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Customer Success Is Our Mission

Building a Complex Hardware Cost Model for Antennas

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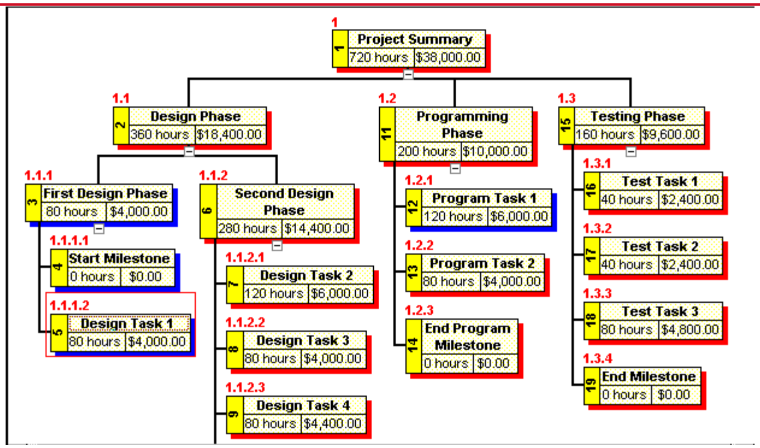
To drive standardization, integration, implementation, and optimization of SAS processes, measures, and resources to achieve proven Mission Assurance.

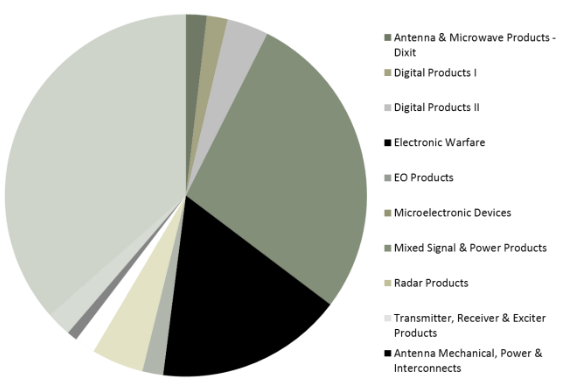
Introduction: An Erector Set Analogy

Challenges of Product Level Cost Model Development



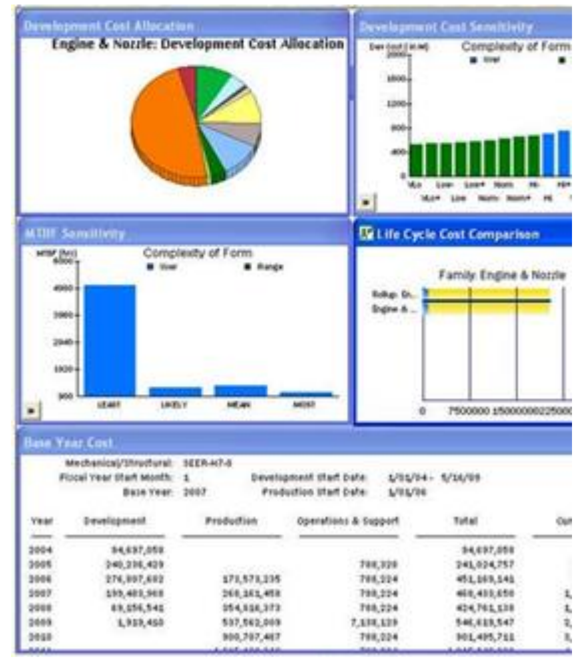
A. Government DOD Contractor Challenge (Cost)
   1. Customer expects WBS
   2. Engineering works to PBS
   3. Must untangle cost relationship between WBS and PBS

B. Internal Organizational Challenge (Cost)
   1. Matrix organizations make collecting product level costs problematic
   2. Matrix organizations in flux are even more problematic
   3. Must unmix organizational data from product data



C. Must Get Agreement on Cost Drivers (Size)
   1. Costs are causal
   2. Key size and scaling factors are causing factors

Challenge of Bidding Work With Commercial Cost Models



A. Strengths of Commercial Cost Models

1. Great at getting the bid in the ballpark
2. Great for tops down, reduced cost, bidding
3. Great for organizing bid into PBS
4. Great for remembering the hidden costs that are often forgotten

B. Weaknesses of Commercial Cost Models

1. Strong matrix organizations argue over allotment
2. Tend to not have a good grasp on todays technology (maybe a few years old technology)
3. No flags for items with wide variance in costs tasks such as a performance threshold for ASICs
4. Jobs are performed bottoms up

C. Observations of Commercial Cost Models

1. Great for ROMs!
2. Should be calibrated for actual bids
3. Possible disconnect between bid and performance

Connecting Tops Down With Bottoms Up

A. Cost Model Connecting Gate 3 (ROM) to Gate 4 (actual bid)
   1. Gate 3 ROM is organizational independent
   2. Gate 4 is organizational and execution dependent
   3. Cost Model must bridge this gap
   4. Cost Model must also provide flags for high cost variance items that can drive architectural and performance trade offs
   5. Cost and size must be based on historical actuals

B. Cost Model Connecting Gate 4 (actual bid) to Gate 5 (plan after win)
   1. Must be detailed enough to provide cost details for execution plan
   2. Must be flexible enough to account for organizational changes

C. Cost Connecting Gate 5 (plan after win) to Execution
   1. Must apply to EACs also!
   2. Must have standardized cost and size collection forms
   3. Must be able to rapidly evolve with technology

