Decision Matrices

Using a 0-to-100-point scale, each team member individually weighted the importance of the requirements then took the average to come up with a final weight. Following this, we graded the design ideas being "-1" = Not Ideal, "0" = Neutral and "1" = Ideal.

Frame					
Requirements	Weight	Wood	Aluminum	PVC	Steel
Overall Weight (lb)	12	0	-1	1	-1
Durability	27	1	1	0	1
Cost	26	1	-1	1	-1
Workability/Repairs	35	1	0	1	-1
Total	100	88	-11	73	-46

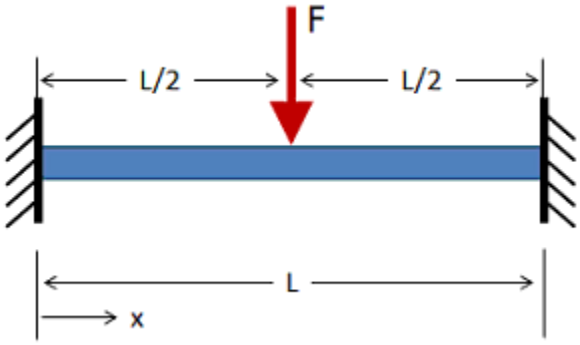
Drawing Meduim							
Customer Requirments	Weight	Pen	Marker	Spray Paint	Chalk	Crayon	Air Brush
Surface Variety	37	-1	0	1	0	0	1
Cost	13	1	1	0	1	1	-1
Setup/ Replacablility	17	1	1	0	1	1	0
Lifespan	20	0	1	0	-1	0	1
Cleaniness	13	1	1	-1	0	1	0
Total	100	6	63	24	10	43	44

Linear Motion Constraints					
Customer Requirments	Weight	Slide Bearing Carriages	Aluminum Extrusion/ Roller Carriages	Linear Shaft Rods	Slide Rail
Cost	13	-1	0	1	0
Setup	15	1	1	0	1
Precision	27	1	1	1	1
Ease of Movement	18	1	1	1	0
Simplicity	27	1	0	1	1
Total	100	74	60	85	69

Motor Drive					
Customer Requirements	Weight	Lead Screw	GT2 Belt/ Pulley	Round Belt/Pulley	Linear Actuator
Cost	13	-1	1	1	-1
Setup	17	1	0	0	1
Precision	18	1	1	0	0
Speed	15	0	1	1	-1
Weight	10	-1	1	1	-1
Reliability	27	1	1	0	1
Total	100	39	83	38	6

Engineering Analysis

Deflection on linear shaft rods



$$\delta_{max} = \frac{FL^3}{192EI} \qquad @\, x = L/2$$

$I = \pi R^4 / 4$

F = 5 lbs.
L = 48 in.
E = 29000 ksi
D = 0.375 in.
$I = 9.707 \times 10^{-4}$ in.^{4}

Theoretical Deflection = -0.102 in.
Actual Deflection = ~ -0.120 to -0.125 in.