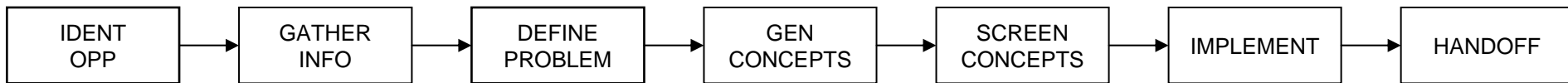


# ME4054 DESIGN PROJECTS

Welcome!





# DESIGN PROCESS

As practiced in ME4054

(Ref: Chaps 1-2, Ulrich & Eppinger text)

# Design Matters



"The Knowledge Economy as we know it is being eclipsed by something new -- call it the Creativity Economy"

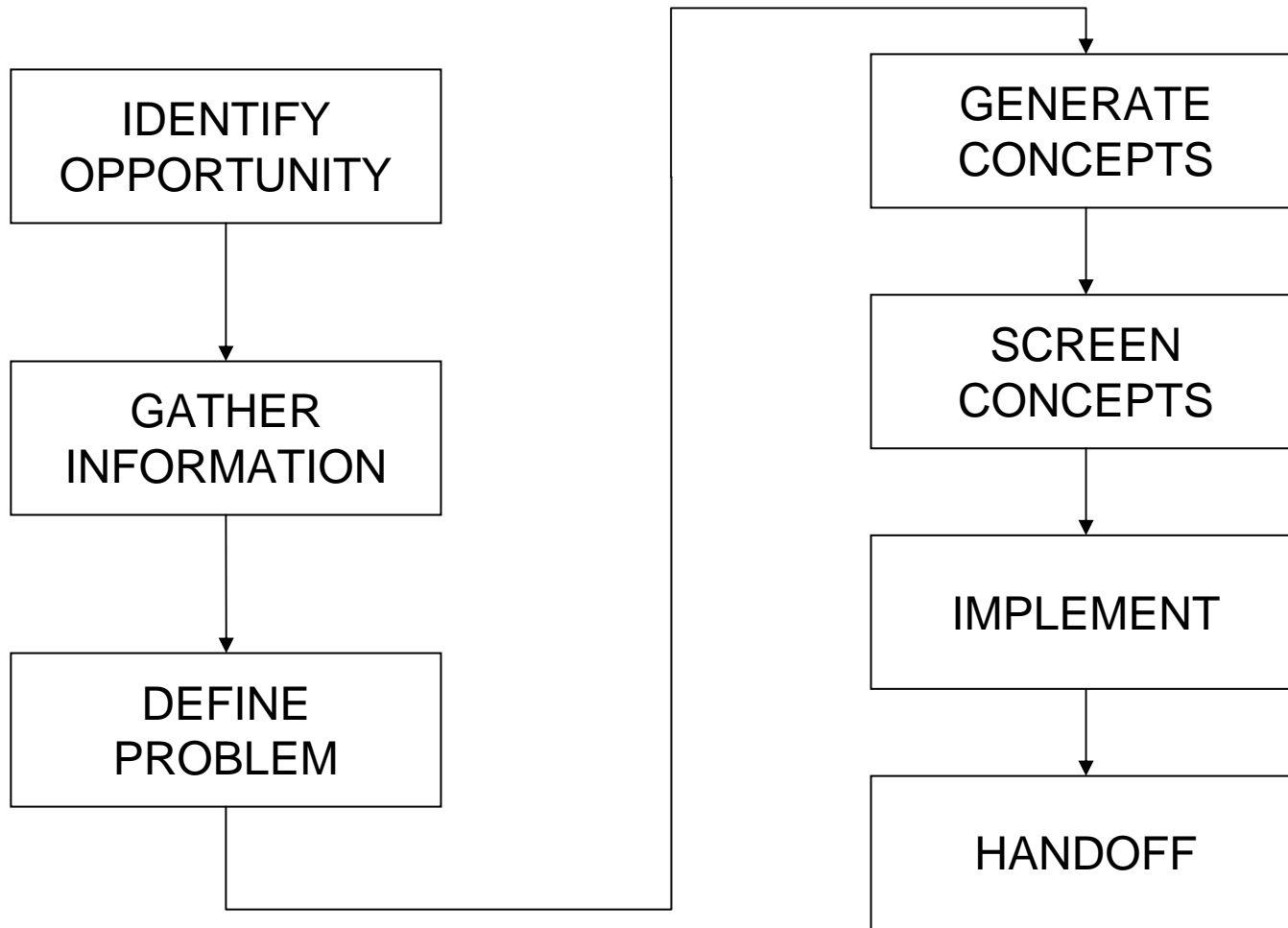
# Classic Failures

- Optimistic sales ramp up (< 3 yrs)
- Too far out there (Segway)
- Focus on features v. benefits

