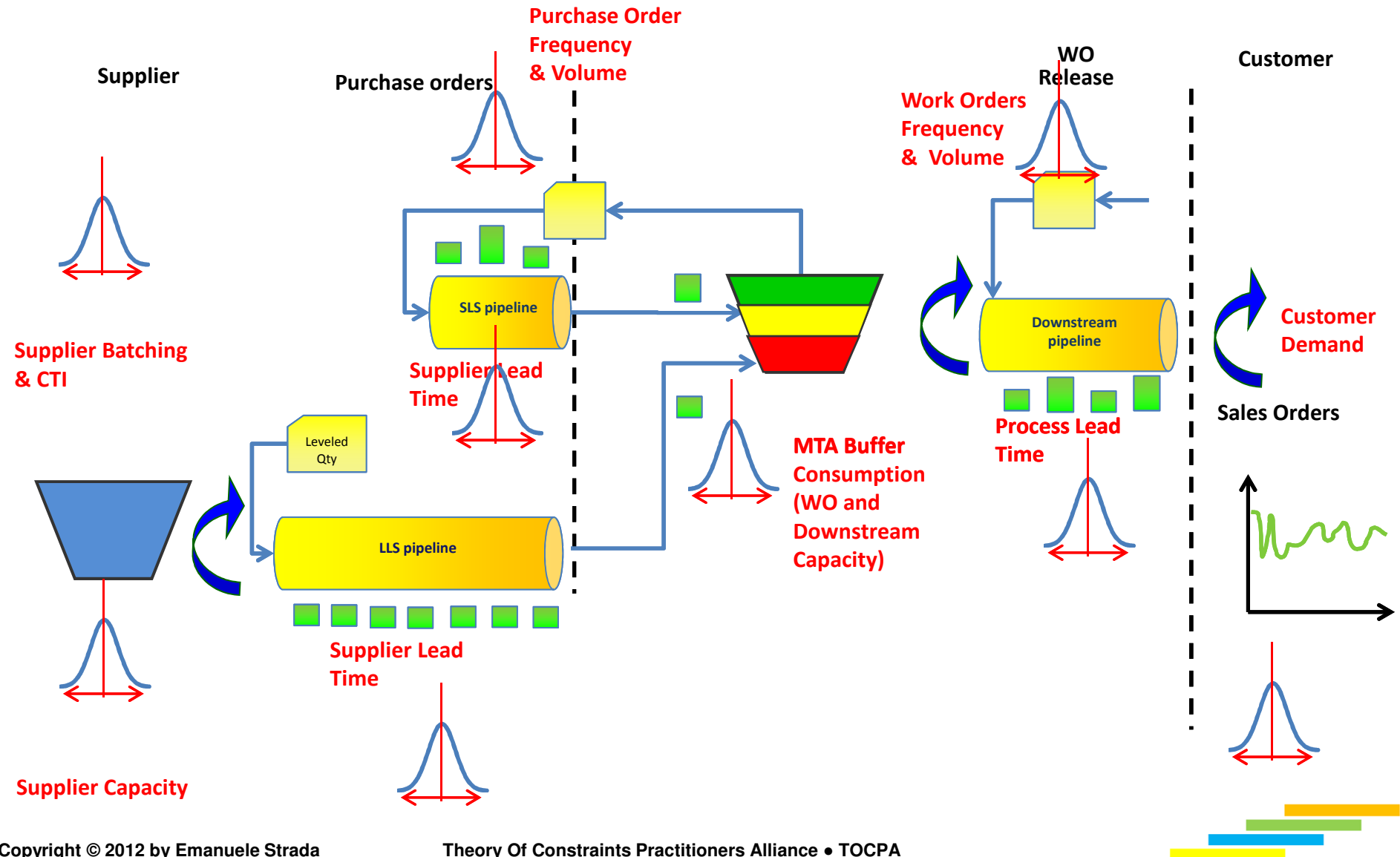
Let's have a look at the system...



MTA System (SLS) Process Map Variation – Summary



MTA System (SLS + LLS) Process Map Variation – Summary



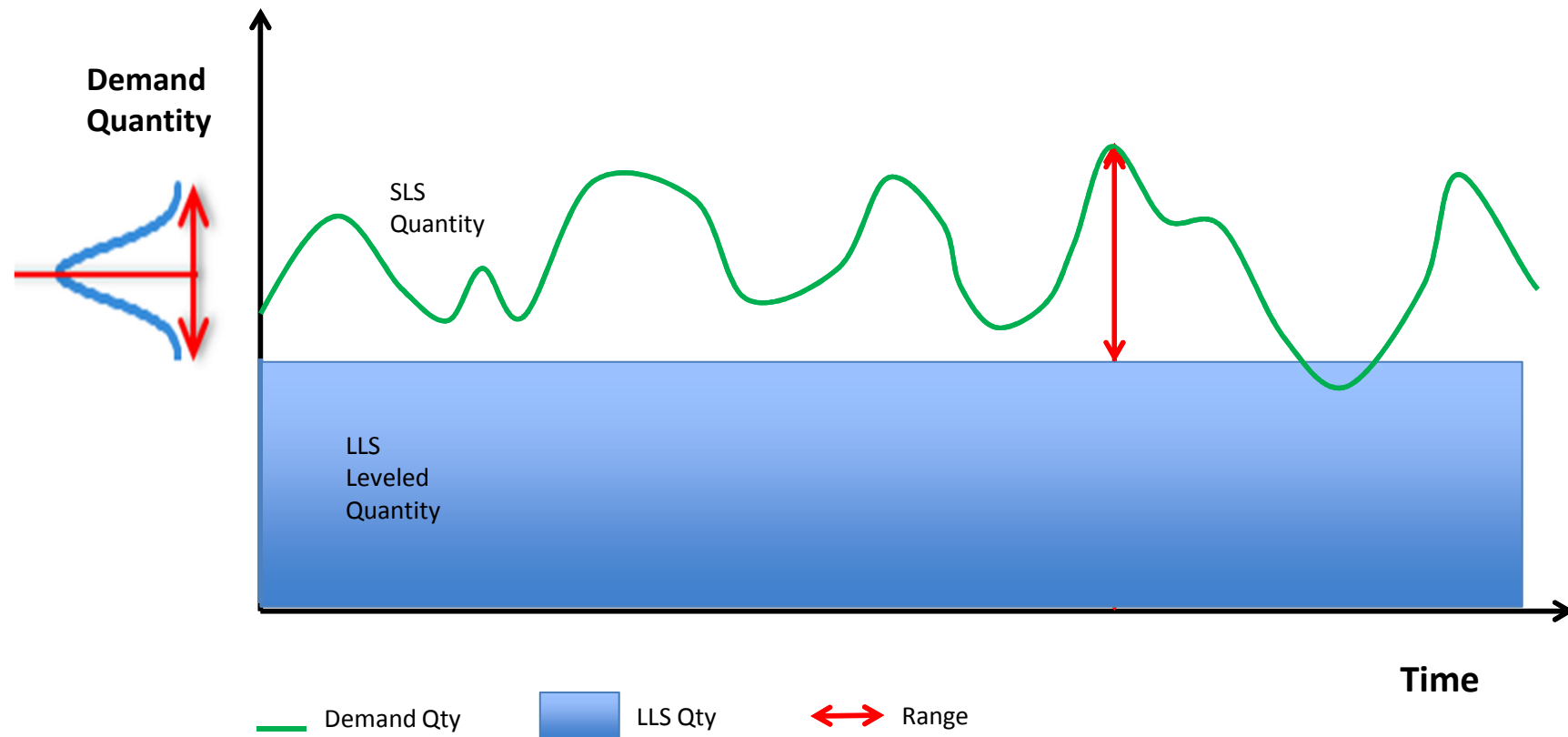


Turning the Theory into the Real Life

- ▶ How to set the MTA Buffer Target Level ?
- ▶ What are the factors we should consider in the formula ?
- ▶ How to set the MTA Buffer Alert Level ?
- ▶ What should be the quantity to set to the Short Lead Time Supplier ?
- ▶ What should be the quantity to set to the Long Lead Time Supplier ?



