

Problem Definition

Creating a more user friendly hands-free door opener

- Presentation created by Team Nugget
- Presented by:
- Nate Saul, Luke Bame, Dingming Lu, Samuel Graham

Problem Definition Update

Specified our product idea:

"Product" → "Foot Operated Hydraulic Unit"

- "Hands-free" limits to operation with either torso, head, legs or feet and having our product be foot operated was most convenient for consumers
- Having the product incorporate hydraulics means that it functions similar to current door closers and remains purely mechanical.

Concept Generation - Functional Decomposition Opent the door without hands Easy User Force Full door Interface Secure Transformation functionality the door Compatible with hand based door Opened by Able to opening applying completely > Retro downward force open door Compatibility Can be opened Efficient use of by handicap applied force persons Close on its own Simple Does not take Obvious how to Installment excessive force use Adjustable time to Comfortable to open/close use Customized pedal location

Concept Generation Overview

Can be opened by handicapped persons	The same of the sa	For will fall cold	0-1	Adjustable time to open/close			
Obvious how to use	STEP	Color redu) Short	STEP	Customized pedal location		Con life moveled to the season	
Comfortable to use	the Section of the section	poor metaled the endorse homeony in	Contact Space	Opened by applying downward force	- Stevenson		
Closes on its own after opening	LULL	many for open Am remore a regular account discounts	to plante	Efficient use of applied force	PETERNIE USE OF		Hydrodia Step State Stat

Concept Selection

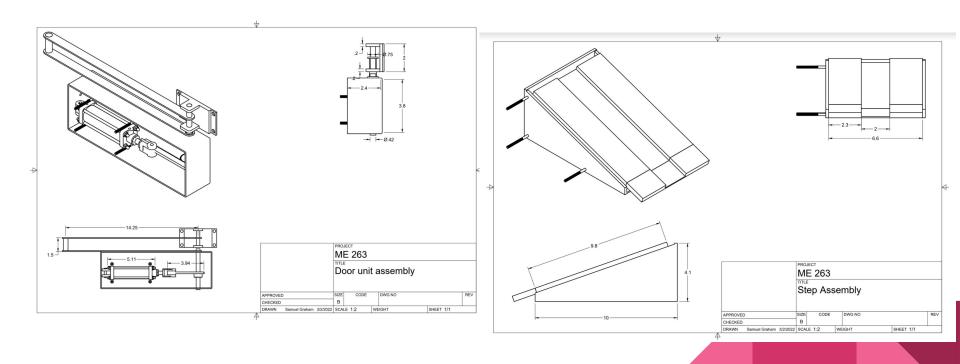
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1.(House of Quality) Customer Requirements	2 Weights	hasts chaid Frank View he door chasting service the safety har countried to door frank have frank to have going to higher to higher	Gent Meshada That Standy Door Standy Door Pedal that Pulls on String Process Thandicap Accessible	special properties the state of	flut zone Lurge pressure Lurge pres
Effort to open the door (low)	4	1	1	1	1
Ease of operating the door (easy)	5	1	1	1	1
Time required to operate door (short)	3	0	-1	1	0
Space filled by unit (small)	2	1	-1	0	-1
Ease of installation (easy)	3	0	0	0	0
Low Cost (low)	4	0	-1	-1	-1
Durability (durable)	5	0	0 4	0	1
Aesthetically pleasing (good)	1	0	-1	0	1
Ease of repair (easy)	2	0	-1	-1	0
Safe to operate (safe)	4	1	1	1	1
Retro-Compatibility (compatable)	2	1	1	1	1
Quiet (true)	1	1	-1	1	1
Purely Mechanical (true)	1	1	1	1	1
Customizability of door operation time	1	1	1	0	1
Total +		8	6	7	9
Total -		0	-6	-2	-2
Overall Total		8	0	5	7
Weighted Total		20	4	14	18

