KGCOE MSD Systems Level Review Agenda
P11553: ProMetal Powder Spreading System

Meeting Purpose:

1. Background on the project and progress to date
2. Confirm customer needs and associated engineering specifications
3. Review design selection and concepts
4. Propose design
5. Generate/refine concepts and ideas through this cross-disciplinary review

Materials to be Reviewed:

1. Project Overview
2. Customer Needs
3. Engineering Specifications
4. Concept Selection – Chassis
5. Concept Selection – Spreading Heads
6. Work Breakdown
7. Project Plan
8. Risk Assessment

Meeting Date: Friday January 14th

Meeting Location: 09-3119

Meeting Time: 9:30-11:00

Meeting Timeline		
Start time	**Topic of Review**	**Required Attendees**
9:30	Project Overview	Dr. Cormier, Prof. Wellin
9:40	Customer Needs	Dr. Cormier, Prof. Wellin
9:45	Engineering Specifications	Dr. Cormier, Prof. Wellin
10:50	Discussion	Dr. Cormier, Prof. Wellin
10:00	Concept Selection – Chassis	Dr. Cormier, Prof. Wellin
10:10	Discussion	Dr. Cormier, Prof. Wellin
10:20	Concept Selection – Spreading Heads	Dr. Cormier, Prof. Wellin
10:30	Discussion	Dr. Cormier, Prof. Wellin
10:40	Work Breakdown	Dr. Cormier, Prof. Wellin
10:45	Risk Assessment	Dr. Cormier, Prof. Wellin
10:50	Discussion	Dr. Cormier, Prof. Wellin
11:00	Project Plan	Dr. Cormier, Prof. Wellin
11:10	Discussion	Dr. Cormier, Prof. Wellin

Project Information

Project #: 11553 **Project Name:** ProMetal Powder Spreading System

Project Track: Printing Systems **Company:** ProMetal

Start Term: 20102 **Team Guide:** Dennis Cormier

Project Sponsor: Denis Cormier – Brinkman Endowment

Project Background

3D Printing (3DP) is a process developed by MIT in which a thin layer of powder is spread across a platform followed by selective inkjet printing of a liquid binder. Powder is spread sequentially across each previous layer. The finished part may then be handled and placed into a furnace for sintering, if using metal powder.

Problem Statement

Variations in the density of powder occur in this 3DP process. Variations in the density of powder may lead to varying material strength, density, and dimensions following the sintering process.

Project Scope

- Create chassis with modular spreading carriage
- Create various powder spreading heads
- Test various powder spreading heads

Deliverables

- Detailed design drawings for system and subsystems
- Functioning powder spreading sub-system along with operating details and an interface
- Accurate and repeatable testing procedures along with results of comparisons between different spreading methods

Expected Project Benefits

The project will realize beneficial powder spreading techniques that improve powder density variation and decrease variations after the sintering process. This will improve tolerances and manufacturing costs of metal products. A test bed platform will be available for future Senior Design teams to analyze powder spreading techniques as well.

Core Team Members

- Carlos Bu – Test Plan/Documentation
- Matthew Rebisz – Binder Type & Application
- Chris Rukas – Motion Control
- Nick Shields – Spreading Platform/Carriage
- Jay Wheaton – Spreading Heads/Carriage

Customer Needs

Customer Need #	Importance	Description	Comments/Status
1.0		**Automated Spreading Head System**	
1.1	9	System Has Motion Control	
1.2	9	Has Fine Z Axis Control	
1.3	1	Capable of Printing Large Area	
1.4	3	Maintains a Level Platform	
1.5	9	Spreader Head Can Be Swapped Easily	
1.6	1	System Collects Excess Powder	
1.7	3	High Reliability	
1.8	1	Easy to Maintain	
1.9	3	System is Easy to Control	
1.10	3	Spreads Layers as Fast as ProMetal Product	
2.0		**Spreading Head Designs**	
2.1	9	Spreads with Even Density	
2.2	3	Spreads with High Density	
2.3	9	Spreads a Smooth Surface	
2.4	9	Spreads without Disturbing Lower Layer	
2.5	3	Spreads Multiple Powder Types	
3.0		**Powder Selection**	
3.1	3	System Spreads ProMetal Powder	

