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Fifth International TOCPA Conference
6-7 April 2013, Pune, India

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

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Thinking Solutions, Italy

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Emanuele Strada

Emanuele is an expert in process modeling with a longstanding experience as an engineer and IT specialist. He has been working at a worldwide leader manufacturing company since more than 20 years, 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 he has got Global Company award 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 the 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

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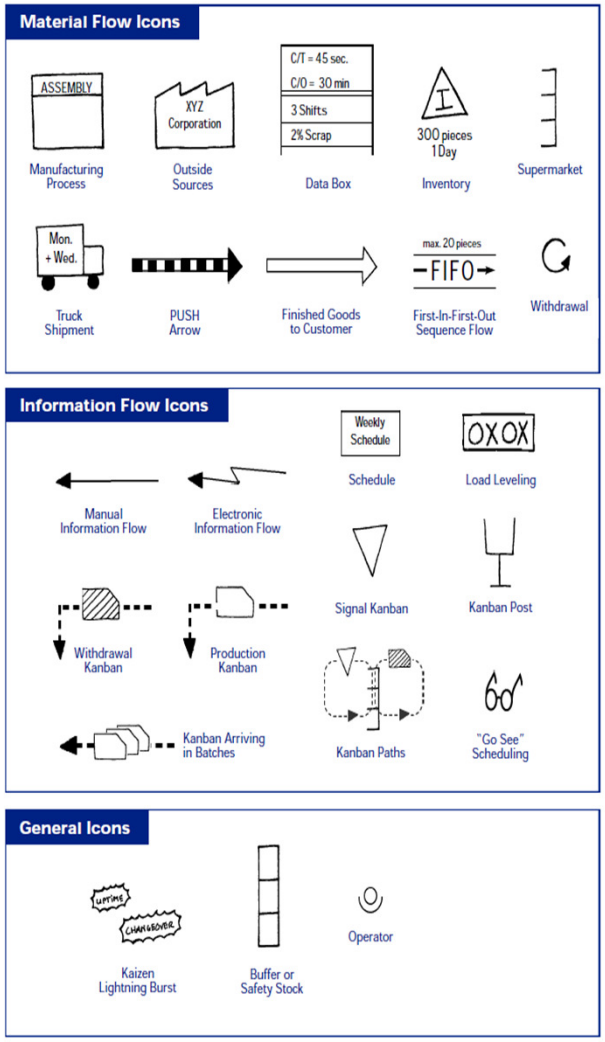
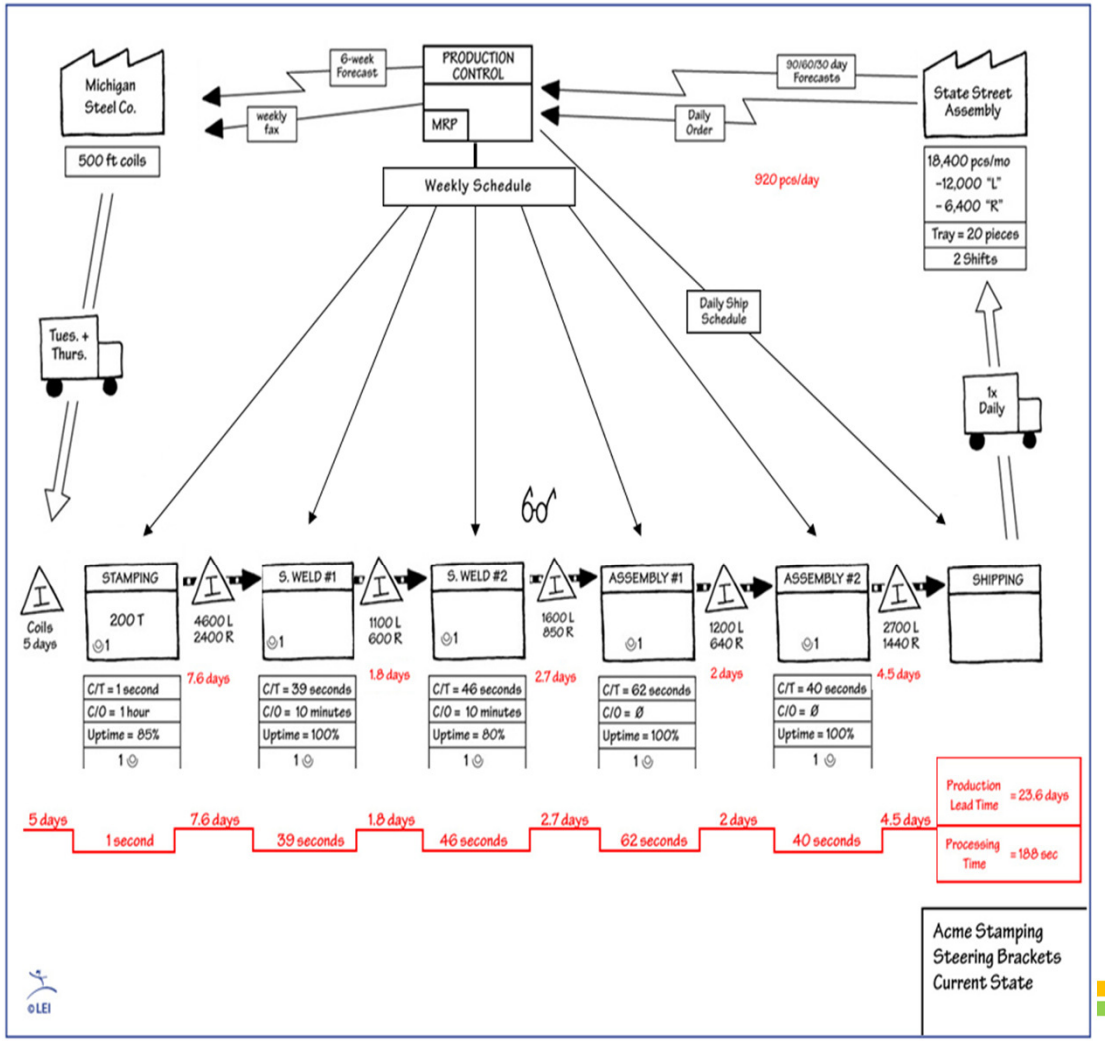
Value Stream Map ...how it looks like





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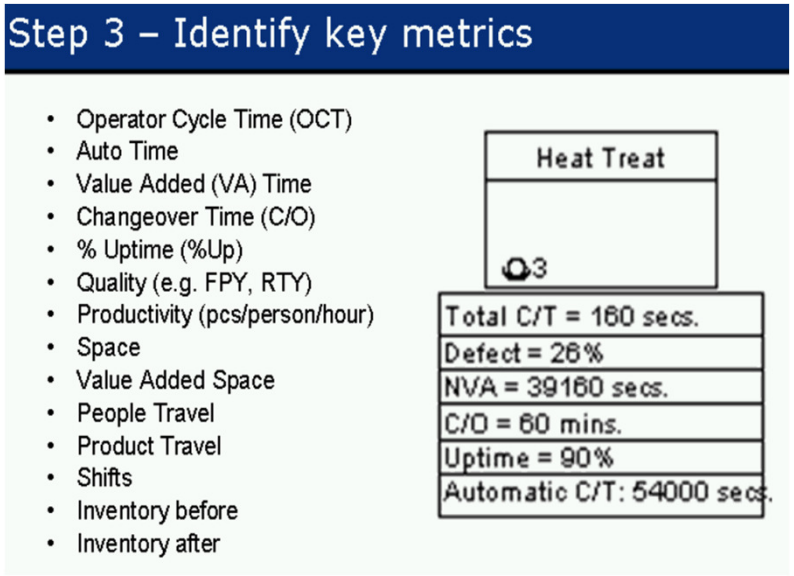
VSM...

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



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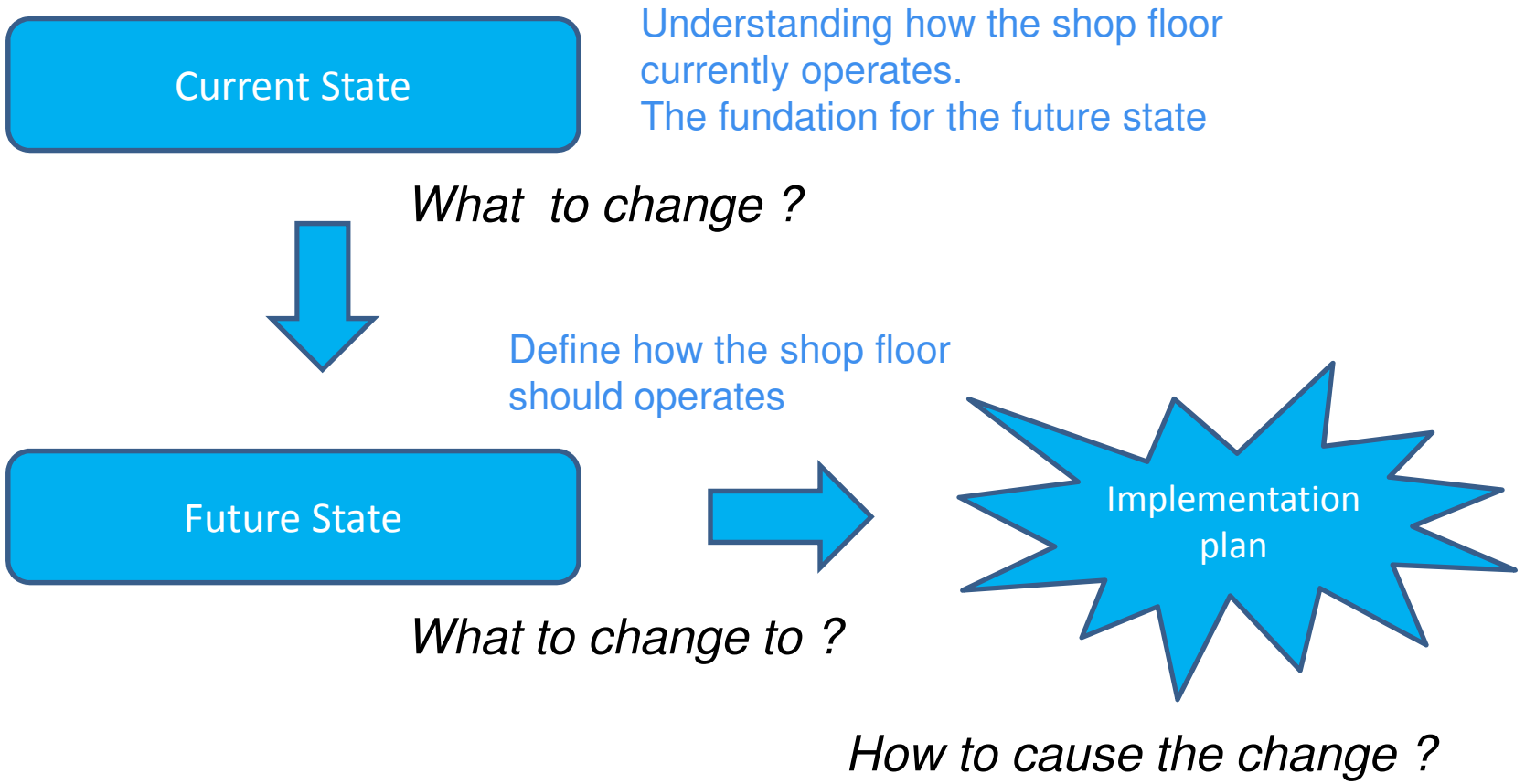
Using the Value Stream Mapping Tool



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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 ?

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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

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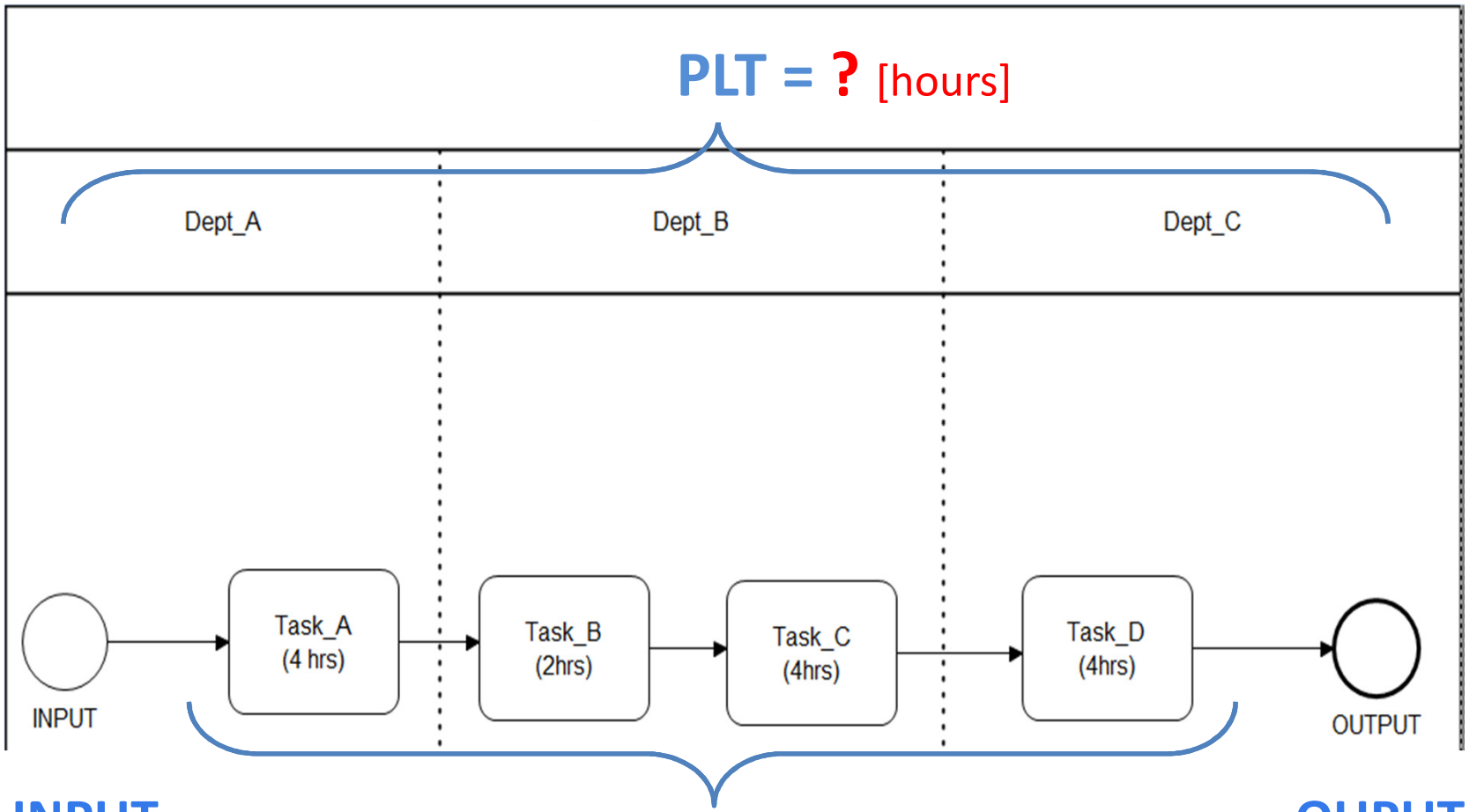
Let's have a look how Process Model looks like…

is it a "complicated" system ?