GOOD BAD NOT SO BAD NOT SO GOOD

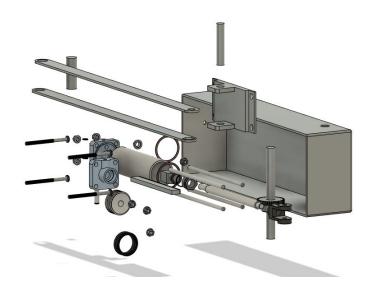
Description of Final Product and Prototype

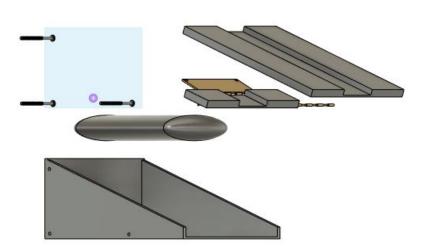
- Pressure Plate
 - Casing, Plate, Spring, Fluid bag
- Fluid Tube
- Force Transformation Device: Linear to Rotation
 - Piston, Gear, Gear Rack, Casing, Shaft
 - Scissor Arm
 - Two Arms, Connecting Pins, Pivot Mount
- Resistance Fluid Tank
 - Casing, Shaft, Fluid Fins, Fluid.

Description of Final Product and Prototype (Cont.)



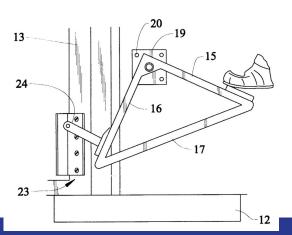
Description of Final Product and Prototype (Cont.)



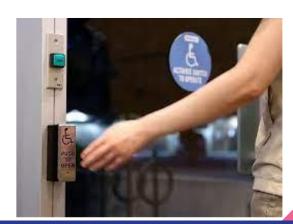


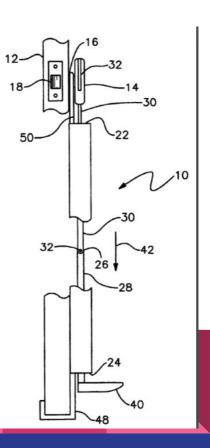
Comparison to Relevant Benchmarks and Patents











