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- Or -

Challenges in Translating Mental Models into Virtual Ones: Describing What's in Your Head

Overview

- Goals (today's)
- Background (my POV)

- What is the problem?
- How to we approach a solution?
  - Model to Model Design
- 2 Queries ?

More Questions than

Today's Goal

- Clearer picture of the nature of the problem and the process for solving it.
  - Heightened appreciation for the challenges.
  - Awareness of what people bring to the table.

- A few tools to help frame a solution.

Sorry, no answers.

But First…

For each card:

Imagine a 'simple' model to illustrate the concept given.

Illustrate it.

constraints:

- Everything on one card
- Maximum 5 words
- Maximum 3 pictures
- Maximum 1 analogy

The simpler the better – as long as it works!

Background

My training is in Systems Analysis

I've watched the technology grow and evolve.

I have a fundamental understanding of the technology's possibilities and its underlying limitations.

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My perspective is Education

People create mental models to help them understand, remember, and relate things.

Ability to communicate mental models is key in education – it's one of the most important tools for learning.

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My philosophy is:

Rationalist

Knowledge is a product of the mind actively organizing and making sense of experience

Realist

There is an existence independent of our perception

Empiricist

Knowledge must be derived from observation or experience

Who Cares? **Personal Bias**

How to get a model from here:

To Here:

Not all viable models need to be accurate or even correct to be useful.[+]

Fidelity of the virtual model becomes less important as interest/engagement increases. [+]

Humans are very good at filling in gaps.[+/-]

If yuo cn raed tihs sectnene u konw waht I'm snynaig.

Model to Model: How It's Done

One-man show?

**NO* problem.*

BUT…

Often those who will eventually build the virtual model are *not* the ones who originated the mental model.

So….

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- Has only a vague model (unfinished)
- Has gaps (missing elements)
- Makes assumptions ("*You* know.")
- Is biased (has a particular spin)
- Uses context-sensitive or professionally 'loaded' language

* Noti on vs. Model *

Problem #1

Making sure what we have is a model, not a notion.

♪♫ 2 notes

Real Problem #2:

Styles vary both by individual and by discipline:

- Language/communication
- Working styles
- Design techniques
- Biases

Problem #2

Getting everyone on the same page.

achieve a shared understanding of a model?

Shaw, M.L.G. & Gaines, B. (1989)		Terminology: Same	Terminology: Different
Attributes: Same		**Consensus** Experts use terminology and concepts in the same way	**Correspondence** Experts use different terminology for the same concepts
Attributes: Different		**Conflict** Experts use same terminology for different concepts.	**Contrast** Experts use different terminology and different concepts

Comparing Conceptual Structures

Design - and - Problem Solving

Problem Solving & Design

Obviously:

At some level, ALL design is about expressing mental models.

Expressing and implementing a mental model is a problem that needs to be solved (= problem-solving).

It's also about guiding a diverse group of people towards a common goal.

Design Problem

What kind?

Design is: (Budgen, 1993)

1. Requirements: needs and constraints (*what is needed*)
2. Specification (*what will be done*)
3. ** Design ** (*how it will be done*)
4. Implementation (*actually making it*)
5. Testing :
   - verification :are we building the thing right?
   - validation: are we building the right thing?

   (*making sure it was the right thing done right*)

Designing 'Widgets'

All of these elements appear in one form or another in every single design process, regardless of the thing being designed.

- What do we need?
- What will we do?
- How will we do it?
- DO IT
- How did we do?

Caution:

Widgets aren't really real.

The common elements are just the beginning.

Each project will have unique elements.

Some problems have more than others.