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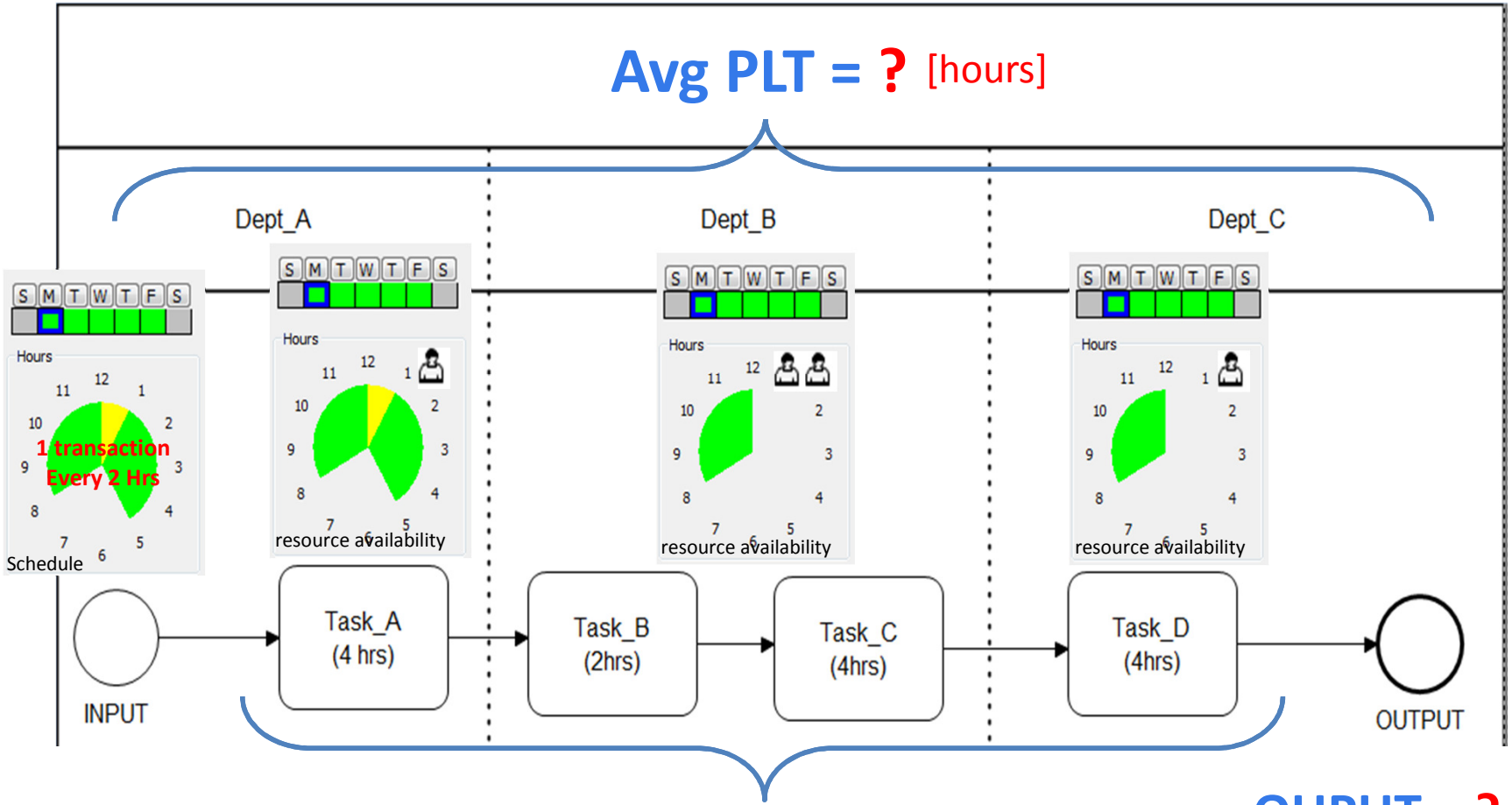
Simulation time: 30 days starting from Monday @ 8:00am



After 7, 14, 21, 28 days...

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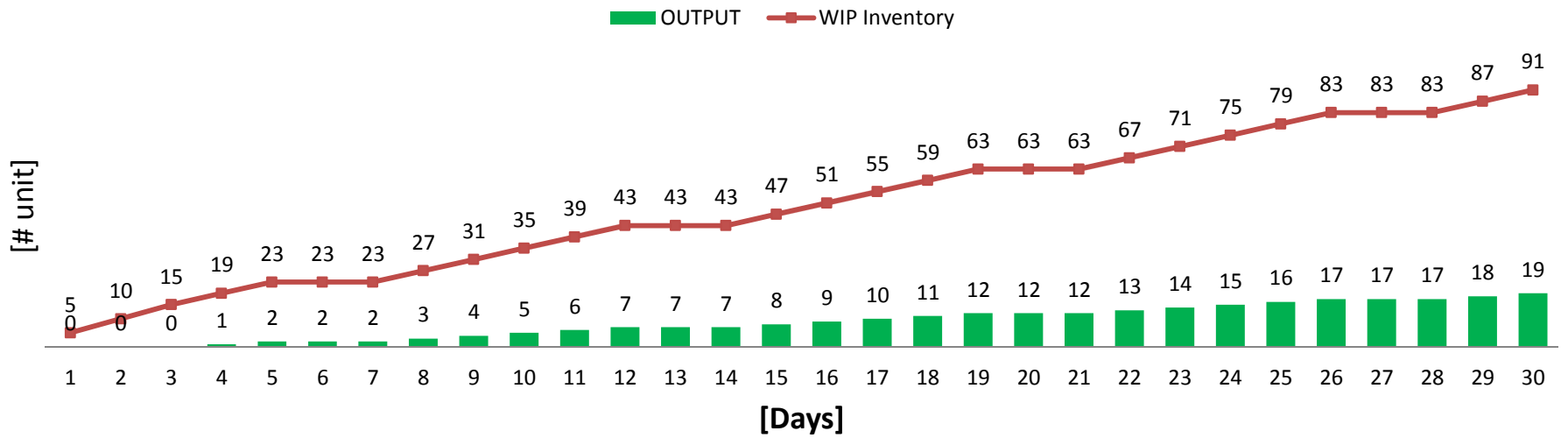
Model outcome (daily snapshot @ 8:00am)

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

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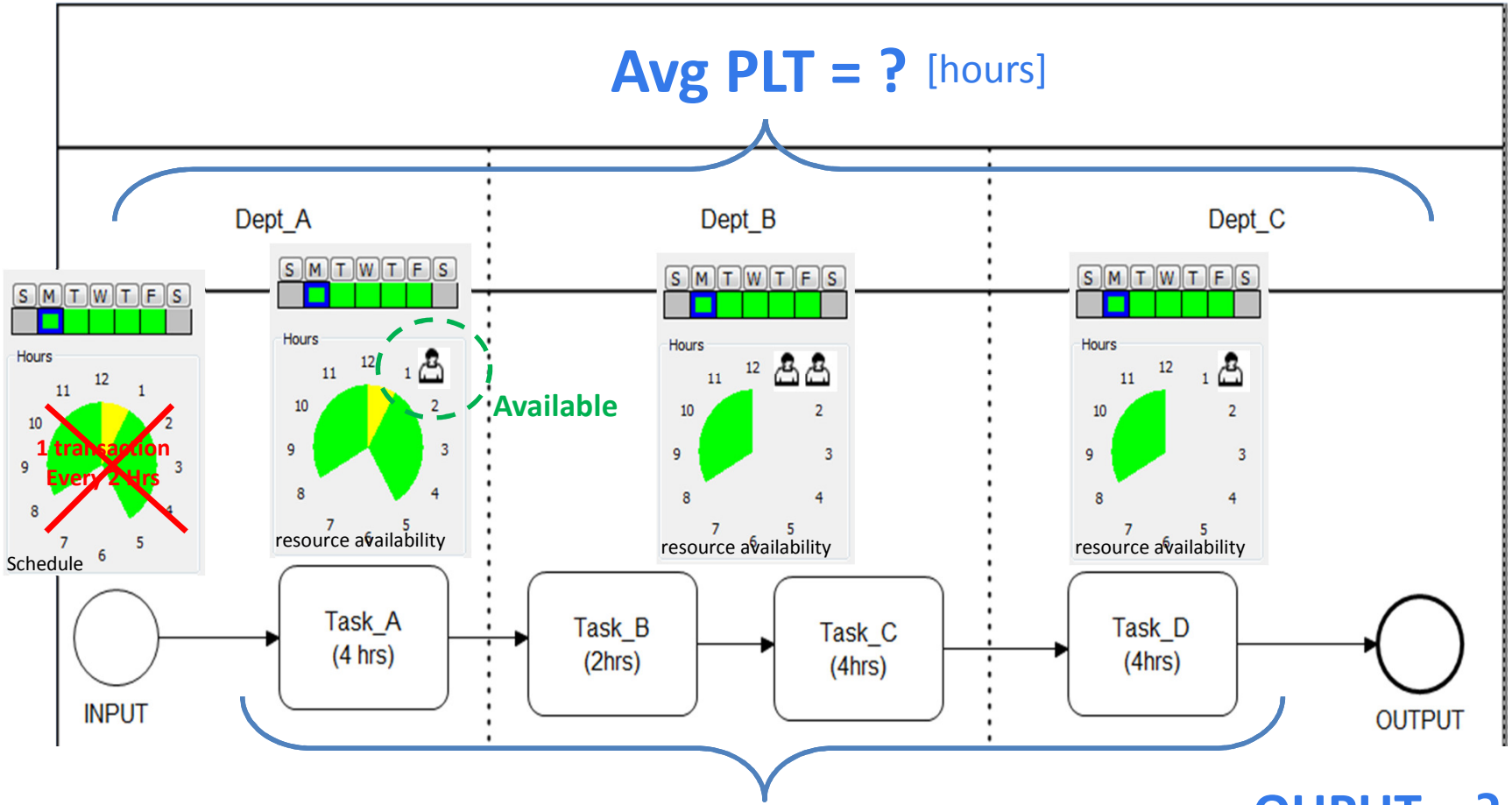
Simulation time: 30 days starting from Monday @ 8:00am



After 7, 14, 21, 28 days...

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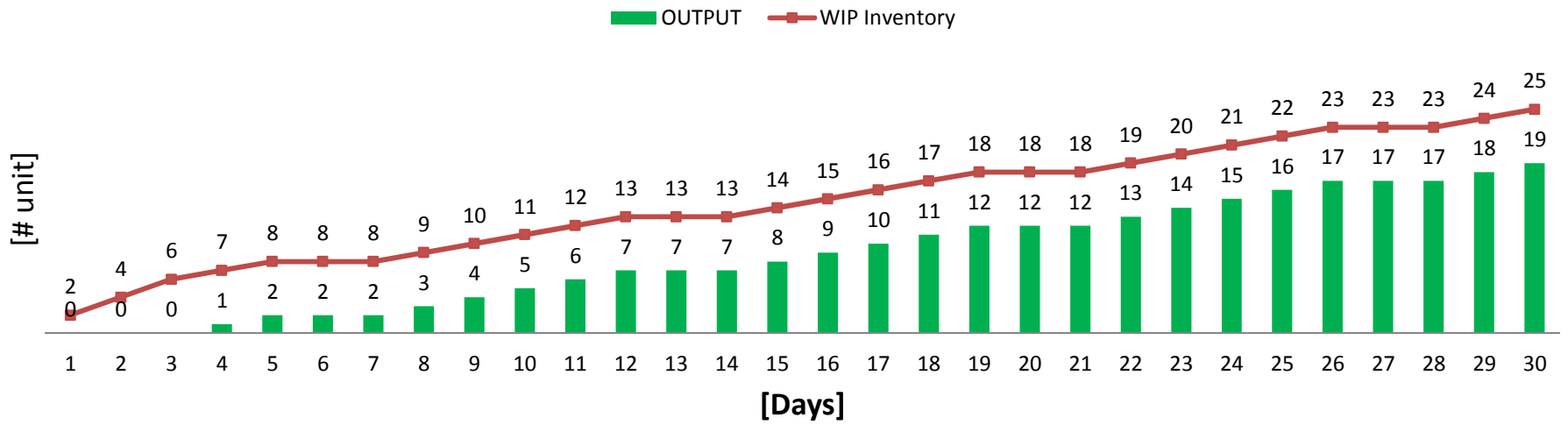
Model outcome (daily snapshot @ 8:00am)

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



Avg Process Lead Time = 10,5 [Days]

