

# Gaming in Systems Engineering

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# What is Gaming in Systems Engineering?

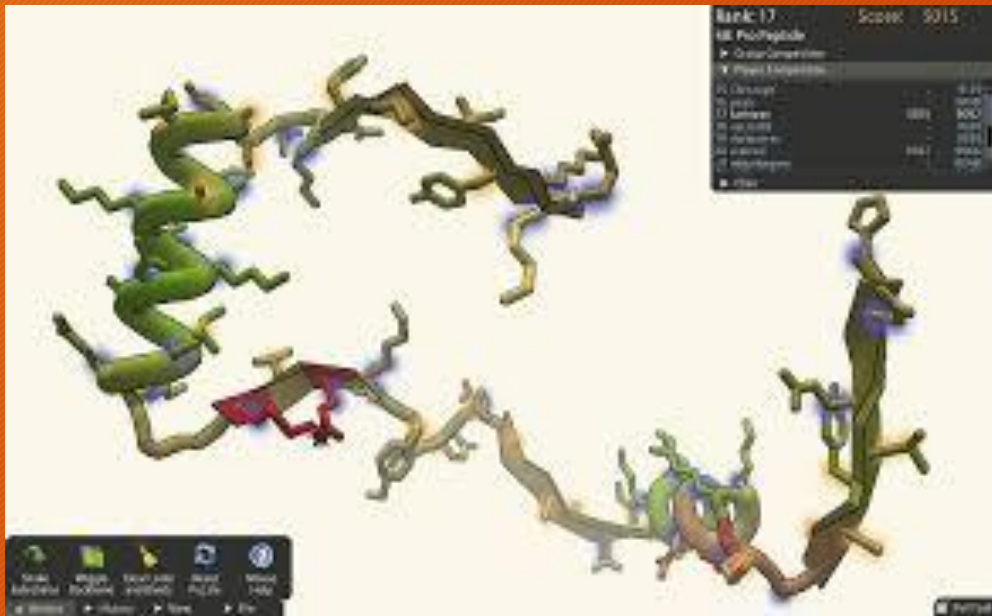
- The process of game-thinking and game mechanics to engage users and solve problems.





## 2 Elements of Gaming in SE

**Gamification:** Use of game elements to improve a system.



**Game-Based Learning:** Use of games to train individuals.



# Gaming Concepts

- Score Keeping
- Competition
- Strategy
- Repetition
- Theme
- Story Telling
- Rewards

## Mechanics and Gameplay

♠ ♥ POKER ♦ ♣	
HAND RANKINGS	
Royal Flush	10♥ J♥ Q♥ K♥ A♥
Straight Flush	4♣ 5♣ 6♣ 7♣ 8♣
Four of a Kind	K♠ K♥ K♣ K♦ 3♠
Full House	10♥ 10♠ 10♦ A♠ A♣
Flush	10♠ K♠ 2♠ 6♠ 7♠
Straight	7♣ 8♠ 9♦ 10♠ J♥
Three of a Kind	5♠ 5♥ 5♣ J♦ A♦
Two Pair	A♠ A♥ 3♣ 3♠ J♣
One Pair	Q♦ Q♥ 2♥ 8♠ 9♣





# Means of Analysis

## *Prisoner's Dilemma*

	<i>Silent</i>	<i>Talk</i>
<i>Silent</i>	1	0
<i>Talk</i>	10	3

Payoffs for the player who chooses the strategy in the row:

- Top-left: (1, 1)
- Top-right: (0, 10)
- Bottom-left: (10, 0)
- Bottom-right: (3, 3)

- Game Theory (Simple Games)
- Surveys and Questionnaires
- Longitudinal Studies
- Direct Experiments

# Standard Uses

- Training
- Improving Engagement
- Improving Motivation
- Increasing Skill Generalization





# My Research: Game-Based Learning of Incentives

## Game 1

- Victory Conditions: Have more than three points
- Moves
  - Give a Point (1 Finger)
  - Trade Points (2 Fingers)
- Rules:
  - Give gives one point
  - Trade swaps the point values
  - Give occurs Before Trade
  - Players begin with three points

## Game 2

- Victory Conditions: Have more than three points
- Moves:
  - Give a Point (1 Finger)
  - Trade Points (2 Fingers)
  - Do Nothing (Fist)
- Rules:
  - Give gives one point
  - Trade swaps the point values
  - Give occurs Before Trade
  - A player playing trade gains 2 points after the trade
  - Players begin with three points

# My Research: Game-Based Learning of Incentives

	<i>Give</i>	<i>Trade</i>
<i>Give</i>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3, L</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">2, L</div>
<div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">3, L</div>	<div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">4, W</div>	
<i>Trade</i>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">4, W</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3, L</div>
<div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">2, L</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3, L</div>	

	<i>G</i>	<i>T</i>	<i>DN</i>
<i>G</i>	0	0	<div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>
<div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">1</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>	0	
<i>T</i>	0	<div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">1</div>	<div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">1</div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>	0	<div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>	0
<i>DN</i>	<div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">1</div>	0	0