LLS Quantity in a (SLS & LLS) environment...



Model example: an assumption

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Suppliers

Purchase orders

WO Release

Customer

OF = 2 times/ Week

Lead Time = 7 Days

OF = 1 Day

Lead Time = 120 Days

SLS pipeline

Levelled Qty

LLS pipeline

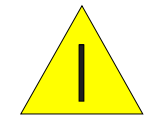
MTA Buffer

Downstream pipeline

Lead Time = 7 Days

Customer Demand

Sales Orders



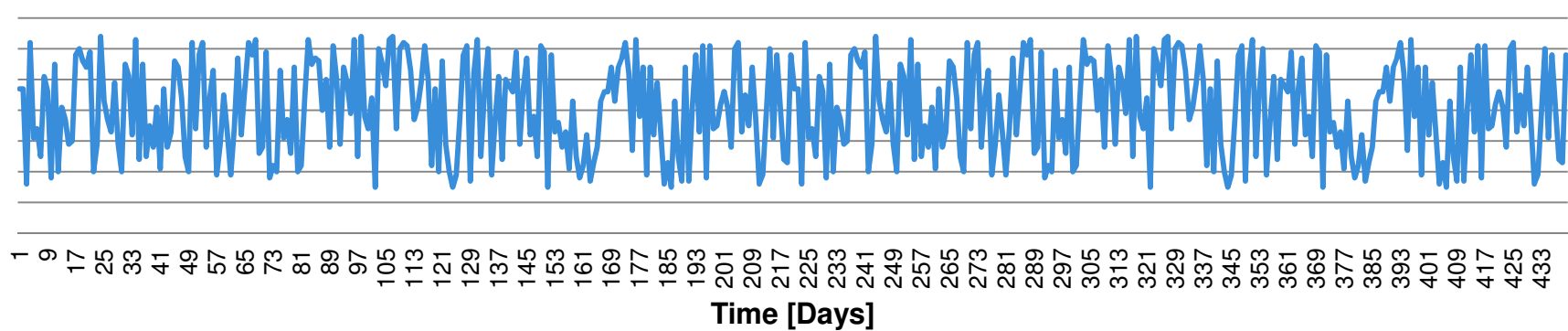
Customer Warehouse

Warehouse Quantity = 300 units

Customer Demand

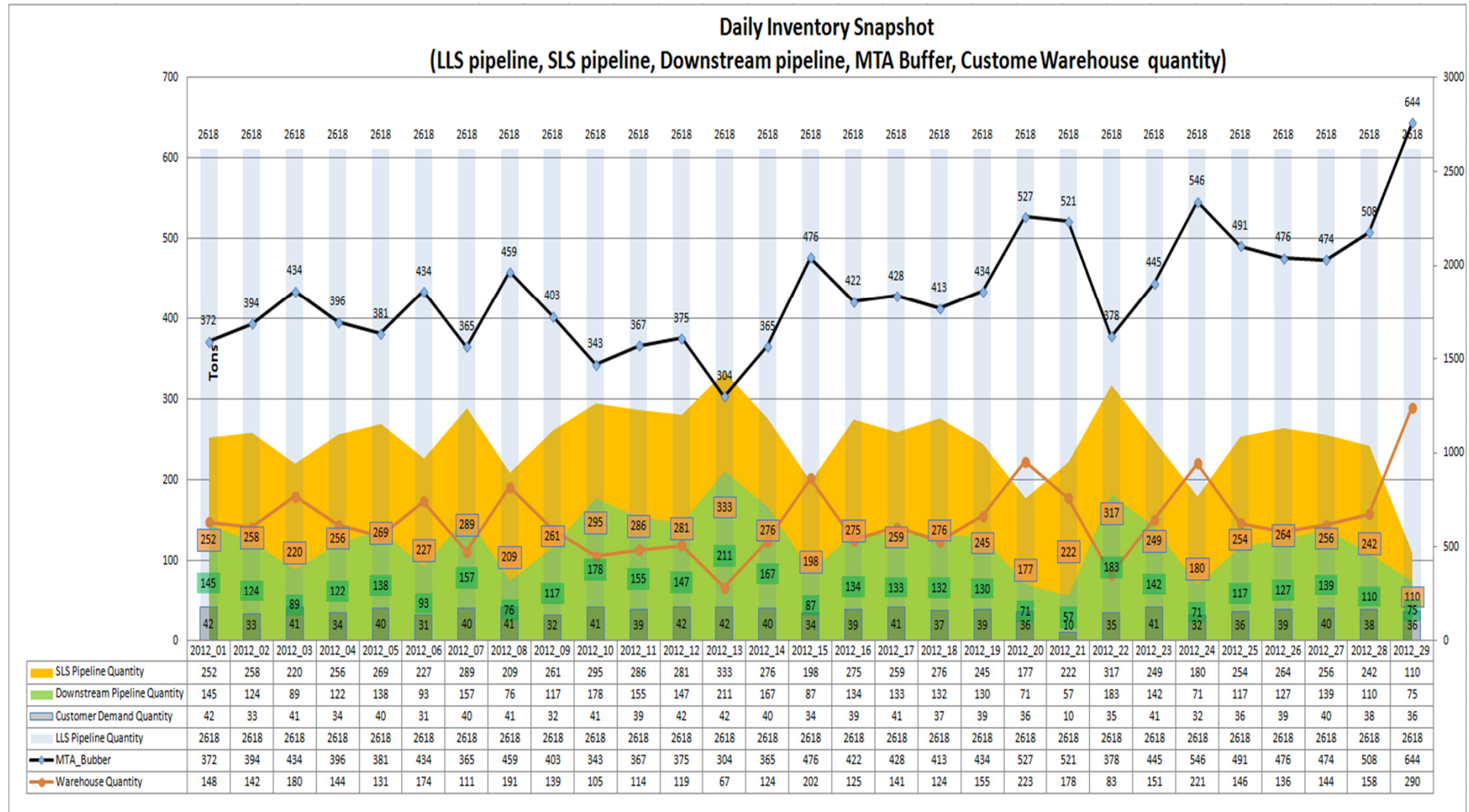


Quantity [# unit]