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

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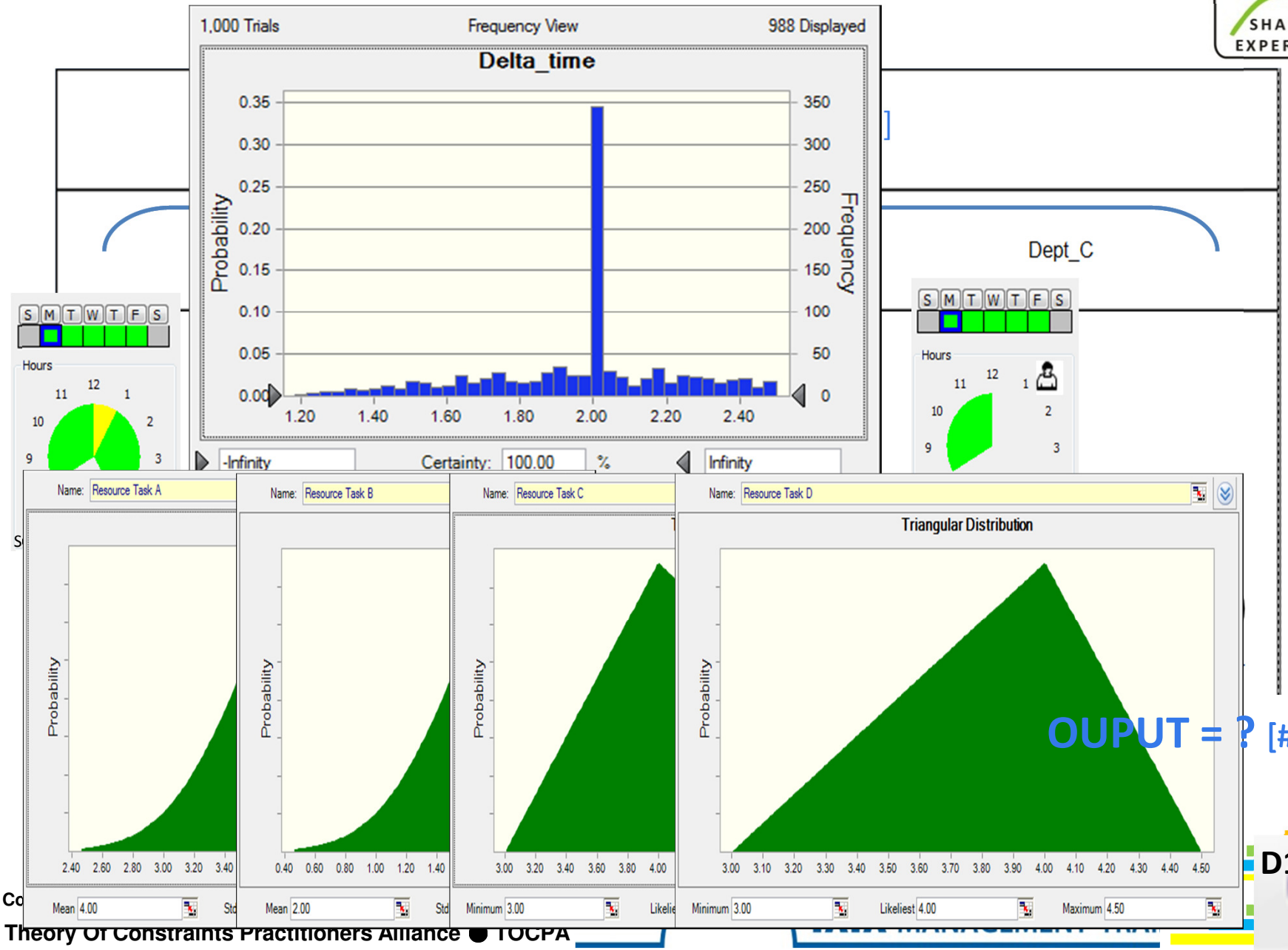
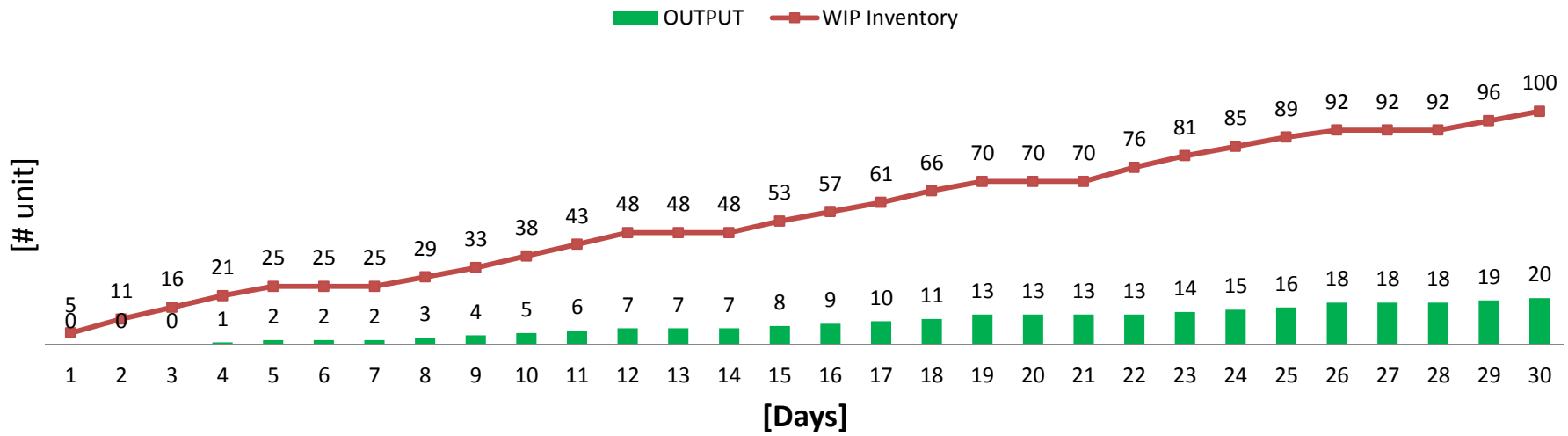
A step closer to the reality…

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

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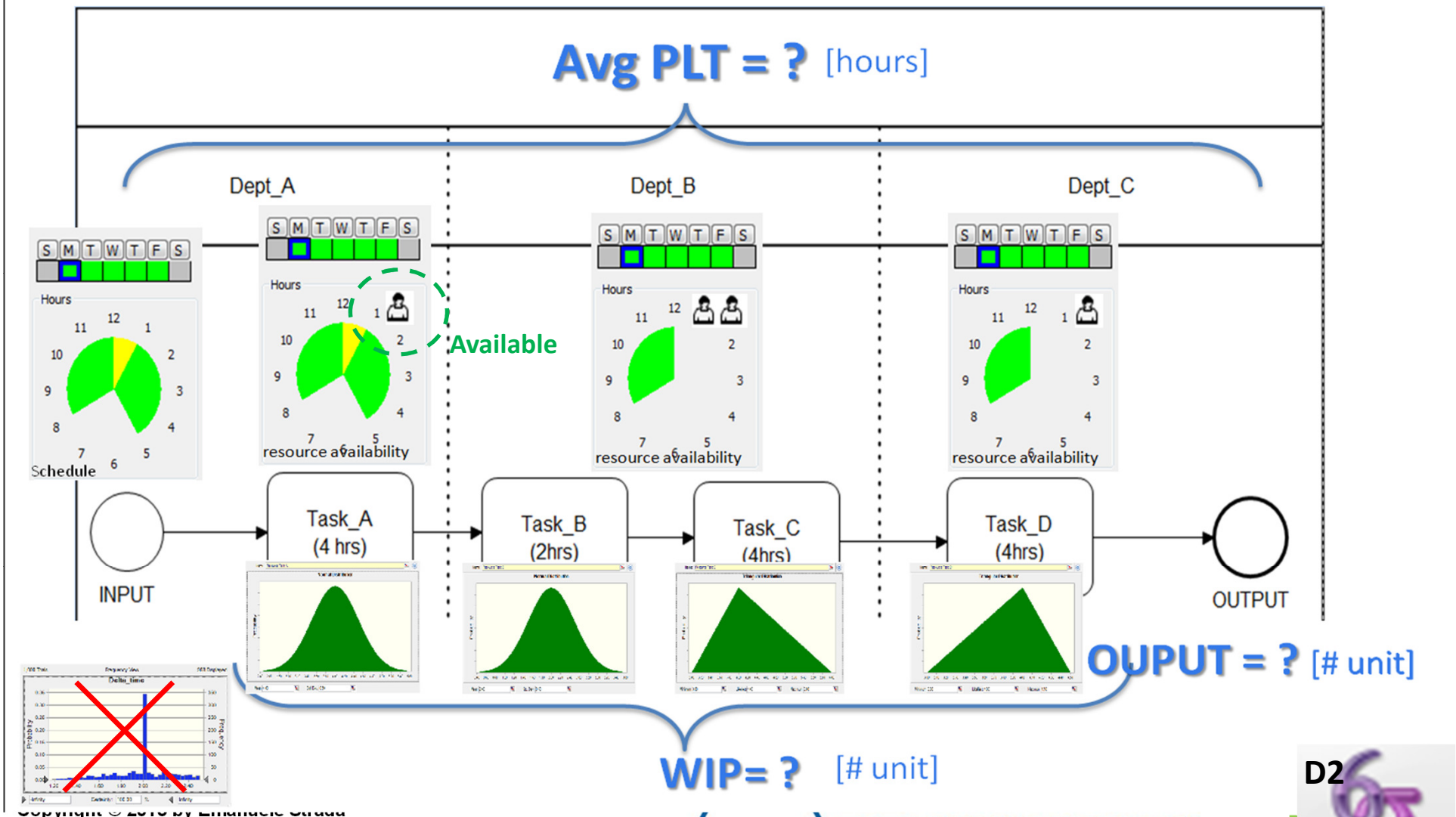
Model outcome (daily snapshot @ 8:00am)



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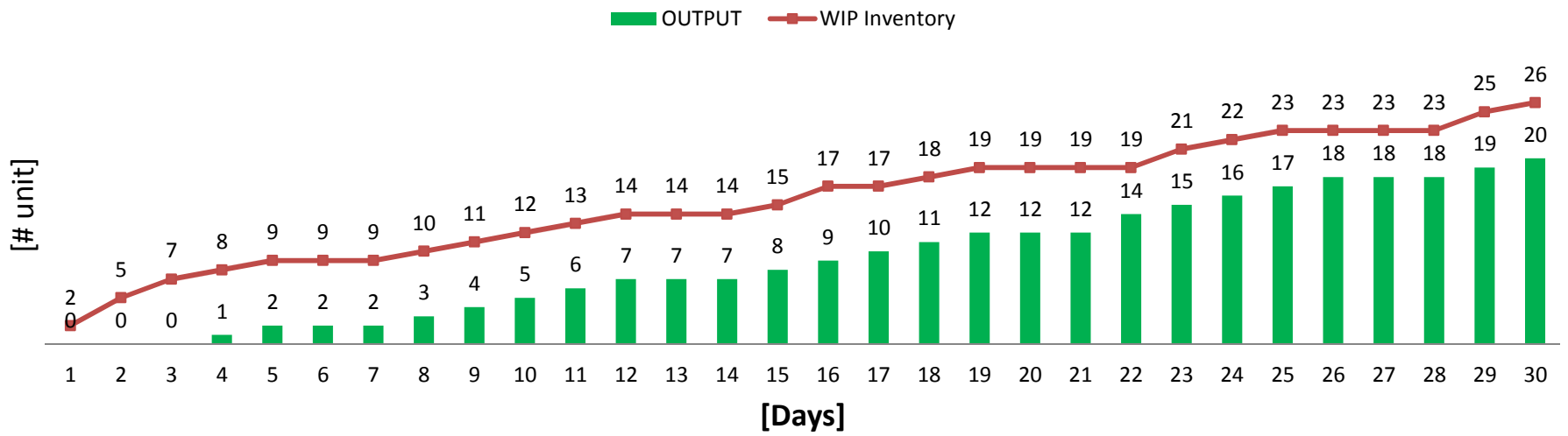
Model outcome (daily snapshot @ 8:00am)

