creatiVE Value Engineering

Value Improvement Through Innovation

The Time to Cost

Value Engineering

by

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Biography

- **Ziad Eldada, M.Eng, CVS**
  - Value engineer
  - Specialized in computer design and applications
  - Developed several VE software tools to assist in product cost alignments, margin improvement and reverse engineering
  - Lead or Participated in more than 30 VE studies in the Electronic Manufacturing industry.

Total Value Engineering Solution

- **Value Engineering Services:**
  - ✓ Target Costing
  - ✓ Product Quality Analysis (FMEA, Components derating, Reliability)
  - ✓ PUPS Optimization
  - ✓ Reverse Engineering
  - ✓ Inventory Reduction
  - ✓ Competitive Bidding Cost Reduction (CR Machine)
  - ✓ Technology Upgrade
- **VAVE Workshop Facilitation**
  - ✓ Unique methodology with Value Index
  - ✓ Complemented by PCM the Cost Buster Software tool
- **Professional Training in:**
  - ✓ Value Engineering

Introduction

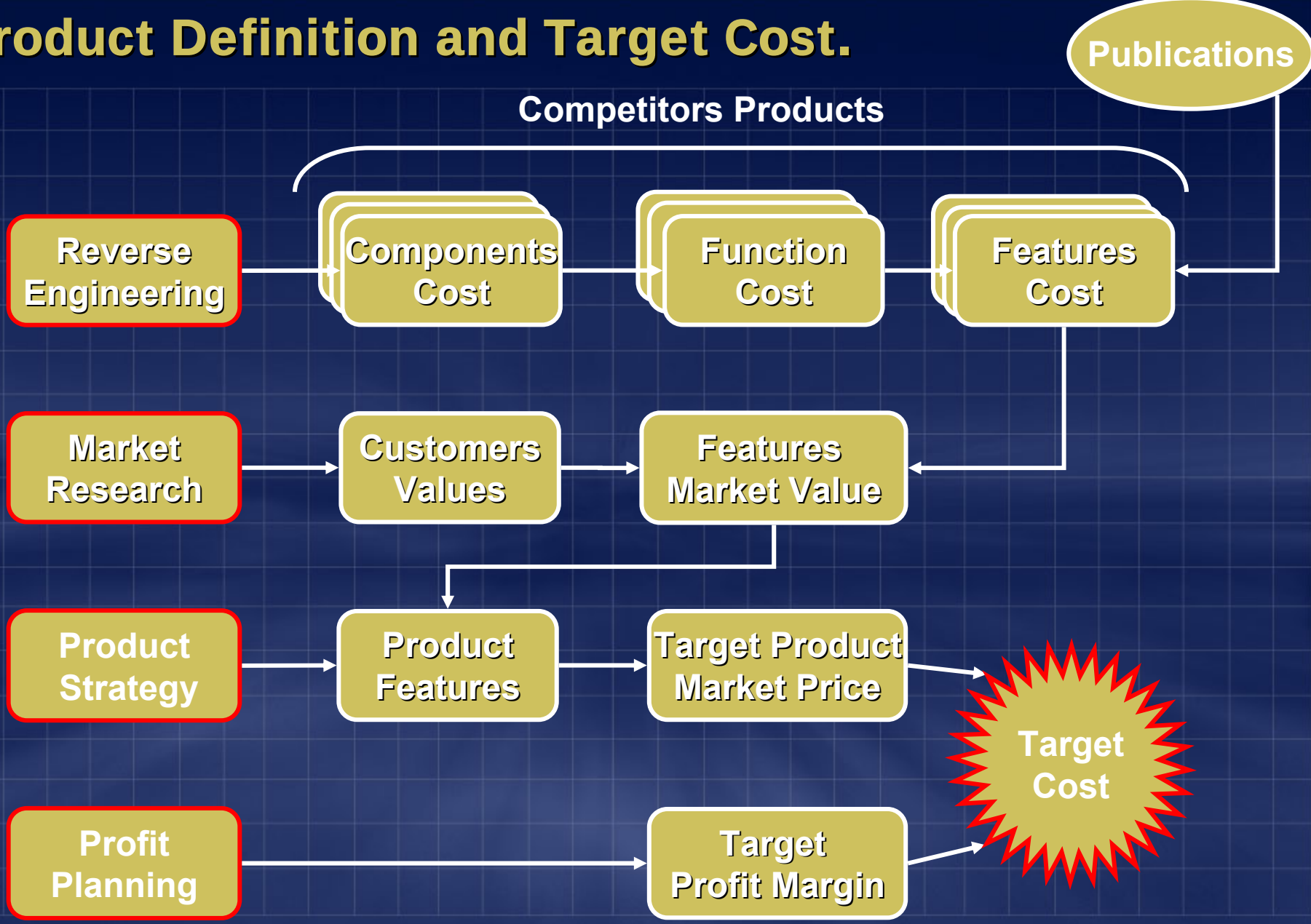
- Rigorous VE methodology is not often used in product development
- New product introduction, misses target cost at the expense of product functionalities and time to market.
- Long production ramp up, allowing product cost alignments' are things of the past, Product cost target must be met up front.

