Learning by Doing:
Human-Centered Design in an Agile Context

Bryan Fricke
Agile Coach & Software Engineer
bryan.fricke@gmail.com

© 2015 Bryan Fricke
Purpose
Systems Thinking

Systems thinking is a discipline for seeing the “structures” that underlie complex situations, and for discerning high from low leverage change. That is, by seeing wholes we learn how to foster health.

— Peter Senge


© 2015 Bryan Fricke
Living Structure

... living structure refers not to biological systems in the world, but is a **general character**, appearing through all systems, organic and inorganic, **of the natural world**.

— Christopher Alexander

Design Thinking

Two powerful tools ... summarize the approach: the British Design Council's "Double-Diamond, Diverge-Converge Model of Design"; and ... "Human-Centered Design."

— Donald Norman

http://www.jnd.org/dn.mss/rethinking_design_th.html
Conundrum

• You want to know what users want; however, you shouldn’t ask
• You want others to do something to meet users’ needs; however, you shouldn’t tell them what much less how
Double Diamond Design Process

- Discover
- Define
- Develop
- Deliver

Diverge on Problem Space → Converge on Solution Goals → Diverge on Design Space → Converge on Solution

Release

http://www.designcouncil.org.uk/news-opinion/design-process-what-double-diamond

© 2015 Bryan Fricke
Human-Centered Design

Empathize  Define  Ideate  Prototype  Test

https://dschool.stanford.edu/

© 2015 Bryan Fricke
Design Thinking

- Discover
  - Empathize
  - Test
- Define
  - Define
  - Ideate
- Develop
  - Prototype
- Deliver

© 2015 Bryan Fricke
Plan, Do, Study, Act (PDSA)

https://www.deming.org/theman/theories/pdsacycle
Plan, Do, Study, Act (PDSA)
The Seven Stages of Action

There are two parts to an action ... doing and interpreting.
— Donald Norman

Control Theory

Reference → + Measured Error → Controller → System Input → System → System Output

Sensor → Measured Output
In systems thinking it [feedback] is an axiom that every influence is both cause and effect.

— Peter Senge

Agile Manifesto

Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

http://www.agilemanifesto.org/principles.html
Scrum

Product Backlog ➞ Sprint Backlog ➞ Sprint ➞ Working increment of the software

- Sprint Backlog: 24 h
- Sprint: 30 days
Scrum Sprint Review

This ... meeting ... is intended to *elicit feedback* and foster collaboration.

http://www.scrumguides.org/scrum-guide.html
Dynamic Systems Development Method (DSDM)

Principle 6 – Develop Iteratively

Build customer feedback into each iteration

http://www.dsdm.org/content/4-atern-principles

© 2015 Bryan Fricke
Living Structure

... Extreme programming is a way of doing ... software development, with a very short cycle of evolution and adaptation, repeated many times ... But this is not the central point at all.

— Christopher Alexander

Living Structure

... The real essence lies in the structure-preserving transformations which ... are primarily responsible for the success of the generating process.

— Christopher Alexander

Living Structure

Change leaders often forget to ask a powerful question: “What do we seek to conserve?”

— Peter Senge

Living Structure

This spirit of learning as **discovering and embodying nature’s patterns** subtly infuses all the other innovations discussed in the preceding chapters.

— Peter Senge

Living Structure

... the objects that are most profound functionally are the ones which also promote the greatest feeling in us.

— Christopher Alexander

https://www.patternlanguage.com/archive/ieee/ieeetext.htm
Living Structure

The comparable view, in software design, would tell you that a program which is objectively profound (elegant, efficient, effective and good as a program) would be the one which generates the most profound feeling of wholeness ...

— Christopher Alexander

https://www.patternlanguage.com/archive/ieee/ieeetext.htm
Levels of Processing

Infiniti Ad Campaign

The joy is feeling connected to it ... it’s the sense of it ... that’s what it feels like to drive one.