— Customer Demand

Model example: outcome



Model example: an assumption

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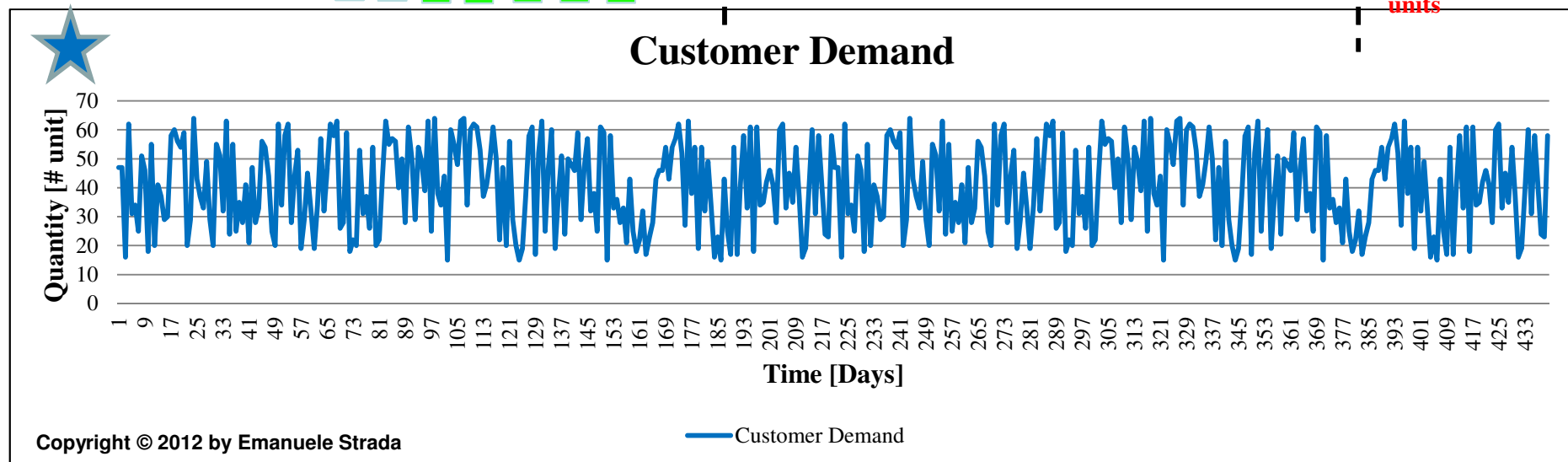
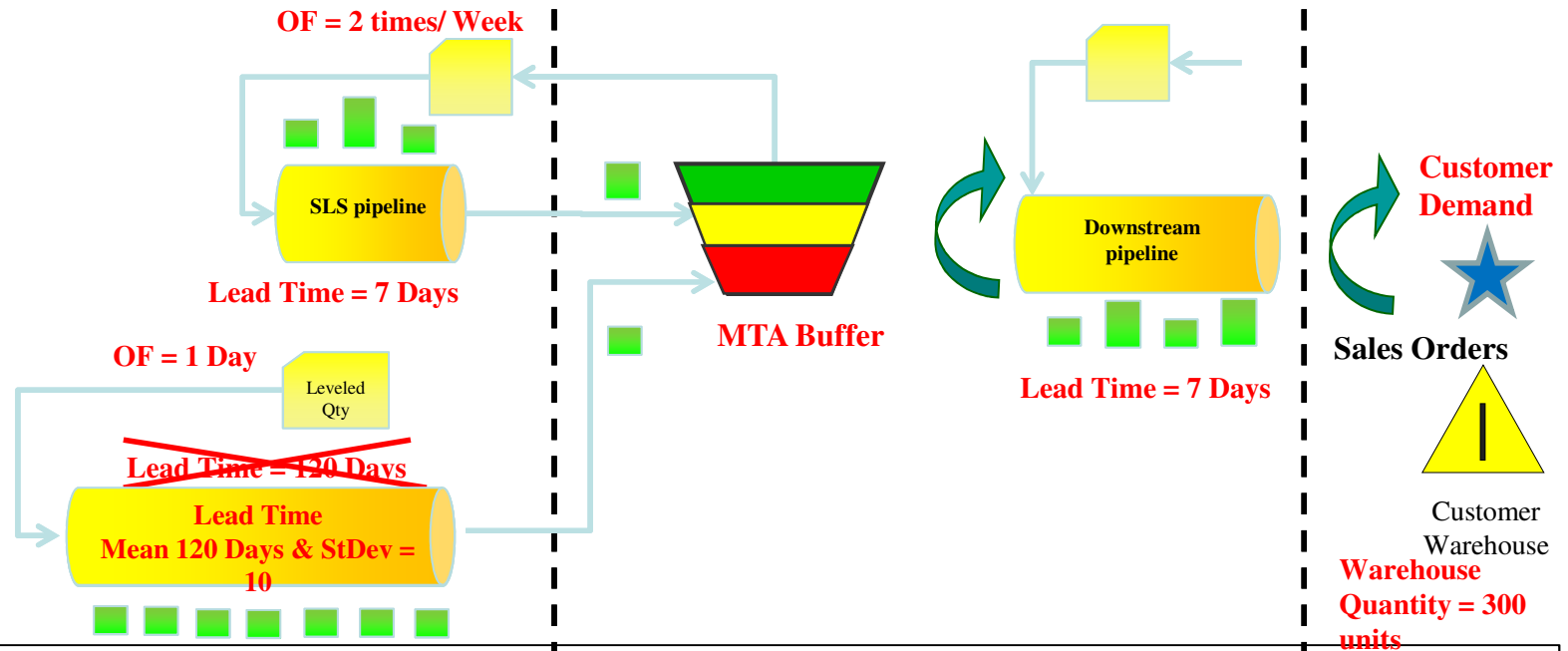