Time to Cost Objectives

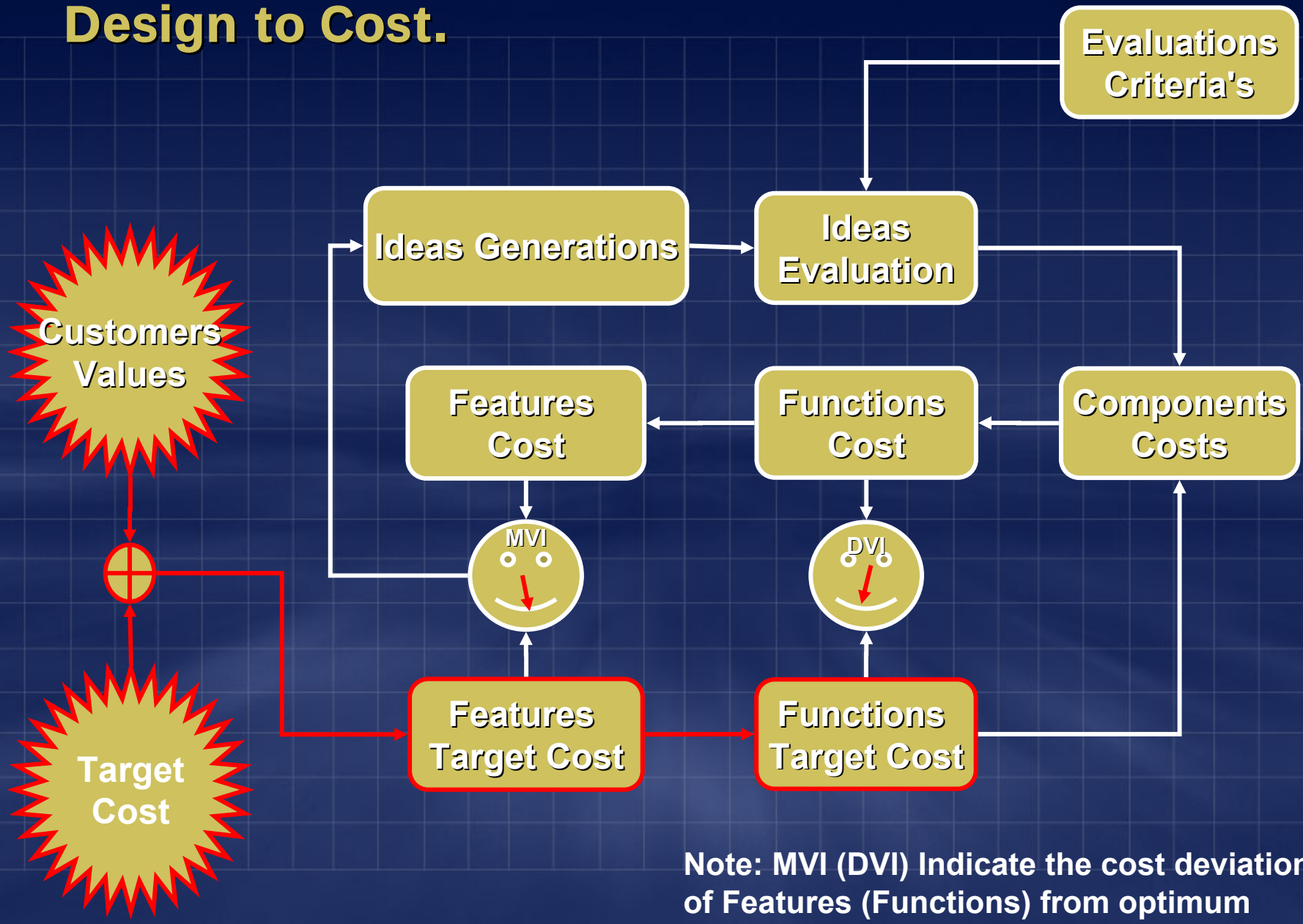
Product Optimization to meet:

- **Customers expectations**
- **Organization Values**
- **True Target Cost**
- **Best in class**
- **Time to cost**

Product Definition and Target Cost.



Design to Cost.



Note: MVI (DVI) Indicate the cost deviation of Features (Functions) from optimum

Features Analysis

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Client: Kitchenhelp

Workshop: Coffee Maker No: 15

Facilitator: Ziad Eldada , Waterloo,Canada Date: 2005/08/22

Report: Features Analysis Cost: 84 $ Target: 60 $

Product: CVE201AA Issue: 1w1 Esspresso like Coffee Maker

			Components Functions										
Product Features	Costomer Ranking	Feature Cost	Control Brew	Display	Filters Coffee	Grinds Coffee	Heat Water	Holds Coffee	Holds Water	Push Water	Safety & Regulation	Set Clock	Warm Coffee
			Total Function Cost										
Absolute Function Cost			8.256	6.919	7.762	9.122	9.358	5.304	7.559	5.293	7.229	8.549	8.149
Relative Function Cost			0.138	0.115	0.129	0.152	0.156	0.088	0.126	0.088	0.120	0.142	0.136
Relative Function Importance			0.100	0.071	0.100	0.107	0.122	0.064	0.090	0.061	0.075	0.108	0.102
Features			Component - Function Cost										
Automatic Control	0.074	9.20	0.212	0.774	0.779	1.555	0.626	0.735	1.189	0.196	1.253	1.379	0.499
Display Time	0.108	7.46	0.196	0.700	0.131	1.450	0.958	0.260	0.172	0.930	0.509	1.361	0.792
Easy to clean	0.069	7.15	0.734	0.921	1.005	0.653	1.059	0.015	0.199	0.339	0.851	0.680	0.692
Has 6+ cup capacity	0.091	7.61	0.288	0.699	1.225	0.321	0.127	1.004	1.212	0.752	0.598	0.278	1.107
Looks nice	0.152	7.69	0.814	0.002	1.276	0.315	1.391	0.555	1.060	0.451	0.056	1.083	0.690
Safety Shut down	0.082	5.96	0.642	0.034	1.149	0.578	0.876	0.047	0.872	0.199	0.769	0.575	0.222
Serve during brew	0.065	5.09	1.069	0.457	0.065	0.378	0.558	0.050	0.356	0.132	0.206	0.956	0.866
Smells like Espresso	0.108	6.07	0.593	0.238	0.167	1.373	1.279	0.432	0.022	0.067	0.356	0.443	1.103
Space Saver	0.078	8.82	0.828	0.912	0.531	0.454	1.243	0.751	1.025	0.846	1.090	0.935	0.201
Tastes like Espresso	0.078	5.57	1.051	0.362	1.031	0.209	0.091	0.739	0.501	0.294	0.108	0.566	0.620
Warm coffee	0.048	5.37	1.029	0.862	0.209	0.408	0.830	0.481	0.491	0.259	0.514	0.043	0.245
Works with different beans	0.048	7.51	0.800	0.959	0.194	1.428	0.321	0.236	0.460	0.829	0.918	0.251	1.114

