# Lerner Exoskeleton I

#### **Team G:**

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(Client Contact)

(Web designer)

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- Saud Almutairi
  - (Document Manager1) Abdullah Alazemi
- Mohammad Alkhaldi (Document Manager2) (Budget Licenses)
  - **Barjas Aldooseri**



#### Introduction

- Project Description.
- Designs Considered (Product).
- Design Selected.
- Schedule & Budget.

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# **Project Description**

- Robotic exoskeletons help neuromuscular disorder to walk.
- System provide assistance at the knee and ankle joints.
- The goal is to design adjustable system and to help the disabilities from (13-75) ages.



Figure 1: Adjustable Human-Exoskeleton Mounting Interface

# **Project Description**

- Our Client is Zach Lerner, Ph.D, director of NAU's Biomechatronics Lab.
- Engineering requirements were specified from customer requirements.
- From the HoQ, the team has developed different designs.
- Design selected can be described by Pugh Chart and Decision Matrix.

#### **Design Considered**



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# **Design Considered**



Table 1: Pros and Cons

	Design #1	Design #3	Design #7
Pros	<ul> <li>Available for user from ages (13-75)</li> <li>Lightweight</li> </ul>	<ul> <li>Multifunctional for thigh and knee</li> <li>Easy to move</li> </ul>	<ul> <li>Low cost material.</li> <li>Easy to do on and off.</li> </ul>
Cons	<ul> <li>Not flexible</li> <li>Breakable</li> </ul>	<ul> <li>Hard to monitor</li> <li>Heavy for the user</li> </ul>	<ul> <li>Durability of the spring.</li> <li>Low amount of energy.</li> </ul>

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# **Design Selected:**

Table 2: Pugh Chart

Criteria / Design #	1	2	3	4	5	6	7	8
Providing rigid mounting points	+	-	+	D	+	+	-	-
Adjustable	-	-	+	А	-	+	+	-
Easy to do on and off	+	-	+	Т	-	+	-	-
Minimize skin irritation	+	+	+	U	-	-	+	-
Allow foot portion to be low profile	-	-	I	Μ	+	-	+	-
Lightweight	+	+	+		+	-	-	-
Strong material	+	-	+		-	-	+	-
$\sum$ +	5	2	6		3	3	4	0
Σ-	2	5	1		4	4	3	7

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# **Design Selected:**

#### Table 3: Decision Matrix

Customer	Weightings	Design #1	Design #3	Design #7			
Requirements							
<b>Rigid mounting</b>	15%	5	5	4			
points							
Adjustable	13%	5	7	3			
Easy to do on and	10%	5	6	5			
off							
Minimize skin	12%	4	6	4			
irritation							
Low profile foot	10%	4	5	4			
portion							
Lightweight	20%	8	3	4			
Strong material	20%	2	8	3			
	100%	33	40	27			

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#### **Gantt Chart**

•	$\leftrightarrow \rightarrow \rightarrow \phi \approx$				Zoom In   Zoom Out Today ▼   ← Past   Future →					Show critical path   Baselines										
	GANTT. project			2017				Background Presentation			Presentation 2				Final Presentation					
Na	ıme		Begin date	End date	Week 4	Week 5 1/29/17	Week б 2/5/17	Week 7 2/12/17	Week 8 2/19/17	Week 9 2/26/17	Week 10 3/5/17	Week 11 3/12/17	Week 12 3/19/17	Week 13 3/26/17	Week 14 4/2/17	Week 15 4/9/17	Week 16 4/16/17	Week 17 4/23/17	Week 18 4/3B/17	Week 19 5/7/17
	0	Team Meeting	1/23/17	1/23/17	1/24/	17														
	0	Team Charter	1/26/17	1/27/17																
	0	Staff Meeting 1	1/30/17	1/30/17																
	0	Researches	2/3/17	2/9/17																
	0	Background Repotr	2/10/17	2/17/17																
		Introduction	2/10/17	2/17/17					]											
		Existing Design	2/13/17	2/13/17																
		Customer Requirement	2/14/17	2/15/17																
		System	2/15/17	2/15/17																
		Sub-System	2/16/17	2/17/17					1											
	0	Client's Meeting	2/17/17	2/17/17	<u></u>				]											
	0	Background Presentation	2/20/17	2/20/17					•											
	0	Staff Meeting 2	3/8/17	3/8/17																
	0	Presentation 2	3/20/17	3/20/17									•							
•	0	Preliminary Report Due	3/21/17	3/24/17																
		House of Quality	3/21/17	3/21/17																
		Concept Generation	3/22/17	3/22/17																
		Pugh and Decision ch	3/23/17	3/23/17																
		Functional and Black	3/23/17	3/23/17																
		Editing	3/24/17	3/24/17										1						
	0	Staff Meeting 3	4/10/17	4/17/17																
	0	Final Project Proposal Re	4/10/17	4/17/17																
	0	Final Presentation	4/20/17	4/20/17													•			

Figure 2: Gantt Chart

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# Budget

- The budget is (\$500).
- Materials (\$300).
- Painting (\$50).
- Prototyping(\$100).
- Remaining(\$50).



Figure 3: Budget [1]

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#### References

[1] N. Management, "Budget 101 | NC OSBM", Osbm.nc.gov, 2017. [Online]. Available: https://www.osbm.nc.gov/budget/budget101. [Accessed: 20- Mar- 2017].

#### **Questions?**

• Thank you for your attention.