An Academic Approach to Value Creation

Kristina Kennedy

Agenda

- **Introduction**
- **Value Creation Roadmap**
- **Primary Research**
- **Define the Opportunity**
- **User Needs**
- **Business Model Canvas**
- **Benchmarking**
- **Concepts & Selection**
- **Closing**

About Me

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Kristina Kennedy
Kennedy.443@osu.edu
https://www.linkedin.com/in/kristinakennedy/

Education:
BS Mech ENGR + MBA

Employment:
Former Honda R&D Engineer
Current OSU Faculty / Program Director

OSU's IBE Program

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Program Mission Statement: *The Integrated Business & Engineering (IBE) honors program offers a unique approach to multi-disciplinary education with a strong focus on innovation, business decision strategy and user-centered design in order to promote cross-functional thinking at the intersection of technology and business.*

Industry needs	IBE approach
Innovation is imperative for businesses to survive and grow in a dynamic global market	Bring together **high caliber engineering and business undergraduates** to study a common curriculum, complementing major of study with opposite minor
Emerging technologies such as AI, automation, and IoT are becoming increasingly critical in business strategy	Design a **four-year multidisciplinary honors program**, featuring unique coursework in: - Design thinking and new product development - Technology and innovation strategy
Multi-year training programs for new hires cost businesses millions of dollars in order to augment: - Engineering graduates with business foundations - Business graduates with technical literacy	Give students **real-world opportunity** to launch new product, service, and business model innovations for paying clients across varying industries Equip graduates to **communicate and drive impact** across business and engineering functions

https://engineering.osu.edu/integrated-business-engineering-honors-program

Overview of IBE Capstone

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Our Process

Semester One
Discovery

Problem Definition

Value Proposition
Pains & Gains
User Experience Chart

End User Research

Persona
Primary Interviews
Survey Tools

Market Analysis

Competitve Analysis
Business Model Canvas

Interim Deliverable

Selected concept validated with ample primary and secondary research.

Semester Two
Solutions

Detailed Design

Prototyping Plan
Material Purchasing
Design Requirements

Validation + Verification

Additional User Interviews
V&V Testing
Robust Product Testing

Go-To-Market Strategy

Next Steps Analysis
Updated Business Model
Market Readiness

Final Deliverable

Validated and verified solution, prototype, and design report including next steps.

Sponsorships

Sponsor Quotes

"We were very impressed with the work product the students delivered, which will become the foundation of some of the development that will follow."

"Anytime we can work with a group like this and get something delivered that provides value to us, it's really a win-win between us and the students."

"I hired a lot of engineers and the students in this group are working at a level that's equivalent to what most engineers hope to aspire to in five to ten years out of college."

Previous Sponsors

P&G · MillerKnoll · WATTS · Church & Dwight Co., Inc. · NEXCERIS · POWER FOR HYDROGEN

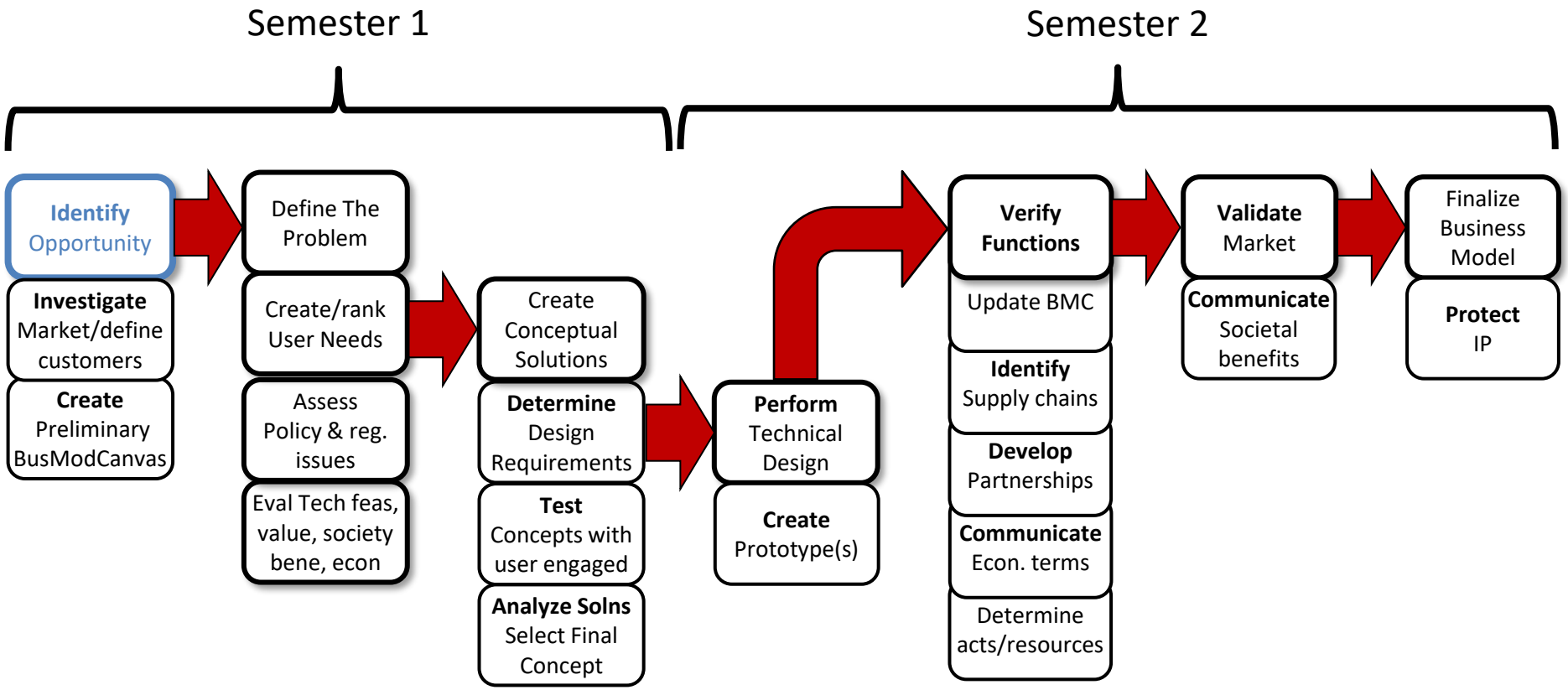
Connect with us!
OhioStateIBE@osu.edu


Group projects in school weren't meant to teach you teamwork, they were meant to teach you how to deal with incompetence of your coworkers in the workplace…

Agenda

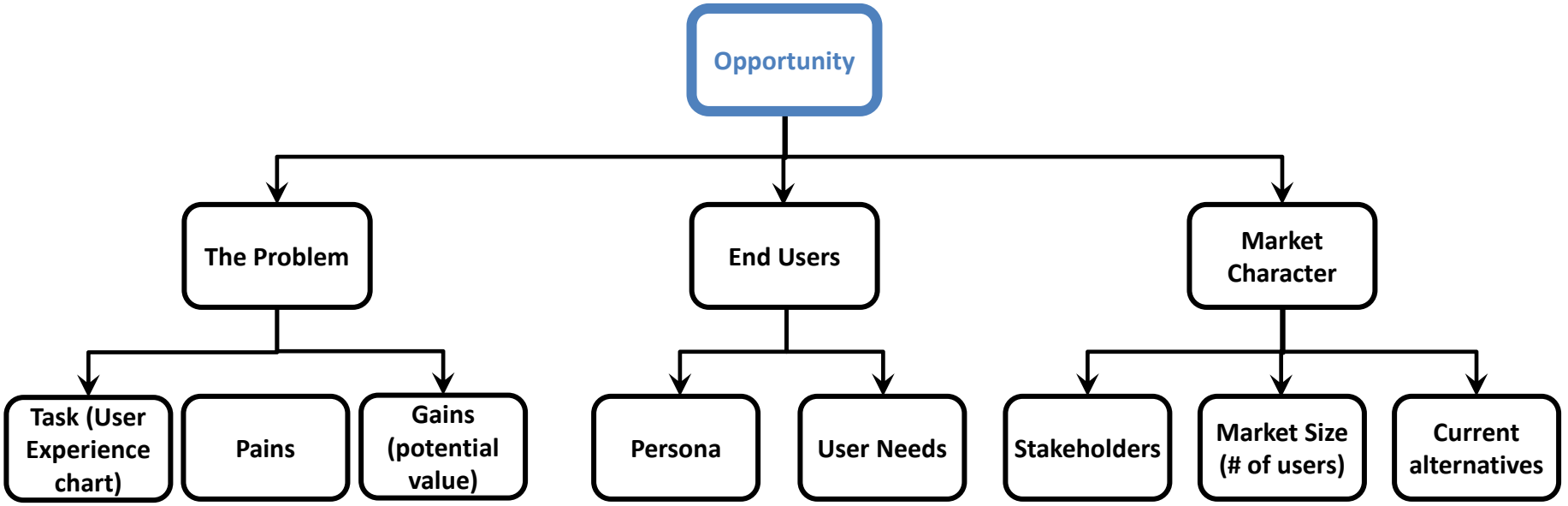
- Introduction
- **Value Creation Roadmap**
- **Primary Research**
- **Define the Opportunity**
- **User Needs**
- **Business Model Canvas**
- **Benchmarking**
- **Concepts & Selection**
- **Closing**

Value Creation Process (Course Roadmap)