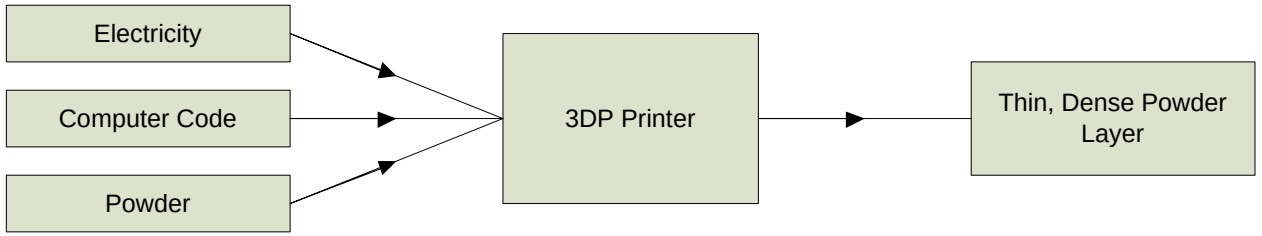
Customer Needs

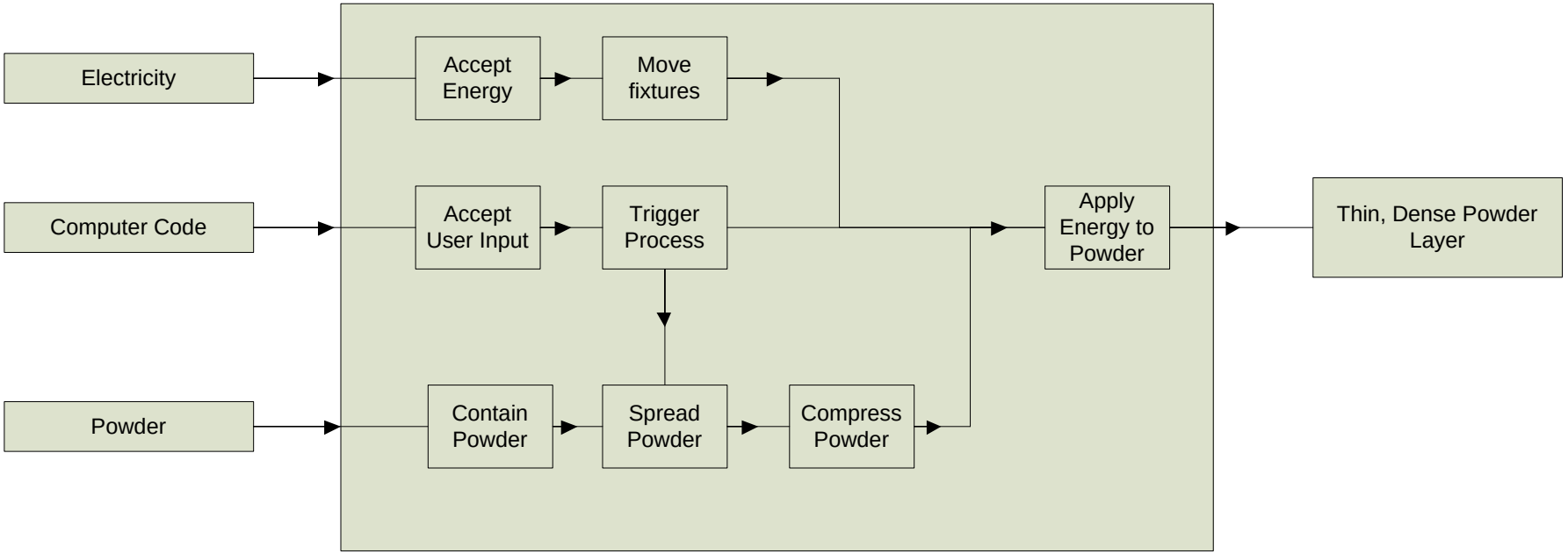
Customer Need #	Importance	Description	Comments/Status
4.0		**Metal Binder**	
4.1	9	Printed Sample Must Withstand Light Manual Handling	
4.2	9	Binder is Applied in a Consistent Layer	
4.3	9	Binder is Applied in a Thin Layer	
5.0		**Ethical Considerations**	
5.1	9	Do Not Share Proprietary Techniques	Includes binding, spreading, sintering
5.2	3	Environmentally Safe Binder and Powder	
5.3	9	Full Disclosure of Findings	
6.0		**Documentation**	
6.1	3	CAD Drawings	
6.2	9	Test Measurements	layer height
6.3	9	Comparison of Binding and Spreading Methods	based on prototype

Engineering Specifications

Specification (description)	Unit of Measure	Marginal Value	Ideal Value	Comments/Status
Spreader Head				
Speed	cm/s	> 1	> 2	ProMetal is 75 seconds per Layer
Powder Density Variation - In-Plane	%	< 5	< 0.1	ProMetal Variation Unknown
Powder Density Variation - Transverse	%	< 5	< 0.1	ProMetal Variation Unknown
Powder Density %	%	> 65	> 80	Percentage of Parent Metal Density
Surface Roughness Average	µm	< 3	0.5	
Platform				
Z Axis Resolution	µm	< 500	< 280	
Platform Parallelism	µm	< 78	< 10	Marginal Value Represents .01 deg. across 450 mm
Platform Size	mm	450 x 305 x 150	1500 x 750 x 700	LxWxH (18 x 12 x 6 in) Ideal value is ProMetal size
Powder				
Must Spread ProMetal Powder	Y/N	Yes	Yes	
Binder				
Viscosity	cP	40	20	