Functional Analysis

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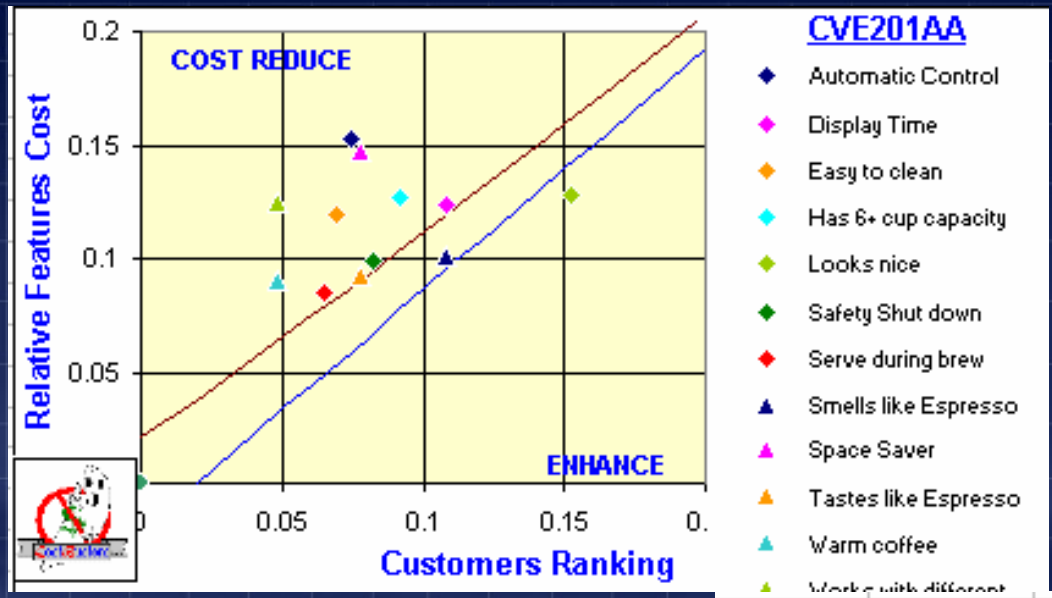
Facilitator: Ziad Eldada , Waterloo,Canada Date: 2005/08/22

Report: Function Analysis Cost: 84 $ Target: 60 $

Product: CVE201AA Issue: 1w1 Esspresso like Coffee Maker

Part No.	Component Description	Extended Component Cost	Control Brew	Display	Filters Coffee	Grinds Coffee	Heat Water	Holds Coffee	Holds Water	Push Water	Safety & Regulation	Set Clock	Warm Coffee
			Components Functions										
			Total Function Cost										
Absolute	Function Cost		8.256	6.919	7.762	9.122	9.358	5.304	7.559	5.293	7.229	8.549	8.149
Relative	Function Cost		0.138	0.115	0.129	0.152	0.156	0.088	0.126	0.088	0.120	0.142	0.136
Relative	Function Importance		0.100	0.071	0.100	0.107	0.122	0.064	0.090	0.061	0.075	0.108	0.102
	Components		Component - Function Cost										
TCE201AA	Transformation Cost	22.00	1.328	1.575	1.069	4.001	2.507	0.138	3.980	0.089	1.745	2.008	3.559
CVE20110	Grinder Mechanism	12.00	0.995	0.898	1.723	1.158	1.750	0.695	0.736	0.931	1.234	1.280	0.600
CVE20107	Display Panel	7.00	0.893	0.074	0.610	0.595	0.924	0.681	0.615	0.082	0.792	1.000	0.735
CVE20105	Water Well	6.00	0.496	0.886	1.011	0.427	0.966	0.517	0.160	0.401	0.417	0.177	0.542
CVE20112	Control Panel	6.00	0.325	0.414	0.692	1.178	0.507	1.026	0.114	0.956	0.194	0.185	0.410
CVE20103	Carafe	5.00	0.881	0.602	0.672	0.111	0.833	0.165	0.464	0.132	0.240	0.692	0.208
CVE20104	Coffee Warmer	5.00	1.064	0.981	0.403	0.160	0.071	0.591	0.095	1.007	0.394	0.233	0.000
CVE20108	Body shape	5.00	0.598	0.650	0.336	0.166	0.543	0.236	0.077	0.582	0.738	0.695	0.377
CVE20111	Power wiring & sensors	5.00	0.317	0.228	0.231	0.440	0.217	0.514	0.349	0.148	0.505	1.068	0.984
CVE20106	Heating Element	4.50	0.620	0.223	0.335	0.502	0.273	0.338	0.428	0.356	0.563	0.729	0.134
CVE20109	Beans container	4.00	0.485	0.138	0.527	0.238	0.599	0.283	0.301	0.458	0.225	0.230	0.516
CVE20102	Brew Basket	2.00	0.253	0.251	0.154	0.145	0.167	0.120	0.240	0.152	0.183	0.250	0.084

