Functional Analysis, Risk Analysis and Mind Mapping Synergy

CSVA 2011 Conference
Toronto, Ontario
Nov 14 -16, 2011

Dr. Michael Mladjenovic and
Tom Fletcher

AGENDA

- Value creation Contradiction
  - FAST
  - FPS
  - Risk
  - Creativity
- Integrated NPI Roadmap
- Application demonstration

VALUE ENGINEERING***

Systematic methodology that analyzes the functions of items and systems so that required functions are achieved at the lowest possible life-cycle cost

$$Value = \sum_{i=1}^{n} \frac{(Function)_i}{\sum_{j=1}^{g} (Cost)_j}$$

$i = number \quad of \quad Functions$

$j = elements \quad of \quad the \quad Cost \quad associated \quad with \quad each \quad of \quad the \quad Functions$

*** Note: Value Engineering (VE), Value Analysis (VA), Value Management (VM), and Value Planning (VP) names describe small variations in the general Value Method and will be used as synonyms during presentation

VALUE CREATION CONTRADICTION

In order to successfully manage value creation and retention organizations must create and manage project portfolio and associated ***organizational execution and creativity capability*** that will constantly optimize value creation and retention system.

$$Value = \sum_{i}^{n}\left[\sum_{k}^{m}\left(\frac{(Performance)_m}{\sum_{l=1}^{n}(Cost_{Performance})_l} + \frac{(Capability)_m}{\sum_{l=1}^{n}(Cost_{Capability})_l}\right)\right]$$

$i = number\ \ of\ \ Functions$

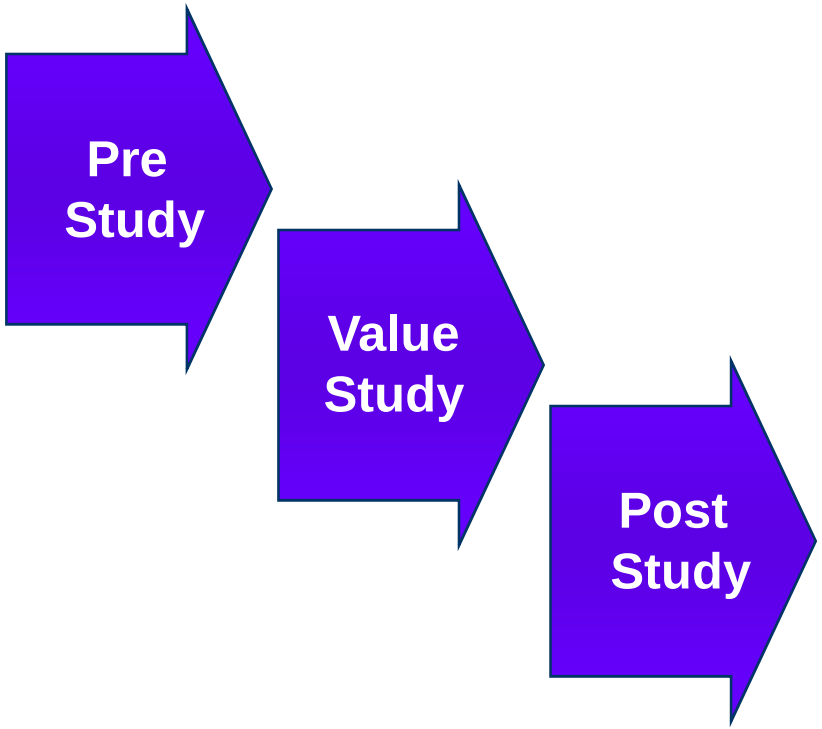
$j = elements\ \ of\ \ the\ \ Cost\ \ associated\ \ with\ \ each\ \ of\ \ the\ \ Functions$

$k = number\ \ of\ \ CTQs\ \ for\ \ each\ \ of\ \ the\ \ Functions$

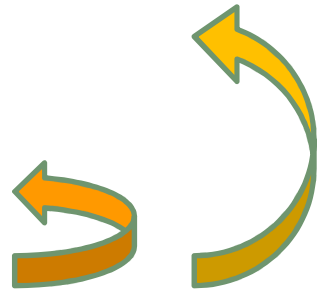
$l = elements\ \ of\ \ the\ \ Cost\ \ associated\ \ with\ \ each\ \ of\ \ the\ \ CTQs$

- Record image
  - 10 Megapixels
    - +/- 100 pixels

How is it Applied?