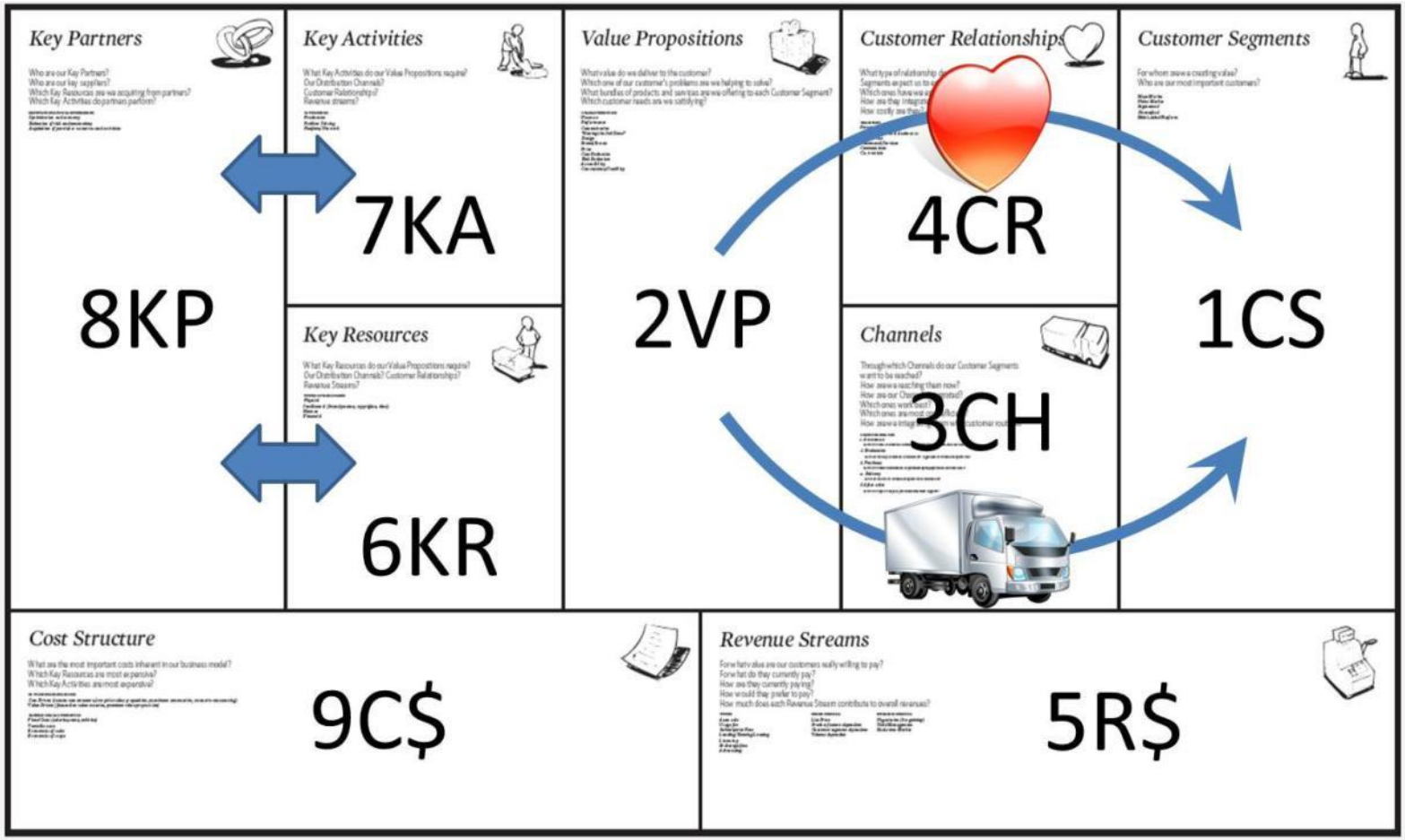


An Opportunity to Create Economic and/or Social Value

First, we will dig in and clarify the OPPORTUNITY



BMC frames Value



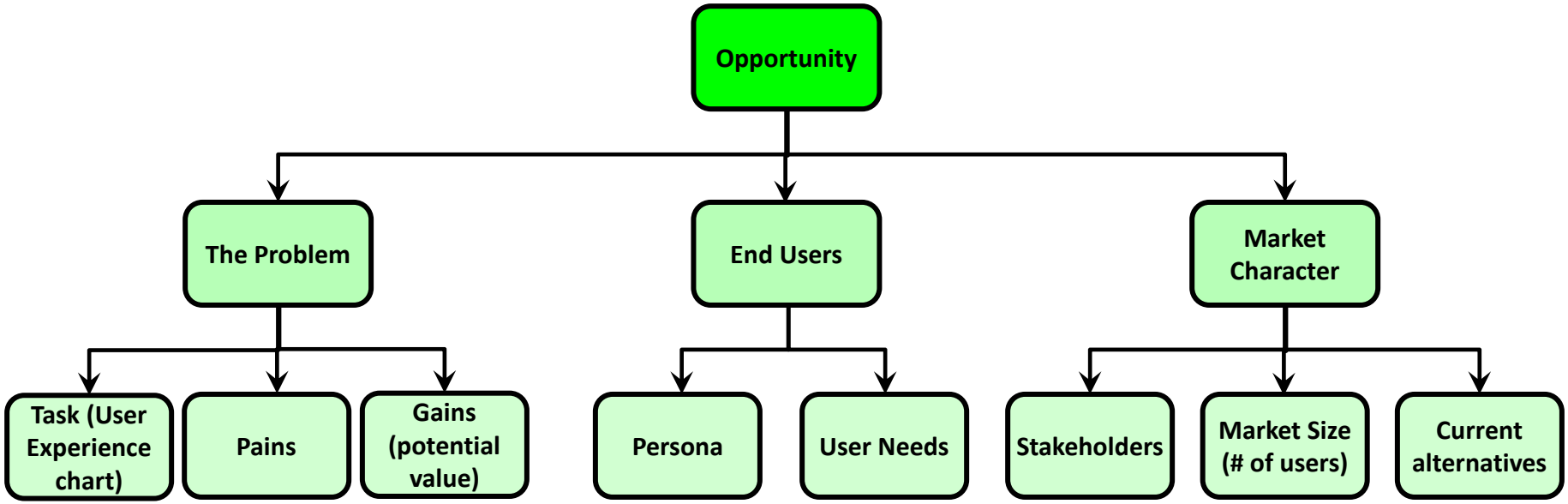
"Business Model Generation", Osterwalder & Pigneur

Agenda

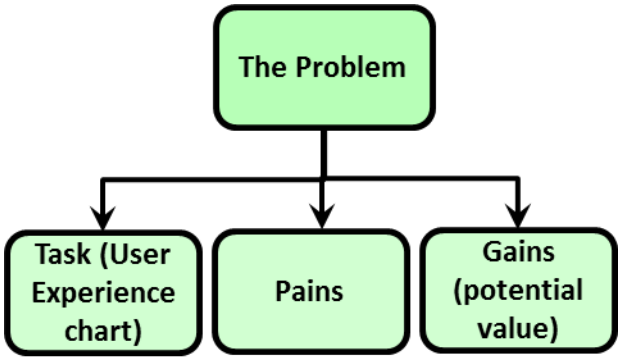
- Introduction
- Value Creation Roadmap
- **Primary Research**
- **Define the Opportunity**
- **User Needs**
- **Business Model Canvas**
- **Benchmarking**
- **Concepts & Selection**
- **Closing**

Design Research

Define Opportunity via Research



Primary Research helps Define (or Reframe) the **Problem**



Define the Problem (by talking to "users“ or SMEs)

- Focus down to specific task
- Define current Pains
- Define future Gains

Let's Practice….
Define the Problem (Tasks/Pains/Gains)?

Situation:
A student and her professor are doing research in wilds of Alaska when a grizzly bear starts to chase them from a distance. Both start running, but it's clear that eventually the bear will catch up with them…

Define the problem: _____

…the student takes off her backpack, gets her running shoes out, and starts putting them on. Her professor says, "You can't outrun the bear, even in running shoes!" The student replies, "I don't need to outrun the bear; I only need to outrun you!"

THE OHIO STATE UNIVERSITY

Strategies for Creative Problem Solving; H. Fogler, S. LeBlanc

Reframe a Problem

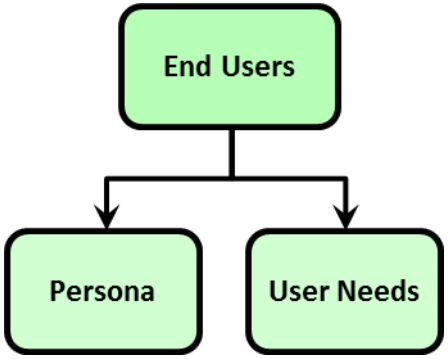
Situation:
Shortly after the upper floors of a high-rise hotel have been renovated to increase the hotel's room capacity, guests complained that elevators are too slow.

Define the problem: _____
Define a solution: _____

…or how about this?

Reframe the problem: Find a way to *minimize the complaints* by taking guests' minds off their wait.

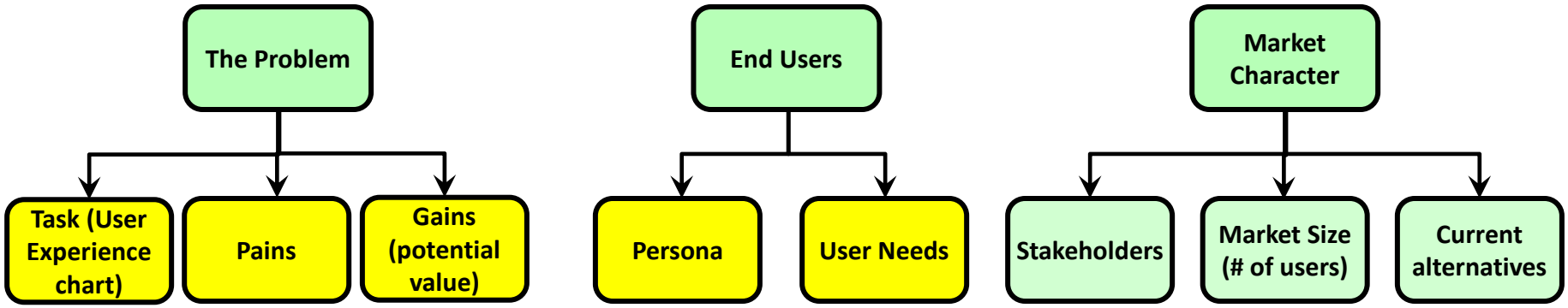
Primary Research helps Define **Users**



End Users

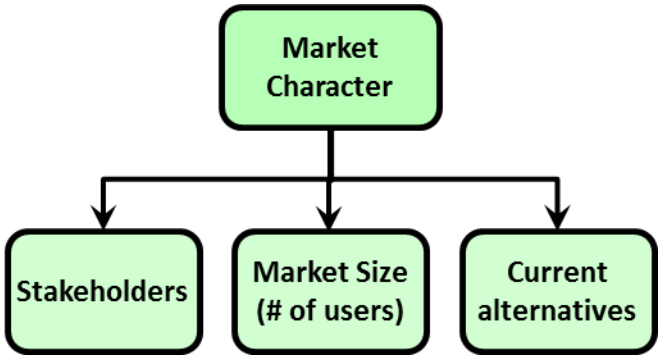
- Understand/define users & stakeholders
- Define primary and secondary users
- Identify people you will interview
- Define interviewing process

Primary Research Focus



1. Clarify problem/task (pains & gains)
2. Create user-experience chart or scenario
3. Characterize your end user (eventual persona)
4. Define user needs **(ensure solution Fits in Market)**

Secondary Research helps Define the **Market**



Market Character

- Understand/define stakeholders
- Define market size (primary vs. secondary)
- Show current alternatives (competitive matrix)

Defining Market Character

Market Character is defined by **Stakeholders** (BMC), **Size of Market** (or “Size of Prize”) and **Current Alternatives** (Competitive Benchmarking).

Size of Market should address:

- How big is your primary market?
  - Based on age, gender, location
- How much of that market is capturable by your solution?
- What is the future outlook of this market segment?
  - Growing, shrinking, stable
- What does a secondary market look like?

Elements of Commercial Value
(Three types of Fit)

It must fit:

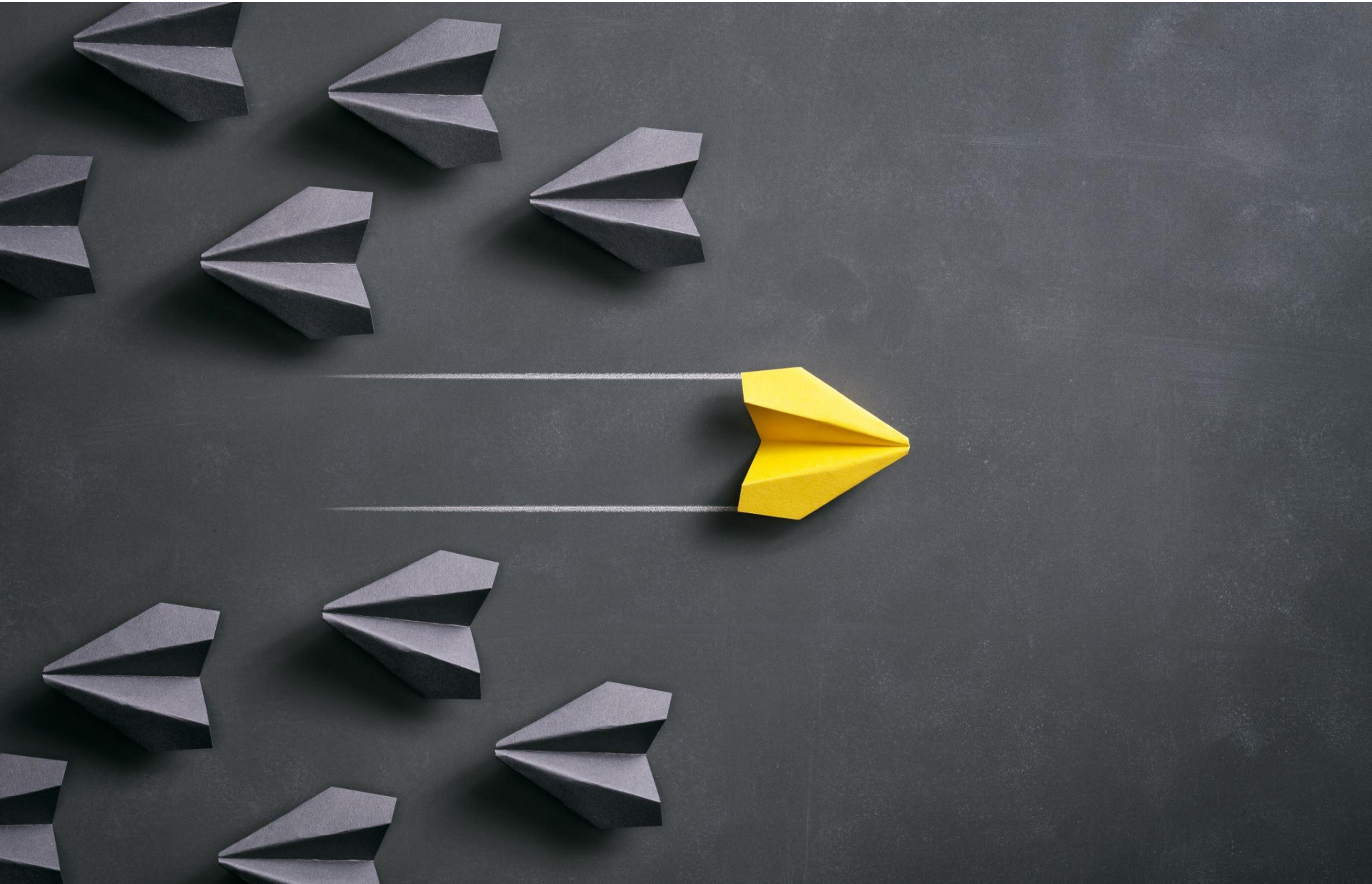
1. In the market—people want or need it
2. On paper—it works
3. In the bank/society—people will buy it