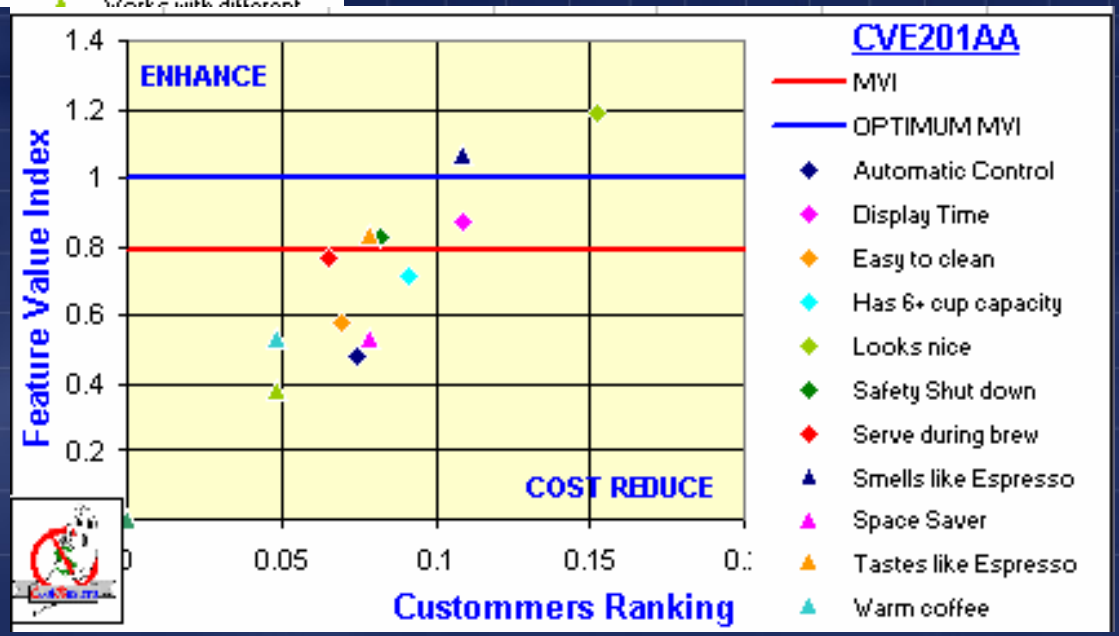
Features Analysis: Marketing Value Index



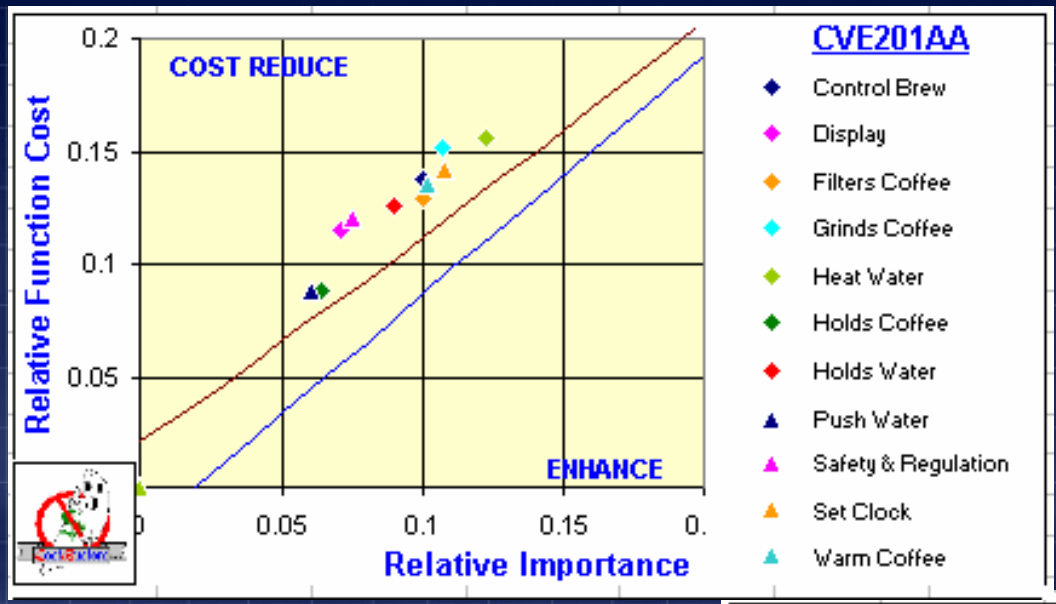
Notes:

Costs are relative to target.