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

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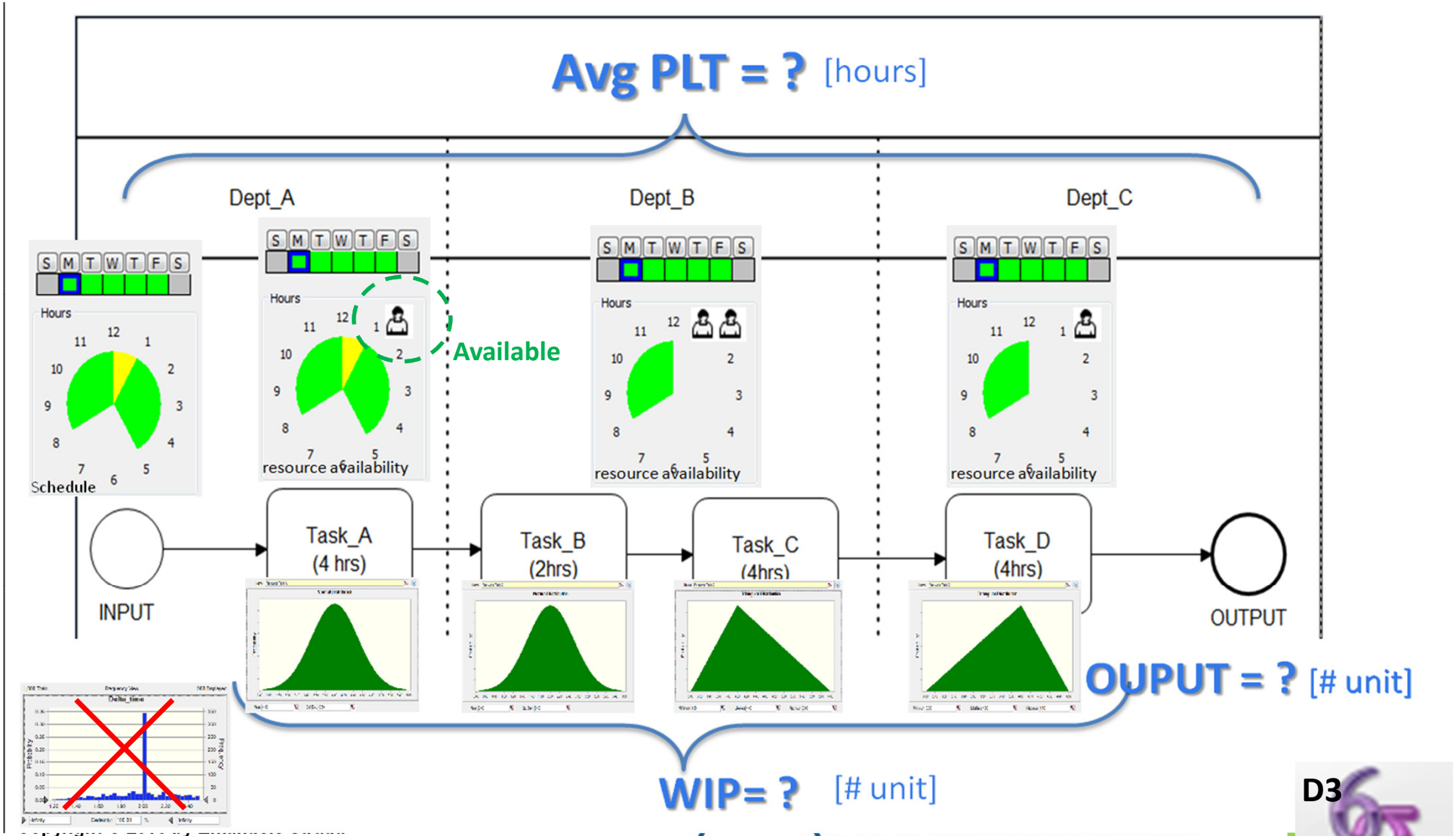
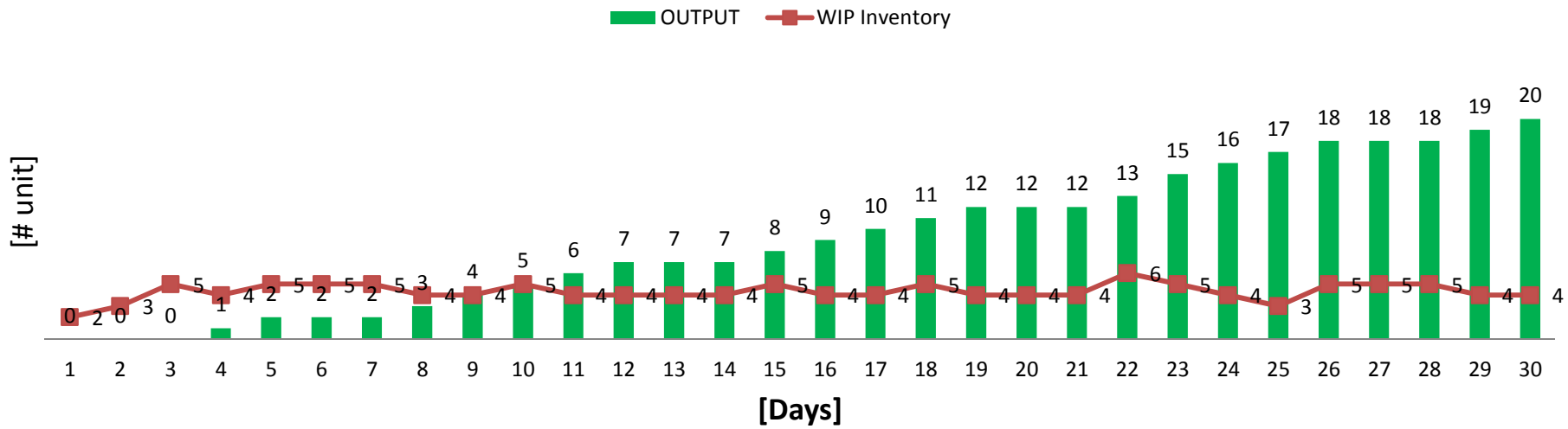
Model outcome (daily snapshot @ 8:00am)



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

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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

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What is the Process Model ?

Reality

Theory

Process Model

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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)

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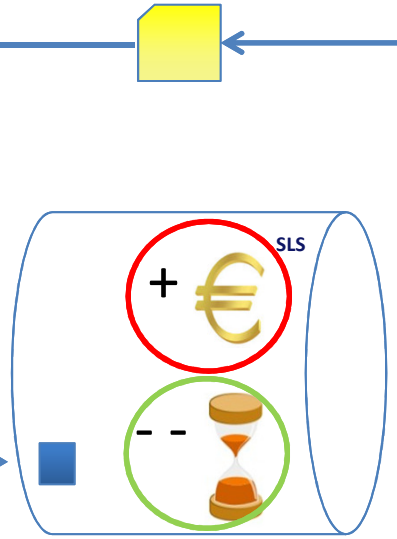
Long Lead Time Supplier (LLS) & Short Lead Time Supplier (SLS)

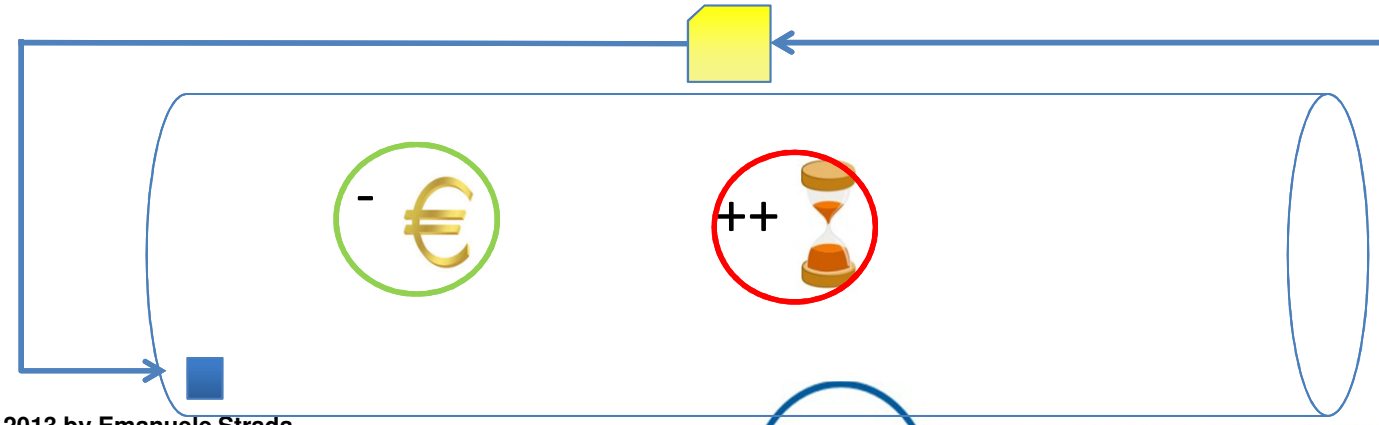
How to manage the +/- & ++/-- & supplier capacity

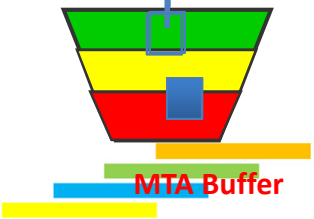
in order to get the better benefit and reduce the overall risk ?



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

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





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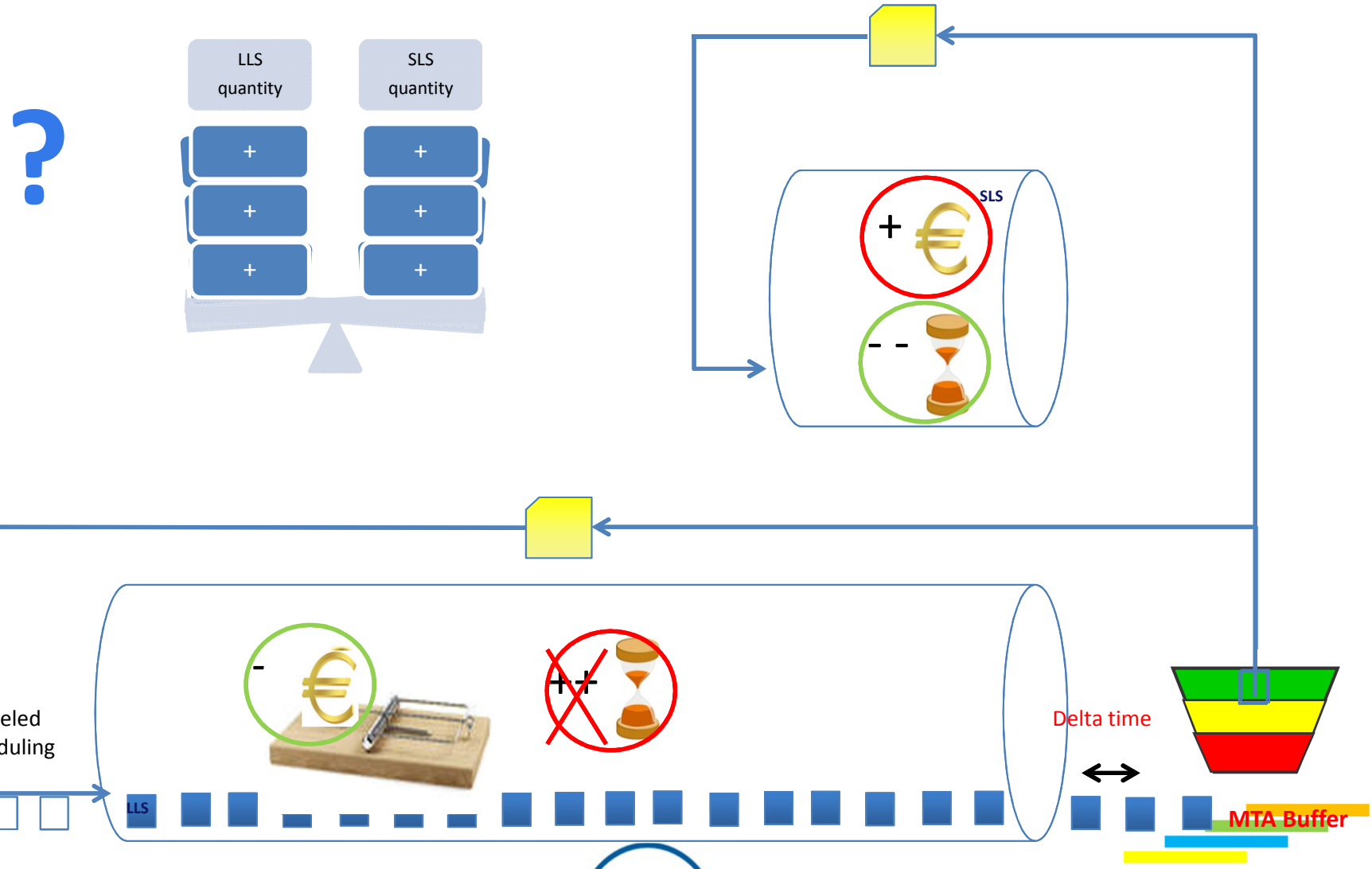
Why not leveled scheduling... yes, But...



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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

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How does the system look

yes, But...

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

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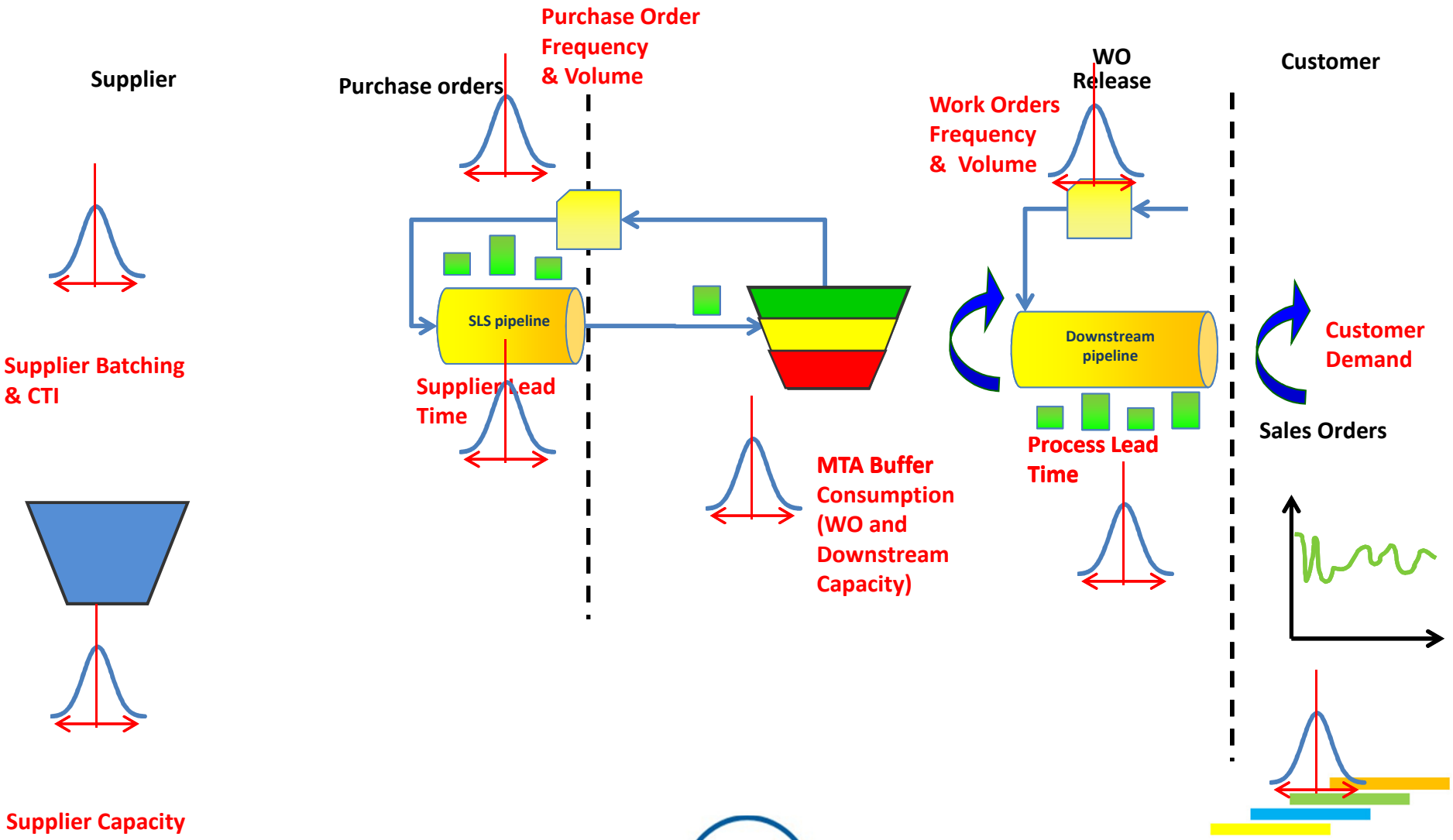
MTA System (SLS) Process Map Variation – Summary