Suppliers

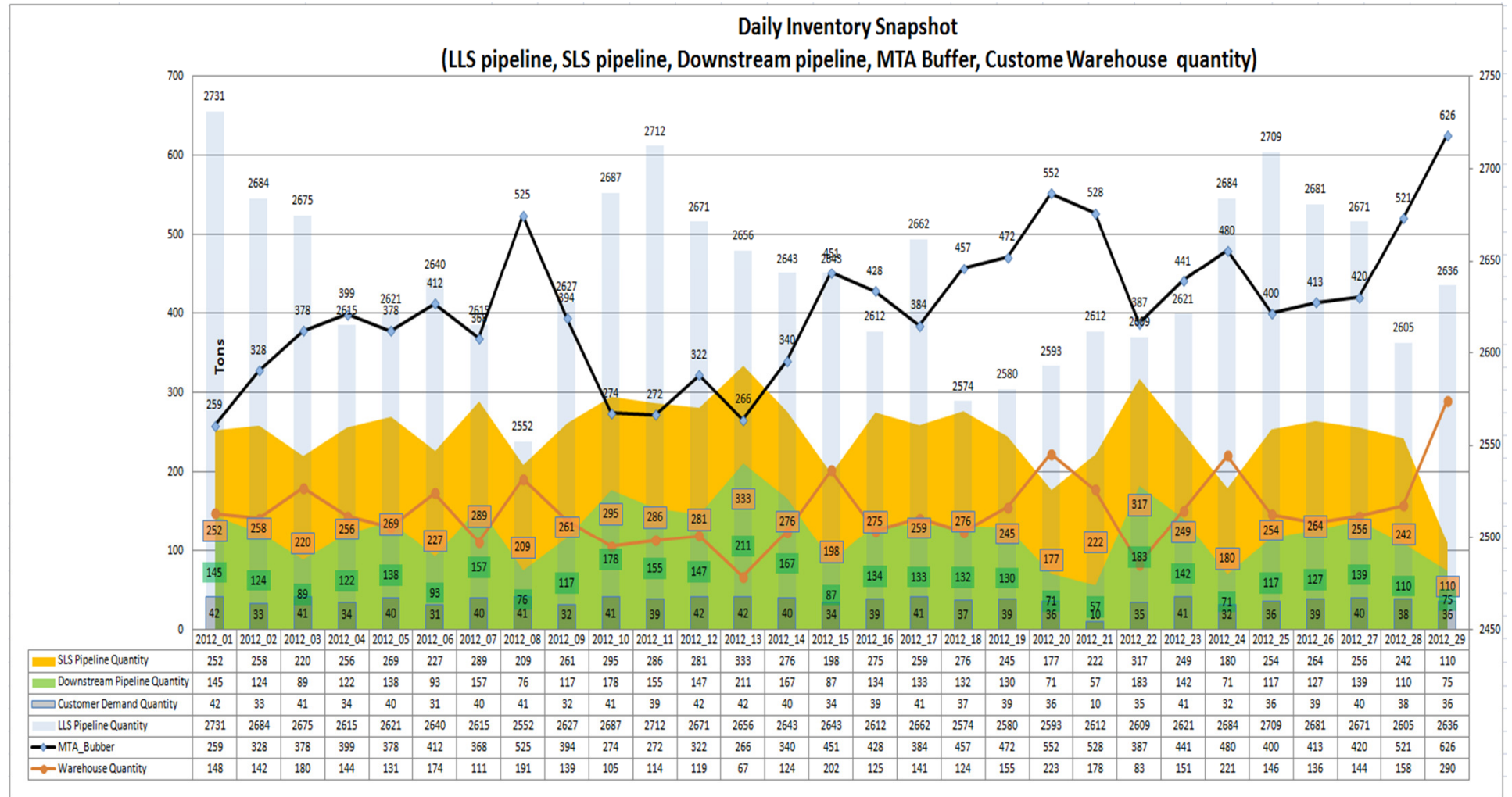
Purchase orders

WO
Release

Customer



Model example: outcome



Model example: an assumption

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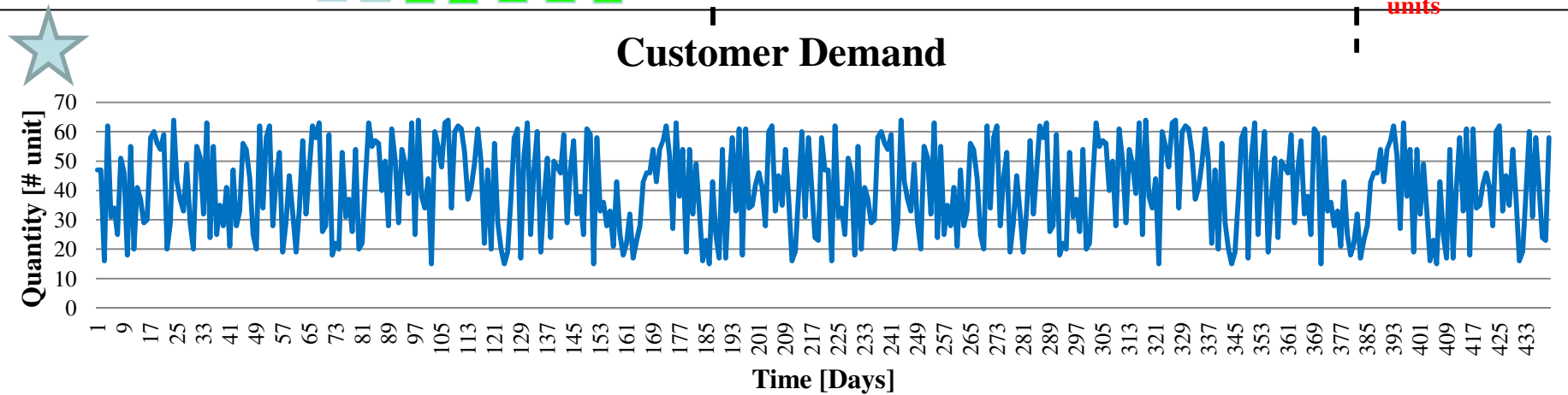
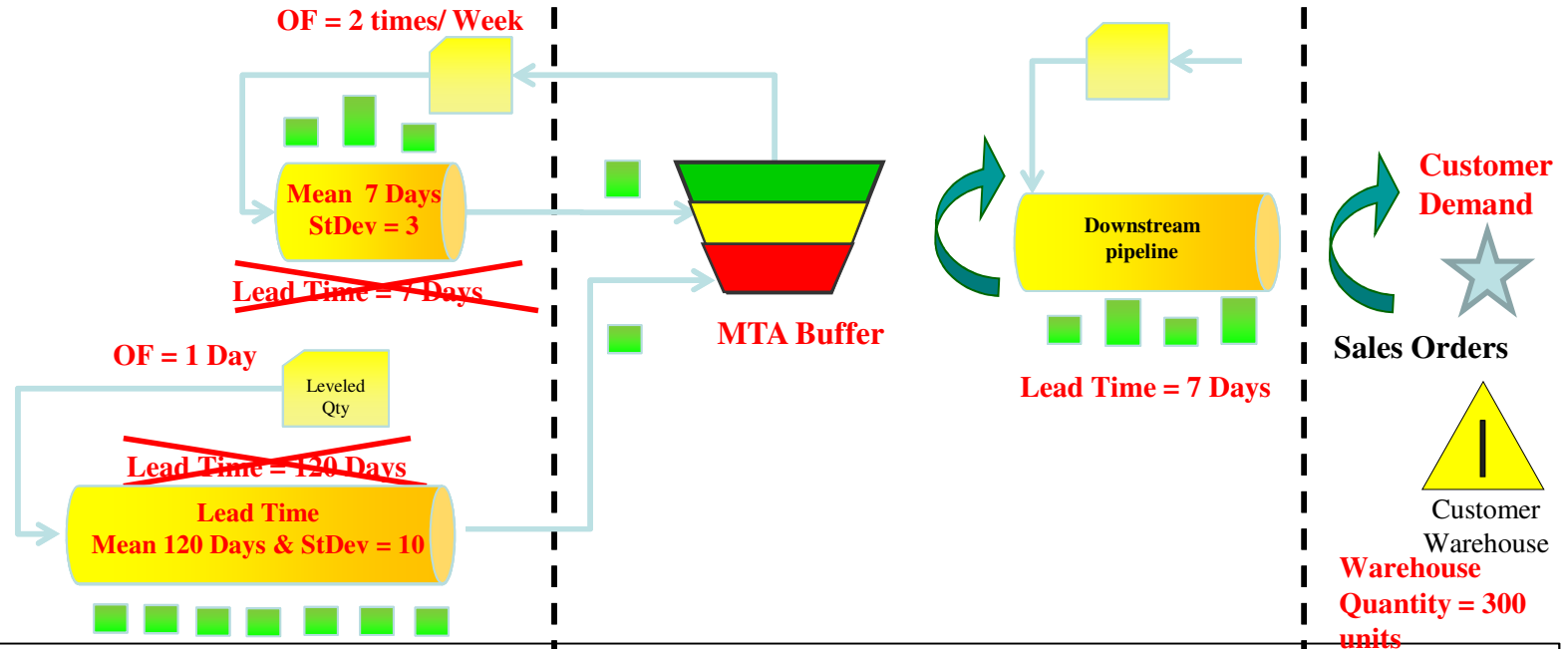