$$VI = \frac{Importance}{Cost}$$



Functional Analysis: Design Value Index



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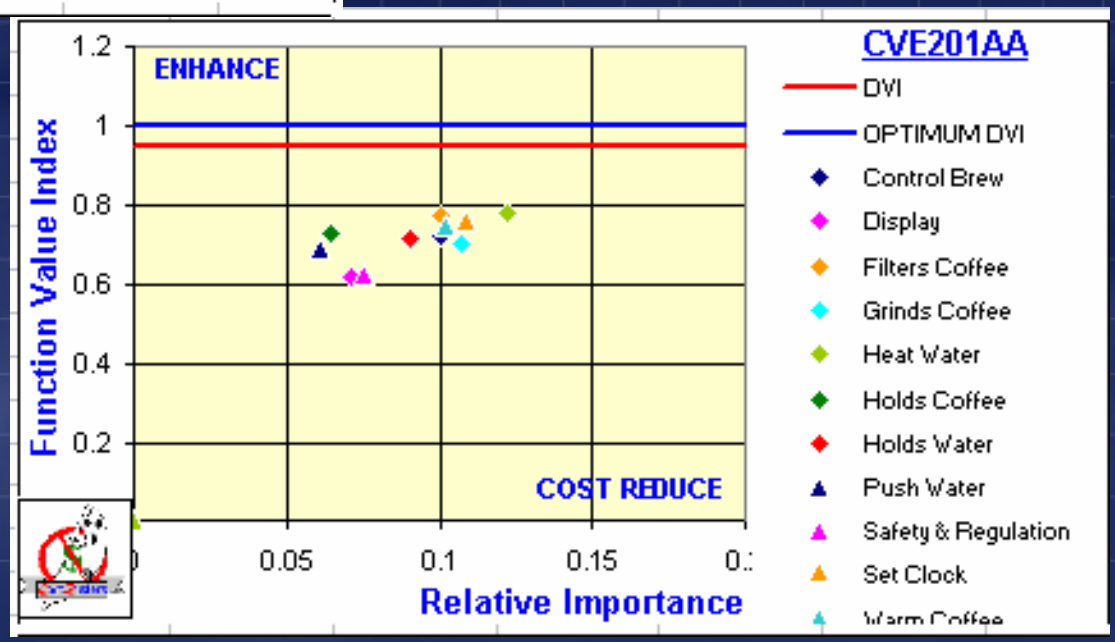


Brain Storming

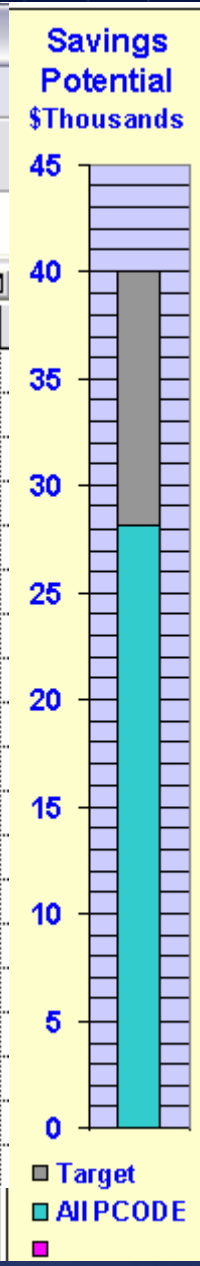
PCM The Cost Buster 01B [FXP]

tics Data Value_Index Creativity Evaluation Development Edit Output Help

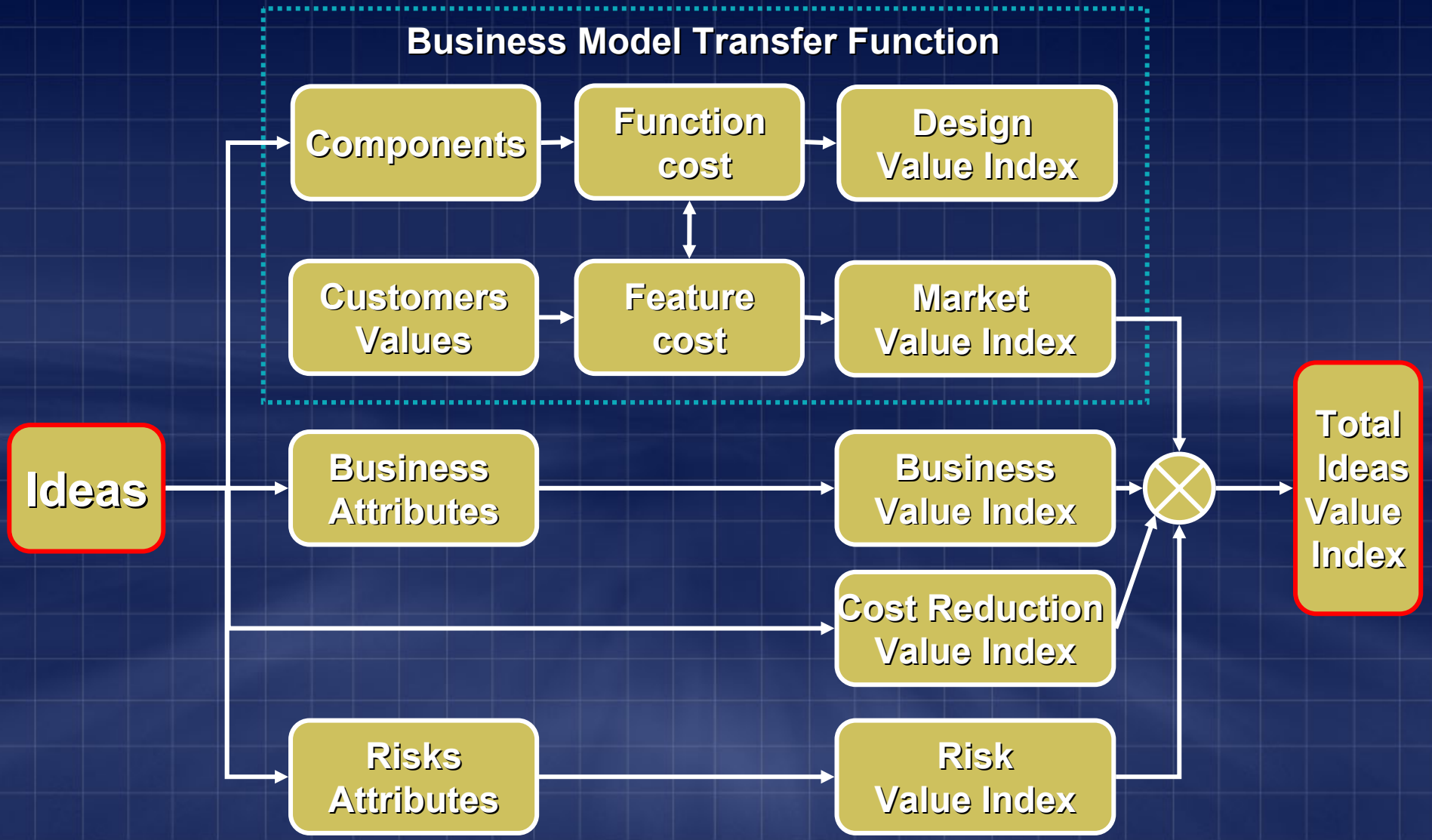
ose | Delete | New Idea | Champion | View | Select PCODE | Ideas Relations

