NORTHERN ARIZONA UNIVERSITY

PROJECT FORMULATION AND PLANNING PRESENTATION

Presented by:

Thaddeus Grudniewksi, Matthew Batten, Jonathan McCurdy, Cody Burbank, & Joy Weber

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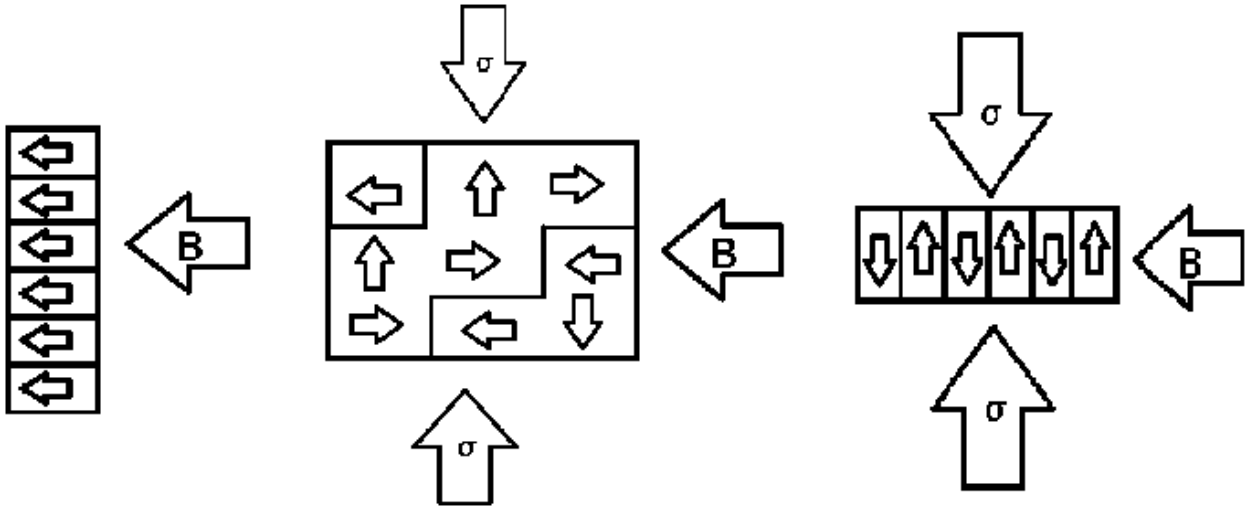
Overview

I. Introduction
II. MSMA Background
III. Recognizing the Need
    a. Dissatisfaction with current situation
    b. Need Statement
IV. Defining the Problem
    a. Goal
    b. Objectives
    c. Constraints
    d. Quality Function Deployment
    e. House of Quality
V. Project Planning
    a. Gantt Chart
VI. Conclusion

- Introduction
  - Client: Dr. Ciocanel
    - Associate Professor at Northern Arizona University
    - Conducts research on Smart Materials
  - Why?
    - He is funding this project because he is trying to expand his testing process.

- **Magnetic Shape Memory Alloy (MSMA)**
  - Ni_2MnGa
  - Magnetization vector rotation
  - Actuating vs. power harvesting

Variant Reorientation Model



Recognizing the Need

- Current situation
  - Testing is currently being done with an Instron machine which is able to provide variable forces in a vertical direction.
  - MSMA is placed under differing forces and a constant magnetic field.
- Dissatisfaction
  - Vertical force varies but there is a lack of force in the lateral direction.
  - Previous attempt at solution was unable to provide a constant lateral force.

Need Statement

- The current process and equipment are not capable of performing tests which are able to determine the sought after properties of the material.

Problem Definition

- Goal
  - To design a piece of equipment that will facilitate the already established testing procedure and enable forces in a third dimension.
- Design Objectives
  - Cost-efficient
  - Precise
  - Reliable