Functional Black Box





Spreader Concept Selection

Criteria	1	2	3	4	5	6	7	8
Distribute Powder	Dump Pile	Blade	Sift	Per Particle	Trough	w/ lead screw	w/Sifting Drum	Spray
Smooth Powder	Roller	Blade	Vibrate	Compressing Plate	Flapper			
Compress Powder	Roller	Pressurize	Vibrate	Compressing Plate	Reverse Blade			
Z axis control	Worm Gear	Hydraulic	Belt	Chain	Shims			
Move along xy plane	Worm gear	Hydraulic	Belt	Chain	Pivot	By hand		
Apply Binder	Spray Bottle	Eye dropper	brush	inkjet	stamp			

Criteria	Fast	Easy To build	Cheap	Datum	Scalable	Accurate
Distribute Powder	Dump Pile	Dump Pile	Dump Pile	Blade	Trough	w/ sifting drum
Smooth Powder	Blade	Blade	Blade	Blade	Roller	Vibrate
Compress Powder	Roller	Reverse Blade	Reverse Blade	N/A	Roller	Compressing Plate
Z axis control	Belt	Shims	Worm Gear	Worm Gear	Chain	Worm Gear
Move along xy plane	By Hand	By hand	Worm Gear	Worm Gear	Chain	Worm Gear
Apply Binder	Spray Bottle	Spray Bottle	Spray Bottle	Inkjet	Inkjet	Inkjet

Spreader Concept Selection

Selection Criteria	**A**	**B**	**C**	**D**	**E**	**F**
Distribute Powder	-	-	-	0	+	+
Smooth Powder	0	0	0	0	0	+
Compress Powder	+	+	+	0	+	+
Z axis control	-	-	0	0	-	0
Move along xy plane	-	-	0	0	-	0
Apply Binder	-	-	-	0	0	0

Sum +'s	1	1	1	0	2	3
Sum 0's	1	1	3	6	2	3
Sum -'s	4	4	2	0	2	0

Net Score	-3	-3	-1	0	0	3
Rank	4	4	3	2	2	1

Criteria	Viable option 1	Viable option 2	Viable option 3	Viable Option 4
Distribute Powder	trough	trough w/ sifting drum	blade	Trough
Smooth Powder	roller	vibrate	blade	Tamper
Compress Powder	roller	roller	roller	Tamper
Z axis control	worm gear	worm gear	worm gear	worm gear
Move along xy plane	worm gear	worm gear	worm gear	worm gear
Apply Binder	spray bottle	spray bottle	spray bottle	spray bottle