# My Research: Game-Based Learning of Incentives

## Game 3

- Victory Conditions: Have more than three points
  - Moves:
  - Hand 1
    - Give a Point (1 Finger)
    - Trade Points (2 Fingers)
    - Do Nothing (Fist)
  - Hand 2
    - Incentivize Trade (Plane)
    - De-Incentivize Trade (Fist)
- Rules:
    - Give gives one point
    - Trade swaps the point values
    - Give occurs Before Trade
    - A player playing “trade” when another player plays “incentivize trade” gains 2 points after the trade
    - A player playing “trade” when another player plays “de-incentivize trade” losses 2 points while the de-incentivizer gains a point after the trade.
    - Players begin with two points

# My Research: Game-Based Learning of Incentives

		Incentive			Reverse Incentive		
		<i>G</i>	<i>T</i>	<i>DN</i>	<i>G</i>	<i>T</i>	<i>DN</i>
Incentive	<i>G</i>	0	0	1	0	0	1
	<i>T</i>	1	1	0	1	1	0
	<i>DN</i>	0	1	0	0	1	0
Reverse Incentive	<i>G</i>	0	0	1	0	0	1
	<i>T</i>	1	0	0	1	0	0
	<i>DN</i>	0	0	0	0	0	0

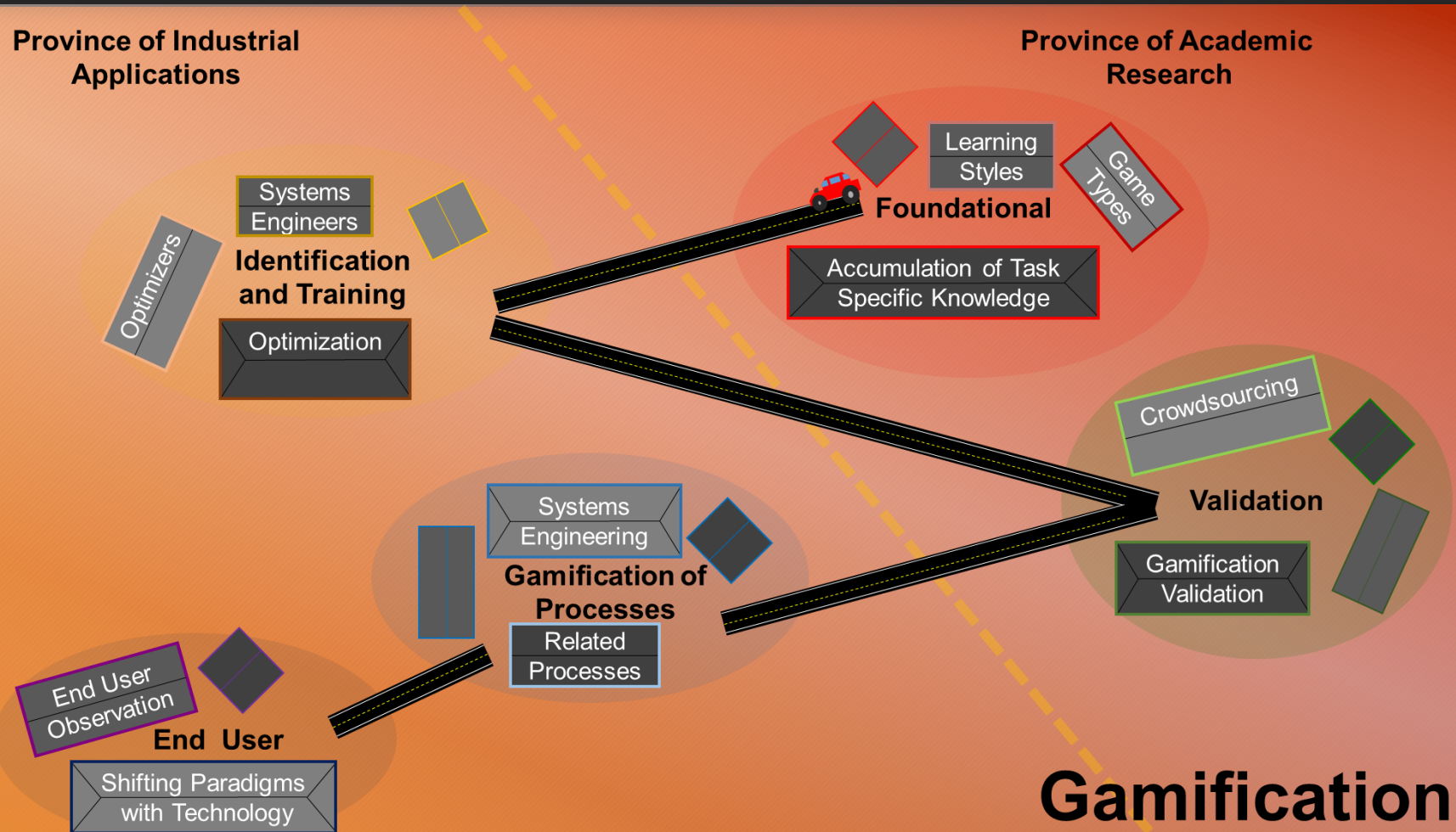