"Value Proposition Design", Osterwalder & Pigneur

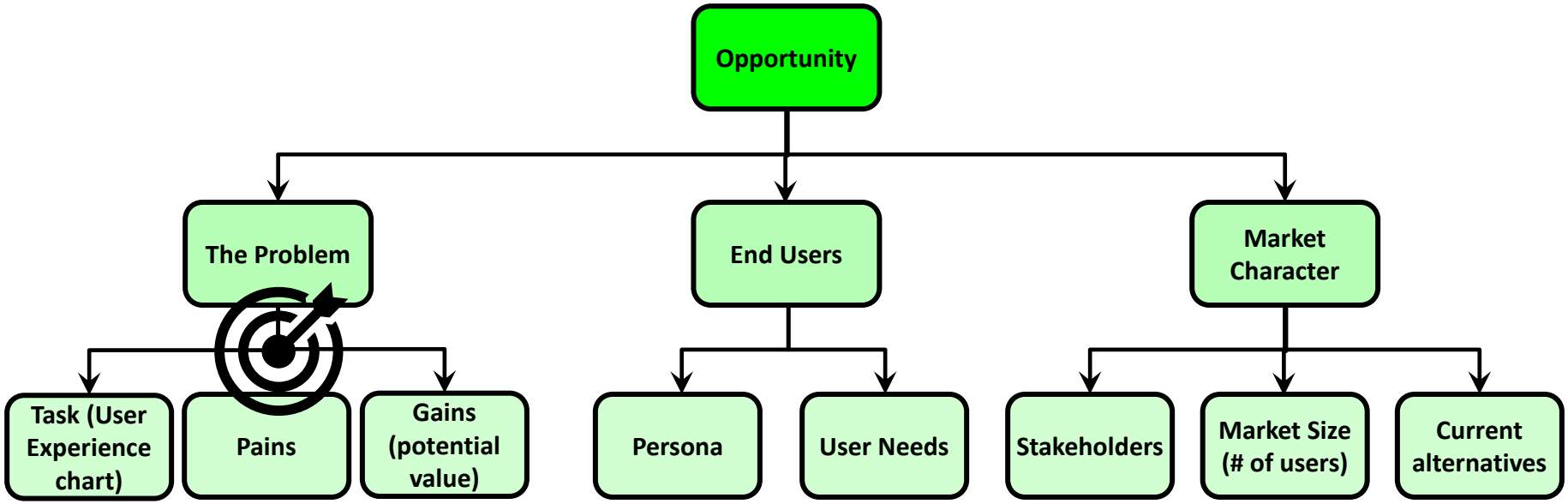
Agenda

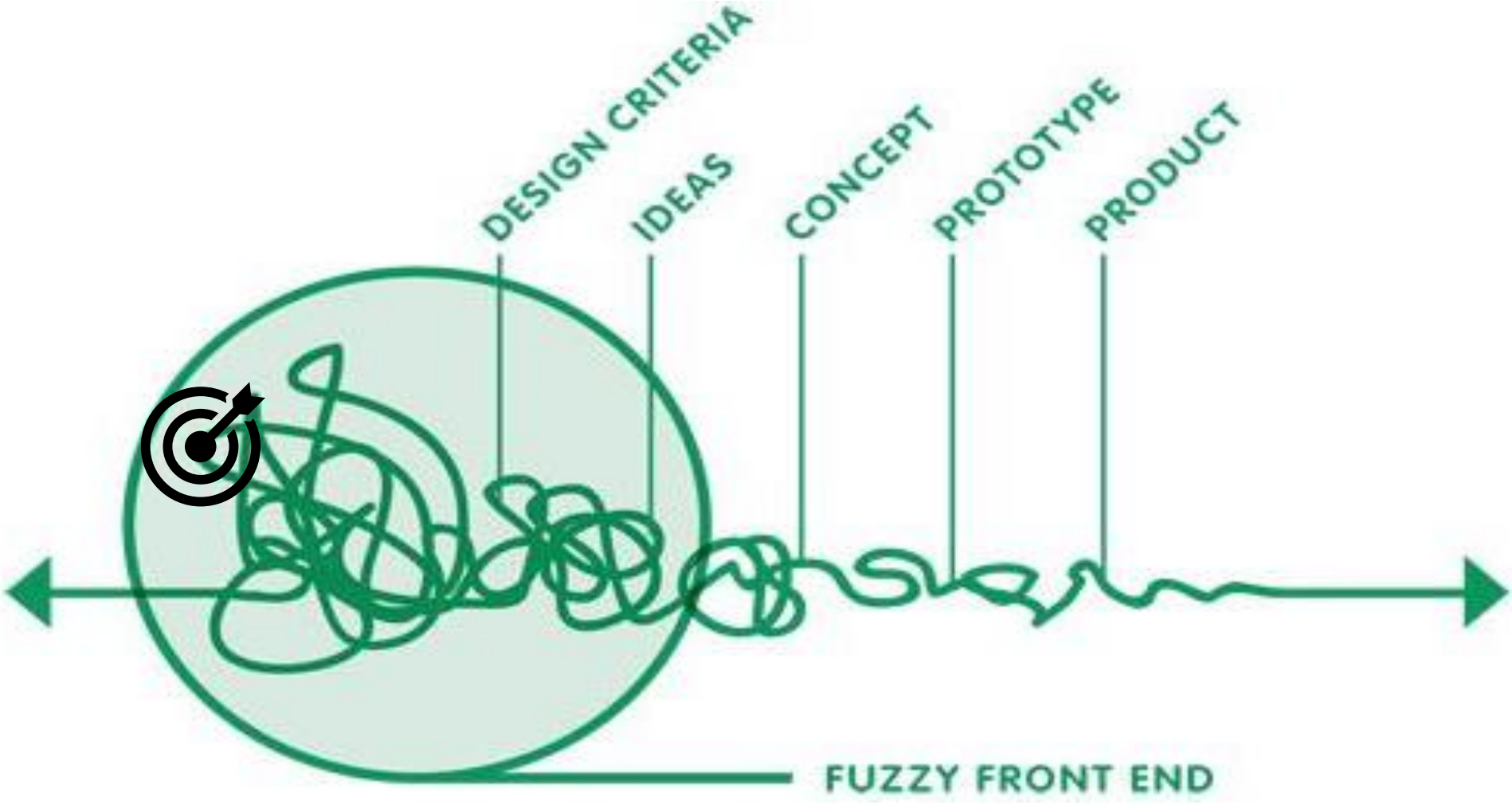
- Introduction
- Value Creation Roadmap
- Primary Research
- **Define the Opportunity**
- **User Needs**
- **Business Model Canvas**
- **Benchmarking**
- **Concepts & Selection**
- **Closing**

Define Opportunity



You are here…


Opportunity
The Problem
End Users
Market Character
Task (User Experience chart)
Pains
Gains (potential value)
Persona
User Needs
Stakeholders
Market Size (# of users)
Current alternatives



“How the sausage is made” in Honda-speak.

Use Primary Research to (further) Define Problem: User Task, Pains, & Gains

- *User Task* = specific job or function performed by end user
- *Pains* = problems with current situation
- *Gains* = possible positive outcomes or values (not design solutions…yet!)

- DO extract information through primary research
- DO describe specific task, pains, and gains
- DON'T think about product or solution yet

Let’s Practice with an Example

We are Honda:

- Current US auto market share ~15%
- New CA regulations for 2035 require 100% new car sales to be Zero-Emission (Electric, Plug-in Hybrid, Fuel Cell)
- Customer access to at-home plug-in technology may be limited

Our opportunity:

- To capitalize on largest US sales market (CA) by increasing EV offerings and at-home charging solutions
- Will other states follow suit?? (Likely.)

The User Problem: I can't charge my vehicle at home (Task, Pains, and Gains)

Task: At-home car charging

- **Current pains:**
  - I don't have at-home charging station
  - I don't have access to at-work charging station
  - I have "range anxiety"
  - City stations are available but may not intersect with my daily schedule each week (@ Public Library, @ Rec Center, etc.)
- **Future gains (created values):**
  - I feel more confident approaching the day with a fully charged vehicle
  - I understand the charge-to-range expectation
  - I know where I can access charging stations

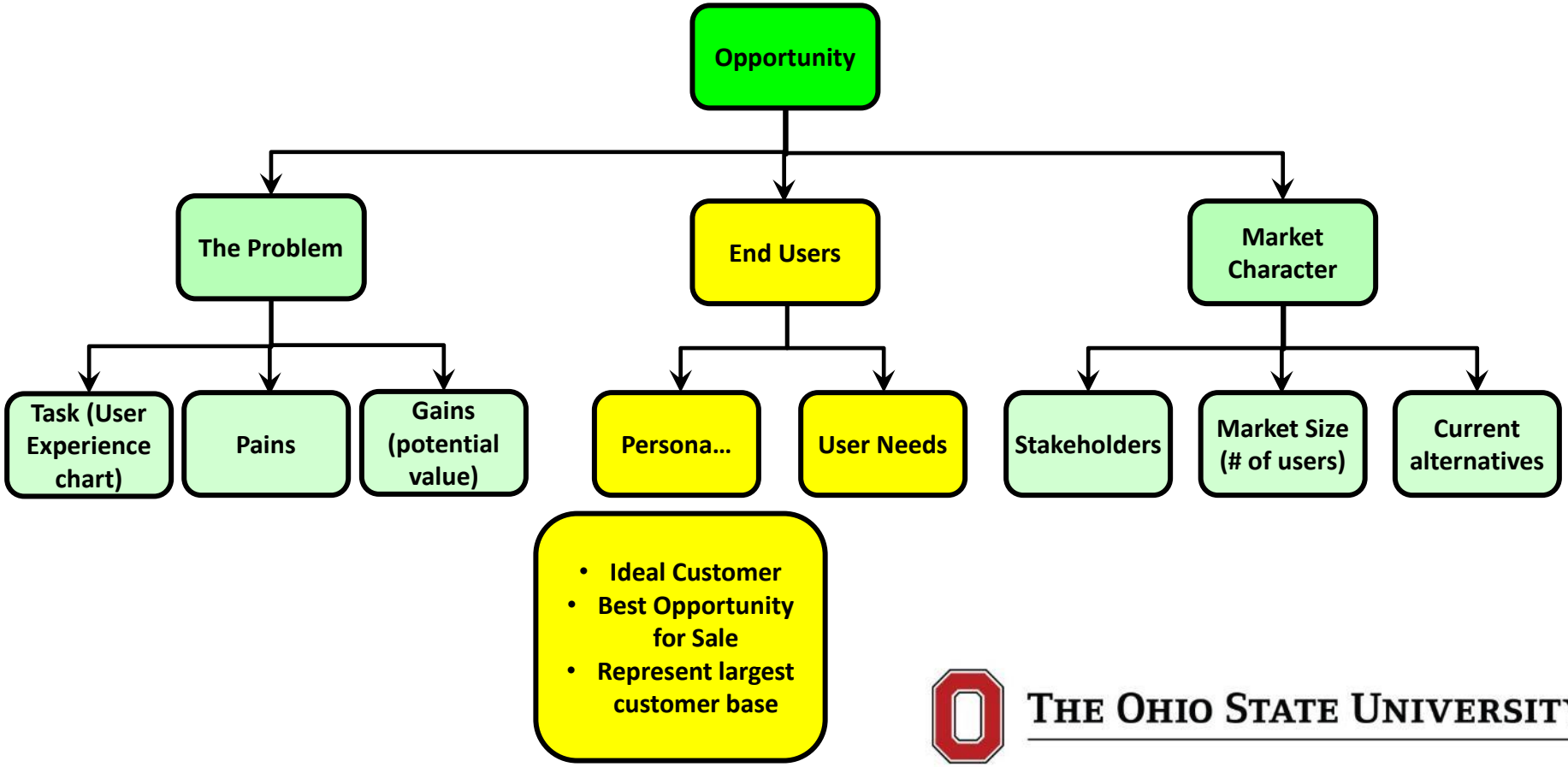
Task: Ensuring Charged Vehicle
Create a ***User Experience Chart***

	Morning						Mid-Day				Night			
	Wake Up	Get Ready for Work	Decide where to work remotely	Drive to Public Library	Find Parking with Charge Station	Plug in vehicle	Go to car / check Charge	Return to home / continue work day	Run errands	Confirm charge	Decide work location for next day	Decide if vehicle needs to charge	Book study room at library	Go to sleep
++														
+														
0														
-														
- -														

Pains

Characterize End Users

Persona: ***A visualization / characterization of target (or typical) end-user***



User Persona - "Logistical Craziness" Parent

Janelle Rogers

Age: 40
Status: Married with four kids
Occupation: Corporate Accountant
Spouse Occupation: Technical Product Manager

Profile: Janelle is a busy parent with four kids, ranging in ages from still diapers to just starting freshman high school. Outside of Janelle's 9-5 corporate job, she spends most of her time chauffeuring her children around to their extracurriculars and daycares and working to keep her house in order. In her rare moments of free time, Janelle enjoys sipping tea while watching Law and Order.

