Project Management for Scientists

Risk Management

Christoph U. Keller, c.u.keller@uu.nl
Sterrekundig Instituut Utrecht
Utrecht University
www.astro.uu.nl/~keller

Outline

- Project Risks
- Risk Analysis
- Risk Mitigation

Risks in Projects

- *Risk* = Any uncertainty in project
- Not everything will go according to plan
- Risks and their mitigation are part of project plan
- Ask: "What could go wrong on this project?"
- Important even for small projects
- *Risk Management* = systematic, disciplined approach to increase likelihood of project success
- "project management = risk management"

Risk Management

- Be ready for the unexpected
- Can prepare for *known risks*
- Can not prepare for *unknown risks*, but can still realize that they will occur and reserve resources to deal with them (contingency)
- Insurance companies:
  - Risk management is their main business
  - Prepare for uncertain event
  - Reduce uncertainty, impact

Questions to Ask

- Requirements well understood and documented?
- Cost and time estimates detailed or top-down?
- How likely is scope to change?
- Dedicated resources or part-time basis?
- Key resources assigned or being lost to other projects?
- Will deadlines be pushed out?
- Will sponsor and stakeholders be responsive, meet milestones?
- Will there be technical problems?
- Addressed effects of single-point estimates and path convergences?

Scientific Project Risks

- Fuzzy requirements
- Scope creep
- Technical difficulties
- Underestimated budget, resource requirements
- Insufficient funding commitments