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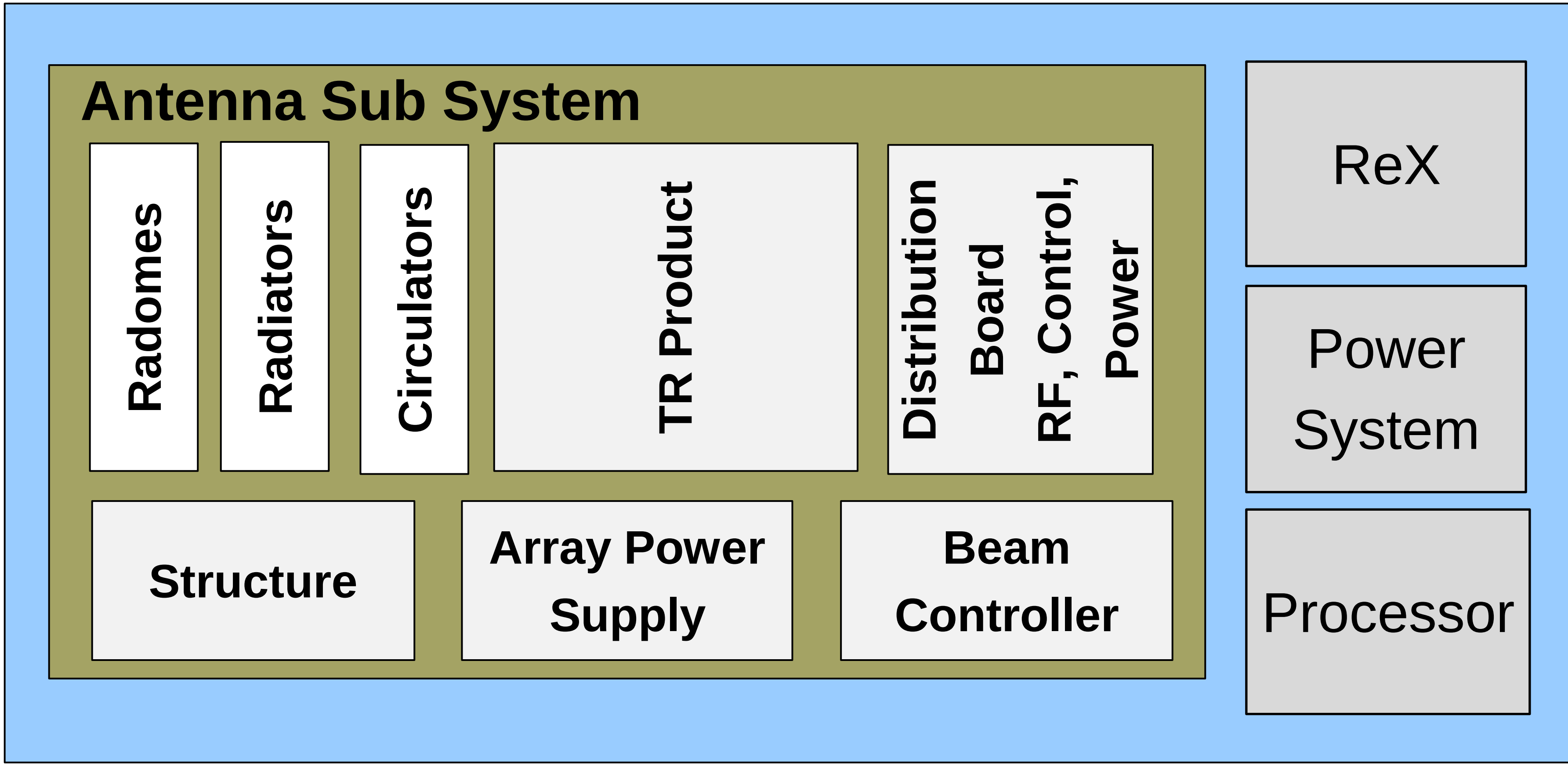
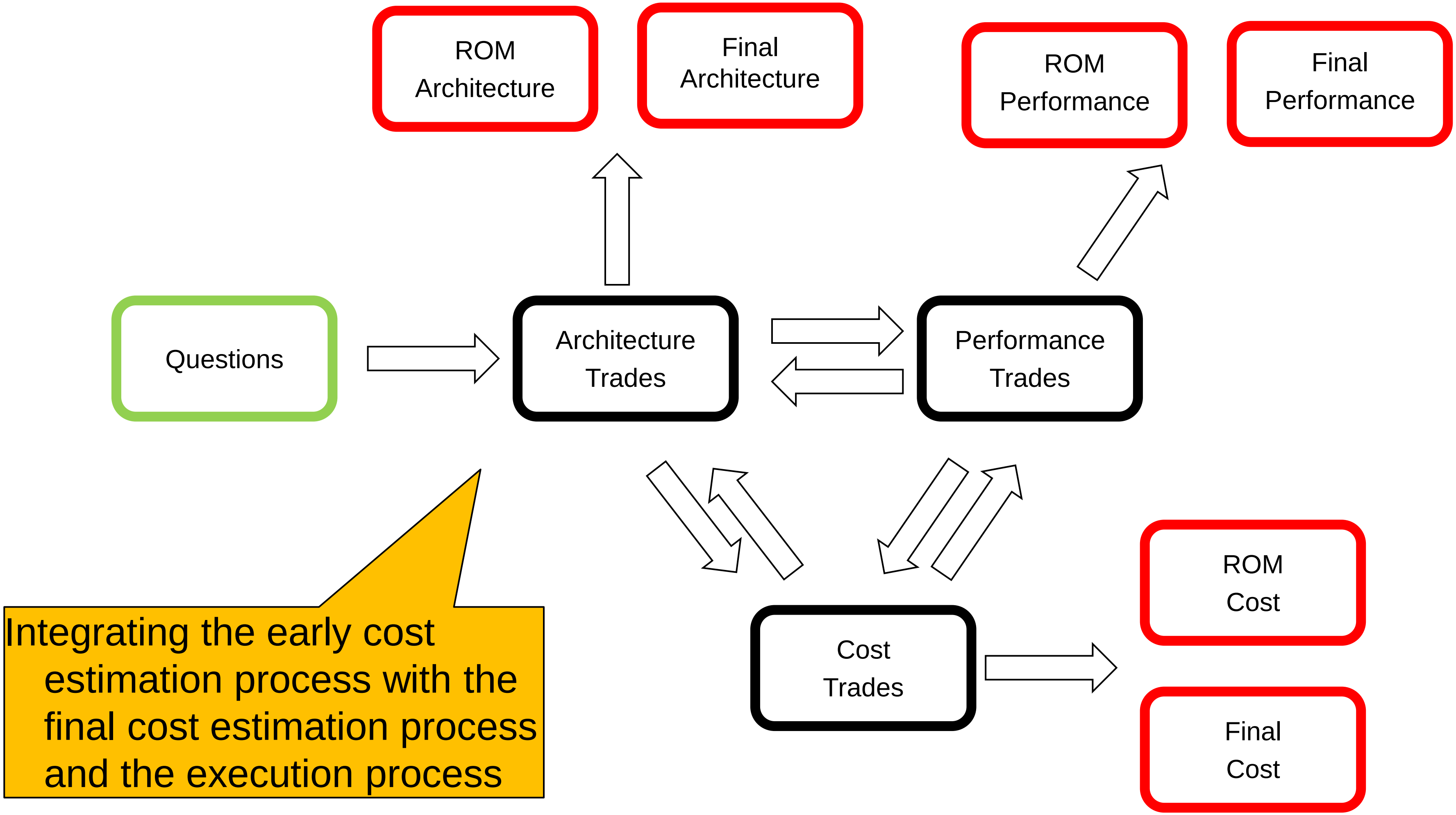
Beginning With a Standard Reference Architecture

Radar Functional Block Diagram – Generic and applicable to any Program



Consistent Product Structure

Overall Antenna Cost Estimation Process



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Getting to a ROM Architecture

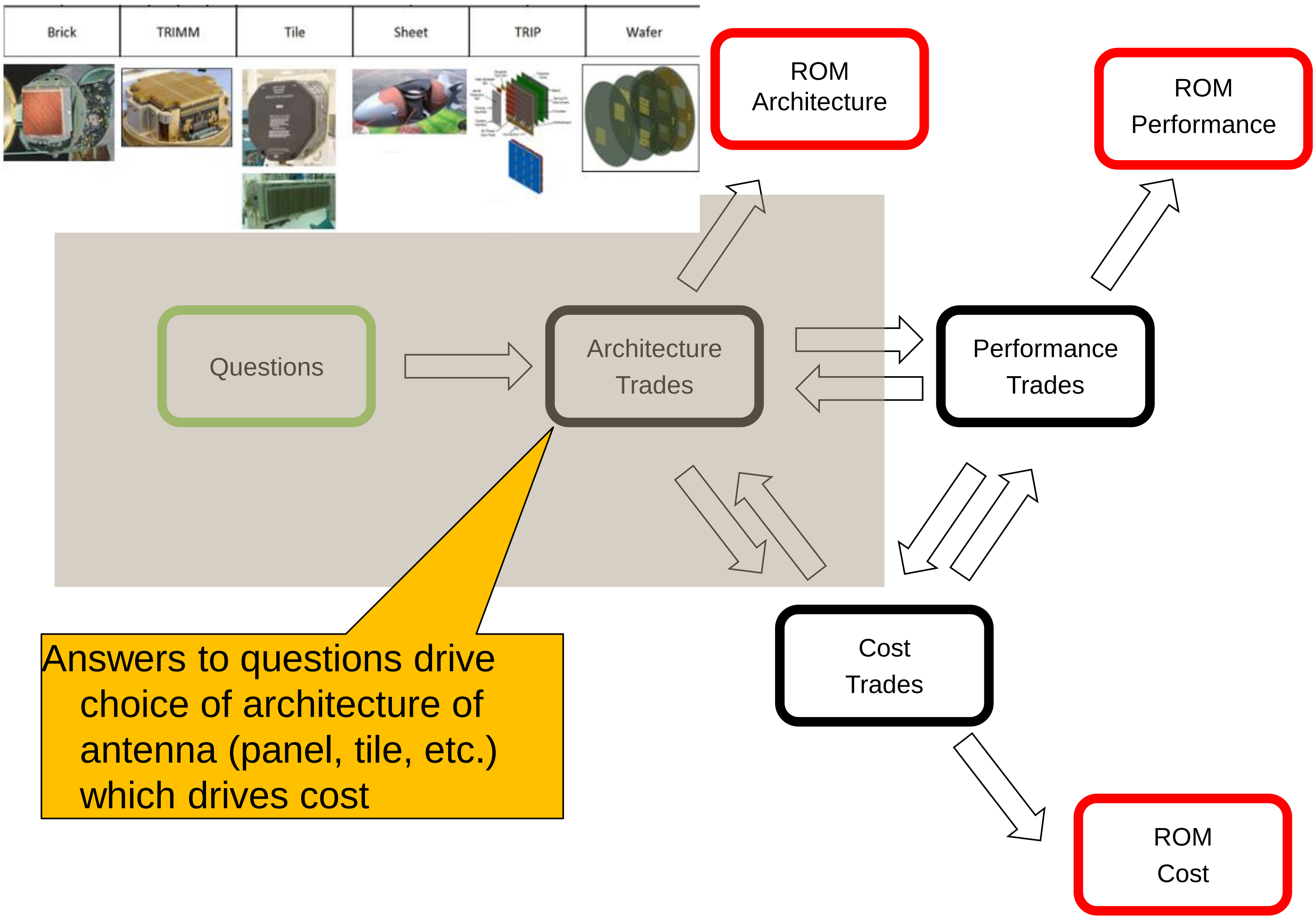
Questions

	A	B	C	D
1				
2	**Requirements**			
3				
4	Bandwidth & Frequency			
5		What is the tunable bandwidth	[redacted]	1
6		What is the instantaneous bandwidth	[redacted]	2
7		Feed/distribution to the back end	[redacted]	3
8	erp			
9		elemental power	[redacted]	4
10		What is the number of elements	[redacted]	5
11	swap			
12		input power (input to PCU)	[redacted]	6
13		cooling	[redacted]	7
14		weight	[redacted]	8
15		volume (depth)	[redacted]	9
16				
17				
18	Electrical Performance			
19		What is the NF of the Receiver	[redacted]	10
20		system nf	[redacted]	11
21				
22	Architecture			
		Aperture	[redacted]	12
		rcs (cross section)	[redacted]	13
		stearable apertures	[redacted]	14
	BSC			
		architecture	[redacted]	15

