Syncing with Technology: What are our new engineers being taught?

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Why this talk

- I consult with organizations that hire new graduates
- These graduates come with different degrees
  - Engineering (usually electrical)
  - Computer Science
  - Computer and Information Systems
  - Information Technology

- Much of this this talk comes from feedback from our Advisory Board and also from interviewing corporations that have had recent hires

Skills for large-scale development

- Team Dynamics
- Software Processes and basic programming skills
- Software Lifecycles
  - Traditional
  - Agile
- Requirements Engineering
- Software Design

Let's start with the basics

- Most graduates have a "working" knowledge of (AT MOST) two languages
  - For a loose definition of "working"
- This assumes that they come from the CS/CIS/IT side of the house
- Many Engineers know only one language

Let's start with the basics

- Typical choices
  - Java (usually on Windows)
  - C++ (mostly on Windows)
  - Visual Basic (which means Windows only)
- Problem – most colleges and universities have fallen in love with Object-Oriented languages
- Outcome – the students know classes and methods, but have problem with basic programming skills

Language Issues

- Students have learned to rely upon rich class-libraries with exotic methods for everything
- They can't perform tasks such as parsing arrays, working with multi-dimensional arrays, sorting, or searching
- Many are unable to declare and use pointers

Language Problems

- It takes months to become useful in new languages, and may require years to become proficient in writing code
- Unable to contribute effectively on legacy code
- Unable to do maintenance!!!

To combat this problem

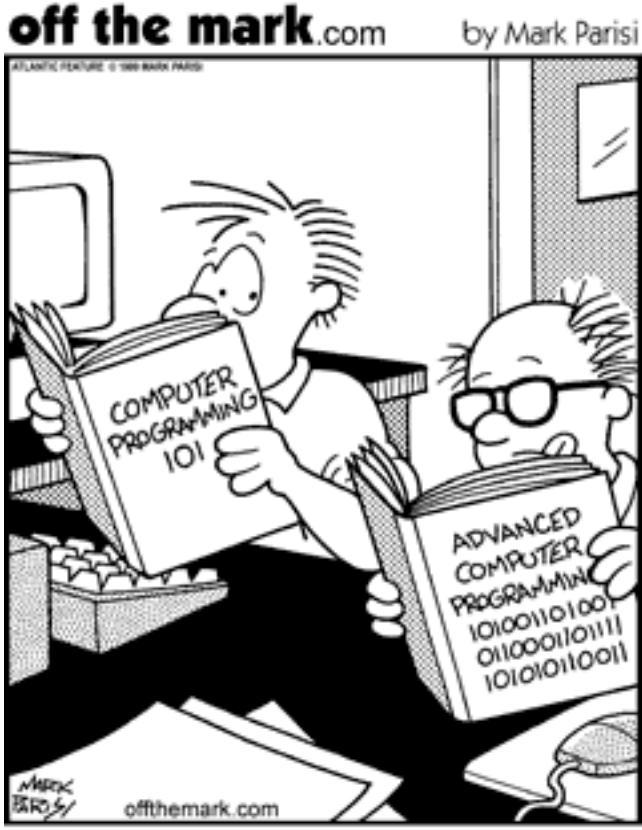
- Be wary of new hires who claim to be experienced in multiple languages
- Plan on giving them time to learn features of languages
- Give then a mentor, and consider formal language training (in-house)
- Be very afraid of self-taught self-proclaimed experts. Teach new hires to share code and skills, and learn from others

Software Processes

- Most new hires are unfamiliar with basic debugging and testing techniques
- They do not even know enough to know they need help
- Consider workshops to teach these important skills

Software Processes

- Most new hires are used to code that is run once, then discarded.
- "Student code" mentality – little documentation, little design and planning. They don't understand coding for maintenance!
- It requires a different mindset to effectively write code that runs 24/7, and will be around for years and years.



