# Requirements 2, Interviews, User Stories, and Risk

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# Learning goals

- Define and identify stakeholders.
- Demonstrate basic proficiency in executing effective requirements interviews.
- Create user stories and evaluate them using INVEST
- Evaluate risk for a product

# Administrivia

- Homework 2 a due today.
- TOC next week
  - We understand if you cannot come to entire class Tues
  - quick discussion of resumes today – ask me for individual feedback

# Resumes

# My Simple rules about Resumes

Top Half, focus on what makes **you special**

Bottom Half, what makes you **good enough**

# Interviews

# REQUIREMENTS ELICITATION

# Typical Steps

- Identify stakeholders
- Understand the domain
  - Analyze artifacts, interact with stakeholders
- Discover the real needs
  - Interview stakeholders
- Explore alternatives to address needs

# Question

- Who is the system for?
- Stakeholders:
  - End users
  - System administrators
  - Engineers maintaining the system
  - Business managers
  - …who else?

# Stakeholder

- Any person or group who will be affected by the system, directly or indirectly.
- Stakeholders may disagree.
- Requirements process should trigger negotiation to resolve conflicts.

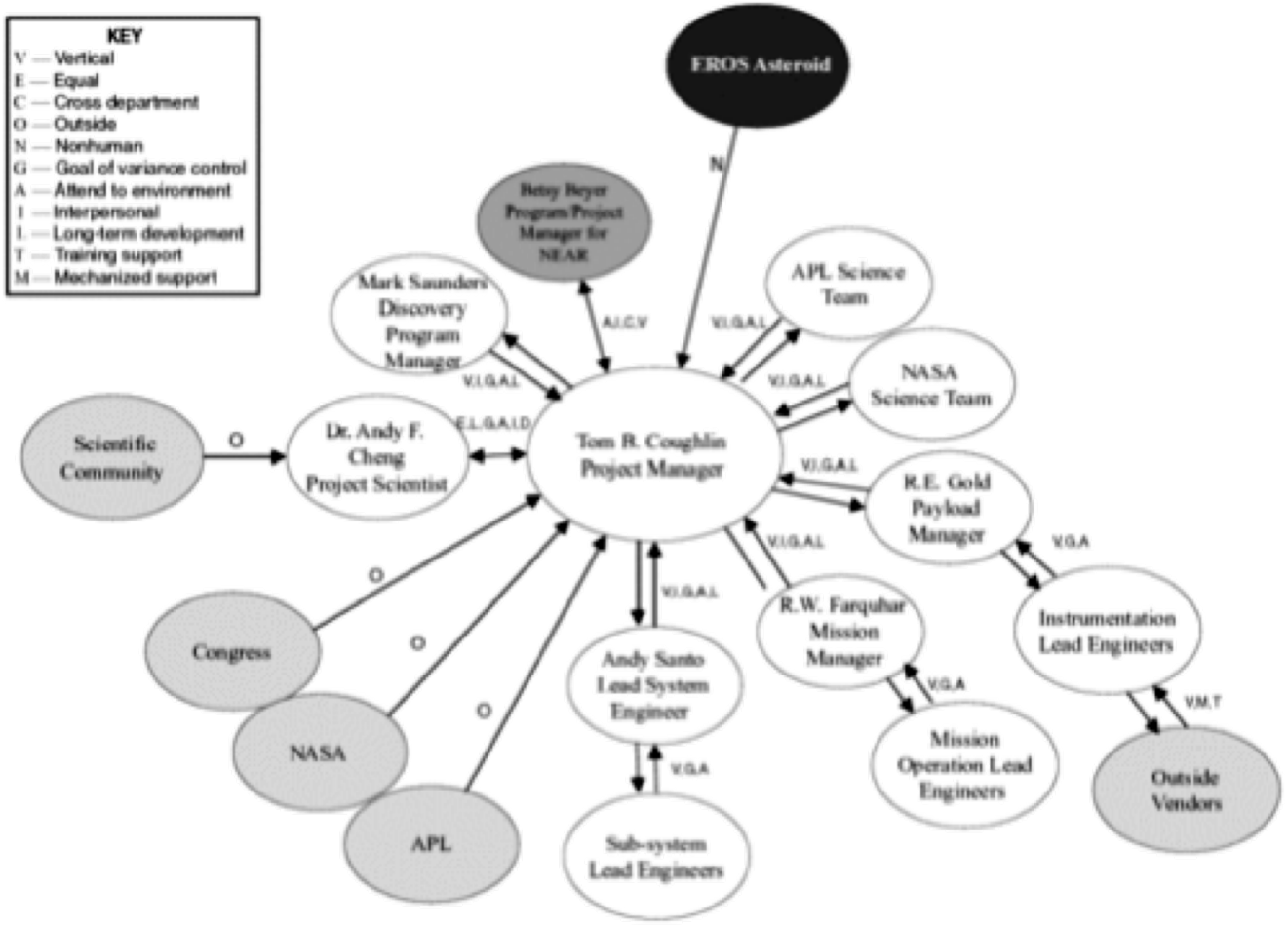
# Defining actors/agents

- An actor is an entity that interacts with the system for the purpose of completing an event [Jacobson, 1992].
  - Not as broad as stakeholders.
- Actors can be a user, an organization, a device, or an external system.

