

TEAM EXERCISE

Catapult Challenge

A design-and-build competition in iterative prototyping, solution selection, and return on investment.

Hit the Target — at the Lowest Cost

Teams of three people design and build a catapult out of ordinary household and office supplies. The teams compete to achieve customer requirements — hit the target — while balancing the cost of materials.

Because every part carries a price on the job cost sheet, the winning catapult is rarely the most elaborate one. Teams that build early and adjust from what they observe tend to finish ahead of teams that perfect a design on paper first.

INSTRUCTIONS

- 1 Divide participants into teams of three**
Three people per catapult keeps everyone hands-on through the build.
- 2 Set out sample designs and a job cost sheet**
Place a design book or sample designs and a job cost sheet at each team table. Participants are free to build a sample design, modify one, or create their own.
- 3 Allow 30–45 minutes to choose a plan and build**
During this time teams may test their models and adjust their designs accordingly.
- 4 Each team takes five shots**
At the end of the construction and testing period, every team fires five shots and records their scores on the flip charts.

TIME TO COMPLETE

60–90 Minutes

BUILD TIME

30–45 Minutes

PARTICIPANTS

Teams of 3

KEY CONCEPTS

Prioritizing & Selecting a Solution

Piloting a Solution

Design-Optimize-Verify

Return on Investment

Sample designs adapted from *Mini Weapons of Mass Destruction 3* by John Austin, Chicago Review Press, 2013.

Materials & Setup

Building supplies are priced on the job cost sheet and charged to each team; equipment is shared and rented from a central table.

Building Supplies

Medium binder clips	Paper clips	Pushpins
Small binder clips	Duct tape (thin rolls)	Plastic bottle or jug caps
Metal coat hangers	Ballpoint pens with caps	Wooden rulers with holes
Assorted Rubber Bands	Pencils	Plastic spoons
Craft sticks	Empty Tic Tac containers	Corks
Wooden tongue depressors	Plastic gift cards	

Equipment Rental

- Permanent markers
- Hot glue gun
- Scissors
- Pliers
- Wire cutters

Ammunition

- Mini marshmallows

Target

- Hoop or thick rope for the outer circle
- Small bucket placed inside the hoop

CUSTOMER REQUIREMENTS

Build a catapult that will launch a mini marshmallow into the target container.

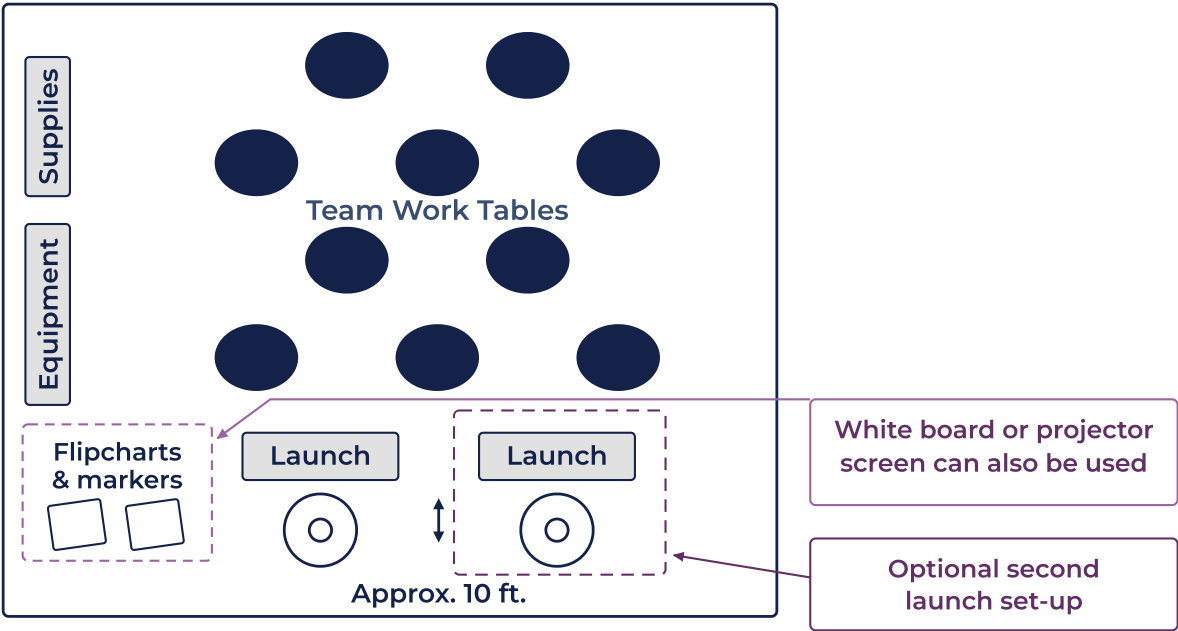
Minimum Requirement

Placement inside the outer hoop.

Target Performance

Placement inside the bucket.

Room Layout



ROOM SET UP NOTES

- Provide one work table with chairs for each team. It is best to have space for teams to spread out.
- Targets: a bucket inside a hoop. A circle of thick rope can be used in place of a hoop.
- If using glue, cover tables with a disposable tablecloth and locate the equipment table near an electrical outlet.

