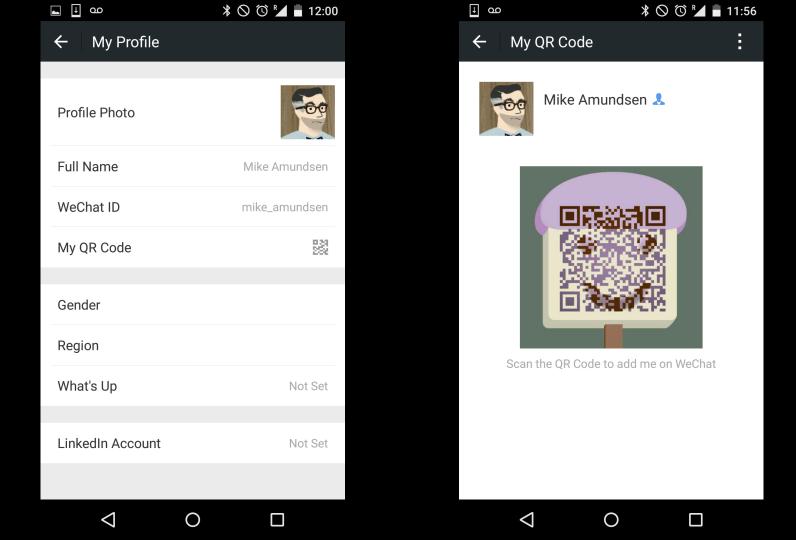


Learning from Conway, Brooks, and Dunbar

Mike Amundsen
CA Technologies
@mamund

Introduction







RETURN TO HOMEPAGE

API ACADEMY SERVICES





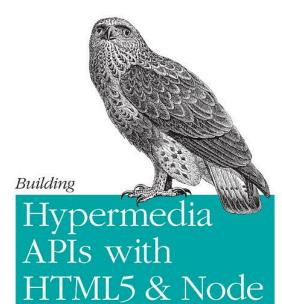


The API Academy team consists of industry experts who have been brought together by CA Technologies to provide expert consulting services for organizations that want to take their API programs to the next level.

Contact us to find out more about how we can help you understand the API economy, plan a program strategy, architect effective interfaces, build a secure, manageable API infrastructure and empower your developers to create truly valuable client apps.