Motivations

- Providing the best possible upbringing for her kids
- Keeping an orderly life by removing the craziness

Frustrations

- Getting dirty doing household chores
- Simply not enough hours in a day
- Kids messing up rooms right after she cleans them
- Finding time to wind down with her hectic schedule

Goals

- Advance in her career while keeping family first
- Be able to return to entertaining friends and family at her household

Favorite Past Times

- Reading stories with her kids
- Watching Law and Order
- Trying new cafes around town
- Online shopping on Amazon Prime

Family Technology Usage

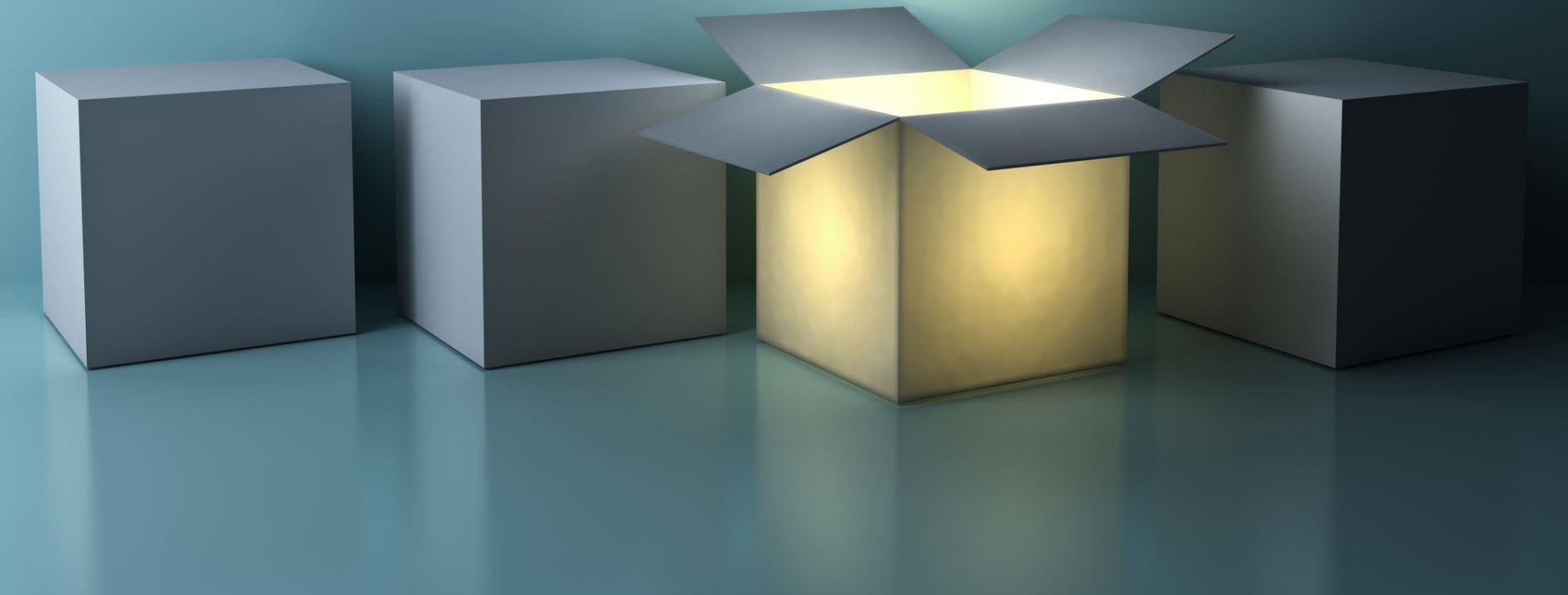
alexa Roku nest

Most Used Apps

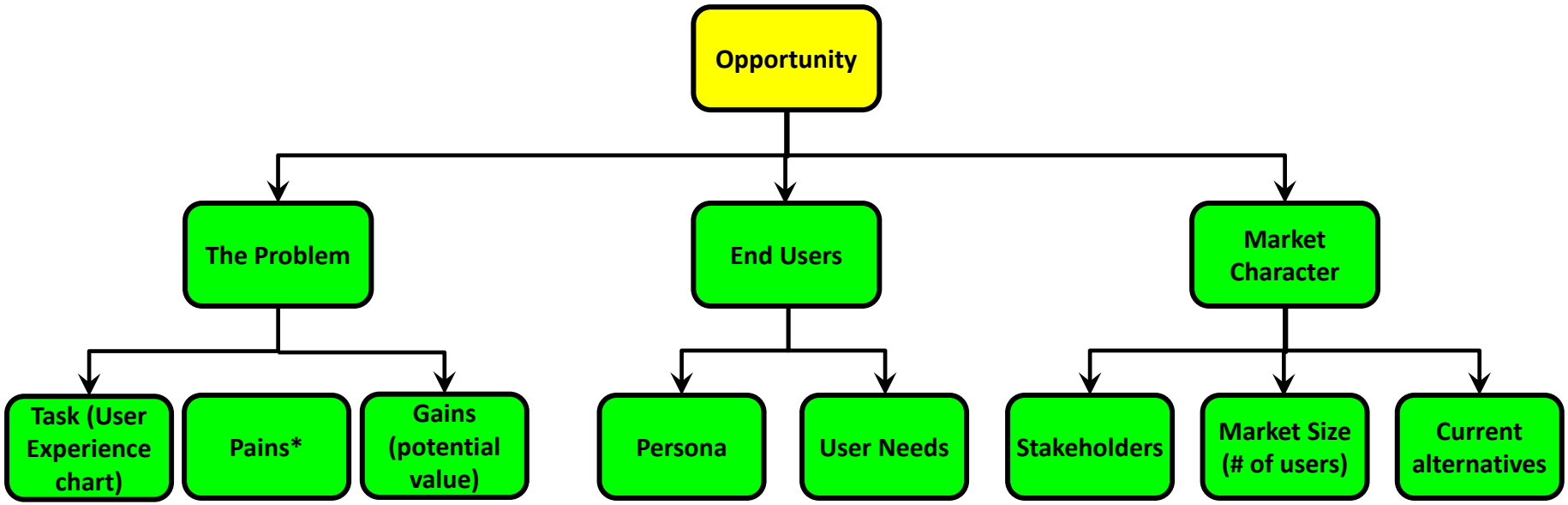
Agenda

- Introduction
- Value Creation Roadmap
- Primary Research
- Define the Opportunity
- **User Needs**
- **Business Model Canvas**
- **Benchmarking**
- **Concepts & Selection**
- **Closing**

User Needs



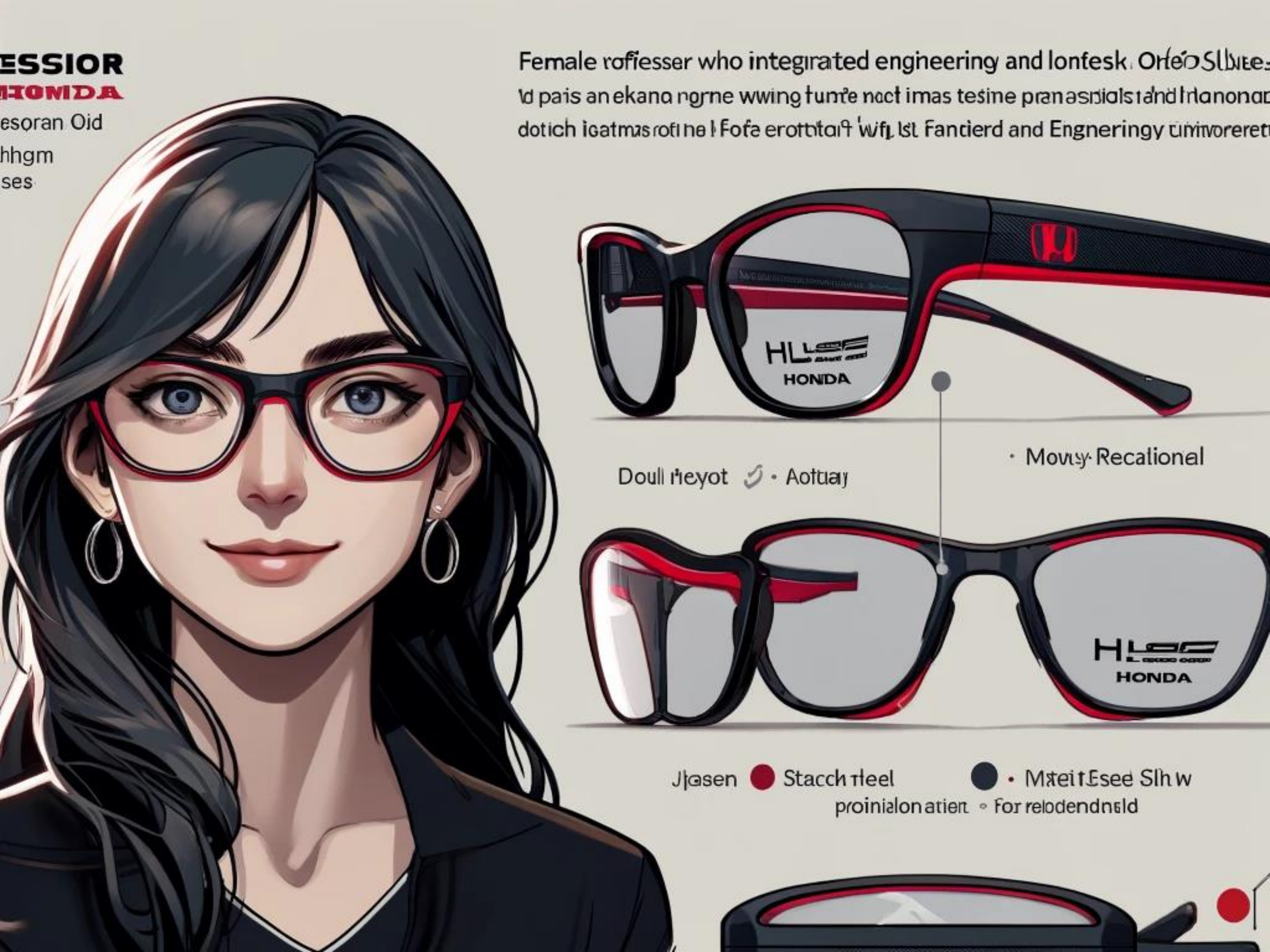
Opportunity is Defined by Problem, End User and Market Character



**Pains could even be "barriers to entry."*

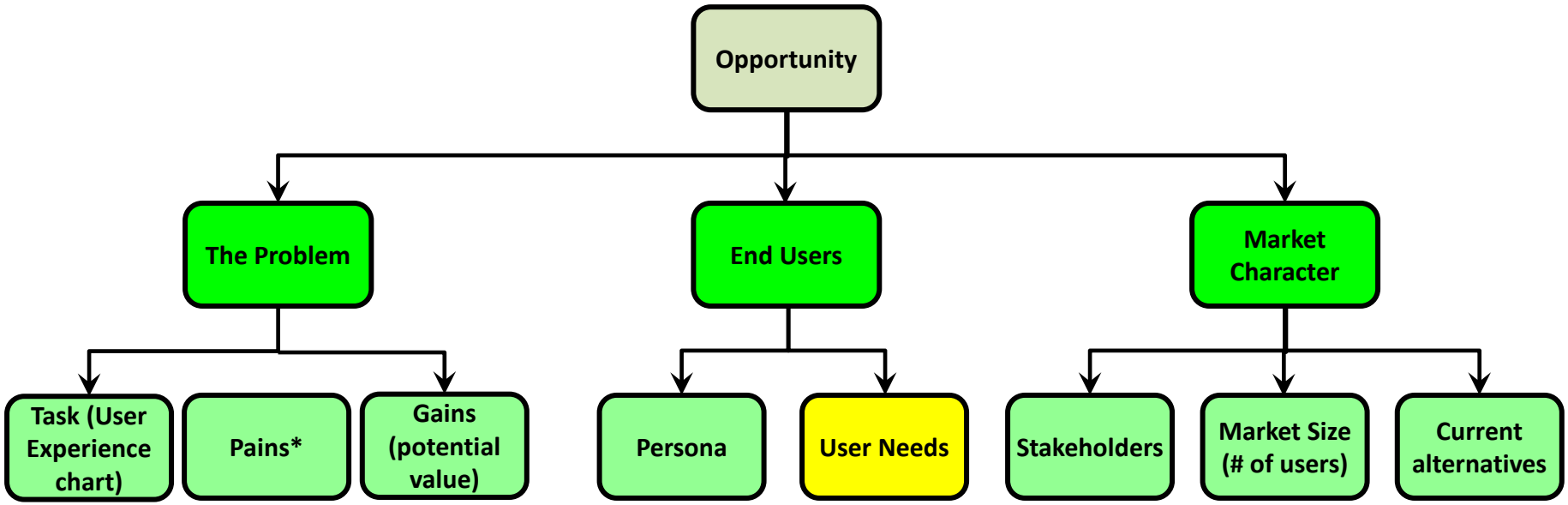
Individual Mini-Design Challenge

- Create glasses for an end user (me)
  - Prototype OR Virtual Image
- Available materials
  - pipe cleaners (6/person)
  - image generating tool (ie: Dall-E)
- Work time: 10 mins
- Sell me your product


ESSIOR
HONDA
esoran Oid
hhgm
ses
Female roffesser who integrated engineering and lonfesk. OrfeoSlbtes
'd pais an ekana ngrne wwing tunte nact imas tesine pranasbials tand Irlanonad
dotich icatmas rotine l Fofa erotttal't Wfj. lst Fandierd and Engneringy umvoreretu
HONDA
Doull rleyot
Aotuay
Movuy Recalional
HONDA
Jlosen
Stacch rleel
Mteit Esee Slh w
proinialonatien
For relodendneld


Integrated Engineering Honors
Lightweight Business Enginering
Blue light
Teaches in business and
& Engineering Honors
at Ohio State University
Ohio State University.
HONDA
Female Professor Engineering Honors

Defining User Needs (=Elimination of Pains)



