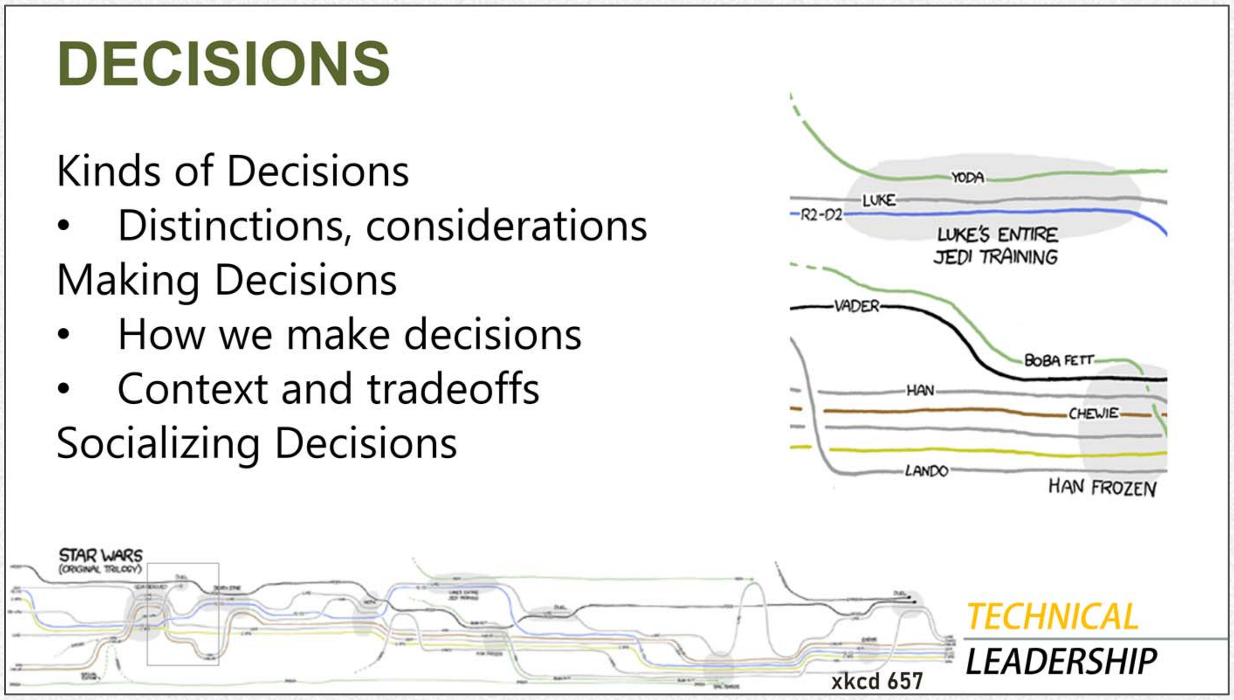
TECHNICAL LEADERSHIP MASTERCLASS

by:
Ruth Malan
Bredemeyer Consulting

September 14, 2021

Helping teams succeed

Decisions



DECISIONS

Kinds of Decisions
- Distinctions, considerations

Making Decisions
- How we make decisions
- Context and tradeoffs

Socializing Decisions

YODA
LUKE
R2-D2
LUKE'S ENTIRE JEDI TRAINING
VADER
BOBA FETT
HAN
CHEWIE
LANDO
HAN FROZEN
STAR WARS (ORIGINAL TRILOGY)
xkcd 657
TECHNICAL LEADERSHIP

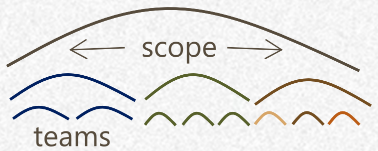
Decisions Across Boundaries

Recall: Leadership plays a role when we're trying to do something bigger than what we can accomplish alone.

We can't have everyone making every decision; it's not feasible or practical or desirable. And, typically, we value moving decision making to those who have necessary perspective and insight into options and impact. This also means that some decisions — those that need perspective across boundaries — need to be made at broader scope.

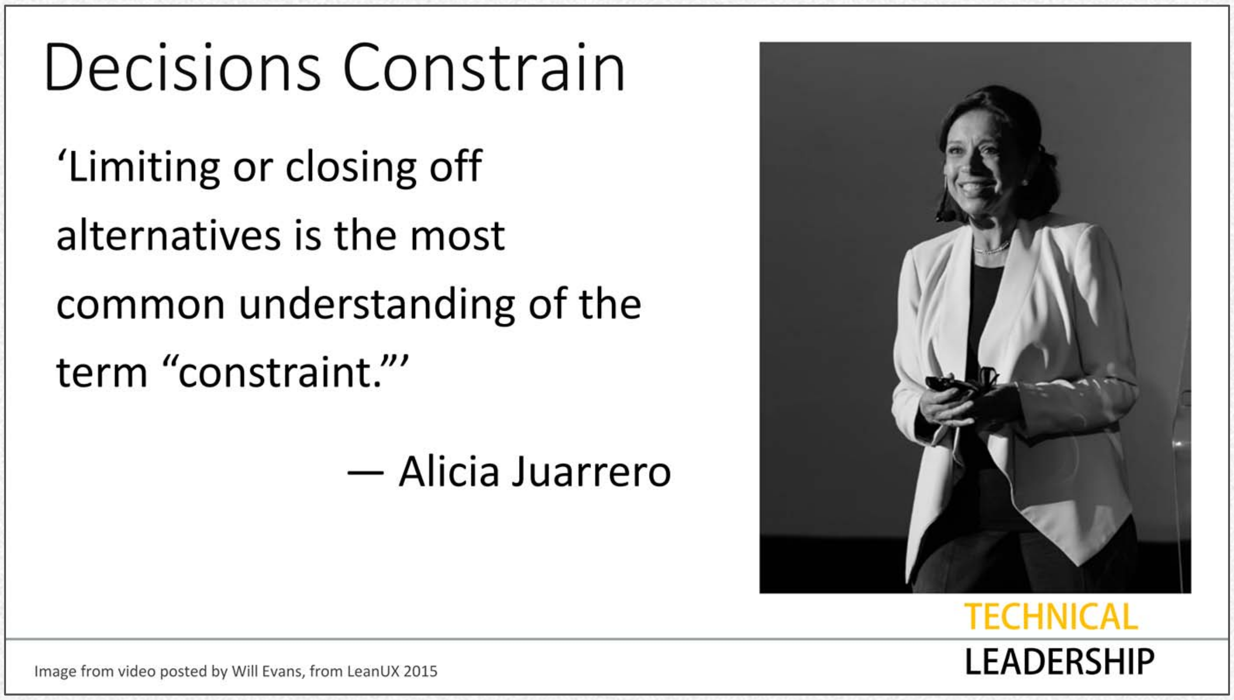
As scope of decision impact increases, what is riding on them is all the more critical.

The demands on expertise and experience, increase with impact. Further, as the scope or span of impact increases (that is, the decision has impact across team and other organizational or system boundaries), so too do the organizational challenges. Decisions with organizational (strategy, team, etc.) impact, need to be made with wisdom (understand impact of choices), strategic acuity, and keen organizational sensibility. Those with technical impact, require technical wisdom.



Leaders make decisions that set context for further decisions. They enable something strategic, but also constrain and shape — but only as essential to system outcomes. And decisions that cross contexts or boundaries, need leadership — to help others understand the need and outcomes, and consequences, and what their role is in making the decision effective. Leaders communicate strategic intent and decisions, and foster organizational will and goodwill, to facilitate work towards coherent strategic outcomes.

We need to make decisions.



Decisions Constrain

'Limiting or closing off alternatives is the most common understanding of the term "constraint."'

— Alicia Juarrero

TECHNICAL LEADERSHIP

Image from video posted by Will Evans, from LeanUX 2015

Constraints are limitations we need to be aware of. They restrict choices open to us.

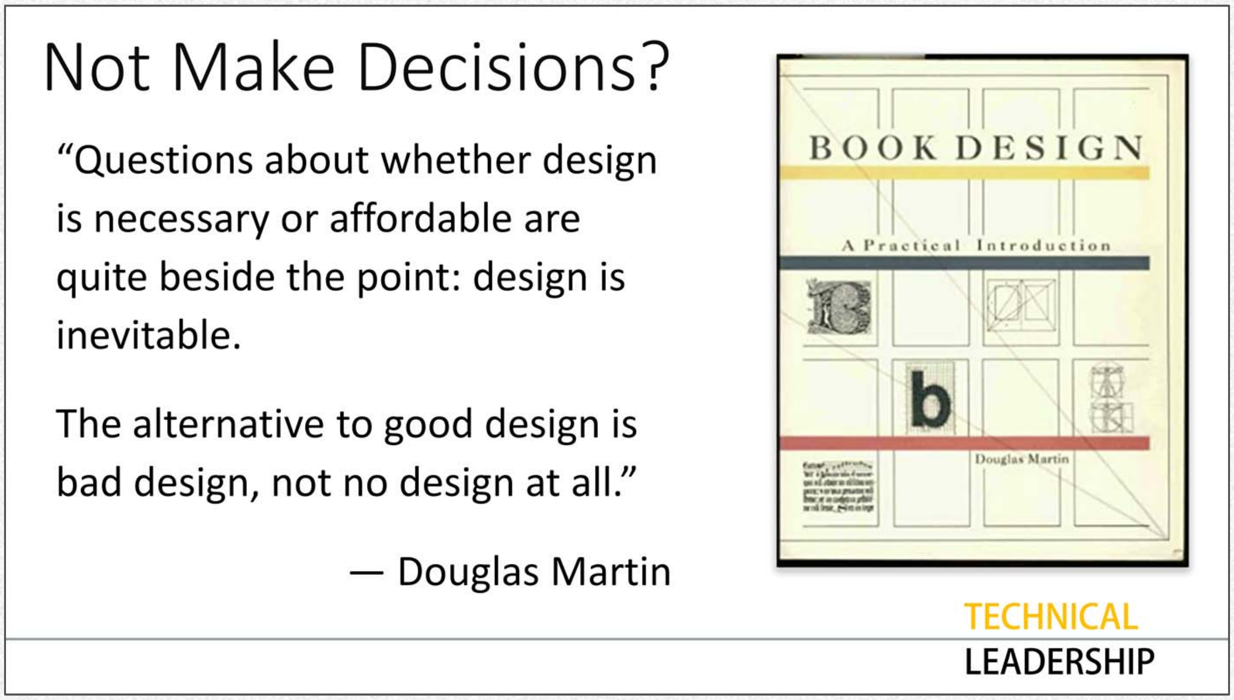
Decisions Reduce the Options Space

Decisions constrain—they eliminate options. Alicia Juarrero observes that this is what we commonly mean by constraint—this limiting or closing off of alternatives; this altering of the probability distribution of available alternatives. But! In so doing, Alicia notes, they make the system "diverge from chance, from randomness."

Illustration of Constraints that Limit

"The connection of the tibia and the peronei to the knee joint constrains the movement of the lower leg in such a way that it makes no sense to examine the tibia's physiology, for example, independently of the knee. The tibia's connection to the knee gives the former characteristics which it wouldn't have otherwise: it can move in some ways but not others. The constraints which the connections subject the lower leg to reduce the number of ways in which the leg can move: it can bend backwards but not forwards, for example. In this example a constraint is a reduction of the leg's state space. This is the most common understanding of the term "constraint" . "

— Alicia Juarrero, "Causality as Constraint"



Not Make Decisions?

"Questions about whether design is necessary or affordable are quite beside the point: design is inevitable.

The alternative to good design is bad design, not no design at all."

— Douglas Martin

BOOK DESIGN
A Practical Introduction
Douglas Martin
TECHNICAL
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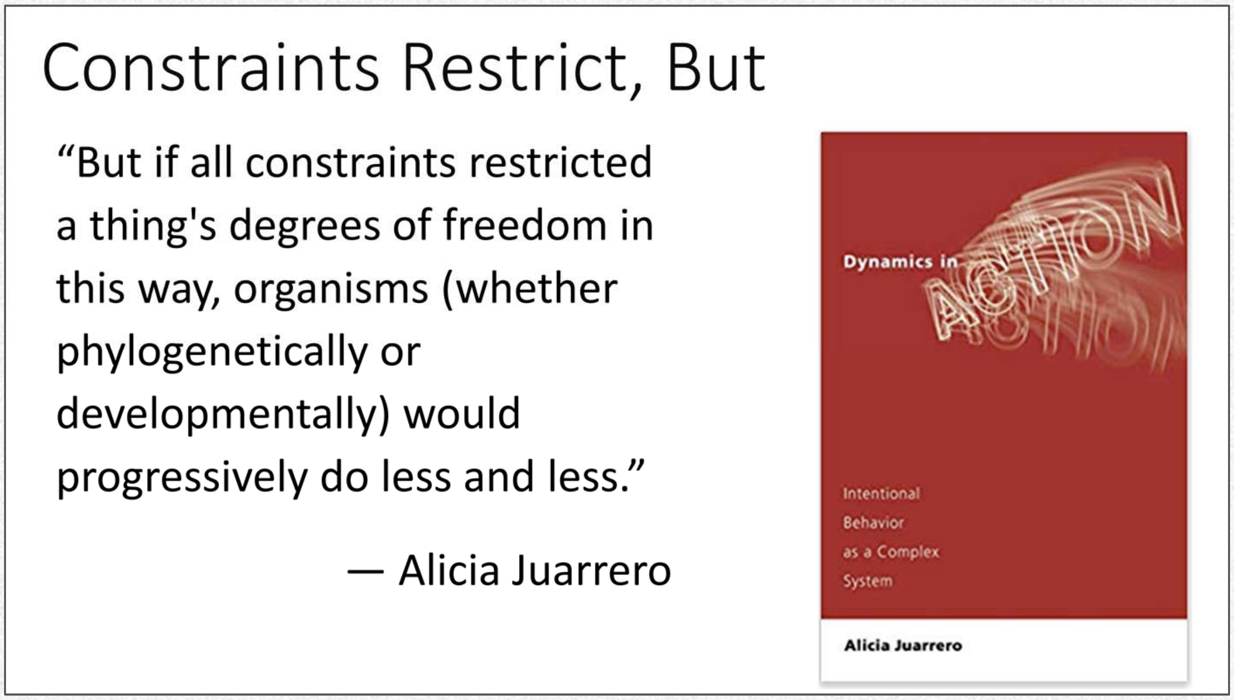
Decisions will be made -- Implicitly or Explicitly; Intentionally or Accidentally,

The question is not "do we have a strategy?" or "does the organization, product or system have an architecture?" What we have is more or less intentional, more or less emergent, and more or less accidental. If we're not making big decisions (intentionally), we're allowing a myriad small decisions, some implicit and not reflectively weighed and checked, to add up, to determine strategy or architecture. So the question is not do we have a strategy or design. But rather "how good is it?" Can it be better? How so?

For example, if we want agility, we need to design and guide evolution for agility, for change and for responsiveness. We need to do this for the organization (teams, organizational and team dynamics, ..) and for the systems (architecture and design) and for the development, deployment and operations environment.

"Every software-intensive system has an architecture. In some cases that architecture is intentional, while in others it is accidental. Most of the time it is both"
— Grady Booch



Constraints Restrict, But

"But if all constraints restricted a thing's degrees of freedom in this way, organisms (whether phylogenetically or developmentally) would progressively do less and less."

— Alicia Juarrero

Dynamics in ACTION
Intentional Behavior as a Complex System
Alicia Juarrero

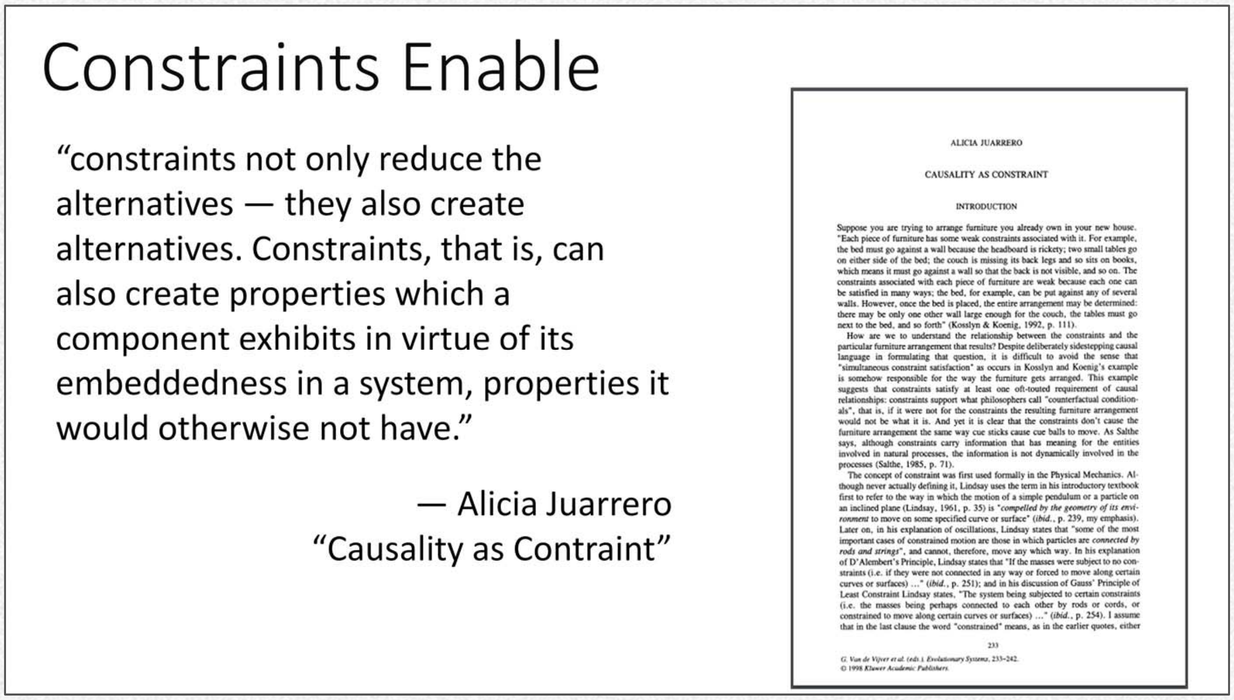
While True, ...

Constraints close off avenues, restrict the degrees of freedom, but if this was all they did, systems, including organisms, would just do less and less, as they became more constrained (Alicia Juarrero).

"Think of constraints not just as a restrictions, but as changes in probability of what's going on, changes in the likelihood of something"
— Alicia Juarrero

Recommended video: Constraints that Enable Innovation - Alicia Juarrero
https://vimeo.com/128934608

Decisions enable



Constraints Enable

"constraints not only reduce the alternatives — they also create alternatives. Constraints, that is, can also create properties which a component exhibits in virtue of its embeddedness in a system, properties it would otherwise not have."

— Alicia Juarrero
"Causality as Contraint"

ALICIA JUARRERO

CAUSALITY AS CONSTRAINT

INTRODUCTION

Suppose you are trying to arrange furniture you already own in your new house. "Each piece of furniture has some weak constraints associated with it. For example, the bed must go against a wall because the headboard is rickety; two small tables go on either side of the bed; the couch is missing its back legs and so sits on books, which means it must go against a wall so that the back is not visible, and so on. The constraints associated with each piece of furniture are weak because each one can be satisfied in many ways; the bed, for example, can be put against any of several walls. However, once the bed is placed, the entire arrangement may be determined: there may be only one other wall large enough for the couch, the tables must go next to the bed, and so forth" (Kosslyn & Koenig, 1992, p. 111).

How are we to understand the relationship between the constraints and the particular furniture arrangement that results? Despite deliberately sidestepping causal language in formulating that question, it is difficult to avoid the sense that "simultaneous constraint satisfaction" as occurs in Kosslyn and Koenig's example is somehow responsible for the way the furniture gets arranged. This example suggests that constraints satisfy at least one oft-touted requirement of causal relationships: constraints support what philosophers call "counterfactual conditionals", that is, if it were not for the constraints the resulting furniture arrangement would not be what it is. And yet it is clear that the constraints don't cause the furniture arrangement the same way cue sticks cause cue balls to move. As Salthe says, although constraints carry information that has meaning for the entities involved in natural processes, the information is not dynamically involved in the processes (Salthe, 1985, p. 71).

The concept of constraint was first used formally in the Physical Mechanics. Although never actually defining it, Lindsay uses the term in his introductory textbook first to refer to the way in which the motion of a simple pendulum or a particle on an inclined plane (Lindsay, 1961, p. 35) is "*compelled by the geometry of its environment* to move on some specified curve or surface" (*ibid.*, p. 239, my emphasis). Later on, in his explanation of oscillations, Lindsay states that "some of the most important cases of constrained motion are those in which particles are *connected by rods and strings*", and cannot, therefore, move any which way. In his explanation of D'Alembert's Principle, Lindsay states that "If the masses were subject to no constraints (i.e. if they were not connected in any way or forced to move along certain curves or surfaces) ..." (*ibid.*, p. 251); and in his discussion of Gauss' Principle of Least Constraint Lindsay states, "The system being subjected to certain constraints (i.e. the masses being perhaps connected to each other by rods or cords, or constrained to move along certain curves or surfaces) ..." (*ibid.*, p. 254). I assume that in the last clause the word "constrained" means, as in the earlier quotes, either

233

G. Van de Vijver et al. (eds.), Evolutionary Systems, 233–242.
© 1998 *Kluwer Academic Publishers.*

Constraints Create Alternatives

"Constraints not only reduce alternatives— they also create alternatives." If we take (Alicia Juarrero's example of) language, the constraints of syntax allow meaning to emerge.

Wholes arise from Constraints, and Wholes give rise to Constraints

"parts interact to produce novel, emergent wholes; in turn, these distributed wholes as wholes regulate and constrain the parts that make them up"

— Alicia Juarrero, "Dynamics in Action: Intentional Behavior as a Complex System"

Juarrero (1999) distinguishes governing from enabling constraints: governing constraints regulate and restrict, while enabling constraints make a new level of complexity possible.

Context-sensitive constraints [..] synchronize and correlate previously independent parts into a systemic whole

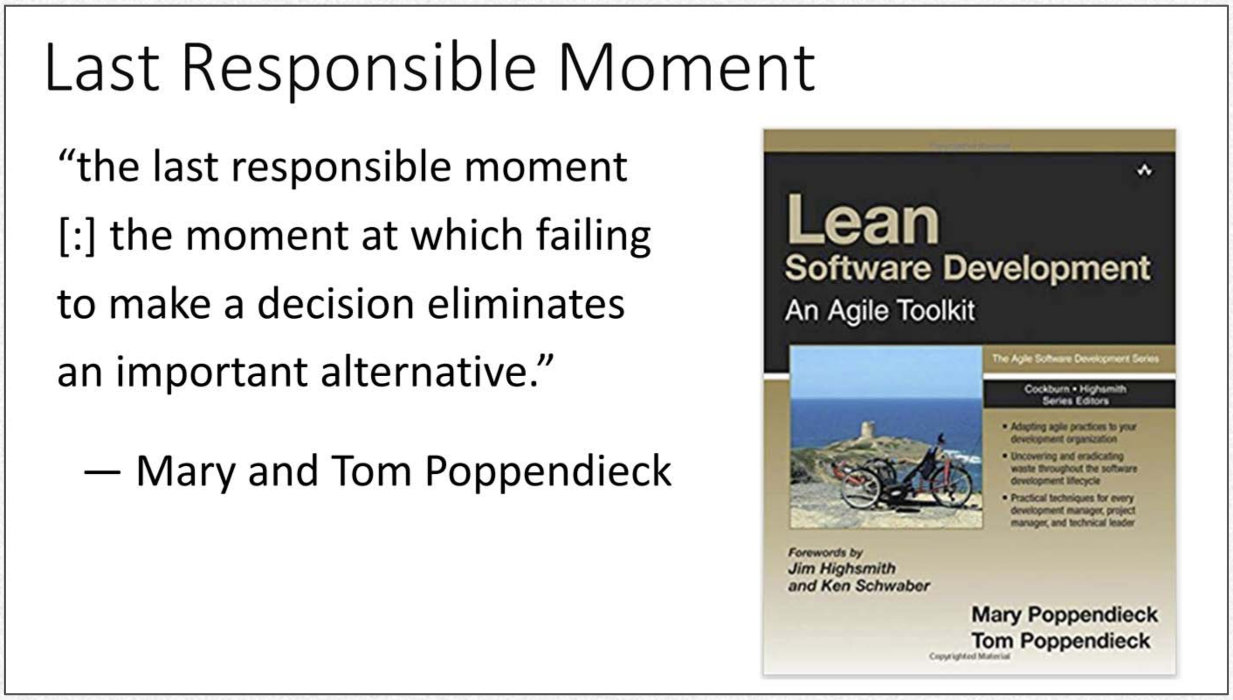
— Alicia Juarrero

By curtailing the potential variation of component behavior, [..] context-dependent constraints paradoxically also create new freedoms for the overall system.

— Alicia Juarrero

We need to make decisions. But when…?

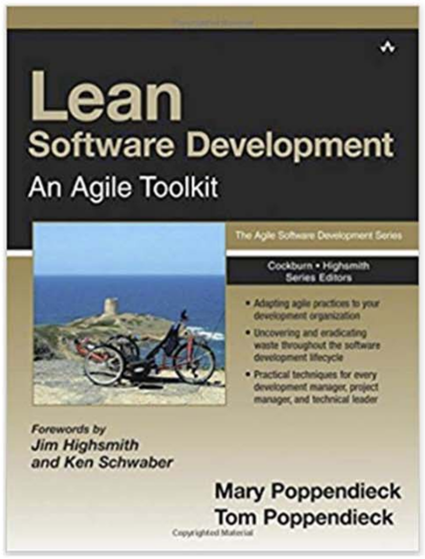
Defer, until we know more?



Last Responsible Moment

"the last responsible moment [:] the moment at which failing to make a decision eliminates an important alternative."

— Mary and Tom Poppendieck


Lean
Software Development
An Agile Toolkit
The Agile Software Development Series
Cockburn • Highsmith Series Editors
Forewords by Jim Highsmith and Ken Schwaber
Mary Poppendieck
Tom Poppendieck

Last Responsible Moment

Jeremy Miller on delaying decisions until the last responsible moment:
"The key is to make decisions as late as you can responsibly wait because that is the point at which you have the most information on which to base the decision."

And Jeff Atwood:
"Deciding too late is dangerous, but deciding too early in the rapidly changing world of software development is arguably even more dangerous. Let the principle of Last Responsible Moment be your guide."

*"delay commitment until the **last responsible moment, that is, the moment at which failing to make a decision eliminates an important alternative**. If commitments are delayed beyond the last responsible moment, then decisions are made by default, which is generally not a good approach to making decisions."*

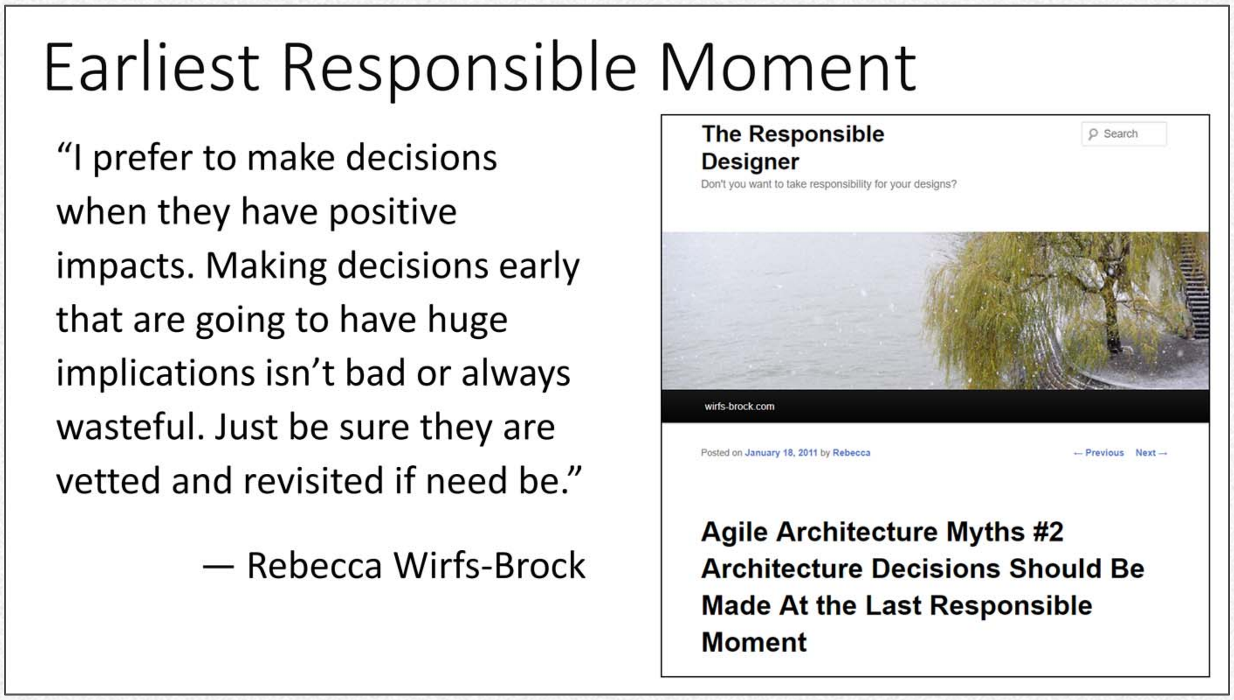
— Mary and Tom Poppendieck

YouArentGonnaNeedIt (often abbreviated YAGNI, or YagNi on this wiki) is an ExtremeProgramming practice which states:

> "Always implement things when you *actually* need them, never when you just *foresee* that you need them."

Source: http://c2.com/xp/YouArentGonnaNeedIt.html

Source: https://blog.codinghorror.com/the-last-responsible-moment/



Earliest Responsible Moment

"I prefer to make decisions when they have positive impacts. Making decisions early that are going to have huge implications isn't bad or always wasteful. Just be sure they are vetted and revisited if need be."

— Rebecca Wirfs-Brock

The Responsible Designer

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Posted on January 18, 2011 by Rebecca

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Agile Architecture Myths #2 Architecture Decisions Should Be Made At the Last Responsible Moment

"I believe that you can and should look ahead. And that most developers, given half a chance, are pretty good at incorporating past experiences and making anticipatory design choices."