# Stakeholder analysis: criteria for identifying relevant stakeholders

- Relevant positions in the organization
- Effective role in making decisions about the system
- Level of domain expertise
- Exposure to perceived problems
- Influence in system acceptance
- Personal objectives and conflicts of interest

# Stakeholders, a NASA example




From HSI NAP 11893

FIGURE 6-3 Role network for National Aeronautics and Space Administration (NASA's) Near Earth Asteroid Rendezvous project.

# Challenges

- Distributed knowledge
- Conflicting knowledge
- Difficult to access sources
- Communication barriers (cultural, terminology, backgrounds)
- Hidden needs, tactic knowledge
- Politics, unstable conc

Examples? Mitigation strategies?

# Studying Artifacts (Content Analysis)

- Learn about the domain
  - Books, articles, wikipedia
- Learn about the system to be replaced
  - How does it work? What are the problems? Manuals? Bug reports?
- Learn about the organization
- Knowledge reuse from other systems?

# Interviews

# Interview Tradeoffs

- Strengths
  - What stakeholders do, feel, prefer
  - How they interact with the system
  - Challenges with current systems
- Weaknesses
  - Subjective, inconsistencies
  - Capturing domain knowledge
  - Familiarity
  - Technical subtlety
  - Organizational issues, such as politics
  - Hinges on interviewer skill

# Interview Process

- Identify stakeholder of interest and target information to be gathered.
- Conduct interview.
  - (structured/unstructured, individual/group)
- Record + transcribe interview
- Report important findings.
- Check validity of report with interviewee.

# Example: Identifying Problems

- What problems do you run into in your day-to-day work? Is there a standard way of solving it, or do you have a workaround?
  - Why is this a problem? How do you solve the problem today? How would you ideally like to solve the problem?
- Keep asking follow-up questions ("What else is a problem for you?", "Are there other things that give you trouble?") for as long as the interviewee has more problems to describe.

- So, as I understand it, you are experiencing the following problems/needs (describe the interviewee's problems and needs in your own words – often you will discover that you do not share the same image. It is very very common to not understand each other even if at first you think you do).
- Just to confirm, have I correctly understood the problems you have with the current solution?
- Are there any other problems you're experiencing? If so, what are they?

# Capturing v. Synthesizing

- Engineers acquire requirements from many sources
  - Elicit from stakeholders
  - Extract from policies or other documentation
  - Synthesize from above + estimation and invention
- Because stakeholders do not always know what they want, engineers must…
  - Be faithful to stakeholder needs and expectations
  - Anticipate additional needs and risks
  - Validate that “additional needs” are necessary or desired

# Interview Advice

- Get basic facts about the interviewee before (role, responsibilities, …)
- Review interview questions before interview
- Begin concretely with specific questions, proposals; work through prototype or scenario
  - Relate to current system, if applicable.
- Be open-minded; explore additional issues that arise naturally, but stay focused on the system.
- Contrast with current system/alternatives. Explore conflicts and priorities
- Plan for follow-up questions

# Bonus: Guidelines for effective interviews

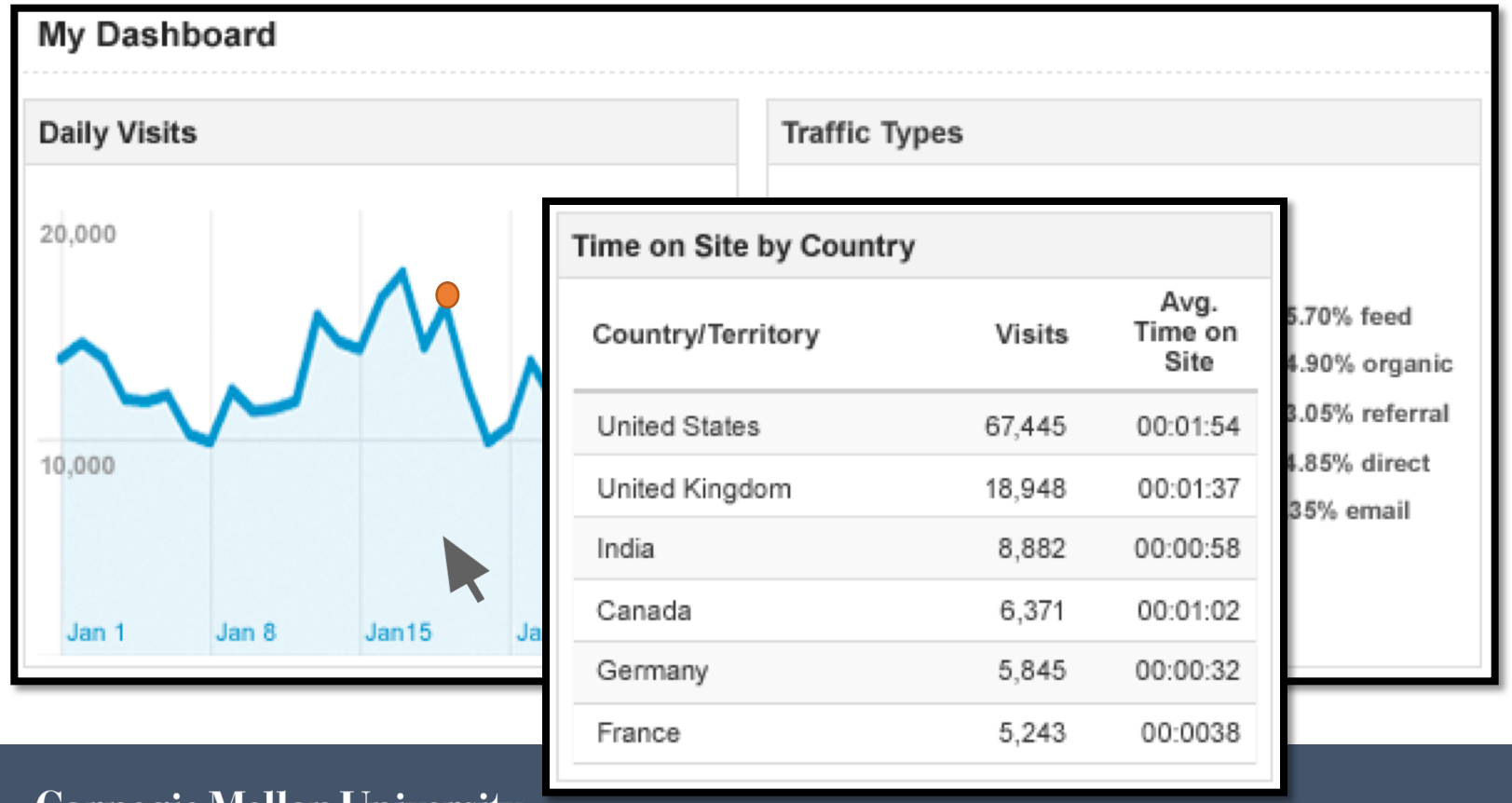
- Identify the right interviewee sample for full coverage of issues
  - different responsibilities, expertise, tasks, exposure to problems
- Come prepared, to focus on right issue at right time
  - backgound study first
  - predesign a sequence of questions for this interviewee
- Centre the interview on the interviewee's work & concerns
- Keep control over the interview
- Make the interviewee feel comfortable
  - Start: break ice, provide motivation, ask easy questions
  - Consider the person too, not only the role
  - Do always appear as a trustworthy partner