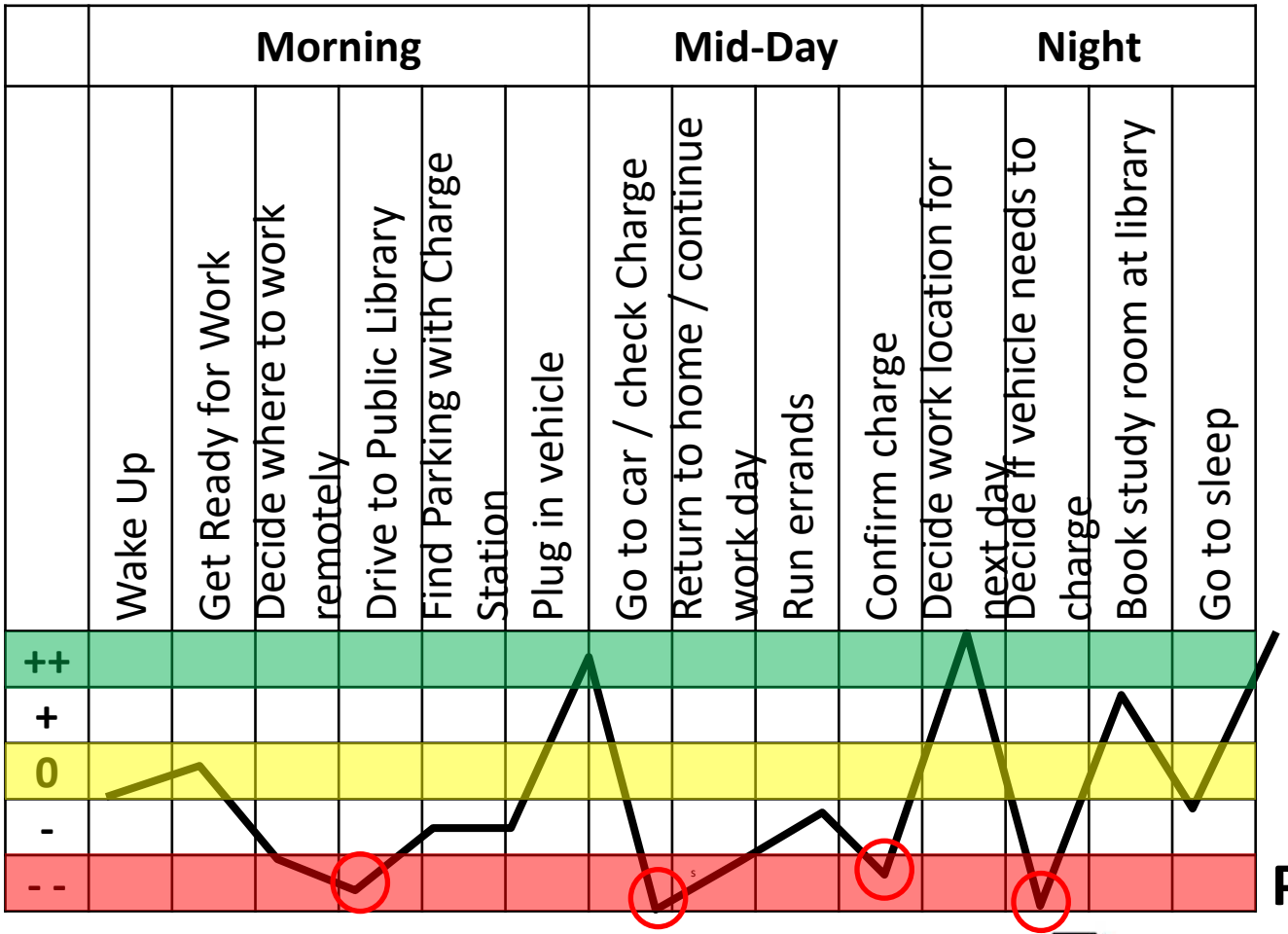
**Pains could even be "barriers to entry."*

The Problem: I can't charge my vehicle at home

Task: At-home car charging

- **Current pains:**
  - I don't have at-home charging station
  - I don't have access to at-work charging station
  - I have "range anxiety"
  - City stations are available but may not intersect with my daily schedule each week (@ Public Library, @ Rec Center, etc.)
- **Future gains (created values):**
  - I feel more confident approaching the day with a fully charged vehicle
  - I understand the charge-to-range expectation
  - I know where I can access charging stations

Visualizing the User Experience



Pains

Define User Needs (What, not How)

- Create a list of customer wants/needs
- Prioritize them (using pair-wise comparison)
- Scale to 5 as highest ranking
- Create a matrix with needs in left column
- We will (later) use these to create concepts

Needs are NOT Created Equal

User Needs (Electric Vehicle Charging):

Easy to install (in-home)	4
Easy to plug-in	5
Notification at full-charge	2
Digital display	5
Time to full-charge displayed	1
Expected Range displayed	2
Small / Takes up little space	2
Quiet operation	5
Compatible with many products	2
Is long lasting/reliable	4
Looks appealing	1

Ranking Methodology
(Scale; 1 = low, 3 = mid, 5 = high)

- First, rank as a team based on preliminary research, user interviews, client input, team "feeling"
- Team can vote, majority rule

Rank Needs with Pairwise Comparison Chart

1. Head-to-head
2. Sum Row(s)
3. Option to Normalize
4. VS Original Team Ranking

	Is portable (battery operated)	Backlight that can turn off	Choice of alarm sounds	Settable alarm volume	Digital and analog display	Accurate time	Separate weekend setting	Is extremely quiet (no ticking)	Alarm & time are easy to set	Long lasting/reliable	Is handsome	TOTAL (2)	Normalized (3)	Original (4)
Is portable (battery operated)	1	1	1	1	1	0	1	1	0	0	1	7	3.5	4
Backlight that can turn off	0		1	1	1	0	1	0	0	0	1	5	2.5	5
Choice of alarm sounds	0	0		1	1	0	1	0	0	0	1	4	2	2
Settable alarm volume	0	0	0		1	0	1	0	0	0	1	3	1.5	5
Digital and analog display	0	0	0	0		0	1	0	0	0	1	2	1	1
Accurate time	1	1	1	1	1		1	1	1	0	1	9	4.5	2
Separate weekend setting	0	0	0	0	0	0		0	0	0	1	1	0.5	2
Is extremely quiet (no ticking)	0	1	1	1	1	0	1		1	1	1	8	4	5
Alarm & time are easy to set	1	1	1	1	1	0	1	0		1	1	8	4	2
Long lasting/reliable	1	1	1	1	1	1	1	0	0		1	8	4	4
Is handsome	0	0	0	0	0	0	0	0	0	0		0	0	1

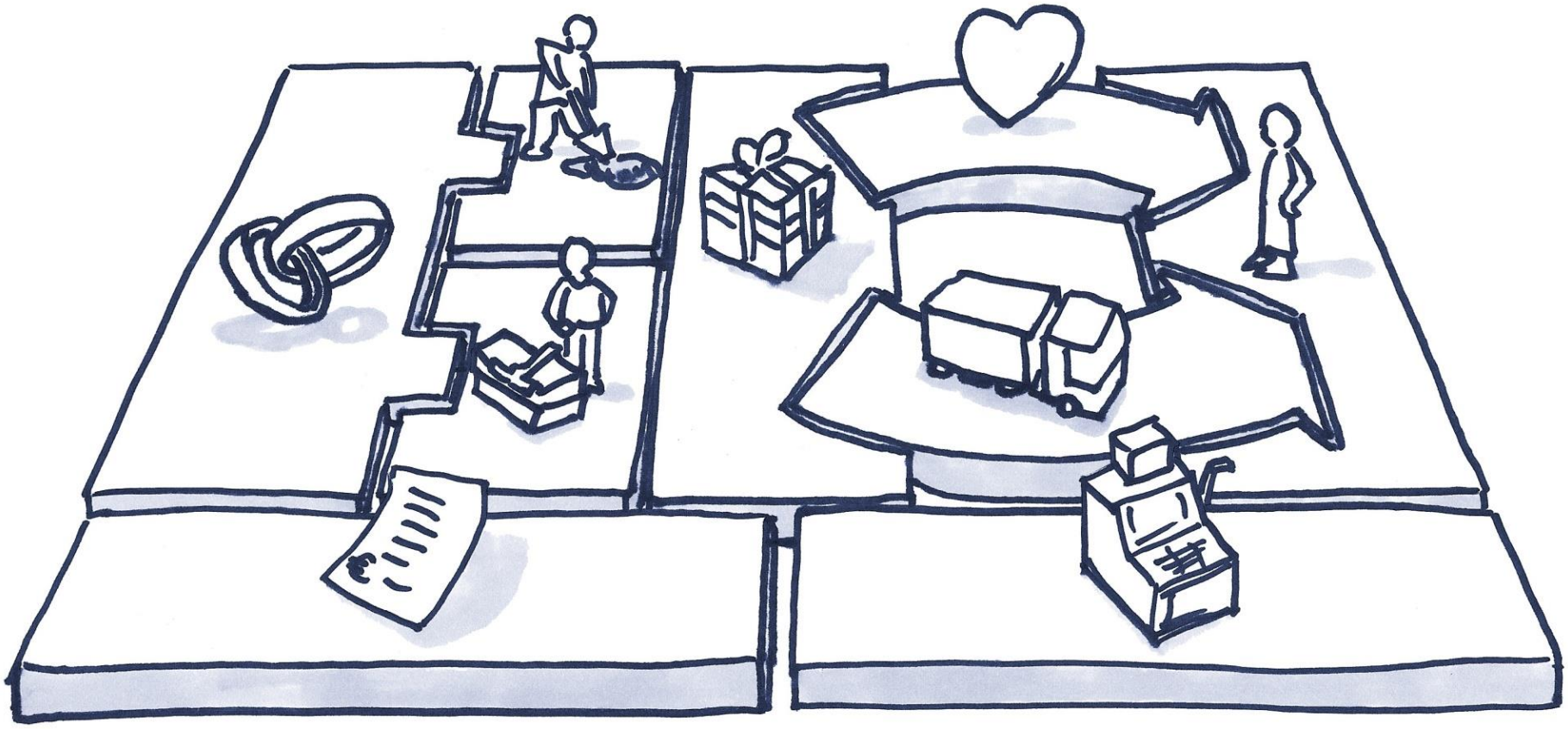
Consider which User Needs should be prioritized based on Pairwise vs. Original Team Ranking

"1" indicates a NEED is MORE important than alternate
"0" indicates a NEED is LESS important than alternate

Agenda

- Introduction
- Value Creation Roadmap
- Primary Research
- Define the Opportunity
- User Needs
- **Business Model Canvas**
- **Benchmarking**
- **Concepts & Selection**
- **Closing**

Business Model Canvas

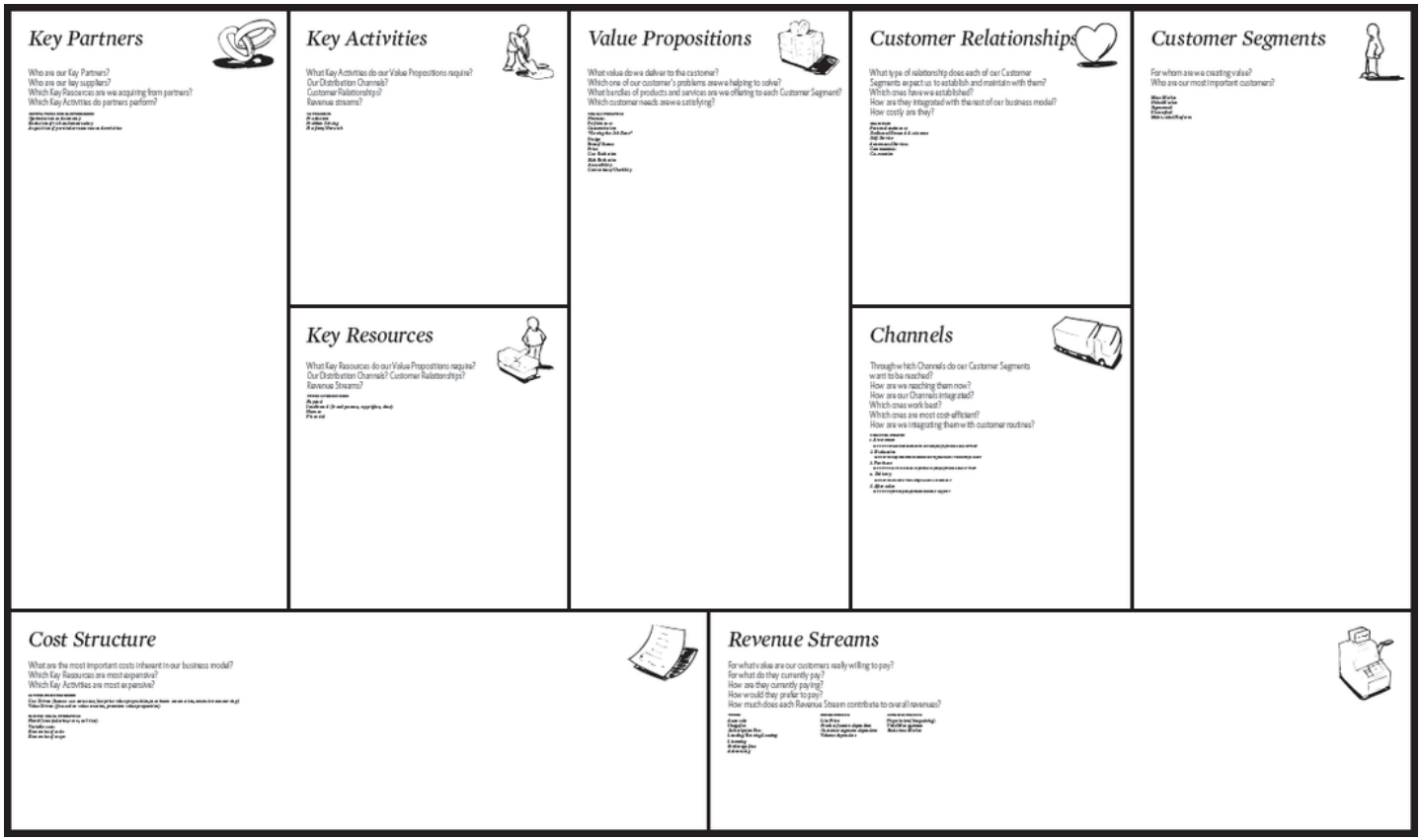


Source: BUS ADM 3531 Startup Entrepreneurship (P. Reeder)

What is a Business Model Canvas (BMC)?