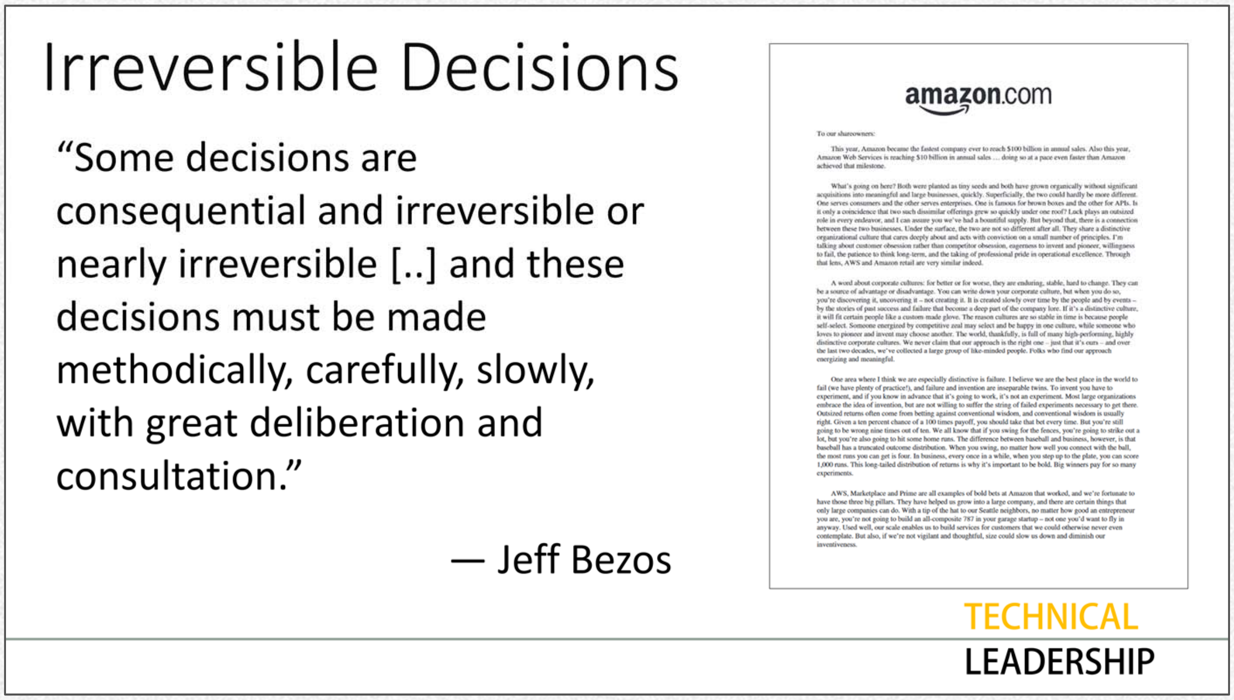
– Rebecca Wirfs-Brock

Creating Ground Under the Feet

Strategy and architecture decisions create context for further decisions, establishing relationships, and reducing the decision space. This is good. It reduces the overload of overwhelming ambiguity and uncertainty, by narrowing the space and putting stakes in the ground. Now we can probe and test, to see how we're doing. We make certain key decisions early, to "put ground under our feet." Huh? Ground? Metaphorically speaking, but to be able to move forward, we have to start to shape the space, gain traction. More metaphors.

We have to decide what we are going to do (next, and at all, and if we want to be proactive about cohesive and concerted action, where we are headed), and how. We may make ad hoc decisions implicitly on the fly without considered reflection, but some of our decisions are going to cleave the design space, ruling some opportunities out. This will be true whether they are implicit or explicit, considered, reasoned and probed, or made on the fly on guesses or without even knowing there were other choices we could have made. Better, if we anticipate they'll be highly consequential, if well considered.

You know the adage: "What's the best time to plant a tree? 20 years ago. What's the second best time? Now." Well, that's true, unless we don't need a tree. And there isn't something more critical to do now. But the point is important too — trees can't be moved so they constrain and set context for other landscaping decisions and they take a long time to grow, so to have the benefit of a bigger tree, we need to start as soon as we can.



Irreversible Decisions

"Some decisions are consequential and irreversible or nearly irreversible [..] and these decisions must be made methodically, carefully, slowly, with great deliberation and consultation."

— Jeff Bezos

amazon.com

To our shareowners:

This year, Amazon became the fastest company ever to reach $100 billion in annual sales. Also this year, Amazon Web Services is reaching $10 billion in annual sales … doing so at a pace even faster than Amazon achieved that milestone.

What's going on here? Both were planted as tiny seeds and both have grown organically without significant acquisitions into meaningful and large businesses, quickly. Superficially, the two could hardly be more different. One serves consumers and the other serves enterprises. One is famous for brown boxes and the other for APIs. Is it only a coincidence that two such dissimilar offerings grew so quickly under one roof? Luck plays an outsized role in every endeavor, and I can assure you we've had a bountiful supply. But beyond that, there is a connection between these two businesses. Under the surface, the two are not so different after all. They share a distinctive organizational culture that cares deeply about and acts with conviction on a small number of principles. I'm talking about customer obsession rather than competitor obsession, eagerness to invent and pioneer, willingness to fail, the patience to think long-term, and the taking of professional pride in operational excellence. Through that lens, AWS and Amazon retail are very similar indeed.

A word about corporate cultures: for better or for worse, they are enduring, stable, hard to change. They can be a source of advantage or disadvantage. You can write down your corporate culture, but when you do so, you're discovering it, uncovering it – not creating it. It is created slowly over time by the people and by events – by the stories of past success and failure that become a deep part of the company lore. If it's a distinctive culture, it will fit certain people like a custom-made glove. The reason cultures are so stable in time is because people self-select. Someone energized by competitive zeal may select and be happy in one culture, while someone who loves to pioneer and invent may choose another. The world, thankfully, is full of many high-performing, highly distinctive corporate cultures. We never claim that our approach is the right one – just that it's ours – and over the last two decades, we've collected a large group of like-minded people. Folks who find our approach energizing and meaningful.

One area where I think we are especially distinctive is failure. I believe we are the best place in the world to fail (we have plenty of practice!), and failure and invention are inseparable twins. To invent you have to experiment, and if you know in advance that it's going to work, it's not an experiment. Most large organizations embrace the idea of invention, but are not willing to suffer the string of failed experiments necessary to get there. Outsized returns often come from betting against conventional wisdom, and conventional wisdom is usually right. Given a ten percent chance of a 100 times payoff, you should take that bet every time. But you're still going to be wrong nine times out of ten. We all know that if you swing for the fences, you're going to strike out a lot, but you're also going to hit some home runs. The difference between baseball and business, however, is that baseball has a truncated outcome distribution. When you swing, no matter how well you connect with the ball, the most runs you can get is four. In business, every once in a while, when you step up to the plate, you can score 1,000 runs. This long-tailed distribution of returns is why it's important to be bold. Big winners pay for so many experiments.

AWS, Marketplace and Prime are all examples of bold bets at Amazon that worked, and we're fortunate to have those three big pillars. They have helped us grow into a large company, and there are certain things that only large companies can do. With a tip of the hat to our Seattle neighbors, no matter how good an entrepreneur you are, you're not going to build an all-composite 787 in your garage startup – not one you'd want to fly in anyway. Used well, our scale enables us to build services for customers that we could otherwise never even contemplate. But also, if we're not vigilant and thoughtful, size could slow us down and diminish our inventiveness.

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"One common pitfall for large organizations – one that hurts speed and inventiveness – is "one-size-fits-all" decision making."
– Jeff Bezos

No "One Time to Rule Them All" Decision Making

So, strategy and architecture are about scope and impact, and not something that is simply determined by being done upfront — that is, by timing. Rather, the other way round. If it's strategically or structurally significant, we want timing to factor in decision making. Is this something we need to pay attention to now? Why?

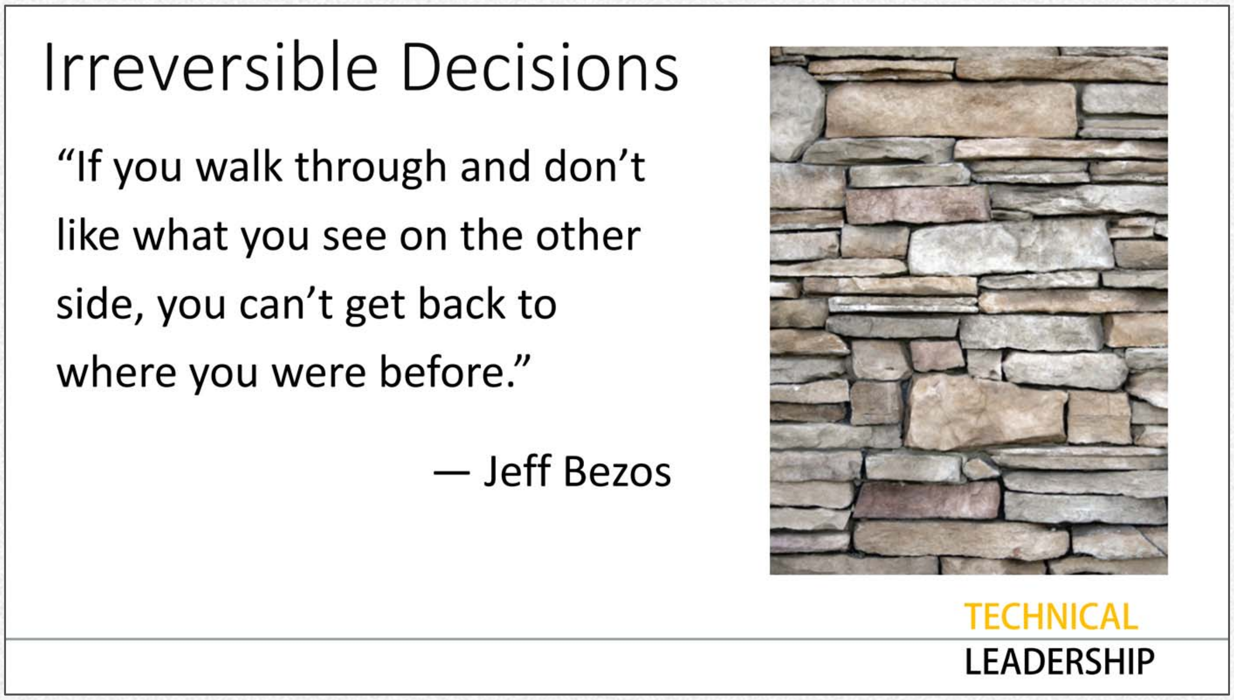
No "One-Size Fits All" Decision Making Either

In his 2015 letter to Amazon shareholders, Jeff Bezos made this important distinction between irreversible and reversible decisions, emphasizing that consequential irreversible decisions need to be made with great deliberation and consultation.

Source: https://www.sec.gov/Archives

Not all decisions are equal. What differences make a difference?

They change consequential things, we can't undo



Irreversible Decisions

"If you walk through and don't like what you see on the other side, you can't get back to where you were before."

— Jeff Bezos

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We need to make those decisions deliberately, attentively

Attending to Irreversible, Consequential Decisions

Shane Parrish collected together a useful series of decision making heuristics in a twitter thread. Here are several (the numbers are Parrish's) that we've selected for their bearing in the case of more consequential decisions [and we've added a few notes]:

17. Put things on a reversibility/consequence grid — irreversible and high consequence decisions likely require more time. The rest of the time you can usually go fast.

10. The rule of 5. Think about what the decision looks like 5 days, 5 weeks, 5 months, 5 years, 5 decades.

11. Let other people's hindsight become your foresight. [Do the research; draw on expertise.]

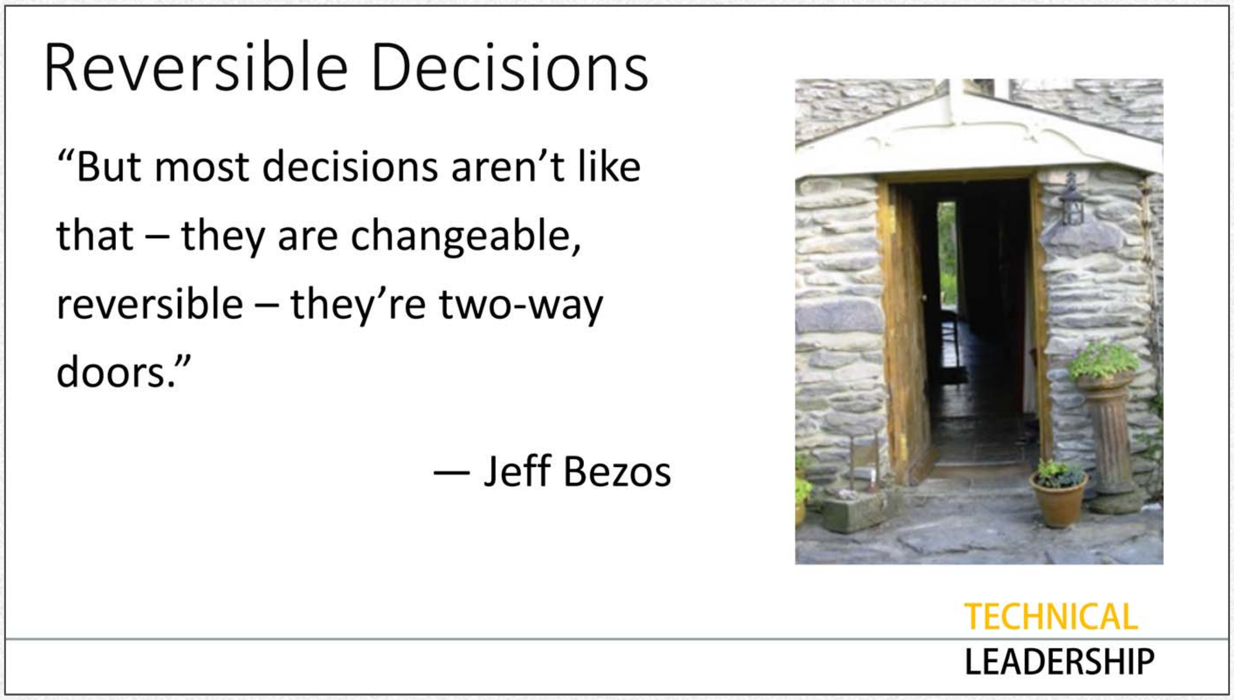
13. Ask what information would cause you to change your mind. If you don't have that information, find it. If you do, track [it] religiously.

22. Walk around the decision from the perspective of everyone implicated (shareholders, employees, regulators, customers, partners, etc.)

26. Ask yourself "and then what?" [and "what if?" and "what else?"]

Source: Shane Parrish (@farnamstreet), on twitter, 5 Aug, 2018

https://twitter.com/farnamstreet/status/1026105498372845571



Reversible Decisions

"But most decisions aren't like that – they are changeable, reversible – they're two-way doors."

— Jeff Bezos

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Reversible Decisions

It's worth highlighting two takeaways from Bezos's insights here:

- where we can, make decisions reversible — reduce the cost of change.
- pay particular attention to consequential irreversible decisions — attend to those that have high cost of change

"If you're good at course correcting, being wrong may be less costly than you think" — Jeff Bezos

Reversibility Approaches

In *Taming Complexity with Reversibility*, Kent Beck outlines several approaches used at Facebook for making changes smaller, and getting feedback more rapidly, so decisions can be tried out and assessed, and reversed if they don't pan out well (enough), before they become entangled in other decisions, expectations and habits. These include:

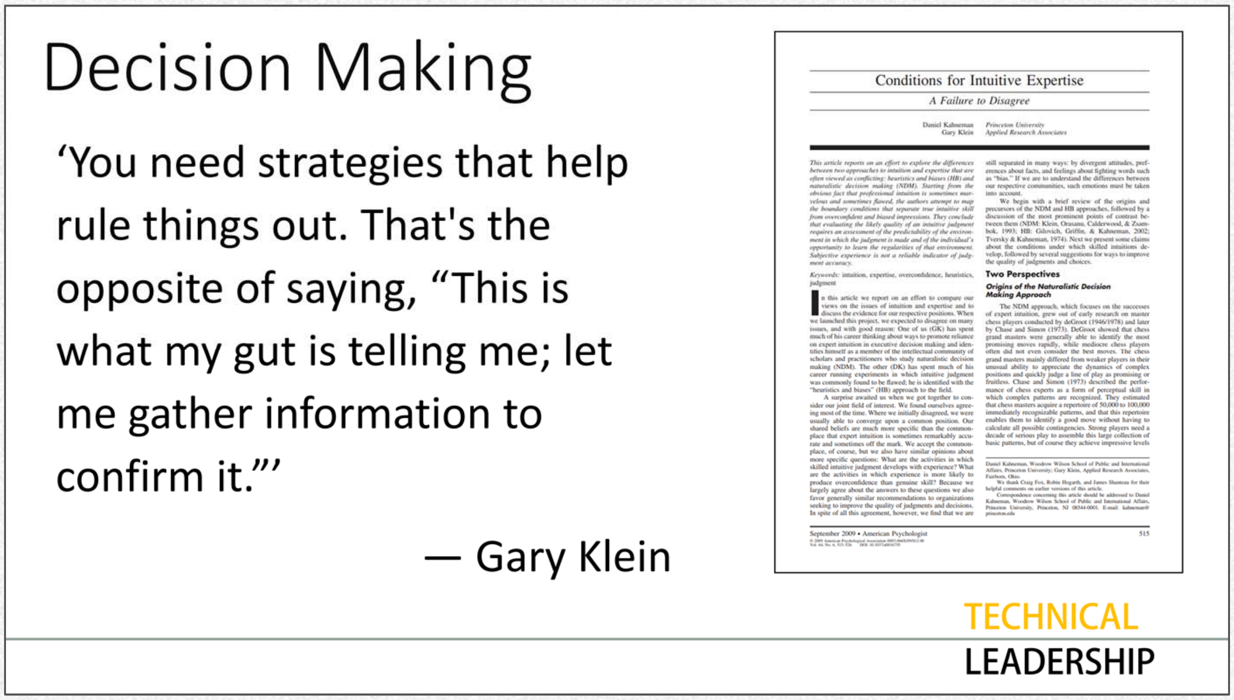
- *Development servers*. Each engineer has their own copy of the entire site. Engineers can make a change, see the consequences, and reverse the change in seconds without affecting anyone else.
- *Code review*. Engineers can propose a change, get feedback, and improve or abandon it in minutes or hours, all before affecting any people using Facebook.
- *Internal usage*. Engineers can make a change, get feedback from thousands of employees using the change, and roll it back in an hour.

Source: Kent Beck, *Taming Complexity with Reversibility*

In part, these satisfy the second of Palchinsky's Principles:

"when trying something new, do it on a scale where failure is survivable" — Peter Palchinsky

So how do we approach consequential decisions?



Decision Making

'You need strategies that help rule things out. That's the opposite of saying, "This is what my gut is telling me; let me gather information to confirm it."'

— Gary Klein

Conditions for Intuitive Expertise

A Failure to Disagree

Daniel Kahneman *Princeton University*
Gary Klein *Applied Research Associates*

This article reports on an effort to explore the differences between two approaches to intuition and expertise that are often viewed as conflicting: heuristics and biases (HB) and naturalistic decision making (NDM). Starting from the obvious fact that professional intuition is sometimes marvelous and sometimes flawed, the authors attempt to map the boundary conditions that separate true intuitive skill from overconfident and biased impressions. They conclude that evaluating the likely quality of an intuitive judgment requires an assessment of the predictability of the environment in which the judgment is made and of the individual's opportunity to learn the regularities of that environment. Subjective experience is not a reliable indicator of judgment accuracy.

Keywords: intuition, expertise, overconfidence, heuristics, judgment

In this article we report on an effort to compare our views on the issues of intuition and expertise and to discuss the evidence for our respective positions. When we launched this project, we expected to disagree on many issues, and with good reason: One of us (GK) has spent much of his career thinking about ways to promote reliance on expert intuition in executive decision making and identifies himself as a member of the intellectual community of scholars and practitioners who study naturalistic decision making (NDM). The other (DK) has spent much of his career running experiments in which intuitive judgment was commonly found to be flawed; he is identified with the "heuristics and biases" (HB) approach to the field.

A surprise awaited us when we got together to consider our joint field of interest. We found ourselves agreeing most of the time. Where we initially disagreed, we were usually able to converge upon a common position. Our shared beliefs are much more specific than the commonplace that expert intuition is sometimes remarkably accurate and sometimes off the mark. We accept the commonplace, of course, but we also have similar opinions about more specific questions: What are the activities in which skilled intuitive judgment develops with experience? What are the activities in which experience is more likely to produce overconfidence than genuine skill? Because we largely agree about the answers to these questions we also favor generally similar recommendations to organizations seeking to improve the quality of judgments and decisions. In spite of all this agreement, however, we find that we are still separated in many ways: by divergent attitudes, preferences about facts, and feelings about fighting words such as "bias." If we are to understand the differences between our respective communities, such emotions must be taken into account.

We begin with a brief review of the origins and precursors of the NDM and HB approaches, followed by a discussion of the most prominent points of contrast between them (NDM: Klein, Orasanu, Calderwood, & Zsambok, 1993; HB: Gilovich, Griffin, & Kahneman, 2002; Tversky & Kahneman, 1974). Next we present some claims about the conditions under which skilled intuitions develop, followed by several suggestions for ways to improve the quality of judgments and choices.

Two Perspectives

Origins of the Naturalistic Decision Making Approach

The NDM approach, which focuses on the successes of expert intuition, grew out of early research on master chess players conducted by deGroot (1946/1978) and later by Chase and Simon (1973). DeGroot showed that chess grand masters were generally able to identify the most promising moves rapidly, while mediocre chess players often did not even consider the best moves. The chess grand masters mainly differed from weaker players in their unusual ability to appreciate the dynamics of complex positions and quickly judge a line of play as promising or fruitless. Chase and Simon (1973) described the performance of chess experts as a form of perceptual skill in which complex patterns are recognized. They estimated that chess masters acquire a repertoire of 50,000 to 100,000 immediately recognizable patterns, and that this repertoire enables them to identify a good move without having to calculate all possible contingencies. Strong players need a decade of serious play to assemble this large collection of basic patterns, but of course they achieve impressive levels

Daniel Kahneman, Woodrow Wilson School of Public and International Affairs, Princeton University; Gary Klein, Applied Research Associates, Fairborn, Ohio.

We thank Craig Fox, Robin Hogarth, and James Shanteau for their helpful comments on earlier versions of this article.

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"Rigor is not a substitute for imagination."
— Gary Klein

" I worry about leaders in complex situations who don't have enough experience, who are just going with their intuition and not monitoring it, not thinking about it."
— Gary Klein

Decisions Are Perfectly Rational, Right?

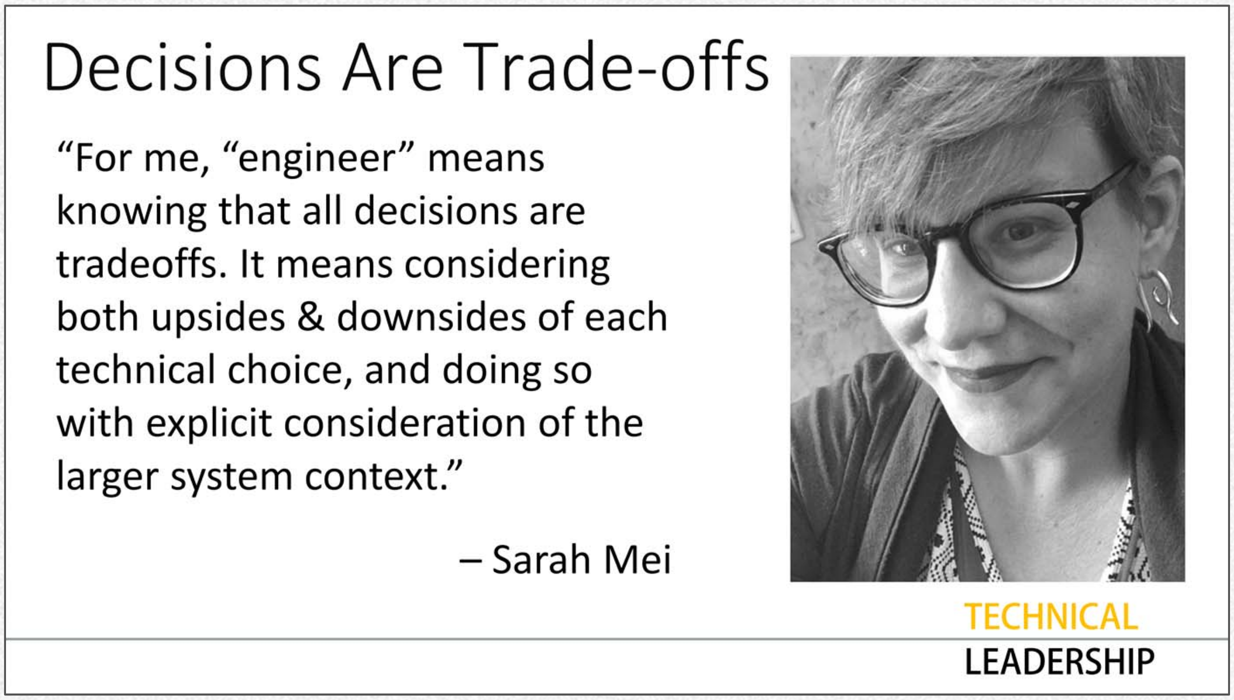
This is the opening to "The Art of Decision-Making" in The New Yorker:

'In July of 1838, Charles Darwin was twenty-nine years old and single. Two years earlier, he had returned from his voyage aboard H.M.S. Beagle with the observations that would eventually form the basis of "On the Origin of Species." In the meantime, he faced a more pressing analytical problem. Darwin was considering proposing to his cousin Emma Wedgwood, but he worried that marriage and children might impede his scientific career. To figure out what to do, he made two lists. "Loss of time," he wrote on the first. "Perhaps quarreling. . . . Cannot read in the evenings. . . . Anxiety and responsibility. Perhaps my wife won't like London; then the sentence is banishment and degradation into indolent, idle fool." On the second, he wrote, "Children (if it Please God). Constant companion (and friend in old age). . . . Home, & someone to take care of house." He noted that it was "intolerable to think of spending one's whole life, like a neuter bee, working, working. . . . Only picture to yourself a nice soft wife on a sofa with good fire and books and music perhaps."

Beneath his lists, Darwin scrawled, "Marry, Marry, Marry QED."'

— Joshua Rothman

Darwin's decision and reasoning aside, it demonstrates how we think decisions are made: we list and weigh reasons. And demonstrate the superior approach to take. Gary Klein makes the case that experts tend not to do this (though novices might), especially not under (time) pressure. Still, when it comes to decisions of consequence to organizations and system design, we do well to better understand what's at stake, what's impacted and how, as well as what options or solution approaches we might take.



Decisions Are Trade-offs

"For me, "engineer" means knowing that all decisions are tradeoffs. It means considering both upsides & downsides of each technical choice, and doing so with explicit consideration of the larger system context."

– Sarah Mei

TECHNICAL LEADERSHIP

"When you build a bridge, you don't build it as a perfect structure that will never collapse. Instead you build it to withstand 500 year winds, 200 year floods, 300% expected maximum load, etc. If you didn't make these design trade-offs, every bridge would be solid concrete [..] Engineering is all about making these compromises"

Pragprog.com/articles/the-art-of-tradeoffs

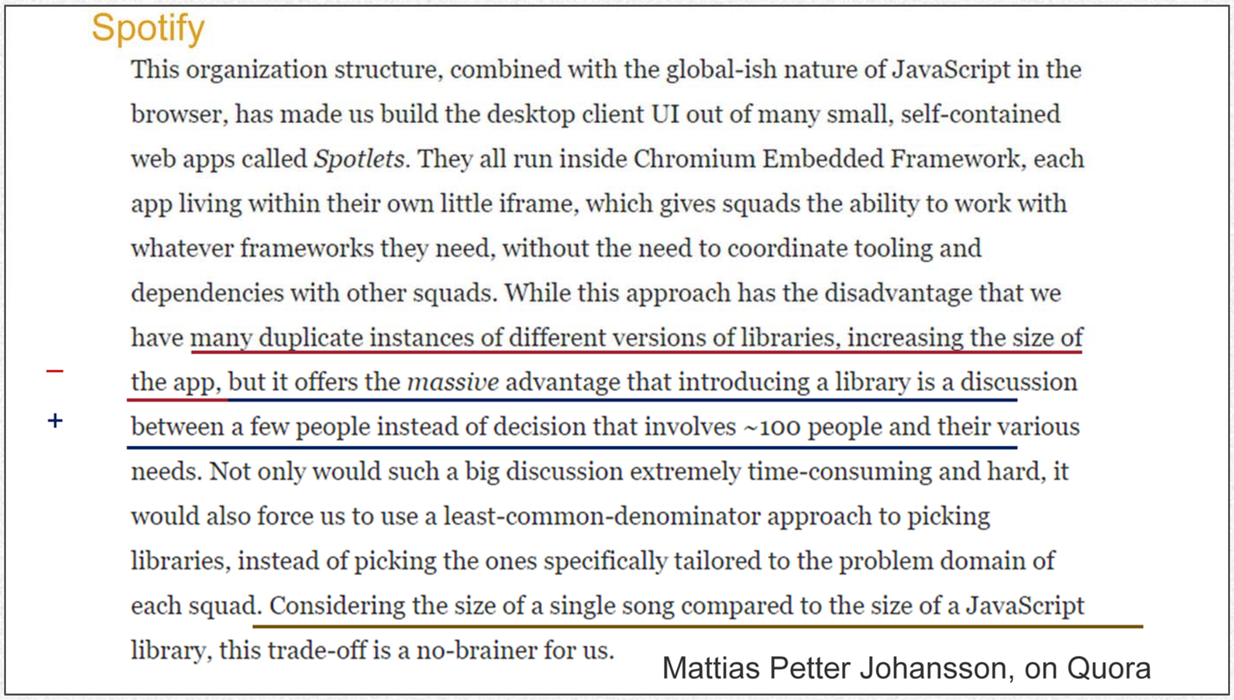
Decisions Entail Tradeoffs and Tradeoffs Don't Stay Their Lane ¯_(ツ)_/¯

As a manager in IT or product development, our decisions don't just impact teams but the systems they create. We see this in Conway's Law:

> "The basic thesis [..] is that organizations which design systems [..] are constrained to produce designs which are copies of the communication structures of these organizations."
>
> -- Melvin Conway, How Do Committees Invent?, 1968

Likewise, as an architect, the choices we're making are technical, but the impacts don't remain neatly in the technical space. The tradeoff space isn't just about qualities that impact developer experience, or security properties or operational complexity, but user experience and partner experience through properties of the system in use. And more. So we investigate the upsides and downsides of our technical decisions, in these various contexts.

We want to surface the trade-offs inherent in our decisions, both to better understand the decision space, and because we may be able, or need, to contend with the downsides of these decisions explicitly, to offset them.