# Bonus: Guidelines for effective interviews

- Be focused, keep open-ended questions for the end
- Be open-minded, flexible in case of unexpected answers
- Ask why-questions without being offending
- Avoid certain types of questions …
  - opinion or biased
  - affirmative
  - obvious or impossible answer for this interviewee
- Edit & structure interview transcripts while still fresh in mind
  - including personal reactions, attitudes, etc
- Keep interviewee in the loop
  - co-review interview transcript for validation & refinement

# PROTOTYPES, MOCKUPS, STORIES

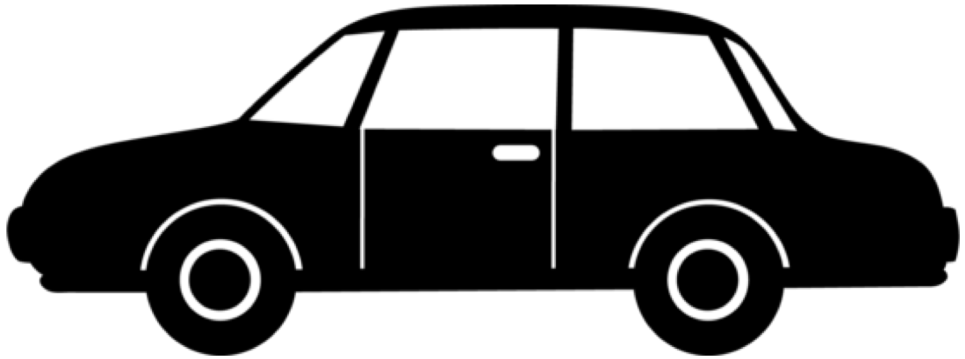
# High- vs low- fidelity mockups



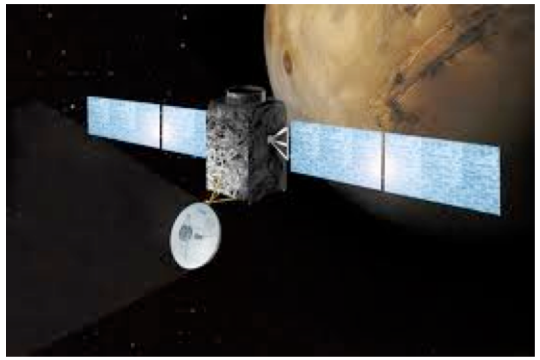
# Mockups, Prototypes, Stories

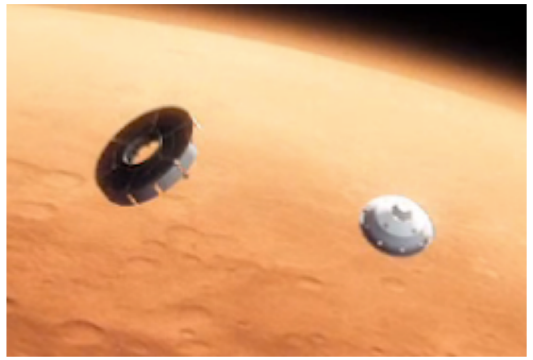
- Humans: better at recognizing whether a solution is correct than solving the problem from a blank page.
- Mock-ups/prototypes help explore uncertainty in the requirements.
  - Validate that we have the right requirements.
  - Elicit requirements at the “borders” of the system.
  - Assert feasibility of solution space.
  - Get feedback on a candidate solution.
- “I’ll know it when I see it”

# Rapid prototyping

- Throw-away: developed to learn more about a problem, not intended for actual use.
- 
- Evolutionary: intended to be incorporated into the final product.