Email: apiacademy@ca.com

Creating Evolvable Hypermedia Applications



O'REILLY®

Mike Amundsen

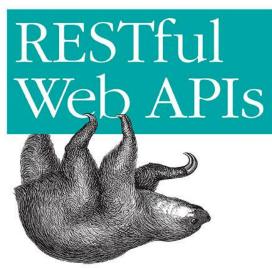


Designing APIs for the Web

Mike Amundsen

VIDEO

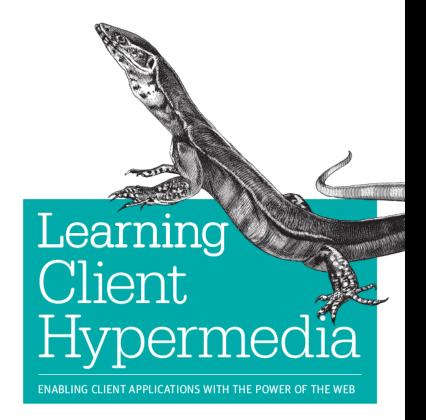
Services for a Changing World



O'REILLY°

Leonard Richardson, Mike Amundsen & Sam Ruby

O'REILLY*



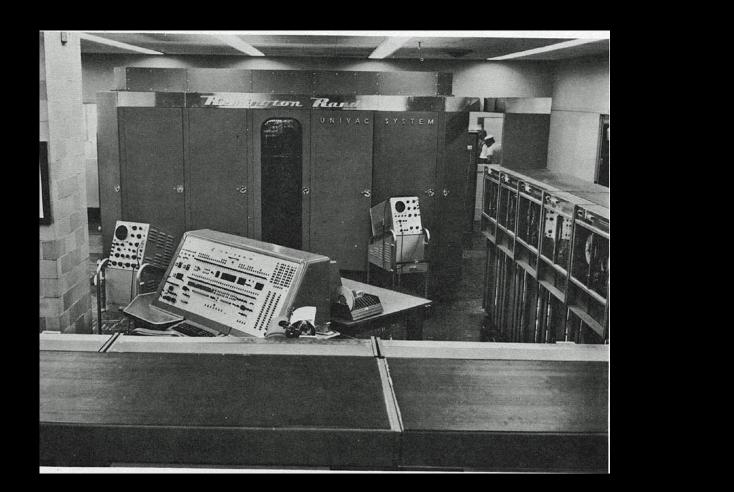
Mike Amundsen

Effective Teams

Effective Teams for Microservices

Melvin Conway





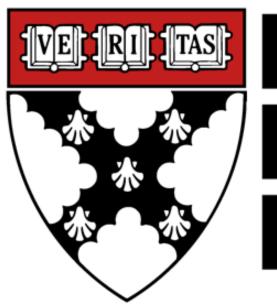
Project-Based Organizations



"Project-based organizations revolve around the concept that a group of individuals or firms join together with the explicit purpose of producing a tangible set of outputs"

-- Paul Chinowsky, EPOJ 2011

"How Do Committees Invent?"



Harvard Business Review





HOW DO COMMITTEES INVENT?

by MELVIN E. CONWAY

That kind of intellectual activity which creates a useful whole from its diverse parts may be called the dosign of a gustom. Whether the particular activity is the creation of specifications for a major weapon system, the formation of a recommendation to meet a social challenge, or the programming of a computer, the general activity is largely the

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stages of design

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Any organization that designs a system (defined more broadly here than just information systems) will inevitably produce a design whose structure is a copy of the organization's communication structure."

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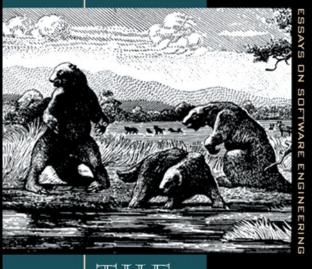
DATAMATION

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Communication dictates design.

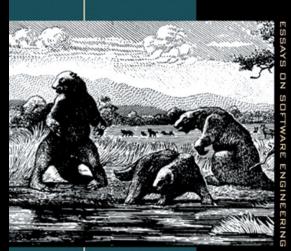
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Conway's Law



THE MYTHICAL MAN-MONTH

FREDERICK P. BROOKS, JR.

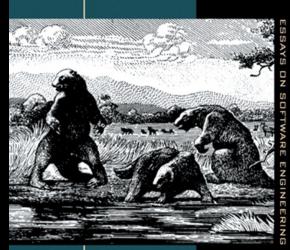


THE
MYTHICAL
MAN-MONTH

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Brooks' Law

"Adding manpower to a late software project makes it later."

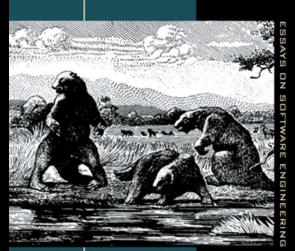


Intercommunication formula

n(n-1) / 2

THE
MYTHICAL
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THE MYTHICAL MAN-MONTH