Spotify

This organization structure, combined with the global-ish nature of JavaScript in the browser, has made us build the desktop client UI out of many small, self-contained web apps called *Spotlets*. They all run inside Chromium Embedded Framework, each app living within their own little iframe, which gives squads the ability to work with whatever frameworks they need, without the need to coordinate tooling and dependencies with other squads. While this approach has the disadvantage that we have many duplicate instances of different versions of libraries, increasing the size of the app, but it offers the *massive* advantage that introducing a library is a discussion between a few people instead of decision that involves ~100 people and their various needs. Not only would such a big discussion extremely time-consuming and hard, it would also force us to use a least-common-denominator approach to picking libraries, instead of picking the ones specifically tailored to the problem domain of each squad. Considering the size of a single song compared to the size of a JavaScript library, this trade-off is a no-brainer for us.

Mattias Petter Johansson, on Quora

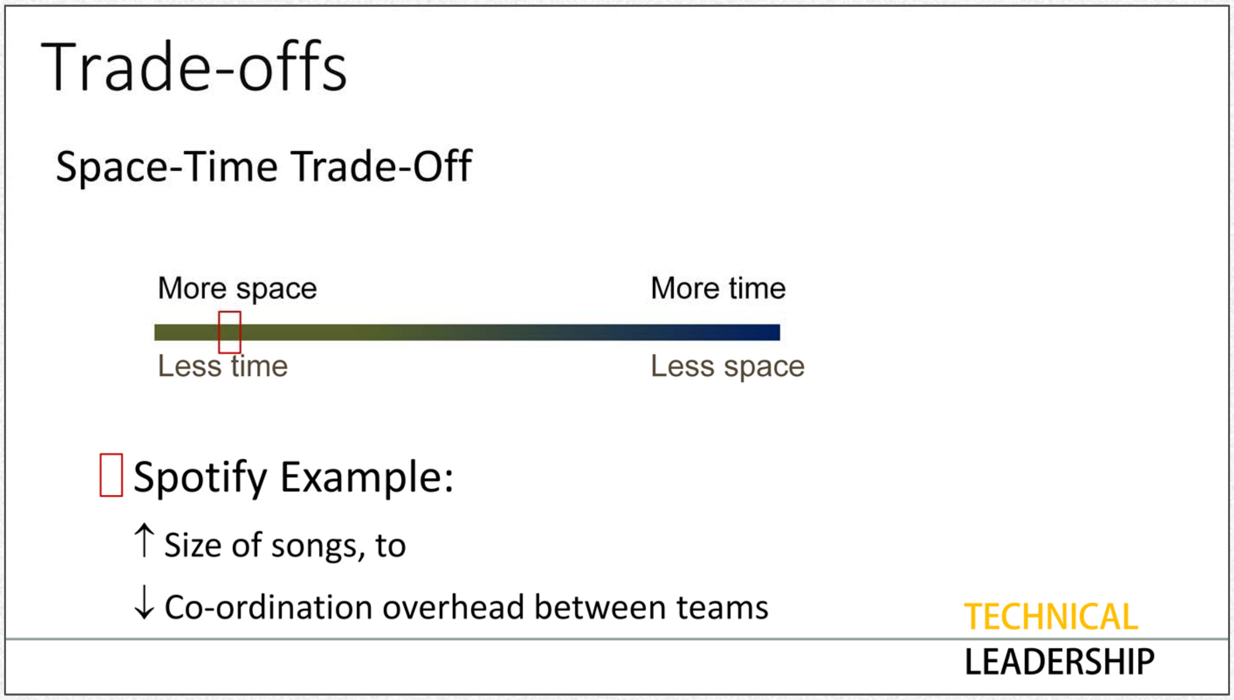
Intentional About Trade-offs

Let's spend a moment and read the discussion (see slide above) from Mattias Peter Johansson on Quora, about Spotify (written in 2017). Ref: https://www.quora.com/How-is-JavaScript-used-within-the-Spotify-desktop-application-Is-it-packaged-up-and-run-locally-only-retrieving-the-assets-as-and-when-needed-What-JavaScript-VM-is-used

We see that allowing duplicate instances of different versions of various libraries enabled Spotify squads (teams) considerable independence, removing the need to coordinate with other squads on libraries and versions. Because song size so dominates considerations that it generally falls beneath the threshold of sensitivity for the user, the tradeoff of team freedom for app size is easily (in their view) within the design acceptance envelope.

So in this case, a technical decision is being made for organizational gain (lowering team coordination costs and increasing team's degrees of freedom) at the expense of app size, which works as long as it's below the app user's tolerance threshold for resource consumption.

"Good engineering is less about finding the "perfect" solution and more about understanding the tradeoffs and being able to explain them."
— Jaana B. Dogan



Trade-offs

Space-Time Trade-Off

More space
More time
Less time
Less space

Spotify Example:

↑ Size of songs, to

↓ Co-ordination overhead between teams

TECHNICAL
LEADERSHIP

"A trade-off (or tradeoff) is a situational decision that involves diminishing or losing one quality, quantity or property of a set or design in return for gains in other aspects. In simple terms, a tradeoff is where one thing increases and another must decrease."

— wikipedia

Space-Time or Time-Memory Trade-Off

"Usually, a TMTO is developed to improve the speed of an algorithm by utilizing one-time work, which results in increased storage (memory) requirements when the resulting algorithm is executed. Of course, it is also possible to work in the opposite direction by reducing the one-time work at the expense of more work each time the algorithm is executed. The goal is to balance the one-time work (memory) requirement with the speed of the algorithm (time)."

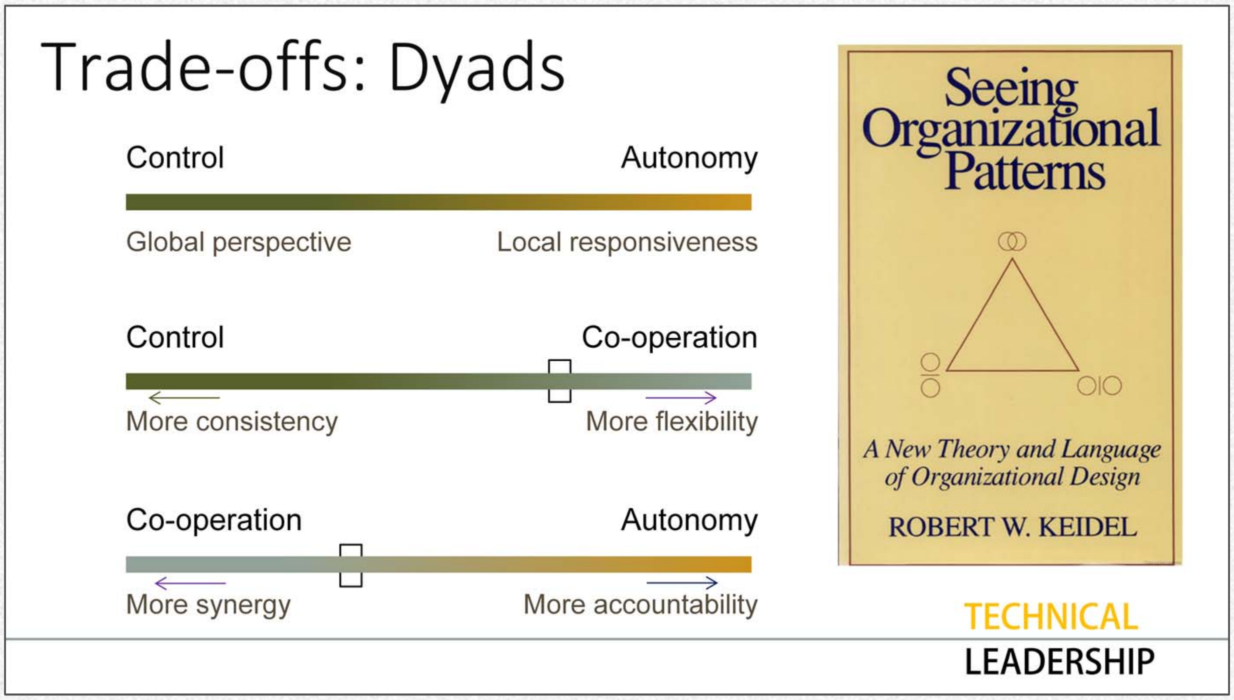
—Mark Stamp, Once Upon a Time-Memory Tradeoff

A classic illustration of the trade-off entails using a lookup table (uses upfront work and a lot of space to enable a fast lookup when the result is needed) versus calculating on demand (uses little space, but can take a long time at the point of demand, depending on the calculation).

Another space-time trade-off arises in data storage. If data is stored uncompressed, it takes more space but less time than if the data were stored compressed.

We're talking about this as a space-time trade-off, but it translates into a cost-performance (i.e., user experience) trade-off.

What are we giving up and what are we gaining?



Trade-offs: Dyads

Control — Autonomy

Global perspective — Local responsiveness

Control — Co-operation

More consistency — More flexibility

Co-operation — Autonomy

More synergy — More accountability

Seeing Organizational Patterns

A New Theory and Language of Organizational Design

ROBERT W. KEIDEL

TECHNICAL LEADERSHIP

"For example, continuous evolution pulls against product stability[..]. Low-level decisions pull against strict process control"

— Eberhardt Rechtin and Mark Maier

Trade-Off Dyads (Picturing the Dilemma)

We have a trade-off when design variations improve one dimension (something we value, like a performance metric), but diminish another. Factor in multiple of these trade-off dimensions, and there is no unique optimal design; the choice lies in what is valued in that context.

By drawing the trade-offs out — making them visible — we can make judgments, and subject them to discourse to better assess impact and value.

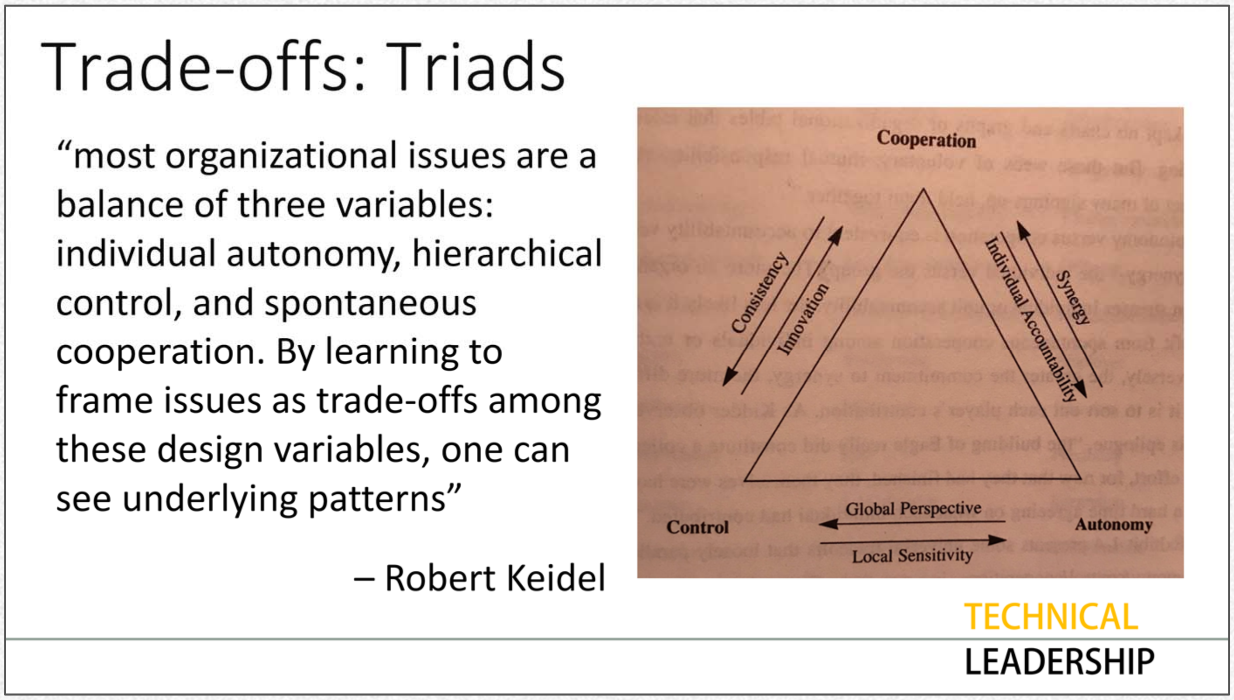
Many trade-offs can usefully be thought of in terms of dyads: performance and cost (another way to frame the space-time trade-off); data confidentiality or security (via encryption) and performance; safety and cost; structural mass (for physical structures) and safety; usability or convenience and security; etc.

In *Seeing Organizational Patterns*, Robert Keidel considers organizational structures and interaction dynamics, and pivotal trade-offs underlying organizing choices.

These could be presented as the dyads shown (slide above).

While considering pair-wise trade-offs can help understand the design space, it can obscure the tensions when multiple variables are simultaneously in play. Keidel points out that "every organization must blend autonomy, control, and cooperation." The trade-off space (the design options), is more usefully visualized as a triad, or triangle.

The multiple library versions example earlier, is missing impacts (eg security implications).



Trade-offs: Triads

"most organizational issues are a balance of three variables: individual autonomy, hierarchical control, and spontaneous cooperation. By learning to frame issues as trade-offs among these design variables, one can see underlying patterns"

– Robert Keidel

A Trilemma of Trade-offs

According to Keidel, any particular organization will focus on at most two of autonomy, control, and co-ordination. (Attempting all three is an unstable form.) These are the organizational forms he identifies:

Organizations that are autonomy-based have as their distinctive competence adding value through solo performers; they are truly star systems. Example: any first-rate university.

Control-based organizations compete on the basis of their ability to reduce costs and/or complexity through global coordination. Authority, information, and initiative reside chiefly at the top levels.

A cooperation-based organization builds synergy across teams. The distinctive organizational competence is innovation through cooperation.

Probably the most familiar example of an autonomy/control hybrid is the divisionalized corporation.

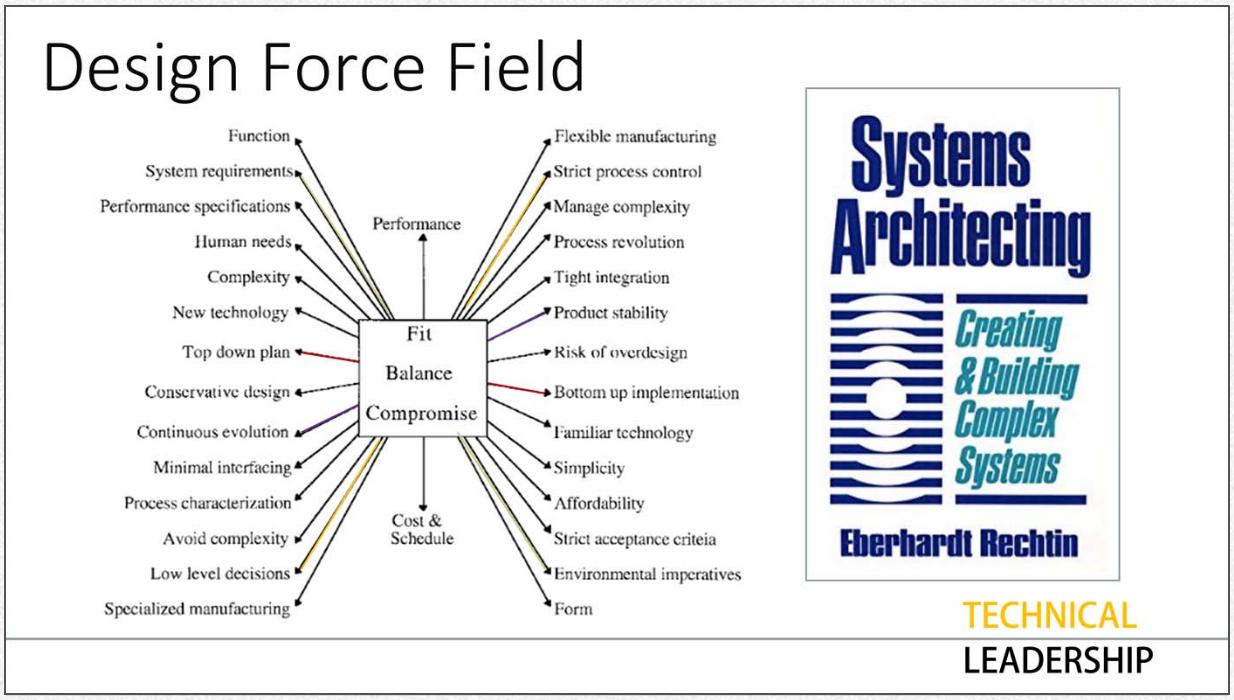
A control/cooperation hybrid may be described as a "humanistic hierarchy." Top-down control remains essential but every effort is made to meld it with voluntary, lateral processes among individuals, functions, and units.

The autonomy/cooperation has the oldest roots. This combination goes back to the craft organizations of the late 18th century, which featured a blend of individual initiative and informal cooperation.

"Equally dangerous is an overemphasis on a single variable to the point that the other two are neglected. Autonomy becomes problematic when a relatively freestanding part-individual or organizational unit-overdoes its own thing."
— Robert Keidel

Seeing Organizational Patterns, Robert Keidel

Demands on the system create a force field



Design Force Field

Tensions

Design has to balance tensions caused by different imperatives, needs, and perceptions.

"Some of competing technical factors are shown in [the figure in the slide above]. This figure was drawn such that directly opposing factors pull in exactly opposite directions on the chart. For example, continuous evolution pulls against product stability; a typical balance is that of an architecturally stable, evolving product line. Low-level decisions pull against strict process control, which can often be relieved by systems architectural partitioning, aggregation, and monitoring. Most of these tradeoffs can be expressed in analytic terms, which certainly helps, but some cannot"

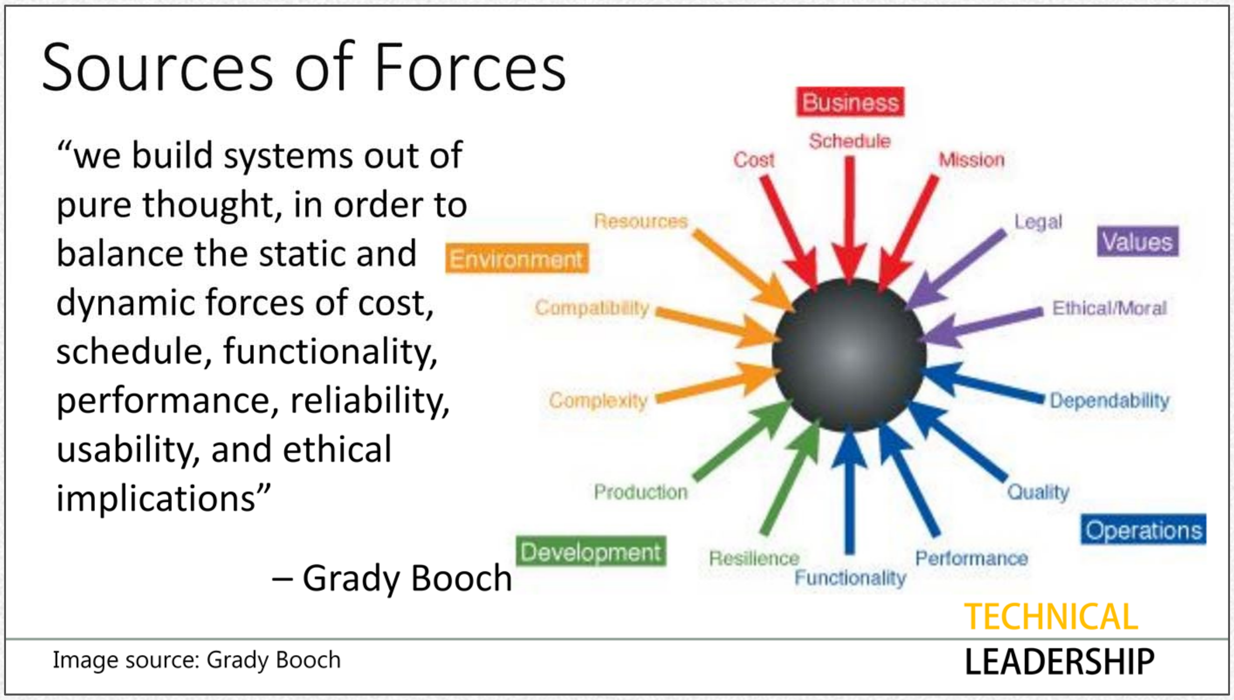
Eberhardt Rechtin and Mark Maier

"design is the [..] structure or behavior of a system whose presence resolves or contributes to the resolution of a force or forces on that system. A design thus represents one point in a potential decision space."

— Grady Booch

"We're trying to find habitable zones in a large multidimensional space, in which we're forced to make regrettable, but necessary, tradeoffs."

— Robert Smallshire



Sources of Forces

"we build systems out of pure thought, in order to balance the static and dynamic forces of cost, schedule, functionality, performance, reliability, usability, and ethical implications"

– Grady Booch

Image source: Grady Booch

TECHNICAL LEADERSHIP

Sources of Forces

"We do not analyze requirements; we construct them from our own perspective. This perspective is affected by our personal priorities and values, by the methods we use as orientation aids, and by our interaction with others" — Christiane Floyd

'The word "requirements" represents a fundamental misunderstanding of software. They're theories, at best.' — Sarah Mei

Design Envelopes

In engineering, we contemplate, weigh, and experiment to find the boundaries of the design envelope.

"Hard" requirements tend to be areas where our design envelope has less "give", so other parts of the requirements design have to flex.

"The better you understand the problem, the closer you can design to tolerances." — Dana Bredemeyer

We innovate by pushing the design envelope — extending the range of possible, into the adjacent possible.

[with reference to the slide:] "Of course they are categories: each describing a class of forces. For example, compatibility encompasses pressures that arise from legacy, frameworks, and standards" — Grady Booch

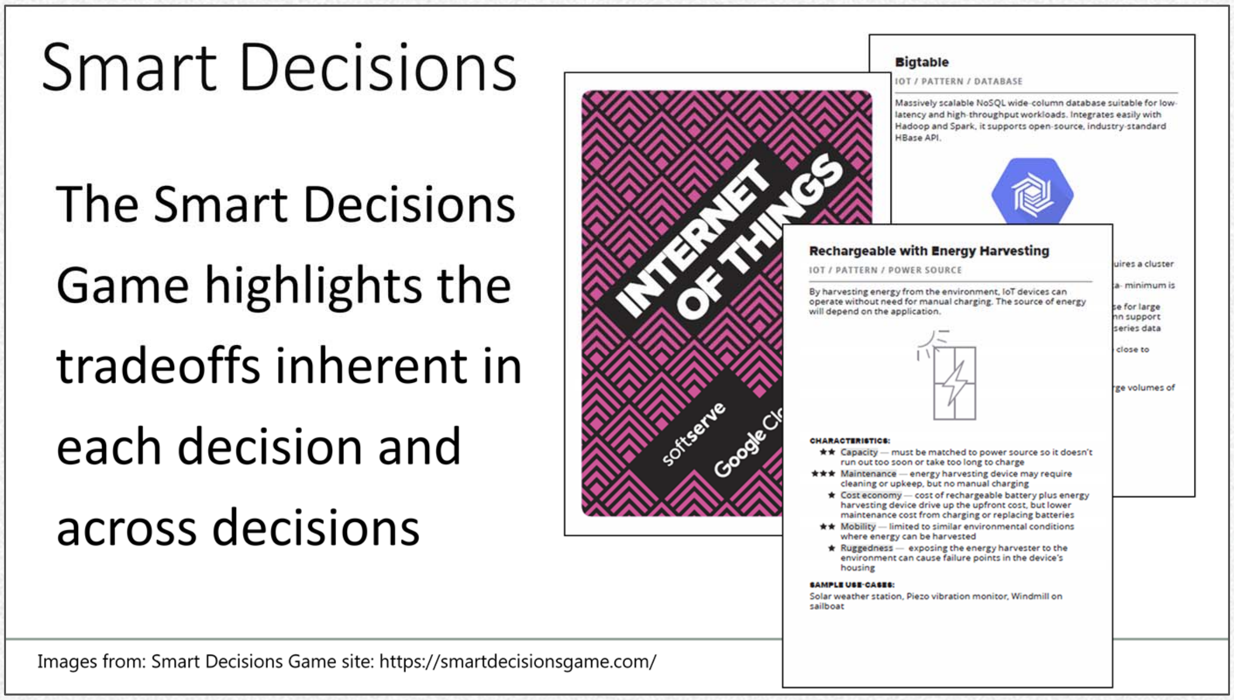
"Architecture is the set of design decisions that provide a reasonably satisfying resolution to the static and dynamic forces on the system." — Grady Booch

There is a multidimensional decision *space.* We want to surface not just options, but assumptions about forces in play.

"the force field of a software project starts with Requirements. Requirements are often categorized in some way, like "functional" and "nonfunctional", or "user requirements" and "system requirements. However, requirements of any kind [..] contribute to shape the overall field."

— Carlo Pescio

Decisions entail tradeoffs:
discerning tradeoffs takes judgment



Smart Decisions

The Smart Decisions Game highlights the tradeoffs inherent in each decision and across decisions

INTERNET OF THINGS
softserve
Google Cl

Bigtable

IOT / PATTERN / DATABASE

Massively scalable NoSQL wide-column database suitable for low-latency and high-throughput workloads. Integrates easily with Hadoop and Spark, it supports open-source, industry-standard HBase API.

uires a cluster

a- minimum is

se for large
nn support
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close to

rge volumes of

Rechargeable with Energy Harvesting

IOT / PATTERN / POWER SOURCE

By harvesting energy from the environment, IoT devices can operate without need for manual charging. The source of energy will depend on the application.

CHARACTERISTICS:

★★ Capacity — must be matched to power source so it doesn't run out too soon or take too long to charge

★★★ Maintenance — energy harvesting device may require cleaning or upkeep, but no manual charging

★ Cost economy — cost of rechargeable battery plus energy harvesting device drive up the upfront cost, but lower maintenance cost from charging or replacing batteries

★★ Mobility — limited to similar environmental conditions where energy can be harvested

★ Ruggedness — exposing the energy harvester to the environment can cause failure points in the device's housing

SAMPLE USE-CASES:

Solar weather station, Piezo vibration monitor, Windmill on sailboat

Images from: Smart Decisions Game site: https://smartdecisionsgame.com/

The Smart Decisions Game

"Smart Decisions is a game that simulates the design process of software systems and promotes learning about it in a fun way." -- from the Smart Decisions Game website; but having played the game at SATURN, I agree. The game can be downloaded, and used in a team learning activity.

It's a good way to highlight for the team that each technology and related decision has its strengths and weaknesses, and architectures are not just about individual decisions, but weighing across the decisions for a fit to the context and purpose of the system. Further, there will not always be agreement on the approach to take, because the nature of tradeoffs is that they entail judgment about the strengths/weakness as well as the value of the outcomes, and the degree to which the consequences (in other areas of the system, or its containing systems) need to be taken into account.

The SEI team has done important work in the system qualities and trade-offs space, including developing the Architecture Tradeoff Analysis Method:

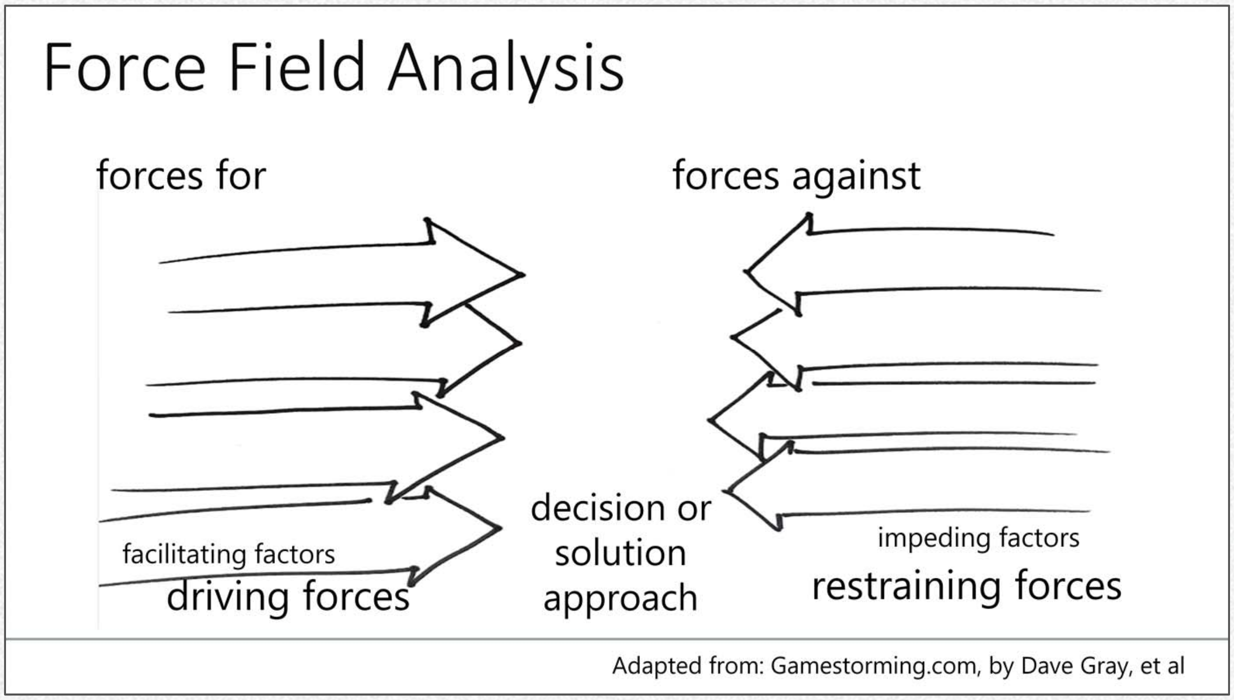
"ATAM gets its name because it not only reveals how well an architecture satisfies particular quality goals, but it also provides insight into how those quality goals interact—how they trade off against each other"

Judgment Factors

We may notice where we're being constrained (that's where we've hit a point of tension in the tradeoff space). But discerning tradeoffs is very much a matter of experience and judgment.

"Because the situation is ill-structured, the goal cannot be optimization. The architect seeks satisfactory and feasible problem-solution pairs."
— Mark Maier and Eb Rechtin

Smart Decisions Game site: https://smartdecisionsgame.com/



Force Field Analysis

Kurt Lewin did pioneering work in group dynamics, Action Research, and organizational development.

Of particular interest to us here, is Force Field Analysis, using Force Field Diagrams, developed by Kurt Lewin. Lewin was interested in group and organizational change or adaptation, and forces holding the organization in quasi-equilibrium. Force field analysis is useful in the context of organizational change, but can also help visualize forces that any decision balances or compromises across.

'According to Kurt Lewin "An issue is held in balance by the interaction of two opposing sets of forces - those seeking to promote change (driving forces) and those attempting to maintain the status quo (restraining forces)." Lewin viewed organizations as systems in which the present situation was not a static pattern, but a dynamic balance ("equilibrium") of forces working in opposite directions. In order for any change to occur, the driving forces must exceed the restraining forces, thus shifting the equilibrium.