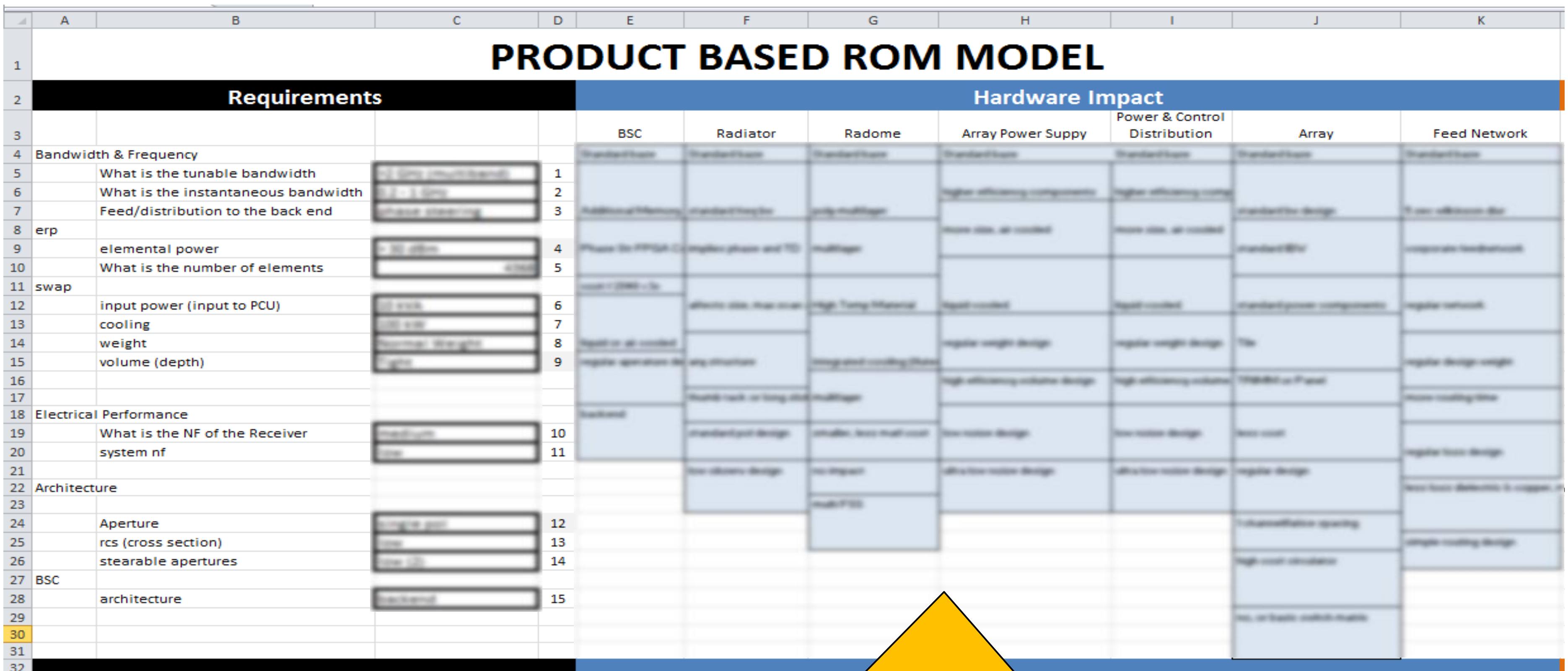
Simple set of high level questions answered using rough requirements

ROM Cost

Architectural Trade-offs



Flexible Reference Architecture Key to Result



	A	B	C	D	E	F	G	H	I	J	K
1	PRODUCT BASED ROM MODEL										
2	Requirements				Hardware Impact						
3					BSC	Radiator	Radome	Array Power Suppy	Power & Control Distribution	Array	Feed Network
4	Bandwidth & Frequency				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5		What is the tunable bandwidth	[illegible]	1							
6		What is the instantaneous bandwidth	[illegible]	2							
7		Feed/distribution to the back end	[illegible]	3							
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27	BSC										
28		architecture	[illegible]	15							
29											
30											
31											
32											

Specific antenna architecture with specific subproducts related to that architecture with average cost driving parameters

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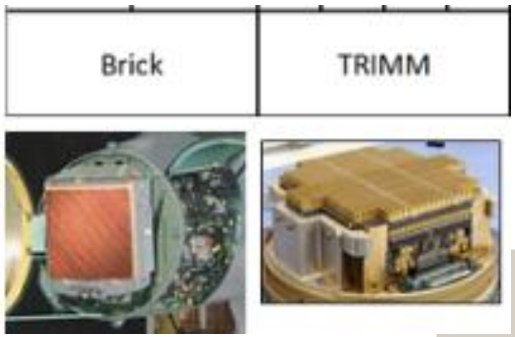
ROM Still Top Down Cost Estimation



ROM Architecture

ROM Performance

Questions

Architecture Trades

Performance Trades

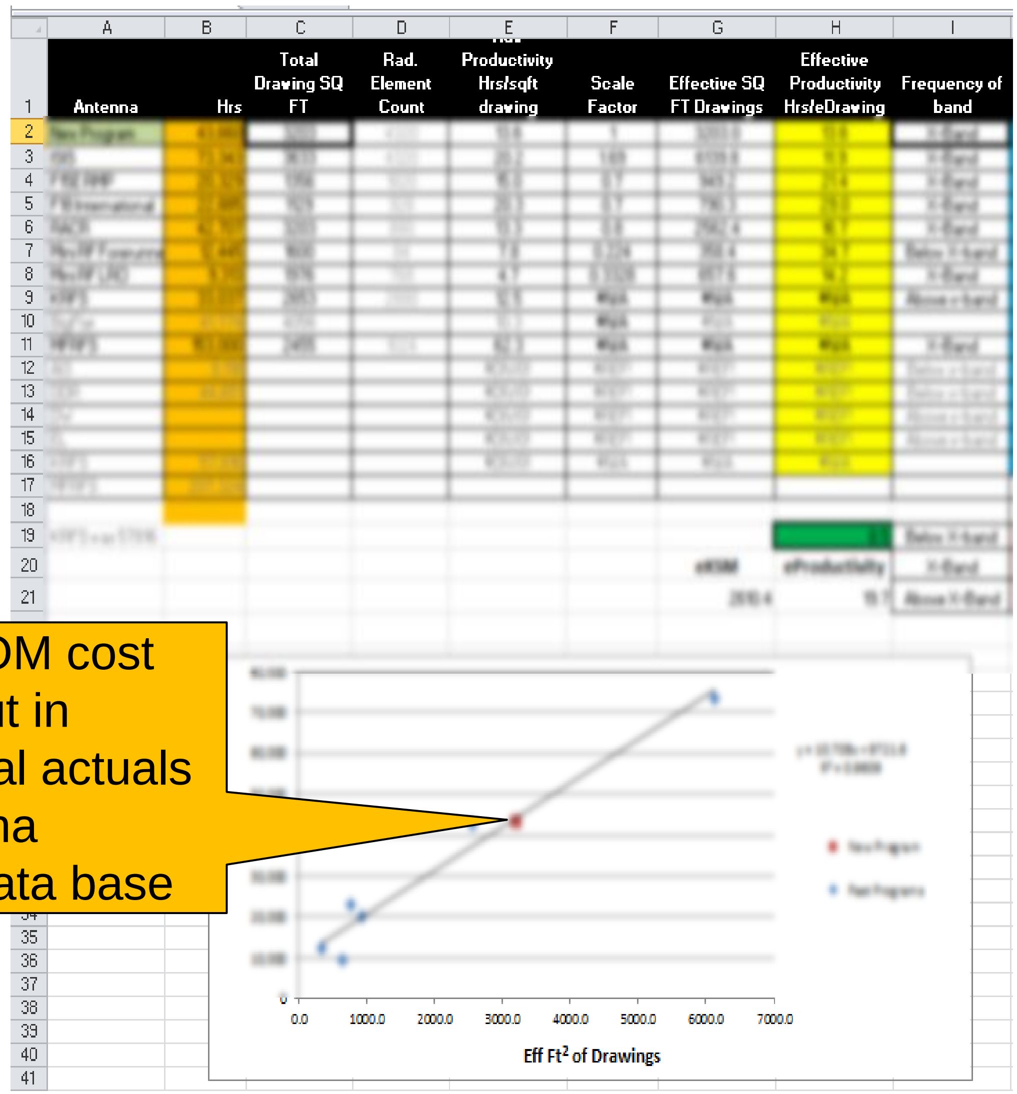
Cost Trades

ROM Cost

High level cost trades based on answers to questions and customer needs

Result of the ROM Bidding Process

4/14/20



Effort results in a ROM cost estimate that is put in context of historical actuals of previous antenna programs in the data base