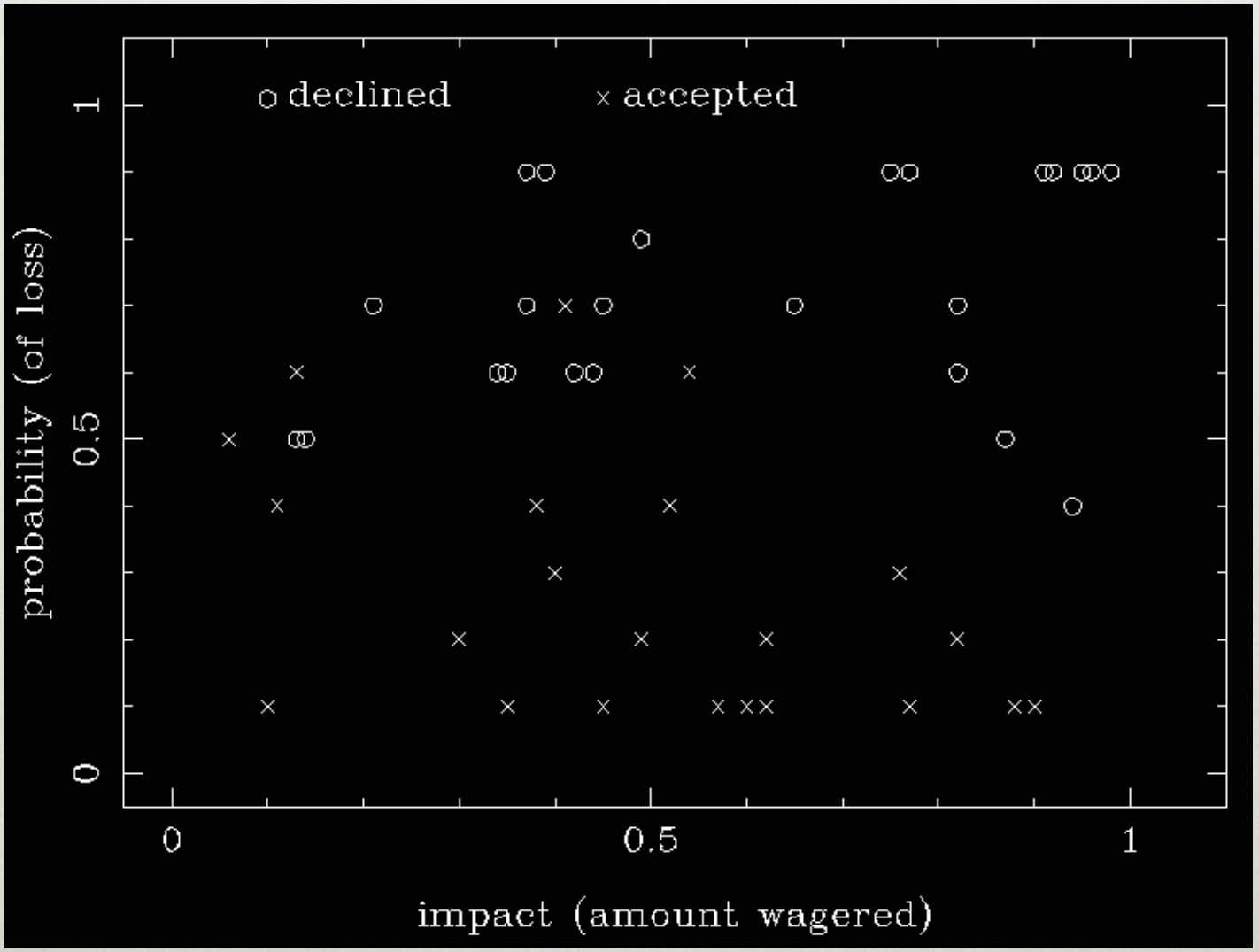
Risk Management Framework

- Risks defined by 3 variables
  - **Event** that disrupts project
  - **Probability** that event will happen
  - **Impact** that event will have on project
- Identify events by asking "what if" questions
- Analyze probability and potential impact of events and prioritize (high, moderate, low risks)
- Mitigate (reduce) high and moderate risk events
- Ignore low risk events