- Methodology
  - ***PRE-STUDY***
  - ***VALUE STUDY***
    - Information Phase
    - Function Analysis Phase
    - Functional Performance Specification
    - Risk analysis
    - Creative Phase
    - Evaluation Phase
    - Development Phase
    - Presentation Phase
  - POST-STUDY



Function Analysis Phase

Identify Functions

Identify Costs

Allocate Cost to Functions

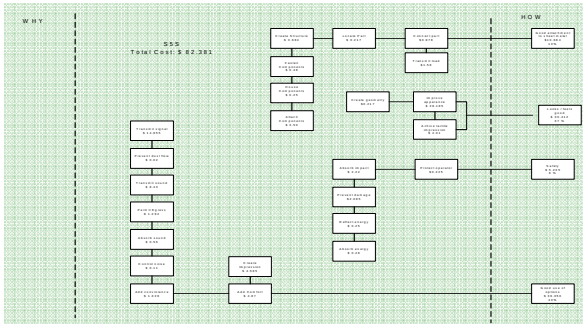
Develop FAST

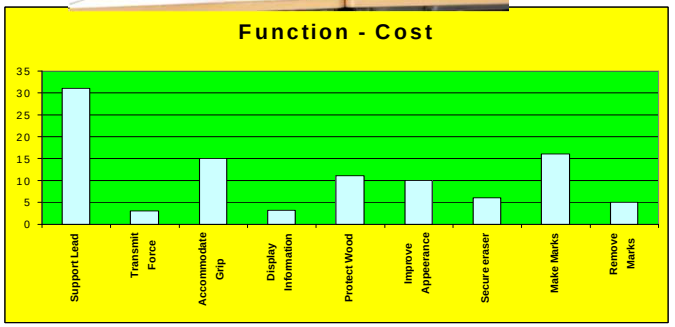
	Support Lead	Transmit Force	Accommodate Grip	Display Information	Protect Wood	Improve Appearance	Secure eraser	Make Marks	Remove Marks
Body (Barrel)	☐	☐	☐	☐					
Paint					☐	☐			
Band						☐	☐		
Lead (Graphite)								☐	
Eraser									☐

Level 1	Component	Function	Cost	%
	Pencil Assembly	Make Marks	89	89%
		Record Data	11	11%
		Total	100	100%