They have few team skills

- Unable to design or code well in a team
  - Not used to being “cog” when all they can see is a wheel
- Unused to testing/debugging/reading other developers’ code
- Solution – force team skills upon them. During hiring interviews, evaluate them as potential team members

Because they lack software engineering skills …

- They are unfamiliar with planning
- Most are unaware of the “time sink” of meetings
- They are more deadline driven (and tend to overestimate their ability to slam code out at the last minute)

This is not as bad as you think!

- Shift from milestones to “inch-pebbles”
- Shift them to Agile methodologies, where short-term deadlines are more appropriate
- Agile methods force new hires into planning and team interaction

Requirements

- DO NOT expect new hires to be able to gather or organize requirements
- They are used to having assignments handed out to them
- They often learn well from “focused failure” – in a non-threatening manner

Lack of formal software processes..

- Often leads to code-focused mentality
- Few know how to manage complexity, cohesiveness and coupling
- Only a few are used to anything other than simple module design (which is mostly useless, anyway)

To combat this..

- Introduce them to
  - Architectural Design
  - Interface Design
  - Data Design (although this is an area that some are VERY good at!)

Why it's not as bad as you think!

- Note that "Law Schools" are not "lawyer schools" – they teach the "theory of the law", not how to be an attorney.
- Medical Schools make graduates an "M.D.", but still require 4 years of internship to become a "Practicing Doctor".
- Hire for the "near future" if you use new hires. If you need immediate skills, be prepared to hire more experienced (and more expensive) developers.

What you can do!

- Assume that new developers straight out of college will need some time to become both technically and interpersonally proficient.

- Take steps to meet their needs on both of these topics

Technical skills

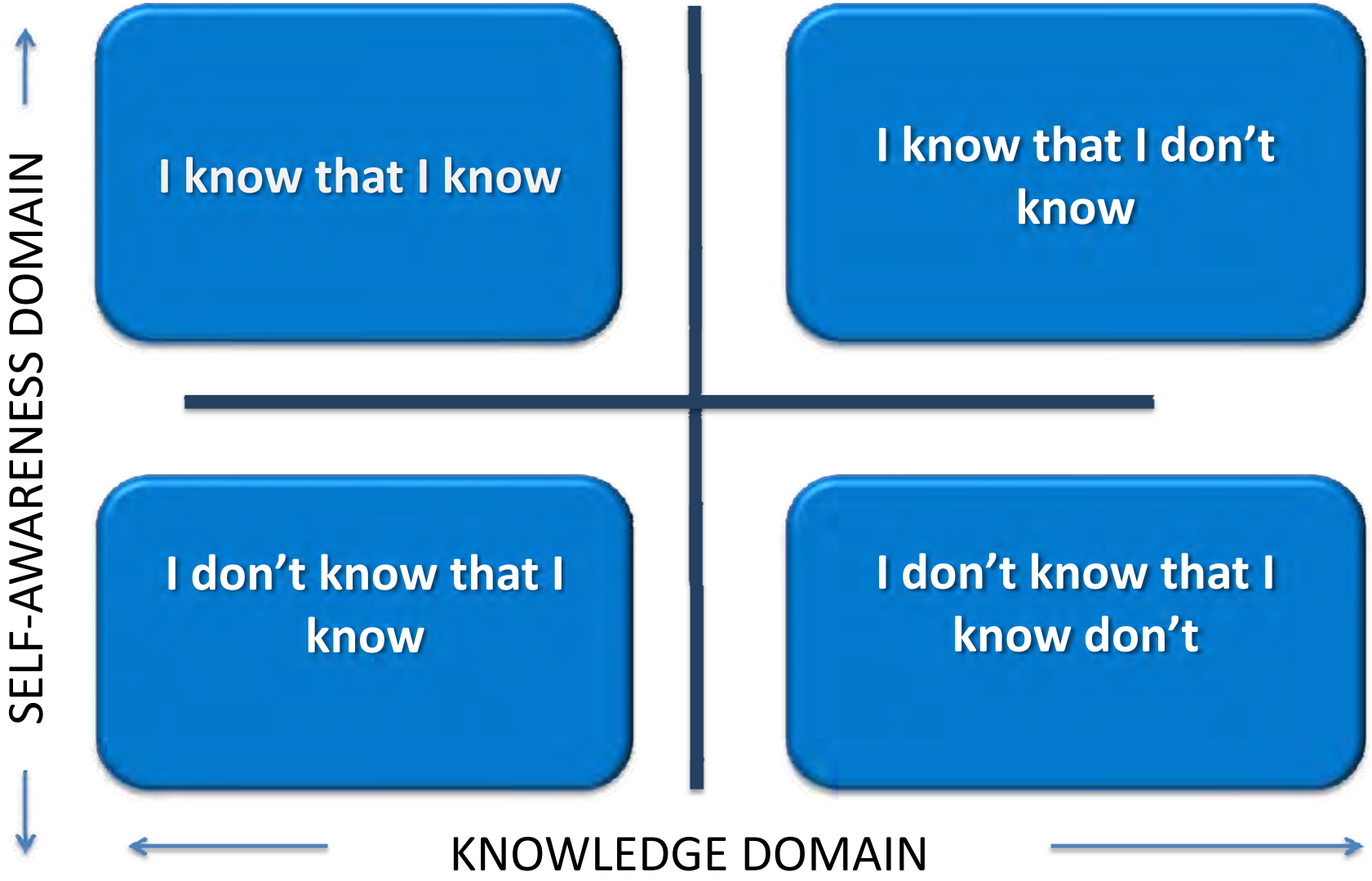
- Assume that pride (and insecurity) will keep new developers from asking for help.
- Classes or workshops should not be limited to those who request them – they should be presented as “skill enhancers” that all “keep new developers sharp”.
- New hires are often timid about asking for training.