"A validated representation which describes the ***rationale*** of how an organization ***creates and delivers value***"

"An ***articulation of management's hypothesis*** about what customers want, how they want it and how an enterprise can best organize to meet those needs, get paid for doing so, and make a profit"



Agenda

- Introduction
- Value Creation Roadmap
- Primary Research
- Define the Opportunity
- User Needs
- Business Model Canvas
- **Benchmarking**
- **Concepts & Selection**
- **Closing**

Competitive Benchmarking

Assessing the “Competitive Battlefield” & Product Competitiveness

Benefits of Benchmarking

1 Set the bar for performance

Understand your performance versus the industry and your key rivals

Similarweb tools to use

- Industry Analysis
- Website Analysis
- Company Analysis

2 Win market share

Seize opportunities to grow your share by applying your strengths to your rival's weaknesses

Similarweb tools to use

- Traffic & Engagement
- Web Segment Analysis
- Industry Trends
- Conversion Analysis

3 React to market trends

Tracking your market position and key metrics over time and report on key seasonal trends

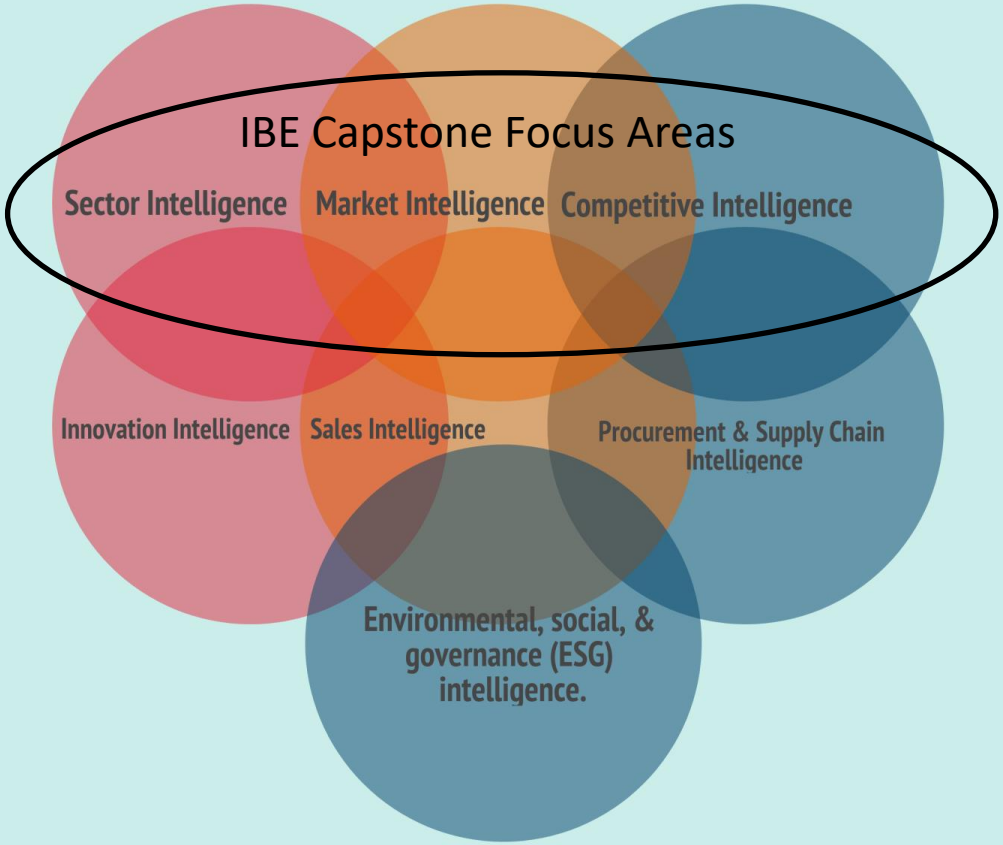
Similarweb tools to use

- Competitive Tracking
- Marketing Channels
- Historical data

https://www.similarweb.com/corp/blog/research/business-benchmarking/benefits-of-benchmarking/

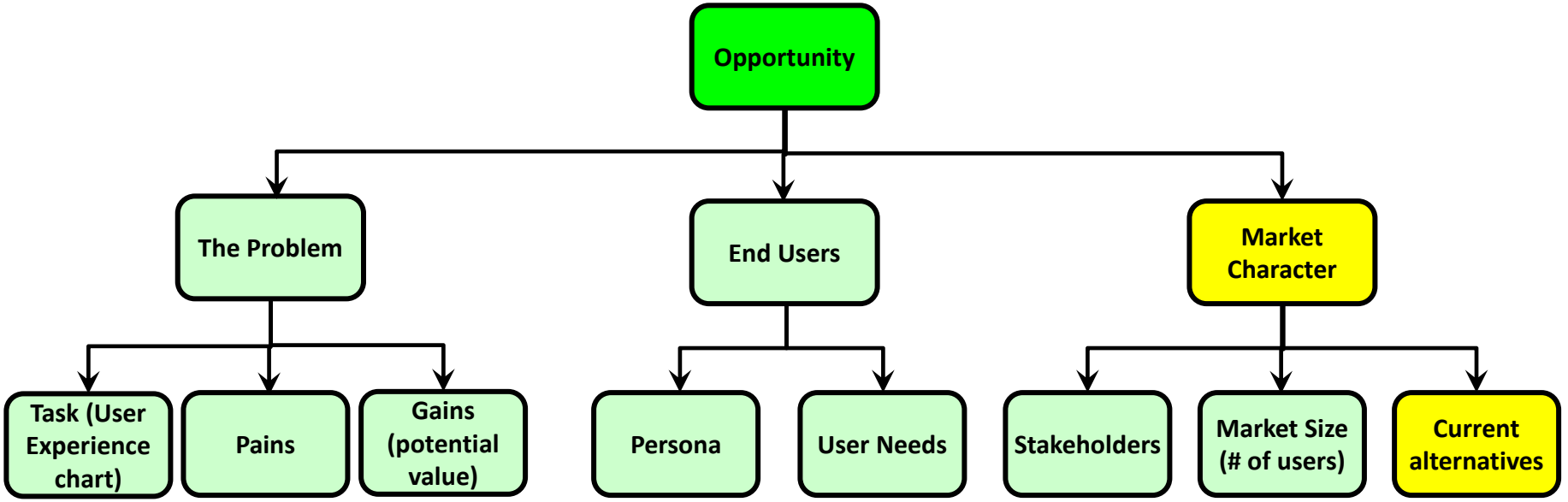
Competitive Intelligence In A Nutshell

Competitive intelligence is the systematic collection of information by a company on its industry, business environment, competitors, products, and consumers. Insights are then used to help the company develop its strategy or improve its competitive position. Competitive intelligence can be assessed according to seven elements: sector intelligence, market intelligence, competitive intelligence, innovation intelligence, sales intelligence, procurement & supply chain intelligence, and Environmental, social, & governance (ESG) intelligence.



Define Market Character

Competitive Battlefield



Think ***beyond*** "Current Alternatives" including:

- Compensating Behavior
- Opting out to WHAT? (IE: Honda Odyssey vs. Honda Pilot)
- In typical business fashion, DO NOTHING is always an option…

Current Alternatives

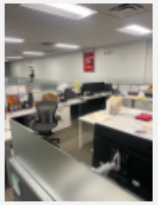
Competitive Analysis or Competitive Battlefield

- **Product / Services review**
  - Understand current practices:
    - Capabilities
    - Performance
    - Limitations
- **Product teardown (reverse engineering)**
  - *Zenbara: Inspection or product tear-down*
  - Take product apart to understand:
    - Components
    - Performance
    - Cost
    - Strengths/weaknesses
    - Repair ability
  - Use product/or watch others use existing products or methods
- **Revisit User Needs**
- **Create competitive / needs matrix**

Fully Fills Need

Partly Fills Need

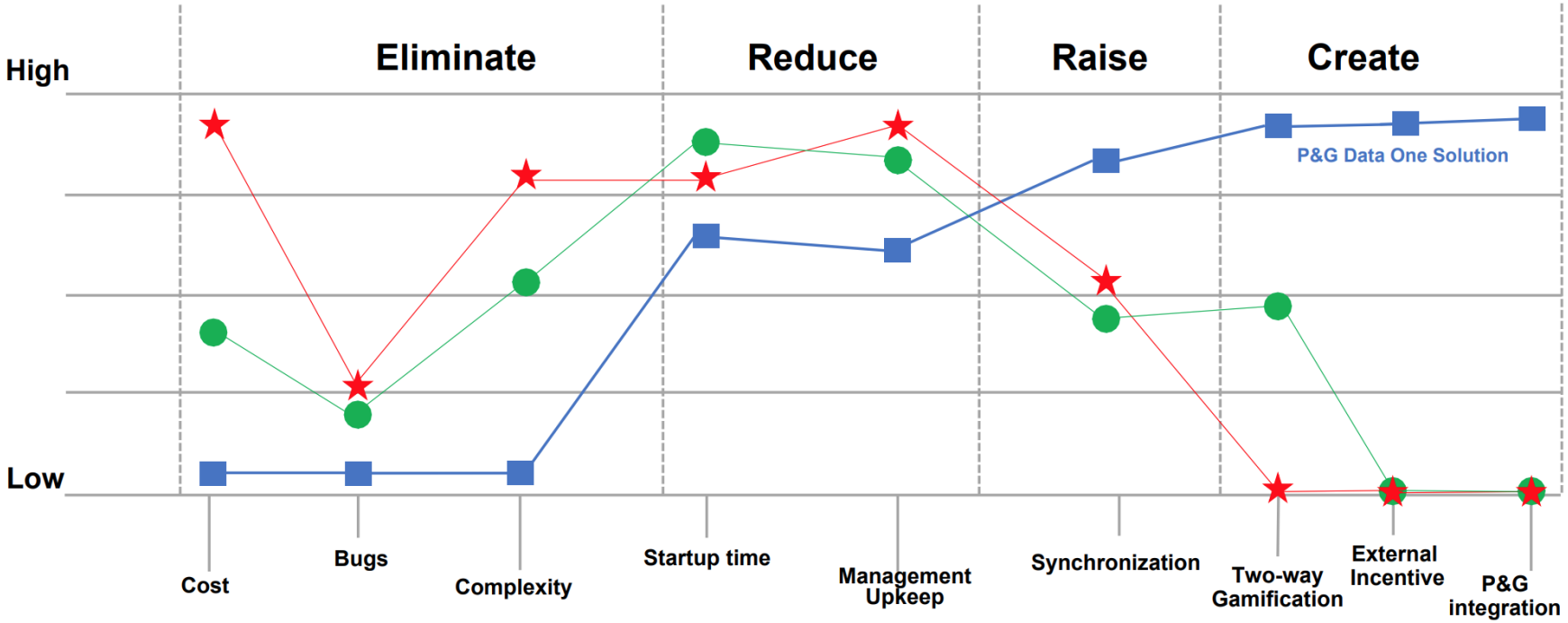
Does Not Fill Need

Updated User Needs	Our Product	Phone Booth	Dividers	Bullpen	Open Layout	Classic Cubicles
						
Background Noise						
Privacy						
Inter-Office Relationships						
Camera Angle						
Background Movement						
Distracting Backgrounds						
Inexpensive						
Ease Of Use						
Hearing others						
See Full Room						
Engagement						