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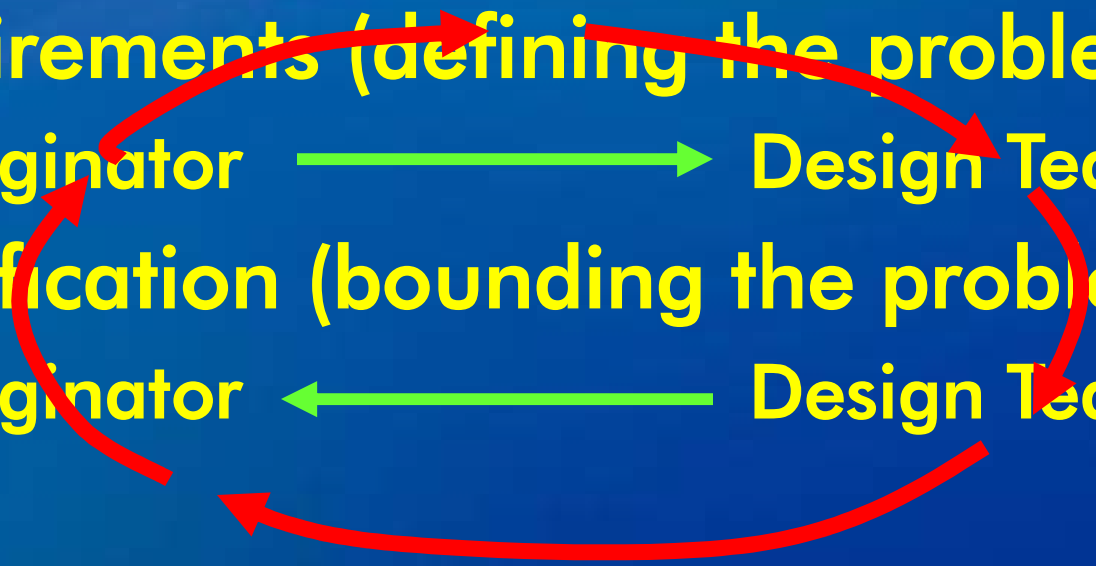
Requirements (defining the problem)

Originator → Design Team

Specification (bounding the problem)

Originator ← Design Team



We need consensus here.

Don't expect to finish this.

How ?

There is NO right answer
– at least no single one.

There are many design models.

Many models work well in specific instances.

None work reliably in all situations = even within a restricted domain .

Why ?

There are simply too many variables in the mental model.

These variables change even while we are solving the problem.

Step 2: the

Storyboarding

Prototyping

That's it?

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- Some of the technology is new.
- Some of the possibilities are new.

- The underlying ideas and principles are NOT.
- The fundamental workings of the machine are NOT.

- Simulations are among the first things we did with computers.

we

up

Creating a Virtual Representation of a Mental Model is a:

Wicked

Problem

Rittel & Webber, (1973)

Wicked Problems

1. There is no definitive formulation of a Wicked Problem.
2. Wicked Problems have no stopping rule.
3. Solutions are not True/False but Good/Bad.
4. There is no ultimate test of a solution to a Wicked Problem.
5. Each solution is a one shot operation.
6. Wicked Problems do not have enumerable (exhaustively describable) solutions.
7. Each problem is unique.
8. Each problem is a symptom of another problem.
9. There are a number of different stakeholders interested in how it is solved.
10. The planner has no right to be wrong.

If we've been doing modeling & simulation since the 40's....

Why such inte rest Now?

Accessibility

- No longer the sole domain of Computer Scientists.
- Tools allow 'outsiders' to create simulations.

NOTE:

- Tools make many things possible.
- Tools are limiting.

1. Make sure we have a MODEL
   (complete, or at least close enough)
2. Make sure everyone's on the same page (or at least close enough)

What is close enough?

1. Make no assumptions about shared understanding: build a common ground.
2. Know your group.
3. Keep your goal obvious.
4. Keep verifying.

The Cards:

Iteration = looping, repitition

Recursion = process within same process

Counting (any base) = odometer

Inquiry Based Learning
= finding answers to my questions

Consensus = permission to proceed

having an impact

Model:

Impact....

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