Creativity: Coffee Maker Workshop Selected View: PCOD : All PCODE

No.	Champ.	Idea Name	PCODE	UnitSave	%VOL	Cost	Pot'l	Target	Volume	$K/Vol
6	A:AL	Replace rubber hose with plastic tube	CVE201AA	3.00	100	84	57	60.00	1041	3
5	B:GL	Use off the shelf coffy grinder	CVE201AA	8.00	100	84	57	60.00	1041	8
4	C:MF	Reduce no of thermistors	CVE201AA	2.00	100	84	57	60.00	1041	2
3	A:GC	Replace LED display with LCD	CVE201AA	5.00	100	84	57	60.00	1041	5
2	B:BM	Use off the shelf clock	CVE201AA	3.00	100	84	57	60.00	1041	3
1	C:GV	Replace SS housing with Plastic molding	CVE201AA	6.00	100	84	57	60.00	1041	6



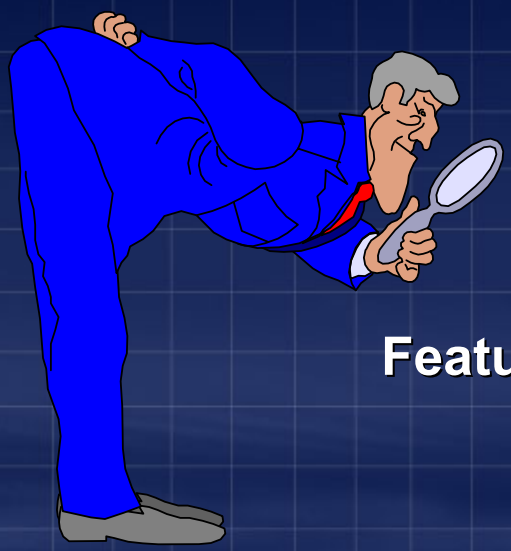
Ideas Evaluation



Value Index Principles : Product Values

- **Functions Values**
  - Identify the functions provided by components
  - Establish the costs per function.
- **Features Values**
  - Identify the product features perceived by customers, and provided by the functions
  - Establish the costs per feature.
- **Customers Values**
  - Customers uses features, customers values quantify the importance of such feature. This is where the customer voice is entered into the equation.
- **Functions Importance**
  - Defined as the importance of the functions in delivering the required features at the customer required cost (value).

Value Index Principles : Definitions



It is also called:
Marketing Value Index

$$\text{Feature Value Index} = \frac{\textit{Customer Ranking}}{\textit{Feature Cost}}$$

$$\text{Function Value Index} = \frac{\textit{Function Importance}}{\textit{Function Cost}}$$

This too is also called:
Design Value Index

Value Index Principles : Improvement Values

- **Marketing Value Index.**
  - Quantify the impact of an idea on functions cost, knowing the relation between functions and features, compute the impact of such idea on features cost, then derive the variation of features Value Index or Marketing Value Index.
- **Cost Reductions Value Index.**
  - Defined as the contribution of an idea into the total target saving.
- **Risk Value Index.**
  - Define and quantify all risks such as Technical, Financial, Resource…..
  - Quantify their impacts on each generated idea.
- **Business Value Index.**
  - Define and quantify business enhancements attributes such as: Lead times, Components Portfolio, Company image, Quality and Reliability ratings etc…
  - Quantify their impacts on each generated idea.
- **Total Value Index.**
  - A linear combination of all above, revealing the true value of an idea.