# Storyboarding and scenarios

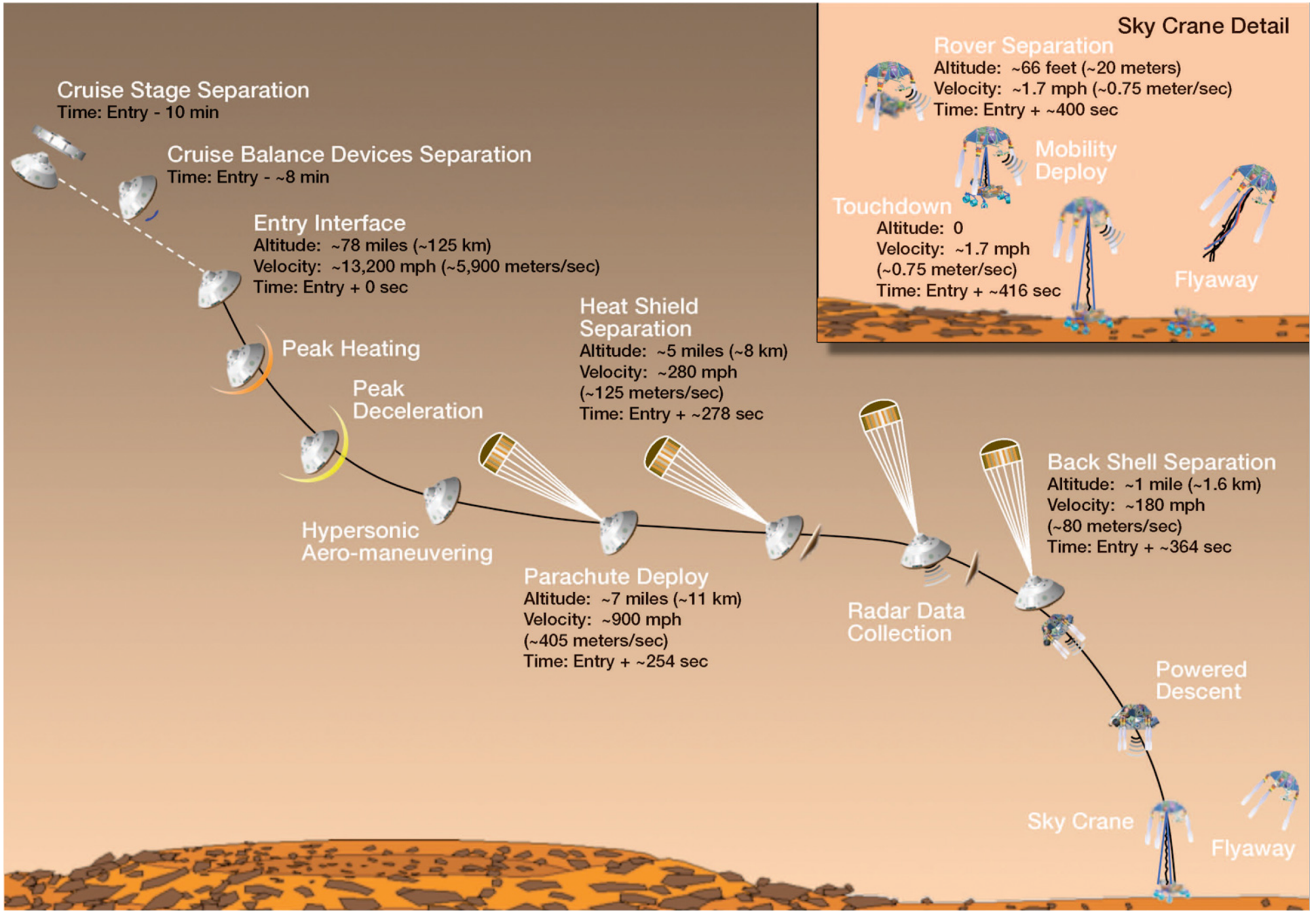




# Story

- **Who** the players are
- **What** happens to them
- **How** it happens through specific episode
- **Why** this happens
- **What** if such and such an event occurs
- **What** could go wrong as a consequence

- **Storyboards illustrate scenarios**: a typical sequence of interaction among system components that meets an implicit objective.
  - **Storyboards** explicitly cover at least **who**, **what**, and **how**.
- Different types:
  - Positive vs negative (should and should not happen)
  - Normal vs abnormal
- As part of elicitation:
  - Learn about current or proposed system by walking through real-life or hypothetical sequences
  - Can ask specific questions
  - Elicit the underlying objectives, generalize into models of desired behaviors.
  - Identify and resolve conflicts
- Pluses: Concrete, support narrative description
- Minuses: inherently partial.