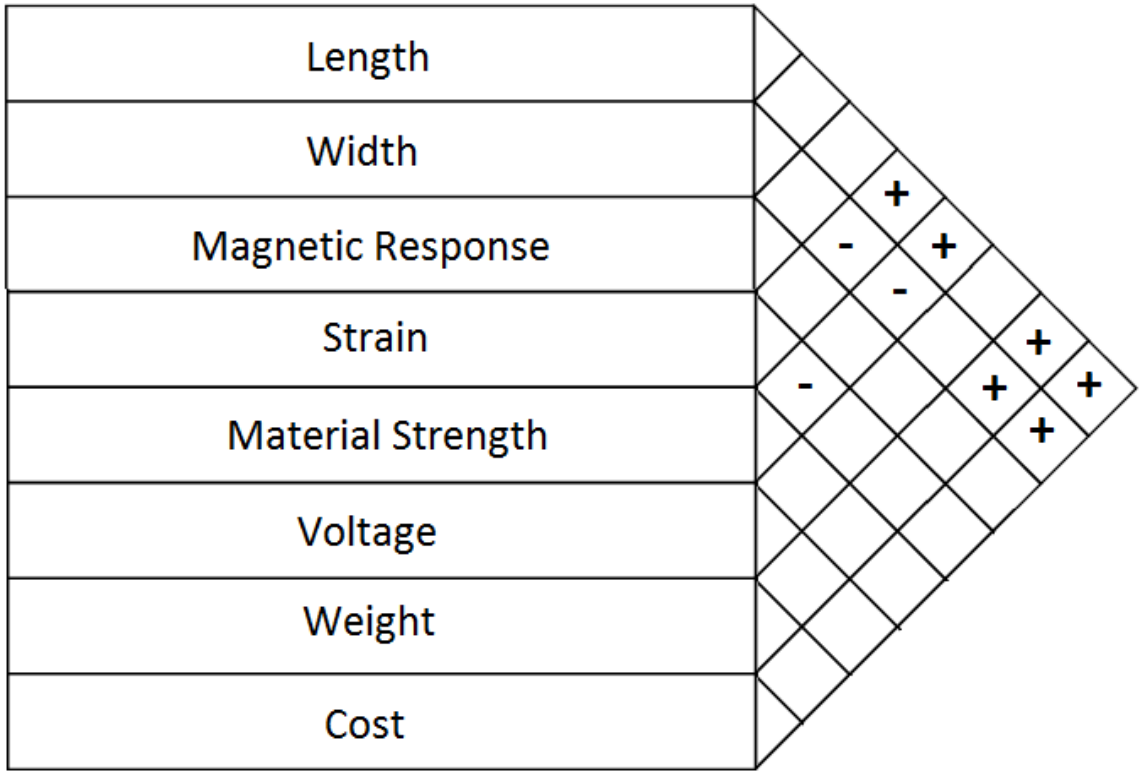
Problem Definition

- Constraints
  - Must be non-magnetic
  - Must integrate with current system
  - Must be installable by 2 people
  - 10mm gap width
  - Height less than 12mm
  - Less than $2500
  - Withstand at least 75N

Quality Function Deployment

		Engineering Requirements							
		Height	Width	Cost	Weight	Magnetic Response	Strain	Material Strength	Voltage
Customer Requirements	1. Inexpensive			X					
	2. Withstand Force						X	X	
	3. Applies a Force						X	X	
	4. Provide Feedback								X
	5. Limited Area	X	X						
	6. Portable	X	X		X				
	7. Non-magnetic					X			
	8. Adaptable with Current System	X	X		X				
	Units	mm	mm	$	kg	T	%	Pa	V
	* To be determined	12	10	2500	*	0	*	*	*
		Engineering Targets							

House of Quality



Senior Design MSMA Testing Timeline

Oct 6, 2013

Gantt Chart

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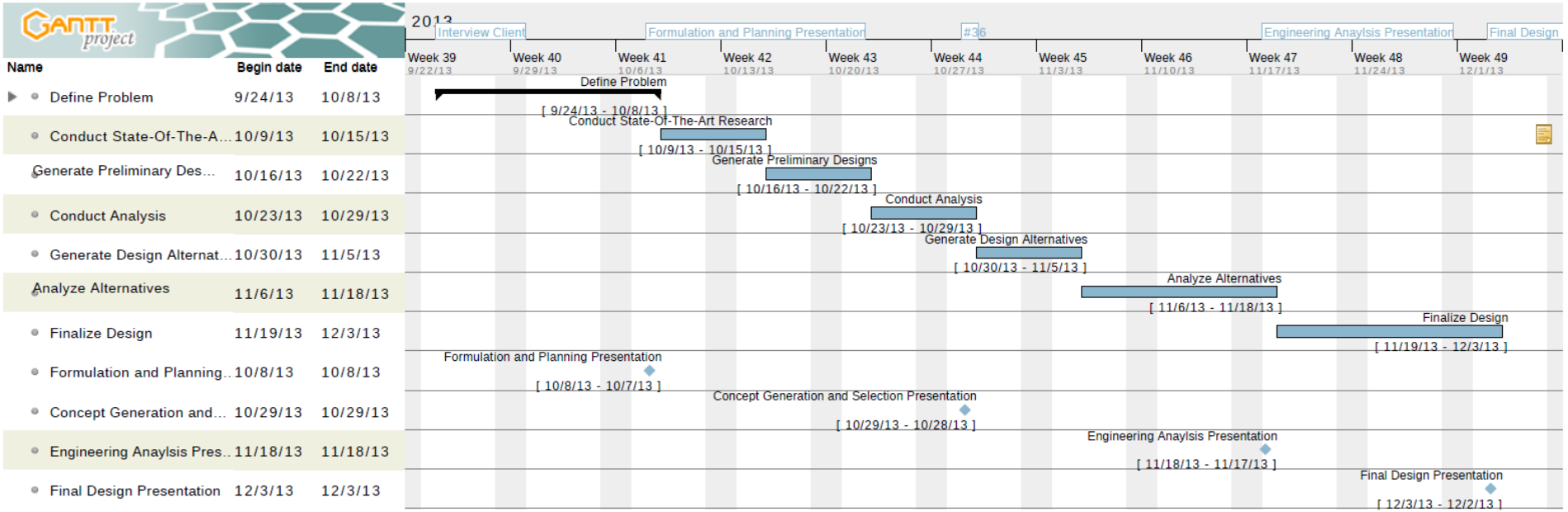

Conclusion

I. Introduction
II. MSMA Background
III. Recognizing the Need
    a. Dissatisfaction with current situation
    b. Not capable of performing tests
IV. Defining the Problem
    a. To design a piece of equipment that will facilitate the already established testing procedure and enable force in a third dimension.
    b. Objectives
    c. Constraints
    d. Quality Function Deployment
    e. House of Quality
V. Project Planning
    a. Gantt Chart

- References

[1] Leo, Donald J. Engineering Analysis of Smart Material Systems. Hoboken, NJ: John Wiley & Sons, 2007.

QUESTIONS?