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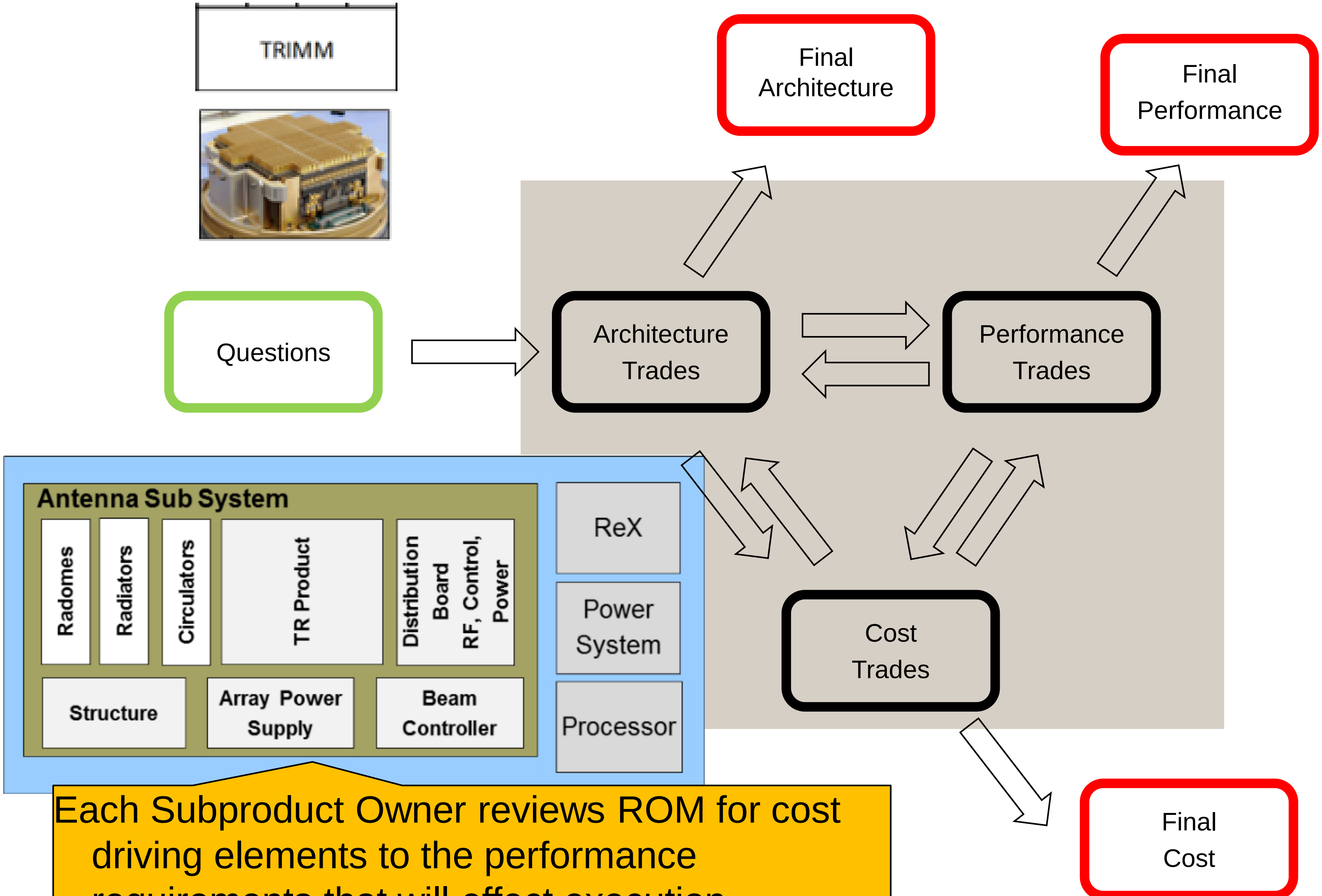
Moving to the Final Cost Estimate



Each Subproduct Owner reviews ROM for cost driving elements to the performance requirements that will effect execution

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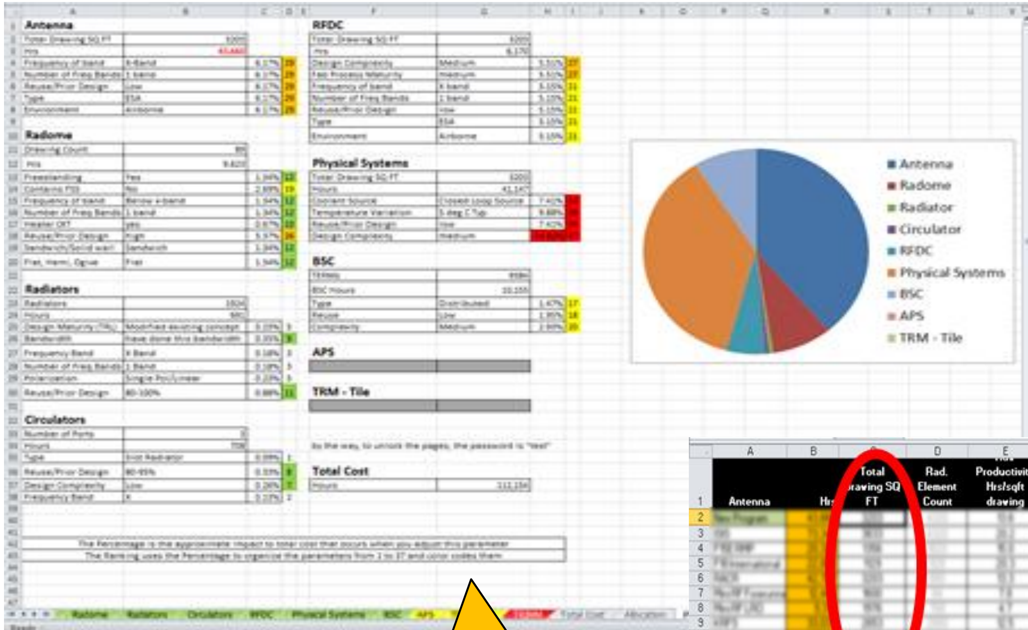
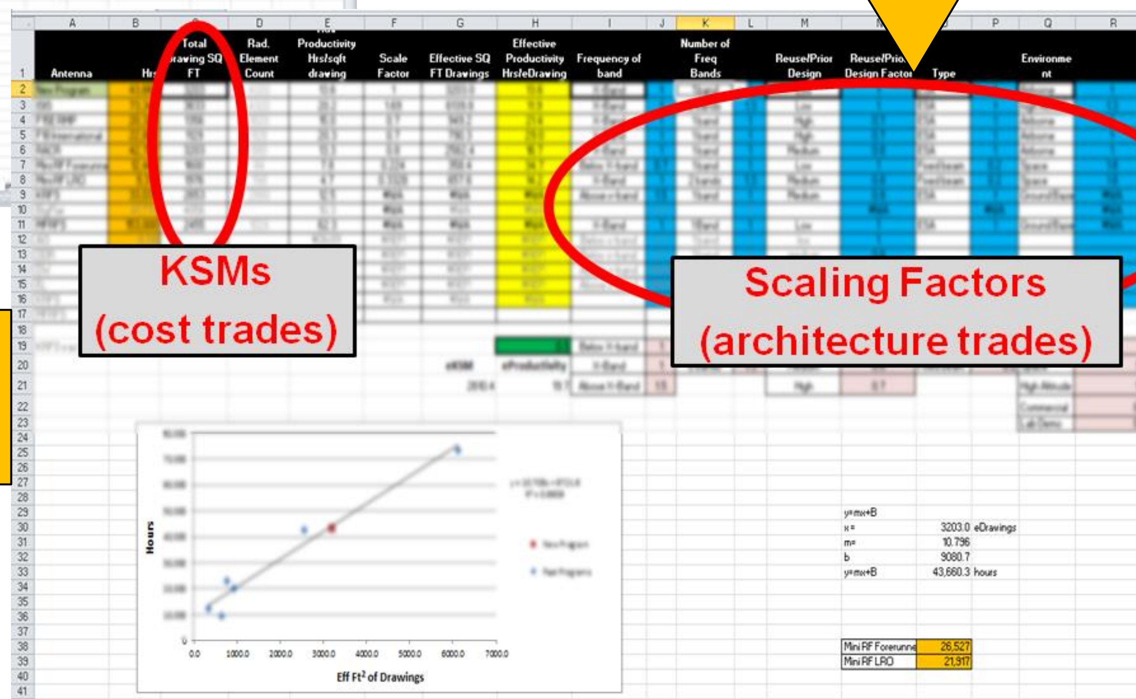
Expert Review of the ROM Cost Estimate