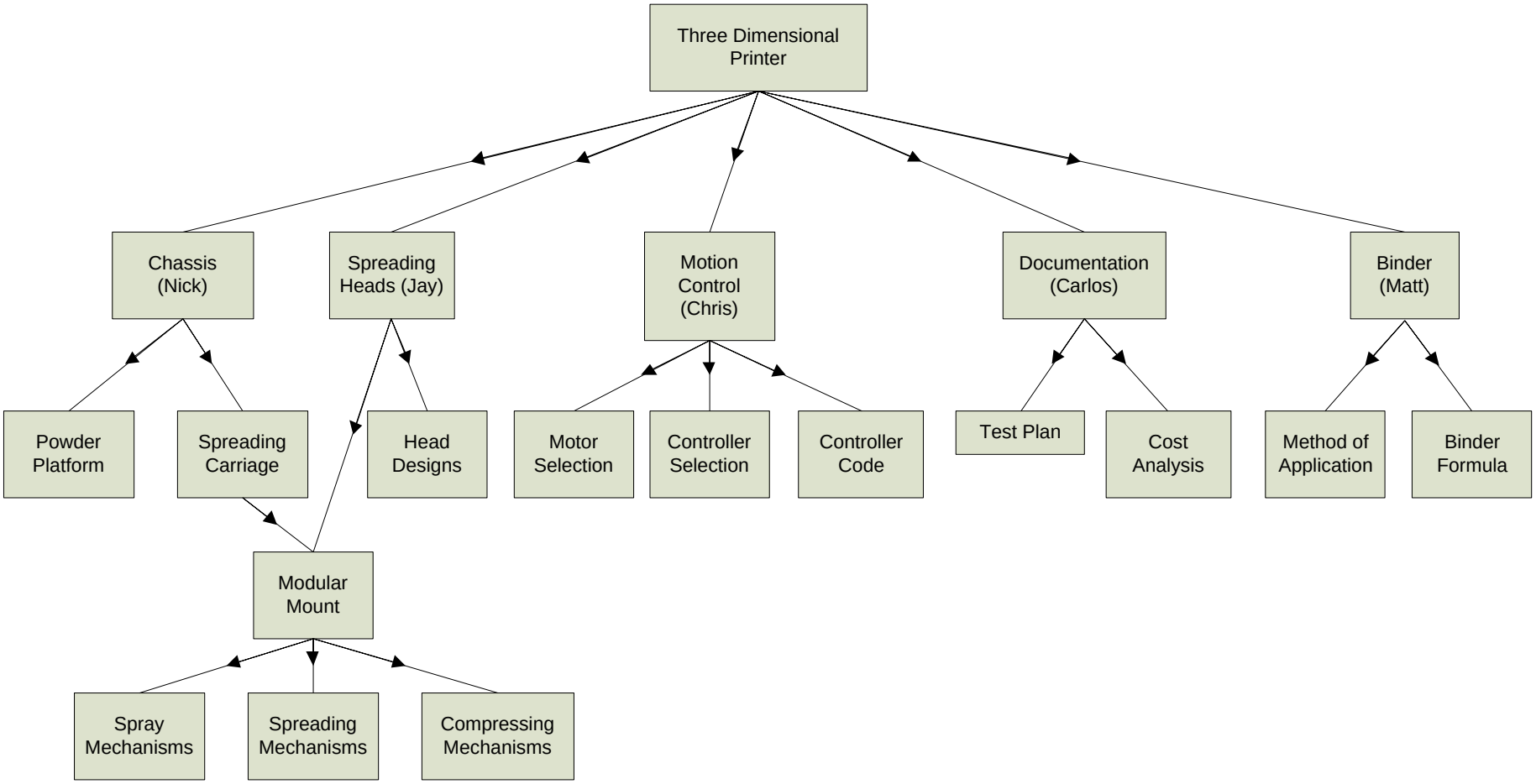
Chassis Concept Selection

Criteria	1	2	3	4	5	6
Movement Method	Power Screw	Hydraulics	Pulleys	Lever	Rack & Pinion	Shims
Movement Power	Servo	Hand	DC Motor	Stepper Motor		
Control Mechanism	Microcontroller	PC	Pushbutton			
Material	Steel	Aluminum	Acrylic	Composites	Wood	
Movement Type	Spreader	Platform				
Modular Carriage for Spreader Attachment	Pins	Screws	Pressure Fit	Magnets	Latch	

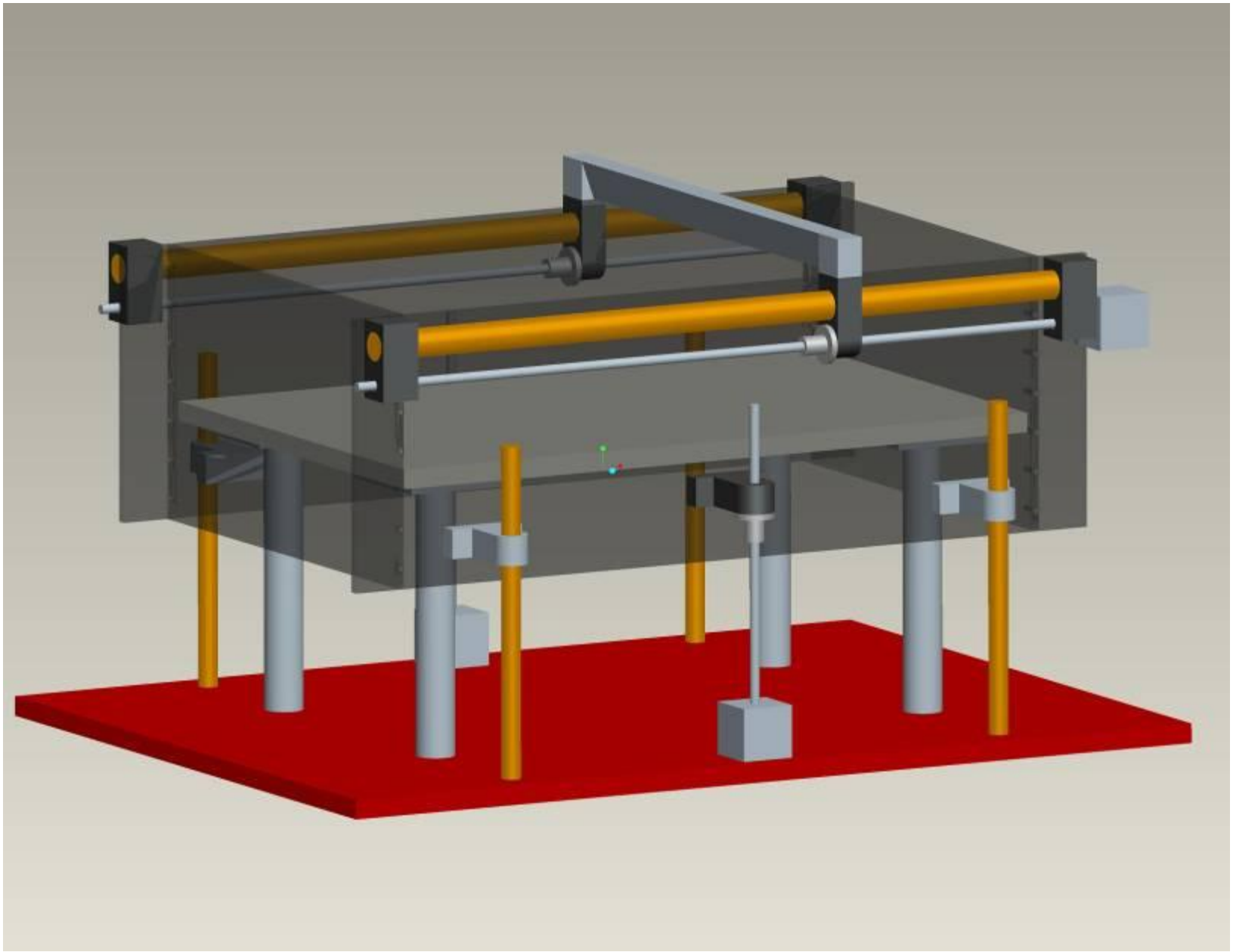
	Speed	Cost	Accuracy	Datum
Criteria	**A**	**B**	**C**	**D**
Movement Method	Lever	Lever	Power Screw	Power Screws
Movement Power	Hydraulics	DC Motor	Stepper Motors	Stepper Motors
Control Mechanism	Microcontroller	Pushbutton	PC	Microcontroller
Material	Wood	Wood	Steel	Steel
Movement Type	Platform	Platform	Spreader	Platform
Modular Carriage for Spreader Attachment	Magnets	Pins	Screws	N/A