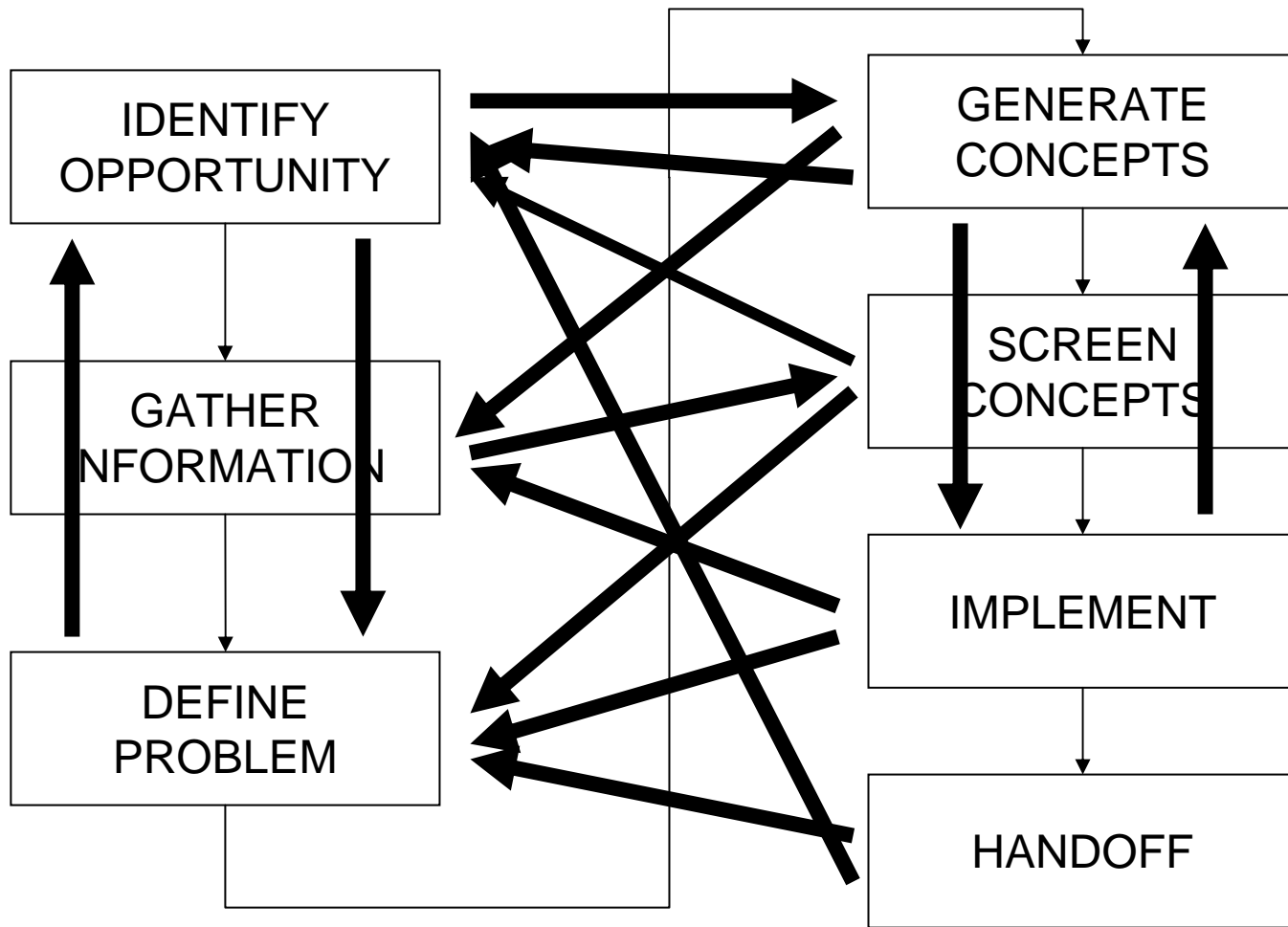
# Habits of Effective Design Teams

- Study the customer
- Creativity
- Quick and dirty prototyping
- Objective evaluation
- Latest technology
- Established Design process
- Manage risk, abandon if necessary

# Design process...ideal



# Design process...real



IDENT  
OPP

GATHER  
INFO

DEFINE  
PROBLEM

GEN  
CONCEPTS

SCREEN  
CONCEPTS

IMPLEMENT

HANDOFF

# Identify opportunity

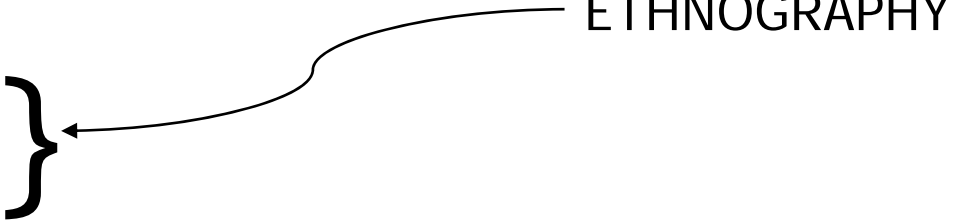
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- What's the business opportunity
- Vision, corporate strategy
- Market trends
- Technology capability
- Emerging technologies
- Unmet needs