Suppliers

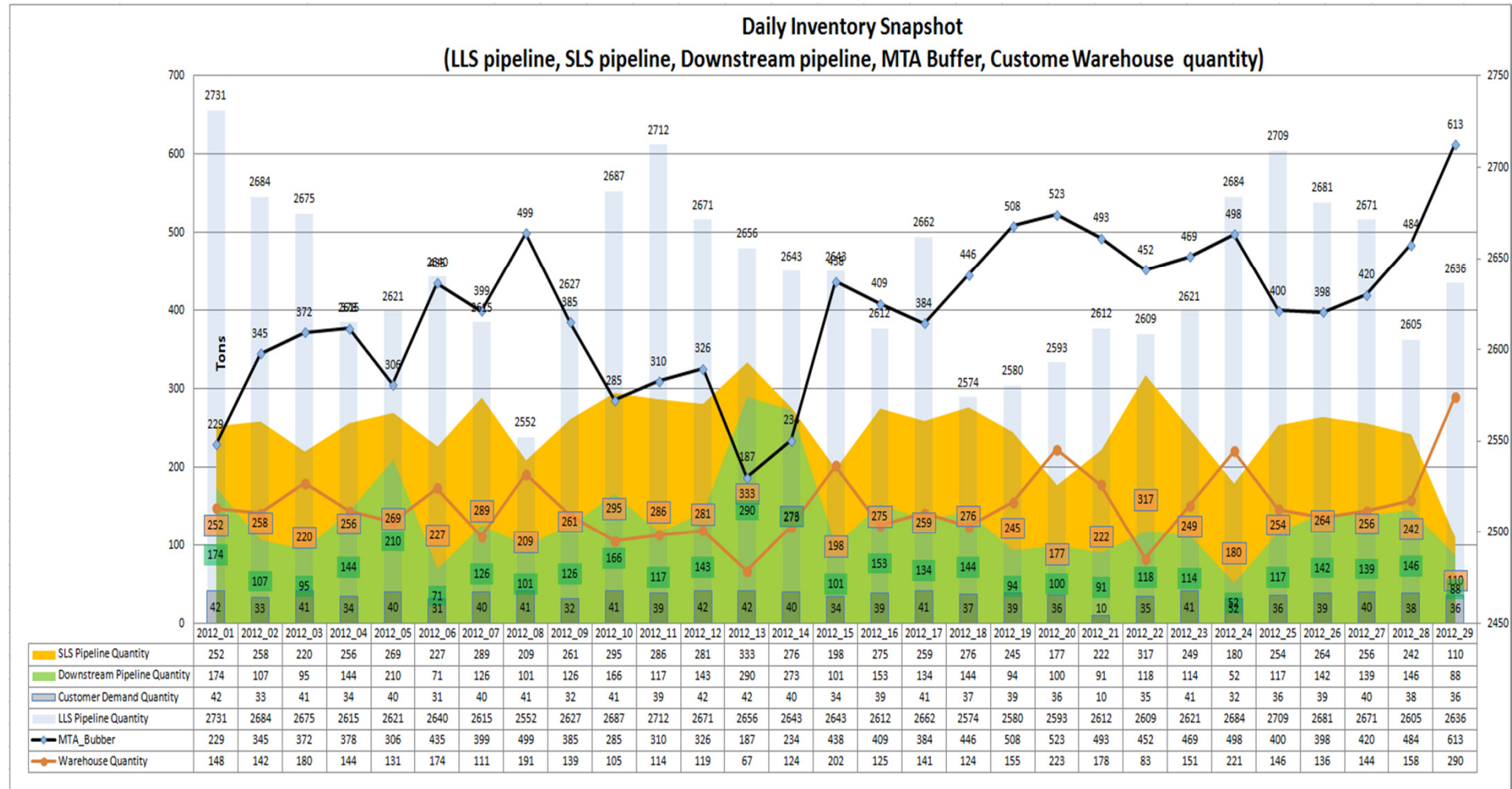
Purchase orders

WO
Release

Customer