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Intercommunication formula

$$5*(5-1)/2 = 10$$

 $15*(15-1)/2 = 105$
 $50*(50-1)/2 = 1,225$
 $150*(150-1)/2 = 11,175$

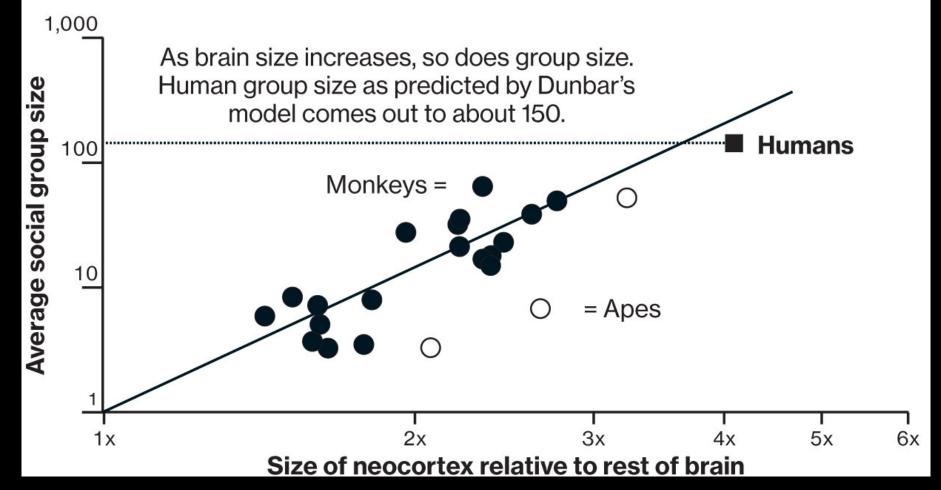


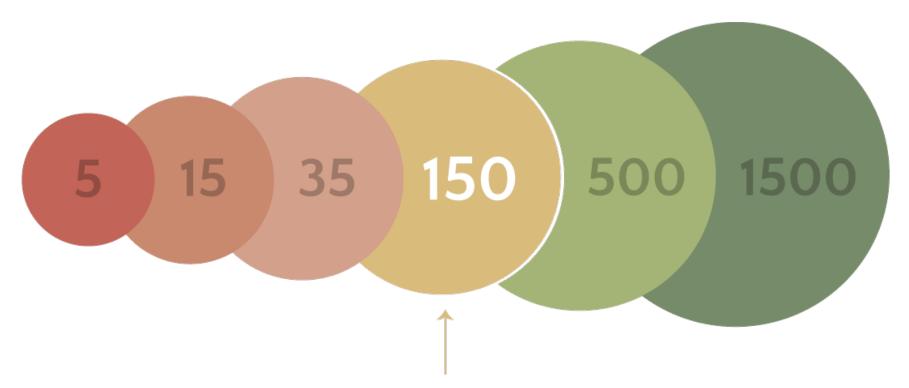
Dunbar's Number

A measurement of the "cognitive limit to the number of individuals with whom any one person can maintain stable relationships."

-- Robin Dunbar, 1992

The Social Cortex





Dunbar's Number

the max number of relationships a person can maintain



Dunbar Groups

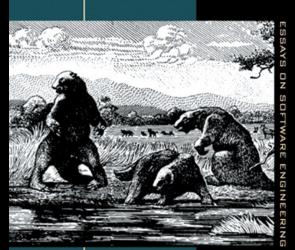
Intimate friends: 5

Trusted friends: 15

Close friends: 35

Casual friends: 150

-- Robin Dunbar, 1992



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Conway's (first) Law

tells us TEAM SIZE is important

Conway's (first) Law

Conway's (first) Law tells us TEAM SIZE is important

SO...

Make the teams as small as necessary.

possibly "Dunbar level 2" (15), be wary of teams above that size.

Aim for "Dunbar level 1" (5),

If you don't have a personal relationship with every member of your team, it is probably TOO BIG.

So... what about other Conway Laws?

Conway's Second Law

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Doing it Over

"There is never enough time to do something right, but there is always enough time to do it over."

-- Mel Conway, 1967

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Trade Offs

Efficiency-Effectiveness Trade Offs (ETTOs)





Principle

Efficiency-Thoroughness Trade-Off

Why Things That Go Right Sometimes Go Wrong.



ERIH HOLLNAGE



Satisficing v. Sacrificing

"Satisficing is explained as a consequence of limited cognitive capacity.

Sacrificing is explained as a consequence of the intractability of the work environment"

-- Eric Hollnagel, 2009



Satisficing v. Sacrificing

Problem too complicated? Ignore details.

Not enough resources? Give up features.

-- Eric Hollnagel, 2009

ETTOs are "normal" and result in

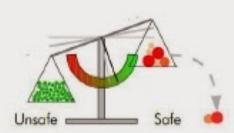
success more often than failure.

Two interpretations of safety



Safety-I

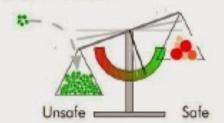
Safety means that the number of things that go wrong (accidents / incidents / near misses) is as low as possible.



Safety can be achieved by first finding and then eliminating or weakening the causes of adverse outcomes.

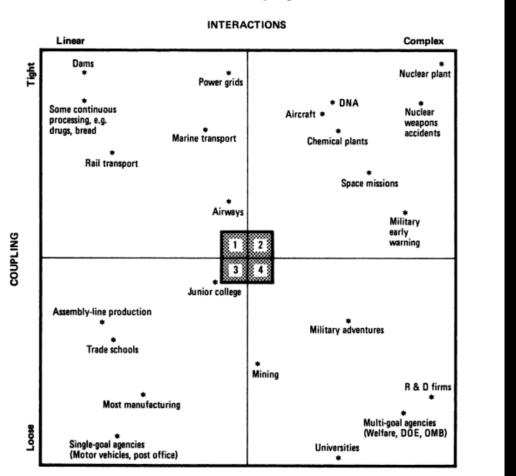
Safety-II Resilience

Safety means that the number of things that go right is as high as possible. Safety is the ability to succeed under varying conditions.