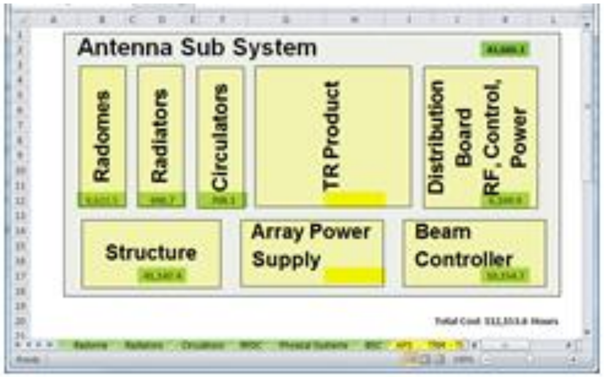
Pre-populated size factors of each subproduct from the ROM is now reviewed in detail for applicability to the final bid

Cost Model maintains running bid total of updated subproduct cost information

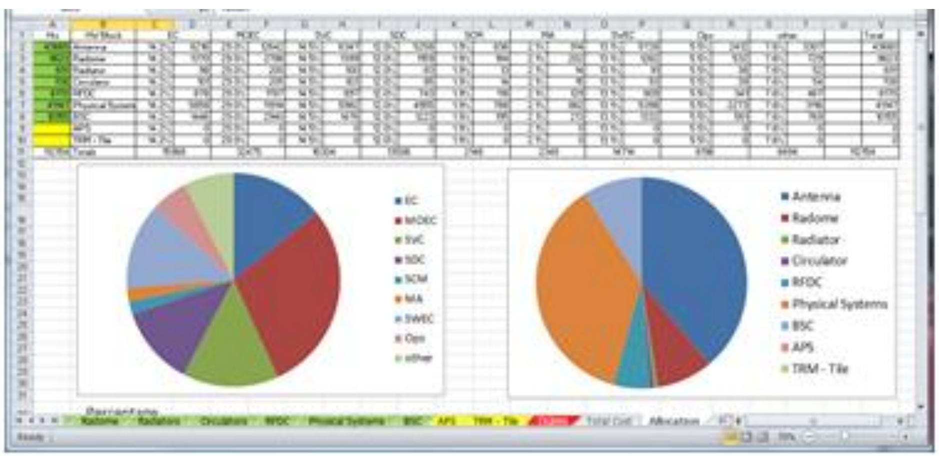


Final Basis Of Estimate is Based on Historical Actuals

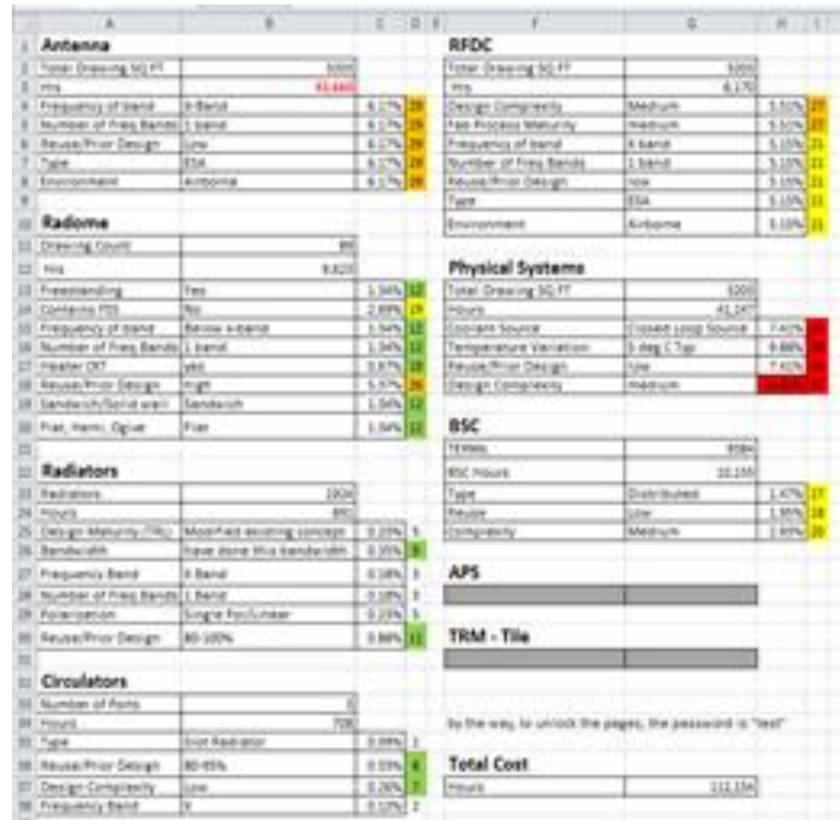
Final Cost Totals



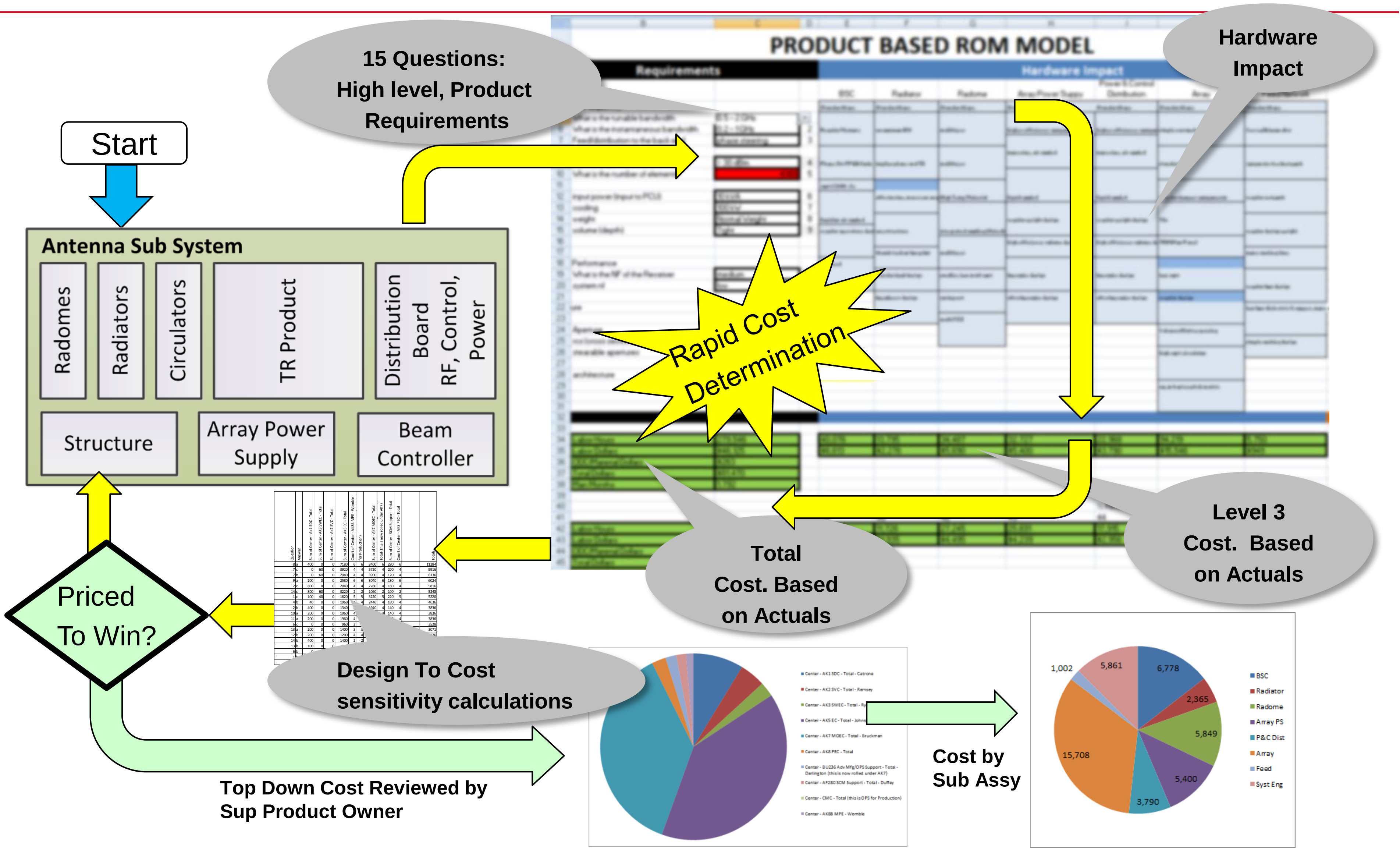