Cruise Stage Separation
Time: Entry - 10 min
Cruise Balance Devices Separation
Time: Entry - ~8 min
Entry Interface
Altitude: ~78 miles (~125 km)
Velocity: ~13,200 mph (~5,900 meters/sec)
Time: Entry + 0 sec
Peak Heating
Peak Deceleration
Hypersonic Aero-maneuvering
Heat Shield Separation
Altitude: ~5 miles (~8 km)
Velocity: ~280 mph (~125 meters/sec)
Time: Entry + ~278 sec
Parachute Deploy
Altitude: ~7 miles (~11 km)
Velocity: ~900 mph (~405 meters/sec)
Time: Entry + ~254 sec
Radar Data Collection
Back Shell Separation
Altitude: ~1 mile (~1.6 km)
Velocity: ~180 mph (~80 meters/sec)
Time: Entry + ~364 sec
Powered Descent
Sky Crane
Flyaway
Sky Crane Detail
Rover Separation
Altitude: ~66 feet (~20 meters)
Velocity: ~1.7 mph (~0.75 meter/sec)
Time: Entry + ~400 sec
Mobility Deploy
Touchdown
Altitude: 0
Velocity: ~1.7 mph (~0.75 meter/sec)
Time: Entry + ~416 sec
Flyaway

# RESOLVING CONFLICTS

# Types of inconsistency

- Terminology clash: same concept named differently in different statements
  - e.g. library management: “borrower” vs. “patron”
- Designation clash: same name for different concepts in different statements
  - e.g. “user” for “library user” vs. “library software user”
- Structure clash: same concept structured differently in different statements
  - e.g. “latest return date” as time point (e.g. Fri 5pm)
  - vs. time interval (e.g. Friday)

# Types of inconsistency, 2

- Strong conflict:  statements not satisfiable together
  - e.g. “participant constraints may not be disclosed to anyone else” vs. “the meeting initiator should know participant constraints”
- Weak conflict (divergence): statements not satisfiable together under some boundary condition
  - “patrons shall return borrowed copies within X weeks” vs. “patrons shall keep borrowed copies as long as

# Handling inconsistencies

- Terminology, designation, structure: Build glossary
- Weak, strong conflicts: Negotiation required
  - Cause: different objectives of stakeholders => resolve outside of requirements
  - Cause: quality tradeoffs => explore preferences

Examples?

# Requirements Traceability

- Keep connections between requirements
- What follows from what

# Requirements prioritization

- Cost, time, and other limits
- Dependencies among requirements
- Nice to have

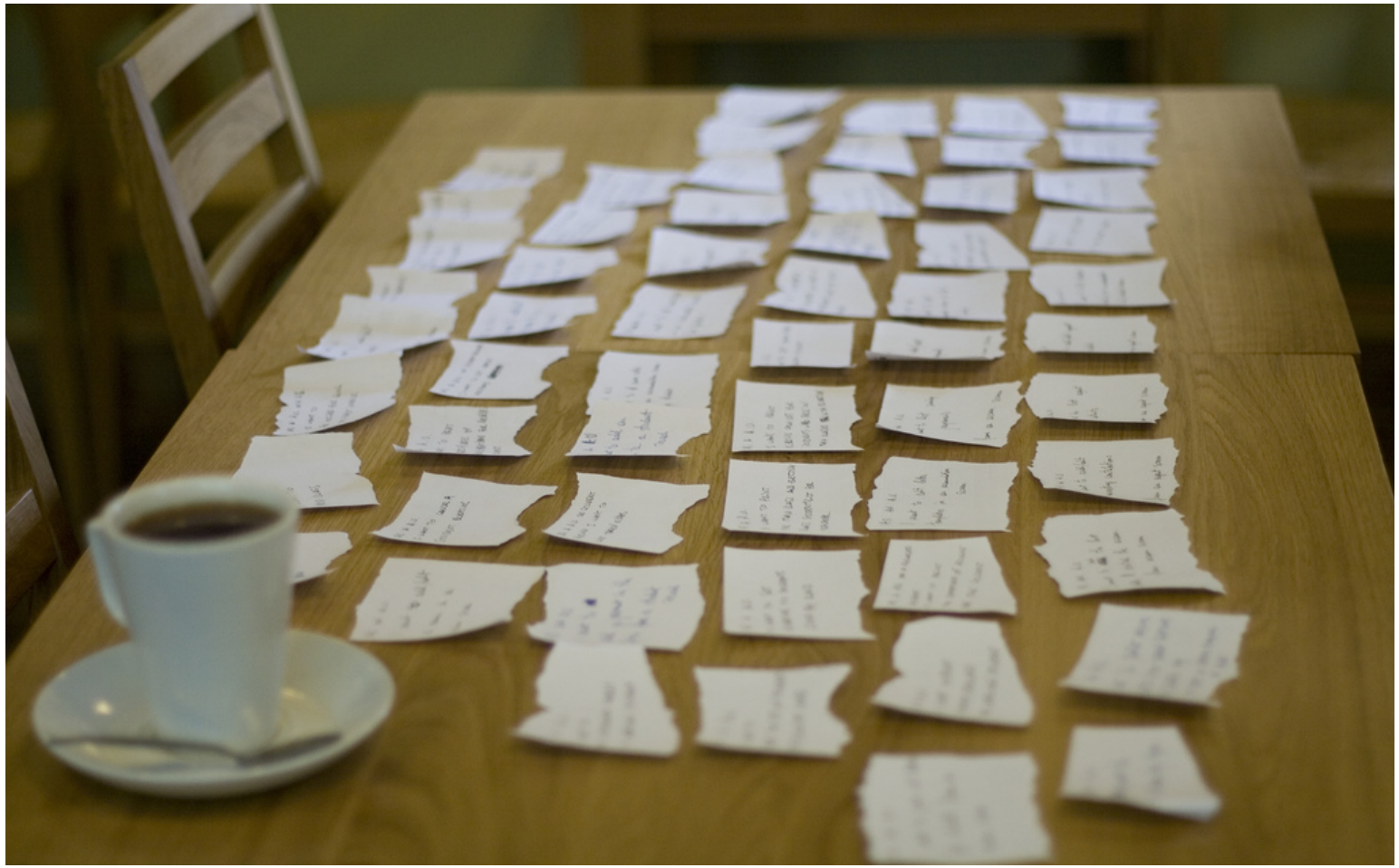
- Strategies to base on value contribution