Infiniti Ad circa 1989
Empathize

• Typical method
  Ask what users want and [optimistically] follow-up with why

• Alternative
  Observe and document what users actually do without interpretation
Mental Models

“Mental models” are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action.

— Peter Senge
Mental Models

... developing [a] capacity to work with mental models ... [requires] skills in two broad categories: **skills of reflection** and **skills of inquiry**.

— Peter Senge

Mental Models

[Face] up to distinctions between **espoused theories** (what we say) and **theories-in-use** (the implied theory in what we do)

— Peter Senge

Observe Behavior

To design the best UX, **pay attention to what users do, not what they say**. Self-reported claims are unreliable, as are user speculations about future behavior. Users do not know what they want.

— Jakob Nielsen

http://www.nngroup.com/articles/first-rule-of-usability-dont-listen-to-users/
Gulfs of Execution and Evaluation

The gulfs are obvious places to start ... The trick is to **develop observational skills** to detect them.

— Donald Norman

Contextual Inquiry Interview

https://en.wikipedia.org/wiki/Contextual_inquiry
Behavior Based Interviews

- Situation or Task
- Action taken
- Results achieved
Behavior Based Interviews

• Ask open ended questions

• Avoid
  – Making a sales pitch
  – Asking users to predict the future
  – Teaching
  – Trying to make things better
Behavior Based Questions

• What were your most common activities when doing X?
• How did you obtain needed information?
• What tools/programs did you use?
Empathize: Pains & Gains

• Pains
  – People we observed don’t need our tool
  – People didn’t complain about what is inside our control

• Gains
  – We had the opportunity to identify real need rather than simply trying to figure out how to enhance our tool
  – We questioned what was inside our control
Define

• Typical method
  Document what the customers/users said they wanted

• Alternative
  – Synthesize what their tasks and activities are
  – Identify primary pain points
  – Identify goals to address pain points
  – Generate metrics for evaluating solution
  – Define persona(s) so we know what user(s) we are serving
Root Cause Analysis

What about radical ideas, ones that introduce new product categories to the marketplace? These come about by reconsidering the goals, and always asking what the real goal is: what is called the root cause analysis.

— Donald Norman

Double-Loop Learning

http://www.afs.org/blog/icl/?p=2653
Analysis

1. Break the whole into its components
2. Understand the function of each part
3. Aggregate the understanding of the components to understand the whole

Synthesis

1. Determine the whole to which a component belongs
2. Understand the containing system
3. Identify the function of the component in the containing system

What Can Be Learned

- **Data**: symbols
- **Information**: who, what, where, when
- **Knowledge**: how
- **Understanding**: why
- **Wisdom**: evaluated understanding
User Experience Map

• Similar to affinity diagram with the addition of time dimension

• Affinity diagram is one of the Seven Management and Planning Tools

• Created by Japanese anthropologist Jiro Kawakita

• Uses synthesis rather than analysis
Contextual Inquiry

The integration of all the details observed, the achievement of a sociological synthesis ... is the task of the Ethnographer ...

– Bronisław Malinowski

User Experience Map

Lynda.com: UX Design Techniques: Analyzing User Data
Mental Models

[Recognize] “leaps of abstraction” (noticing our jumps from observation to generalization)

— Peter Senge


© 2015 Bryan Fricke
Mental Models

There were no inventories in any of the plants. I’ve been in manufacturing operations for almost thirty years and I can tell you those were not real plants. They had clearly been staged for our tour.