Safety requires an understanding of everyday performance. Safety can be achieved by strengthening this ability.

FIGURE 3.1 Interaction/Coupling Chart



The enemy is intractability.



Increasing Intractability

Systems grow too large
 Rate of change increases
 Overall expectations keep rising

-- Eric Hollnagel, 2009

Key benefits of Continuous delivery



Conway's Second Law

tells us PROBLEM SIZE is important

Conway's Second Law tells us PROBLEM SIZE is important

SO...

Make the solution as small as necessary.

in your release package, your release is TOO LARGE

If you (or your team)

cannot explain ALL the code

Conway's Third Law

HOW DO COMMITTEES INVENT?

....

That kind of intellectual activity which creates a useful whole from its diverse parts may be called the design of a system. Whether the particular activity is the creation of specifications for a major weapon system, the formation of a recommendation to meet a social challenge, or the programing of a computer, the general activity is largely the

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design organization criteria

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5. Consolidation of subdesigns into a single design.

3. Consortation to subtracting the state of the state



Dr. Conwey is manager, peripheral systems research, et Sperry Rand's Univac Div., whate he is working an recognition of continuous speech. He has previously been a research associate at Case Wastern Reserve Univ., and a software consultant. Ne has an MS in physics from Collech and a 4hD in meth from Case. Homomorphism

"There is a homomorphism from the linear graph of a system to the linear graph of its design organization"

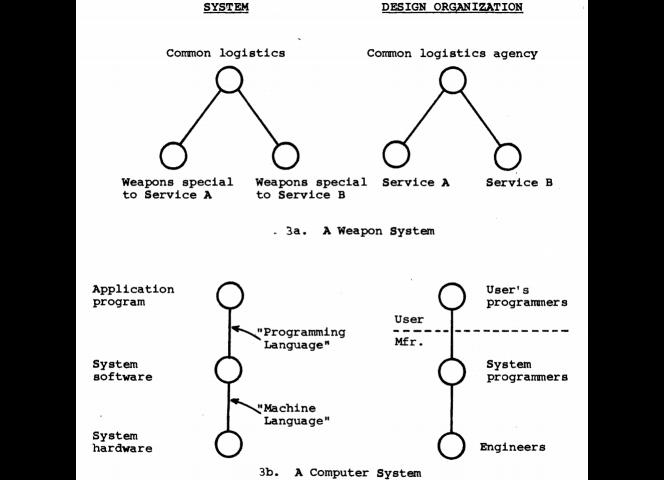
-- Mel Conway, 1967

ho·mo·mor·phism

/ hōmə môrfizəm/

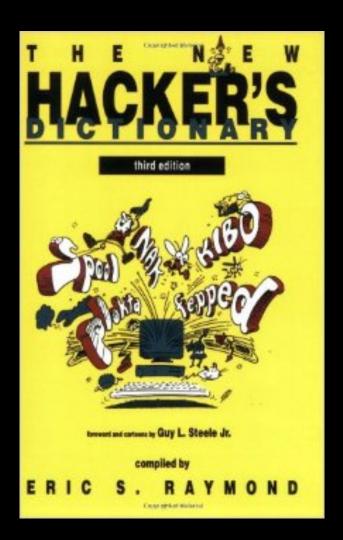
noun MATHEMATICS

a transformation of one set into another that preserves in the second set the relations between elements of the first.



3b. A Computer System

Figure 3 Two examples of identity of structure between a system and its design organization.



Homomorphism

"If you have four groups working on a compiler, you'll get a 4-pass compiler."

- Eric S. Raymond, 1991

Conway's Third Law tells us CROSS-TEAM INDEPENDENCE is important.

Conway's Third Law tells us CROSS-TEAM INDEPENDENCE is important.

So...

Make each team fully independent.

If you have to hold a release

until some other time is ready,

you are not an INDEPENDENT TEAM

Conway's Fourth Law

HOW DO COMMITTEES INVENT?

