Ten years after and still based on the presentation of Mark Weiser!

Software Engineering for People
Mark Weiser
Chief Technologist
Xerox PARC
1997

[I replaced ‘engineer’ with ‘scientist’, ‘marketeer’ with ‘designer’, ‘engineering’ with ‘technology’, and ‘software engineering’ with ‘design science’; the rest remains mainly the same from Mark’s original presentation!]
Most important thing Mark Weiser learned as an entrepreneur

- ...
- Problems with reaching agreement
- ...

Problem with Agreement: Reality Distortion

- Why is it that designers and scientists rarely understand each other?
- Answer: they have different cultures for communicating importance.
  - Scientists and Designers have anathematic distortion fields.
Reality Distortion varies

• Let 1.0 stand for a perfect match of reality to words
  – “The house appears white on this side.”

Reality Distortion varies

• Scientists/engineers speak at 0.5-0.8
  – generally understated
  – more understated if more important
  – “The house was probably white.”
  – “We wish to suggest a software architecture for the living room in the context of ambient intelligence.”
Reality Distortion varies

- Designers speak at 1.5-2.0
  - more if more important
  - “The house is dazzlingly white inside and out.”
  - “Outstanding product and service quality”

Reality Distortion creates a listening

- Designer speaks at 1.2-2, and discounts everything heard by 0.8-0.5

- Scientist speaks at 0.5-0.8, and boosts everything heard by 1.2-2.0

- Can you see the problem?
Reality Distortion
what are these two people thinking?

It may be ok.  It is a perfect design.

Reality Distortion

Scientist says: This is a pretty good piece of technology.

Designer hears: ???

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Reality Distortion

Scientist says: This is a pretty good piece of technology.

Designer hears: This guy has no confidence, and his technology is pretty bad.

Reality Distortion

Scientist hears: ???

Designer says: This is really really important!
Reality Distortion

Scientist hears:
Either he’s discovered cold fusion, or he’s lying.

Designer says:
This is really really important!

Reality Distortion:
the same thought can lead to different words

It may be ok.

It will solve all our problems.

This embedded system is good enough.

This embedded system is good enough.
Reality Distortion

Let $S_S$ = speaking of scientist, about 0.7
Let $L_S$ = listening of scientist, about 1.4
Let $S_D$ = speaking of designer, about 2.0
Let $L_D$ = listening of designer, about 0.5
Then $L_S(S_S(x)) = x$, and $L_D(S_D(x)) = x$

But $L_D(S_S(x)) = 0.3x$, and $L_S(S_D(x)) = 2.8x$

What to do about Reality Distortion?

• Do you want to be understood?
  – speak into the culture of your listener
  – notice how you are heard
• Do you want to be understand?
  – apply the appropriate distortion field
  – ask questions to tune your distortion ratio
• Don’t ever expect 1.0
Problems of agreement in Design Science (DS)

• There are many kinds of reality distortion
  – seeming to agree but not really understanding

• What do we agree about in DS?
  – What are the foundations of our work?
    • Questioning their truth is almost unheard of.
    • We almost all are familiar with and use them.
  – What should all practitioners know?
    • Beyond technical skill in particular languages and systems

On What Do We Agree: Some of Mark’s Answers

• High level design languages, if appropriate, improve all aspects of a project except possibly running time.
• Dividing systems into modules improves implementation time and maintainability
• Documentation helps
• Adding people to a late project makes it later
Forces against agreement

• Benefits to disagreeing
• Absence of pressure for agreement
• Benefits, when present, come slowly

How can we understand DS better?
(in industry and academia)

• More reflective practitioners
• More social science attention to technology and engineering processes
Skill is not enough

- Knowledge of technology are crucial enablers ...
- But not always necessary nor sufficient
  - not necessary for many utilitarian and policy understandings
  - not sufficient for productive engineering
- Other community skills are required
  - students implicitly learn values, language, and culture whether we like it or not

Learning is always joining a community

- Learning is not poured from faculty to student brains
  - especially not without a strong community in place
- All learning is within and about a community
  - Lave and Wenger, 1991
Humanities

- “The goal is of computer science to make [computers] more useful and useable.”
  - Rick Weingarten, testifying to Congress, May 1996

- For people
- What are people like? This is the subject of humanities and social sciences
- Example: “The Tacit Dimension”

The Tacit Dimension
from philosopher Polanyi’s book by same name

- Imagine strapping toilet tubes to your eyes and walking around for two hours
  - lots of surprises
The periphery informs and creates the center

- The periphery is the “tacit” dimension to thinking and understanding
- Technology tends to deliver information to the center, and strips off the periphery
  - causing flame-wars in email…
- The tacit is easy to forget…but without it nothing gets done

The Flow State and the Tacit Dimension

- If you work uninterruptedly on a sufficiently interesting problem:
  - you forget where you are
  - time passes quickly
  - your unconscious (tacit) mind rallies to make you smart
Academics are members of a foreign community

- They have not coded much, nor as a team
- They don’t deeply know aesthetics or design
- Humanities (or customers) are not their life
- They hang out a lot with computer scientists and grad students

Curriculum

- History of Technological Change
  *Electrifying America; Natural Monopoly and Universal Service; History of Technology Failures*

- History of the Modern Age
  *Cosmopolis; A Social History of Truth; The Pencil*

- Common Sense
  *The Tacit Dimension; The Psychology of Everyday Things; Elements of Style; Computer Projects That Failed; Mythical Man-Month*
Agree to Agree

• Teach your graduate students, and your employees, to measure, and reflect, on themselves and others.
• Come to agreement on ethics, people, and tools
  – Tentative agreement is more important than being right!
  – When you know more, then disagree.