Criteria	**A**	**B**	**C**	**D(atum)**
Movement Method	'-	-	0	0
Movement Power	'+	0	0	0
Control Mechanism	0	-	0	0
Material	-	-	0	0
Movement Type	0	0	0	0
Modular Carriage for Spreader Attachment	'+	'+	'+	0
Sum +'s	2	1	1	0
Sum 0's	2	2	5	6
Sum -'s	2	3	0	0
Net Score	0	-2	1	0
Rank	2	3	1	2

Work Breakdown



System Diagram



QFD Matrix

QFD Matrix

PHASE I QFD *P11553*

Correlation Codes	
+ +	Very Positive
+	Positive
-	Negative
- -	Very Negative

Spreader Speed											
Powder Density Variation - In-Plane		-									
Powder Density Variation - Transverse											
Powder Density %		--	+								
Surface Roughness		-	+	-							
Z Axis Resolution		-			-	-					
Platform Parallelism			-		-		++				
Platform Size		-					-	--			
Must Spread ProMetal Powder								-			
Binder Viscosity										--	
Preferred		up	dwn	dwn	up	dwn	up	nom	nom	nom	nom
	Engineering Metrics										
Customer Requirements	**omer We**	Sprea	Powd	Pow	Pow	Surfa	Z Axis	Platfo	Platfo	Must	Binder Viscosity
System Has Motion Control	9	9	1	1	1	1	9	1	3		
Has Fine Z Axis Control	9		3	9	3	3	9	1	1		
Capable of Printing Large Area	1	3	9	1	3		1	3	9		
Maintains a Level Platform	3		1	1			1	9	3		
Spreader Head Can Be Swapped Easily	9	1	1	1	1	1				3	
System Collects Excess Powder	1	3								3	
High Reliability	3	9					3	3	1		3
Easy to Maintain	1	9					3	3	3		3
System is Easy to Control	3	9					9				
Spreads Layers as Fast as ProMetal Product	3	9							3	9	
Spreads With Even Density	9	3	9	9	3	1	3	3		3	
Spreads With High Density	3	3	3	3	9	3	1			3	
Spreads A Smooth Surface	9	3	3	3	3	9				1	
Spreads Without Disturbing Lower Layer	9					3	3	3		1	
System Spreads ProMetal Powder	3									9	
Printed Sample Must Withstand Light Manual Handling	9				3						3
Binder is Applied in a Consistent Layer	9					3					9
Binder is Applied in a Thin Layer	9					3					9
Technical Targets		>10 c	< 0.1'	< 0.1	> 80%		< 0.28	< 10	450x	Yes	20 cP
	Raw scor	451	82	58	64	49	231	81	117	114	54
	Relative	53%	10%	7%	8%	6%	27%	10%	14%	13%	6%