Bill of Materials

Item No.	Part No.	Part Name	Units	Qty	TARTIFICATION AND CONTROL OF THE PROPERTY OF T		Catalog No.	Unit Cost (\$)	Unit Processing Cost (\$)	Assembly Cost (\$)	Line Total Cost	List Price (\$)
0100	0101	Pressure plate	m*m	1	Aluminum Alloy / Where people will step on	Custom	N/A	0.82	0	0.1	0.92	3.28
Pressure plate	0102	Spring	N/m, pcs	2	stainless spring steels / reset the pressure plate and close the door	The Spring Stor	PC060-296-350	0.46	0	0.1	1.02	1.84
triggering and	0103	Fluid Bag	in^2	1	Rubber / Shoots the fluid out due to the force of the pressure plate	Custom	N/A	7.26	1.5	0.1	8.86	29.02
force	0104	Long tube	ft	1	Rubber / transfer fluid to top	Lowe's	Item #814315	1.89	0	0.1	1.99	7.55
transformation	0105	Hydraulic Fluid	Liters	4.68	mineral-based fluids / transfer the force	Grainger	DTE 24	2.81	0	0.1	13.24	11.23
0200	0201	Main casing	m*m*m	1	stainless steels / hold the components	Custom	N/A	1.68	5	0.1	6.78	6.71
Door	0202	Main casing screws	pcs	4	stainless steels / connect to the door	Grainger	G2584	0.01	0	0.1	0.13	0.03
openinging	0203	Piston pack - arm	pcs	1	stainless steels / push the gear rack	Custom	N/A	0.15	3	0.1	3.25	0.60
	0204	Piston pack - cylinder	pcs	1	stainless steels / hold the arm and the fluid	Custom	N/A	0.79	3	0.1	3.89	3.17
	0205	Piston pack - seal ring	mm	1	Rubber / seal the fluid	Shadow Trailer	#DBC-225-SE/	1.00	0	0.1	1.10	3.99
	0206	Piston pack - screws	pcs	3	stainless steels / secure the cylinder to casing and gear rack	Grainger	G2584	0.01	0	0.1	0.12	0.03
	0207	Piston pack - nut	pcs	3	stainless steels / secure the screws	Grainger	447J35	0.80	0	0.1	2.51	3.22
	0208	Gear rack	mm	1	stainless steels / transfer linear motion	McMaster-Carr	2485N242	5.39	0	0.1	5.49	21.54
	0209	Large gear	pcs	1	stainless steels / transfer linear motion to rotational motion	McMaster-Carr	5172T16	10.73	0	0.1	10.83	42.92
	0210	Main shaft	mm	1	stainless steels / transfer the force from gear to arms	Custom	N/A	0.11	2	0.1	2.21	0.45
	0211	Rotational Pushing Arm	pcs	2	stainless steels / rotate and push the door open	Custom	N/A	0.14	2	0.1	2.39	0.57
	0212	Connecting pin	mm	2	stainless steels / connect the arms together and to the door frame mount c	Custom	N/A	0.01	2	0.1	2.12	0.03
	0213	Door frame mount case		1	stainless steels / allows the arm connect to the door and rotate	Custom	N/A	0.71	5	0.1	5.81	2.82
	0214	Door frame mount Screv	pcs	4	stainless steels / secure the case	Grainger	G2584	0.01	0	0.1	0.13	0.03
0300	0301	Small gear	pcs	1	stainless steels / drive the slowing device	McMaster-Carr	5172T12	6.72	0	0.1	6.82	26.88
Door Closing	0302	Fluid tank	pcs	1	stainless steels / hold the liquid	Custom	N/A	5.12	5	0.1	10.22	20.48
	0303	Shaft	mm, pcs	1	stainless steels / drive the drag fin bars	Custom	N/A	0.11	2	0.1	2.21	0.45
	0304	Drag fins	pcs	4	stainless steels / create drag in fluid	Custom	N/A	0.04	2	0.1	2.27	0.17
	0305	Fin bars	pcs	4	stainless steels / hold the fins together and prevent opening to large	Custom	N/A	0.95	4	0.1	7.88	3.78
	0306	Long screws	pcs	2	stainless steels / adjust the height of the tank	Grainger	6JA46	0.07	0	0.1	0.23	0.26
	0307	Nut	pcs	2	stainless steels / hold the screws	Grainger	22UK82	0.00	0	0.1	0.11	0.02
	0308	Spring	N/m, pcs		stainless spring steels / secure the tank on the long screws	The Spring Stor	PC060-296-350	0.30	0	0.1	0.70	1.20
	0309	Drag Fluid	Liters	4.68	mineral-based fluids / source of drag	Grainger	DTE 24	2.85	0	0.1	13.45	11.41
0400	0401	Final Assembly	-	1	Final assembly of all parts	-	¥	-	3/20	5.00	5.00	
Assmeblies	0402	Pressure plate assy	-	1	Assembly of the step plate	10.51	-	- 1	(C=)	3.00	3.00	
	0403	Door opening assy	72		Assembly of door opening mechanism	920	2	4 (32-	3.50	3.50	
	0404	Door closing assy		1	Assembly of dor closing mechanism		-		870	3.50	3.50	

Bill of Materials (cont.)