Final Cost Subproduct Allocations



Final Architecture With Sizing Parameters

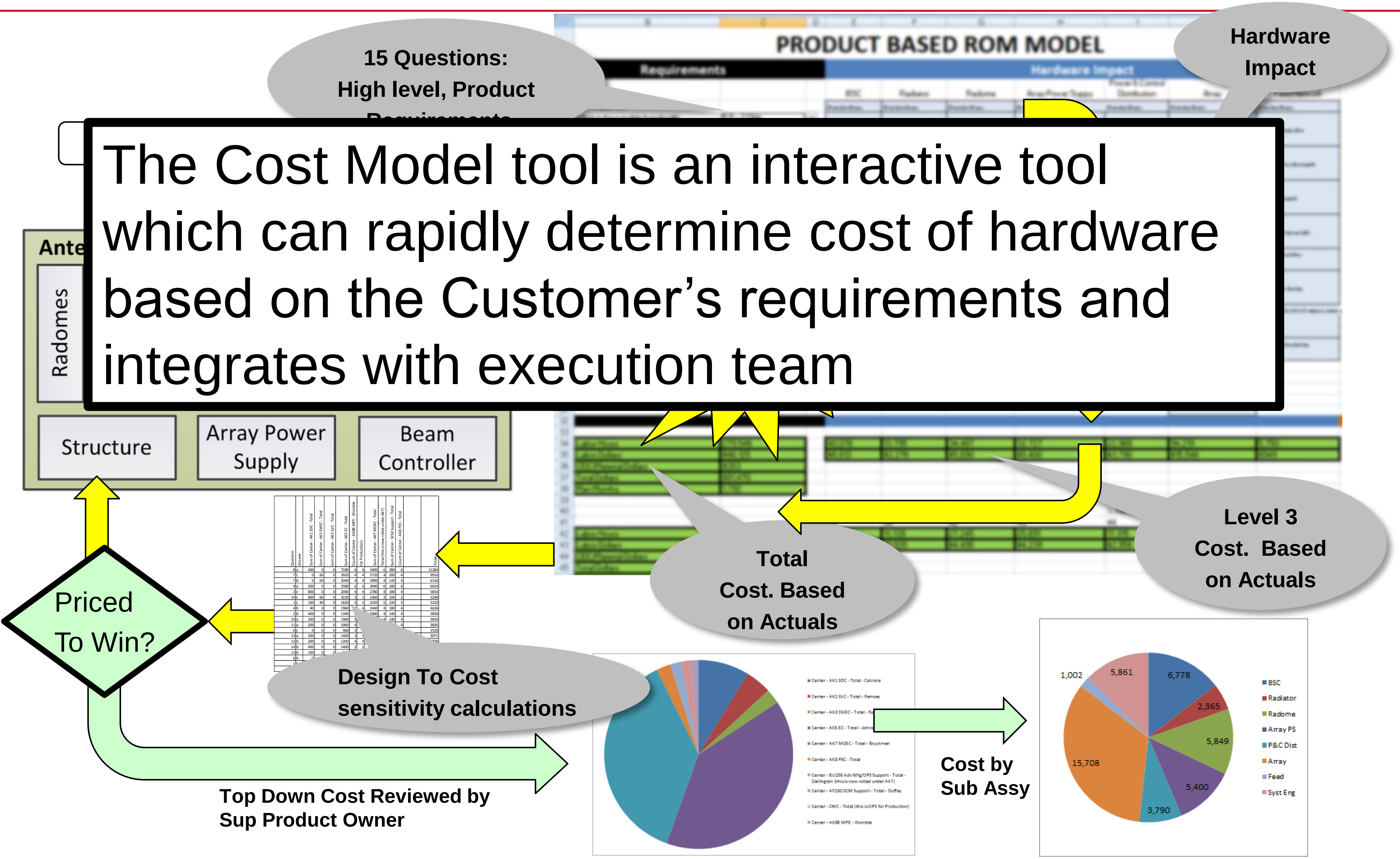


Review Tops Down, Bottoms Up Approach

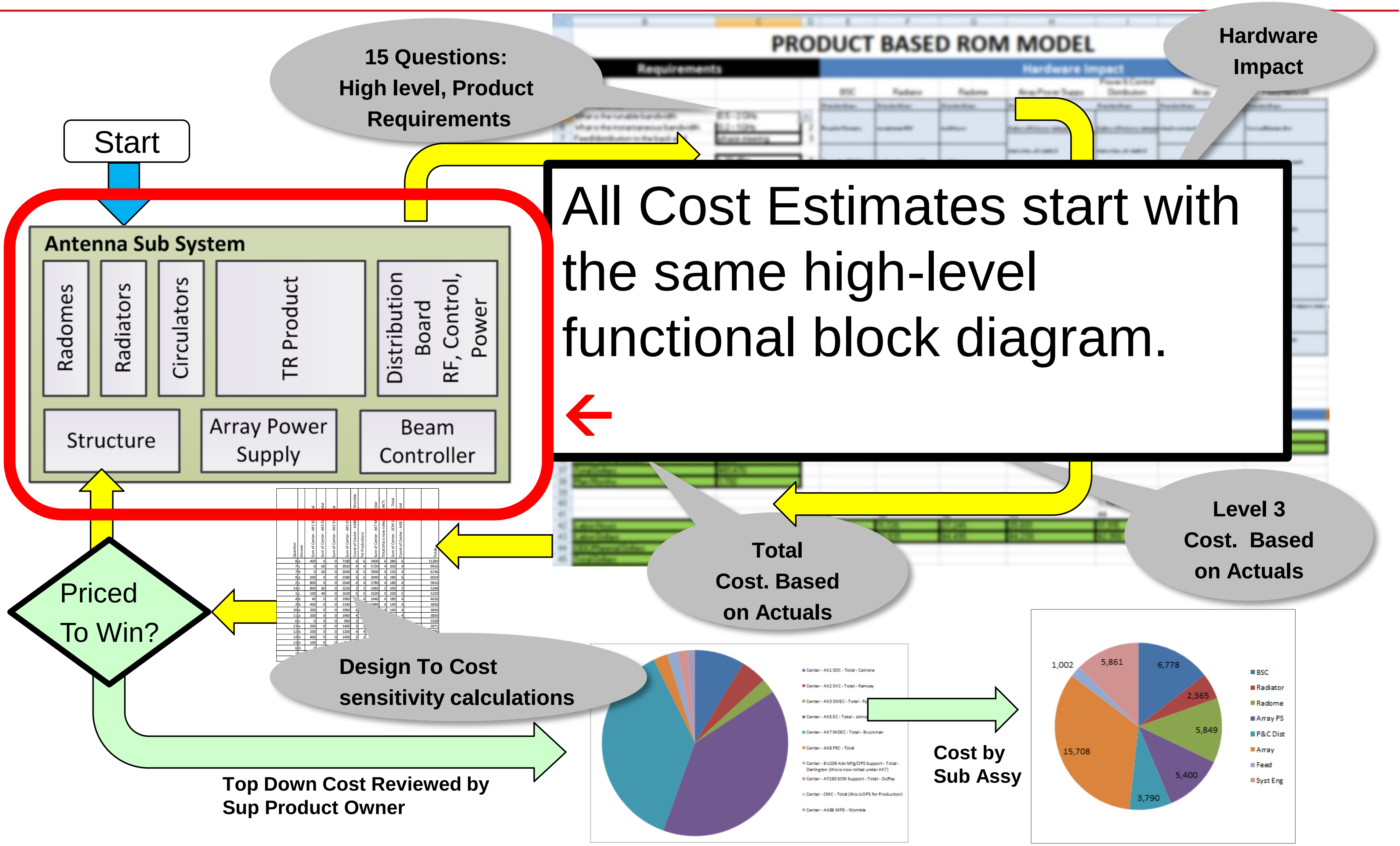


Cost Models – Tops Down, Model Based bidding

The Cost Model tool is an interactive tool which can rapidly determine cost of hardware based on the Customer's requirements and integrates with execution team