# My Research: Game-Based Learning of Incentives

## Game 4

- Victory Conditions: Have the Most Points
- Moves:
  - Select Mission Control By Pointing at the player. Once Everyone is pointing at the same player. That player is the first Mission Control
  - Mission Control
    - Guess How Many are Going on the Mission (Fingers)
  - Other Players
    - Go On Mission (Finger)
    - Don't Go On Mission (Fist)
- Rules:
  - Mission Control Decides when to Go On Mission and how many points each player will get.
  - Missions Are failed if mission control picks a number that is not the number of players going on the mission.
  - Award for Successful Mission =  $(\# \text{ of Players})^{\# \text{ Mission Control Guessed}}$
  - Award is Negative if Mission is failed.
  - Game Ends when all players have been mission control
  - Player with the highest stake receives points or Penalties first
  - Mission Control Rotates Clockwise

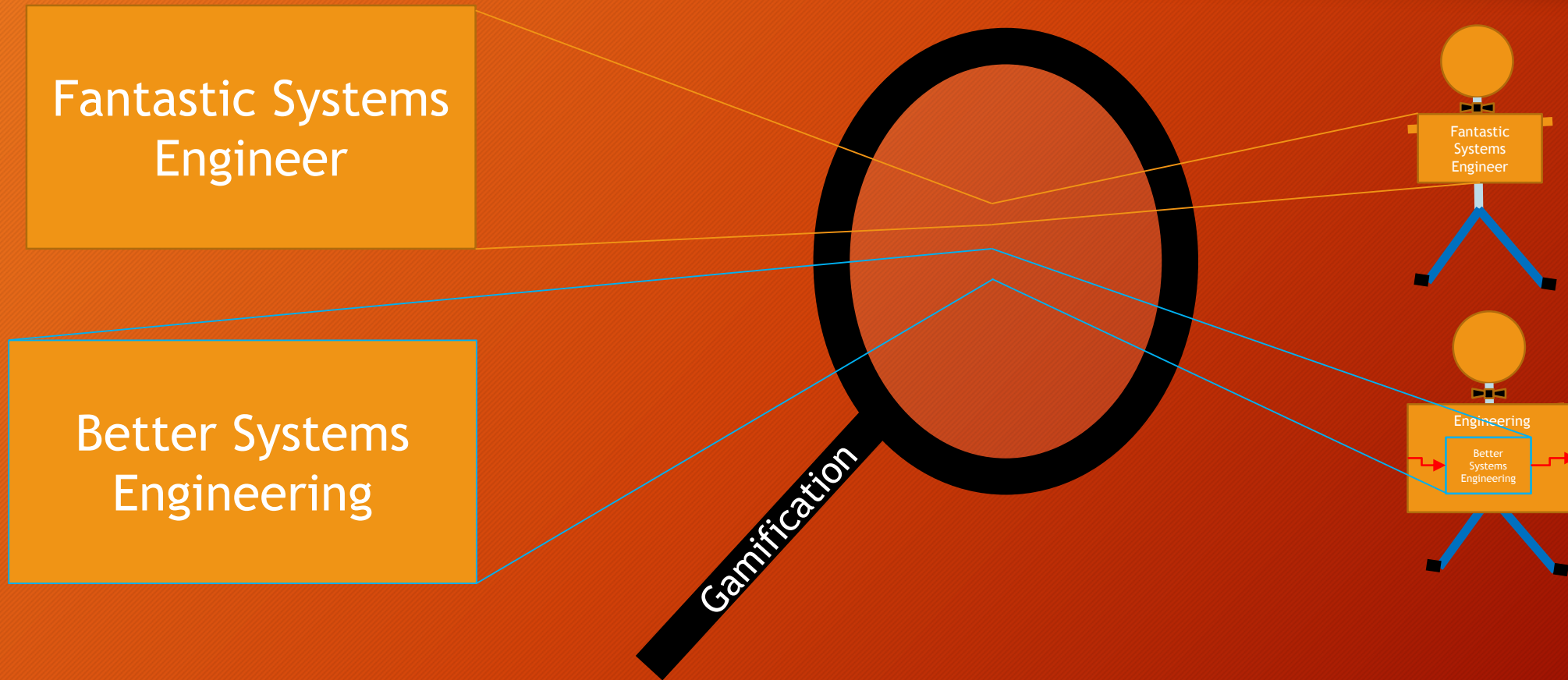
# The Way Forward





# Additional Uses

- Identification
- Crowdsourcing
- User Experience



Questions?