MELLON E CONTRANT

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It seems reasonable to suppose that the knowledge that one will have to carry out one's own recommendations or that this task will fall to others, probably affects some design choices which the individual designer is called upon to make. Most design activity requires continuely nating choices. Many of times choices may be more than design individual choices. Many of times choices may be more than design makes about his own future. As we shall see later, the intensities without east in a conventional management environment can motivate choices which subvert the intent of the sponsor?

stages of design

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Disintegration

"The structures of large systems tend to disintegrate during development, qualitatively more so than with small systems."

-- Mel Conway, 1967

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DATAMATION

design organization criteria

Three reasons Disintegration occurs...

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by MELVIN E. CONWAY

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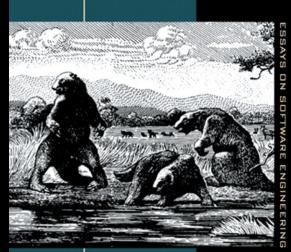


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Disintegration: Reason #1

"The realization that the system will be large, together with organization pressures, make irresistible the temptation to assign too many people to a design effort"

-- Mel Conway, 1967



THE
MYTHICAL
MAN-MONTH

FREDERICK P. BROOKS, JR.

Brooks' Law

Adding manpower to a late software project makes it later.

-- Fred Brooks, 1975

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Disintegration: Reason #2

"Application of the conventional wisdom of management to a large design organization causes its communication structure to disintegrate."

-- Mel Conway, 1967



Dunbar's Number

A measurement of the "cognitive limit to the number of individuals with whom any one person can maintain stable relationships."

-- Robin Dunbar, 1992

HOW DO COMMITTEES INVENT?

L MEIVIN E CONWAY

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Disintegration: Reason #3

"Homomorphism insures that the structure of the system will reflect the disintegration which has occurred in the design organization."

-- Mel Conway, 1967

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design organization criteria

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DATAMATION

Communication dictates design.

-- Mel Conway, 1967

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Conway's Fourth Law

tells us TIME is against LARGE teams.

Conway's Fourth Law tells us TIME is against LARGE teams.

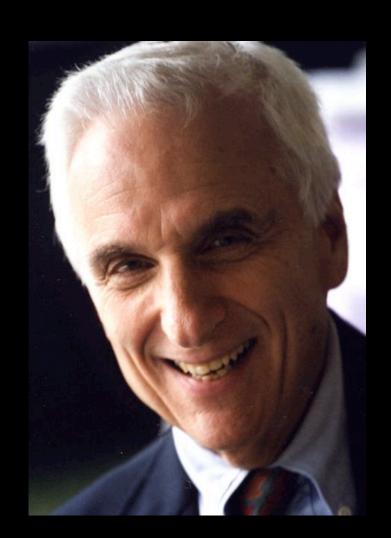
So...

Make release cycles short and small.

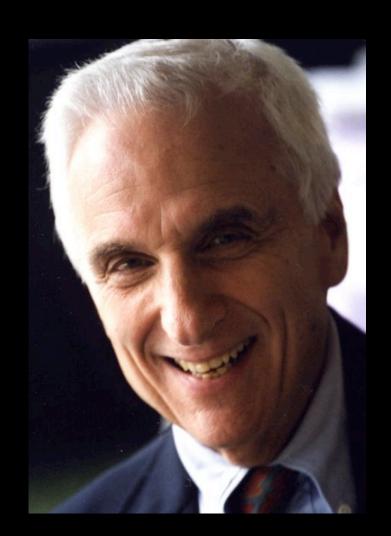
If your release dates are often missed,

your release SIZE is TOO BIG.

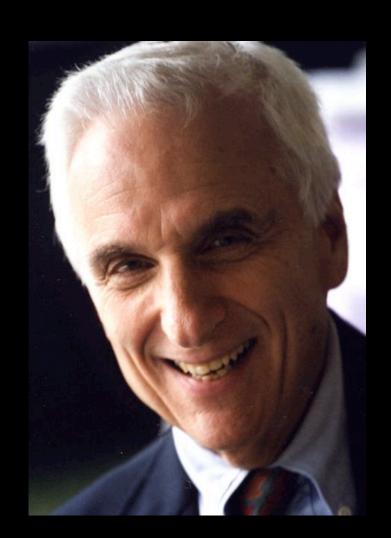
So, let's review our options...