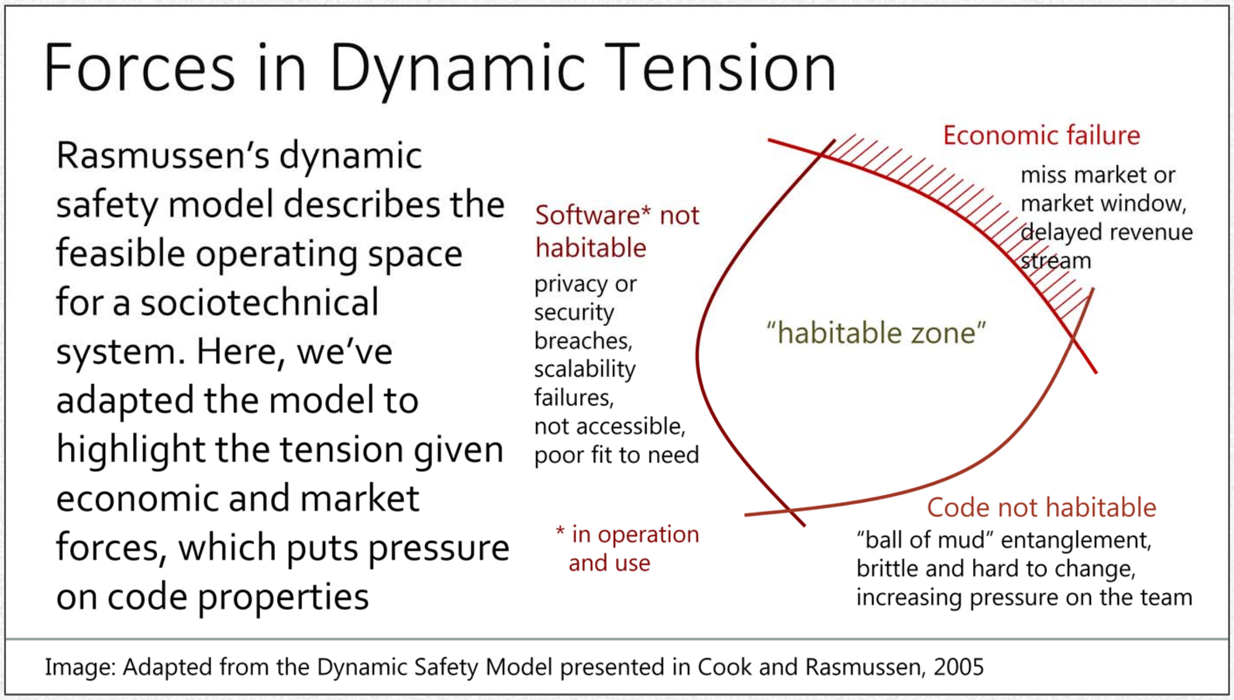
The Force Field Diagram is a model built on this idea that forces - persons, habits, customs, attitudes - both drive and restrain change.'

"If you want truly to understand something, try to change it."
*— Kurt Lewin**

* this quote is attributed to Kurt Lewin by Charles Tolman in *Problems of Theoretical Psychology,*

"Any given change may be a positive for some people and a negative for others. Who benefits from they way things are now? Who will benefit from a change? Who will experience the negative space, and what will that negative be?
— Esther Derby

http://www.valuebasedmanagement.net/methods_lewin_force_field_analysis.html



Forces in Dynamic Tension

Rasmussen's dynamic safety model describes the feasible operating space for a sociotechnical system. Here, we've adapted the model to highlight the tension given economic and market forces, which puts pressure on code properties

Economic failure
miss market or market window, delayed revenue stream
Software* not habitable
privacy or security breaches, scalability failures, not accessible, poor fit to need
"habitable zone"
Code not habitable
"ball of mud" entanglement, brittle and hard to change, increasing pressure on the team
* in operation and use

Image: Adapted from the Dynamic Safety Model presented in Cook and Rasmussen, 2005

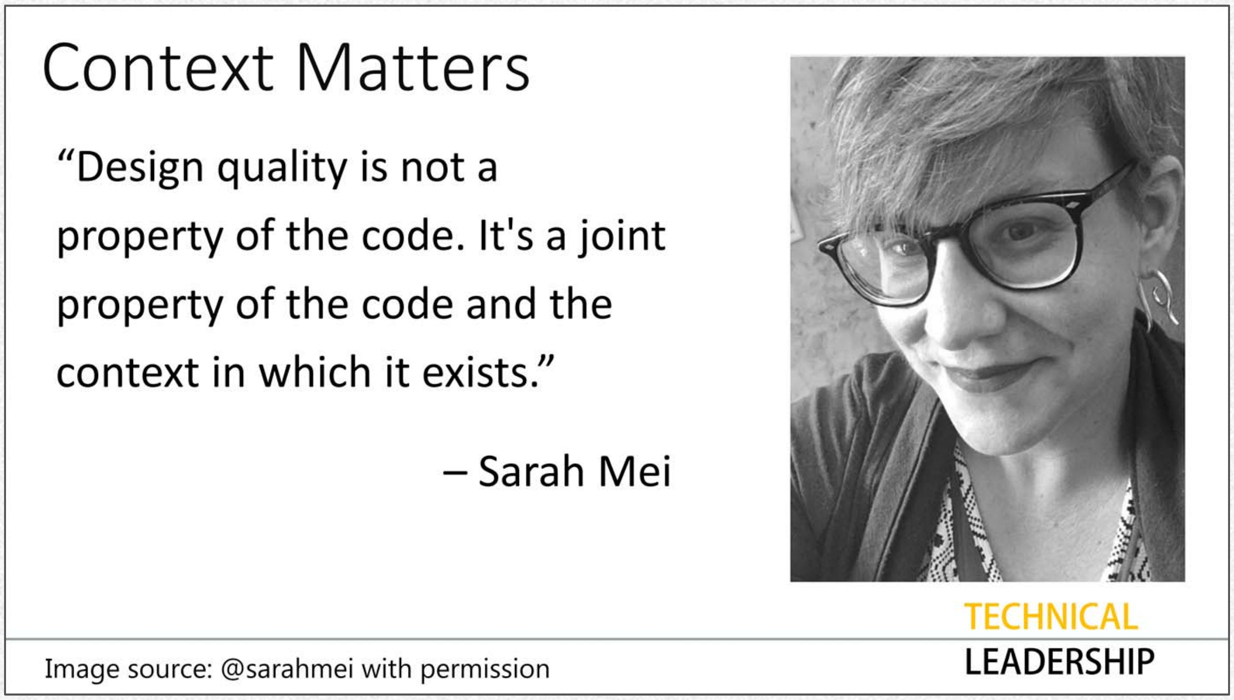
Dynamic Safety Model

The dynamic safety model was developed by Jens Rasmussen; adapted by Cook, Rasmussen, and others. It is described by Richard Cook in his presentation titled "Resilience In Complex Adaptive Systems" (Velocity 2013). This talk is available to watch on Youtube (under 19 minutes), and highly recommended.

In the Cook and Rasmussen model (2005), a business operates within 3 boundaries (economic, workload and acceptable performance); failure occurs when the operating point moves outside this envelope. The economic boundary is formed by the zone outside which the organization will fail—make a loss, run out of investor willingness to fund the venture, etc. The workload boundary delineates where the workload becomes too much, the pressures on workers too high, etc. Because a business doesn't want to fail, it pushes to lower costs and this puts pressure on the operating point, pushing it closer to the acceptable performance boundary (outside which the system fails). Exactly where this boundary is, is not known precisely—it is only discovered when an accident or failure occurs. Therefore, the organization needs a safety buffer or margin, so that it doesn't cross the failure boundary. The dynamic nature is emphasized, as workers constantly strive to keep the system operating without serious failure. In the operations case, the performance boundary has, for example, to do with scalability and resilience—failures that cause loss and/or distress for customers and news vans to line up outside corporate headquarters.

This model can be used to inform how we think about habitable zones and technical debt—in this case, we're dealing with developer workload and code habitability. Within the boundary, the code is sufficiently changeable or adaptable; the boundary or failure threshold has to do with coupling and other forms of debt, that thwart adding features and raise cost of change. And we can relate the "performance boundary" to the edge of habitable zone for users and operators, beyond which, for example, security breaches and system outages cause failure. Code quality erosion can feed forward into economic failures (impacting reputation/trust and revenue), impact software properties and lead to workload (intolerable stress and cognitive load) failures.

"all systems are what emerges over its history of adaptation to stressors"
— David Woods



Context Matters

"Design quality is not a property of the code. It's a joint property of the code and the context in which it exists."

– Sarah Mei

TECHNICAL LEADERSHIP

Image source: @sarahmei with permission

"The value of every decision we make depends on the context in which we make it. In The Lord of the Rings, *Frodo's journey to destroy the ring is meaningful inside the context of Middle Earth. Otherwise, he's a short, hairy guy with apocalyptic hallucinations." — Diana Montalion*

'better expression than "common sense" is contextual sense — a knowledge of what is reasonable within a context'
— Eb Rechtin

Context Factors

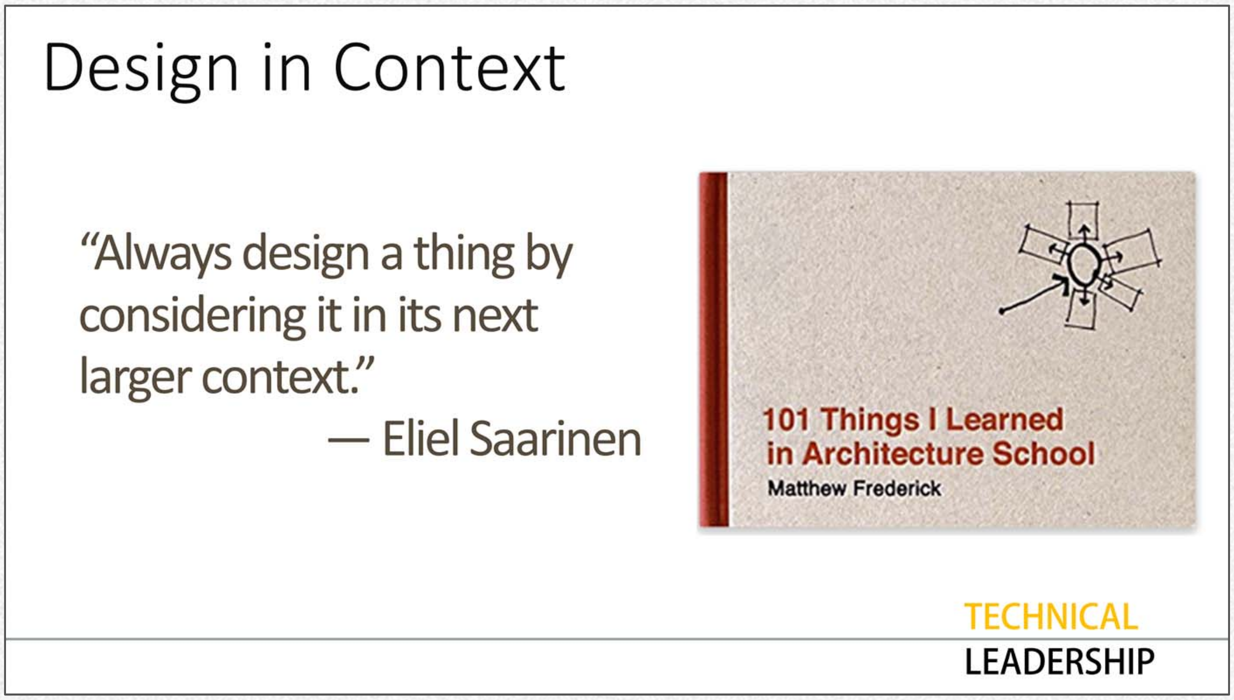
"[system design] strives for fit, balance and compromise among the tensions of [stakeholder] needs and resources, technology, and multiple stakeholder interests" (Rechtin and Maier) There is no perfect solution. Eb Rechtin put it this way: "The essence of architecture is structuring, simplification, compromise, and balance."

We joke about the two word answer to any question, that distinguishes the architect: "It depends." But a good architect tells you what it depends on.

At a recent conference, Diana Montalion shared her definition of wisdom:

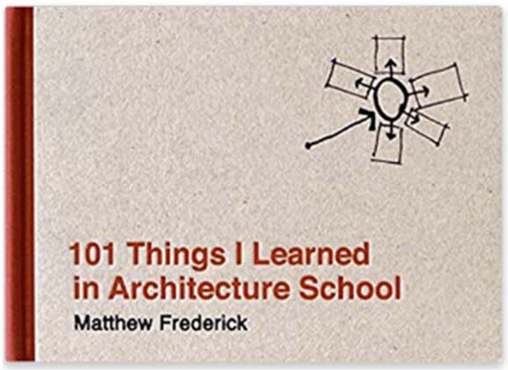
Wisdom = knowledge + experience + good judgment

According to this definition, wisdom is the ability to know what "it depends" on.



Design in Context

"Always design a thing by considering it in its next larger context."
— Eliel Saarinen



TECHNICAL
LEADERSHIP

Always Consider

"101 Things" is a book written for building architects, but has translatable lessons for software architects. In it, Eliel Saarinen* is quoted: "Always design a thing by considering it in its next larger context — a chair in a room, a room in a house, a house in an environment, environment in a city plan." We could amend Saarinen's point to "always decide a thing by considering its context." Decisions, any decisions, must take context into account too. From desired outcome(s) to forces that impinge, to side-effects, interactions and consequences, context factors. [* Also, related by Eero Saarinen in *Time Magazine*, "The Maturing Modern," 7/2/56, pp-50-57]

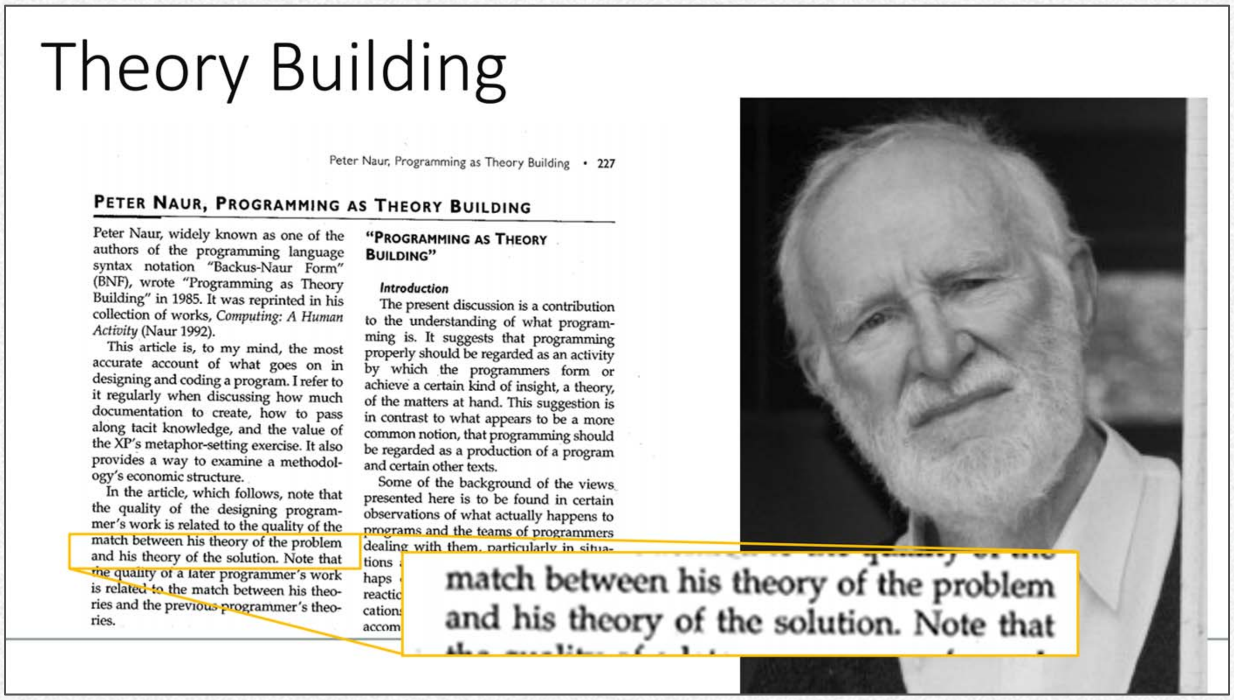
"The problem is connected to a larger system, and it's not solved by the quick fix."
— Mary Catherine Bateson

Christiane Floyd pointed out: "Design consists of a web of design decisions which, taken together, make up a proposed solution."

This is true of any design – including organizational design, or UI design, and system design. As well as the design or formulation of initiatives and strategies.

Back to Christiane Floyd: 'By design I understand the creative process in the course of which the problem as a whole is grasped, and an appropriate solution worked out and fitted into human contexts of meaning. In [Peter] Naur's words: "Software development is an activity of overall design with an experimental attitude".'

"Software Development as Reality Construction" (by Christiane Floyd, 1992) is an exciting work, for it articulates software development as a co-evolving, dialogic process where we are learning what the design needs to be, even as we adapt both the system and its context. That is, it exhibits what Nora Bateson termed "symmathesy" (learning together).



Theory Building

Peter Naur, Programming as Theory Building • 227

PETER NAUR, PROGRAMMING AS THEORY BUILDING

Peter Naur, widely known as one of the authors of the programming language syntax notation "Backus-Naur Form" (BNF), wrote "Programming as Theory Building" in 1985. It was reprinted in his collection of works, *Computing: A Human Activity* (Naur 1992).

This article is, to my mind, the most accurate account of what goes on in designing and coding a program. I refer to it regularly when discussing how much documentation to create, how to pass along tacit knowledge, and the value of the XP's metaphor-setting exercise. It also provides a way to examine a methodology's economic structure.

In the article, which follows, note that the quality of the designing programmer's work is related to the quality of the match between his theory of the problem and his theory of the solution. Note that the quality of a later programmer's work is related to the match between his theories and the previous programmer's theories.

"PROGRAMMING AS THEORY BUILDING"

Introduction

The present discussion is a contribution to the understanding of what programming is. It suggests that programming properly should be regarded as an activity by which the programmers form or achieve a certain kind of insight, a theory, of the matters at hand. This suggestion is in contrast to what appears to be a more common notion, that programming should be regarded as a production of a program and certain other texts.

Some of the background of the views presented here is to be found in certain observations of what actually happens to programs and the teams of programmers dealing with them, particularly in situa-
tions
haps
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match between his theory of the problem
and his theory of the solution. Note that

Building our Theory of the Problem

Our field contends with complex software-intensive systems and their evolution, and one of the classics (1980) is "Programs, Life Cycles, and Laws of Software Evolution." In it, Meir Lehman observed:

> "The installation of the program together with its associated system [..] change the very nature of the problem to be solved. The program has become a part of the world it models, it is embedded in it. Analysis of the application to determine requirements, specification, design, implementation now all involve extrapolation and prediction of the consequences of system introduction and the resultant potential for application and system evolution. This prediction must inevitably involve opinion and judgment."

Peter Naur, in "Programming As Theory Building" (1985), argues

> "programming properly should be regarded as an activity by which the programmers form or achieve a certain kind of insight, a theory, of the matters at hand."

A theory, that is, of the problem* being solved, and how the code relates to and addresses this problem.

Returning to Lehman:

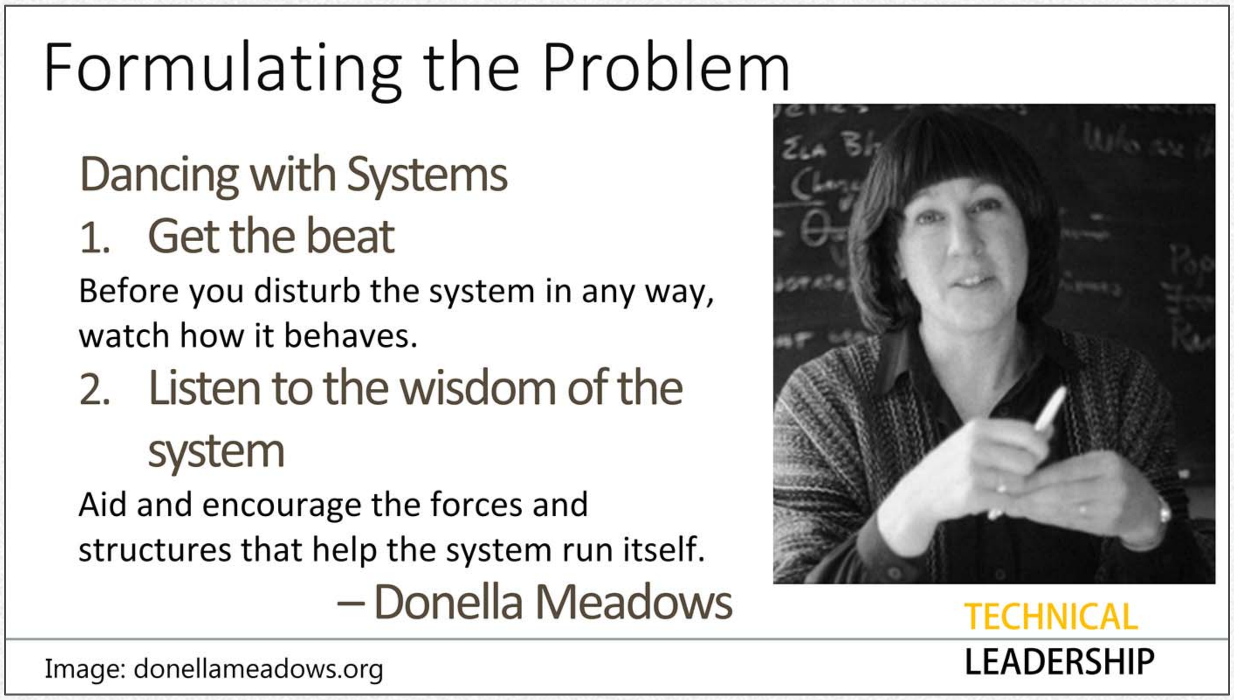
> "any program is *a model of a model within a theory of a model of an abstraction of some portion of the world or of some universe of discourse"*

* Where the "problem" is the opportunity we're creating, the need we're addressing, etc, with the capability we're building.

Between Lehman, Floyd, and Naur, we have an important set of ideas for software, or any systems, really. We're building a theory, that informs our (design) decisions. We need to anticipate the impact of our decisions, in making them. And probe, to assess/amend our theory.

"what has to be built by the programmer is a theory of how certain affairs of the world will be handled by, or supported by, a computer program."
— Peter Naur

These classics advanced ideas about design that are important today



Formulating the Problem

Dancing with Systems

1. Get the beat

Before you disturb the system in any way, watch how it behaves.

2. Listen to the wisdom of the system

Aid and encourage the forces and structures that help the system run itself.

– Donella Meadows

Image: donellameadows.org

TECHNICAL LEADERSHIP

Formulating the Problem Is the Problem

Horst Rittel, the design theorist who coined the term "wicked problem," also said "formulating the problem is the problem." Donald Schon, another pioneering system thinker, wrote (in The Reflective Practitioner): “problems do not present themselves to practitioners as givens. They must be constructed from the materials of problematic situations which are puzzling, troubling, and uncertain.” Design is fractal and emergent. We move (in both directions) between problem and solution, constructing a theory of the problem and theory of the solution (Peter Naur).

Observe the System

“Before you disturb the system in any way, watch how it behaves. [..] If it’s a social system, watch it work. Learn its history. Ask people who’ve been around a long time to tell you what has happened. If possible, find or make a time graph of actual data from the system. Peoples’ memories are not always reliable when it comes to timing.

Starting with the behavior of the system forces you to focus on facts, not theories. It keeps you from falling too quickly into your own beliefs or misconceptions, or those of others. It’s amazing how many misconceptions there can be. [..]

Listen to the wisdom of the system. [..] Don’t be an unthinking intervener and destroy the system’s own self-maintenance capacities. Before you charge in to make things better, pay attention to the value of what’s already there.” — Donella Meadows

“the problem itself is grasped in the course of the design process.”
—Christiane Floyd

Mental Models

'these facets are incorporated into an internal representation that is sometimes called a "mental model"'

— SNAFUcatchers

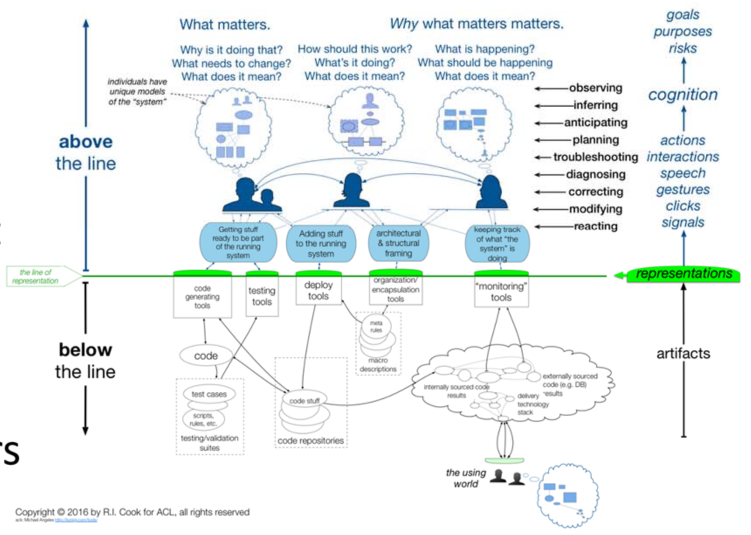


Image: Richard I. Cook, STELLA Report

Mental Models

We all have mental models. They are all imperfect. And they are all different. But they are the basis for our decisions — consequential decisions; decisions we may not be able to back out of, especially as other decisions become layered upon, and even entangled with, them.

"Perspectivity necessarily entails blindness. I cannot see what I cannot see from my perspective."

— Christiane Floyd

+

"what [@ri_cook] says is that there are multiple mental models inside an organization. And that is advantageous! It's good that there are multiple models. And the reason it's good, is because of the bounded rationality of each of these actors – no one person can hold the whole system in their head. The frames they make in their mind of what exists below the line, are what enable them to understand and make decisions about what's happening. If they tried to put the whole thing in their head, they'd spend their whole time trying to load it in their head, and they'd never make any decisions." – Jabe Bloom, Two Frames on Development and Operations, DevOpsCon

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Woods' Theorem: "As the complexity of a system increases, the accuracy of any single agent's own model of that system decreases rapidly."

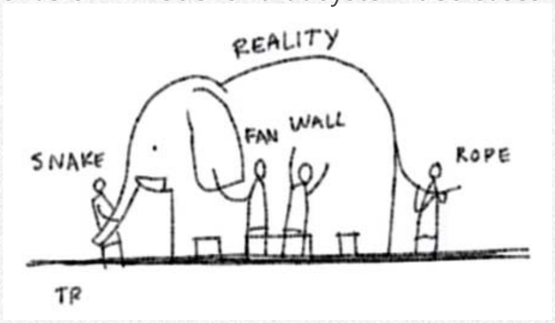
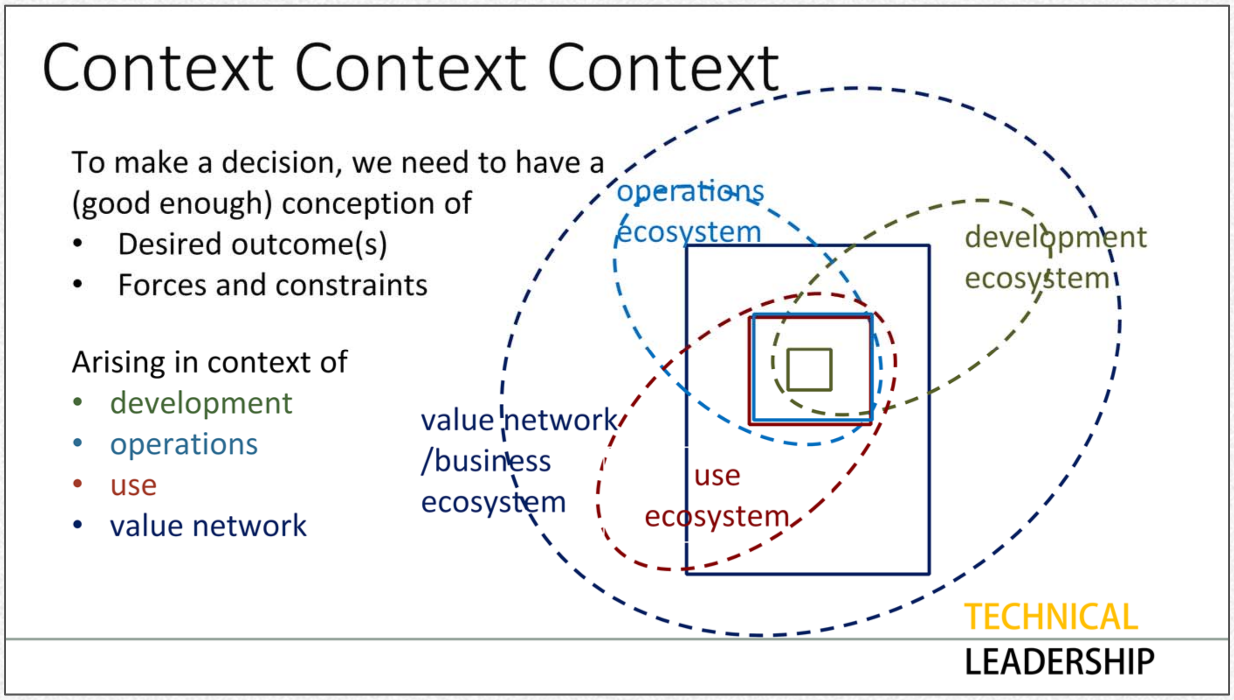


Image by Dave Gray in "Liminal thinking The pyramid of belief"

We need to understand various contexts, and their shaping forces, constraints, and trends



Context Context Context

To make a decision, we need to have a (good enough) conception of
- Desired outcome(s)
- Forces and constraints

Arising in context of
- development
- operations
- use
- value network

Contexts Factor

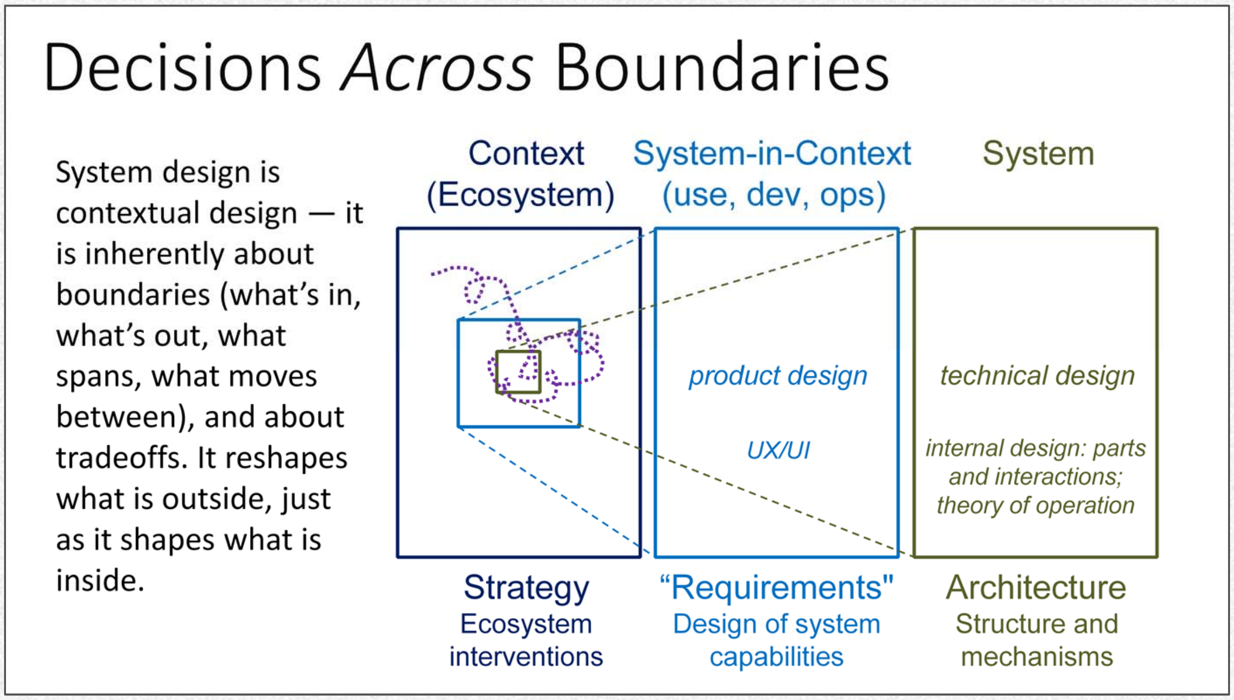
Making decisions, as well as conveying decisions, is as much about what is relevant in the context as it is about the decision we make in response. If we want to make better decisions, and convey them well, we need to have a (good enough) conception of the desired outcome(s), the forces we need to weigh and constraints we need to take into account, as well as the significant consequences and side-effects of our decision. Where these goals and forces arise in various contexts — development and operations, the contexts of use, and the broader value network. We're concerned with factors impacting developer experience, and forces arising from development constraints, capabilities, organizational forces like coordination mechanisms and costs (differing for collocated and distributed teams, say) and taking into account trends in the technology ecosystem. And so forth, also for operations engineers, management teams, security teams, as well as customers and users in various segments and at different points on the user path, as well as partners in the value network — channel partners, others adding value to our products, and more.