# Summary

- Many solicitation strategies, including document analysis, interviews, and ethnography
- Do not underestimate the challenge of interviews
- Resolving conflicts
- Using prototypes to enhance discussions and decision making
- Many documentation strategies; our focus is on *user stories*

# User Stories

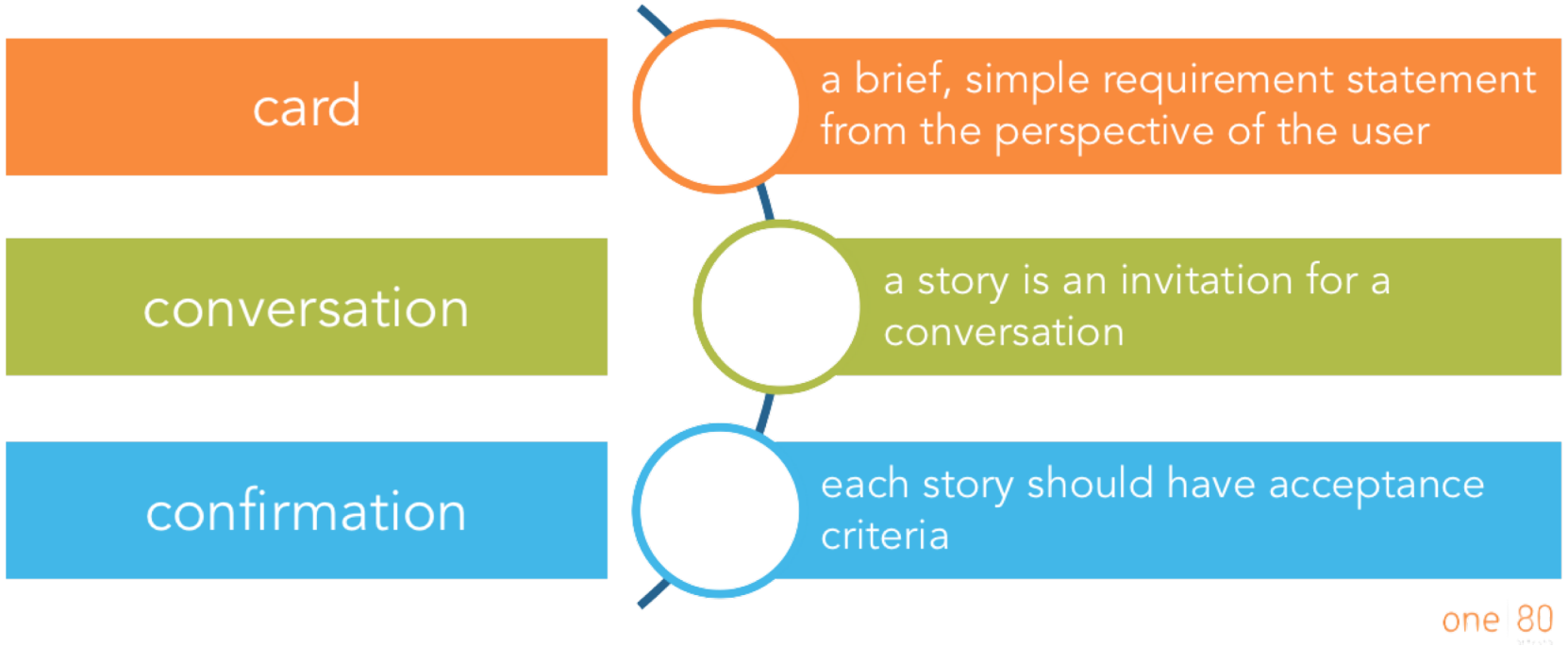
# User Stories





Source: https://www.flickr.com/photos/jakuza/2728096478

# User Stories




Source: http://one80services.com/user-stories/writing-good-user-stories-hint-its-not-about-writing/

# The card

- “As a [role], I want [function], so that [value]”
- Should fit on a 3x5 card

# The conversation

- An open dialog between everyone working on the project and the client

- Split up Epic Stories if needed

# The Confirmation

- A confirmation criteria that will show when the task is completed
- Could be automated or manual

# Exercise




https://www.bird.co/

# How to evaluate user story?

Follow the INVEST guidelines for good user stories!

one 80


Source: http://one80services.com/user-stories/writing-good-user-stories-hint-its-not-about-writing/

# Independent


- Schedule in any order.
- Not overlapping in concept
- Not always possible

# Negotiable


- Details to be negotiated during development
- Good Story captures the essence, not the details

# Valuable


- This story needs to have value to someone (hopefully the customer)
- Especially relevant to splitting up issues

# Estimable


- Helps keep the size small
- Ensure we negotiated correctly
- “Plans are nothing, planning is everything” -Dwight D. Eisenhower