Evaluations Criteria's: Values Definitions

- Customers Values → Marketing Value Index
- Business Values → Business Value Index
- Risk Values → Risk Value Index
- Cost Reductions Values → CR Value Index
- Total Value → Total Value Index

Ranking methods

- **Priority Ranking** - provides rank order importance of requirements by nominally ranking them from highest to lowest priority.
- **Multi-voting** - indicates importance based upon the absolute number of votes each requirement receives. Typically participants are given a number of votes which are equivalent with a third of the requirements.
- **Linear Rating Scale** - denotes requirement priorities on a scale of 1-5 or 1-10. Respondents indicate preferences on the scale selected for the inquiry.
- **Constant Sum** - demonstrates customer priorities based upon the total number of points participants assign to requirements. Frequently customers are giving 100 points and allowed to assign them as they will to the set of requirements. Some analysis is required to examine if any participants skewed the results.
- **Dollar Distribution** - customers divvy up perhaps $100 or $1000 to understand how customers make buying choices and which features are associated with the most value (priorities).
- **Kano Survey** - identifies requirements which are expected, satisfiers and exciters. It asks the same question twice in a positive and negative manner such as "If I had . . . ", and "If I didn't have . . .".
- **Analytic Hierarchy Process - provides the importance of requirements as percentages based upon forced pair comparisons.**
- **Conjoint Analysis** - develops the best combination of requirements at various product levels such as basic versus luxury through forced ratings of different combinations and intensity levels.

Customer Value Index

Customer Ranking for PCODE : CVE201AA

Rank	Total	Feature	Desig	A	B	C	D	E	F	G	H	I	J	K	L	M
0.074	17	Automatic Control	A	•	A4	C1	D3	A2	A3	G2	H4	I5	J1	A5	A2	
0.108	25	Display Time	B	•	•	B2	B4	E5	F5	G4	B5	B4	B3	B2	B4	
0.069	16	Easy to clean	C	•	•	•	D5	E2	F1	C3	C2	C2	C3	C4	L4	
0.091	21	Has 6+ cup capacity	D	•	•	•	•	E5	D2	D3	H3	I5	J2	D4	D3	
0.152	35	Looks nice	E	•	•	•	•	•	E3	E3	E4	I5	E5	E4	E3	
0.082	19	Safety Shut down	F	•	•	•	•	•	•	F3	F4	F5	J1	K4	L5	
0.065	15	Serve during brew	G	•	•	•	•	•	•	•	H3	I2	J1	G5	G3	
0.108	25	Smells like Espresso	H	•	•	•	•	•	•	•	•	H2	H3	H4	H5	
0.078	18	Space Saver	I	•	•	•	•	•	•	•	•	•	J4	K1	L1	
0.078	18	Tastes like Espresso	J	•	•	•	•	•	•	•	•	•	•	J5	J3	
0.048	11	Warm coffee	K	•	•	•	•	•	•	•	•	•	•	•	K5	
0.048	11	Works with different bear	L	•	•	•	•	•	•	•	•	•	•	•	•	

Business Value Index

Business Attributes For Workshop:Coffee Maker

BIMP	Total	Business Attribute	Desig	A	B	C	D	E	F	G	H	I	J
0.202	23	Aesthetics	A	▪	A3	C1	A5	A4	A5	A3	A2	I2	
0.132	15	Colour	B	▪	▪	C4	B5	B3	F3	G1	B4	B2	
0.140	16	Economy	C	▪	▪	▪	D2	C4	C3	G3	C3	I2	
0.123	14	Maintenance	D	▪	▪	▪	▪	D2	F2	D5	H2	D4	
0.070	8	Performance	E	▪	▪	▪	▪	▪	E2	G1	E5	I1	
0.088	10	Safety	F	▪	▪	▪	▪	▪	▪	G3	F4	I2	
0.132	15	Automation	G	▪	▪	▪	▪	▪	▪	▪	G4	G2	
0.026	3	Mfg Lead Time	H	▪	▪	▪	▪	▪	▪	▪	▪	I2	
0.088	10	Operability	I	▪	▪	▪	▪	▪	▪	▪	▪	▪	

Risk Value Index

Risk Attributes For Workshop:Coffee Maker

RIMP	Total	Risk Attribute	Desig	A	B	C	D	E	F	G
0.194	13	Customer Acceptance	A	▪	A4	A2	A1	A3	A2	G2
0.149	10	Design Management Resourc	B	▪	▪	B4	D4	B1	F2	B4
0.149	10	Development Scope	C	▪	▪	▪	C3	E3	C4	C2
0.104	7	Feasibility Study Difficu	D	▪	▪	▪	▪	E4	D2	G2
0.164	11	Implementation Scope	E	▪	▪	▪	▪	▪	F4	E3
0.164	11	Investment Range	F	▪	▪	▪	▪	▪	▪	F4
0.075	5	Technical Difficulty	G	▪	▪	▪	▪	▪	▪	▪

Cost Reductions Values

Defined as the idea contribution into target saving.

$$CVI = \frac{\text{Net unit Savings}}{\text{Target Total Savings}}$$

E.g.

Idea Annual Saving:	120K
Workshop Target Saving:	1M
CR Value Index:	120K/1M= 0.12

Total Value Index

Linear Combination of all Value Indexes

$$TVI = \frac{\alpha.MVI+\beta.BVI+\gamma.RVI+\delta.CVI}{\alpha+\beta+\gamma+\delta}$$

Where α,β,γ,δ are defined as attribute importance parameters, set to define the business needs.