Conway's Laws can help us succeed

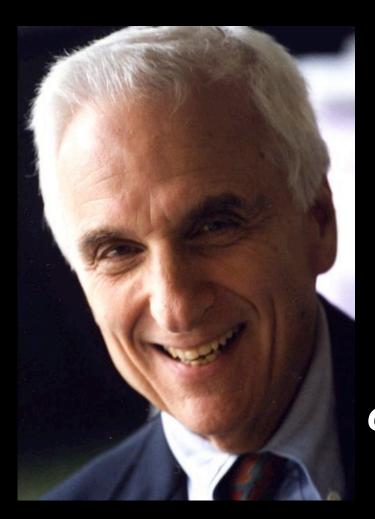


Conway's Laws can help us succeed when working with microservice teams.



Conway's First Law

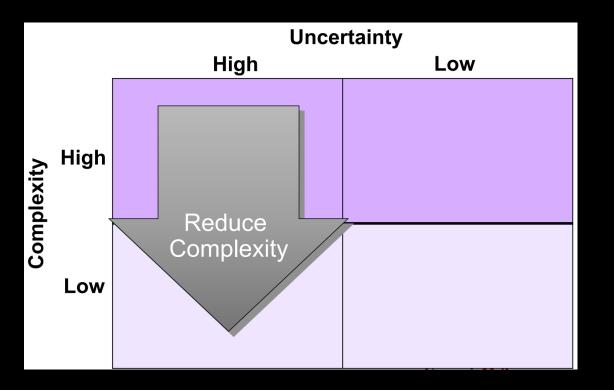
A system's design is a copy of the organization's communication structure.



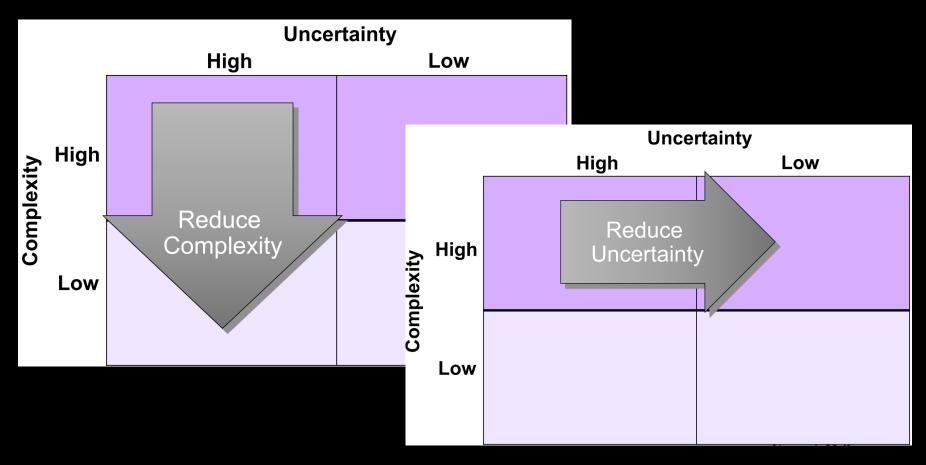
Conway's First Law

A system's design is a copy of the organization's communication structure.

Actively manage communications within the teams and across teams.



James Herbsleb: "Tactics for Global Software Development"

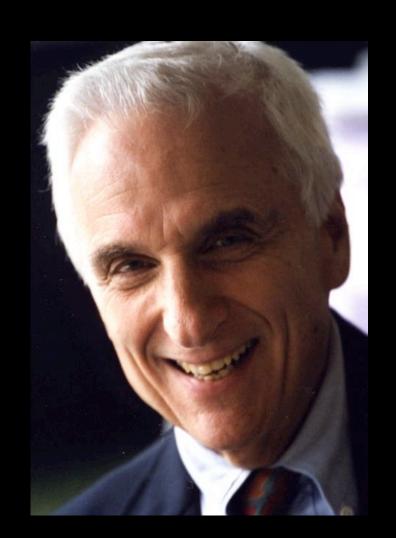


James Herbsleb: "Tactics for Global Software Development"