Value Curve

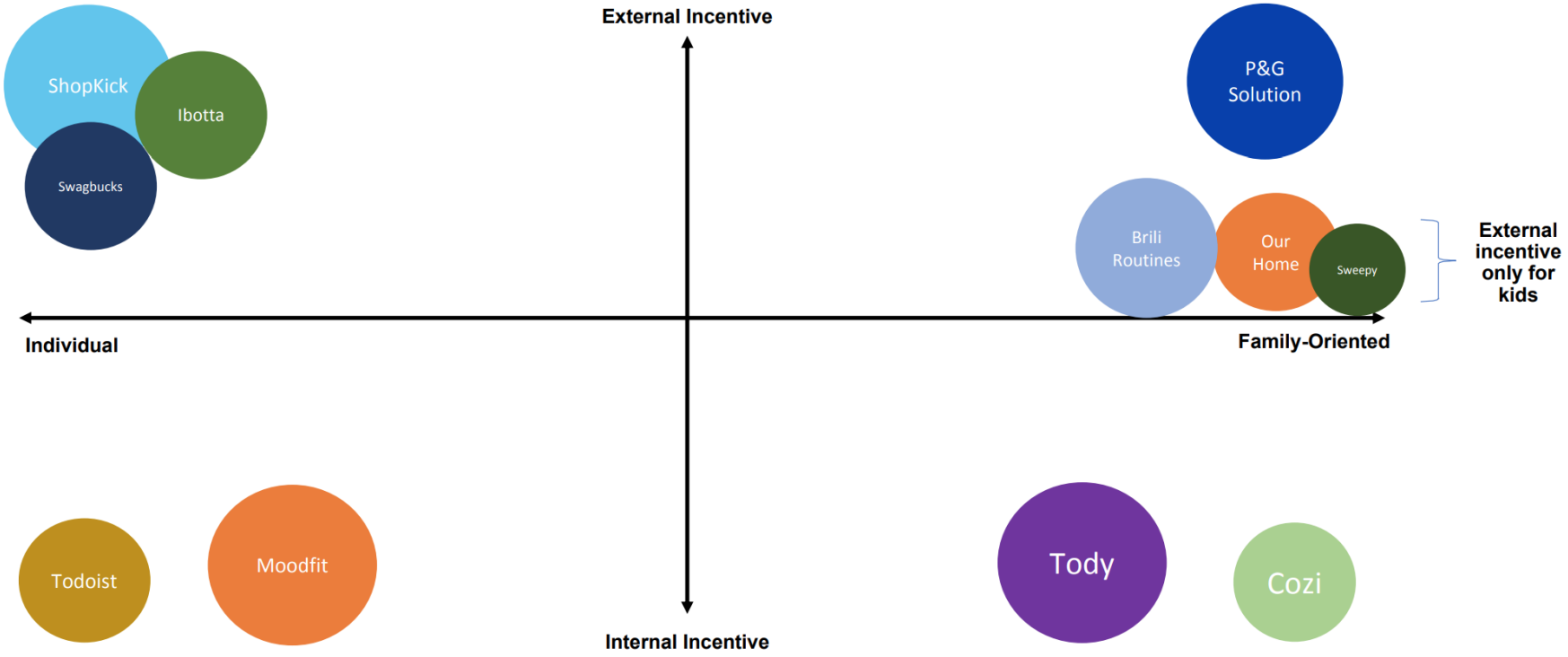
Confidential

★ - Cozi
● - Tody
■ - P&G Alternative



Key Takeaway: The current "best" ISN'T EVEN "good enough"

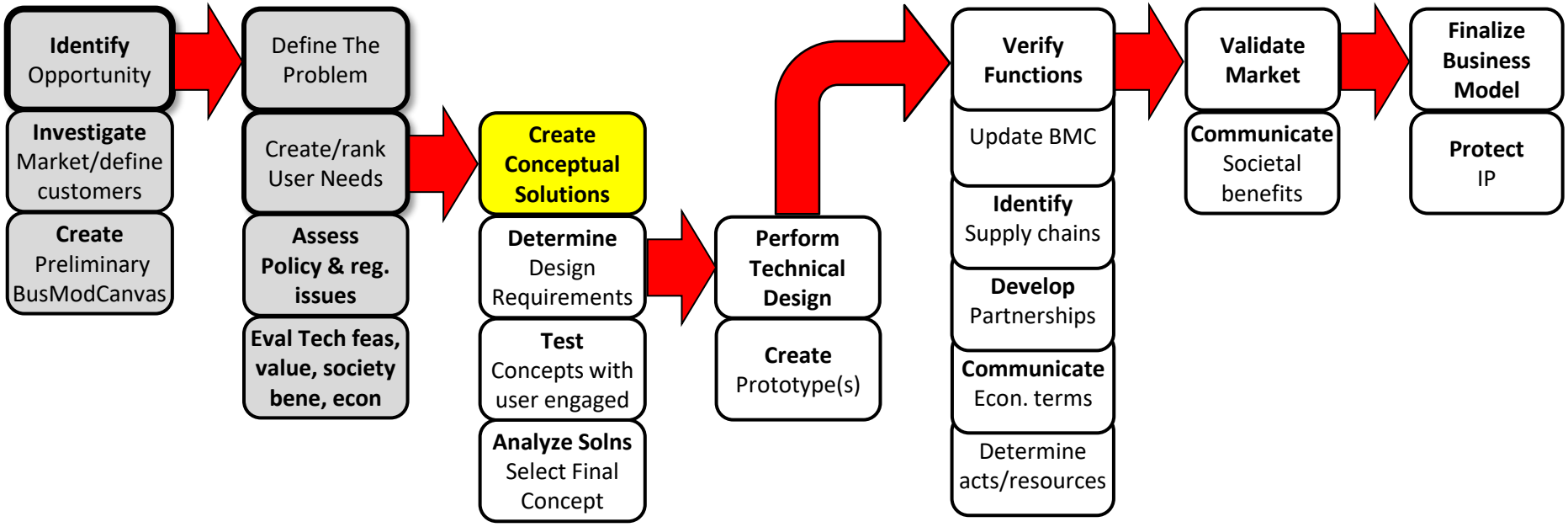
Graphical Market Analysis



Agenda

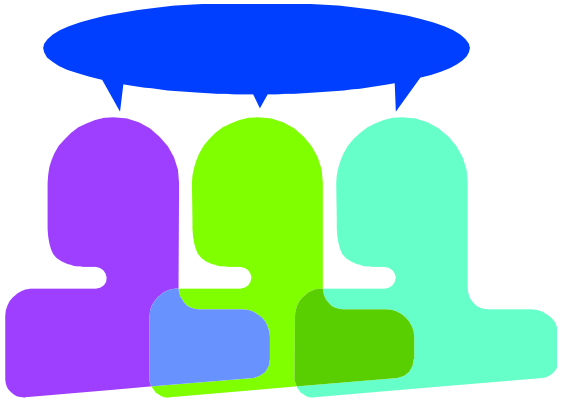
- Introduction
- Value Creation Roadmap
- Primary Research
- Define the Opportunity
- User Needs
- Business Model Canvas
- Benchmarking
- **Concepts & Selection**
- **Closing**

Value Creation Process:
You are here



THE OHIO STATE UNIVERSITY

Some Techniques to Unlocking Creativity and Creating Ideas*



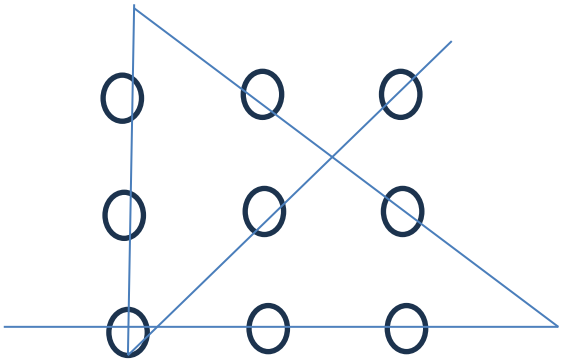
1. **Notebook***
2. **Attribute Listing***
3. Drawing
4. Construction
5. Research and Lateral Thinking
6. **Assumption Smashing***
7. Fail Fast
8. **Brainstorming* / Ideation / Bisociation**

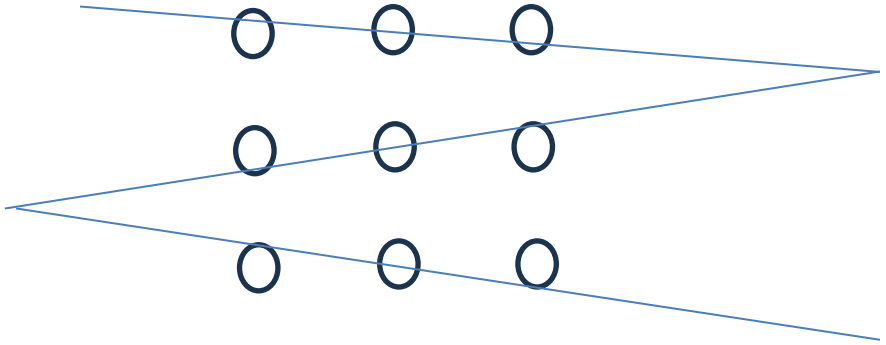
**Combination of these will be used for our class.*

Assumption Smashing

Consider what happens to the design of a product or system if each of the assumptions are dropped one at a time?

The 9-Dot Challenge: Draw 4 or fewer lines without lifting your pencil to connect all dots





Fewer Limitations ➔ More Creativity

Caution: Group Brainstorming

Recent research from HBR, Columbia Business School, and others cautions against Group Brainstorming

- Results in powerful group dynamics
  - Social loafing (coasting on others' contributions)
  - Social anxiety (fears about judgment of one's ideas)
- Hinders original thinking
- Stifles the voices of quieter members

https://hbr.org/2015/03/why-group-brainstorming-is-a-waste-of-time

Enhancing Design via Biomimicry

Biomimicry is a practice that *learns from and mimics* the *strategies found in nature* to *solve human design challenges*—and find hope.

The 3 Essential Elements of Biomimicry

When translating nature's strategies into design, the science of the practice involves three essential elements: Emulate, Ethos, and (Re)Connect. These three components are infused in every aspect of biomimicry and represent these core values at its essence.

Emulate

The scientific, research-based practice of learning from and then replicating nature's forms, processes, and ecosystems to create more regenerative designs.

Ethos

The philosophy of understanding how life works and creating designs that continuously support and create conditions conducive to life.

(Re)Connect

The concept that we are nature and find value in connecting to our place on Earth as part of life's interconnected systems. (Re)Connect as a practice encourages us to observe and spend time in nature to understand how life works so that we may have a better ethos to emulate biological strategies in our designs.

https://biomimicry.org/what-is-biomimicry/

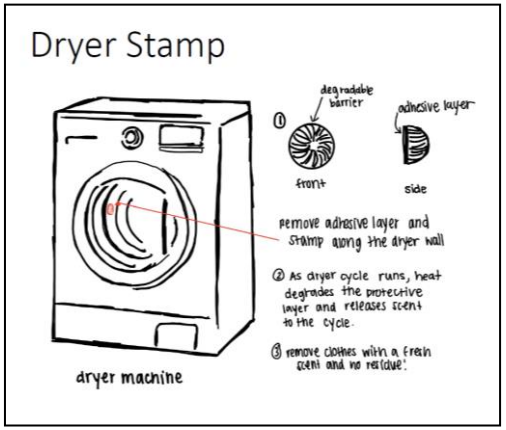
Enhancing Design via Bisociation

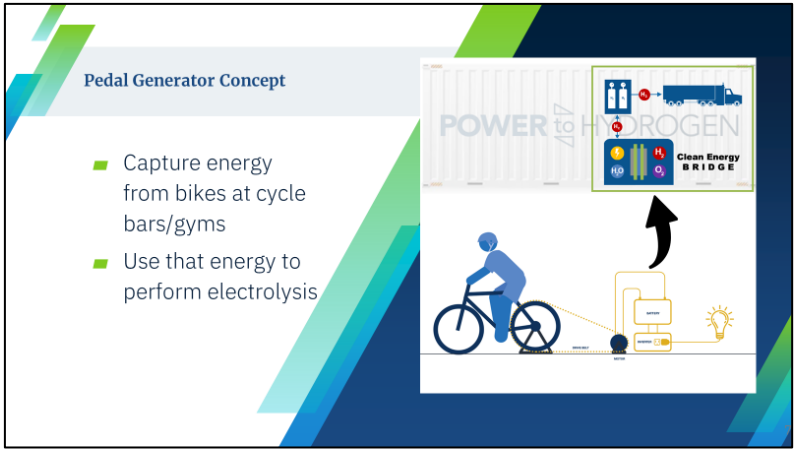
Bisociation *refers to* ***the creative process in which objects, images, concepts or ideas from very different conceptual frames of reference are linked with one another****.*

Group Activity:

- List attributes of the "stimulus" provided (~5 mins)
- Go back and look at your concept ideas
- Anything from your attribute list that could enhance your original brainstormed / concept ideas?
  - If so, jot down and include for further consideration
  - If not, thank you for participating in this experiment