Evaluation

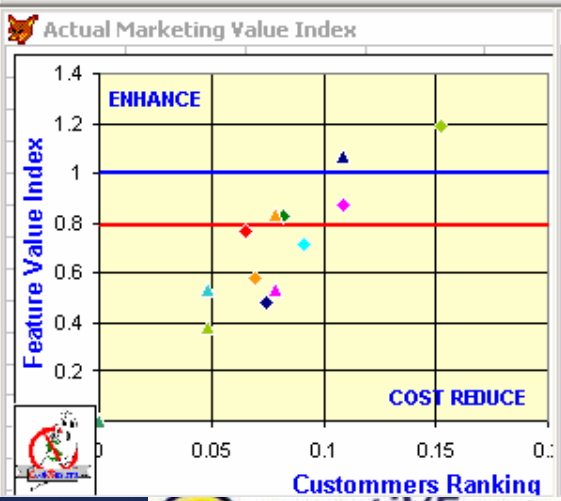
Close | Delete | New Idea | Champion | View | Select PCODE | Ideas Relations | Compute

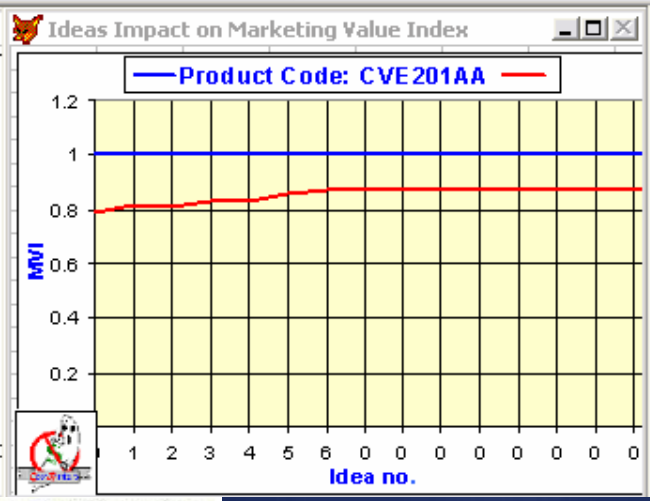
Evaluation: Coffee Maker Workshop — F=Reject/Dependant (R/D) — 0.36 0.11 0.36 0.18

No.	Champ.	Idea Name	Pcode	Save	$K/Vol	F	Sc	Sel	CVI	BVI	mMVI	RVI	TVI
6	A:AL	Replace rubber hose with plastic tube	CVE201AA	3	3123			1	0.08	0.07	13.7	0.95	0.21
5	B:GL	Use off the shelf coffy grinder	CVE201AA	8	8328			1	0.21	-0.13	23.7	0.73	0.20
1	C:GV	Replace SS housing with Plastic molding	CVE201AA	6	6246	D		1	0.16	-0.02	21.7	0.77	0.20
3	A:GC	Replace LED display with LCD	CVE201AA	5	5205	D		1	0.13	0.18	18.4	0.68	0.19
4	C:MF	Reduce no of thermistors	CVE201AA	2	2082			1	0.05	0.24	7.0	0.63	0.16
2	B:BM	Use off the shelf clock	CVE201AA	3	3123	D		1	0.08	0.10	-2.5	0.50	0.13

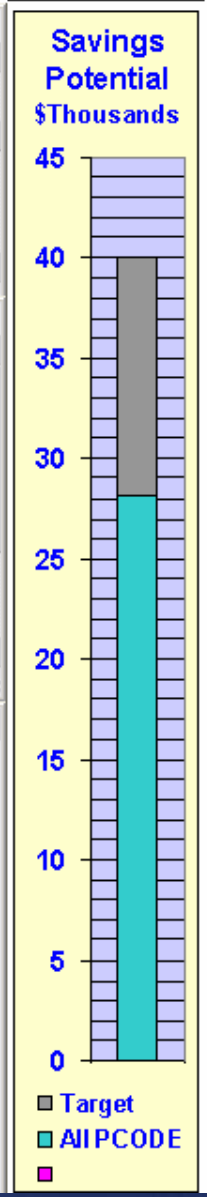
Idea Impact on Business Attribute: (-9<BIF<9) | Idea Impact on Functions: (-9<FIF<9) | Risk Analysis: (0<RIF<9)

No.	[Business Attributes]	Score	BIF	[Functions]	RCost	FIF	[Risk Elements]	Score	RIF
5	Aesthetics	0.20	-3.00	Heat Water	0.16	1.00	Customer Acceptance	0.19	3.00
5	Economy	0.14	2.00	Grinds Coffee	0.15	2.00	Investment Range	0.16	1.00
5	Automation	0.13	-3.00	Set Clock	0.14	4.00	Implementation Scope	0.16	1.00
5	Colour	0.13	-4.00	Control Brew	0.14	6.00	Development Scope	0.15	2.00
5	Maintenance	0.12	1.00	Warm Coffee	0.14	2.00	Design Management Resource	0.15	4.00
5	Operability	0.09	1.00	Filters Coffee	0.13	7.00	Feasibility Study Difficulty	0.10	5.00
5	Safety	0.09	1.00	Holds Water	0.13	5.00	Technical Difficulty	0.08	1.00
5	Performance	0.07	-4.00	Safety & Regulation	0.12	0.00			0.00
5	Mfg Lead Time	0.03	1.00	Display	0.12	0.00			0.00





Idea Description



Conclusion

- The scenario:

  There's never time to do it right,
  but always to do it over.

- is now replaced by:

  Do it right upfront

- Thanks to VE methodologies, assisted by VE software tools.

Future Development

- Integration with Cost Reduction Machine Results.
- Integration of design CR Projects.
- Remote Value Index Workshops. (VAVE on the WEB)
- Projects Scheduling and Status Reporting