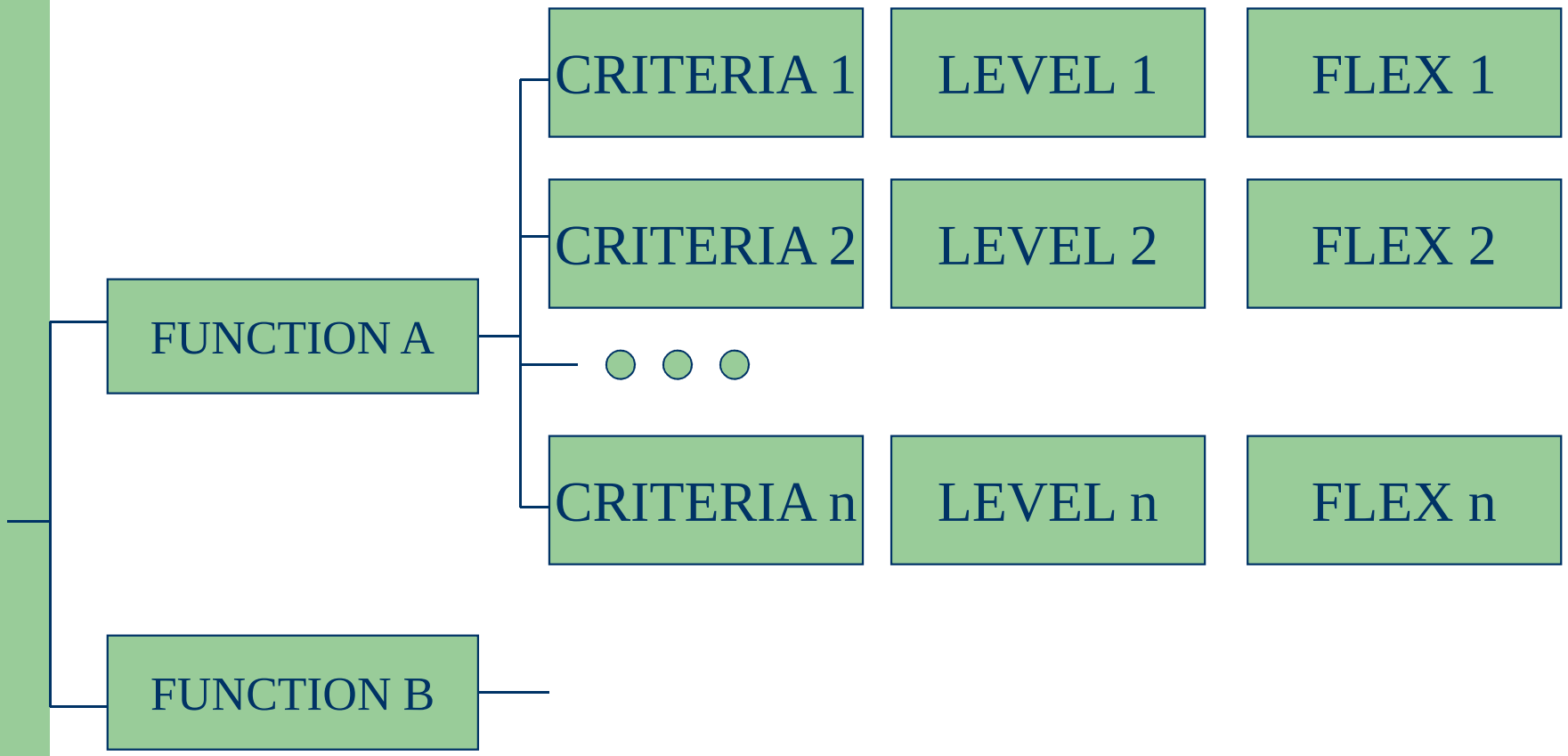
Level 2				
	Body (Barrel) = 52	Support Lead	31	31%
		Transmit Force	3	3%
		Accommodate Grip	15	15%
		Display Information	3	3%
	Paint = 19	Protect Wood	11	11%
		Improve Appearance	8	8%
	Band = 8	Secure Eraser	6	6%
		Improve Appearance	2	2%
	Lead (Graphite) = 16	Make Marks	16	16%
	Eraser = 5	Remove Marks	5	5%
		Total	100	100%

			Total	100	0
Part	Material	Labor	Overhead	Total	%
Body (Barrel)	35	12	5	52	100%
Paint	10	7	2	19	100%
Band	4	3	1	8	100%
Lead (Graphite)	9	3	4	16	100%
Eraser	3	1	1	5	100%