Sample Early Concepts



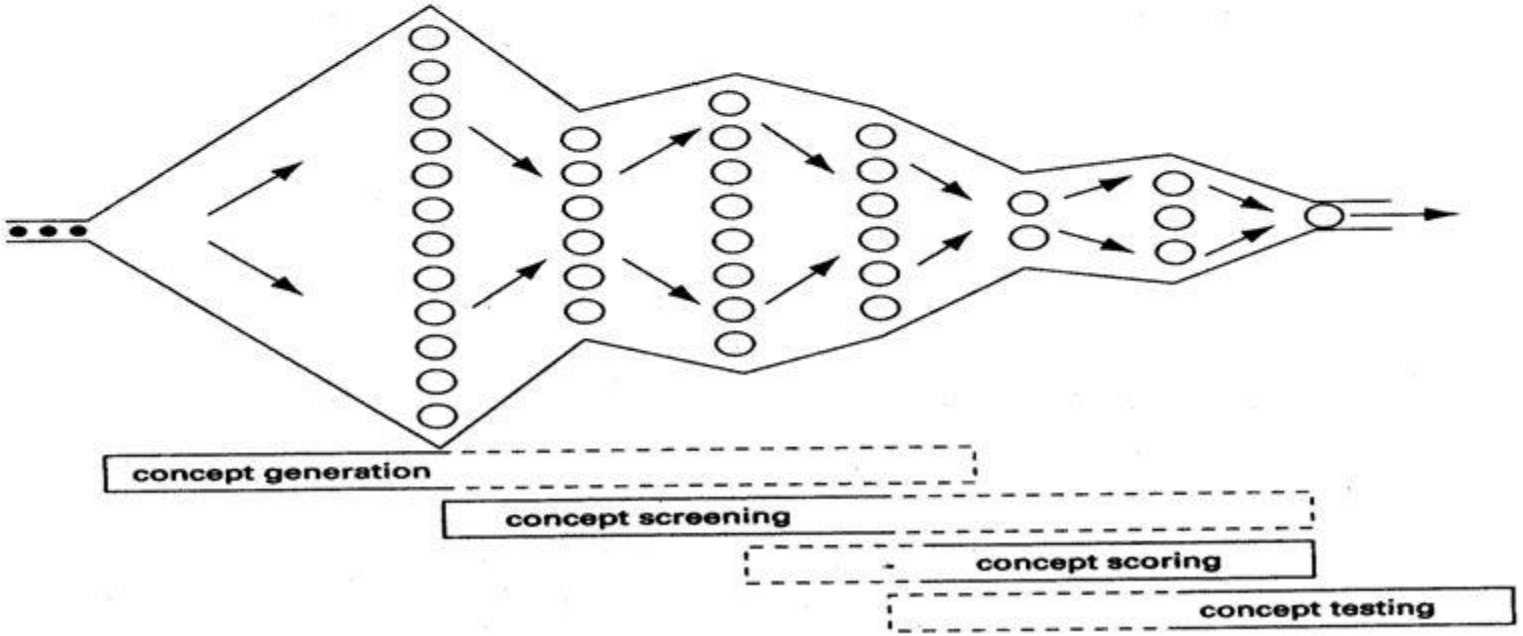


Concept Selection

Concept Selection Approach

http://slideplayer.com/slide/8741529/26/images/6/Iterative+Process+Concept+selection+is+an+iterative+process+closely+related+to+concept+generation+and+testing..jpg

- Concept selection is an iterative process closely related to concept generation and testing.



Concept Selection Approaches

- *External Stakeholders* - customer, client, end user
- *Product Champion* - influential (or outspoken) team member
- *Intuition* - "the stomach feel"
- *Multi-voting* - popular demand
- *Prototype and Test* - trial and error
- *Pros/Cons** - evaluate strengths/weakness

*Most similar to the approach we will take with options to intertwine the other methods for additional selection criteria.

Two Stages to Concept Selection

1. Concept *Screening*

- Down-select lots of ideas quickly
- Compare to existing solution
- Combine various concepts ideas or portions
- Use for simple projects or many ideas

2. Concept *Scoring*

- Provides better resolution than screening
- Apply with weighted User Needs
- “Modify” Needs if required to distinguish
- Use a “gut check” to confirm

https://sixsigmastudyguide.com/pugh-analysis/

Screening Matrix

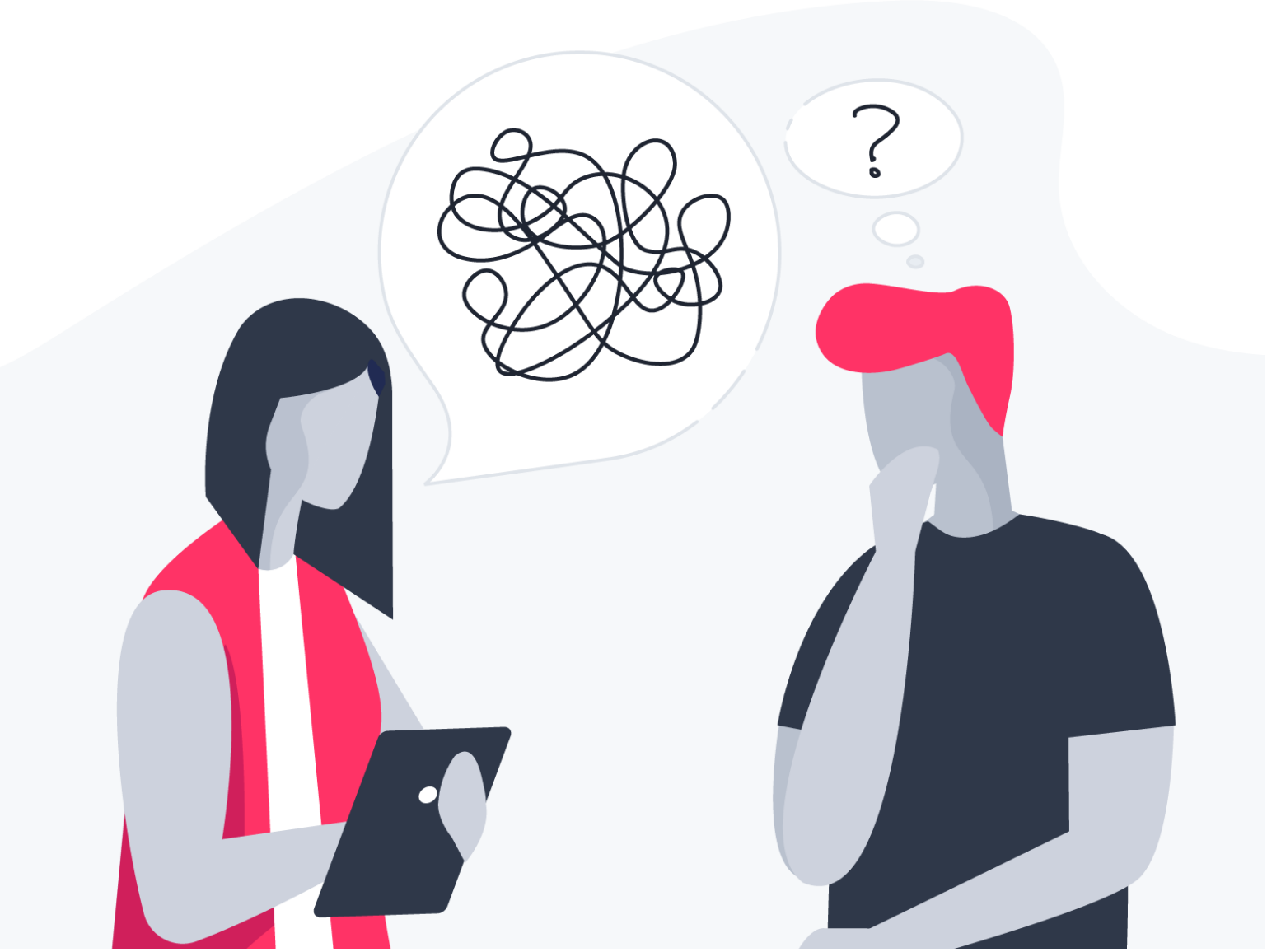
	Multi Worker Desk	Backpack & Display	Collapsible Table	Workstation Tent	Material Tray	Table Suitcase	Frankenstein Product
Long-term durability/reliability	✓		✓	⊘		✓	
Portability between locations	⊘	✓	⊘	✓	✓		✓
Simple setup and use		✓	⊘	✓	✓	⊘	✓
Protection from damage and theft	✓	⊘	⊘	⊘	⊘	⊘	⊘
Ergonomic design	✓	✓	✓	⊘			✓
Privacy from environment		⊘	⊘	✓	⊘	⊘	✓
Sufficient space	✓		✓		⊘	✓	✓
Adaptability	⊘	✓	✓	✓	✓	✓	✓
Sum ✓	4	4	4	4	3	3	6
Sum blank	2	2	0	1	2	2	1
Sum ⊘	2	2	4	3	3	3	1
Net Score	2	2	0	1	0	0	5
Rank	2	2	5	4	5	5	1
Continue?	Yes	Yes	No	Combine	No	No	Yes

Concept Scoring (2nd step)

1. Combine or modify designs based on Screening
2. Weigh the importance of each Need (pairwise comparison)
3. Define a Reference Concept and newly revised set of design concepts as result of 1st step
4. Rate how each concept meets each Need (1-5, 5 being best)
5. Calculate concept ranking by adding weighted scores
6. *Select highest ranked design concept*

Scoring Matrix

		Unfoldable Backpack		Workstation Tent		Material Tray		Frankenstein Product	
Needs	Weight	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Long-term durability/reliability	15%	2	0.3	2	0.3	3	0.45	3	0.45
Portability between locations	10%	4	0.4	2	0.2	4	0.4	4	0.4
Simple setup and use	10%	3	0.3	4	0.4	4	0.4	4	0.4
Protection from damage and theft	10%	2	0.2	3	0.3	2	0.2	2	0.2
Ergonomic design	20%	4	0.8	2	0.4	3	0.6	4	0.8
Privacy from environment	10%	2	0.2	5	0.5	1	0.1	4	0.4
Sufficient space	15%	3	0.45	2	0.3	2	0.3	4	0.6
Adaptability	10%	4	0.4	3	0.3	4	0.4	5	0.5
Total Score			3.05		2.7		2.85		3.75
Rank			2		4		3		1
Continue?			Combine		Combine		Combine		Develop

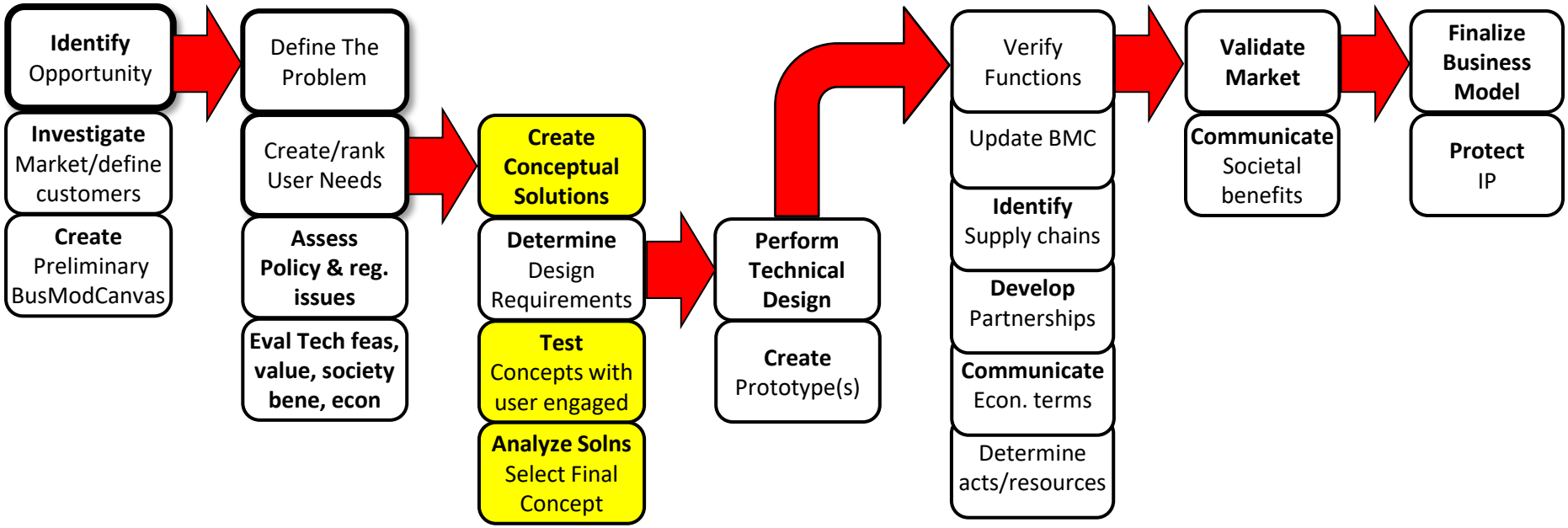


User Feedback on Early Concepts

Value Creation Process

User Validation is Key

Next Up: Start to collect feedback from End Users or SMEs on your Early Concepts



THE OHIO STATE UNIVERSITY

Agenda

- Introduction
- Value Creation Roadmap
- Primary Research
- Define the Opportunity
- User Needs
- Business Model Canvas
- Benchmarking
- Concepts & Selection
- **Closing**

Our Process

Semester One
Discovery

Problem Definition

Value Proposition
Pains & Gains
User Experience Chart

End User Research

Persona
Primary Interviews
Survey Tools

Market Analysis

Competitve Analysis
Business Model Canvas

Interim Deliverable

Selected concept validated with ample primary and secondary research.

Semester Two
Solutions

Detailed Design

Prototyping Plan
Material Purchasing
Design Requirements

Validation + Verification

Additional User Interviews
V&V Testing
Robust Product Testing

Go-To-Market Strategy

Next Steps Analysis
Updated Business Model
Market Readiness

Final Deliverable

Validated and verified solution, prototype, and design report including next steps.

Sponsorships

Sponsor Quotes

"We were very impressed with the work product the students delivered, which will become the foundation of some of the development that will follow."

"Anytime we can work with a group like this and get something delivered that provides value to us, it's really a win-win between us and the students."

"I hired a lot of engineers and the students in this group are working at a level that's equivalent to what most engineers hope to aspire to in five to ten years out of college."

Previous Sponsors

P&G · MillerKnoll · WATTS · Church & Dwight Co., Inc. · NEXCERIS · Power of Hydrogen

Connect with us!
OhioStateIBE@osu.edu