Scoring

Revenue

Inside the bucket · +\$5

Inside the outer hoop · +\$2

Team Score

$\text{Output} \div \text{Input} - \text{revenue performance divided by total costs.}$

Winning Design

The catapult that meets customer requirements at the least cost — the highest ROI.

EXAMPLE SCORING

TEAM	CUMULATIVE REVENUE	TOTAL COSTS	ROI
1	\$6.00	\$24.50	24%
2	\$9.00	\$3.00	300%
3	\$0.00	\$2.00	0%

Debrief

How did your team decide on the design of your catapult?

Ask who made the call, and whether cost entered the conversation before or after the design was chosen.

How much time did your team spend designing versus testing?

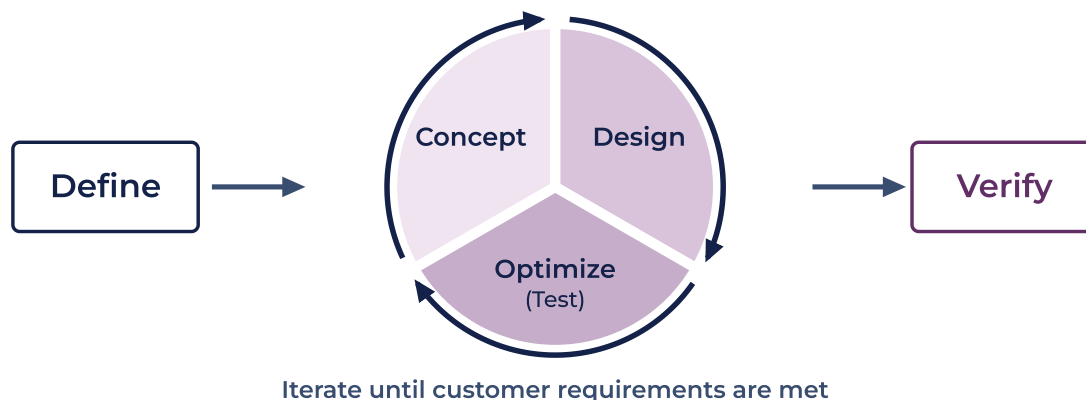
Compare the split across teams against where each one finished on the scoreboard.

In general, what is the most effective approach?

Building test models lets you keep refining the design to better meet customer requirements.

KEY LEARNING POINTS

The design roadmap is most accurately portrayed as iterative Concept-Design-Optimize steps rather than a simple linear Define-Concept-Design-Optimize-Verify process.



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Participant Scoring Sheet

Your team challenge: achieve the customer requirements while balancing cost.

- 1 You have 30–45 minutes to plan, choose a design, and build a catapult model out of the ordinary household and office supplies provided.
- 2 During this time your team may test its models and adjust the design accordingly.
- 3 At the end of the construction and testing period, each team competes against the other teams in the market. Every team is scored on a set of five shots.

Customer Requirements

Build a catapult that will launch a mini marshmallow into the target container.

Minimum requirement — inside the outer hoop

Target performance — inside the bucket

Scoring

Inside the bucket · +\$5

Inside the outer hoop · +\$2

Costs are tallied per item used at job cost sheet prices.

Team score = revenue ÷ total costs.

EXAMPLE SCORING

TEAM	REVENUE	COSTS	ROI
1	\$6.00	\$24.50	24%
2	\$9.00	\$3.00	300%
3	\$0.00	\$2.00	0%

YOUR TEAM SCORE

LAUNCH	REVENUE	COSTS	ROI
1			
2			
3			
4			
5			

TOTAL

Winning design: the catapult that meets the customer requirements at the least cost — the highest ROI.



Job Cost Sheet

Record the cost of every material used, including materials used in test models and later discarded.
Any breakage must also be included in your costs.

TEAM NAME _____

ITEM	UNIT COST	UNITS USED	TOTAL	TOTAL (\$)
BUILDING SUPPLIES				
Medium binder clip	\$2.00			
Small binder clip	\$1.00			
Metal coat hanger	\$2.00			
Rubber band — large, heavy duty	\$3.00			
Rubber band — medium, heavy duty	\$2.00			
Rubber band — medium, thin	\$1.00			
Rubber band — small	\$0.50			
Craft stick	\$1.00			
Wooden tongue depressor	\$1.50			
Paper clip	\$0.50			
Duct tape	\$2.00			
Plastic ballpoint pen with cap	\$1.00			
Pencil	\$1.00			
Tic Tac container	\$1.00			
Plastic gift card	\$2.00			
Pushpin	\$0.50			
Plastic bottle or jug cap	\$0.50			
Wooden ruler with holes	\$2.00			
Plastic spoon	\$2.00			
Cork	\$1.00			
EQUIPMENT RENTAL				
Permanent marker	N/C			
Utility razor cutter	N/C			
Scissors (central supply)	N/C			
Wire cutters (central supply)	N/C			
AMMUNITION				
Mini marshmallows	N/C			

TOTAL EXPENSE