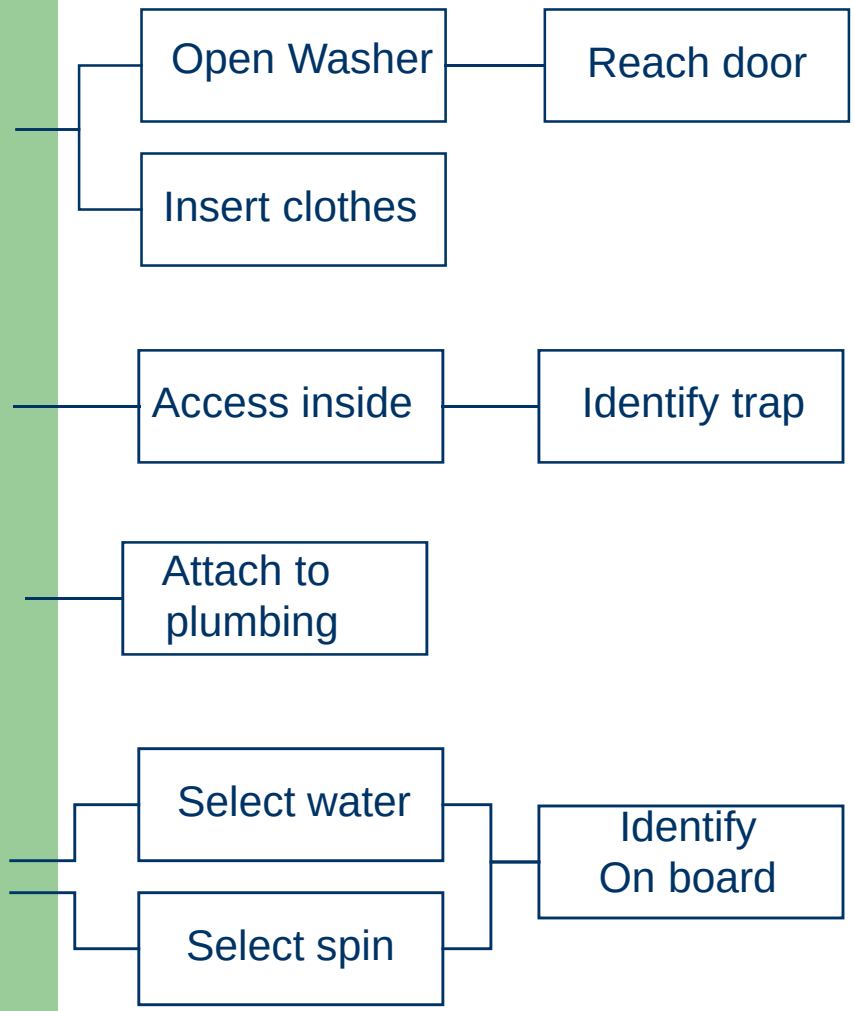




Function performance specification phase



Ex: washer



Size of door	24 x 24 in	F2
Position of door	front	F0
Quantity of clothes	8 cu.ft	min
Size of trap	3 x 3 in	min
Quantity of detergent	1 cup	F1
Type of connection	quick	F0
Position of connection	back	F0
Temperature levels	3	min
Spin cycles	4	max
Location of controls	front	F1

Courtesy of Lucie Parrot

Characterizing functions

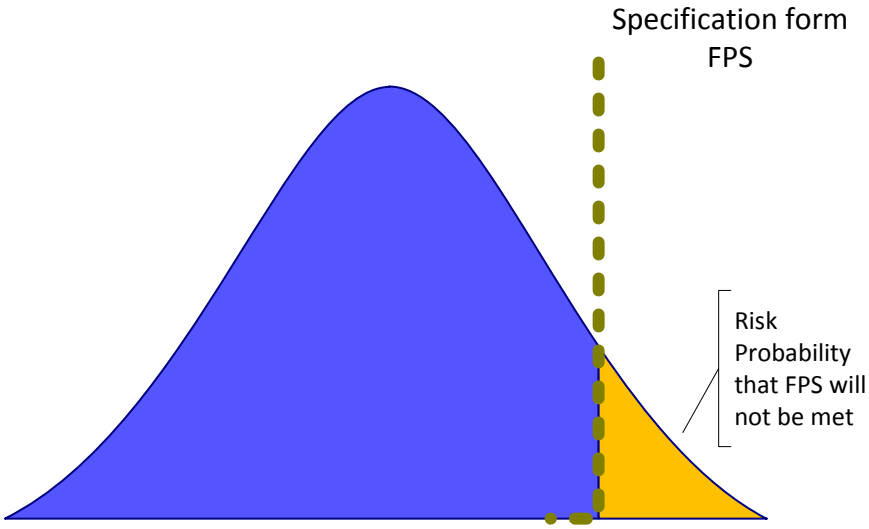
Function	Criteria	Level	Flex	notes
Transfer load	Vertical load	500 lb	+50, -10 lb	Positioned in centre
Show targets	Number of concurrent targets	10	-20% for each target less	
	Type of targets	mobile	F0	In all directions
Carry passengers	Number seated	35	F1	
Greet clients	Waiting time	3 minutes	Maximum	

Courtesy of Lucie Parrot

Risk

The ISO 31000 (2009) /ISO Guide 73 definition of risk is the 'effect of uncertainty on objectives'. In this definition, uncertainties include events (which may or not happen) and uncertainties caused by a lack of information or ambiguity. This definition also includes both negative and positive impacts on objectives.

