Design Activity Framework for Visualization Design

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visualization design
What We Did

cybersecurity redesign project

Who We Are

visualization experts

psychologist
dominika

designer
jim
visualization & creative re-design
Challenges

- connect actions we take and decisions we make

**process** models

**decision** models

Sedlmair et al, “Design study methodology” 2012

Munzner, “A Nested Model for Visualization Design and Validation” 2010
Challenges

- support a **more flexible** design process

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**engineering process**

**creative process**

Tory & Möller, “Human factors in visualization research” 2004

Kumar, 101 Design Methods, 2012
• where am I?
• what is my goal?
• how do I get there?

} actionability
  + flexibility
Design Activity Framework

where am I?
- motivation

what is my goal?
- outcomes

how do I get there?
- methods

**specific purpose** behind the methods and actions that are performed within that activity

**specific, unique results** of an activity, characterized by which level or levels of the nested model they address

**actions or techniques** that a designer employs to either generate or evaluate outcomes
Design Activity Framework

four activities

**understand** 

**ideate**

**make**

**deploy**

Design activity

- motivation
- outcomes
- methods
• where am I?

• what is my goal?

• how do I get there?
Design Activity Framework

**Understand**

*motivation*: finding the needs of the user

**Ideate**

generate good ideas to support needs

**Make**

concretize ideas, make them tangible

**Deploy**

bring a prototype into effective action
• where am I?

• what is my goal?

• how do I get there?
## Design Activity Framework

<table>
<thead>
<tr>
<th>Understand</th>
<th>Ideate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>motivation:</strong> finding the needs of the user</td>
<td>generate good ideas to support needs</td>
</tr>
<tr>
<td><strong>outcome:</strong> sets of design requirements</td>
<td>sets of ideas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Make</th>
<th>Deploy</th>
</tr>
</thead>
<tbody>
<tr>
<td>concretize ideas, make them tangible sets of prototypes</td>
<td>bring a prototype into effective action visualization system</td>
</tr>
</tbody>
</table>
Design Activity Framework

<table>
<thead>
<tr>
<th></th>
<th>u</th>
<th>i</th>
<th>m</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>domain characterization</td>
<td></td>
<td></td>
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<tr>
<td>data / task abstraction</td>
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<tr>
<td>encoding / interaction technique</td>
<td></td>
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<tr>
<td>algorithm design</td>
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</tbody>
</table>

- **Understand** (u)
- **Ideate** (i)
- **Make** (m)
- **Deploy** (d)
• where am I?

• what is my goal?

• how do I get there?
Design Activity Framework

- **Motivation**
  - Divergent: create e.g. brainstorming
  - Generative

- **Outcomes**
  - Convergent: filter e.g. feedback, user studies
  - Evaluative

- **Methods**
| #   | method                          | u | g | e | i | g | e | m | g | e | d | g | e | v         | definition                                                                                                                                                                                                 |
|-----|---------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | A/B testing                      |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “compare two versions of the same design against a predetermined goal” [18]                                                                                                                                  |
| 2   | activity map                     |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “structuring activities of stakeholders and a list of activities gathered during research. . . . relationships” [14]                                                                                       |
| 3   | AEIOU framework                  |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “organizational framework reminding the researcher of the context of their work. . . . taxonomy of user behaviors” [18]                                                                               |
| 4   | affinity diagramming             |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “process used to externalize and meaningfully organize design ideas and concepts” [6]                                                                                                                     |
| 5   | algorithmic performance          |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “quantitatively study the performance of algorithms” [13]                                                                                                                                                  |
| 6   | analogical reasoning             |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “cognitive strategy in which previous knowledge is applied to new situations. . . . requirements of a novel situation” [8]                                                                             |
| 7   | appearance modeling             |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “systematic examination of the materials, aesthetics, and interactive qualities of objects contributed to an understanding of their physical characteristics” [18] |
| 8   | artifact analysis                |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “captures the users’ patterns of activity. . . . error message, menu-item selection, dialogue or web-page access. . . . can also capture contextual memory and domain knowledge” [18] |
| 9   | automated logging               |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “simulating situations of user activity concepts. . . . through observation and conversation on the concepts” [14]                                                                                         |
| 10  | behavioral prototype             |   |   |   |   |   |   |   |   |   |   |   |   |   |         | “helping understand the users’ goals, objectives, and activities” [15]                                                                                                                                     |
Methods: Paper Prototyping

“create a **paper-based simulation of an interface** to test interaction with a user”

Maguire, “Methods to support human-centred design” 2001

Lloyd & J. Dykes, “Human-centered approaches in geovisualization design” 2011
“personal letter written to a product… [to reveal] profound insights about what people value and expect”

Martin & Hanington, Universal Methods of Design: 100 Ways to Research, 2012
• where am I?

• what is my goal?

• how do I get there?

{ actionability + flexibility }
Capturing Design Flow

- **flexible**: support messiness

- two basic **movement principles**
  1. **forward** movement is **ordered**
  2. activities can be **nested** or conducted in **parallel**
Process Timelines

- redesign project

**Process Stages**

- **d (Plan)**
  - May: plan, artifact analysis, literature review

- **u (Understand)**
  - Jun: open coding, identify key opportunities
  - Jul: concept sketches, analysts interview

- **i (Ideate)**
  - Aug: wireframes, developer interview

- **m (Make)**
  - Sep: interface mockups, time series ideation
  - Oct: developer prototype, A/B testing + questionnaire

- **m (Deploy)**
  - Nov: final deadline
Process Timelines

- colleague's design study

- Interviews
- Tool analysis
- Participatory design
- 1st data prototype
- 2nd prototype + lit review
- Iterative interviews
- Consolidation
- 1st release
- 2nd release
- 3rd data prototype
- 3rd release
Process Timelines

• **communicates** a messy, creative process

• supports flexibility
  • nested
  • parallel
• **motivation**

  - **Understand**
    - Motivated finding needs of the user
    - Outcome: sets of design requirements
  - **Ideate**
    - Generate good ideas to support needs
    - Outcome: sets of ideas
  - **Make**
    - Concretize ideas, make them tangible
    - Outcome: sets of prototypes
  - **Deploy**
    - Bring a prototype into effective action
    - Outcome: visualization system

• **outcomes**

• **methods**

  - **actionability**
  - **flexibility**
Take-Aways

• **design activity framework** can influence how you:
  
  • design
  
  • connect
  
  • explore
  
  • communicate

• **embrace the messiness!**
Questions?

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