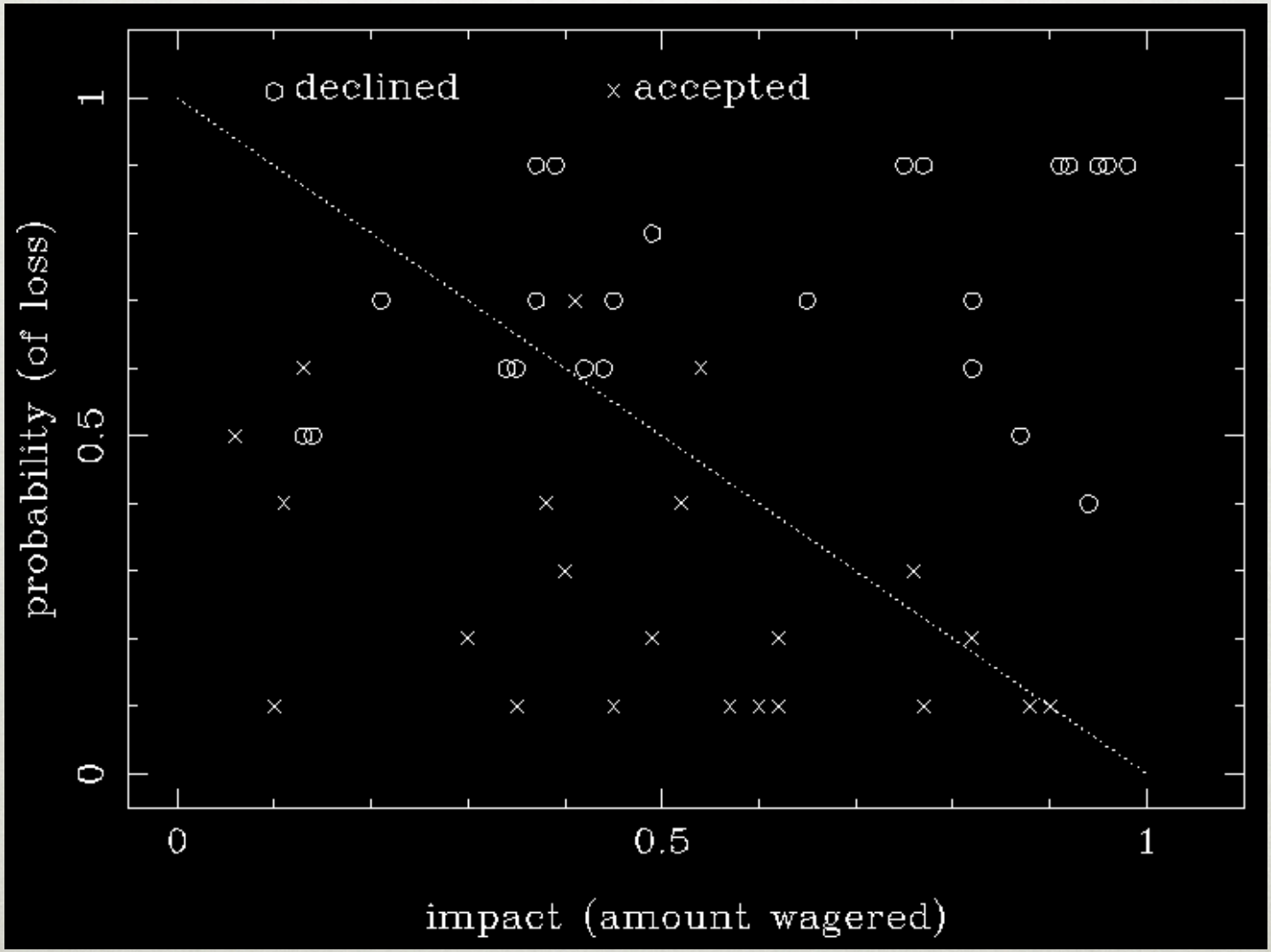
Risk Identification

- Requires skill, experience, knowledge of project management techniques
- Ask stakeholders (brainstorming)
  - no analysis, responses, mitigation etc.
  - Combine similar risks and sort
  - Remove unlikely risks
- Interview individuals with list of questions
- "Anything that can go wrong will go wrong"
- Learn from past, similar projects
- Consider schedule and budget risjs