Increase communications

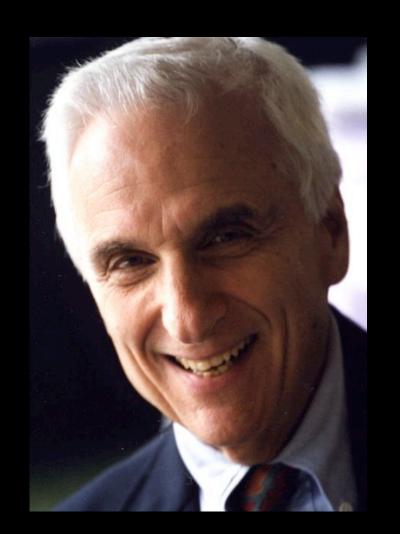
- Real-time Chat Tools
- Video Conferencing
- Online Forums/News Groups
- Wiki and Web Sites

Reduce the effort required to locate and interact with the 'right people'



Conway's Second Law

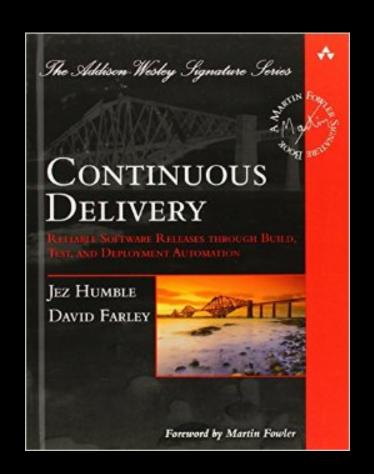
There is never enough time to do something right, but there is always enough time to do it over.



Conway's Second Law

There is never enough time to do something right, but there is always enough time to do it over.

Remember the process is continually repeating.



Continuous Delivery

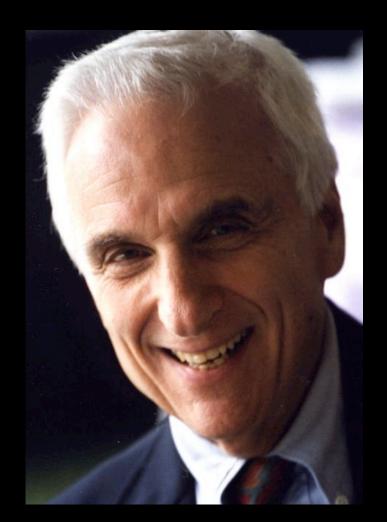
"The core concept of making small frequent changes, and testing at every step, reduces the risk inherent in deploying new code."

Jez Humble, Thoughworks.

Support continuous processes

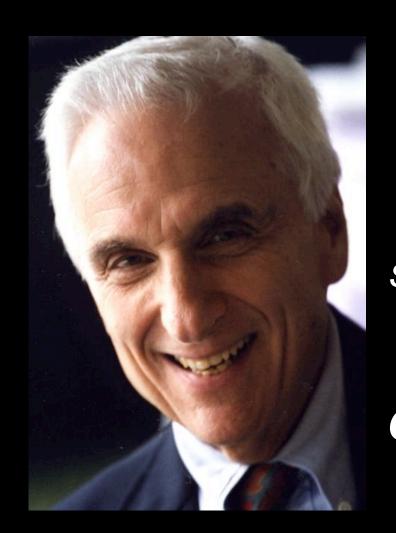
- Implement small changes
- Test immediately
- Deploy constantly

Shorten the feedback loop as much as possible.



Conway's Third Law

There is a homomorphism from the linear graph of a system to the linear graph of its design organization.



Conway's Third Law

There is a homomorphism from the linear graph of a system to the linear graph of its design organization.

Organize teams in order to achieve desired system.

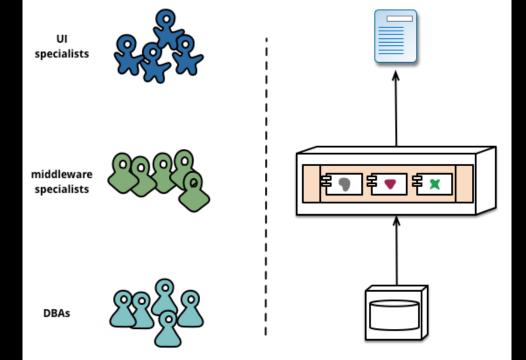


Microservices

Organized around business capabilities.

Products, not projects.