Risk Assessment

Risk Item	ID	Effect	Cause	Likelihood	Severity	Importance	Action to Minimize Risk	Owner
Cannot get ProMetal binder	**2**	Test results cannot be directly related to ProMetal process	ProMetal wont provide binder or not given enough leadtime to provide it	2	2	4	Research alternative binders compatible with metal powders	Matt
Project goes over budget	**4**	Cannot complete project	Parts are too expensive	1	2	2	Research alternate suppliers for parts	Team
	5	Cannot complete project	Design includes too many high price items	1	2	2	Utilize alternative designs using cheaper parts	Team
Ordered parts do not arrive in time	**6**	Design cannot be assembled	Wrong part ordered	1	2	2	Maintain contact with suppliers / order parts as soon as need is recognized	Team
	7	Design cannot be assembled	Supplier send the wrong part	2	2	4	Maintain contact with suppliers / order parts as soon as need is recognized	Team
	8	Design cannot be assembled	Late ordering, unreliable supplier	2	2	4	Maintain contact with suppliers / order parts as soon as need is recognized	Team
	9	Design cannot be assembled	Delayed for weather	2	2	4	Maintain contact with suppliers / order parts as soon as need is recognized	Team
Lifting mechanism binds	**13**	Cannot create multiple layers of powder	Lifting screws not synchonized properly	2	3	6	Design lifting screws with timing belts to ensure synchronous motion	Nick & Chris
Motor is too weak to move build platform	**14**	Design is not completed, failure to satisfy customer needs	Insufficient research into available Fab@Home parts, failure to order new parts if needed	1	3	3	Determine compatibility of Fab@Home parts, order larger motor if needed	Nick & Chris
Build platform step is larger than marginal value	**17**	System fails to satisfy customer needs	Insufficient research into available Fab@Home parts, failure to order new parts if needed	1	3	3	Determine compatibility of Fab@Home parts, order new leadscrew if needed	Chris

Risk Assessment

Risk Item	ID	Effect	Cause	Likelihood	Severity	Importance	Action to Minimize Risk	Owner
Powder density is not even throughout test specimen	**19**	Failure to satisfy customer needs	System is poorly designed	2	2	4	Build early, allow room for error	Team
	20	Failure to satisfy customer needs	System is not an improvement to ProMetals'	2	2	4	Follow through with risk assessment, early testing	Team
	21	Failure to satisfy customer needs	Testing procedure is not accurate	2	2	4	Accurate testing procedure, validate results	Carlos
System cannot maintain accurate spreading depth	**24**	Cannot properly create test specimens	Deflection in spreader supports	1	2	2	Use FEA to analyze spreader supports and design to avoid large deflection	Nick
	25	Cannot properly create test specimens	Deflection in build platform and supports	1	2	2	Use FEA to analyze build platform and design to avoid large deflection	Nick
Surface is too rough for printing	**26**	System fails to satisfy customer needs	Poor choice of spreading/smoothing method	1	3	3	Test smoothing methods before choosing final concept	Jay
Binder is too weak to hold powder together	**28**	Difficult/impossible to evaluate effectiveness of design	Cannot get ProMetal binder, alternative binder sources not researched	1	3	3	Research and test alternative binders to ensure metal powder compatibility	Matt