# Small


- Fit on 3x5 card
- At most two person-weeks of work
- Too big == unable to estimate

# Testable


- Ensures understanding of task
- We know when we can mark task “Done”
- Unable to test == do not understand

# Activity

Follow the INVEST guidelines for good user stories!


one 80

# Risk


Tony Webster
@webster
Follow
I appreciate the honesty.
Pick a password
Don't reuse your bank password, we didn't spend a lot on security for this app.
At least 6 characters
your password
Continue
8:20 PM - 15 Sep 2018
5,868 Retweets 15,672 Likes
58
5.9K
16K

# What are risks?

- A **risk** is an uncertain factor that may result in a loss of satisfaction of a corresponding objective

For example…

- System delivers a radiation overdose to patients (Therac-25, Theratron-780)
- Medication administration record (MAR) knockout
- Premier Election Solutions vote-dropping “glitch”

# How to assess the level of risk?

- Risks consist of multiple parts:
  - Likelihood of failure
  - Negative consequences or impact of failure
  - Causal agent and weakness (in advanced models)
- Risk = Likelihood x Impact

# CVSS V2.10 Scoring

The Common Vulnerability Scoring System consists of:

- 6 base metrics (access vector, complexity, confidentiality impact, …)
- 3 temporal metrics (exploitability, remediation, …)
- 5 environmental metrics; all qualitative ratings (collateral damage, …)

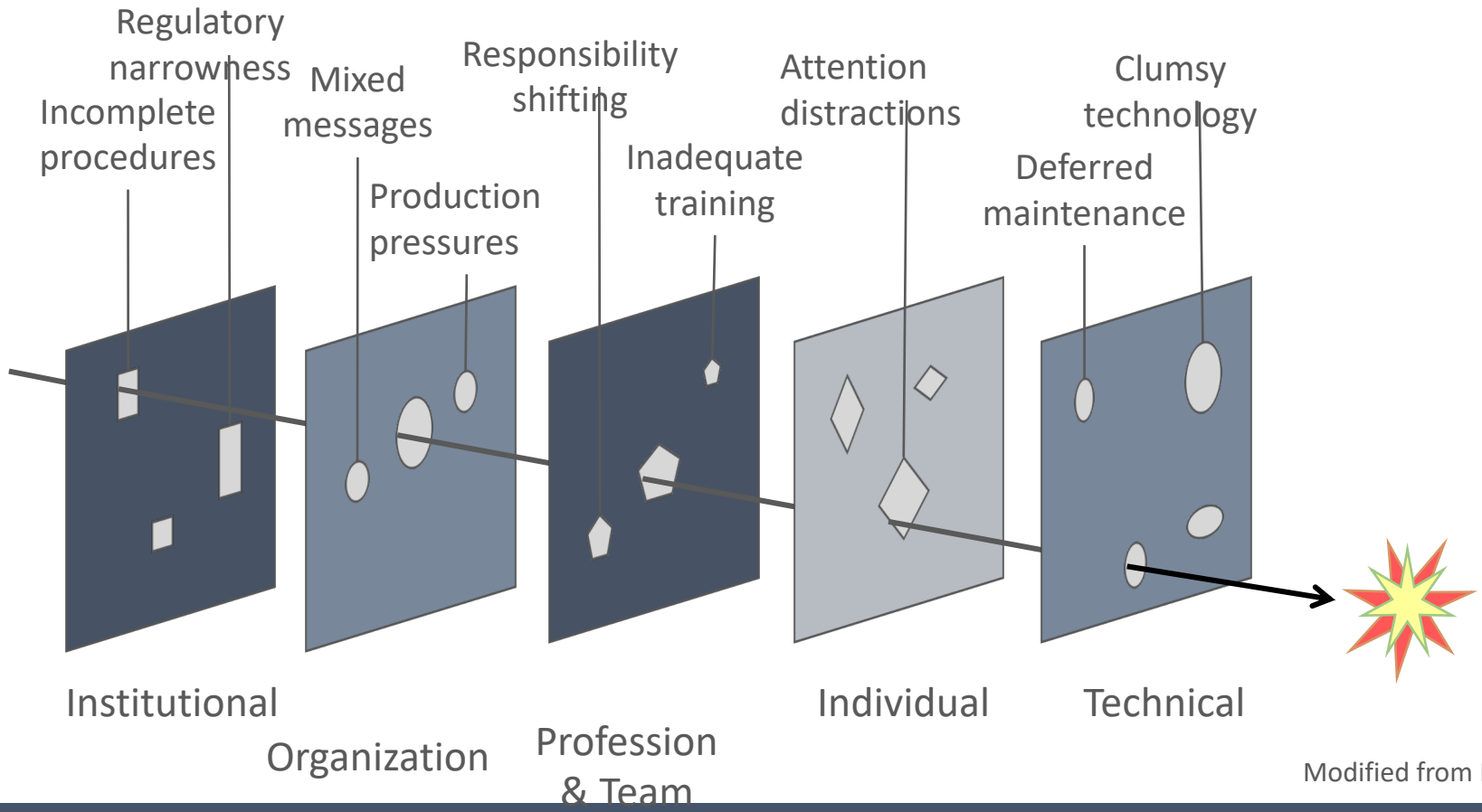
**BaseScore** =
round_to_1_decimal(((0.6*Impact)+(0.4*Exploitability)–1.5)*f(Impact))