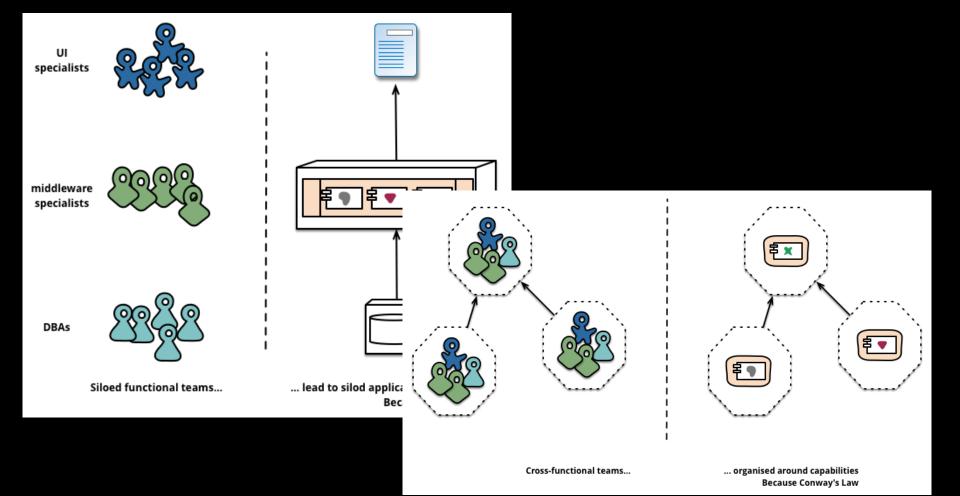
Martin Fowler, Thoughtworks



Siloed functional teams...

... lead to silod application architectures.

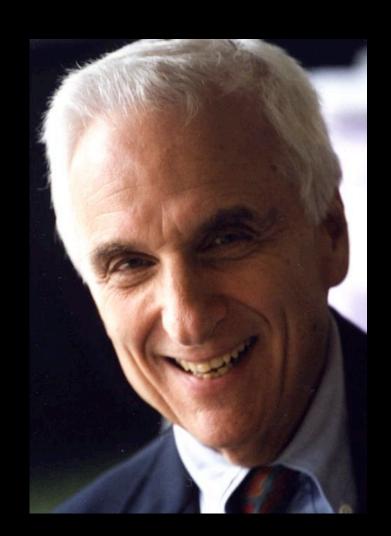
Because Conway's Law



Organize teams by product or BU

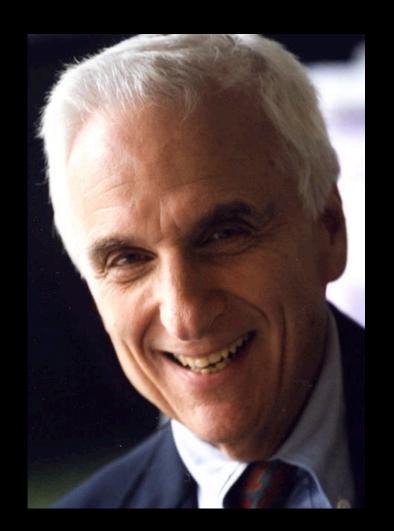
- Combine design, develop, test, & deploy
- Include storage, business process, & UI
- Allow teams autonomy within their boundary
- Require teams to *inter-operate*, not integrate

Make sure teams own their complete lifecycle.



Conway's Fourth Law

The structures of large systems tend to disintegrate during development.



Conway's Fourth Law

The structures of large systems tend to disintegrate during development.

Keep your teams as small as necessary, but no smaller.



Sizing Teams



Jeff Bezos, Amazon



Sizing Teams

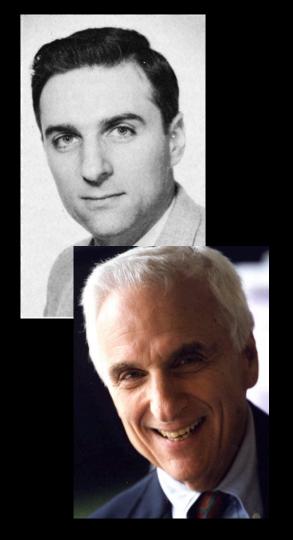
If a team can't be fed with two pizzas, it's too big.

Jeff Bezos, Amazon

Make team as small as necessary

- Resist urge to grow teams in response to deadlines
- Consider Dunbar's groups when sizing teams
- Be prepared to break into smaller teams

It's better to be "too small" than to be "too big."



Conway's Lessons

- 1. Increase communications
- 2. Support continuous process
- 3. Organize teams by products
- 4. Make teams as small as necessary



Learning from Conway, Brooks, and Dunbar

http://g.mamund.com/2015-10-qcon-teams

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