Massachusetts Institute of Technology

Architecture of Complex Systems

Week 2: Function and Emergence

Project Portfolio

Name

Tomas Mawyin

Massachusetts Institute of Technology

Instructions

Before you begin, you should save your Project Portfolio on your local drive. We recommend the following format:

Lastname_Firstname_Course1_Week2

Please note: You will not be able to re-download your file after submission; therefore, please keep this file in a central location for future reference.

While you may be working with a group, the project deliverable is an **individual submission**. A scoring rubric can be downloaded from the course in the Resources/Downloads tab on the top navigation.

You will be self-assessing your work. If you have any questions, feel free to start a thread in the Discussion Forum. Although work is strictly individual, sharing ideas and concepts with other students or your team is encouraged.

Note: edX has a 10MB file size limit for document submission. If you have selected large image(s), you may need to resize before submitting, OR you may simply include a web URL for the image in the image location. Be sure to submit your assignment at least one hour before the deadline to provide time for troubleshooting.

Once the deadline passes, you will not be able to upload the document and therefore will not be able to submit and complete the assignment.

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Week 2 Project

Overview

In the second project activity of this course, you will build on your project work from Week 1 by developing a graphical representation of the system.

The steps to the right will guide you through this process.

REQUIRED STEPS:

Step 1: For your project system, identify the object elements you will represent.

Step 2: Develop an OPM diagram for the system.

Step 3: Identify how functional information is normally conveyed in your field. Detail an example.

Step 4: Review and submit your project.

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STEP 1: ABSTRACTIONS OF FORM

For the system you chose in Week 1, list five or more object elements or abstractions of form, to make a level 1 decompositional view. Don't feel constrained to use the same objects as you listed in Week 1.

Object elements or abstractions of form:

Level 0: Balse Glider

Level 1: Wings, Fuselage, Winglets, Tail, Stabilizer, Landing Gear, Counterbalance

Please describe how and or why you used these elements / abstractions of form to construct your graphical decompositional view for the form of your system.

The elements are chosen because for a simple system they constitute the atomic parts of the glider. These are the physical elements of the system that enable the function. We can also think of these **nouns** as what the system is.

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STEP 2: SYSTEM OPERANDS AND FUNCTIONS

For your next step, you will consider value related and principal internal operands and states. With your chosen system in mind, answer the following questions:

What is the value related operand? What is/are the value related states that change? Value related process of changing those states?

User | Bored/Entertained | Entertainment

What are the principal internal operands? What principal internal processes act on them? what are the principal internal functions?

Glider; Assembling, Throwing, Flying, Watching; Parts-Creating, User-Launching, Glider-Flying, User-Observing

How do the principal internal functions connect to form the primary value pathway? How does the external function emerge from these internal functions?

Pathway: User creates and assemble parts, user then throws the glider, launching it into the air. The glider then flies to provide the user some entertainment. *Being entertained is what emerges*

How do internal functions map to objects of form? How do the operands move between or change because of objects of form?

Glider Parts – Assembly; Fuselage – Launching; Wings/Stabilizer/Fin – Flying; Landing Gear – Landing.

Glider can change direction because of the wing, stabilizer, or fin.