Two “must haves”

- A mentor program that is separate from the supervisory chain
  - The mentor should not even work for the same supervisor
- A peer review program that is not optional
  - Education/Training
  - Knowledge
  - Skill Enhancement
  - Sharing of ideas

Why required skill classes?

- It's the old "If all you have is a hammer – all problems look like nails" problem
- Many new graduates do not know what they don't know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I know that I don't know
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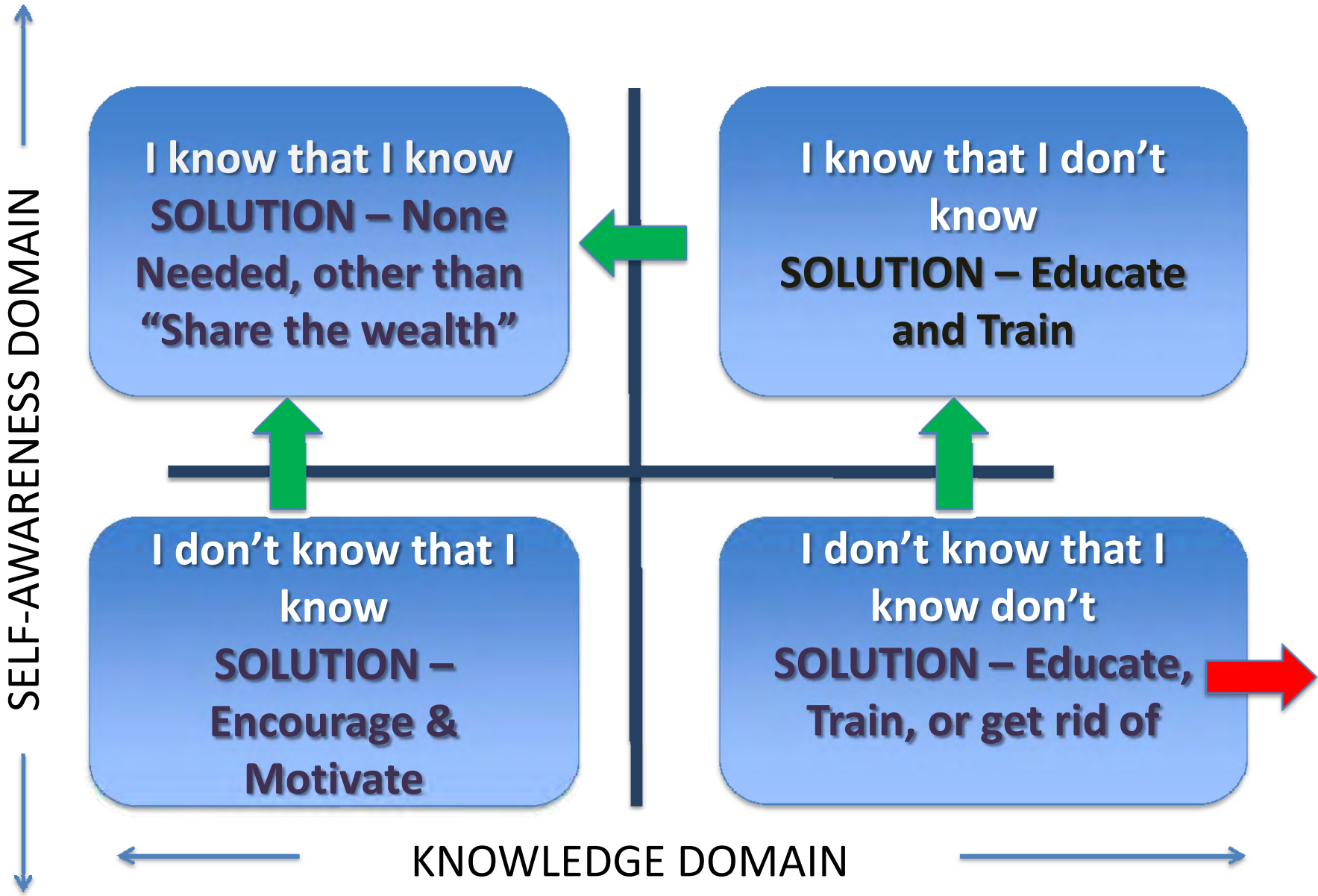
SELF-AWARENESS DOMAIN
KNOWLEDGE DOMAIN