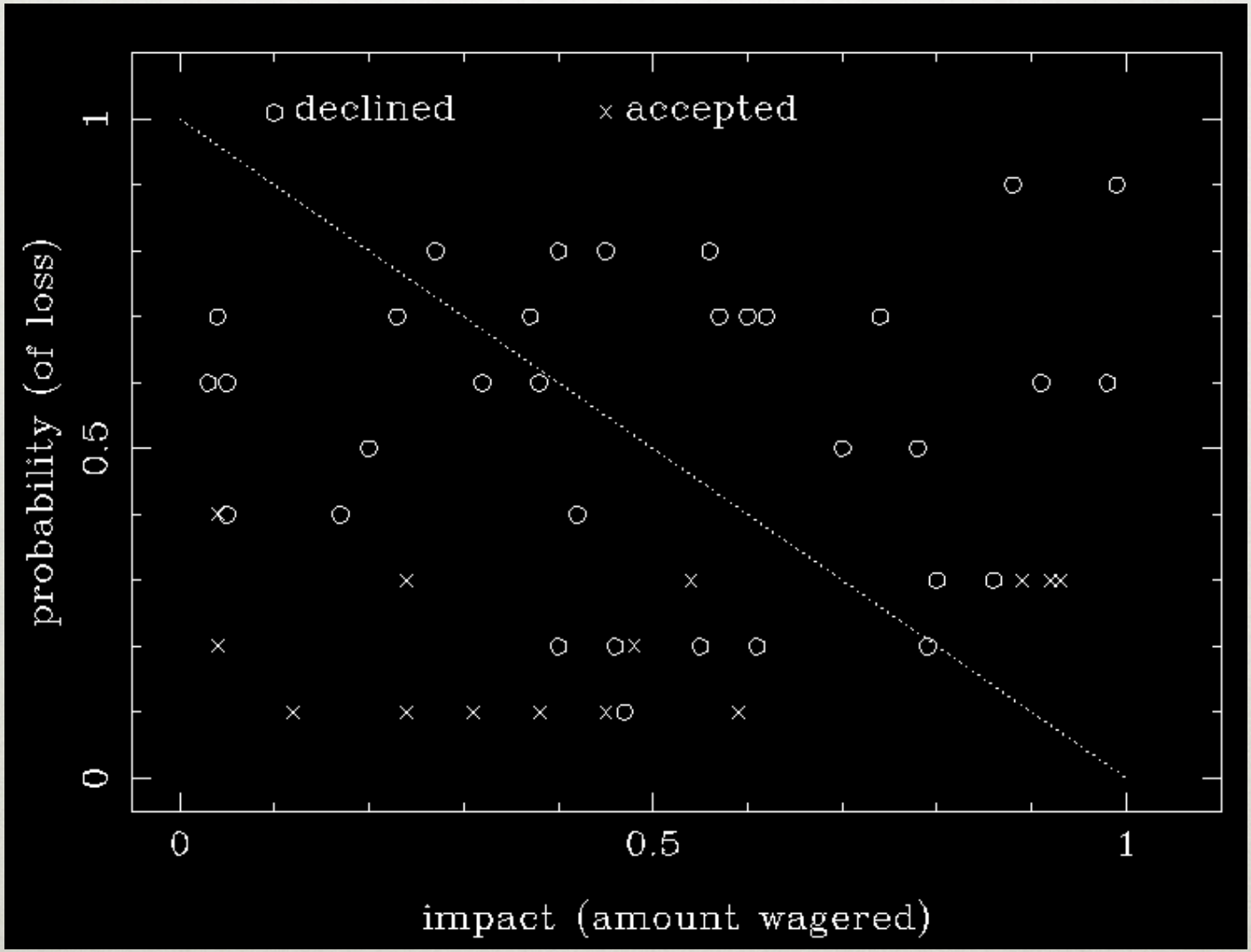
Intuitive Risk Analysis



Intuitive Risk Analysis



Intuitive Risk Analysis

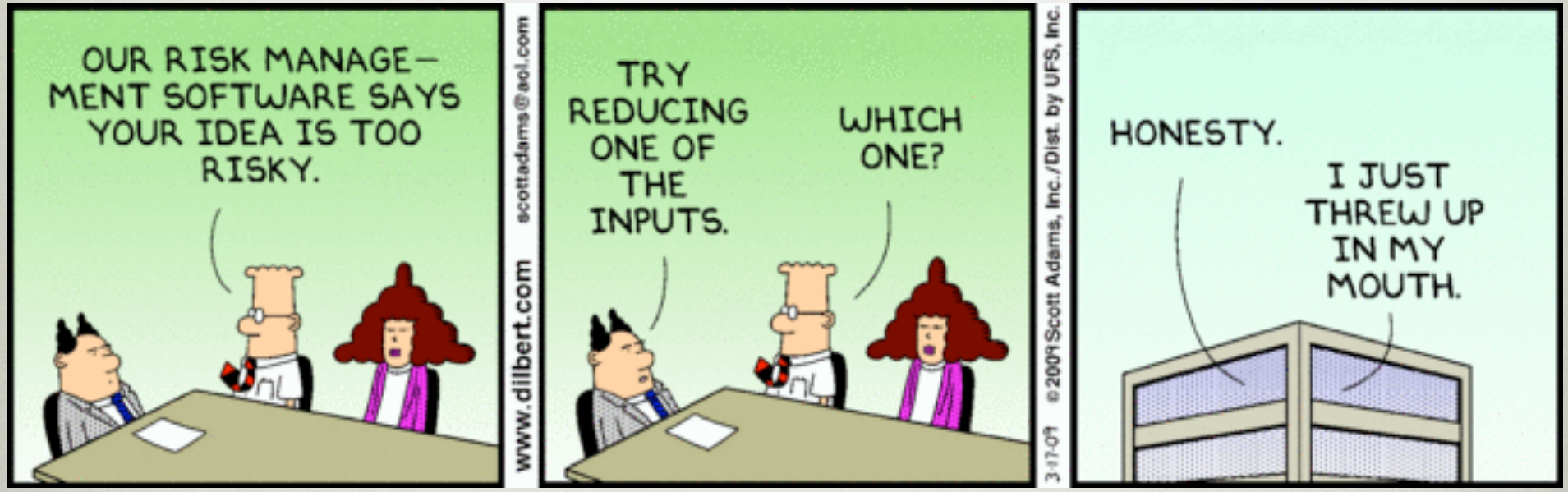


Risk Analysis & Priority

- Identify events by asking "What if?"
- Assign numerical value to probability of occurrence (high = high probability of occurrence)
- Assign numerical value to impact of event on project (high = high cost/schedule/science impact)
- Probability, impact should be assessed by group
- Draw values on 2-D graph, work from top right
- Or multiply the 2 values, work from top down

Risk Analysis Example

risk	likelihood	impact	rank
spectrograph design not working	6	8	**48**
calibration not precise enough	3	10	**30**
influence of temperature variations on FLC	6	5	**30**
pointing too critical	4	7	**28**
degradation of liquid crystal components	8	3	**24**
alignment too critical	3	7	**21**
camera read-out too slow	3	5	**15**
stiffness requirements too critical	3	3	**9**


OUR RISK MANAGE-
MENT SOFTWARE SAYS
YOUR IDEA IS TOO
RISKY.
www.dilbert.com
scottadams@aol.com
TRY
REDUCING
ONE OF
THE
INPUTS.
WHICH
ONE?
3-17-09
©2009 Scott Adams, Inc./Dist. by UFS, Inc.
HONESTY.
I JUST
THREW UP
IN MY
MOUTH.