"What, at this extraordinary moment, is the most important thing for me to be thinking about?"
— Buckminster Fuller

Of course, this is a lot. These contexts are all important, and to avoid being overwhelmed, we have to use judgment in determining what to pay attention to. What do we need to be paying attention to, now? And what do we need to table, but be mindful about returning to, later? And what is tantalizingly almost relevant, that is hovering in peripheral vision, that we might, at some point need to turn our attention to?

Aside: There are several sociotechnical systems of note: the sociotechnical system that is the system and its users; the operations sociotechnical system, and the development sociotechnical system. (Or a devOps STS.) And there are associated ecosystems (value networks, organizations and teams, etc.).

Decisions that impact across boundaries, need perspective across boundaries


Decisions *Across* Boundaries

System design is contextual design — it is inherently about boundaries (what's in, what's out, what spans, what moves between), and about tradeoffs. It reshapes what is outside, just as it shapes what is inside.

System Design is Contextual Design

Recognizing that a system changes its contexts, means recognizing we're designing the system-in-context — not just the system, but the socio-technical system or system-in-context (of use) too. While we have limited degrees of design freedom with respect to the context, everything the system takes on, impacts its (various) context(s), so we are redesigning at least some aspects of the containing socio-technical systems and broader context.

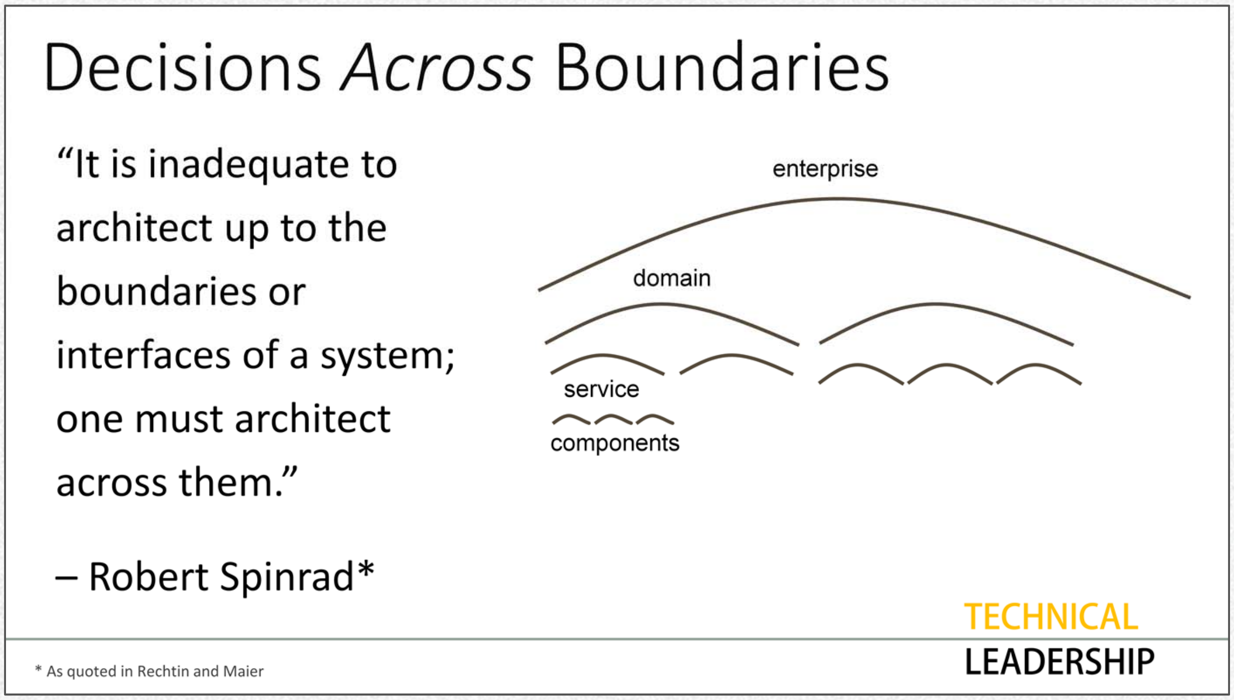
Alternately put, to develop our "theory of the problem," or to "load" the context into our mental models, so that we can uncover this multidimensional decision options and tradeoff space, we need to ask (not just) "what do users need?" but also "what do developers and testing need?" and "what do our operations and security teams need?" and "what do others in the value network need?"

We architect across — across boundaries: across not just the code and the teams involved, but across the internal system design (architecture and code/tests) and design of the system-in-use or system-of-systems design (what our industry has tended to call "requirements"); across the different languages and concerns of these different spaces, the technical language of code and test and integration, deployment and operation, and the languages of the domains where the system is used; across the turfs and sense of ownership and decision responsibility; across views and perspectives; etc.

But of course, we can't attend to everything, at least not all at the same time, in detail. We "zoom out," as it were, to scan the ecosystem or value landscape, to identify opportunities and challenges that do warrant closer attention. To set framing for the problem, to understand the trends and forces that shape and constrain it. To get a bearing on the ecosystems that are or will be impacted.

"We need to ask: what does the code need?" — Michael Feathers

"The greatest complexities arise exactly at boundaries"
— Donella Meadows



Decisions *Across* Boundaries

"It is inadequate to architect up to the boundaries or interfaces of a system; one must architect across them."

– Robert Spinrad*

enterprise
domain
service
components

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* As quoted in Rechtin and Maier

Systems: Cohesion, Integrity and Leadership

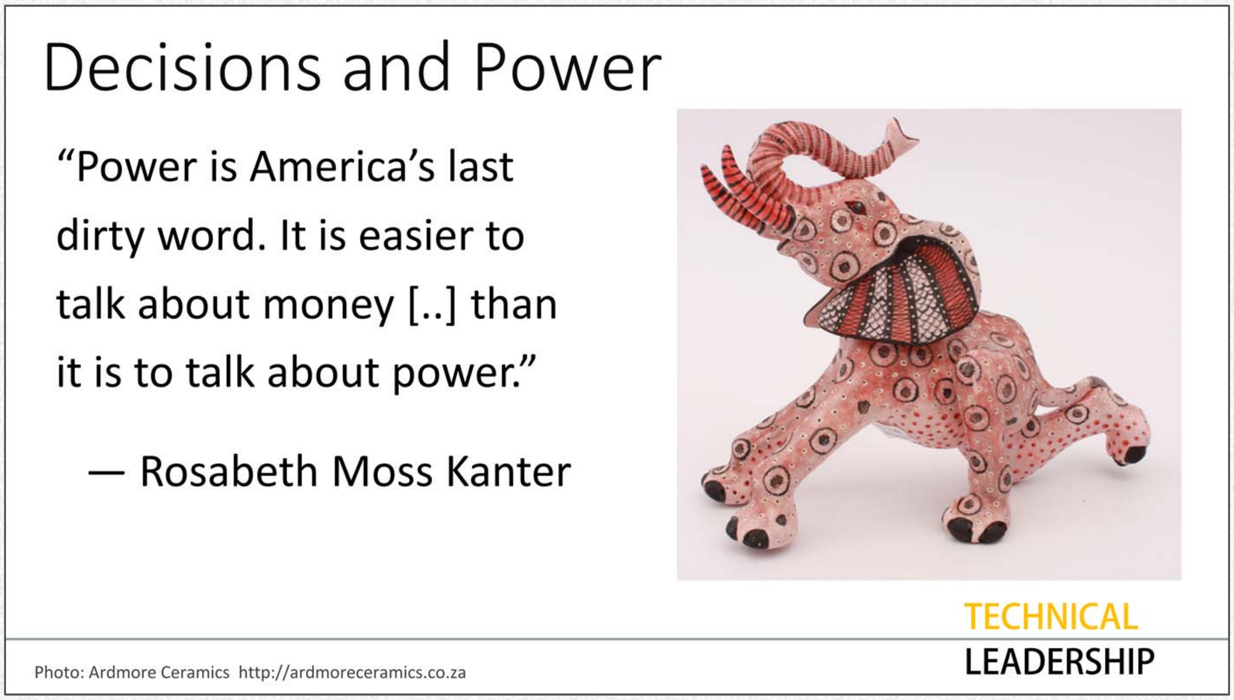
Recap: Our systems, and organizations, are complex, or grow to be (Lehman's Laws). Organization design, like other system design, entails a set of tradeoffs to weigh and balances to strike. Organizations have sub-entities because we organize to focus, to build and leverage capabilities, to get work done.

Communication costs – in terms of time but also in terms of focus of attention. Diverse perspectives are important to innovation; too many perspectives diffuses attention, increasing cognitive burden and demands on relationship fostering. Interdependencies cost in terms of potential for delays as well as interactions and relationships which need to be established and maintained.

So we seek to identify responsibility boundaries so teams can be more independent. And yet we want to create systems with structural and design integrity – that is, conceptual integrity, as well as robustness where it matters, and resilience or adaptive capacity. And organizational integrity (matters of ethics, and social and environmental responsibility).

Decision making in strategy and architecture is about setting direction and context, so that decision making and work at more narrow scope, produces something coherent at broader (system or system-of-systems) scope. Without these decisions, we have piecemeal contributions which fail to add up to a system with integrity. These decisions have impact across boundaries (and their associated arenas of responsibility), and it takes organizational will (determination, because they are hard and other things compete for attention), and a commitment to understanding the decision and its ramifications, to follow through.

Participation in decision making helps build understanding and a sense of priorities, but broad participation in every decision doesn't scale. So "higher level" decisions (decisions that impact across boundaries) need to be attended to and made in a smaller decision setting (a few people), but advocated for and shared in a way that brings others along, so that impacted work is consonant with these decisions. That is, decisions that impact others' work across boundaries, entail leadership across boundaries.



Decisions and Power

"Power is America's last dirty word. It is easier to talk about money [..] than it is to talk about power."

— Rosabeth Moss Kanter

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Photo: Ardmore Ceramics http://ardmoreceramics.co.za

About Power

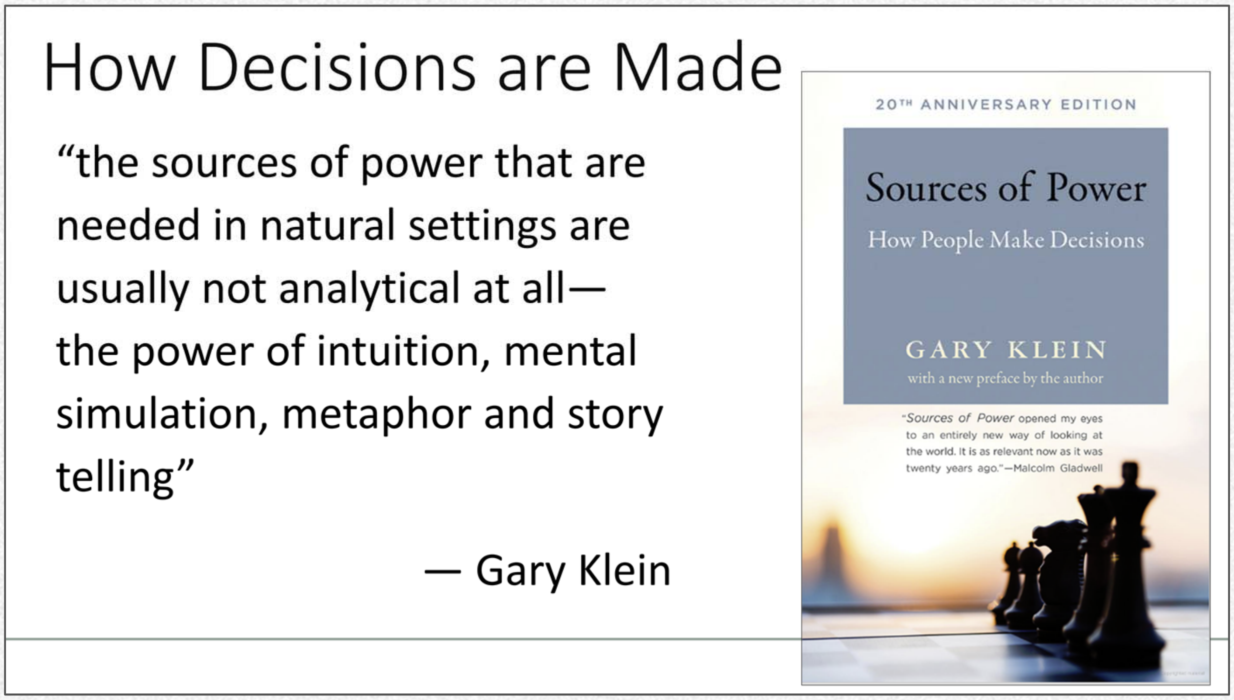
Making good decisions in high risk, high outcome situations, is a source of power. If people look to you to make critical outcome-shaping decisions, in a socio-dynamic sense, that's leadership. It's not all of leadership. But it factors.

In many situations, good decision making is associated with being in a leadership position. Yes, there's the Peter Principle (a person will rise in the hierarchy, stopping when they reach the level at which they are incompetent), but is that cynical? Working at broader scope, across domains, changes at each scope change (or level, in a hierarchy). The demands of the role differ, the context shifts, the relationships are different. Expertise needed shifts. Some people don't make the transition — perhaps because they need mentors or coaches and time to learn. Just like anything else.

Now, an inversion of the structures and dynamics of power comes of drawing on others to share in the decision making. "This typically requires an intersection of the right technical knowledge, a thorough understanding of your organization's goals, authority to make the decision, and responsibility for the consequences of the decisions made." — David Marquet (*Turn the Ship Around*)

"the core of the leader-leader model is giving employees control over what they work on and how they work. It means letting them make meaningful decisions. The two enabling pillars are competency and clarity"

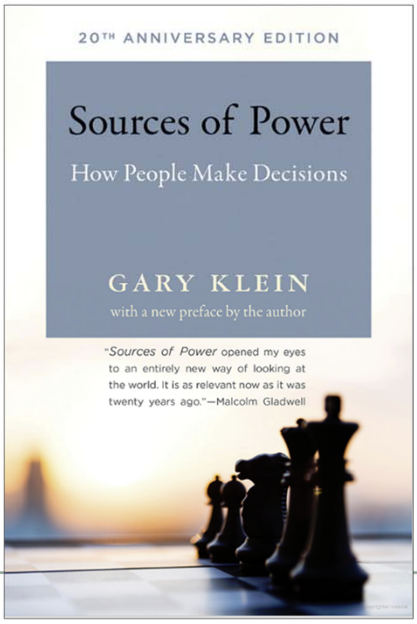
— David Marquet



How Decisions are Made

"the sources of power that are needed in natural settings are usually not analytical at all—the power of intuition, mental simulation, metaphor and story telling"

— Gary Klein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Sources of Power
How People Make Decisions
GARY KLEIN
with a new preface by the author
"Sources of Power opened my eyes to an entirely new way of looking at the world. It is as relevant now as it was twenty years ago."—Malcolm Gladwell

"In many cases, the problem isn't about having or noticing insights; it is about acting on them. The organization lacks the willpower to make changes."
— Gary Klein

Sources of Power

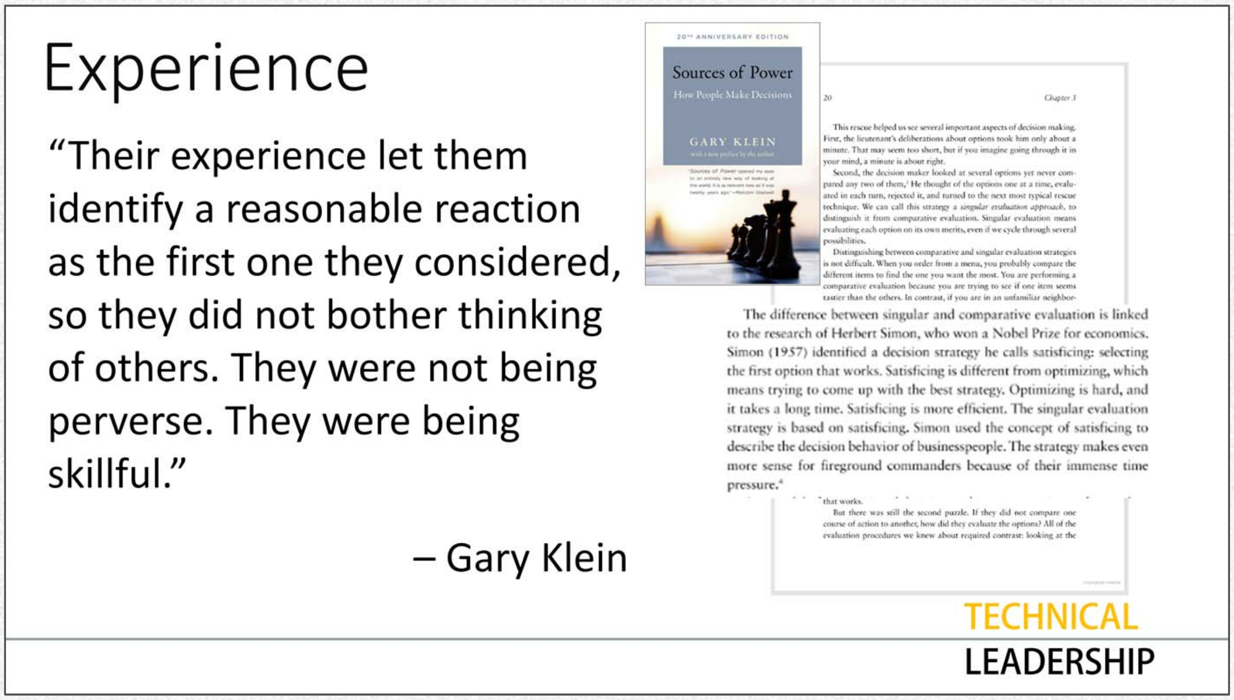
Gary Klein (*Sources of Power: How People Make Decisions*) studied decision making in settings that he characterizes as naturalistic decision making:

> "Features that help define a naturalistic decision-making setting are time pressure, high stakes, experienced decision making, inadequate information, ill-defined goals, poorly defined goals and procedures, and dynamic conditions."

Here, rather than deductive analysis and statistical methods, other "powers" were used:

> "The power of intuition enables us to size up a situation quickly. The power of mental simulation lets us imagine how a course of action might be carried out. The power of metaphor lets us draw on our experience by suggesting parallels between the current situation and something else we come across. The power of storytelling helps us consolidate our experiences to make them available in the future, either to ourselves or others."

Experience lets us recognize situations and identify actions to take, intuitively



Experience

"Their experience let them identify a reasonable reaction as the first one they considered, so they did not bother thinking of others. They were not being perverse. They were being skillful."

– Gary Klein

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Sources of Power

How People Make Decisions

GARY KLEIN

with a new preface by the author

20 *Chapter 3*

This rescue helped us see several important aspects of decision making. First, the lieutenant's deliberations about options took him only about a minute. That may seem too short, but if you imagine going through it in your mind, a minute is about right.

Second, the decision maker looked at several options yet never compared any two of them.[3] He thought of the options one at a time, evaluated in each turn, rejected it, and turned to the next most typical rescue technique. We can call this strategy a *singular evaluation approach*, to distinguish it from comparative evaluation. Singular evaluation means evaluating each option on its own merits, even if we cycle through several possibilities.

Distinguishing between comparative and singular evaluation strategies is not difficult. When you order from a menu, you probably compare the different items to find the one you want the most. You are performing a comparative evaluation because you are trying to see if one item seems tastier than the others. In contrast, if you are in an unfamiliar neighbor-

The difference between singular and comparative evaluation is linked to the research of Herbert Simon, who won a Nobel Prize for economics. Simon (1957) identified a decision strategy he calls satisficing: selecting the first option that works. Satisficing is different from optimizing, which means trying to come up with the best strategy. Optimizing is hard, and it takes a long time. Satisficing is more efficient. The singular evaluation strategy is based on satisficing. Simon used the concept of satisficing to describe the decision behavior of businesspeople. The strategy makes even more sense for fireground commanders because of their immense time pressure.[4]

that works.

But there was still the second puzzle. If they did not compare one course of action to another, how did they evaluate the options? All of the evaluation procedures we knew about required contrast: looking at the

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Experts Tend to Make Good (Enough) Decisions, Based on Experience

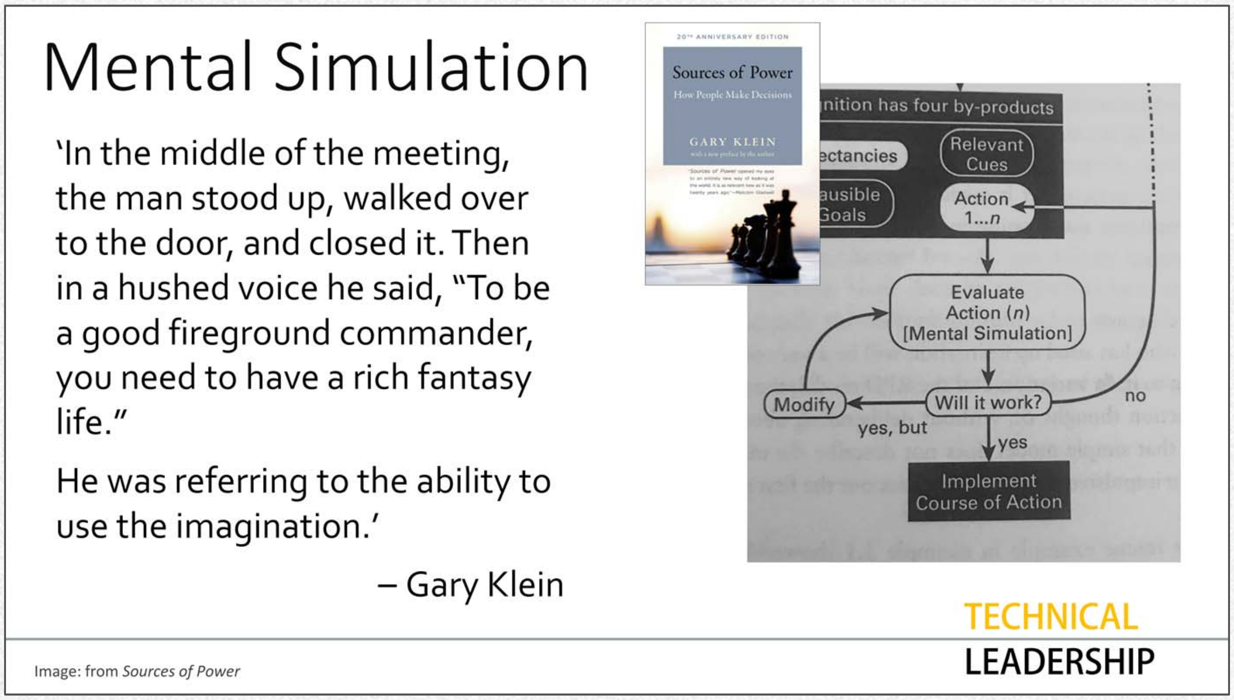
"The standard advice for making better decisions is to identify all the relevant options, define all the important evaluation criteria, weight the importance of each evaluation criterion, evaluate each option on each criterion, tabulate the results, and select the winner. In one form or another, this paradigm finds its way into training programs the world over. Again and again, the message is repeated: careful analysis is good, incomplete analysis is bad. And again and again, the message is ignored; trainees listen dutifully, then go out of the classes and act on the first option they think of. The reasons are clear. First, the rigorous, analytical approach cannot be used in most natural settings. Second, the recognitional strategies that take advantage of experience are generally successful, not as a substitute for the analytical methods, but as an improvement on them. The analytical methods are not the ideal; they are the fallback for those without enough experience to know what to do."

"*Intuition* depends on the use of experience to recognize key patterns that indicate the dynamics of the situation. This is one basis for what we call intuition: recognizing things without knowing how we do the recognizing." "If you want people to size up situations quickly and accurately, you need to expand their experience base."

Satisficing: "selecting the first option that works. Satisficing is different from optimizing, which means trying to come up with the best strategy. Optimizing is hard, and it takes a long time. Satisficing is more efficient." — Gary Klein, *Sources of Power*

"decision makers can satisfice either by finding optimum solutions for a simplified world, or by finding satisfactory solutions for a more realistic world"
*— Herbert Simon**

* in his Nobel Prize in Economics speech



Mental Simulation

'In the middle of the meeting, the man stood up, walked over to the door, and closed it. Then in a hushed voice he said, "To be a good fireground commander, you need to have a rich fantasy life."

He was referring to the ability to use the imagination.'

– Gary Klein

Image: from *Sources of Power*

Thought Experiments

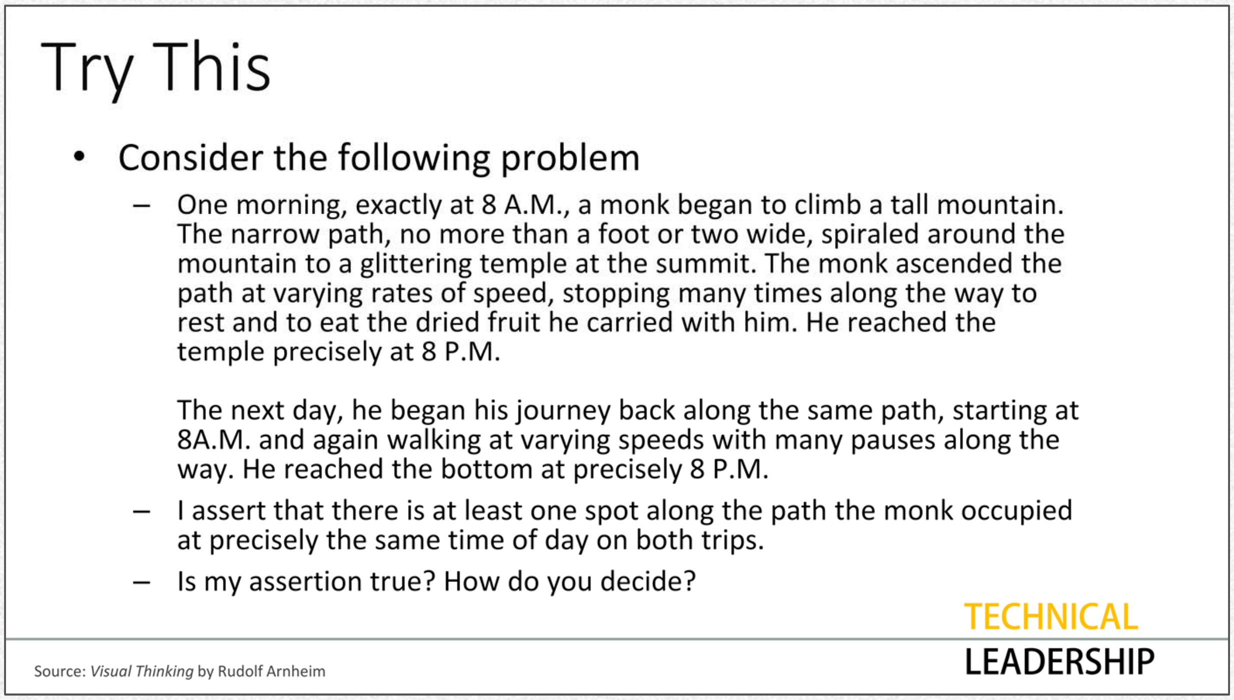
The quote in the slide above, is in the introductory paragraph in Gary Klein's chapter on mental simulation (in *Sources of Power*). It is a reminder that we tend too much to treat soft skills, and imagination in particular, as less than professional – less than "rational" or "objective" reasoning. Klein reminds us that we play out scenarios and alternatives in mind, to understand, to discover, to decide on courses of action.

Foresight is the application of imagination, of anticipating. I used to annoy my kids (don't judge me; repetition to the point of absurdity is the stuff of humor) when they'd say "I didn't mean to" and I'd respond "You've got to mean not to" – meaning, we need to try to anticipate the likely or even the possible, when it has bad consequences. Foresight is not a direct application of hindsight or learning from the past, but a willingness to take the risk of playing threads of the present forward, staying creative under uncertainty. Experience is valuable in giving us practice in recognizing cues and applying "muscle-memory" and tested-through-trial approaches, as well as in giving us the ability to anticipate, to "look ahead" and "look around" in an imaginative playing out of features and forces in a design or (other) decision moment. Project premortems (Gary Klein, HBR, 2007) asks us to imagine, during design, say, that a project *has* gone wrong, and to explore why.