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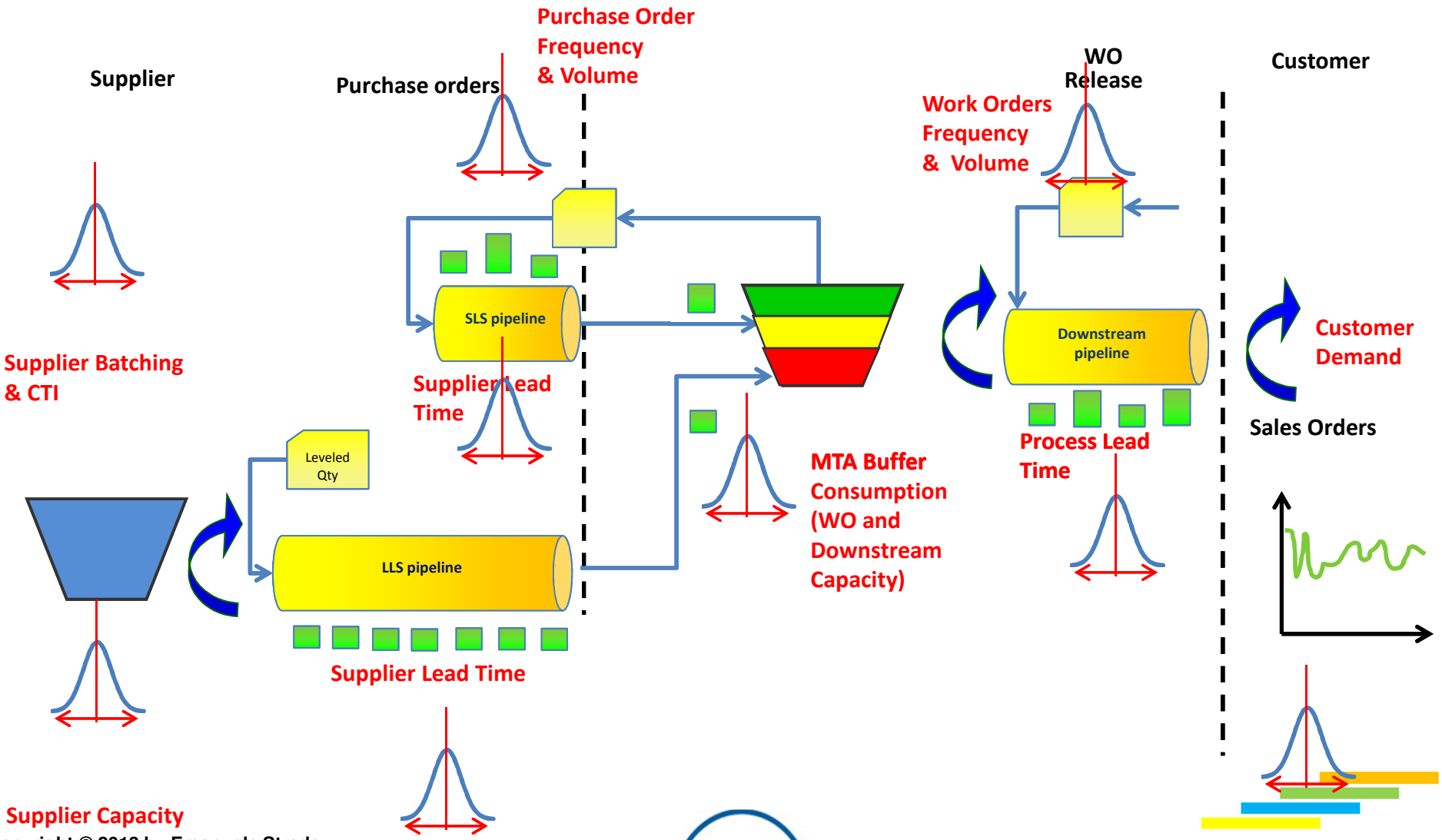
MTA System (SLS + LLS) Process Map Variation – Summary



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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 ?

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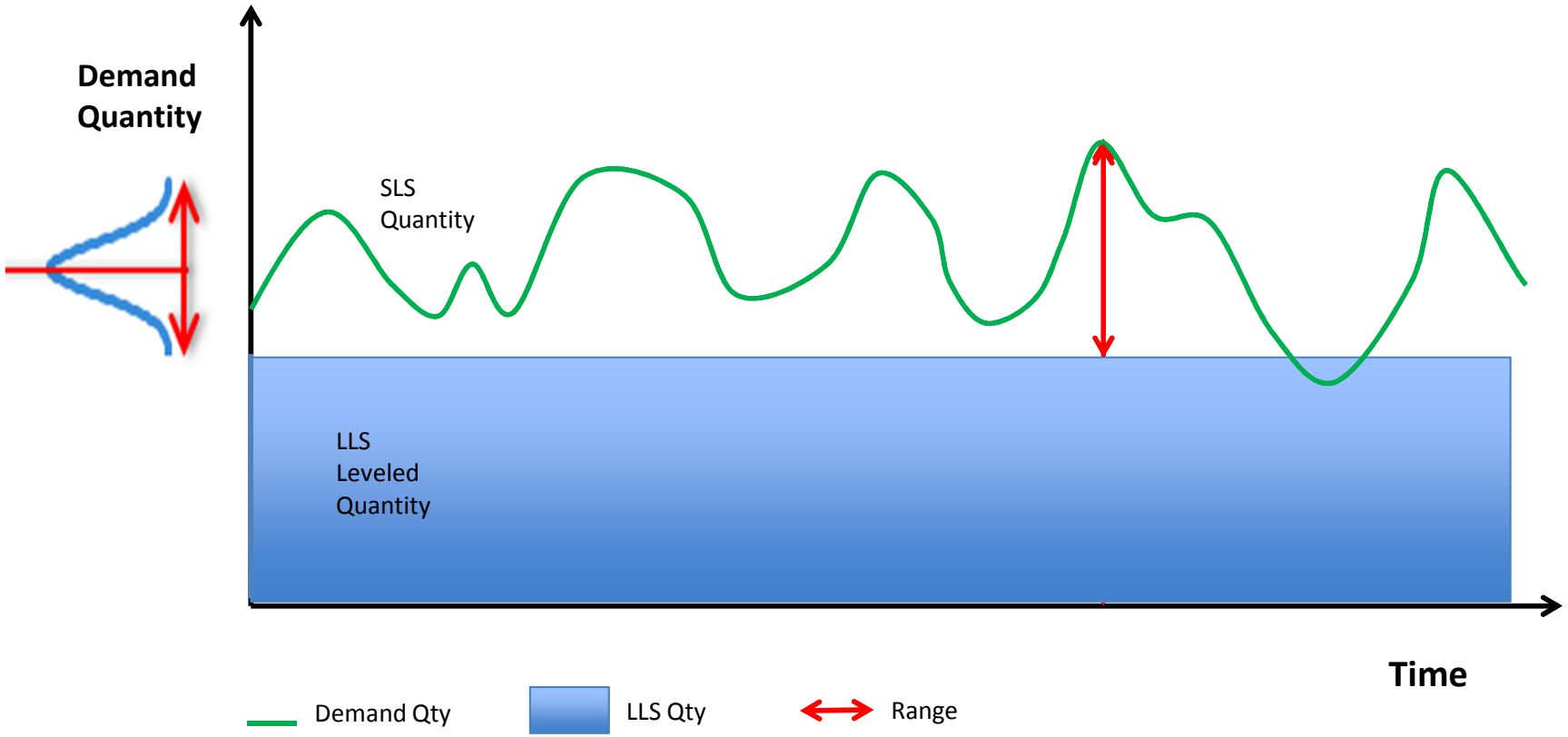
LLS Quantity in a (SLS & LLS) environment...



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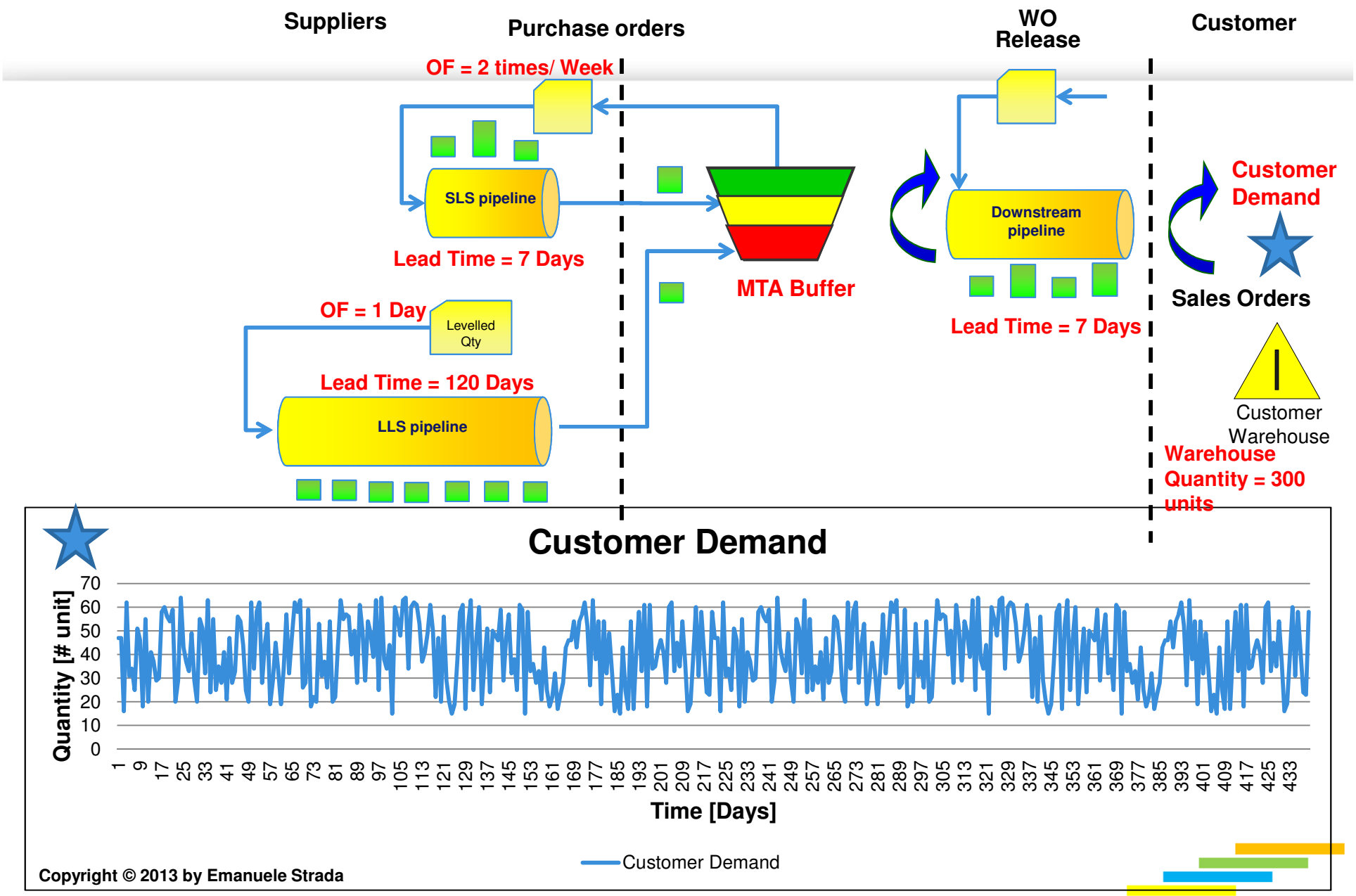
Model example: an assumption



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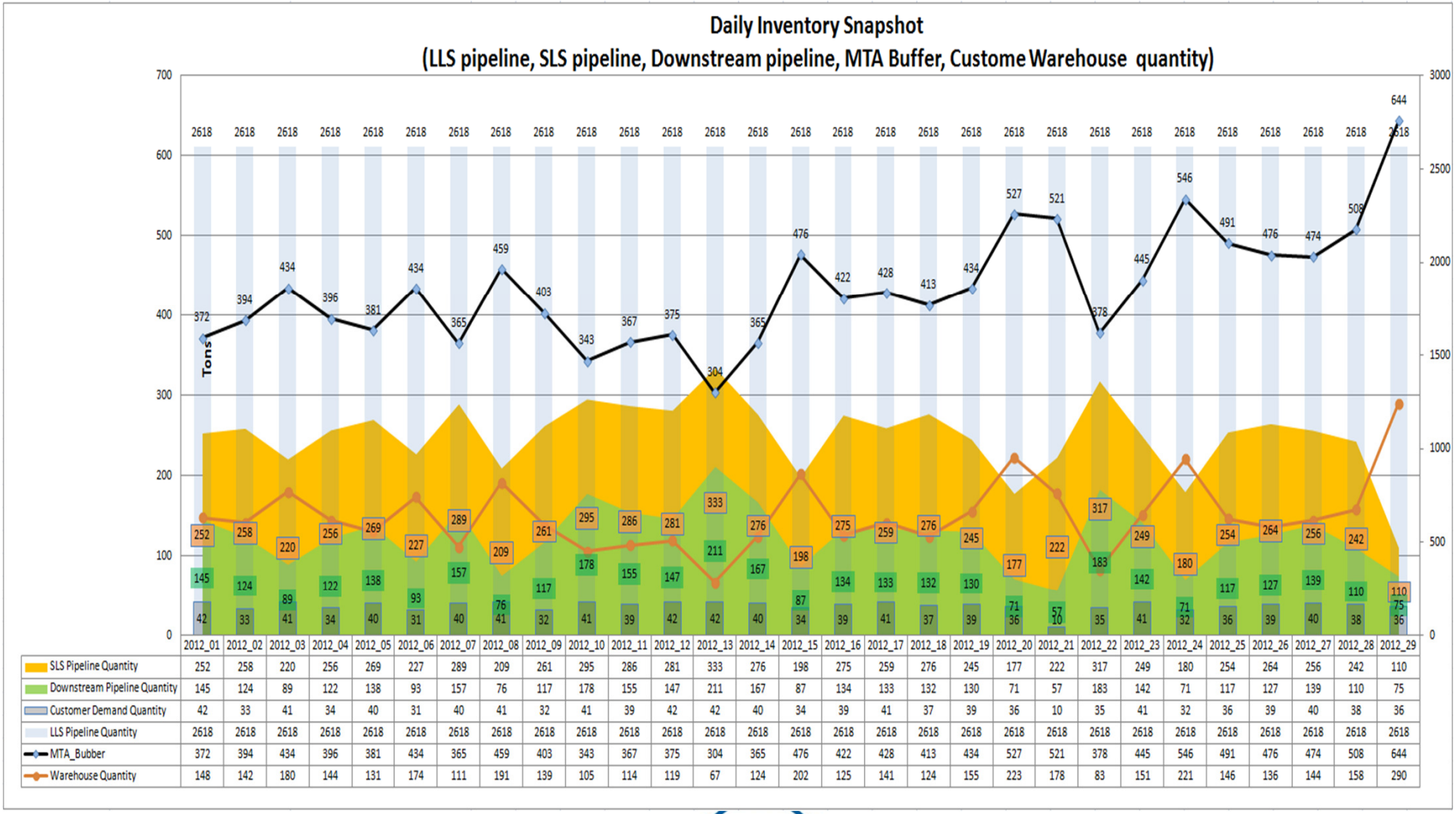
Model example: outcome