**Impact** =
10.41*(1-(1-ConfImpact)*(1-IntegImpact)*(1-AvailImpact))

**Exploitability** =
20* AccessVector*AccessComplexity*Authentication

**f(impact)** = 0 if Impact=0, 1.176 otherwise

# The Swiss cheese model




Modified from Reason, 1999, by R.I. Crook

# Aviation failure impact categories

- **No effect** – failure has no impact on safety, aircraft operation, or crew workload
- **Minor** – failure is noticeable, causing passenger inconvenience or flight plan change
- **Major** – failure is significant, causing passenger discomfort and slight workload increase
- **Hazardous** – high workload, serious or fatal injuries
- **Catastrophic** – loss of critical function to safely fly and land

DO-178b, Software Considerations in Airborne Systems and Equipment Certification, RTCA, 1992

# Risk assessment matrix

- MIL-STD-882E

  https://www.system-safety.org/Documents/MIL-STD-882E.pdf

**TABLE III. Risk assessment matrix**

| RISK ASSESSMENT MATRIX | | | | |
|---|---|---|---|---|
| SEVERITY / PROBABILITY | Catastrophic (1) | Critical (2) | Marginal (3) | Negligible (4) |
| Frequent (A) | High | High | Serious | Medium |
| Probable (B) | High | High | Serious | Medium |
| Occasional (C) | High | Serious | Medium | Low |
| Remote (D) | Serious | Medium | Medium | Low |
| Improbable (E) | Medium | Medium | Medium | Low |
| Eliminated (F) | Eliminated | | | |

# DECIDE Model


**D**etect that the action necessary

**E**stimate the significance of the action

**C**hoose a desirable outcome

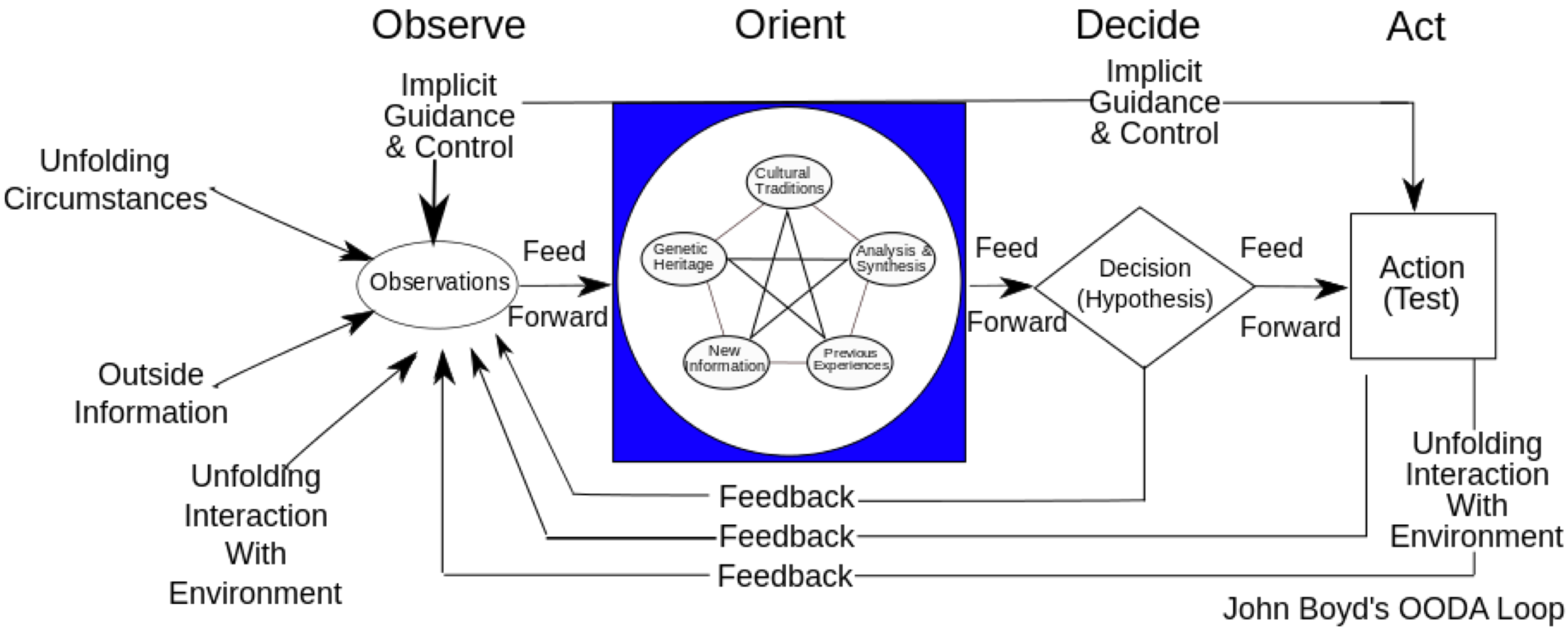
**I**dentify actions needed in order to achieve the chosen option

**D**o the necessary action to achieve change

**E**valuate the effects of the action

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/FAA-H-8083-2.pdf

# OODA Loop



# Bird Risks

# Further Reading

- Larman, Craig. *Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Interative Development*. Pearson, 2012. Chap. 6
- Van Lamsweerde A. Requirements engineering: From system goals to UML models to software. John Wiley & Sons; 2009. Chapter 2-4