## **DELIVERABLE(S):**

- 1. Project description**
- 2. Mission statement**

# Understand the Customer

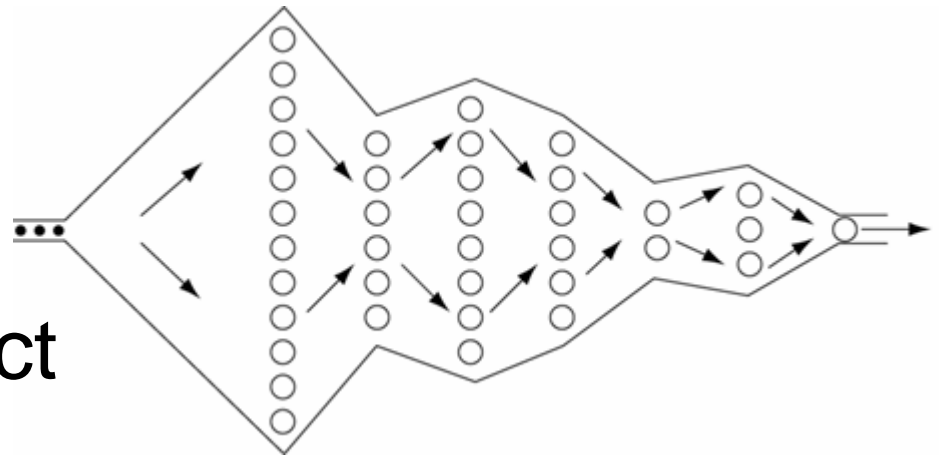
- Voice of the Customer (VOC)
  - Who?
    - Market segmentation
    - Personas
  - How
    - Observation
    - Interviews
    - Survey
    - Focus Group
- ETHNOGRAPHY
- 

# Idea Generation

- External
  - Patents
  - Reverse engineering
  - Trade magazines, trade shows, stores
  - Experts
  - Users
- Internal
  - Brainstorming (many methods)
  - Solo storming

# Concept Screening

- Define the metrics
  - Internal screen
  - Customer screen
- Include all stakeholders
- Be objective
- Step back and reflect



# Engineering Design

- Analysis-based design
  - Use equations to ball park
  - Use computer simulations to fine-tune
  - Show that you know physics and engineering
- Get in the ball park with the prototype
  - But don't obsess over the details

# Build Prototypes

- Quick and Dirty is good
  - Fast
  - Cheap
- Learn from the prototypes
  - Internal communication
    - Solo/Team
  - External communication
    - Customer
    - Boss

If you have  
many  
prototypes,  
you will  
impress your  
client!

# IP is Critical

- Value of company is in its intellectual property and the ability of staff to generate IP, not in the products
- VCs look at people more than at concept
- IP, utility patents
  - Provisional Patent
  - Patent Application
  - Issued Patent

# Companies Receiving Most U.S. Patents

2005 Rank	# Patents	Company	2004 Rank
1	2,941	IBM	1
2	1,828	Canon	3
3	1,797	Hewlett-Packard	4
4	1,688	Matsushita	2
5	1,641	Samsung	6
6	1,561	Micron	5
7	1,549	Intel	7
8	1,271	Hitachi	8
9	1,258	Toshiba	9
10	1,154	Fujitsu	11

# Implementing the Design

- Analysis-driven design
- Simulation-aided design
- Prototyping
- DFX
  - Environment
  - Reliability
  - Assembly
  - Safety

# Evaluating the Design

- Experimental validation of hardware
  - Design of Experiments
- Validation through simulation

# Common ME4054 Errors

- Did not understand the problem
  - Background research
  - Knowledge of prior art
- Did not specify outcomes
  - Key part of project planning
- Did not use analysis
  - Key part of engineering design
  - Key metric in ME4054
- Did not document
  - Essential to all modern projects
- Team meltdown
  - Team management needed
- Under-delivered
  - Effective scheduling and task allocation

# Design Show in 14 Weeks



Lots of people

# Trade Show Booths



# Prototypes



# Judges



# No Stress



# ME4054W Opportunities

- Gain real-world design experience
  - Return value to client
- Design to customer needs
- Great job experience
  - Put on your resume
  - Networking
- Apply engineering science course analysis
- Learn to work in a team
- Learn to communicate as an engineer

# Project Kick-Off on Wednesday

- Read about your client
- Read about your project
  - Prior art?