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SLS Pipeline Quantity	252	258	220	256	269	227	289	209	261	295	286	281	333	276	198	275	259	276	245	177	222	317	249	180	254	264	256	242	110
Downstream Pipeline Quantity	145	124	89	122	138	93	157	76	117	178	155	147	211	167	87	134	133	132	130	71	57	183	142	71	117	127	139	110	75
Customer Demand Quantity	42	33	41	34	40	31	40	41	32	41	39	42	42	40	34	39	41	37	39	36	10	35	41	32	36	39	40	38	36
LLS Pipeline Quantity	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618	2618
MTA_Bubber	372	394	434	396	381	434	365	459	403	343	367	375	304	365	476	422	428	413	434	527	521	378	445	546	491	476	474	508	644
Warehouse Quantity	148	142	180	144	131	174	111	191	139	105	114	119	67	124	202	125	141	124	155	223	178	83	151	221	146	136	144	158	290

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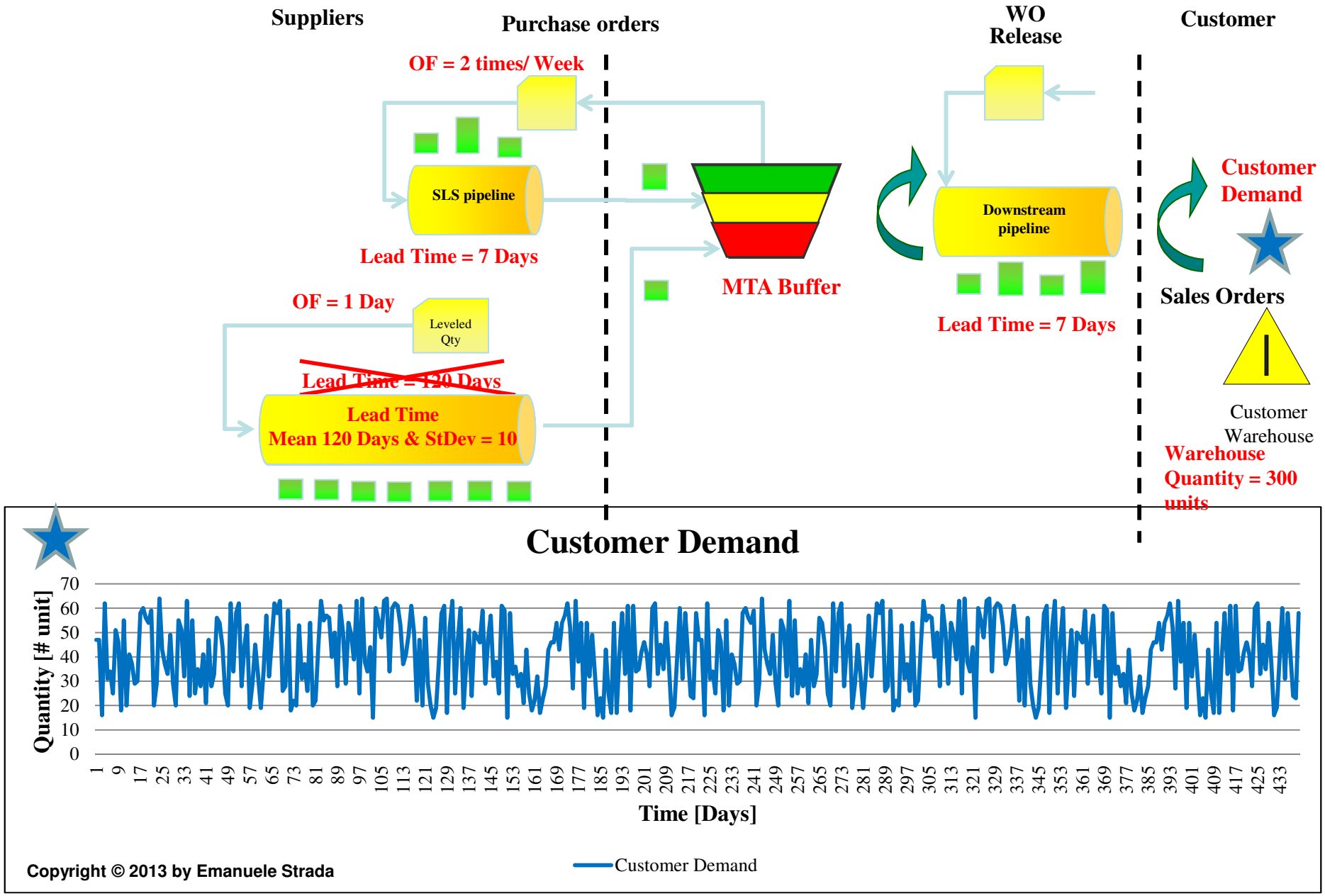
Model example: an assumption



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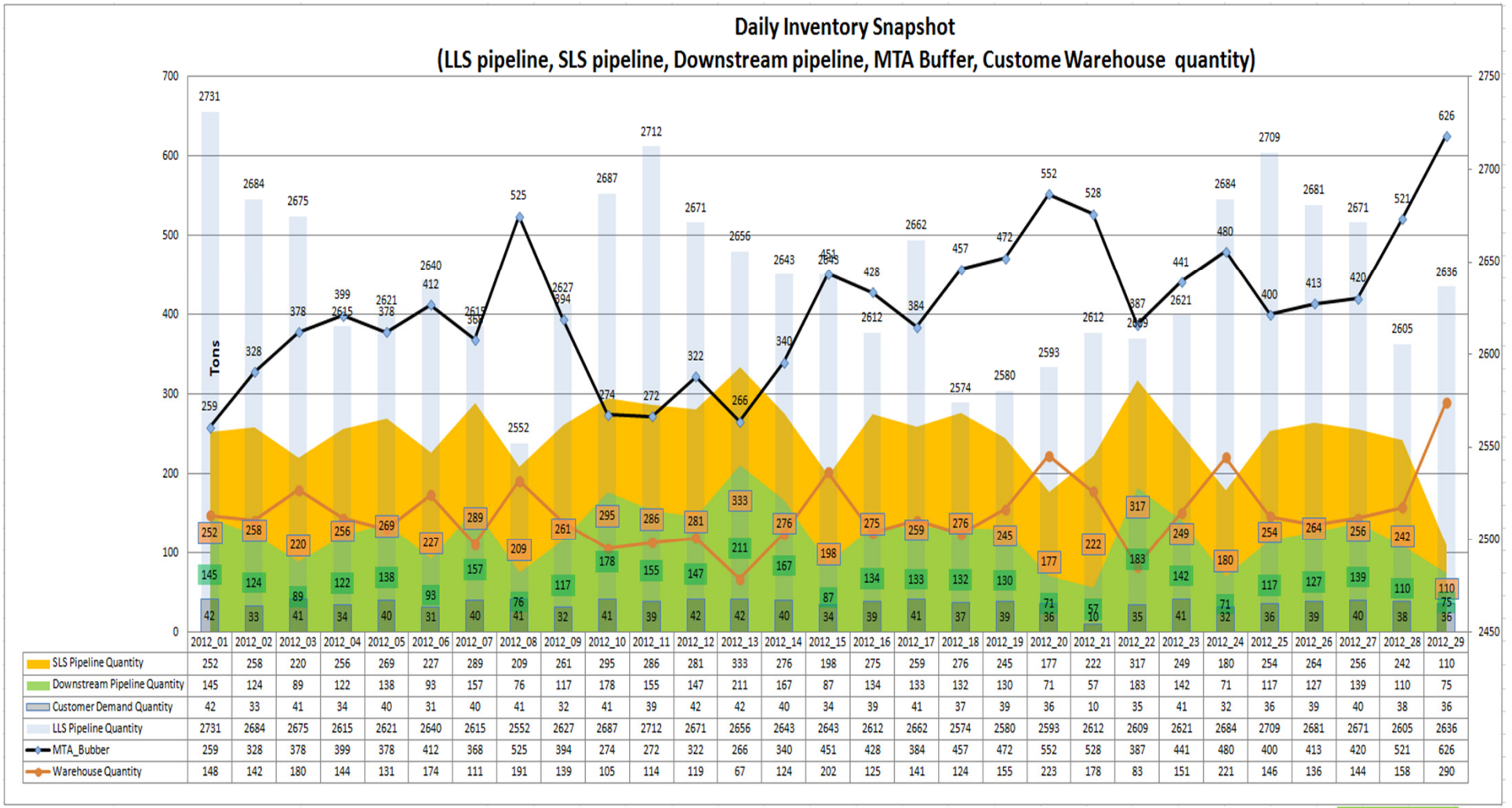
Model example: outcome



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SLS Pipeline Quantity	252	258	220	256	269	227	289	209	261	295	286	281	333	276	198	275	259	276	245	177	222	317	249	180	254	264	256	242	110
Downstream Pipeline Quantity	145	124	89	122	138	93	157	76	117	178	155	147	211	167	87	134	133	132	130	71	57	183	142	71	117	127	139	110	75
Customer Demand Quantity	42	33	41	34	40	31	40	41	32	41	39	42	42	40	34	39	41	37	39	36	10	35	41	32	36	39	40	38	36
LLS Pipeline Quantity	2731	2684	2675	2615	2621	2640	2615	2552	2627	2687	2712	2671	2656	2643	2643	2612	2662	2574	2580	2593	2612	2609	2621	2684	2709	2681	2671	2605	2636
MTA_Bubber	259	328	378	399	378	412	368	525	394	274	272	322	266	340	451	428	384	457	472	552	528	387	441	480	400	413	420	521	626
Warehouse Quantity	148	142	180	144	131	174	111	191	139	105	114	119	67	124	202	125	141	124	155	223	178	83	151	221	146	136	144	158	290

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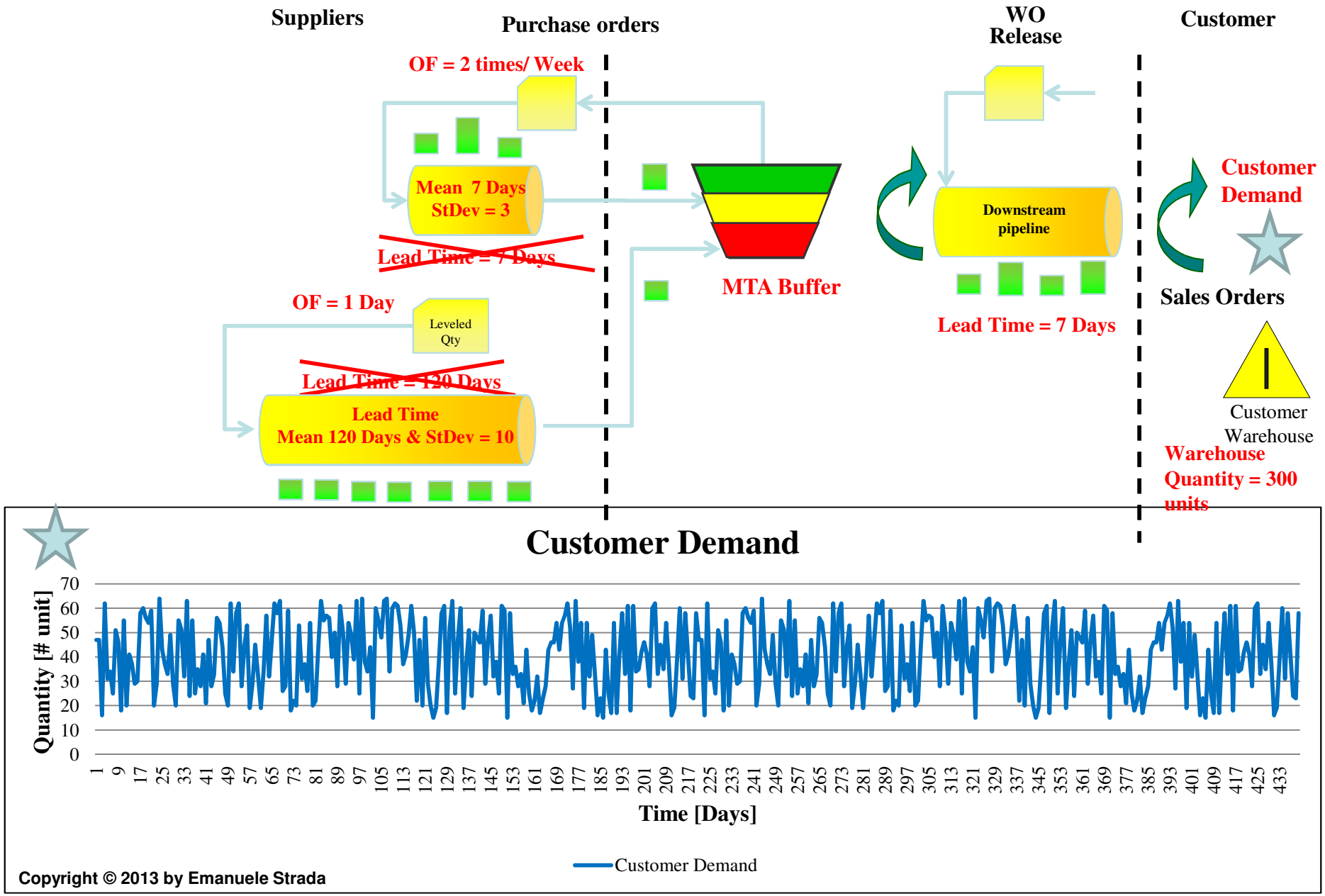
Model example: an assumption



