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| Stage:Walk |  | DesignEx: Developing a Car Prototype |

This facilitator guide provides step-by-step instructions for running DesignEx, including suggested facilitator scripts and “Pro Tip” pop-ups, which contain tips for the facilitator to take into consideration as they guide participants through the exercise.

While the facilitator may choose to adapt some of the script language or other execution guidelines depending on personal styles and available resources, we recommend following the guide as closely as possible to ensure that participants receive adequate training on each of the concepts and objectives.

**Exercise Overview**

This exercise involves two to three competing teams working to design and build a model of a car based on evolving demands, limited information/feedback, varying time and information delays, limited resources, and sometimes competing objectives. Each two- to four-player team must work together to create and “pitch” a vehicle prototype while balancing customer and focus group requirements. The exercise contains multiple rounds, all of which introduce players to new customer specifications. Participants must learn to adapt and revise their models rapidly, and learn to anticipate unexpected events and time delays as they compete to win a customer bid.

**Sociocultural Systems Thinking Concepts Addressed**

* Multiple players/stakeholders
* Goal conflict
* Interdependence and interaction
* Dynamic/changing circumstances
* Second and third order effects
* Sensemaking
* Adaptability

By the end of the exercise, participants should be better able to:

2.1. Understand the range and nature of stakeholder groups in SCS

2.2. Understand the structural characteristics of SCS

2.3. Understand the manifestations of SCS structural characteristics

3.4. Interpret the results of interventions and adapt courses of action

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|  | *Preparation*  |

The exercise involves two or three competing teams working to design and build a model of a car in a way that challenges multiple aspects of systems thinking. Teams must work together to satisfy a customer who will be investing in a particular prototype at the end.

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|  | Game materials needed: |
|  | 3 design specification cards |
|  | A large assortment of Lego pieces |
|  | Lego pieces for each team: four wheels, three different-sized base pieces: compact, standard, and large |
|  | Three boxes for specialized pieces, pre-selected from the large assortment |
|  | Scoring sheets (for customers roles only) |
|  | Debrief guide |

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|  | *Execution Guidelines* |

From the available group, select two players to play the role of customers. Break the remaining group up into teams. At this time, distribute the ‘Introduction to Systems Thinking’ handout (Attachment A), especially if it is the players first sociocultural thinking exercise.

Ensure that each team is assembled around a large table within a room (circles labeled 1, 2, and 3 for team positions). Also position the teams some distance apart so that their materials will not be visible to any other team, and conversation within teams will not be easily overheard. The table should have three boxes, labeled A, B, and C. These will be explained later in the guide.



Inform each team that they each represent a design team. Brief the exercise participants with the following:

 *Each group will be playing the role of an automobile design team, charged with the development of a prototype for an interested customer. You will begin the game with a set of specifications that your customer is particularly interested in seeing. You will have five minutes to plan the initial concept of your design and create sketches. Following this period, you will begin to actively build a prototype of the design for the customer. You will have seven minutes to complete this initial prototype, after which you will meet the customer and pitch your concept for no more than 30 seconds. Your customers will then provide you with feedback based on your design, and you will have redesign opportunities. At the end of this exercise, a winner will be determined on the basis of how well the design meets the desired specifications and on the customer’s subjective preferences.*

Each player should receive a slip of paper with two initial design specifications (see Attachment B) in which the customers are interested. Customers receive a scoring sheet for the stage when they have to rate the different designs (Attachment C).

State that all players should be careful not to share this information with the other teams. There are six specifications, and each team will receive two specifications per round. The exercise has three rounds total, so by the end of the exercise, each team will have received all of the available design specifications. The specifications are as follows:

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| **Specification** | **Instructions** |
| 1. Large capacity
2. Aerodynamic
3. Lightweight
4. Safe/sturdy
5. Aesthetically pleasing
6. Extra Features
 | Design your car so that it can hold enough cargo/passengersDesign your car so that it is sleekDesign your car so that it does not physically weight a lotDesign so that it will perform well in a crash testDesign your card so that it is attractiveDesign your car so that it has exciting and innovative extra features |

Specifications are staggered, and should be assigned to groups as follows:

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| * Team 1 receives A&B (Round1), C&D (Round2), and E&F (Round3).
* Team 2 receives C&D (Round1), E&F (Round2), and A&B (Round3).
* Team 3 receives E&F (Round1), A&B (Round2), and C&D (Round3).
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Once each team has received specifications, players should receive packets of basic building materials.