I know that I know
SOLUTION – None Needed, other than "Share the wealth"
I know that I don't know
SOLUTION – Educate and Train
I don't know that I know
SOLUTION – Encourage & Motivate
I don't know that I know don't
SOLUTION – Educate, Train, or get rid of
SELF-AWARENESS DOMAIN
KNOWLEDGE DOMAIN

Combat the “newness” with

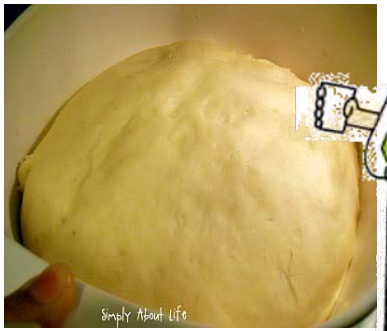
- Mentors
- Constructive and non-supervisory feedback
- Opportunities to work with diverse group of developers
- Constructive teamwork – with engineers who can effectively mentor, train, teach, and share, NOT just give busywork!

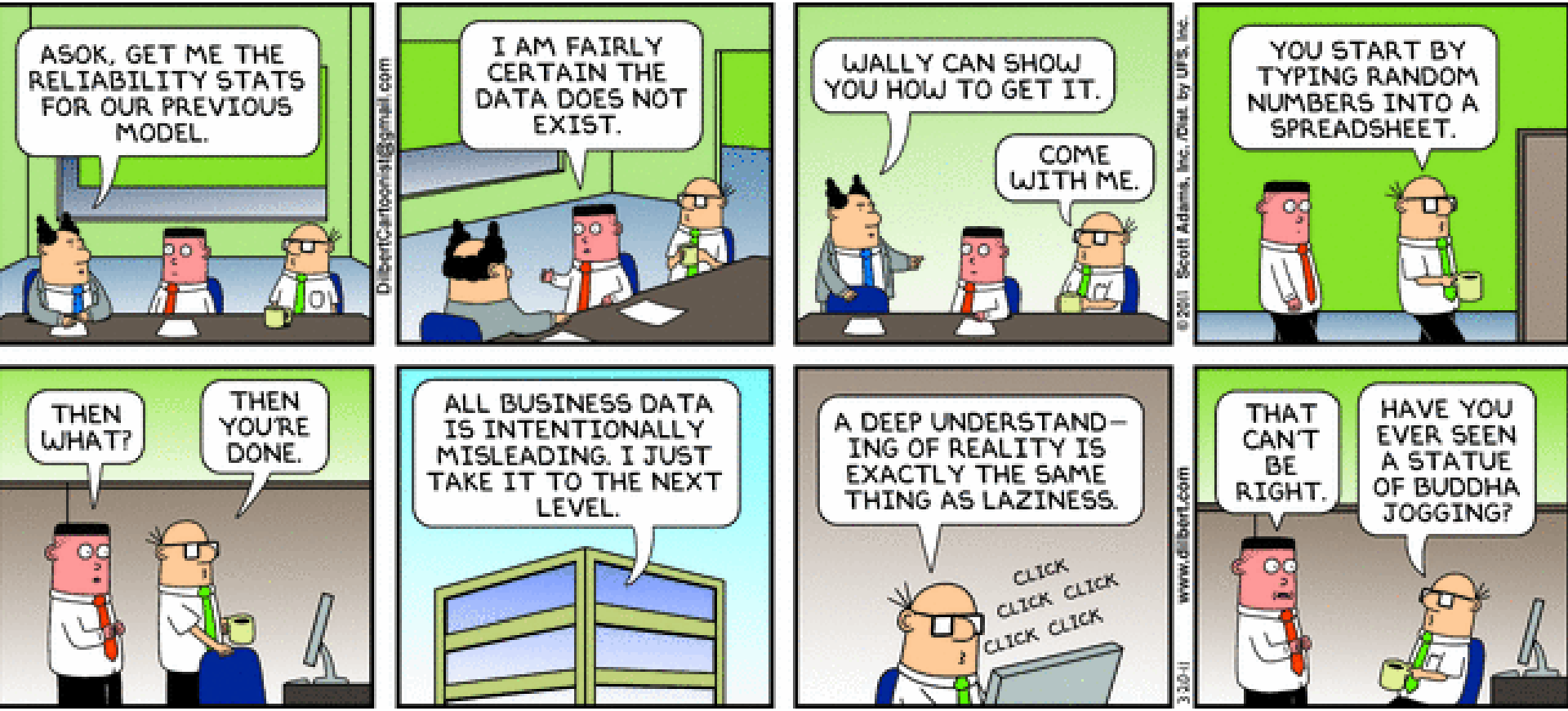
Also….

- Remember to leverage the skills of the new hires. Most have a new skill that older, more "experienced" developers might not have. It can be a two-way street.

Final thoughts

- Think of new hires as “raw dough”. All of the ingredients are already incorporated. All it needs is a warm, supportive environment.
- If there is not enough “heat”, it stays dough. On the other hand, if there is too much “heat”, it rises too quickly and you get poor results




ASOK, GET ME THE RELIABILITY STATS FOR OUR PREVIOUS MODEL.
I AM FAIRLY CERTAIN THE DATA DOES NOT EXIST.
WALLY CAN SHOW YOU HOW TO GET IT.
COME WITH ME.
YOU START BY TYPING RANDOM NUMBERS INTO A SPREADSHEET.
THEN WHAT?
THEN YOU'RE DONE.
ALL BUSINESS DATA IS INTENTIONALLY MISLEADING. I JUST TAKE IT TO THE NEXT LEVEL.
A DEEP UNDERSTAND-ING OF REALITY IS EXACTLY THE SAME THING AS LAZINESS.
CLICK CLICK CLICK CLICK CLICK
THAT CAN'T BE RIGHT.
HAVE YOU EVER SEEN A STATUE OF BUDDHA JOGGING?
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Questions or comments??

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Note: Please consider this talk the conclusion of a presentation I did last year, “What your developers don’t know”. Email me for a .pdf if you would like a copy