Cost Models – Tops Down, Model Based bidding



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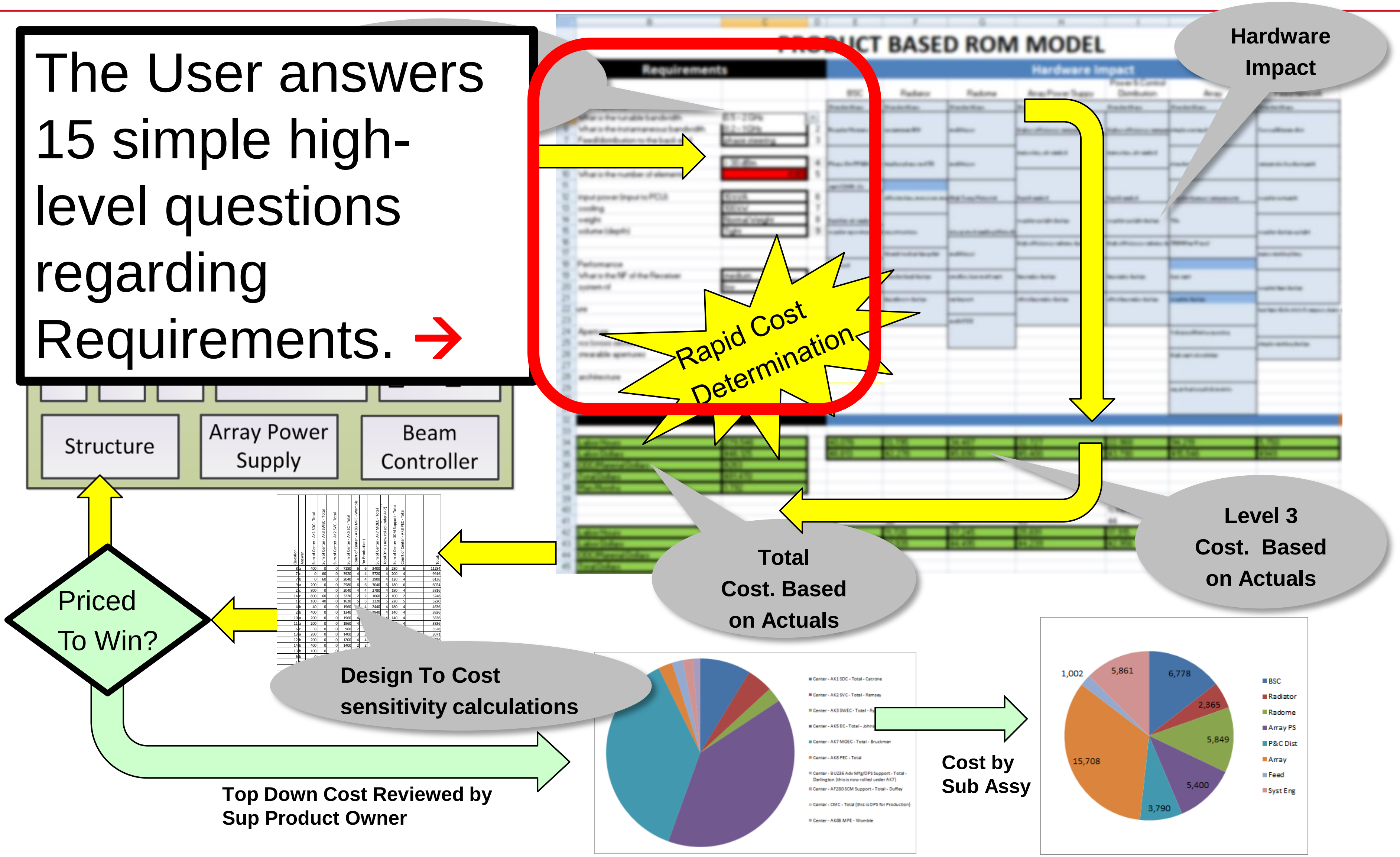
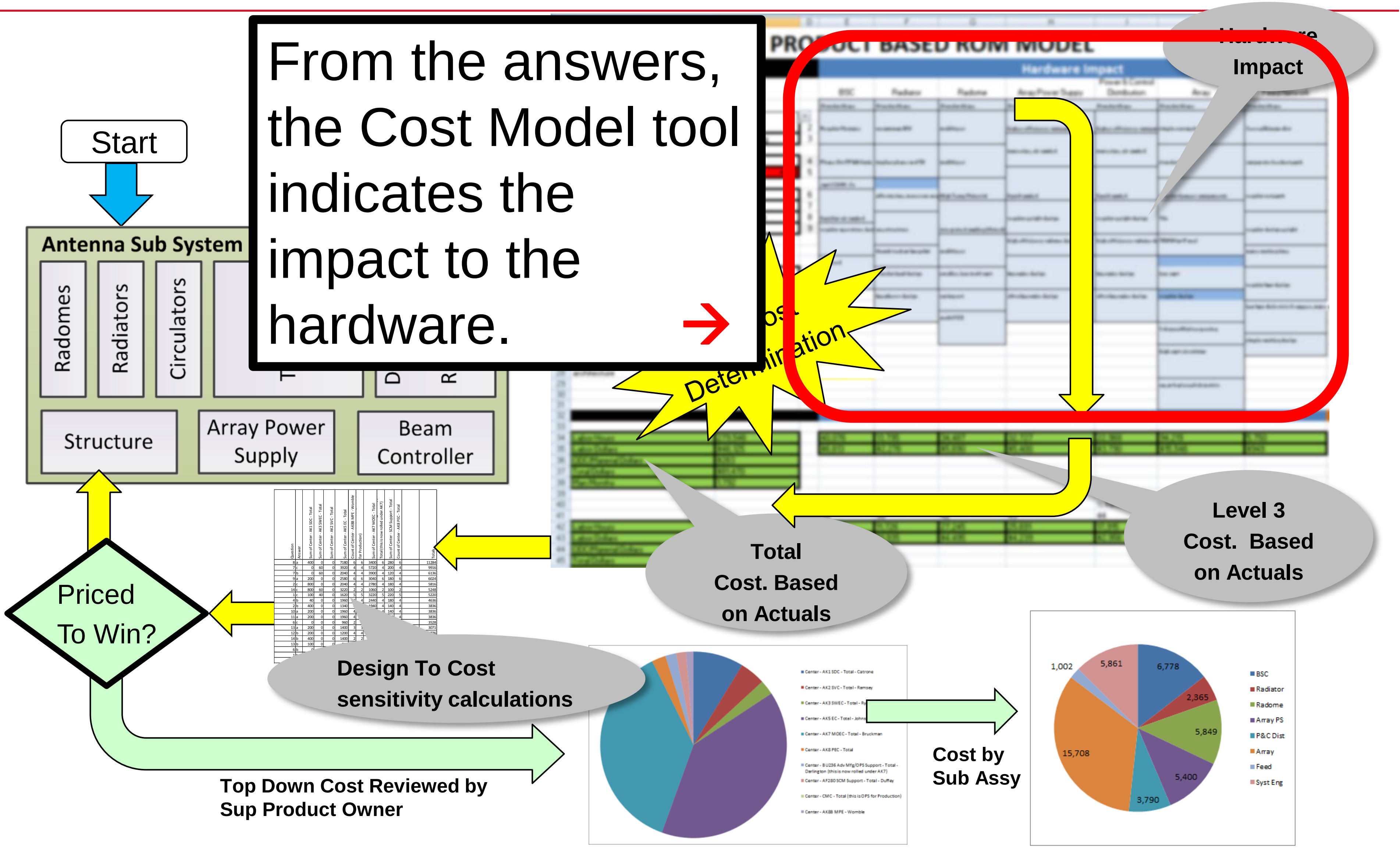


Cost Models – Tops Down, Model Based bidding



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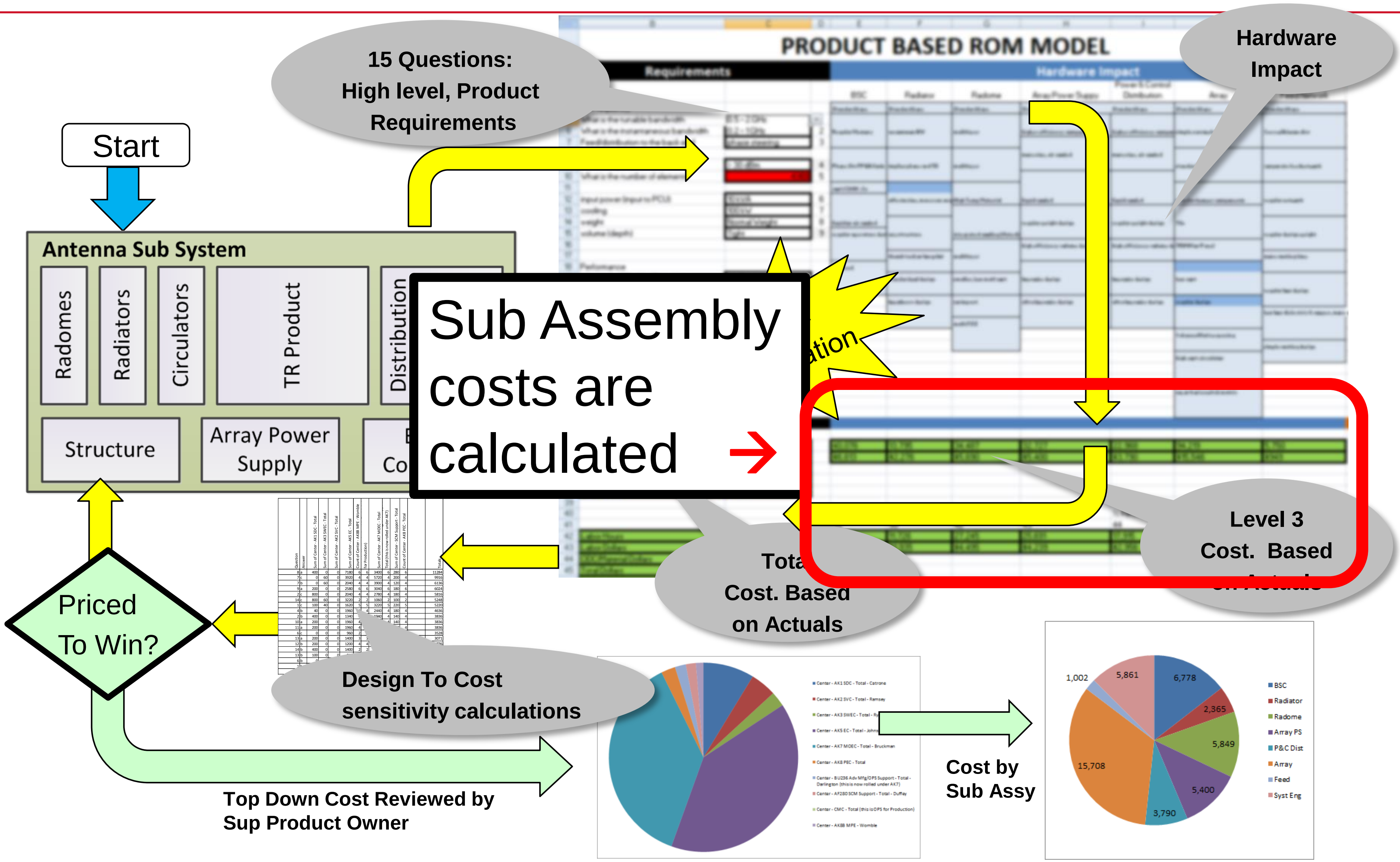
Cost Models – Tops Down, Model Based bidding