	Total Purchased Parts \$	58.57
T	otal Custom Manufactured Parts \$	58.80
	Total Assembly Cost \$	15.00
	Total Cost \$	131.67

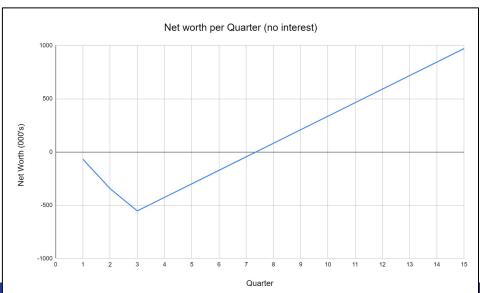
Financial Analysis - Values

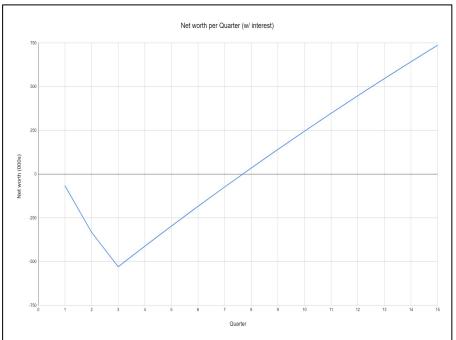
Inpu	ıt	
Interest Rate / year	8	%
Analysis Periods / year	4	#
Tooling and Fixtures	419000	
Annual Production	19200	#
Estimated Purchased Parts	58.57	\$
Estimated Fabricated Parts	58.8	\$
Estimated Assembly Cost	15	\$
R&D Costs	134264	\$
Cost % of Retail	25	%
Return to Project % of Retail	30	%

Cal	culated	
Intereset Rate per Period	0.02	rate/period
Estimated Mfg. Cost	132.37	\$
Retail Price	529.48	\$
Build per Period	4800	#
Total Program Build	57600	#
Total Retail Sales	30498048	\$
Return to Project	9149414.4	\$
Net Present Value	737.23	\$(000)
Net Worth (excl. interest)	971.64	\$(000)

ROI=	46.83	% per year	Min production with no interest=	1741			
ROR=	69.19	% per year	Min production with interest=	2005			
PB=	8th	Quarter					
NPV=	737.23	\$(000)					

Financial Analysis -Net Worth Charts





Project Scheduling - Phase 3

	START	DUE		WEEK 1									Week 2							
TASK TITLE	DATE	DATE	DURATION	М	Т	w	R	F	s	SUN	М	Т	w	R	F	s	SUN			
				21	22	23	24	25	26	27	28	29	30	31	1	2	3			
Completion of Modeling and Product Design	3/21/22	4/1/22	10																	
Operational Description	3/21/22	4/1/22	10																	
Part Drawings	3/21/22	4/1/22	10																	
Assembly Drawings	3/21/22	4/1/22	10																	
Update Bill of Materials	4/1/22	4/3/22	3																	
Justify Final Design	4/4/22	4/8/22	4																	
Performance Analysis	4/9/22	4/13/22	4																	
Assembly Analysis	4/5/22	4/8/22	3																	
Economic Analysis	4/4/22	4/7/22	3																	
Phase 3 Prototype	4/4/22	4/24/22	20																	
Preapre Final Report	4/19/22	4/24/22	5																	
Audience Analysis	4/19/22	4/20/22	1																	
Content	4/21/22	4/23/22	2																	

Project Scheduling - Phase 3 (cont.)

	START	DUE	DURATION	Week 3						Week 4								Week 5						
TASK TITLE	DATE	DATE		М	Т	W	R	F	5	SUN	М	Т	W	R	F	5	SUN M		Т	W	R	F	5	SUN
				4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Completion of Modeling and Product Design	3/21/22	4/1/22	10																					
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Phase 3 Prototype	4/4/22	4/24/22	20																					
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Audience Analysis	4/19/22	4/20/22	1)																· ·					
Content	4/21/22	4/23/22	2																					

Conclusion and Recommendation

Key takeaways

- Product is financially feasible
- Despite high unit cost, still under some competitors

Moving Forward

- Further iterate and enhance design
- Fabricate and analyze prototype

Questions?