"*Code wins arguments*" (from Zuckerberg's "Hacker Way" letter to investors included in Facebook's IPO filing). Sure, but are all arguments worth having? Out beyond not valuing design/anticipation/etc. and not valuing making stuff, there is a field… (apologies to Rumi, etc.)

"To me, the real challenge is getting teams to slow down for a moment and think about what's going to be built, why, what the risks are, and what might change." — Phillip Johnston

"mental anticipation.. pulls the future into the present"
— Erich Jantsch



Try This

- Consider the following problem
  - One morning, exactly at 8 A.M., a monk began to climb a tall mountain. The narrow path, no more than a foot or two wide, spiraled around the mountain to a glittering temple at the summit. The monk ascended the path at varying rates of speed, stopping many times along the way to rest and to eat the dried fruit he carried with him. He reached the temple precisely at 8 P.M.

    The next day, he began his journey back along the same path, starting at 8A.M. and again walking at varying speeds with many pauses along the way. He reached the bottom at precisely 8 P.M.
  - I assert that there is at least one spot along the path the monk occupied at precisely the same time of day on both trips.
  - Is my assertion true? How do you decide?

Source: *Visual Thinking* by Rudolf Arnheim

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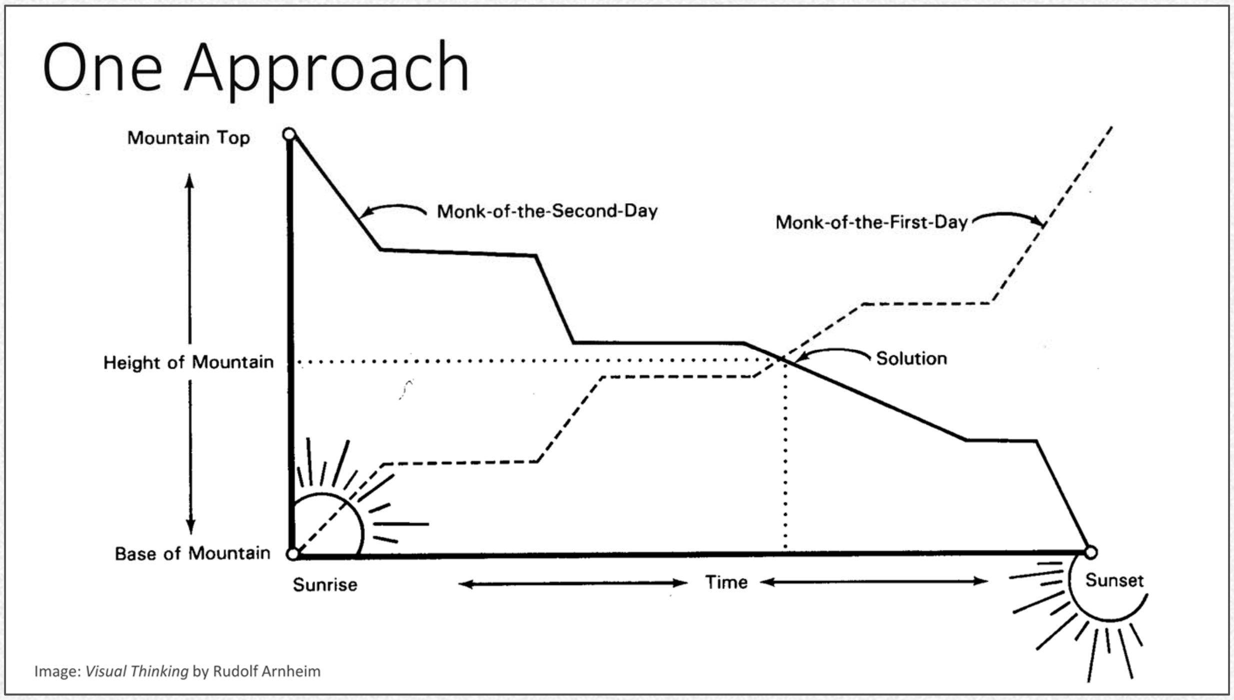
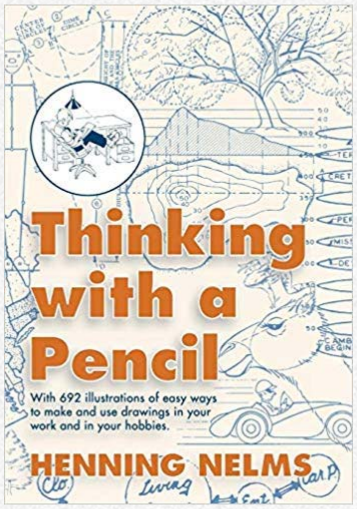
Exercise: Read the slide

And don't turn the page until you've had a chance to think about it.

"But thinking is nothing but talking to yourself inside."
"Oh yeah?" Bernie said. "Do you know the crazy shape of the crankshaft in a car?"
"Yeah, what of it?"
"Good. Now tell me: how did you describe it when you were talking to yourself?"
So I learned from Bernie that thoughts can be visual as well as verbal."
— Richard Feynman



(Mental) Simulation Illustration


Thinking with a Pencil
With 692 illustrations of easy ways to make and use drawings in your work and in your hobbies.
HENNING NELMS

One way to think, is to draw, and the diagram illustrates that we can say yes. Another way to think about it is each of my hands is the monk on the two days, and one hand will move along the path in one direction, and the other hand is the monk starting at the other end of the path, and moving in the other direction on the same path. My hands have to meet at some point, at the same time. As important as the illustrations are to the point that we can put something in the world to help us think, it's also illuminating that some people will still not see it, and these people are important too. We can try to illuminate the solution different ways, but our perspectives differ, we're looking for a catch, and trust and credibility may factor, etc.

"We have misfiled the significance of drawing because we see it as a professional skill instead of a personal capacity [..] This essential confusion has stunted our understanding of drawing and kept it from being seen as a tool for learning above all else." — D.B. Dowd

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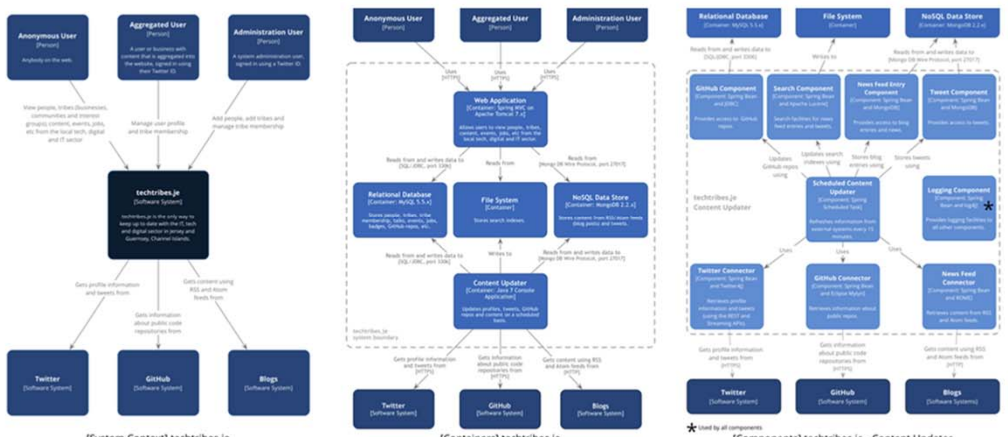
Modeling and Sketchprototypes



[System Context] techtribes.je

[Containers] techtribes.je

[Components] techtribes.je - Content Updater

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Image: Simon Brown's C4 Model https://c4model.com/

Thought Experiments, Sketchprototypes, and Heuristics

Whether you're using an ad hoc approach, or *Visual Architecting* with UML and/or C4 (from Simon Brown), or something else, diagrams, models, views of the system, are ways to explore "decisions in formation" — sets of related decisions, as well as formative ideas — to probe and assess them.

We take a guess as a starting point, and improve on it: model, and run thought experiments across it. For example, take use cases or user stories or focus on one property, then another, etc., and "run" (imagine and talk through) behavior across the structure models, to flush out component responsibilities we overlooked in our initial guess. Lists of responsibilities (for elements of a system — technical, strategic or organizational) are a powerful and largely overlooked/under used tool in the architect's toolbelt. If the responsibilities don't cohere within an overarching responsibility, or purpose, that should trip the architect's boundary bleed detectors. Interactions at the boundaries are essential to making a system more than the sum of its parts, but introduce coupling and (inter)dependencies.

As we do this exploration with the aid of models (just as we do when doing design in the medium of code), we're applying heuristics we've developed through experience, and exposure to other people's work (books, and such). Heuristics don't take away the need to think, to reason and try things out. They help us identify what to think about, as we do so, and may suggest how to go about it (better).

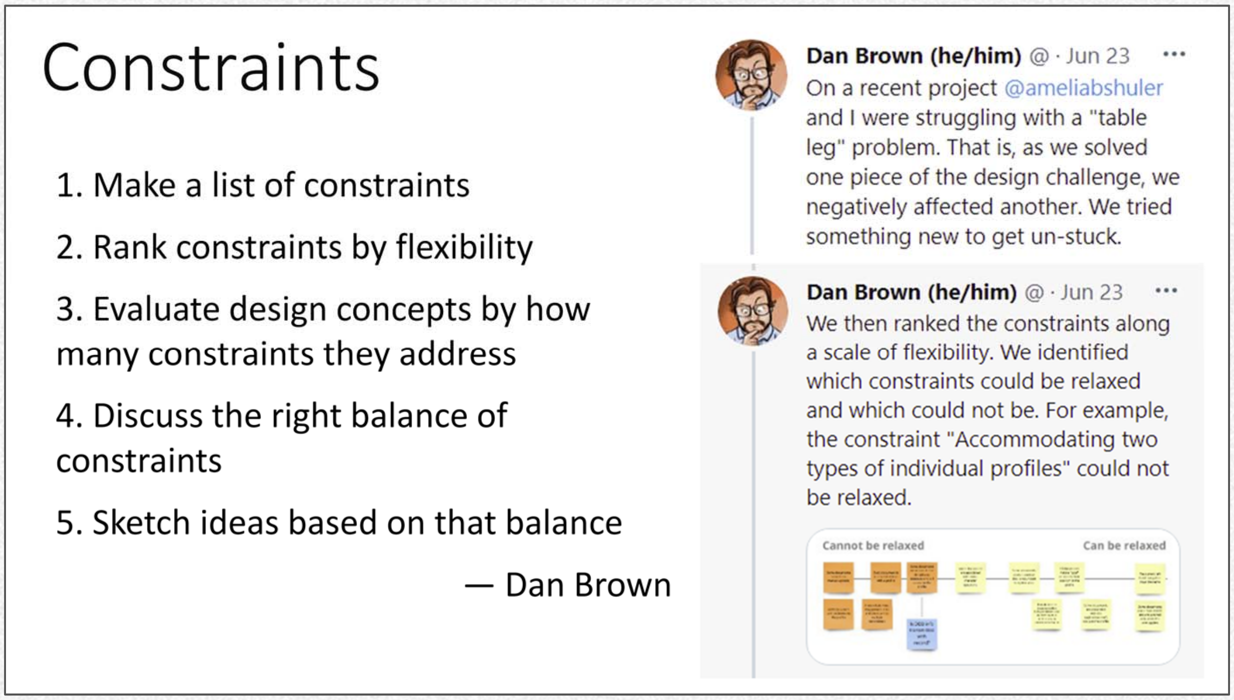
"Heuristics offer plausible approaches to solving problems, not infallible ones." — Rebecca Wirfs-Brock

To illustrate, let's turn to Parnas and his criteria (heuristics) for decomposing, and hence coping with complex systems despite our bounded rationality:

> "[begin] with a list of difficult design decisions [..] Each module is then designed to hide such a decision from the others ."

Be deliberate and deliberate all the things"
— Dawn Ahukanna

Identifying constraints and degrees of freedom.



Constraints

1. Make a list of constraints
2. Rank constraints by flexibility
3. Evaluate design concepts by how many constraints they address
4. Discuss the right balance of constraints
5. Sketch ideas based on that balance

— Dan Brown

Dan Brown (he/him) @ · Jun 23
On a recent project @ameliabshuler and I were struggling with a "table leg" problem. That is, as we solved one piece of the design challenge, we negatively affected another. We tried something new to get un-stuck.

Dan Brown (he/him) @ · Jun 23
We then ranked the constraints along a scale of flexibility. We identified which constraints could be relaxed and which could not be. For example, the constraint "Accommodating two types of individual profiles" could not be relaxed.

Cannot be relaxed

Can be relaxed

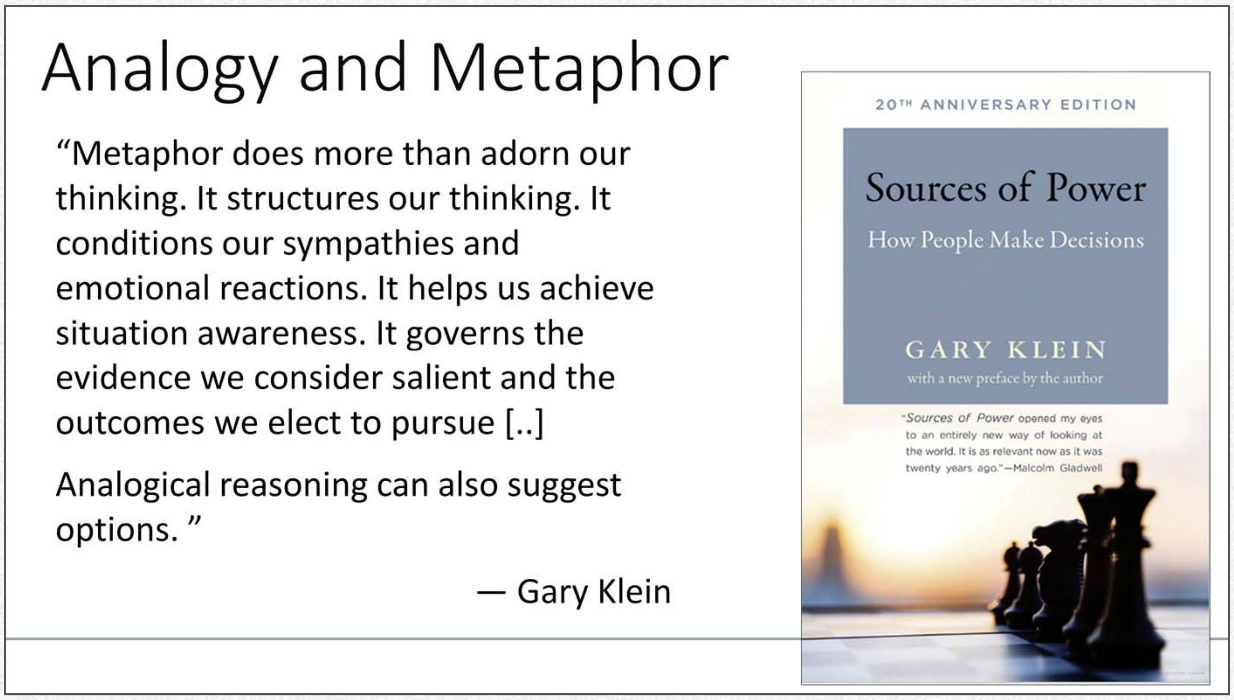
Constraints and the Design Envelope

Engineers have a concept of a design envelope or design space that is created by constraints – outside the design envelope, the design is (technically) infeasible or (economically or socially) not viable.

The concept of a Pareto frontier is useful, not because we know (in general) where this frontier lies exactly (though we find out when we cross it), but because it reminds us we're working in a space of interacting decisions and constraints – some of which may only "bite" (factor crucially) at some point.

Pareto Frontier: "The Pareto frontier is the set of all Pareto efficient allocations, conventionally shown graphically. ... It is a statement of impossibility of improving one variable without harming other variables in the subject of multi-objective optimization (also termed Pareto optimization)." (Source: wikipedia)

"Pareto efficiency or Pareto optimality is a situation where no individual or preference criterion can be better off without making at least one individual or preference criterion worse off or without any loss thereof." (Source: wikipedia)

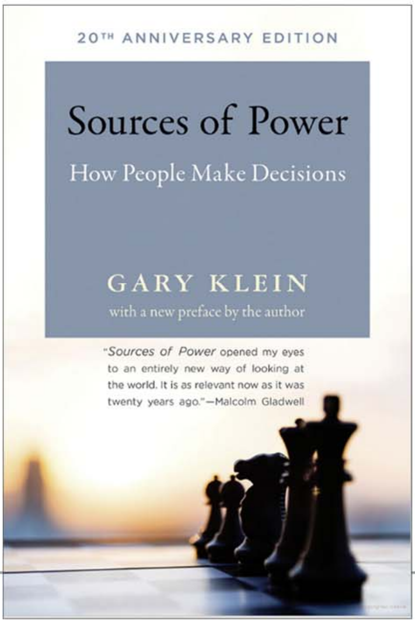


Analogy and Metaphor

"Metaphor does more than adorn our thinking. It structures our thinking. It conditions our sympathies and emotional reactions. It helps us achieve situation awareness. It governs the evidence we consider salient and the outcomes we elect to pursue [..]

Analogical reasoning can also suggest options. "

— Gary Klein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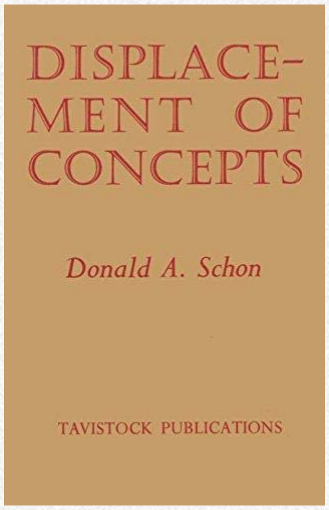
"Analogues provide the problem solver with a recommendation about what to do."
— Gary Klein



Using Analogies To Solve Problems

"If we did not want to use analogical reasoning for tasks like these, we would be stuck. We would not know enough to construct formulas or to use them or have enough hard information to proceed. By using analogues, we are tapping into the same source of power for stories. We are applying an informal experiment, using a prior case with a known outcome and a semi-known set of causes to make predictions about a new case."

"First, we learned that they do not select analogues just based on similarity. [..] You would select an analogue that shares the same dynamics [..] If you do not have enough experience to take causal factors into account, you can get into trouble. The engineers we studied were all knowledgeable.

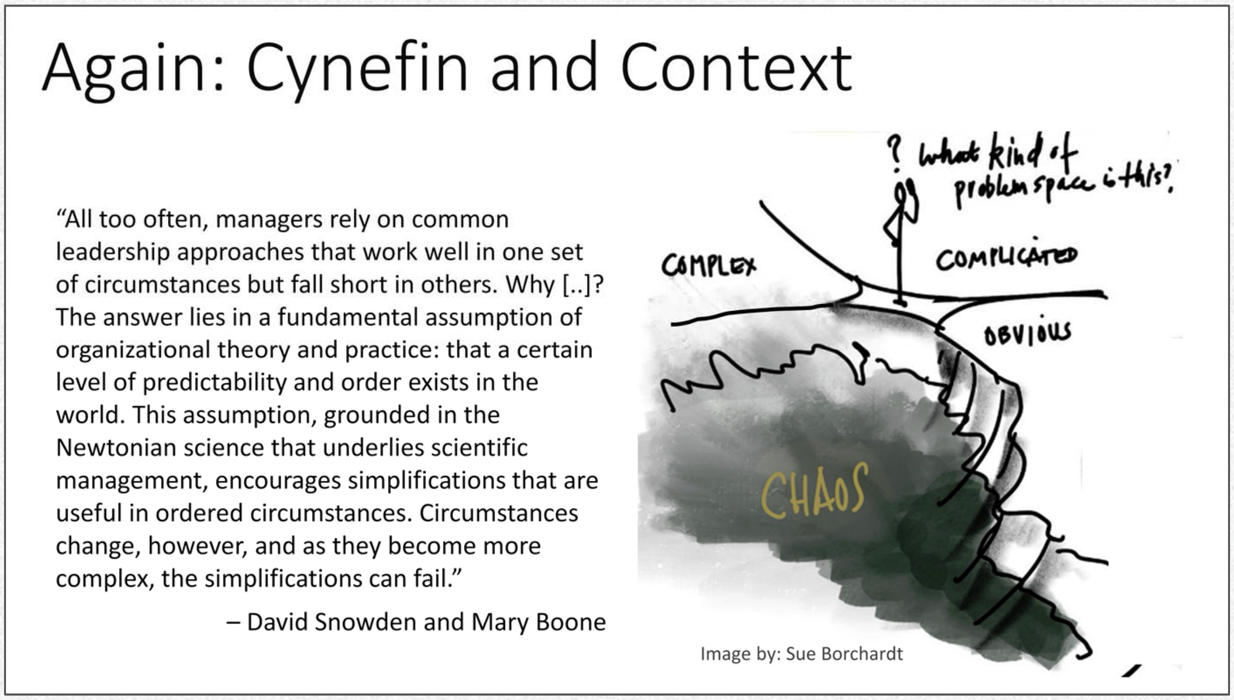
Second, we learned that some causal factors are easy to adjust for, and others are not.

Third, we learned that the logic of reasoning by analogy is similar to the logic of an experiment: to draw a conclusion without having to know all of the important factors operating."

— Gary Klein, *Sources of Power*

Analogies help us shape the problem (what we're addressing, and how we conceive of it) and get ideas for solutions (how we approach it).

Circumstances matter — is this ordered and routine, or novel and unpredictable?



Again: Cynefin and Context

"All too often, managers rely on common leadership approaches that work well in one set of circumstances but fall short in others. Why [..]? The answer lies in a fundamental assumption of organizational theory and practice: that a certain level of predictability and order exists in the world. This assumption, grounded in the Newtonian science that underlies scientific management, encourages simplifications that are useful in ordered circumstances. Circumstances change, however, and as they become more complex, the simplifications can fail."

– David Snowden and Mary Boone

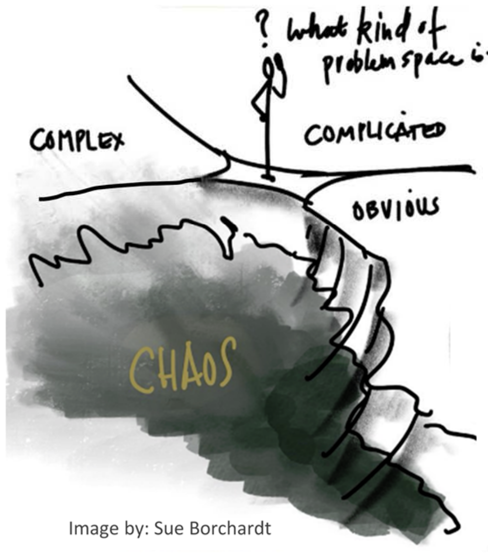


Image by: Sue Borchardt

Liz Keogh's Introduction to Cynefin

Liz Keogh has a useful introduction to Dave Snowden's Cynefin framework (and the extracts below are from Liz Keogh's post). Cynefin introduces four domains – obvious, complicated, complex and chaotic:

Obvious

Obvious problems are ones that either children can solve, or, if they do require expertise, the solution is obvious. In the obvious domain, there's normally one good way to solve the problem – a "best practice".

Complicated

As things become more and more complicated, the solution requires more and more expertise. A watchmaker knows how to fix your watch. The outcome is still predictable, but now it takes an expert to know how to get there. Both the Obvious and Complicated domains are called ordered. Ordered problems have repeatable solutions; the same process applied to the same problem will always work.

Complex

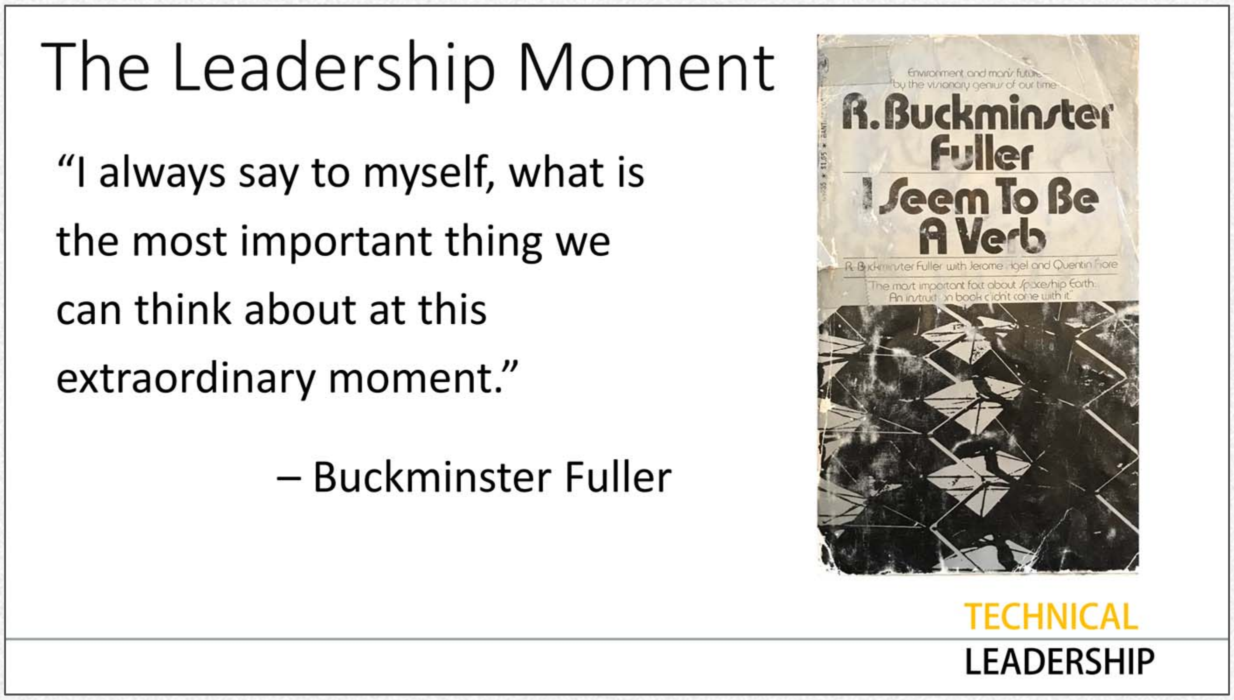
Complex problems are ones in which the solution, and the practices which lead to it, emerge. While it's possible to think of examples of what a solution might look like, attempting to create that solution usually creates unexpected side-effects; other problems or unintended consequences that might need to be solved. Cause and effect are only correlated in retrospect; you can see how you got there, but you couldn't possibly have predicted it. This is the domain of "wicked" problems that tend to resist being easily solved with expertise. In the complex domain, we have to probe the problem.

"A Quick Introduction to Cynefin ," by Liz Keogh

Chaos

Chaos is a transient domain; it resolves itself quickly, and not necessarily in your favor. It's dominated by urgency and the need to act, and act fast.

"Cynefin, pronounced ku-nev-in, is a Welsh word that signifies the multiple factors in our environment and our experience that influence us in ways we can never understand"
— David Snowden and Mary Boone



The Leadership Moment

"I always say to myself, what is the most important thing we can think about at this extraordinary moment."

– Buckminster Fuller

Environment and man's future by the visionary genius of our time
R. Buckminster Fuller
I Seem To Be A Verb
R. Buckminster Fuller with Jerome Agel and Quentin Fiore
"The most important fact about Spaceship Earth: An instruction book didn't come with it."

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What at this Moment?

It's a lot? Sure. We need to continually be asking ourselves the orienting question: "what at this extraordinary moment, is the most important thing for me, and for us, to be attending to?"

Leadership is associated with vision, or at least, we tend to attribute absence of leadership when clear, shared vision is lacking. Is vision what we need to be attending to? Is it threat, and inhibitors to success? Is it decisions and shared understanding of the outcomes and our chosen approach to reaching them?

Who *at this Moment?*

We need to be aware of, think consciously about, who is involved. Diverse perspectives, born of different backgrounds and experience sets, are important to understanding the (various) contexts of use, development, and operations, surface ethical considerations, and understanding alternatives and impacts.

Asking who, is also about understanding that with too many involved, we can slow the process down (reaching agreement, decisions by committee, etc.). And we need to balance this with creating shared understanding and insight into the constraints and forces taken into account. We can get some of these benefits, involving others in reviews, etc.

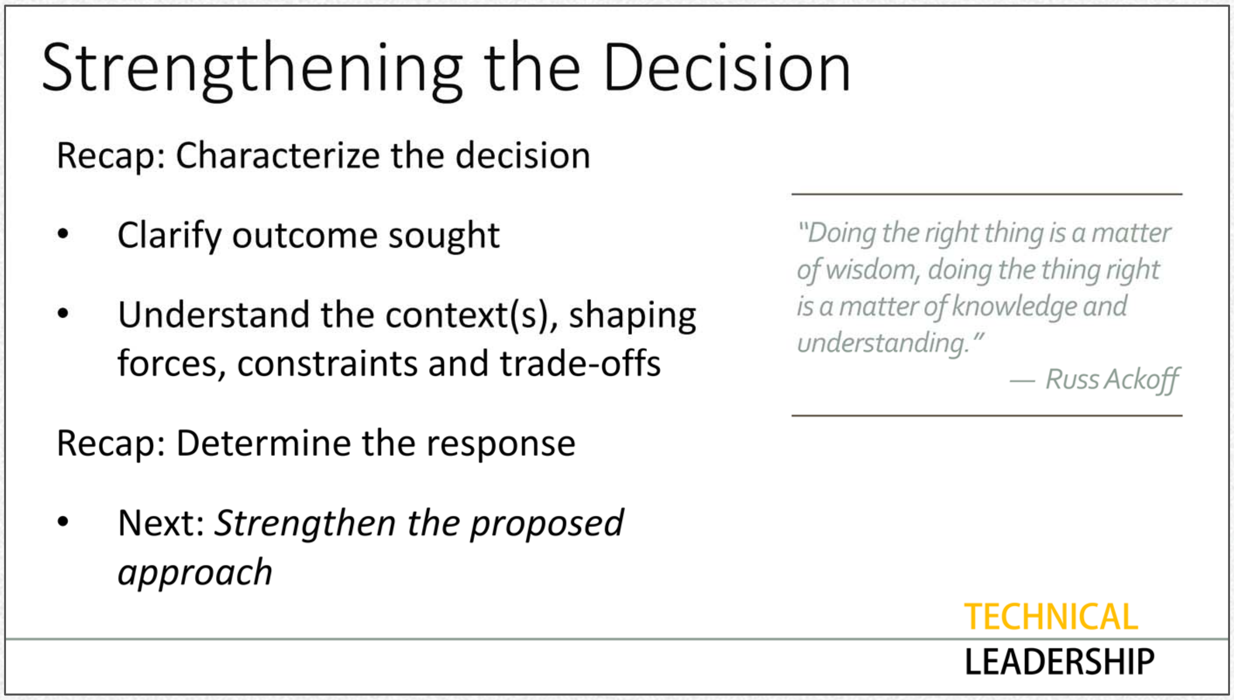
Minimalist Discipline

Adopt a minimalist orientation:

Leaders work across; any decisions we make (or decisions we guide in the making), ought to be those that have substantive consequence and impact on system outcomes, and implications in different contexts.