Dealing with Risks

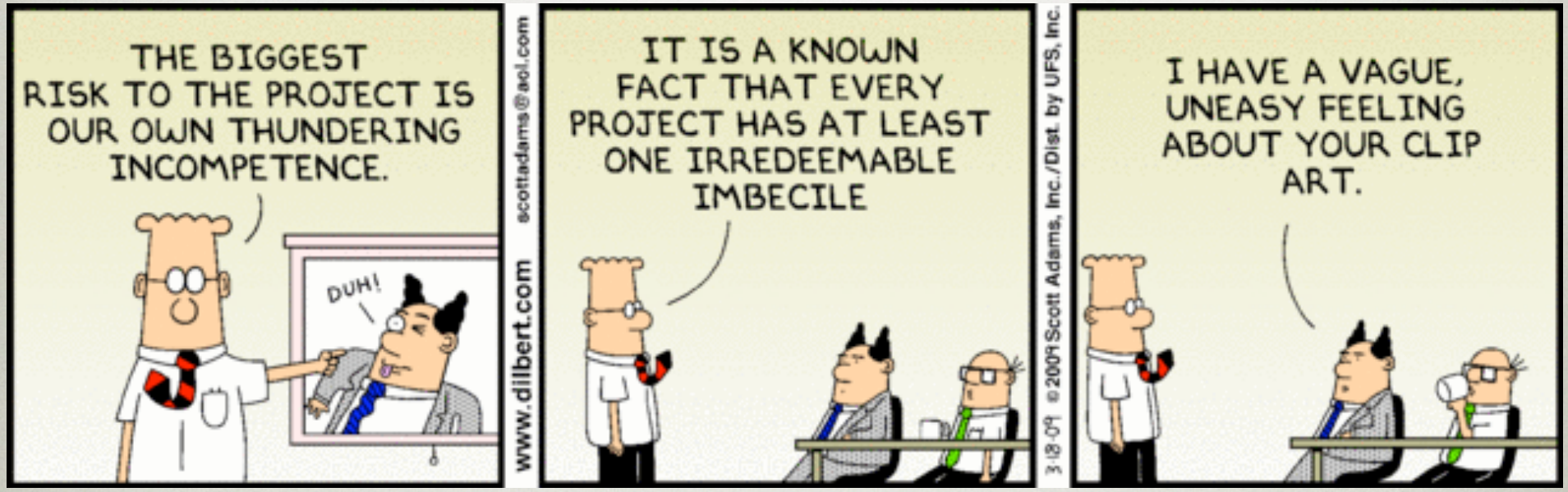
- Avoid: don't do it! (don't get anything)
- Accept: do you feel lucky? (consequences < cure)
- Mitigate: take action to reduce probability and/or impact (plan B, contingency)
- Transfer: have another party share or take over the risk (insurance)
- Continuous risk (reduction) control

Risk Mitigation

- Reduce impact, probability, or both
- No influence on probability:
  - Reduce negative impact
  - Monitor risk (detect in due time, trigger implementation of planned actions)
  - Plan alternative (contingency plan: money set aside,)
- No influence on impact:
  - Reduce probability
  - Phased development
  - Prototyping

Risk Mitigation Example

risk	likeli hood	impact	rank	mitigation
spectrograph design	6	8	**48**	- learn from experts - reduce spectral resolution at edges of spectral range
calibration not precise enough	3	10	**30**	- test on prototype -more manual calibrations
influence of temperature variations on FLC	6	5	**30**	- test on prototype - thermal measurements - thermal isolation - thermal control
pointing too critical	4	7	**28**	- improve hardware/software
degradation of liquid crystal components	8	3	**24**	- regular checks - spare parts
alignment too critical	3	7	**21**	- alignment plan high priority - use tapered fibers - use precision translation stages
camera read-out too slow	3	5	**15**	- accept reduced polarimetric sensitivity
stiffness requirements too critical	3	3	**9**	- move spectrograph to fixed position


THE BIGGEST RISK TO THE PROJECT IS OUR OWN THUNDERING INCOMPETENCE.
DUH!
www.dilbert.com scottadams@aol.com
IT IS A KNOWN FACT THAT EVERY PROJECT HAS AT LEAST ONE IRREDEEMABLE IMBECILE
3-18-09 ©2009 Scott Adams, Inc./Dist. by UFS, Inc.
I HAVE A VAGUE, UNEASY FEELING ABOUT YOUR CLIP ART.