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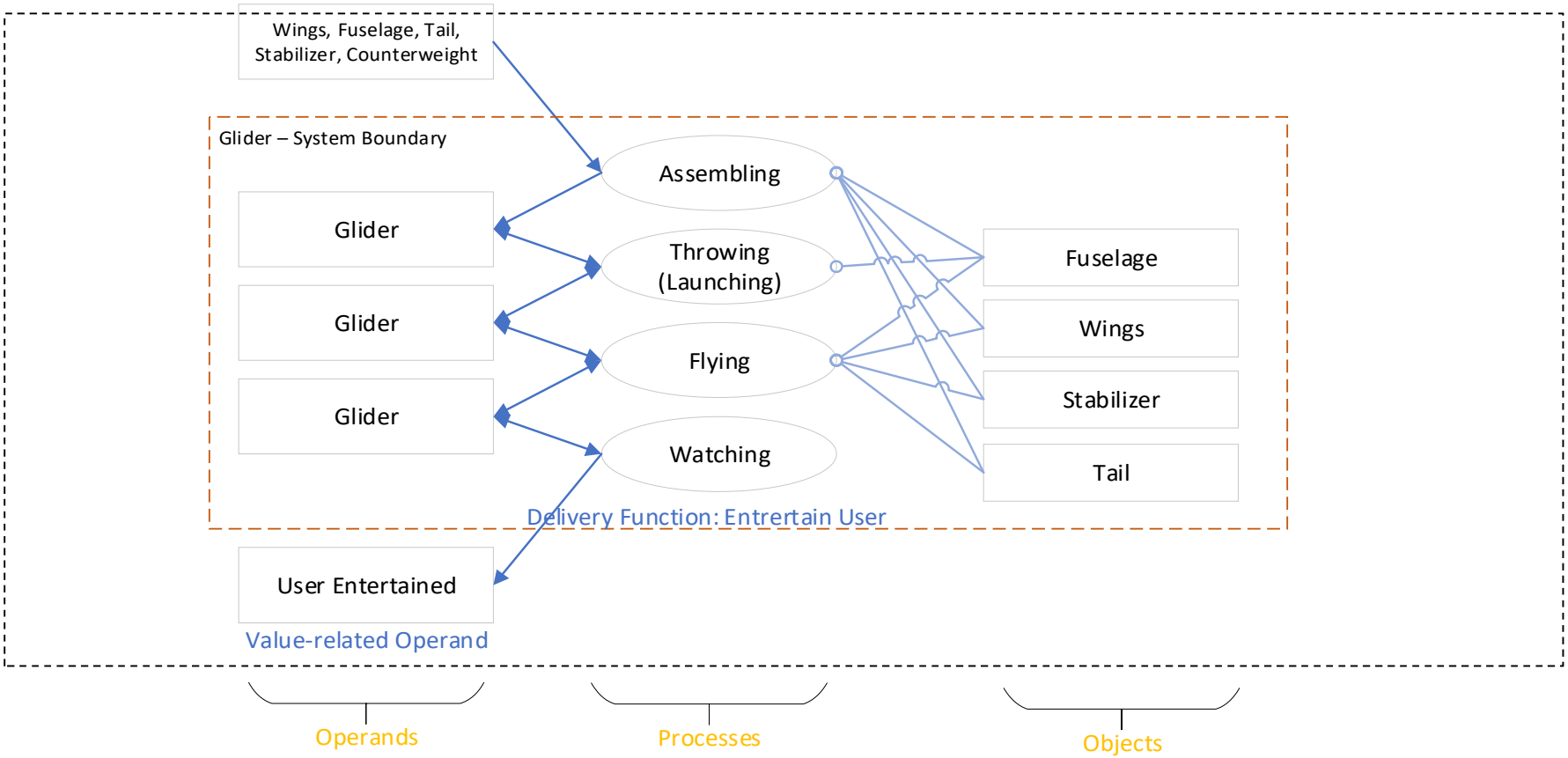
STEP 3: DEVELOP AN OPM DIAGRAM

For your system, develop an OPM diagram and insert the diagram below. Highlight or circle and label the the following: value related operand, delivered function, internal functions (operands and processes), and form. Provide a brief description of each in the field provided in the next slide.

Please remember the file size limit and resize or paste the image URL instead, as needed.

System Diagram/Schematic



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STEP 3: DEVELOP AN OPM DIAGRAM

Provide a brief description of each in the field provided of the following: value related operand, delivered function, internal functions (operands and processes), and form.

Value Related Operand:

User – This is who gets entertained at the end

Delivered Function:

Entertainment – What we want to achieve by building the glider

Internal Functions (operands and processes):

User-Building – The user put the parts together to assemble the glider
Glider-Launching – The user launches the glider into air
Glider-Flying – The glider can fly through the air (lifting)

Form:

Wings, Fuselage, Counterbalance, Stabilizer, Fin

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STEP 4: FUNCTIONAL INFORMATION

For your last step, you will think about how functional information is normally conveyed in your field or discipline. Cite and briefly describe a specific example.

Give a brief description of your field and how functional information is normally conveyed. Are processes indicated? Operands? Are processes and operands combined into functions? In your description, be sure to cite at least one example:

I work in the Automotive field. Typically information for systems is conveyed using several documents. Form is typically conveyed using diagrams and CAD drawings. Formal architecture is given in the context of the location of the system in the vehicle or by the use of exploded views. Functional architecture is sometimes described in models (typically for software) or in function matrices or flow diagrams (for hardware functions).

My field is moving more towards descriptions using SysML and MBD in order to provide a more complete information of the system.

One example is the steering system, the formal function is provided in CAD drawings (positions in vehicle, exploded views, and 2D drawings showing different spatial views and dimensions). Functional information is given in Visio flow diagrams with an implication on the processes and operands but not in the same context as what was shown in this course.

STEP 5: REVIEW & SUBMIT PROJECT

- Submit and self assess your completed Week 2 Project Portfolio file
- Note: The maximum file size that can be submitted is 10MB.
  - A sample project submission and scoring rubric can be downloaded from the course in the Resources/Downloads tab on the top navigation.
  - Please remember that there are two steps to this assignment: Submission and self assessment. Please be sure to provide enough time to complete both steps.