Minimalist: does the decision need to be made by me? Scope? Timing? Impact? No? Then don't make it!

If it's highly consequential, make it good, and then make it better



Strengthening the Decision

Recap: Characterize the decision

- Clarify outcome sought
- Understand the context(s), shaping forces, constraints and trade-offs

Recap: Determine the response

- Next: *Strengthen the proposed approach*

"Doing the right thing is a matter of wisdom, doing the thing right is a matter of knowledge and understanding."
— Russ Ackoff

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Strengthening Our Decisions

So far, we've been considering why we make decisions and what kinds of decisions we make more intentionally and when. And what goes into making technical decisions. Not prescriptively, for it's a judgement call, or rather, sets of judgment calls.

To inform the decision, we seek to understand the context or circumstances (Diana Montalion), and seek to identify the best possible approach, or solution, or resolution.

If the decisions we're making are make or break, it's worth considering how might we strengthen our reasoning underlying the decision. What do we need to learn, to increase confidence (our own, and stakeholders') in our approach? What constrains us? What are we not willing to compromise on? And yes, this can take time. We acknowledge uncertainty and incompleteness and seek to improve our understanding of impact and fit and options and opportunities.

Not that we want bullets, but to play with the "no silver bullets" (Brooks in MMM) expression: we know that objectivity isn't a thing we reach, but in attempting it, we employ the practices of science and experiment, to try to get to sounder decisions. To discover. To adapt. Where it matters.

"My first round I tried appealing to rationality. Then I ran smack bang into bounded rationality."
— Abdul Gani

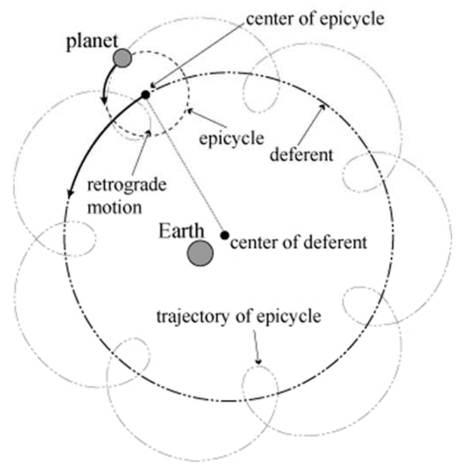
"There is a silver bullet — it's relationships of goodwill and a commitment to objectivity"

"look at reasons in terms of:
- *fact: is it so?*
- *inference: does it follow?"*
- *weight: does it matter?"*

— Diana Montalion

Perspective influences our views, and our views influence our perspectives

Perspective, Illustrated



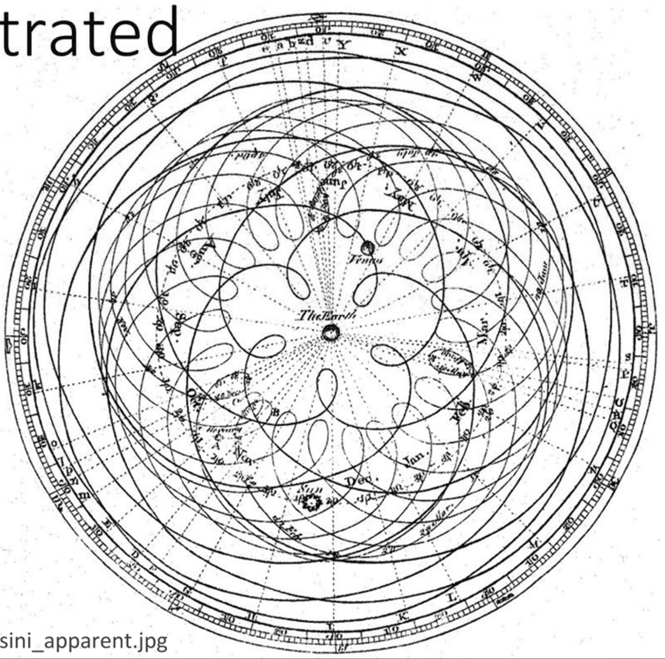


Image: wikimedia.org/wikipedia/commons/0/0e/Cassini_apparent.jpg

One way to change your vantage point is to see from someone else's point of view

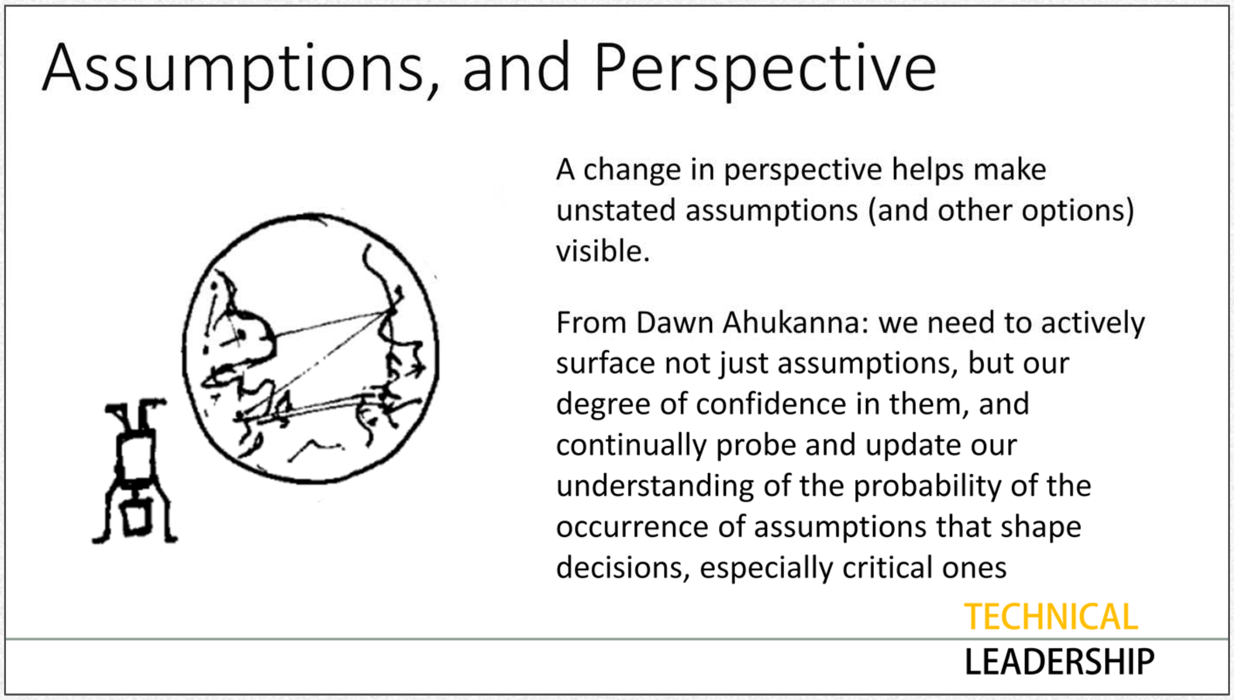
Perspective (Shifts)

Christin Gorman used this example in a wonderful talk recently: Before Copernicus, the earth was generally assumed to be at the center of the universe (geocentricism), and observations about the planets' movements were explained by a model that worked – its predictions were consistent with observations. Copernicus argued that the sun was at the center of the solar system, which resulted in a much simpler model, that explained and predicted the planets paths.

Christin uses this as an example of how we can be wrong. (And not know it. Until we know it.) Which brings in Kathryn Schulz's TED Talk: *On being wrong*. It is wonderful, and highly recommended, but here is the most important (and funny, when she does it) take-away: When asked "what does it feel like, emotionally, to be wrong?" we answer things like "embarrassed," "awkward," (and if we're self-aware?) "defensive," … Kathryn points out: "That is answering a different question – namely, "what does it feel like to find out we're wrong?" She recalls how, when running off a cliff, Wile Coyote continues running -- on thin air, and only falls when he realizes there's only air beneath him. And she points out that *being wrong feels exactly the same as being right*. Sure, Feynman pointed out "The first principle is that you must not fool yourself – and you are the easiest person to fool." But notice that he was talking about *you*. I'm kidding, but also not. It's key to Kathryn's talk.

Christin Gorman: Our architecture is a mess! Are you sure?, DevCon 2019

Kathryn Schulz: https://www.ted.com/talks/kathryn_schulz_on_being_wrong



Assumptions, and Perspective

A change in perspective helps make unstated assumptions (and other options) visible.

From Dawn Ahukanna: we need to actively surface not just assumptions, but our degree of confidence in them, and continually probe and update our understanding of the probability of the occurrence of assumptions that shape decisions, especially critical ones

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Repairing Blindspots

'But the critical ones are what Jeff Bezos calls "irreversible" and therefore load bearing. If they are built on assumptions (with probability o) "Things fall apart; the center does not hold" (Yeats, quoted by Chinua Achebe in Things Fall Apart.)'
— Dawn Ahukanna

"A change of perspective is worth 80 IQ points" (Alan Kay) reminds us to take a different vantage point, to see from a different perspective, use the lens of various views. We need to notice what is hard to notice from inside the tunnel of our own vision — where what we're paying attention to, shapes what we perceive and pay attention to. Another way to get a change of perspective, is to get another person's perspective. Our team can miss the gorilla*, so to speak, when our attention is focused on the design issues of the moment. Fresh perspective, and even just naive questions about what the design means, can nudge an assumption or weakness into view. And merely telling the story, unfolding the narrative arc of the architecture to fit this person or audience, then that, gets us to adopt more their point of reference, across more perspectives — in anticipation, and when we listen, really listen, to their response and questions.

We need to adopt the discipline of not just accepting our initial understanding, but rather seeking different understandings. This illuminates options, and gives us other things to try. These are the significant decisions, decisions about the important stuff, after all.

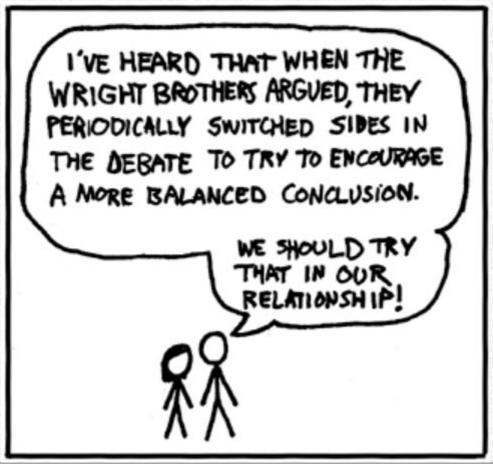
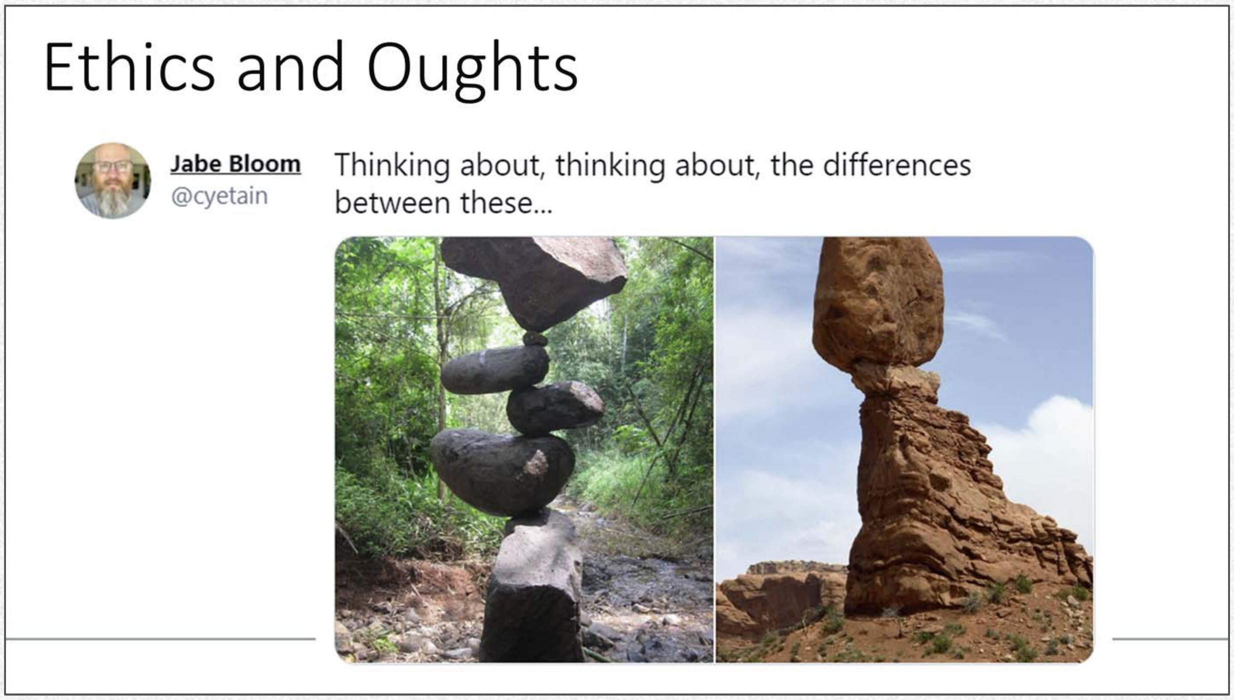

I'VE HEARD THAT WHEN THE WRIGHT BROTHERS ARGUED, THEY PERIODICALLY SWITCHED SIDES IN THE DEBATE TO TRY TO ENCOURAGE A MORE BALANCED CONCLUSION.
WE SHOULD TRY THAT IN OUR RELATIONSHIP!

Image xkcd.com/106/

** referencing the Simons and Chabris Selective Attention Experiment.*

Design expresses intention. Once we have intention, we have judgment. Consequences. Tradeoffs. Oughts. Ethics.



Ethics and Oughts

Jabe Bloom
@cyetain

Thinking about, thinking about, the differences between these...

"the designer, is concerned with how things ought to be - how they ought to be in order to attain goals, and to function. "
— Herbert Simon

We lead to enable things to be more the way they ought to be.

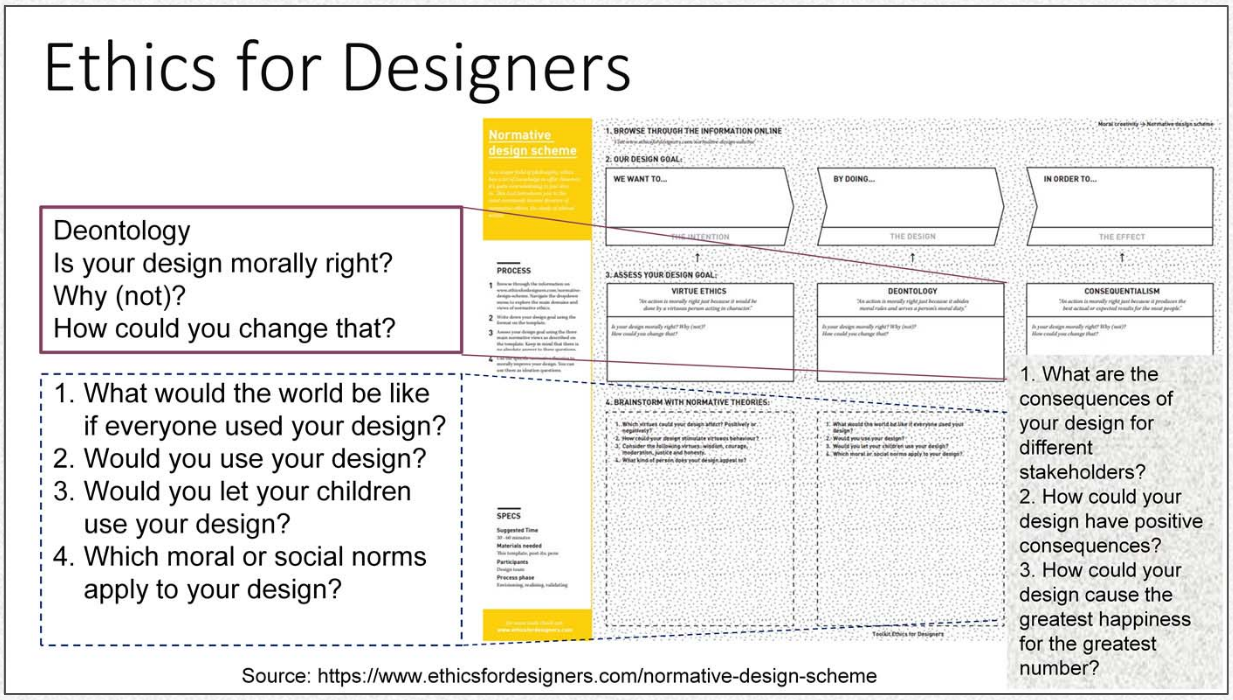
Intention, and Oughts

"The rocks on the right where (presumably) assembled by "objective" means, no human intervened, physical explanations should be able to capture how it "got like that. " [T]he rocks on the left... OTOH... can't VIOLATE physical laws... but their assembly includes a good deal of human judgment" — Jabe Bloom (@cyetain)

Just because we can, doesn't mean we should. But there is a lot to discern, and forces and pressures.

Consider rock stacking in river beds. "Rock stacking can be detrimental to the sensitive ecosystems of rivers and streams. Moving rocks from the river displaces important ecosystem structure for fish and aquatic invertebrates. Many of our Ausable River fish species lay eggs in crevices between rocks, and moving them can result in altered flows, which could wash away the eggs or expose the fry to predators. Salamanders and crayfish also make their homes under rocks, and rock moving can destroy their homes, and even lead to direct mortality of these creatures." (Ausable River Association website)

The point? Is that our impact adds up. How much should and could we think about? More than we have, typically? Yes, technology disrupts. Has positive and negative effects. Still, considerate design would have us think in terms of impacts.



Ethics for Designers

Normative design scheme
PROCESS
SPECS
1. BROWSE THROUGH THE INFORMATION ONLINE
2. OUR DESIGN GOAL:
WE WANT TO...
BY DOING...
IN ORDER TO...
THE INTENTION
THE DESIGN
THE EFFECT
3. ASSESS YOUR DESIGN GOAL:
VIRTUE ETHICS
DEONTOLOGY
CONSEQUENTIALISM
4. BRAINSTORM WITH NORMATIVE THEORIES:
1. Which virtues could your design affect? Positively or negatively?
2. How could your design stimulate virtuous behaviour?
3. Consider the following virtues: wisdom, courage, moderation, justice and honesty.
4. What kind of person does your design appeal to?
1. What would the world be like if everyone used your design?
2. Would you use your design?
3. Would you let your children use your design?
4. Which moral or social norms apply to your design?

Deontology
Is your design morally right?
Why (not)?
How could you change that?

1. What would the world be like if everyone used your design?
2. Would you use your design?
3. Would you let your children use your design?
4. Which moral or social norms apply to your design?

1. What are the consequences of your design for different stakeholders?
2. How could your design have positive consequences?
3. How could your design cause the greatest happiness for the greatest number?

Source: https://www.ethicsfordesigners.com/normative-design-scheme

How Design Designs Us: Part 3 | The Ethics of Design

Leyla Acaroglu writes:

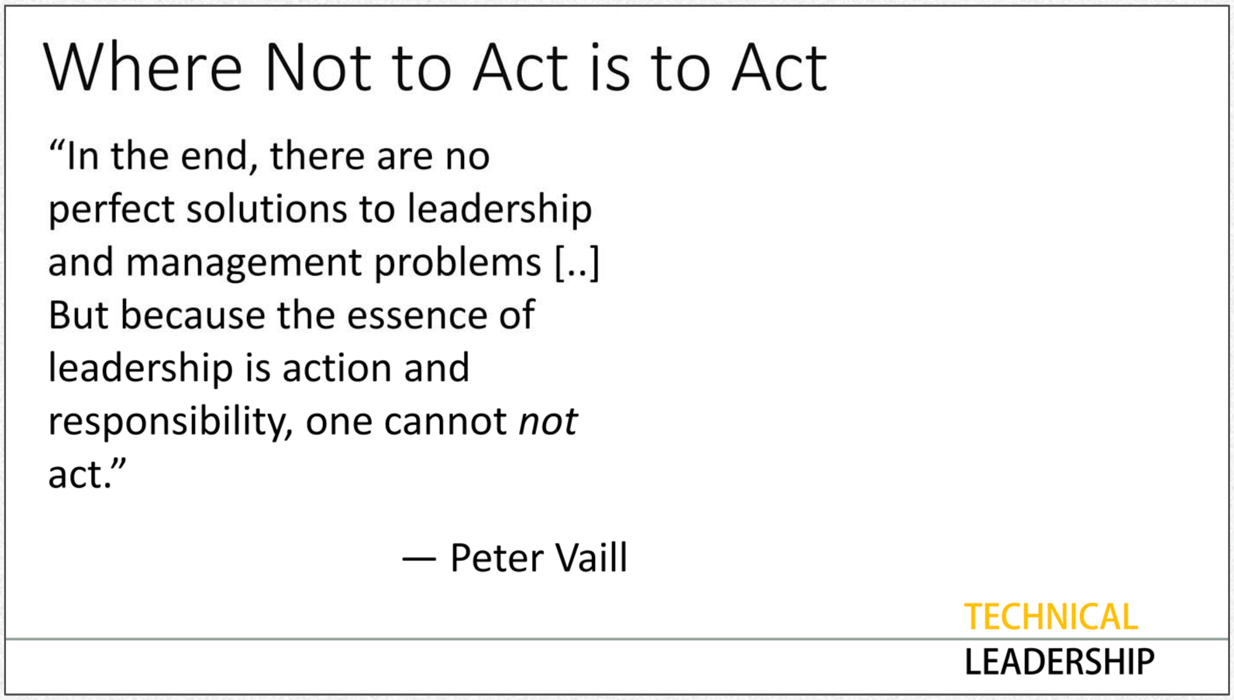
"With all this rapid post-industrial revolution growth and technological advancement, we are beginning to see the fall-out of the avoidance of a singular question: how does what we design, design us?"

"Nearly everyone I interviewed had, at some point, learnt about the systemic implications of rapid innovation and how to make better decisions; yet, most of them still passed off the responsibility of 'right' decision making to someone else. It was the boss's, client's, manufacturer's, government's, or consumer's choice that would solve the problem that their production would participate in. When everyone within a system plays this hands-off, 'that's not my problem' game, the system is very quickly riddled with externalities··· and a shit load of problems! This appears to be the case with the complex debate around the ethics of design and technology."

"Who is taking responsibility for the outcomes, externalities, and downright damaging impacts of our hyper-consumer, ever-changing landscape of new gadgets and virtual arenas that are coming on board at a lighting speed pace?"
— Leyla Acaroglu

Source: Leyla Acaroglu, How Design Designs Us: Part 3 | The Ethics of Design
https://medium.com/disruptive-design/how-design-designs-us-part-3-the-ethics-of-design-ca40e33f5842#.5ur28he4l

Not deciding and not acting, just means other things are being decided and acted on …



Where Not to Act is to Act

"In the end, there are no perfect solutions to leadership and management problems [..] But because the essence of leadership is action and responsibility, one cannot *not* act."

— Peter Vaill

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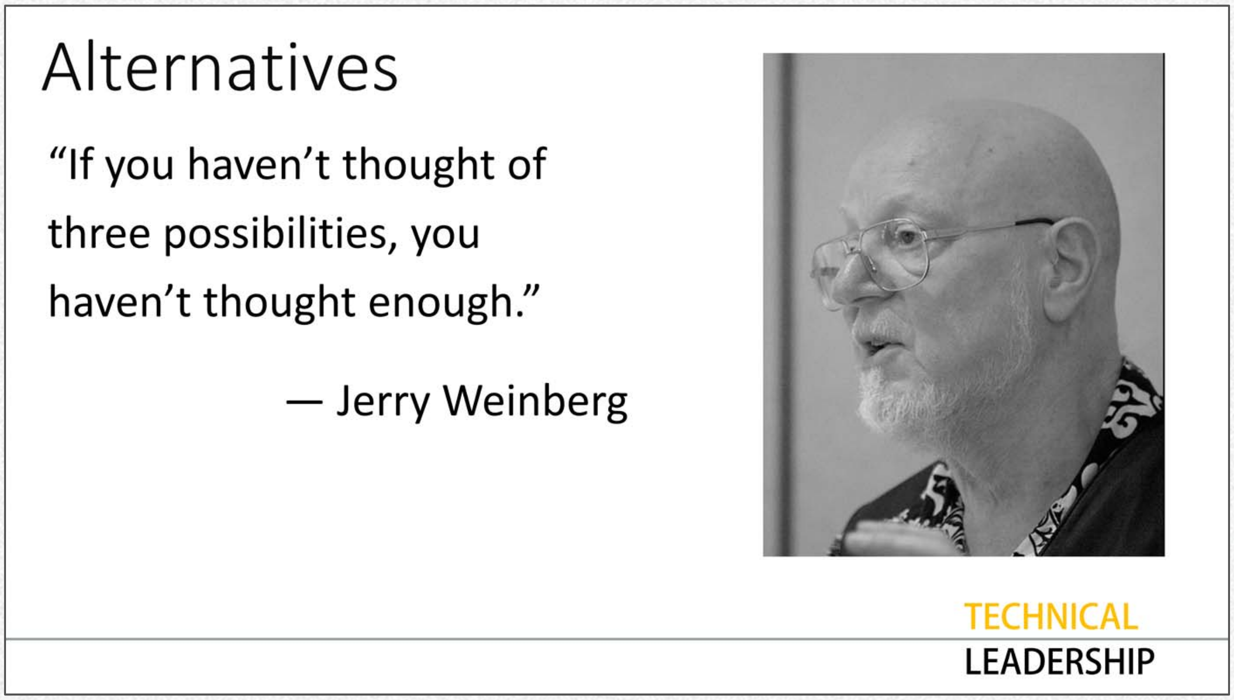
Hard Things Are Still Hard

Ethical matters often contain clear choices. And not so clear choices. A technology that takes away jobs in one area, may open up jobs or create solutions to a societal concern (treatments, etc.) in another. Not considering ethical choices, and their conflicts, doesn't make them go away (like some object permanence game).

"the ability to hold two opposing ideas in mind at the same time and still retain the ability to function. One should, for example, be able to see that things are hopeless yet be determined to make them otherwise."
— F. Scott Fitzgerald

Alternatives shed light on tradeoffs and relative strengths and weaknesses



Alternatives

"If you haven't thought of three possibilities, you haven't thought enough."

— Jerry Weinberg

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Experiment, On Paper Too

Fred Brooks wrote "Plan to throw one away. You will, anyway." I'd say: that too, but plan to throw several away — on paper. It's quick and cheap. Use rich pictures, use case and component diagrams and play over behavior of interest — repeat. Use other views. Do this at system level early to clarify direction worth taking/starting out in. But continue to do this (with just enough sketches and modeling focused on the concerns at hand) as challenges present themselves; some of these arise in the use context; some are internal "life sustaining" mechanisms that the system needs for it to be/become the kind of system it is (meet its persistence and dynamic data delivery/consistency needs; meet its scaling demands for spikes and growth; etc.).

At any rate; "plan to throw some away," needs to include sketchprototypes. We need to try out alternatives in the cheapest medium we can learn more in; sometimes that's code, but not if a sketch will do. We don't learn at the granularity we learn when we learn in the medium of code, but we at least start to try ideas out, and explore and bat at them, investigate how they could work, in sketch-driven-dialog.

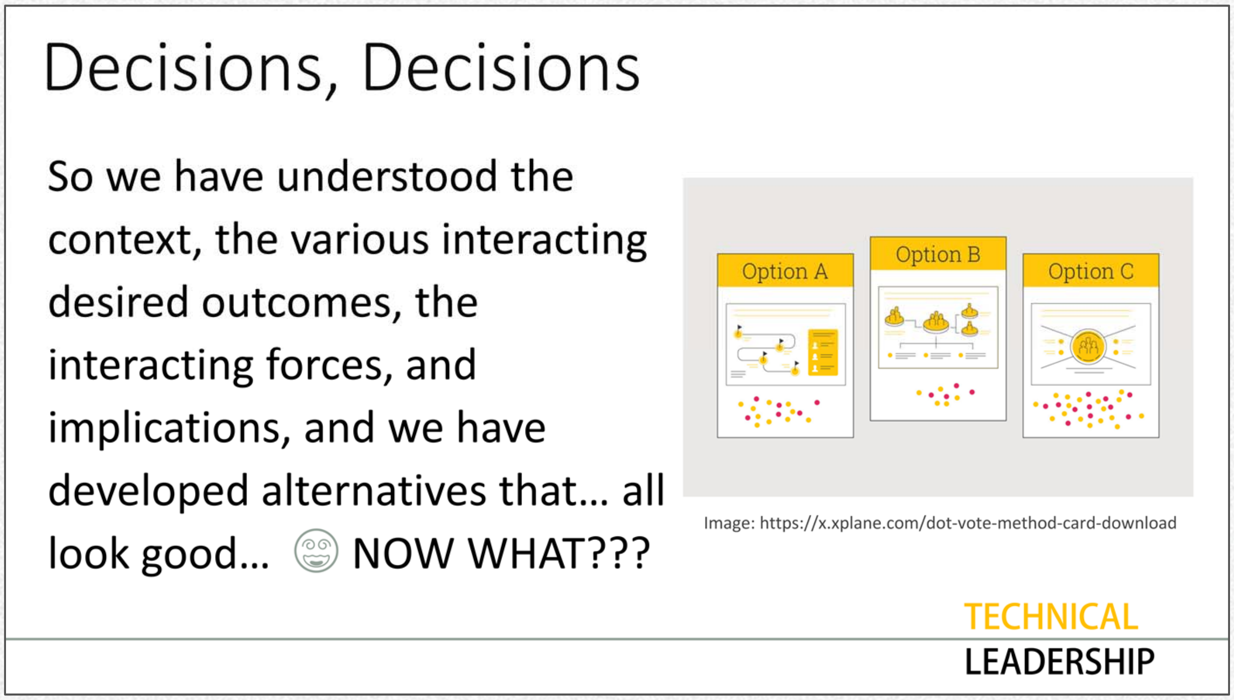
Three possibilities? For everything? That smacks of BDUF FUD (fear, uncertainty and doubt)?? Can't we just YAGNI that? Well, remember, these are make or break decisions. Game shapers and game changers.