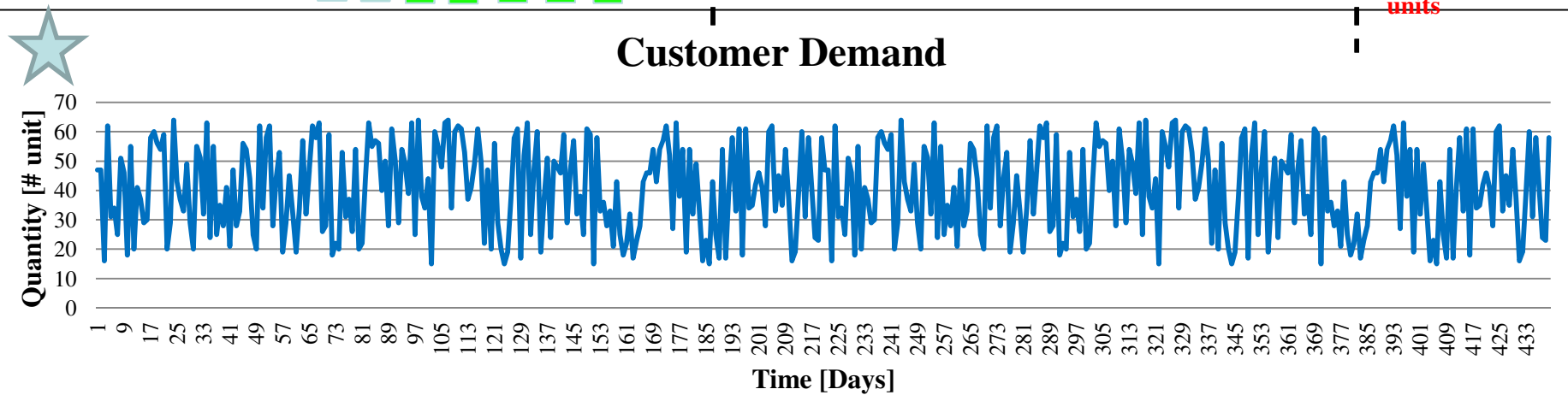
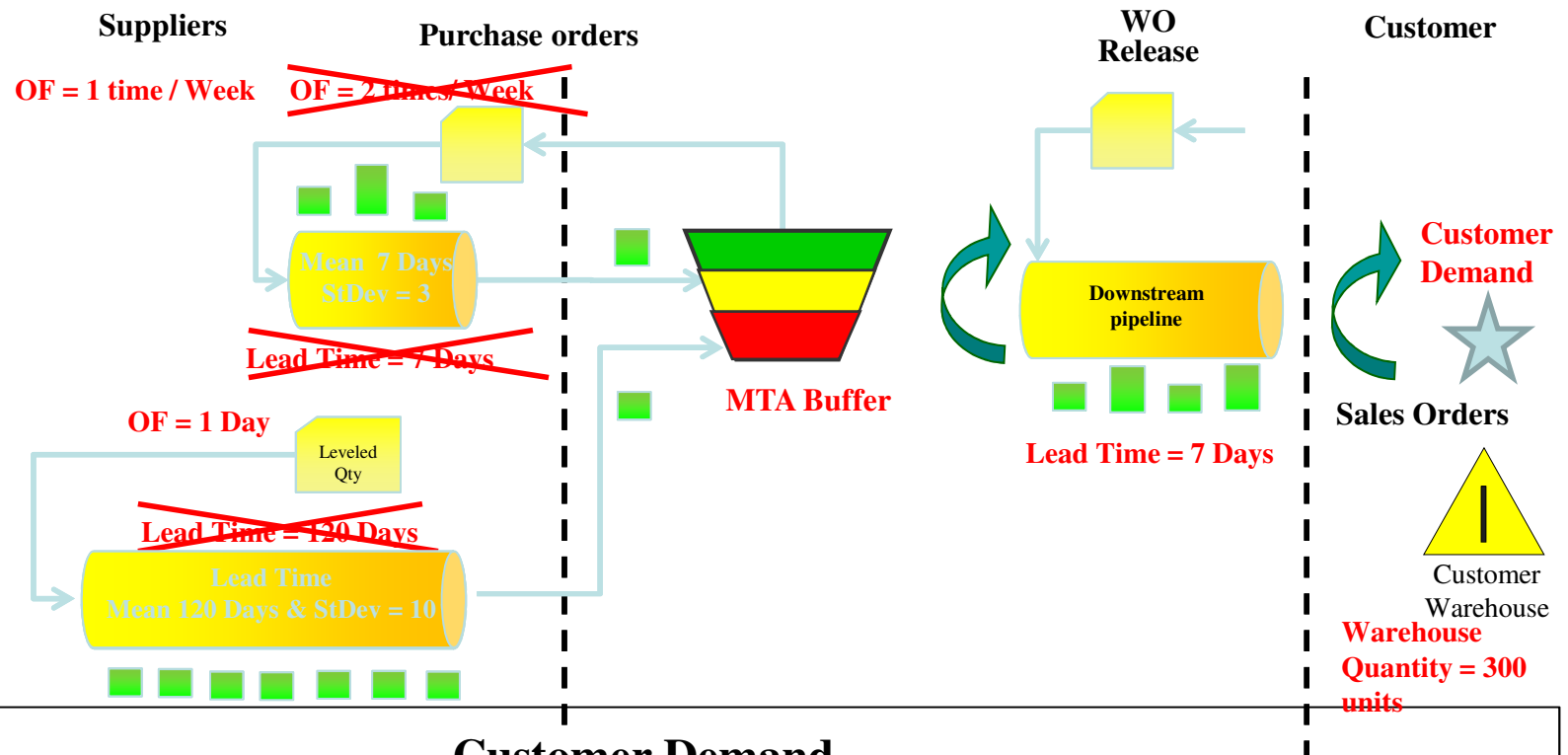