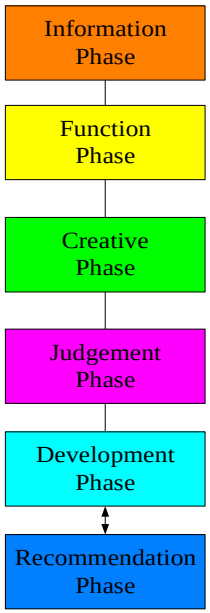
http://en.wikipedia.org/wiki/Risk



VALUE ENGINEERING JOB PLAN

Analytics vs. Creativity

- Value-based decision process
- Uses functional approach
- Follows a very structured, systematic and organized plan
- Focus towards optimal possible solution based on ***creativity techniques***

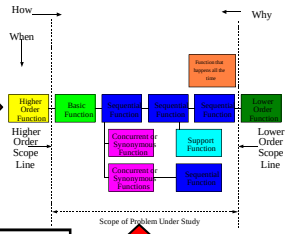


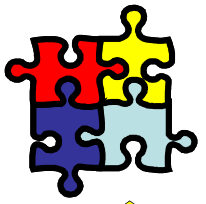
Phase	Analytical	Creative
Preparation	✪	✪
Information	✪	✪
Analysis	✪	✪
Creation	✪	✪
Evaluation	✪	✪
Development	✪	✪
Presentation	✪	✪
Follow-up	✪	✪

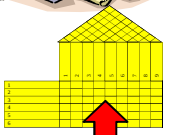
INTEGRATED NPI JOB PLAN

Analytics vs. Creativity

MARKET DOMAIN | **INFORMATION PHASE** | **FUNCTION PHASE** | **FPS & RISK** | **CREATIVE PHASE** | **EVALUATION AND DEVELOPMENT PHASE**