Project Schedule

Max Score	Task Name	Deadline	Start	Finish	Duration	Predecessors	% Complete	Resource Names
	Start MSDI	NA	Mon 11/29/10	Mon 11/29/10	0 days		100%	
	Project Definition	**NA**	**Fri 12/3/10**	**Tue 1/11/11**	**118.13 days**		**66%**	
2	Define Customer Needs	Fri 12/17/10	Mon 12/6/10	Fri 12/17/10	5 hrs		100%	Carlos Bu,Chris Rukas,Jay Wheaton,Matt Rebisz,Nick Shields
	Assign Team Roles	Fri 12/10/10	Fri 12/3/10	Fri 12/10/10	1 hr		100%	Chris Rukas
	Define Knowns/unknowns	Fri 12/10/10	Fri 12/10/10	Fri 12/10/10	2 hrs		100%	Nick Shields
2	Quantitative Specifications	Fri 12/17/10	Fri 12/10/10	Fri 12/10/10	2 hrs		100%	Carlos Bu[20%],Chris Rukas[20%],Jay Wheaton[20%],Matt Rebisz[20%],Nick Shields[20%]
	Research Spreading Methods	NA	Fri 12/3/10	Tue 12/7/10	20 hrs		20%	Carlos Bu[20%],Chris Rukas[20%],Jay Wheaton[20%],Matt Rebisz[20%],Nick Shields[20%]
	Spec out Fab@Home system	Fri 1/7/11	Fri 12/10/10	Fri 1/7/11	2 hrs		100%	Nick Shields
	Research binding materials	NA	Fri 12/10/10	Tue 1/11/11	10 hrs		100%	Matt Rebisz
1	Team Norms/values	Fri 12/10/10	Fri 12/3/10	Fri 12/10/10	5 hrs		100%	Nick Shields[20%],Jay Wheaton[20%],Carlos Bu[20%],Matt Rebisz[20%],Chris Rukas[20%]
	Planning	**NA**	**Tue 12/7/10**	**Tue 2/15/11**	**211 days**		**35%**	
2	Project Plan	Fri 12/17/10	Tue 12/7/10	Fri 12/17/10	12 hrs		100%	Jay Wheaton
2	MSDII Schedule	Fri 2/25/11	Tue 2/15/11	Tue 2/15/11	7 hrs		0%	Jay Wheaton
	Design test plan/procedure	Fri 1/14/11	Thu 1/13/11	Fri 1/14/11	15 hrs		0%	Carlos Bu
	Exploratory Development/Feasibility	**NA**	**Fri 12/10/10**	**Tue 1/25/11**	**138.5 days**		**81%**	
	Set-up Workspace	NA	Fri 12/10/10	Fri 12/10/10	1 hr		100%	
	Familiarize with code for Fab@Home	NA	Mon 1/10/11	Mon 1/10/11	1 hr	16	100%	Chris Rukas
	Obtain Powder	NA	Wed 1/5/11	Tue 1/11/11	1 wk		100%	
	Powder Spreading Proof of Concept	NA	Wed 1/12/11	Wed 1/12/11	4 hrs	18	80%	Chris Rukas,Jay Wheaton
	Obtain various binders	NA	Tue 1/18/11	Tue 1/18/11	6 hrs		0%	Matt Rebisz
	Bonding Proof of Concept	NA	Wed 1/19/11	Wed 1/19/11	2 hrs	20	0%	Matt Rebisz
	Choose components to use from Fab@Home	NA	Tue 1/25/11	Tue 1/25/11	4 hrs	21	40%	Chris Rukas[40%],Jay Wheaton[20%],Nick Shields[40%]
	Basic System Dimensions	NA	Tue 1/25/11	Tue 1/25/11	1 hr	24	100%	
	Calculate Weight of Components	NA	Tue 1/25/11	Tue 1/25/11	0.25 hrs	22	100%	Chris Rukas
	Evaluation	**NA**	**Tue 12/14/10**	**Fri 2/11/11**	**178.13 days**		**0%**	
	Budget Summary	Fri 2/4/11	Mon 1/17/11	Mon 1/17/11	3 hrs	14	0%	Carlos Bu
	System Level Design Review	**NA**	**Tue 12/14/10**	**Tue 12/14/10**	**0 days**		**0%**	