Model example: outcome

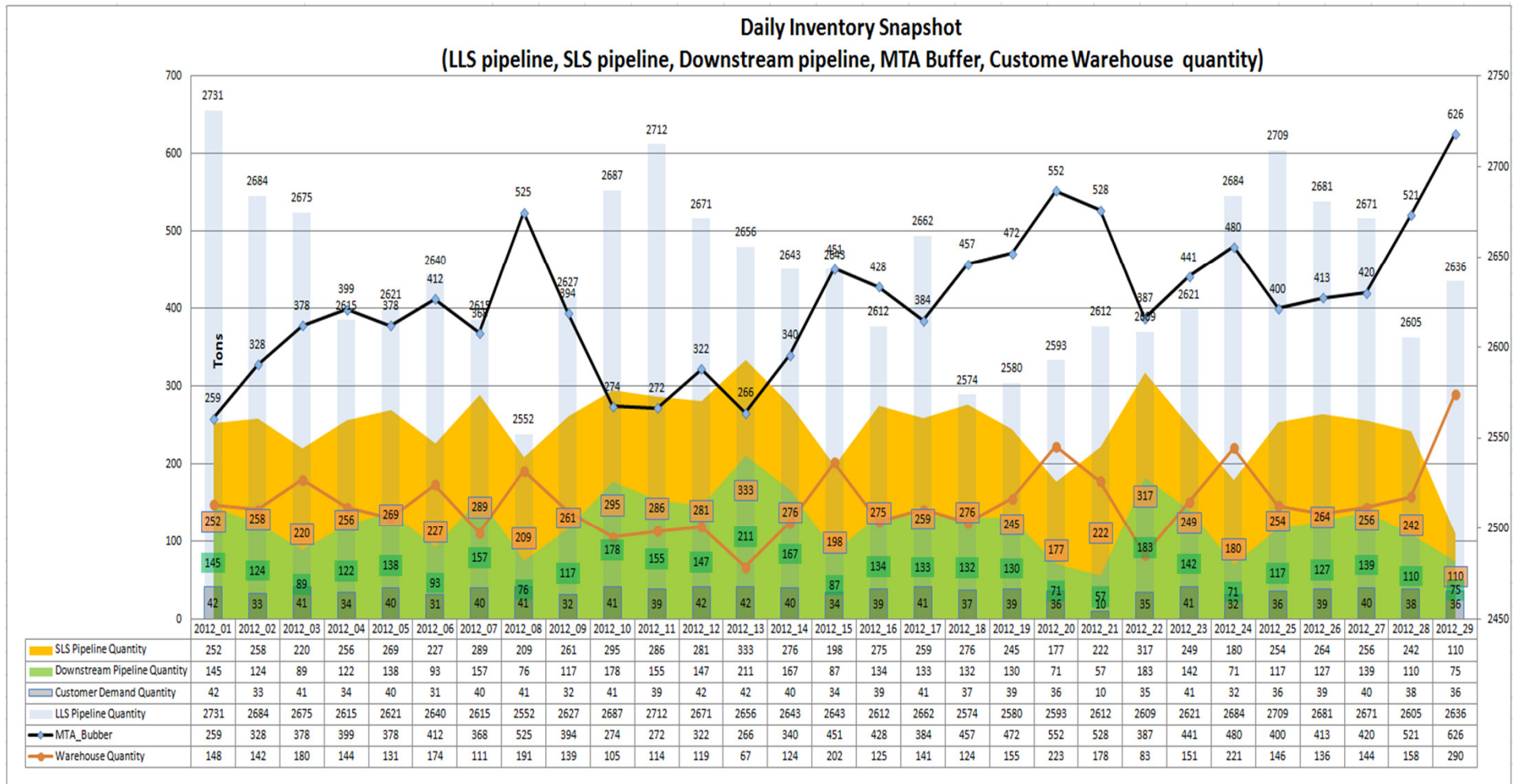


Model example: an assumption

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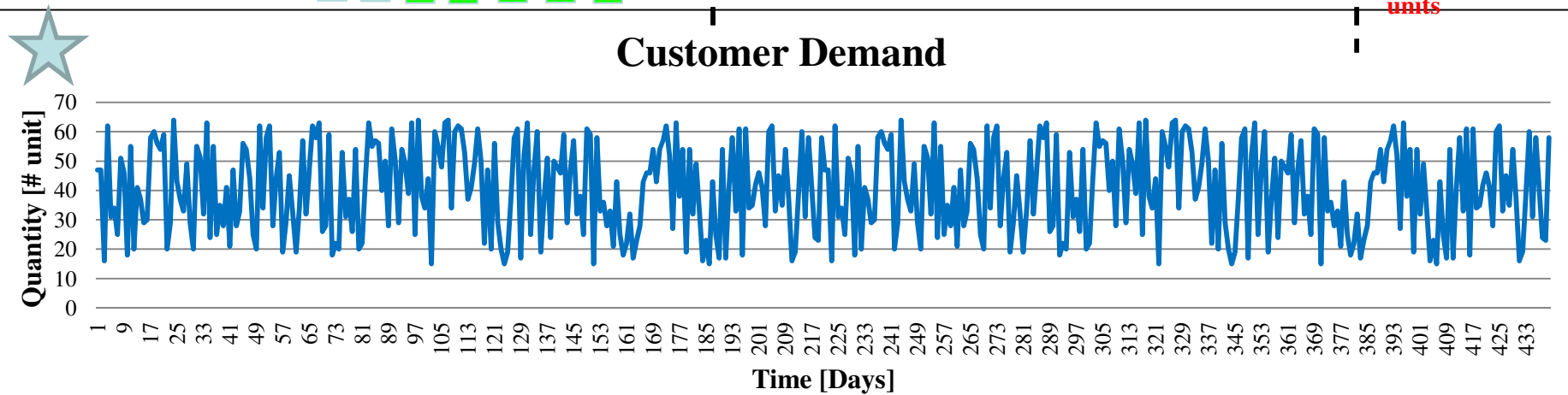
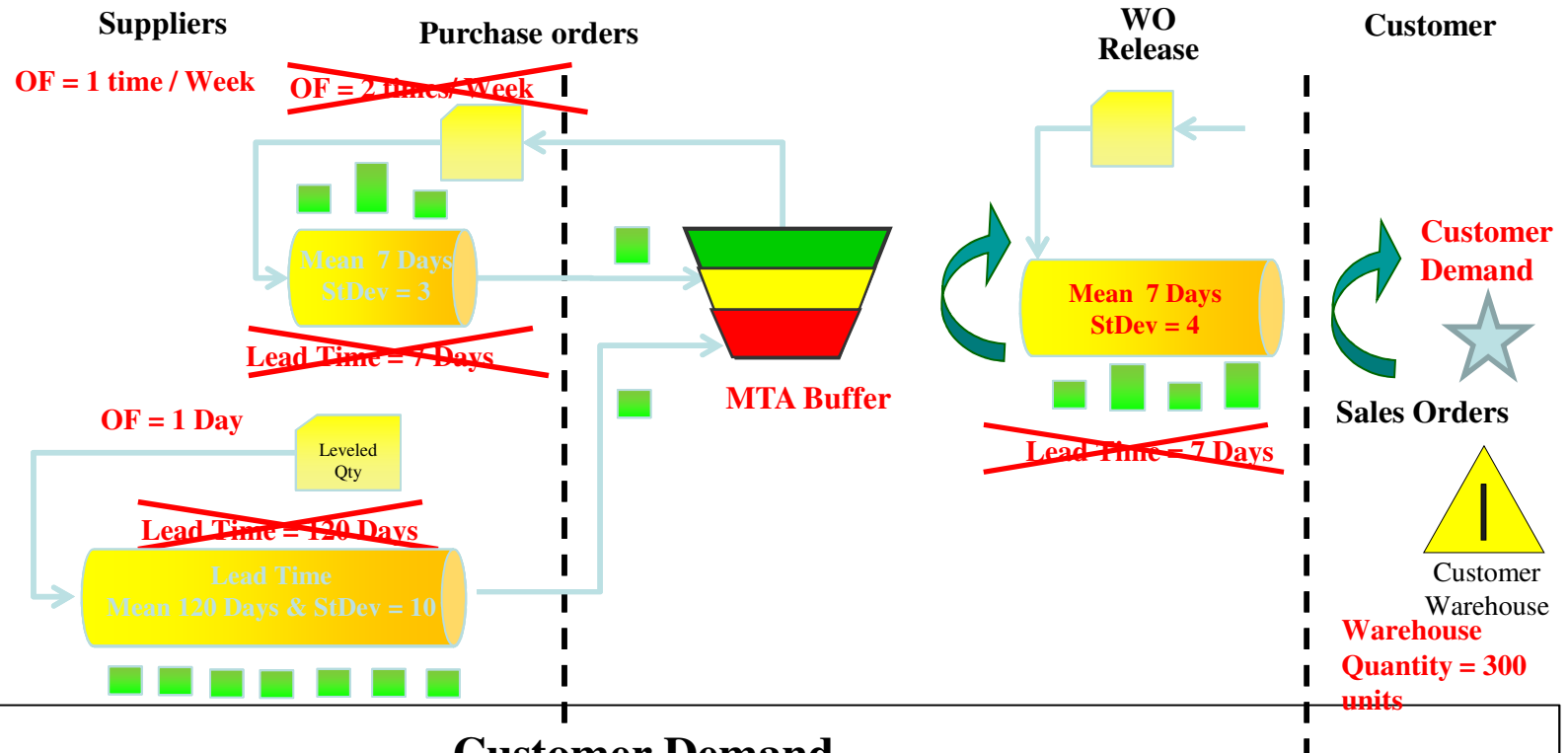