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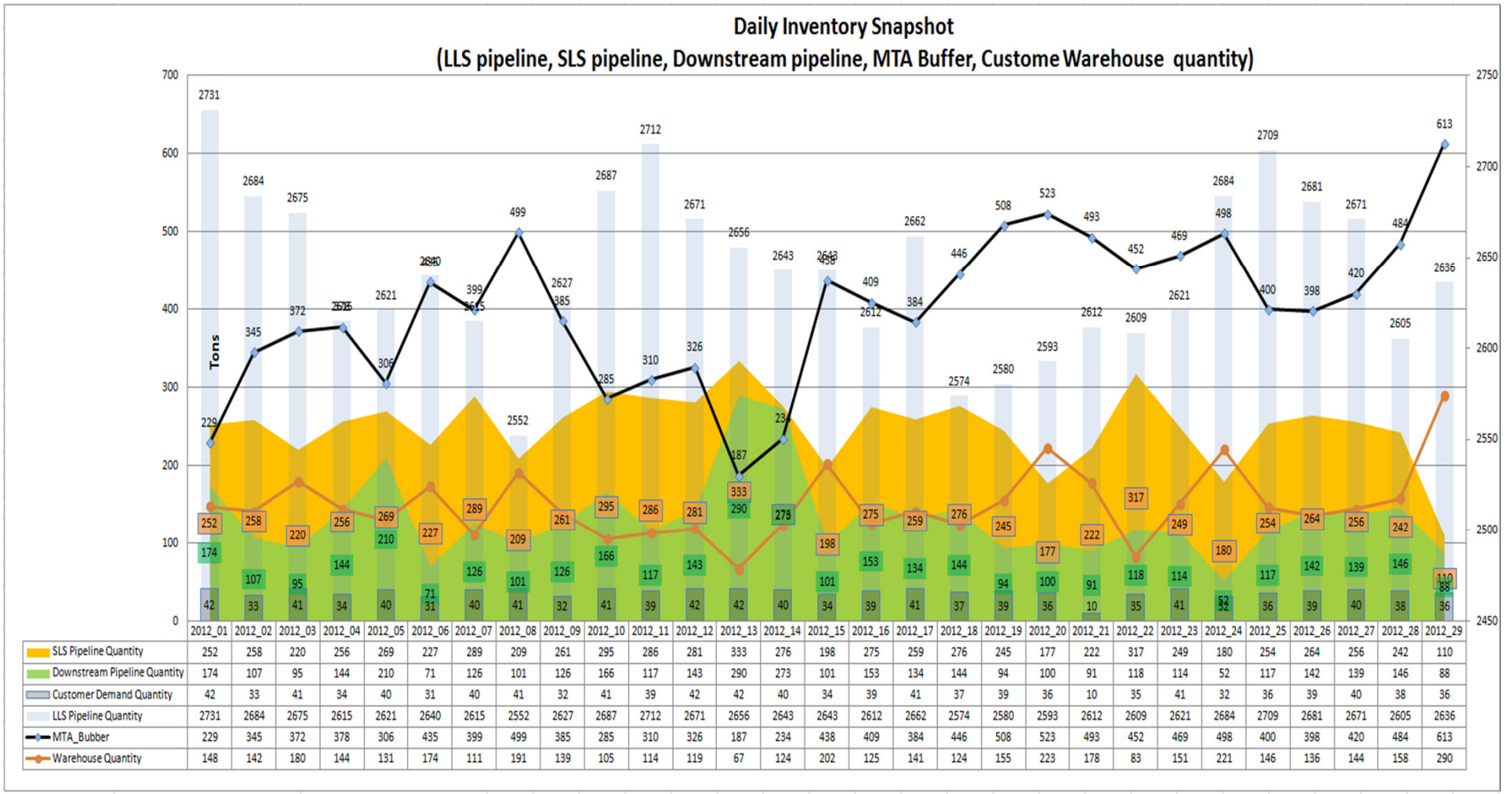
Model example: outcome



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SLS Pipeline Quantity	252	258	220	256	269	227	289	209	261	295	286	281	333	276	198	275	259	276	245	177	222	317	249	180	254	264	256	242	110
Downstream Pipeline Quantity	174	107	95	144	210	71	126	101	126	166	117	143	290	273	101	153	134	144	94	100	91	118	114	52	117	142	139	146	88
Customer Demand Quantity	42	33	41	34	40	31	40	41	32	41	39	42	42	40	34	39	41	37	39	36	10	35	41	32	36	39	40	38	36
LLS Pipeline Quantity	2731	2684	2675	2615	2621	2640	2615	2552	2627	2687	2712	2671	2656	2643	2643	2612	2662	2574	2580	2593	2612	2609	2621	2684	2709	2681	2671	2605	2636
MTA_Bubber	229	345	372	378	306	435	399	499	385	285	310	326	187	234	438	409	384	446	508	523	493	452	469	498	400	398	420	484	613
Warehouse Quantity	148	142	180	144	131	174	111	191	139	105	114	119	67	124	202	125	141	124	155	223	178	83	151	221	146	136	144	158	290

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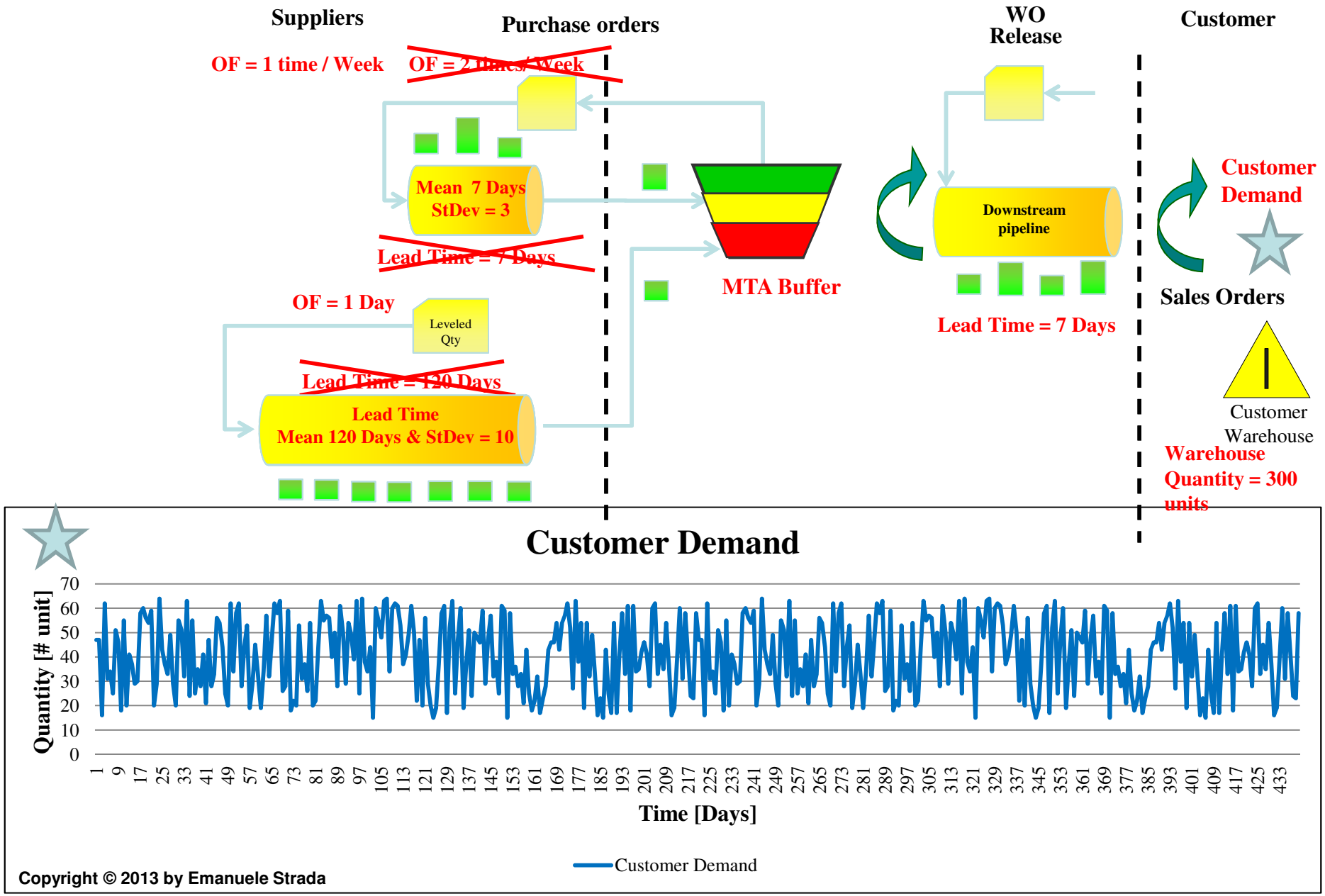
Model example: an assumption



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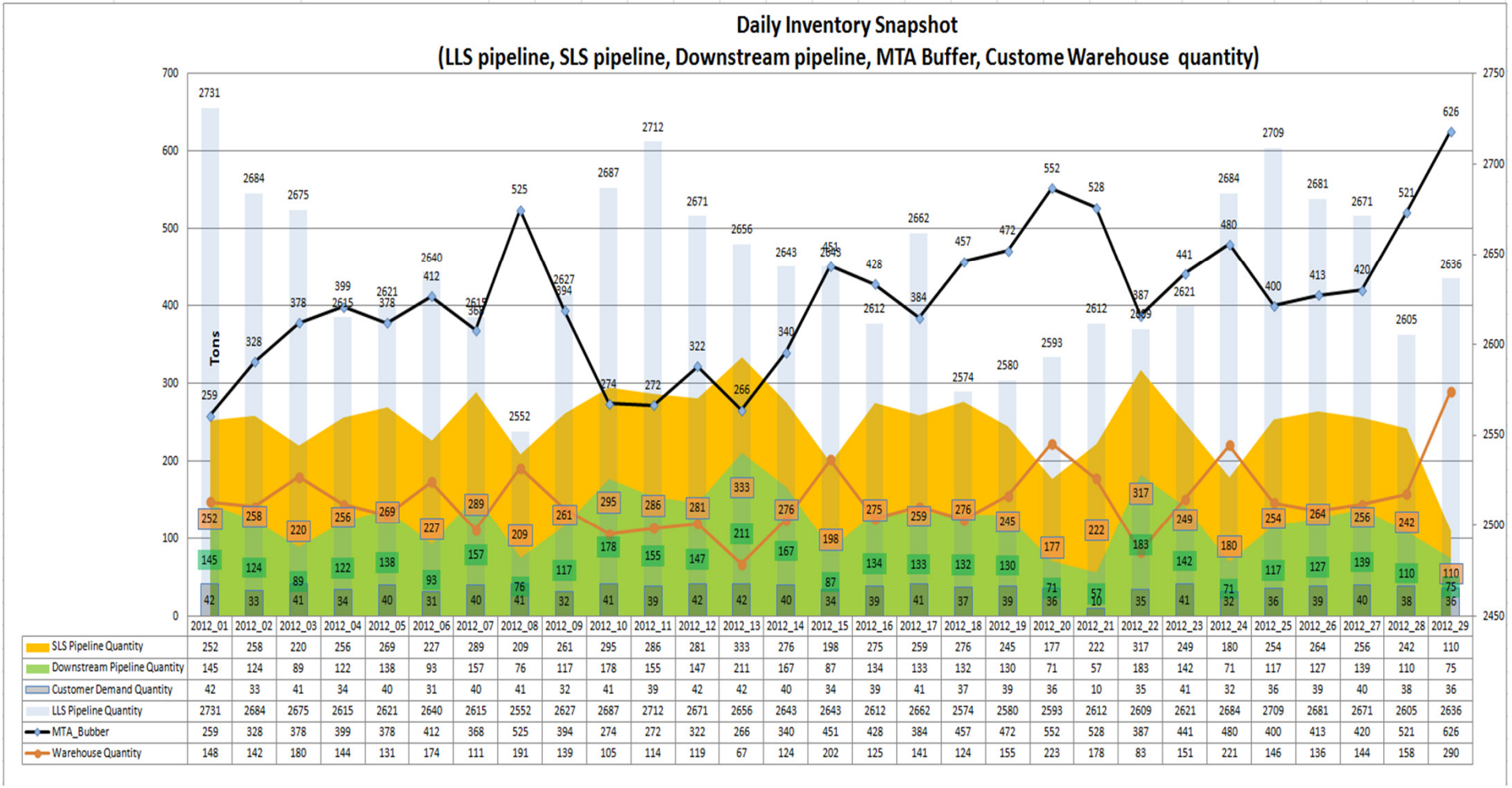
Model example: outcome



	2012_01	2012_02	2012_03	2012_04	2012_05	2012_06	2012_07	2012_08	2012_09	2012_10	2012_11	2012_12	2012_13	2012_14	2012_15	2012_16	2012_17	2012_18	2012_19	2012_20	2012_21	2012_22	2012_23	2012_24	2012_25	2012_26	2012_27	2012_28	2012_29
SLS Pipeline Quantity	252	258	220	256	269	227	289	209	261	295	286	281	333	276	198	275	259	276	245	177	222	317	249	180	254	264	256	242	110
Downstream Pipeline Quantity	145	124	89	122	138	93	157	76	117	178	155	147	211	167	87	134	133	132	130	71	57	183	142	71	117	127	139	110	75
Customer Demand Quantity	42	33	41	34	40	31	40	41	32	41	39	42	42	40	34	39	41	37	39	36	10	35	41	32	36	39	40	38	36
LLS Pipeline Quantity	2731	2684	2675	2615	2621	2640	2615	2552	2627	2687	2712	2671	2656	2643	2643	2612	2662	2574	2580	2593	2612	2609	2621	2684	2709	2681	2671	2605	2636
MTA_Bubber	259	328	378	399	378	412	368	525	394	274	272	322	266	340	451	428	384	457	472	552	528	387	441	480	400	413	420	521	626
Warehouse Quantity	148	142	180	144	131	174	111	191	139	105	114	119	67	124	202	125	141	124	155	223	178	83	151	221	146	136	144	158	290