Make the following announcement:

*INTRODUCING THE BUILDING PHASE*

 *Each team is now receiving some basic materials to assist the development of your car prototype. Yes, these are Legos. Each of you should now have four wheels and three different-sized base pieces: compact, standard, and large. Tell me now if you are missing any of these pieces.*

 *Since this is not enough to build a vehicle, there is a dump site that contains assorted pieces, as well as three bins of specialized pieces in the center of the table. Together, these options should provide all the materials you need to complete a design.*

 *Each team is limited to six draws from the specialized bins across the entire exercise. Be aware that different bins have different delay times to receive “ordered” parts, ranging from 30 seconds to two minutes. There are no limits on how many draws you can take from the dump site, however.*

 *You have* ***seven minutes*** *to complete the building phase. After time runs out, any pieces you do not use to complete your prototype must be returned to the dump site.*

While the teams are developing their prototypes, instruct the customer players to come forth and review score sheets with you. Inform them that they will be evaluating the sales pitch and design for each design team.

Customers should record one point if they believe a team has fulfilled a building specification, or they should record zero points if the team has not satisfactorily met a specification. Additionally, instruct the customers that they must provide one piece of positive and negative feedback to each of the design teams based on their prototypes. Customers may survey the development at a distance, but should not interact with any of the teams during the building phase. They should also not answer any questions from the teams during the exercise.

Once building time expires, have the customers approach the front. Announce that time is up, and make sure everyone stops building.

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| **Pro Tip** | When the seven minute period has expired, be very firm about all teams ceasing production, since players often feel motivated to keep adding and tinkering in spite of the game’s deadlines. Quickly pick a team to start things off as opposed to asking for volunteers. |

Announce the following:

 *Team (choose a team), you will begin. You have 30 seconds to make a pitch to the customer about the prototype you have developed. Design teams—pay close attention—you must not use any of the words used in the specifications you received. So, if your specification was to make the car look like a dinosaur, you must not say “our prototype is very dinosaur-like.” The customer might choose to dock you points if you do not abide this instruction. Begin.*

All design teams should all receive two additional building specifications that the customers would like to see incorporated into existing prototypes. Two more rounds (comprised of a building phase and a feedback phase) will follow, in identical fashion to the first round.

Following the final round, customers should tally points and choose a winner from the available designs. Afterward, the debrief may begin. Players will answer group- and individual-level questions regarding the systems concepts within the game and their overall learning and game experiences.

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|  |  *Debrief Guide* |

Summary trend graphics for all the rounds appear in the sheet “Trend\_Graphics\_Round5.” It may be useful to have these visible during debriefing.

Below are some sample debriefing questions to generate discussion. While you may have other questions in mind, try to ask open-ended questions (*What* / *Where* / *How* / *Why* as opposed to *Did you*) and to allow participants to express their thoughts fully.

* **What were you aware of during this exercise?**
Sample answers:
*“It was hard making sure we could make the design fit the specs.”*
*“This wasn’t fair. We had to completely change everything.”*

To respond to this, first mirror back or clarify what was said. Then, you might follow up with
	+ **“What were the major *goal conflicts* that you encountered?”**
	+ **“What did you end up doing as a result?”**

If not elicited in your initial probe, use this opportunity to introduce the concepts of *multiple players/stakeholders, interdependence and interaction, dynamic/changing circumstances,* and *adaptability*. Ask

* + **How did you deal with the sources of uncertainty in this exercise?**
	+ **What were some dynamic circumstances you encountered?**
	+ **How did you observe other teams interacting and presenting?**
	+ **How did other teams affect the outcomes of your design?**

Next, introduce the concepts of *tradeoffs* and *time delays*. Ask

* + **What were some major *trade-offs* in this exercise?**
	+ **How did you manage time delays?**
* **What are the implications of an exercise like this?**Sample answers:
*“You can’t put all your eggs in one basket. Sometimes you think you’ve got the perfect answer and then everything changes.”
“You can’t trust yourself too much. You have to always be questioning the way things have been done, or else you get locked into habits and things that don’t work.”*
* Finally, follow up with
	+ **“Where might the lessons of DesignEx help you in your career?”**
	+ **“What should you do when you encounter real-life systems similar to this one?”**