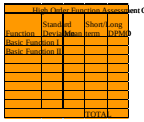


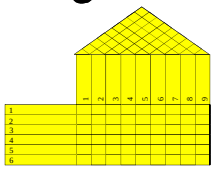




ASSESSMENT CARD

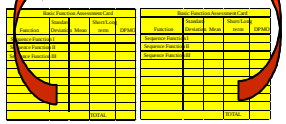
QFD

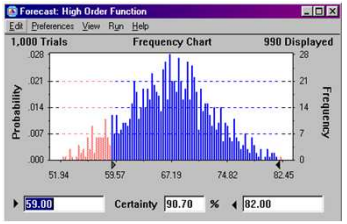


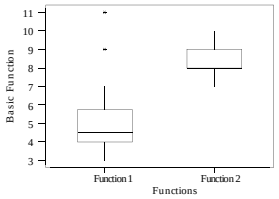


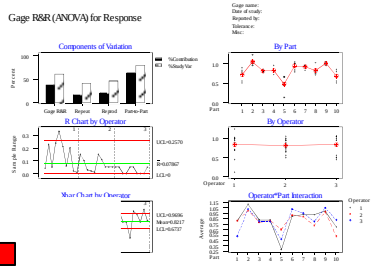
ANALYZE IMPROVE/DESIGN OPTIMIZE

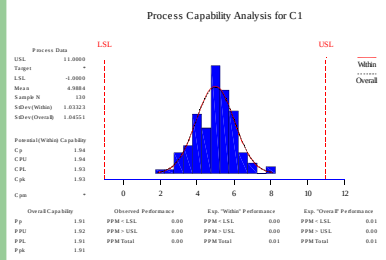
MEASURE

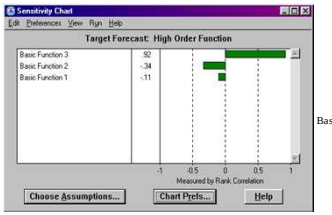


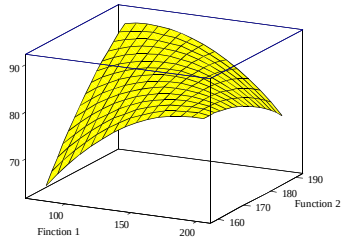


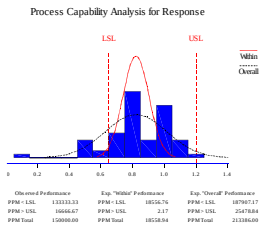












CONTROL/VALIDATE

System Design

Subsytem Design

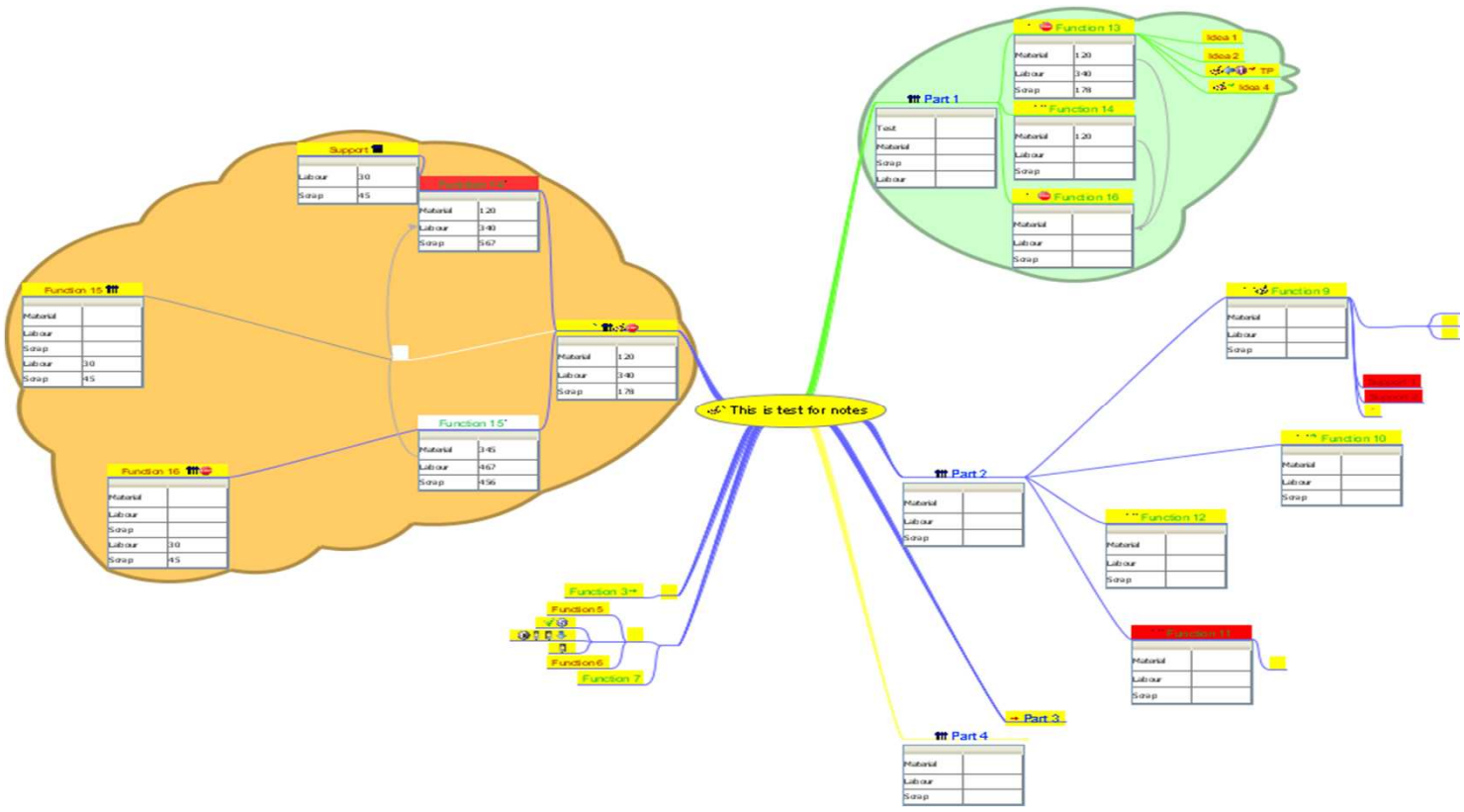
Component Design

Process design

FAST, FPS, RISK and CREATIVITY Synergy

- Ability to further enhance insight in “Big picture” of the project
- Ensure VOC
- Reduce overall solution Risk
- Optimize collective learning
- Boost creativity

Demonstration



Thank you

Questions