Project Schedule

	System Design Risk Assesment	**NA**	**Tue 12/14/10**	**Tue 12/14/10**	**0.25 days**		**0%**	
	Technology	Fri 1/14/11	Tue 12/14/10	Tue 12/14/10	2 hrs		0%	Carlos Bu[30%],Matt Rebisz[30%],Nick Shields[40%]
	Cost and Schedule	Fri 1/14/11	Tue 12/14/10	Tue 12/14/10	1 hr		0%	Carlos Bu,Matt Rebisz,Nick Shields
	Feasibility	Fri 1/14/11	Tue 12/14/10	Tue 12/14/10	2 hrs		0%	Carlos Bu,Matt Rebisz,Nick Shields
	Actions to minimize risk	Fri 1/14/11	Tue 12/14/10	Tue 12/14/10	2 hrs		0%	Carlos Bu,Matt Rebisz,Nick Shields
	Develop Meeting Agenda	NA	Tue 12/14/10	Wed 12/15/10	12 hrs		0%	Chris Rukas
	Request Attendees	NA	Tue 12/14/10	Tue 12/14/10	1 hr		0%	Chris Rukas
	Prepare Presentation	NA	Tue 12/14/10	Tue 12/14/10	5 hrs		0%	Carlos Bu,Jay Wheaton,Matt Rebisz
3	Detailed Design Review	NA	Fri 1/14/11	Fri 1/14/11	0 days		0%	Carlos Bu,Chris Rukas,Jay Wheaton,Matt Rebisz,Nick Shields
	Risk Assesment (design phase)	Fri 2/11/11	Fri 2/11/11	Fri 2/11/11	6 hrs		0%	Carlos Bu,Chris Rukas,Jay Wheaton,Matt Rebisz,Nick Shields
	Development	**NA**	**Thu 12/16/10**	**Tue 2/1/11**	**140.13 days**		**0%**	
	System Chassis	**NA**	**Thu 12/16/10**	**Fri 1/21/11**	**109.13 days**		**0%**	
	Design Spreading Carriage Concept in CAD	NA	Fri 1/21/11	Fri 1/21/11	3 hrs		0%	Nick Shields
	Design Powder Platform Concept in CAD	NA	Thu 12/16/10	Thu 12/16/10	2 hrs		0%	Nick Shields
	Redesign Chassis in CAD	NA	Thu 12/16/10	Thu 12/16/10	3 hrs		0%	Nick Shields
	Finalize CAD Models	NA	Thu 12/16/10	Thu 12/16/10	2 hrs		0%	Nick Shields
	CAD Drawings	NA	Thu 12/16/10	Thu 12/16/10	5 hrs		0%	Nick Shields
	Bill of Materials	NA	Thu 12/16/10	Thu 12/16/10	2 hrs		0%	Nick Shields
	Spreading Heads	**NA**	**Thu 12/16/10**	**Tue 1/25/11**	**121.13 days**		**0%**	
	Design powder spreader Concepts in CAD	NA	Tue 1/25/11	Tue 1/25/11	4 hrs		0%	Jay Wheaton
	Choose Final Spreader Head(s)	NA	Thu 12/16/10	Thu 12/16/10	1 hr		0%	Jay Wheaton
	Finalize CAD Models	NA	Thu 12/16/10	Thu 12/16/10	2 hrs		0%	Jay Wheaton
	Design Modular Mount for Spreading Head	NA	Thu 12/16/10	Thu 12/16/10	6 hrs		0%	Jay Wheaton
	CAD Drawings	NA	Thu 12/16/10	Thu 12/16/10	5 hrs		0%	Jay Wheaton
	Bill of Materials	NA	Thu 12/16/10	Thu 12/16/10	2 hrs		0%	Jay Wheaton
	Motion Control	**NA**	**Thu 12/16/10**	**Tue 12/21/10**	**15.13 days**		**0%**	
	Motor Selection	NA	Thu 12/16/10	Thu 12/16/10	4 hrs		0%	Chris Rukas
	Controller Selection	NA	Thu 12/16/10	Thu 12/16/10	4 hrs		0%	Chris Rukas
	Controller Code	NA	Thu 12/16/10	Tue 12/21/10	25 hrs		0%	Chris Rukas
	Analysis	**NA**	**Thu 12/16/10**	**Thu 12/16/10**	**0.88 days**		**0%**	

Project Schedule

	Component Deflection	NA	Thu 12/16/10	Thu 12/16/10	3 hrs		0%	Chris Rukas,Jay Wheaton
	Required Force for Movement	NA	Thu 12/16/10	Thu 12/16/10	3 hrs		0%	Chris Rukas
	Powder Density	NA	Thu 12/16/10	Thu 12/16/10	6 hrs		0%	Carlos Bu
	Surface Roughness	NA	Thu 12/16/10	Thu 12/16/10	2 hrs		0%	Carlos Bu
	Z-axis Resolution	NA	Thu 12/16/10	Thu 12/16/10	1 hr		0%	Chris Rukas
	Binder	**NA**	**Thu 12/16/10**	**Tue 2/1/11**	**140.13 days**		**0%**	
	Develop Application Methods	NA	Thu 12/16/10	Thu 12/16/10	8 hrs		0%	Matt Rebisz
	Test Binder Applications	NA	Thu 12/16/10	Thu 12/16/10	4 hrs		0%	Matt Rebisz
	Choose binder	NA	Fri 1/28/11	Fri 1/28/11	1 hr	21	0%	Matt Rebisz
	Integrate Binder Application Into System	NA	Thu 12/16/10	Thu 12/16/10	4 hrs		0%	Matt Rebisz,Nick Shields
	Procure binding material	NA	Fri 1/28/11	Tue 2/1/11	2 wks	66	0%	
	Finalize CAD Drawing Package	Fri 2/11/11	Wed 1/26/11	Wed 1/26/11	4 hrs	47	0%	Nick Shields
	Procure building materials	NA	Tue 1/25/11	Sat 1/29/11	2 wks	47	0%	
	Presentation	**NA**	**Fri 2/18/11**	**Fri 2/18/11**	**0.88 days**		**0%**	
	Show Execution vs. Plan	Fri 2/25/11	Fri 2/18/11	Fri 2/18/11	6 hrs	38	0%	Jay Wheaton
	Project Status	Fri 2/25/11	Fri 2/18/11	Fri 2/18/11	1 hr	38	0%	Carlos Bu
1	Risk Assesment update	Fri 2/25/11	Fri 2/18/11	Fri 2/18/11	3 hrs	38	0%	Carlos Bu,Chris Rukas,Jay Wheaton,Matt Rebisz,Nick Shields
5	Design History File on EDGE	Fri 2/25/11	Fri 2/18/11	Fri 2/18/11	1 hr	38	0%	Jay Wheaton

Donated Metal Powder from ProMetal