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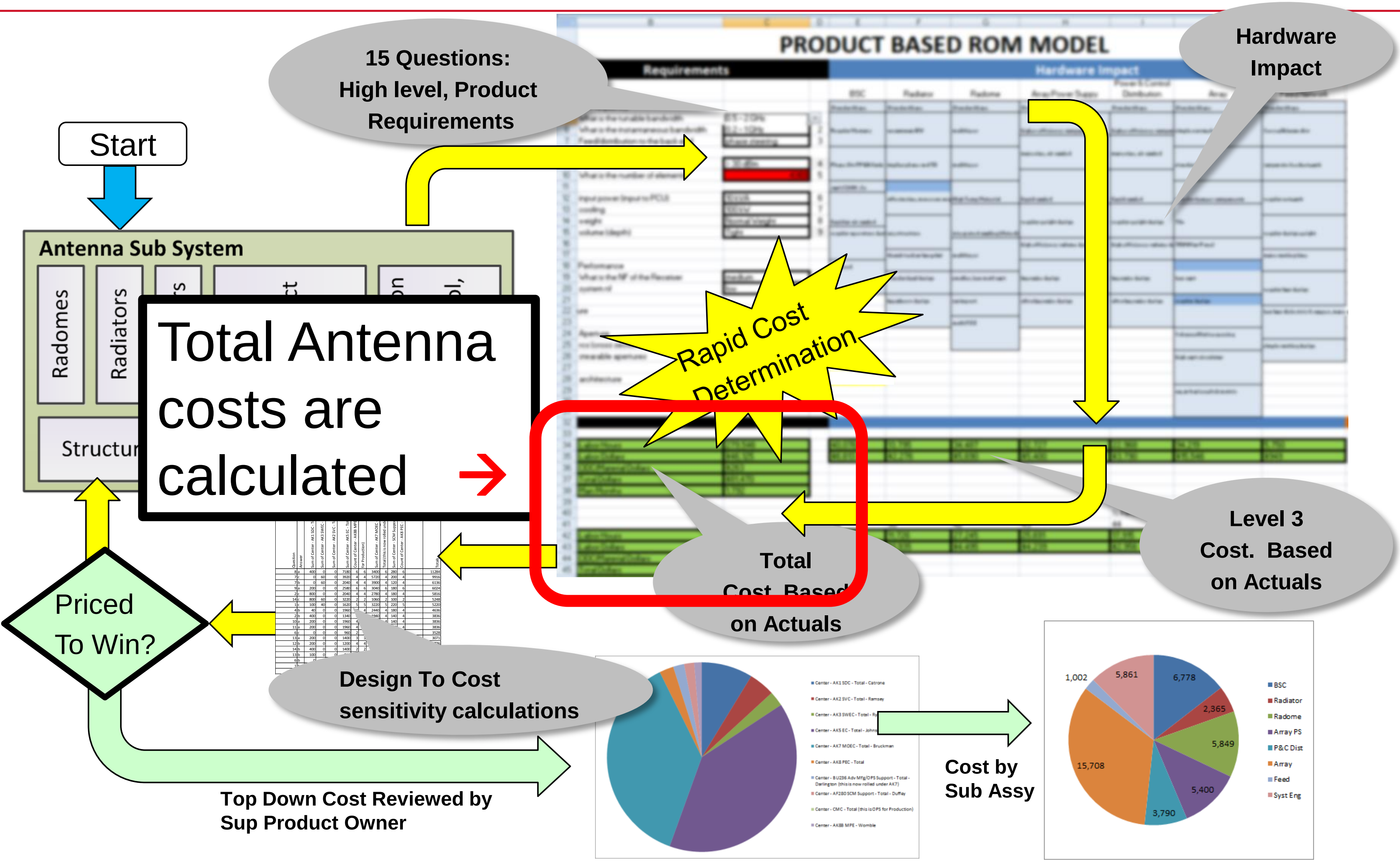

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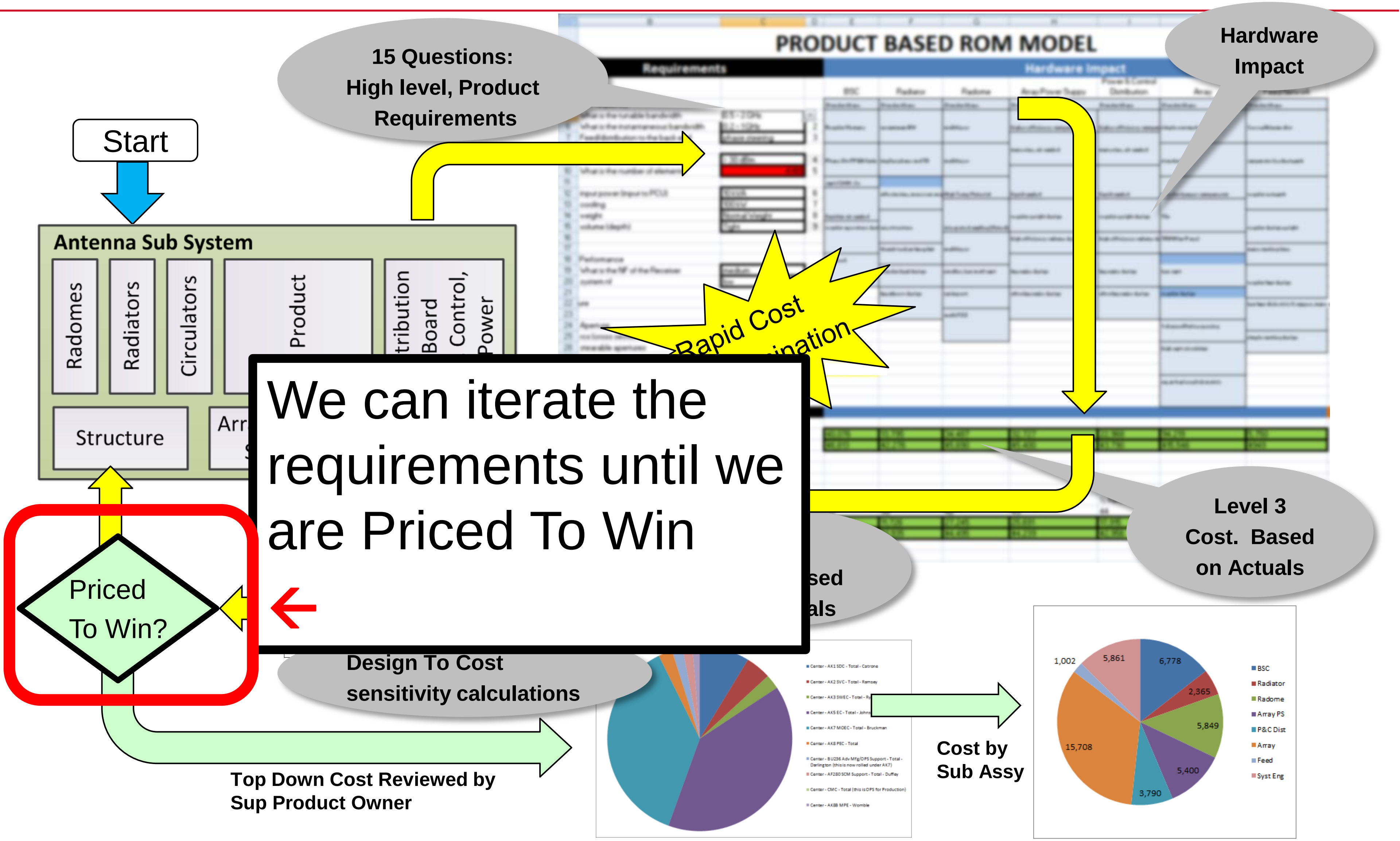

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Concluding Comments

- Strengths
  - Integrated ROM/Final Bid/Execution planning
  - Historical Actuals based
  - Organizational roles accounted
  - Quantitative complexity factors
  - Very fast
  - Accuracy
- Weaknesses
  - Data collection burdensome
  - What is easy to use is also easy to abuse

Backup and alternative slides