— Detroit auto executive

User Experience Map
Identify Pain Points

Organized Chronologically
Identify Pain Points

PAIN POINTS

# Dots	Issue
7	Existing software tool crashes
4	Difficult to input data
3	Prefer text to speech functionality
Define and Prioritize Goals

<table>
<thead>
<tr>
<th>PAIN POINTS</th>
<th>GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td># Dots</td>
<td>Issue</td>
</tr>
<tr>
<td>7</td>
<td>Existing software tool crashes</td>
</tr>
<tr>
<td>4</td>
<td>Difficult to input data</td>
</tr>
<tr>
<td>3</td>
<td>Prefer text to speech functionality</td>
</tr>
</tbody>
</table>

Lynda.com: [UX Design Techniques: Analyzing User Data](https://www.lynda.com)
Define Metrics

Goal
Reduce difficulty of data entry

• **Efficiency**
  New input method at least 40% faster

• **Effectiveness**
  New entry method introduces 50% fewer errors

• **Satisfaction**
  Improves from 2/5 to at least 4/5 on average
Create Personas

Ralph the engineer

Attributes
• 42 years old
• 17 years of experience
• Basic computer literacy

Concerns
• Having to learn complicated software
• 3D navigation
• Having to interpret statistical information

Goals
• Keep customers satisfied with generated reports
• Generate more reports without having to edit generated reports

Lynda.com: UX Design Techniques: Creating Personas
Pains & Gains

Pains

– Time intensive

– Team members didn’t like generating metrics as they seemed arbitrary and difficult to determine

Gains

We developed some baseline measures to determine success
• Typical method
  – One person takes ownership for developing and championing an idea
  – Discusses (argues) with others about idea relative to other peoples’ ideas

• Alternative
  – Explore multiple alternative designs before becoming engrossed in any one
Model I

Governing Variables

• Define goals and try to achieve them
• Maximize winning and minimize losing
• Minimize generating or expressing negative feelings
• Be rational

https://en.wikipedia.org/wiki/Chris_Arleyris
Model II

Governing Variables

• Valid information
• Free and informed choice
• Internal commitment to the choice and constant monitoring of its implementation
Double-Loop Learning

Model I is the group which has been identified as inhibiting double-loop learning. It has been described as being predominantly competitive and defensive.

Hill Climbing

There are very good descriptions of the hill-climbing process for design in Christopher Alexander’s book Note on the Synthesis of Form...

— Donald Norman
Building Shared Vision

Shared visions emerge from personal visions. This is how they derive their energy and how they foster commitment.

— Peter Senge

If there was no gap, there would be no need for any action to move toward the vision. Indeed, the gap is the source of creative energy. We call this gap creative tension.

— Peter Senge

Methods

• Brainstorming
• Design Charrettes
• Possible Futures
• Role playing different parts of the system
When you think about brainstorming I want you to think about jazz ...

— Bill Burnett

https://www.youtube.com/watch?v=34EuT2KH2Lw&feature=youtu.be&t=34m25s
We want to accept our partners ideas ... accept the reality they are offering so that we can build and work together collaboratively ... you can get a laugh sometimes by putting up a block, but you can’t create any story

— Kasey Klemm, BATS Improv

https://youtu.be/lBV8oVxXUM8
Sound Ball

Design Charrettes

• Sketch solutions individually
  – Use large sheets of paper
  – Put up on wall
• Critique each design idea
• Dot vote for ideas to take to the next round

Lynda.com: **UX Design Techniques: Ideation**
Design Charrettes

• Work in pairs to synthesize the concepts
  Mindset is for creating something in the way jazz is
  produced where people play off each others’ ideas

• Critique and make final decisions about which
  ideas to carry through into prototypes

Lynda.com: UX Design Techniques: Ideation
Team Learning

A learning team masters movement back and forth between dialogue and discussion. A unique relationship develops among team members who enter into dialogue regularly. They develop a deep trust that cannot help but carry over to discussions.