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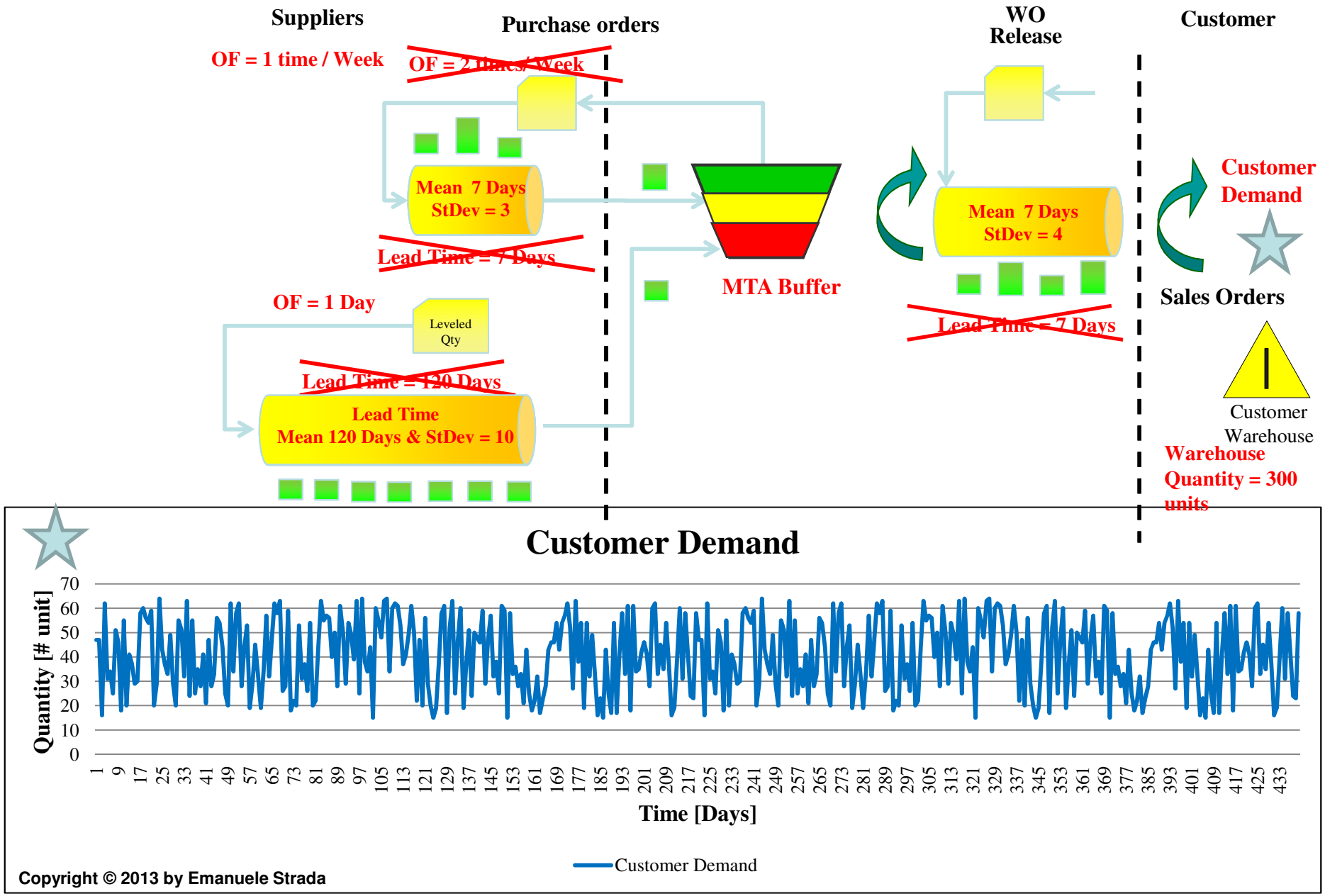
Model example: an assumption



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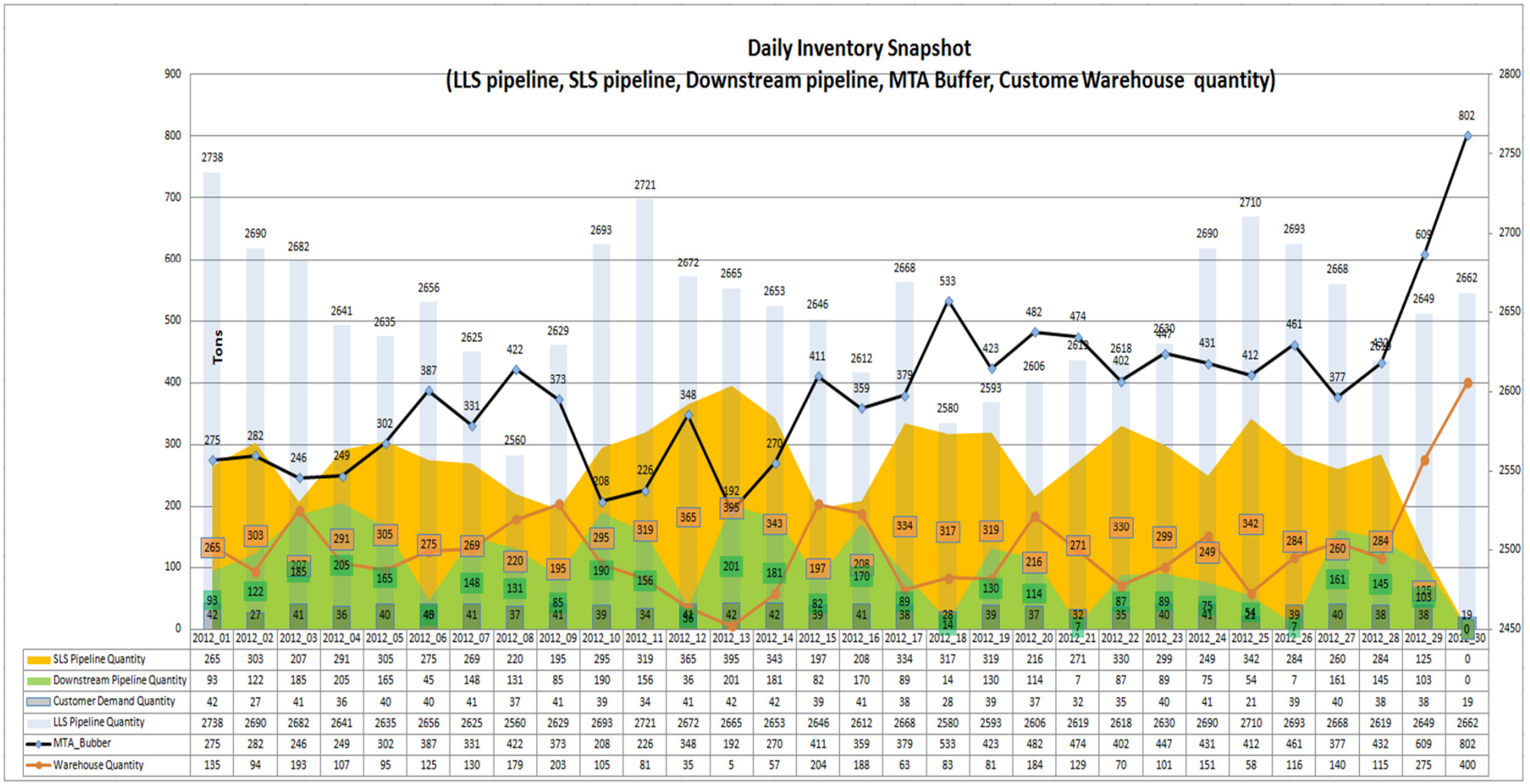
Model example: outcome



	2012_01	2012_02	2012_03	2012_04	2012_05	2012_06	2012_07	2012_08	2012_09	2012_10	2012_11	2012_12	2012_13	2012_14	2012_15	2012_16	2012_17	2012_18	2012_19	2012_20	2012_21	2012_22	2012_23	2012_24	2012_25	2012_26	2012_27	2012_28	2012_29	2012_30
SLS Pipeline Quantity	265	303	207	291	305	275	269	220	195	295	319	365	395	343	197	208	334	317	319	216	271	330	299	249	342	284	260	284	125	0
Downstream Pipeline Quantity	93	122	185	205	165	45	148	131	85	190	156	36	201	181	82	170	89	14	130	114	7	87	89	75	54	7	161	145	103	0
Customer Demand Quantity	42	27	41	36	40	40	41	37	41	39	34	41	42	42	39	41	38	28	39	37	32	35	40	41	21	39	40	38	38	19
LLS Pipeline Quantity	2738	2690	2682	2641	2635	2656	2625	2560	2629	2693	2721	2672	2665	2653	2646	2612	2668	2580	2593	2606	2619	2618	2630	2690	2710	2693	2668	2619	2649	2662
MTA_Bubber	275	282	246	249	302	387	331	422	373	208	226	348	192	270	411	359	379	533	423	482	474	402	447	431	412	461	377	432	609	802
Warehouse Quantity	135	94	193	107	95	125	130	179	203	105	81	35	5	57	204	188	63	83	81	184	129	70	101	151	58	116	140	115	275	400

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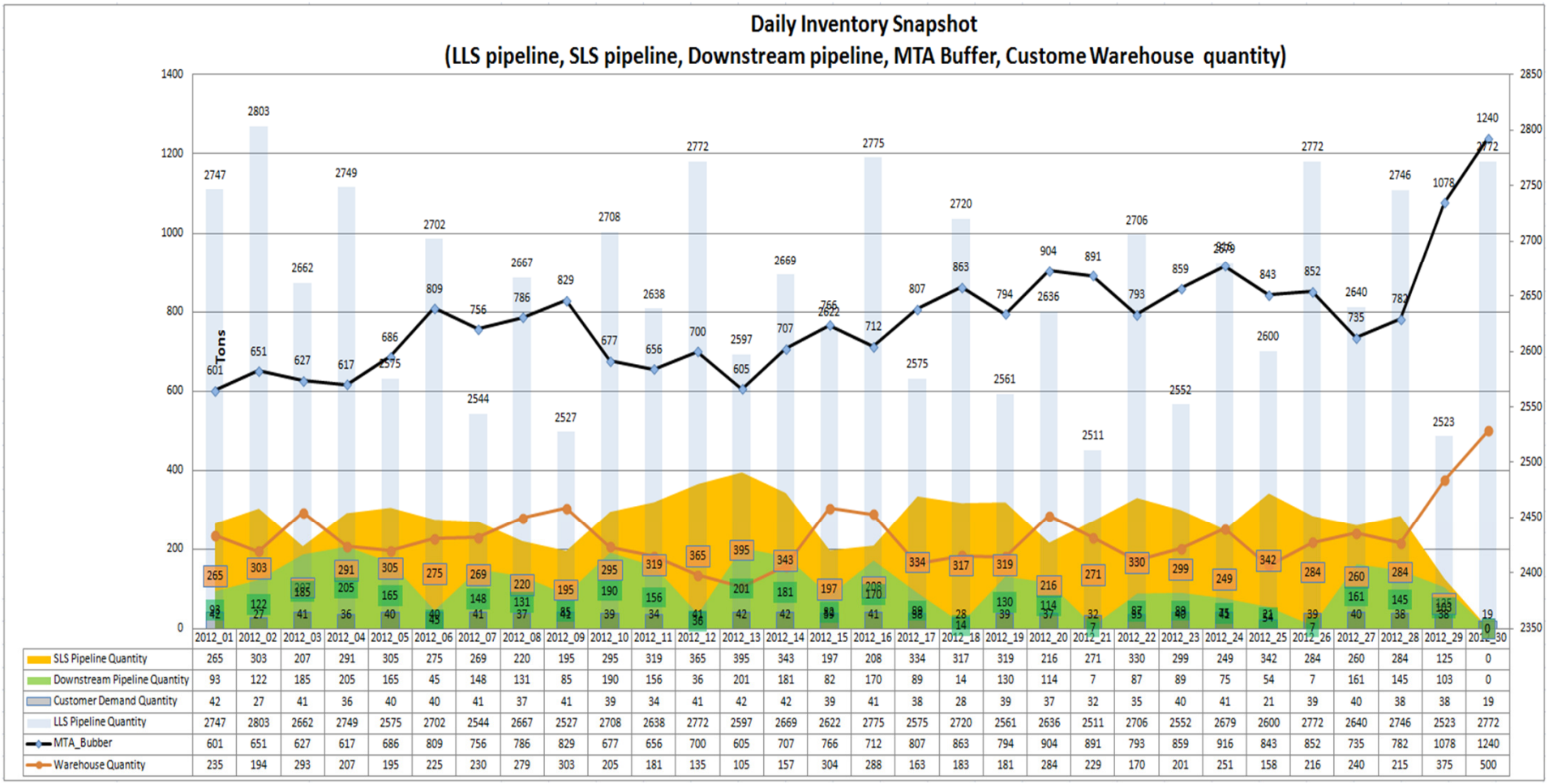
Model example: outcome



	2012_01	2012_02	2012_03	2012_04	2012_05	2012_06	2012_07	2012_08	2012_09	2012_10	2012_11	2012_12	2012_13	2012_14	2012_15	2012_16	2012_17	2012_18	2012_19	2012_20	2012_21	2012_22	2012_23	2012_24	2012_25	2012_26	2012_27	2012_28	2012_29	2012_30
SLS Pipeline Quantity	265	303	207	291	305	275	269	220	195	295	319	365	395	343	197	208	334	317	319	216	271	330	299	249	342	284	260	284	125	0
Downstream Pipeline Quantity	93	122	185	205	165	45	148	131	85	190	156	36	201	181	82	170	89	14	130	114	7	87	89	75	54	7	161	145	103	0
Customer Demand Quantity	42	27	41	36	40	40	41	37	41	39	34	41	42	42	39	41	38	28	39	37	32	35	40	41	21	39	40	38	38	19
LLS Pipeline Quantity	2747	2803	2662	2749	2575	2702	2544	2667	2527	2708	2638	2772	2597	2669	2622	2775	2575	2720	2561	2636	2511	2706	2552	2679	2600	2772	2640	2746	2523	2772
MTA_Bubber	601	651	627	617	686	809	756	786	829	677	656	700	605	707	766	712	807	863	794	904	891	793	859	916	843	852	735	782	1078	1240
Warehouse Quantity	235	194	293	207	195	225	230	279	303	205	181	135	105	157	304	288	163	183	181	284	229	170	201	251	158	216	240	215	375	500

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

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

November 25th, 2012
Moscow

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Thanks

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