Characteristics of architects:

"High tolerance for ambiguity"

"The willingness to backtrack, to seek multiple solutions"

— Eb Rechtin



Decisions, Decisions

So we have understood the context, the various interacting desired outcomes, the interacting forces, and implications, and we have developed alternatives that… all look good… 😳 NOW WHAT???

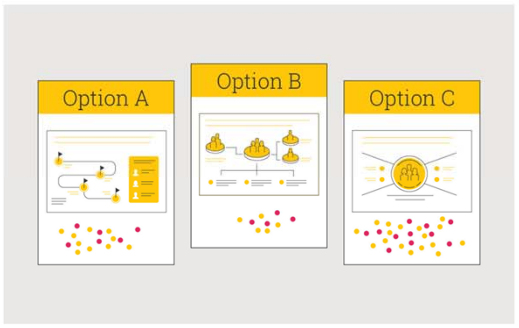


Image: https://x.xplane.com/dot-vote-method-card-download

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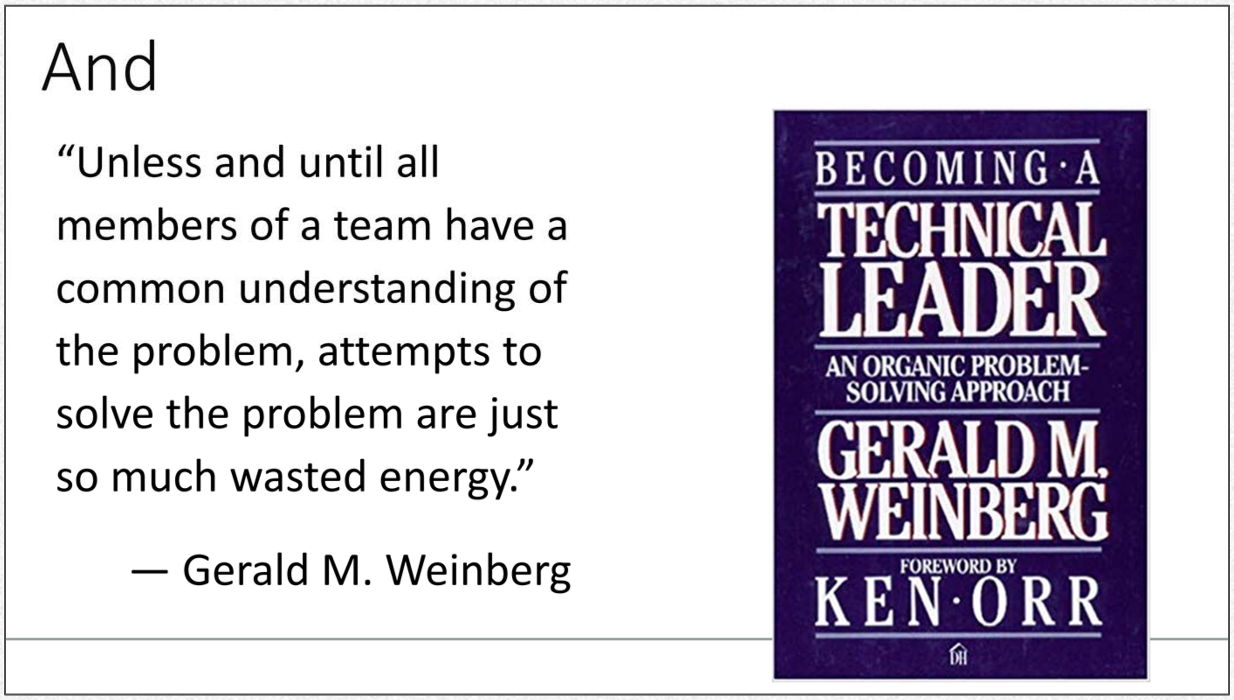
Decisions Are About Choices

Sometimes we'll do this work, and the choice is clear. Or we pick the most intuitive path based on our experience and best sense of what to do with limited time, and attention and resources. Other times, it's hard — the choice may not be clear, or those involved may be split on what alternative is preferred. It is all the more difficult (and potentially fractious), if it's a crucial decision that much depends on.

Some ways to winnow the choice set: dot voting and attempts to converge; play "vote off the island," voting the least preferred out of the consideration set (and then considering factors like minimization of regret). A powerful approach, is to go back to the notion of reversibility, and consider how to make the decision testable in a short timeframe, before too much depends on it and while it is still reversible.

Hard Choices

When we're working across the system, strategically and structurally significant decisions need to be made from a system — not local (to a part) — perspective. So not only do they impact different people — stakeholders (the ones with stakes, to quote Tom Graves) — but they are things people care about, and have strong, but different, opinions about. They are seen from different vantage points where there are different pressure points, by different teams and their people, responsible for different pieces of the system. We work across the system. And across the turfs and charters of teams, and individuals, and functions. Well. All this means that people will see things differently. Care about them differently. And as leaders we need to make decisions to meet broader system or organizational goals. Decisions that will sometimes look suboptimal from the perspective of local goals. These decisions need to be communicated effectively, so that progress can be made even if there isn't uniform agreement.



And

"Unless and until all members of a team have a common understanding of the problem, attempts to solve the problem are just so much wasted energy."

— Gerald M. Weinberg

BECOMING · A
TECHNICAL LEADER
AN ORGANIC PROBLEM-SOLVING APPROACH
GERALD M. WEINBERG
FOREWORD BY
KEN · ORR

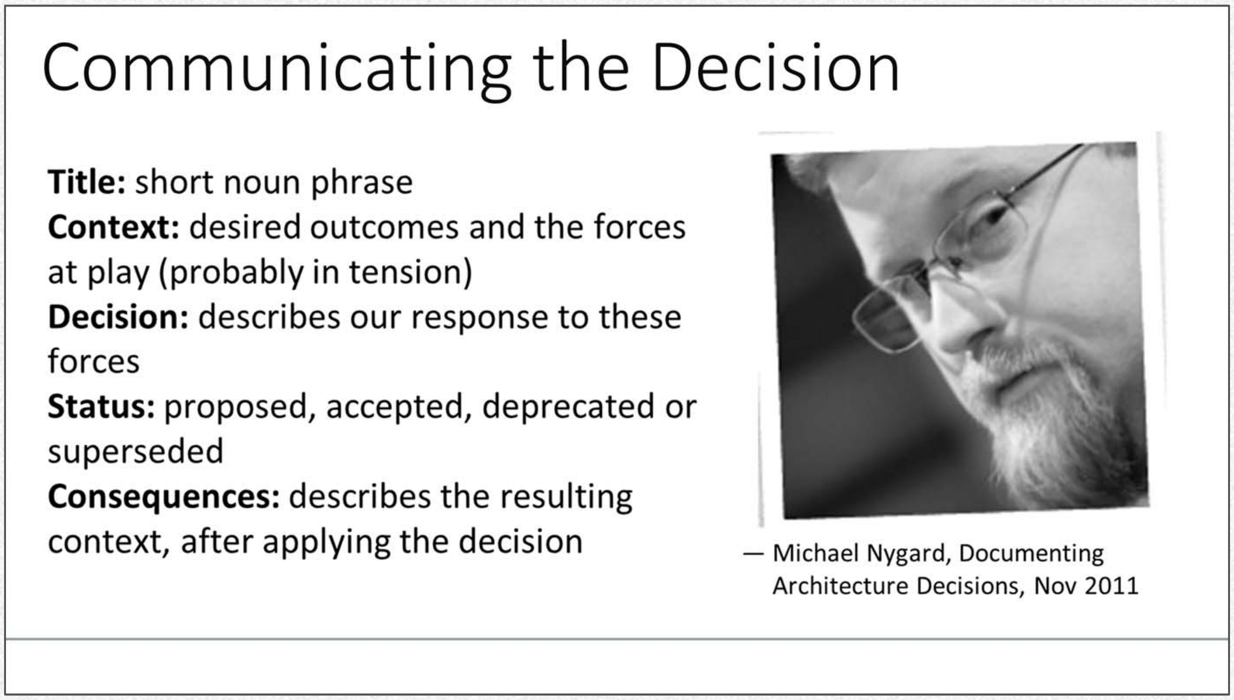
Some Ways to Develop Common Understanding

We orient to working together, especially in ways that draw out assumptions and ideas, so that we can ask questions and probe (work them out, as well as instrument, to better assess) and respond to them together. Working together is a rich way to build common ground and shared understanding. But when teams (of teams) get too large for this to be particularly effective, we start to rely on a more fractal approach, with smaller teams. As much as we can, we involve team members to work collaboratively on interface design and to address concerns that cut across teams. Still, proactive system identity and integrity defining work, needs perspective and leadership across boundaries. There's also the matter of building organizational will to do bigger things that impact various teams. At any rate, even where everyone can't be involved, drawing in some of those who'll be impacted, helps to bring ideas and concerns into the decision making, and builds understanding among those who can share it in their teams. In other words, working organically, through participation, broadens the set of those who can tell the story of the architecture and key decisions. We still need to write significant decisions down (and describe architectural models and their implications) and talk about them.

*If you are a good leader,
Who talks little,
They will say,
When your work is done,
And your aim fulfilled,
"We did it ourselves."*

— Lao Tse

Writing it down helps clarify , communicate and record



Communicating the Decision

Title: short noun phrase
Context: desired outcomes and the forces at play (probably in tension)
Decision: describes our response to these forces
Status: proposed, accepted, deprecated or superseded
Consequences: describes the resulting context, after applying the decision

— Michael Nygard, Documenting Architecture Decisions, Nov 2011

Write It Down -- No Really, Do It!

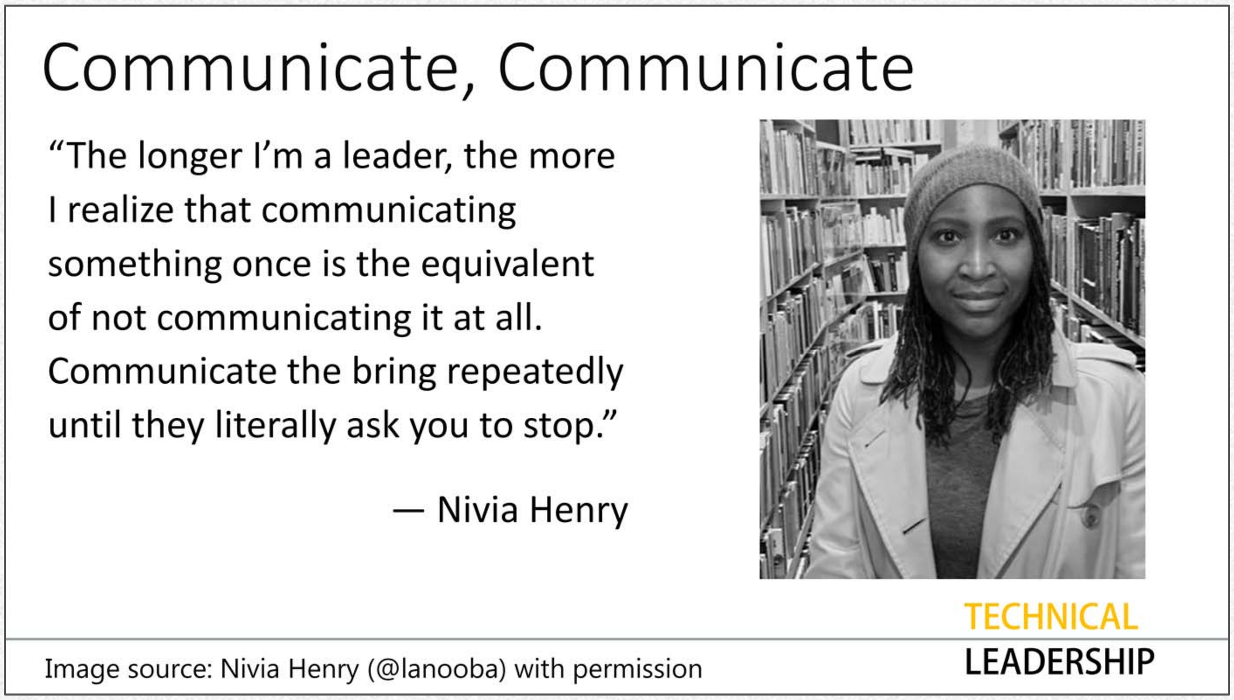
Writing our thinking down helps us to see what we're thinking, so we can improve it – the thinking, or the way we're communicating it. It creates externalized memory that others can access, understand, and help improve.

Various architecture decision templates have been published, including by Jeff Tyree and Art Akerman then at Capital One (in IEEE Software, so this template and discussion gained exposure and influence), and Olaf Zimmerman at IBM. But Michael Nygard's simplified (yet well-described) Architecture Decision Record template caught on as a just enough version for documenting architecture decisions in an Agile context.

The Architecture Decision Record documents decisions in terms of the statement of the decision, the outcome sought and the forces weighed in the making of the decision, along with consequences or implications of the decision.

The Tyree/Akerman and Zimmerman versions also keep track of alternatives considered but ruled out, and this is valuable too.

See Nat Pryce's ADR tools on Github: https://github.com/npryce/adr-tools



Communicate, Communicate

"The longer I'm a leader, the more I realize that communicating something once is the equivalent of not communicating it at all. Communicate the bring repeatedly until they literally ask you to stop."

— Nivia Henry

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Image source: Nivia Henry (@lanooba) with permission

Go Ahead, Repeat Yourself

I really have to remind myself that I not only get to repeat myself, but I MUST repeat myself -- for the benefit of others. Contrast this (apocryphal??) interchange:

> "Simplify, simplify" — H. D. Thoreau
>
> 'One "simplify" would have sufficed' — Ralph Waldo Emerson

with Eberhardt Rechtin's:

> "Simplify, simplify, Simplify"

And recall he also said:

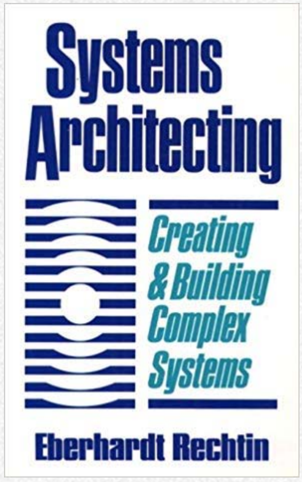
> "Communicate, Communicate, Communicate"

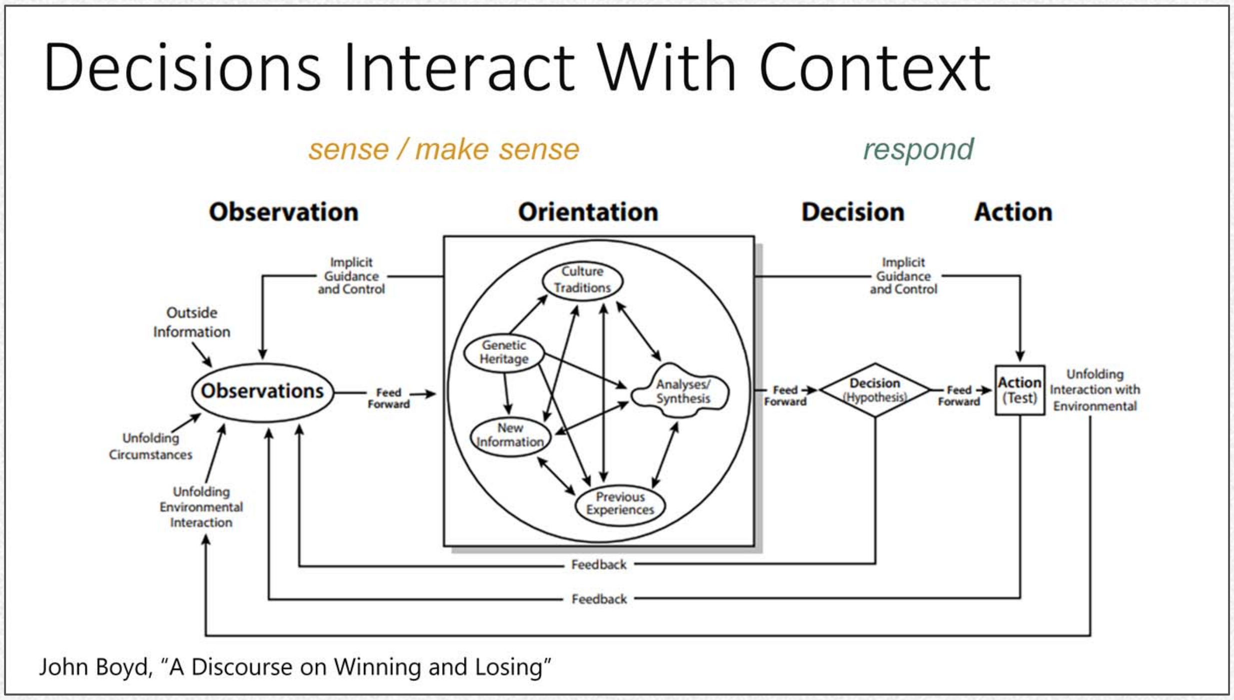
So much competes for attention, we miss things. And there are things we don't understand at first, and need to hear again, perhaps another way. Communicating helps increase awareness – of the decision and its ramifications, and implications we may not have been aware of. Conversations move understanding around. We need to keep having them, and drawing attention to what is important, or subtle or overlooked. We're helping to build shared understanding of critical shaping decisions, whether its architecture, product direction, strategy, or other matters of importance to system integrity and business outcomes.

"bring" was a typo (for thing), but I liked it — communicating what we're doing, and how that's important for the system (us/stakeholders/..).

"Don't ever stop talking about the system"

— Eb Rechtin



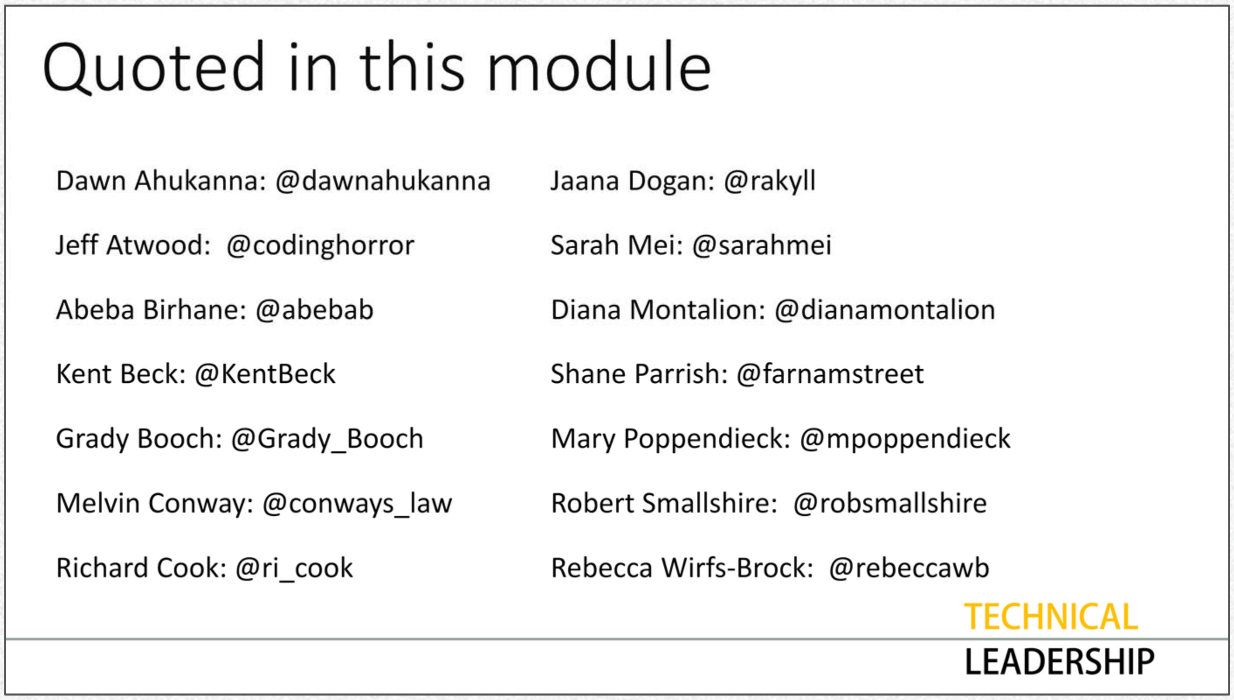


Decisions Interact With Context

John Boyd, "A Discourse on Winning and Losing"

Decisions Orient; Decisions Interact with Context; It's Loopy!

The OODA loop is a simplification, for all its depiction of feedback loops. While we're making decisions, we need information and re-enter observe/orient or sense/make sense stances and activities. Our evolving understanding changes our perception of the context. Our decisions change actions, potentially already underway. Actions change the context. And so forth.



Quoted in this module

Dawn Ahukanna: @dawnahukanna	Jaana Dogan: @rakyll
Jeff Atwood: @codinghorror	Sarah Mei: @sarahmei
Abeba Birhane: @abebab	Diana Montalion: @dianamontalion
Kent Beck: @KentBeck	Shane Parrish: @farnamstreet
Grady Booch: @Grady_Booch	Mary Poppendieck: @mpoppendieck
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Richard Cook: @ri_cook	Rebecca Wirfs-Brock: @rebeccawb

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"There is a Zulu phrase, 'Umuntu ngumuntu ngabantu', which means 'A person is a person through other persons.'
—Abeba Birhane

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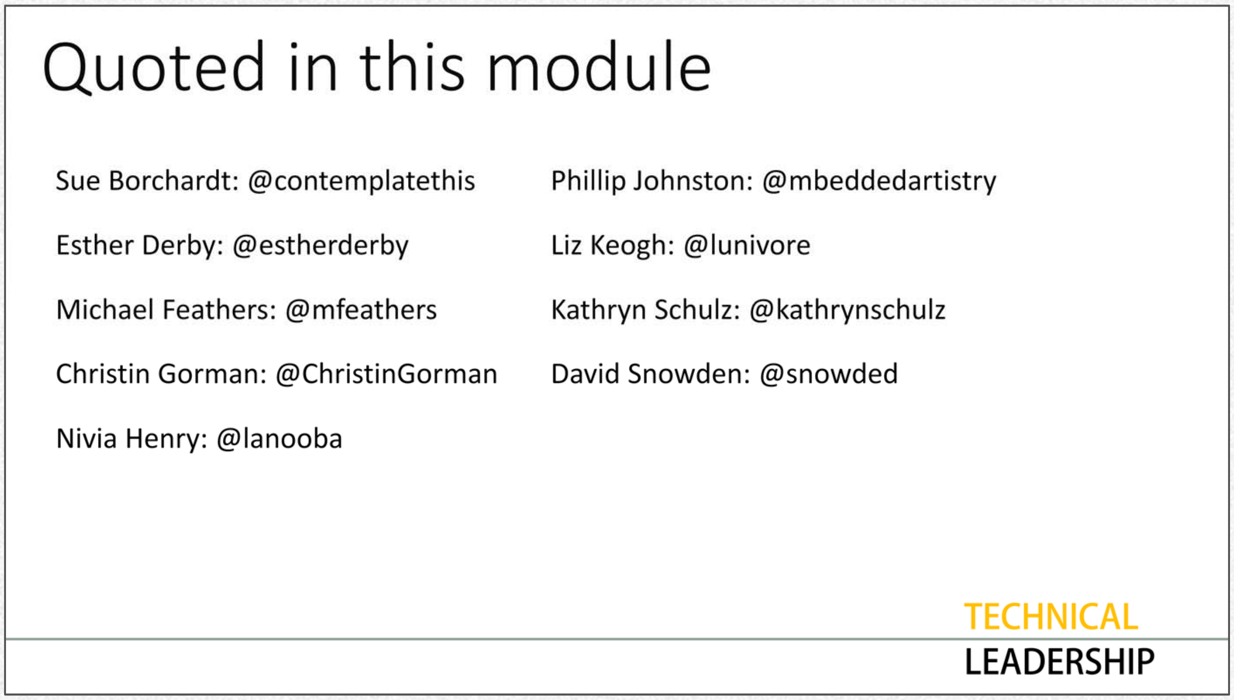

Quoted in this module

Sue Borchardt: @contemplatethis

Esther Derby: @estherderby

Michael Feathers: @mfeathers

Christin Gorman: @ChristinGorman

Nivia Henry: @lanooba

Phillip Johnston: @mbeddedartistry

Liz Keogh: @lunivore

Kathryn Schulz: @kathrynschulz

David Snowden: @snowded

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"We know from everyday experience that a person is partly forged in the crucible of community."
—Abeba Birhane

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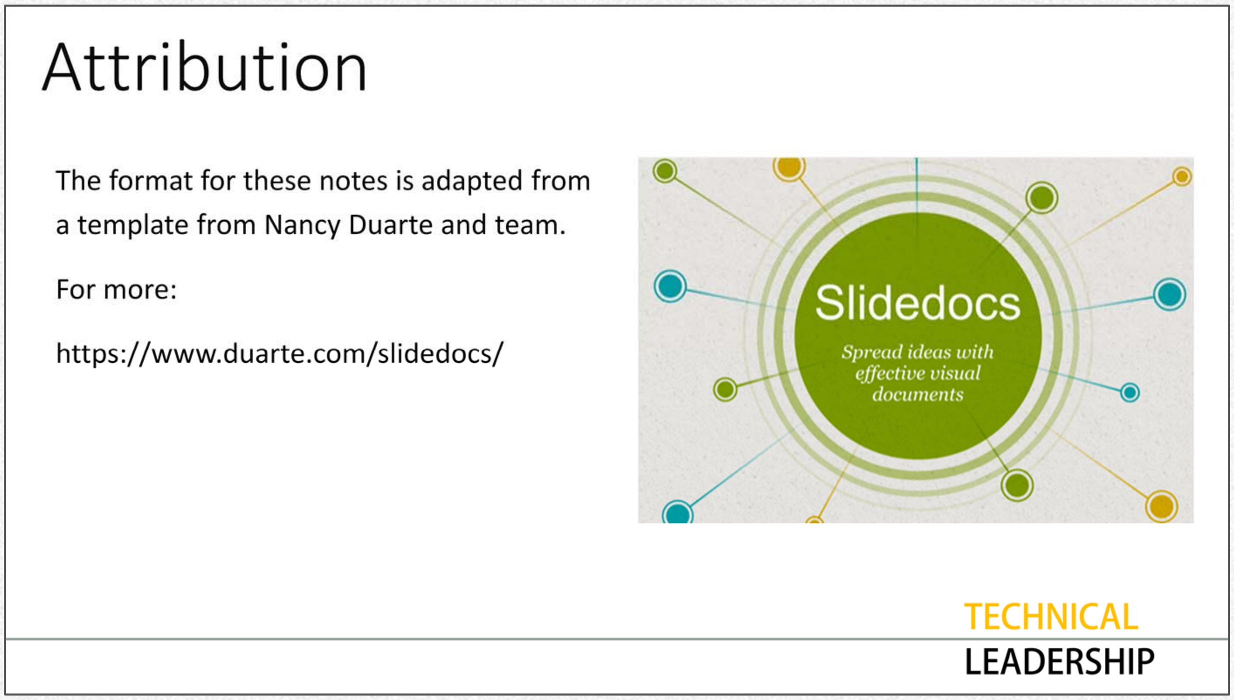

Attribution

The format for these notes is adapted from a template from Nancy Duarte and team.

For more:

https://www.duarte.com/slidedocs/

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Duarte Slidedocs®

We recommend the Duarte material on slidedocs® in addition to the template; much that is valuable there.

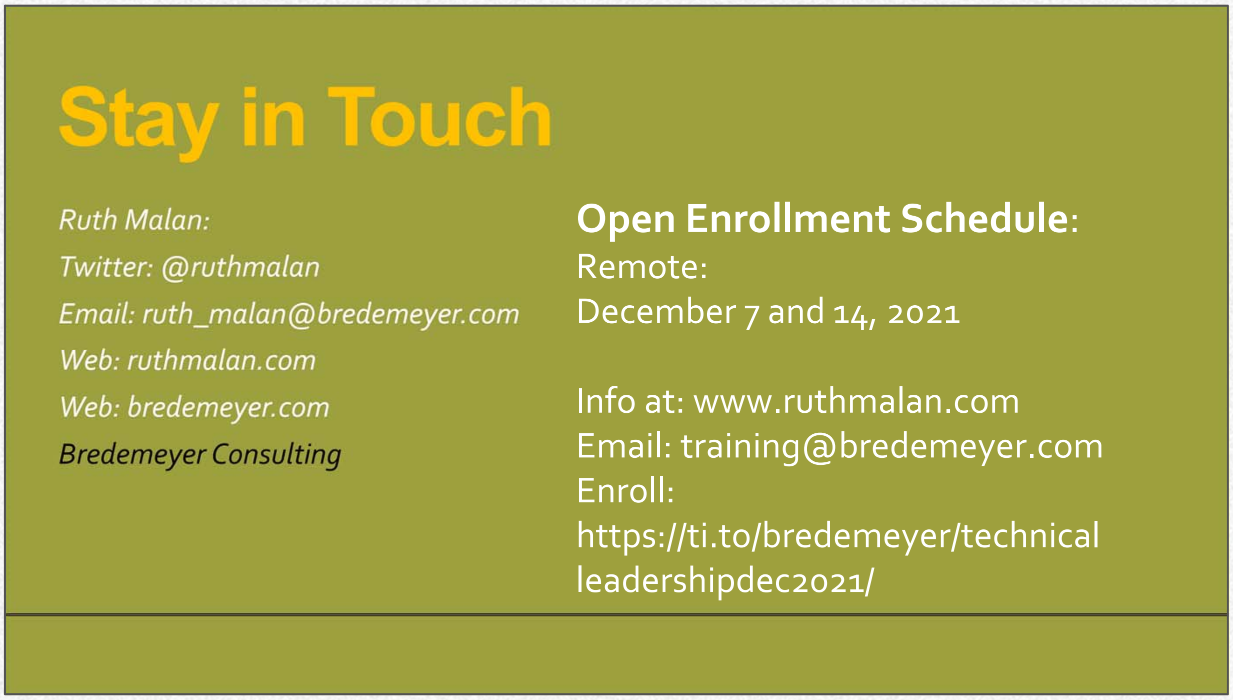
Quotes and Photos

We have consciously brought various pioneers and contemporaries visibly into our materials for two reasons:

i. to acknowledge and celebrate the extent to which we are because of others (Abeba Birhane). It is a small way to bring into the room, so to speak, with us people whose insights and work has influenced us, and integrated with our experiences, other reading and conversations, and more, to build what we understand and can share.

ii. to recommend to you wonderful work you may want follow up on, and also to draw in our contemporaries who are sharing insights that you too may find useful, and want to follow them on twitter, etc.

"Act always so as to increase the number of choices.'
— Heinz von Foerster



Stay in Touch

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Enroll:
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leadershipdec2021/

"The most essential (and satisfying) work of the leader is to create more leaders."
— Mary Parker Follett