Model example: outcome

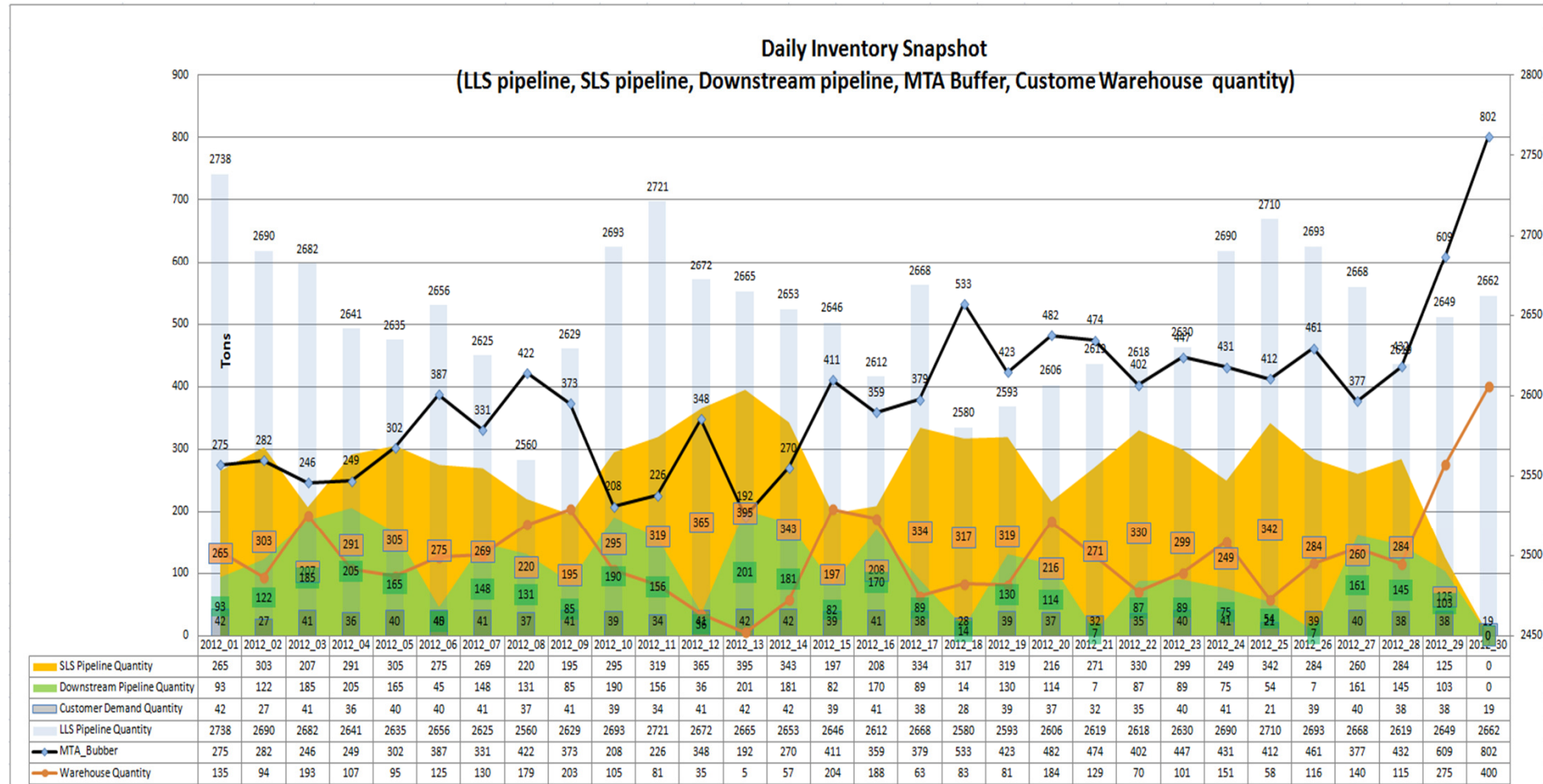


Model example: an assumption

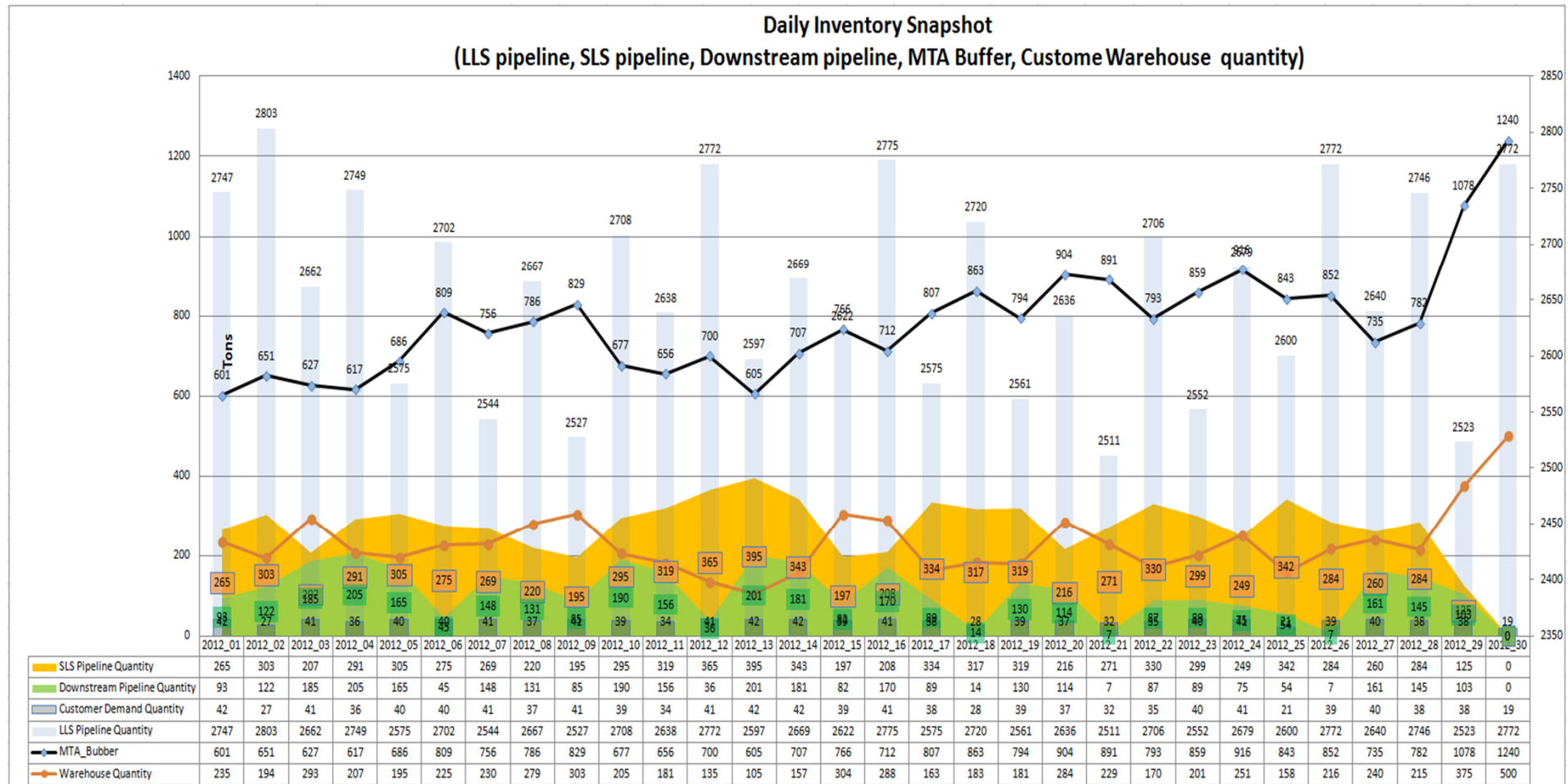
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Model example: outcome



Model example: outcome



The MTA Target Level and the initial warehouse quantity have been reviewed due to the system fluctuation



Process Model... Key Learning

Agreeing with the change and taking actions to implement the change are two separate issues...

► What is the main power of the technology?

The capability to Measure and Analyze the system performance in a dynamic environment. (actual & future state)

► What limitation does it diminish?

The risk of implementation failure





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Moscow

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