— Peter Senge

Team Learning

• **Dialogue**: Free and creative exploration of complex and subtle issues, a deep “listening” to one another and suspending of one's own views

• **Discussion**: Different views are presented and defended

Design Charrettes
Pains & Gains

• Pains
  Some people had a hard time entertaining far fetched ideas

• Gains
  – Explicitly asking what is and is not feasible
  – Ideas were able to breathe longer than they would have otherwise
  – What we thought were the problems were not the problems
  – Realized how many intricacies there are in the user interface and usability issues
  – Felt like the ideation part of the process worked well enough to try again
  – Liked drawing on big paper
Scenarios

• Typical method
  Jump straight to code or GUI mockups

• Create scenarios of activities similar to use cases to determine flow of interaction (independent of interface elements)
  Helps to determine feasibility and practicality of design ideas by seeing them in context of entire workflow
Scenario Creation

• Choose one or more of the user activity areas from the experience map (i.e., the blue cards on the experience map)

• Work in pairs to define scenarios
Scenario Creation

If more than one pair worked on the same scenario combine the best elements into one combined scenario.

Lynda.com: UX Design Techniques: Creating Scenarios and Storyboards

© 2015 Bryan Fricke
Scenario Pains & Gains

• Pains
  – Sometimes difficult to use interface agnostic language
  – Using white board is more convenient
  – Some people wanted to work on everything

• Gains
  – Helps to define concepts prior to investing in a prototype
Paper Prototype

• Typical method
  Non-interactive high fidelity GUI mockup

• Alternative
  Create paper prototype or low fidelity mockup that can be tested by users
Paper Prototype

Lynda.com: UX Design Techniques: Paper Prototyping

© 2015 Bryan Fricke
Paper Prototype

Build interface elements for each part of the scenario

– Don't add elements that are not in the defined scenarios
– Use a separate piece of paper for each interface element
– Ask someone who isn't familiar with the project to complete the task
Paper Prototype Pains & Gains

• Pains
  – Felt expensive to produce (although less than 2 days)

• Gains
  – Obtained hands-on feedback
Testing

• Typical Method
  – Design Reviews
  – Beta Test
  – Releases from Sprints

• Alternative

  **Usability Test with Actual Users**
  
  Formally collect feedback on usability before writing code
  Continue to run usability tests as the design progresses into digital wireframes and code
Scrum

This holistic approach has six characteristics: built-in instability, self-organizing project teams, overlapping development phases, “multilearning,” subtle control, and organizational transfer of learning ...

Multilearning

Team members engage in a continual process of trial and error to narrow down the number of alternatives that they must consider.

Usability Testing

“Computer” — Moderator

Participant

Moderator

Lynda.com: UX Design Techniques: Usability Testing
Usability Testing

• Find and fix as many conceptual issues as possible
• Better to iterate on the design than to just keep testing a design that is known to be broken
Pains & Gains

• Pains
  – Investment of time
  – Got unexpected feedback from users
  – People were sometimes confused about what interface elements the paper represented

• Gains
  – Got unexpected feedback from users
  – Feedback was based on users actually using a prototype
  – Much of the feedback was about the basic functionality

© 2015 Bryan Fricke
User Story Map

• Typical Method
  – PO specifies backlog and associated priorities based on feedback from customer and professional judgment

• Generate backlog from scenarios and paper prototypes
  – Specify backlog in strata of priority that makes a minimum viable product releasable as early as possible
  – Subsequent releases should have the features that have the best cost/benefit ratio for addressing pain points
  – Releases are needed to conduct additional usability testing in order to refine interaction/interfaces and to adjust prioritization
## User Story Map

Use analysis to define activities, tasks, and stories

<table>
<thead>
<tr>
<th>Minimum Requirement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Majority Requirement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nice to have</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

User Story Map

Users need a whole product rather than pieces in order to give feedback. This is the notion of minimal viable product.

— Chris Nodder
User Story Map

Something new is happening. And it has to do with it all — the whole.

— Peter Senge


© 2015 Bryan Fricke
Design Method Tools

In addition to the resources referenced throughout this presentation, Catherine, our meeting organizer, referred me to the tools offered by the Institute of Design at Stanford:

http://dschool.stanford.edu/use-our-methods/