Conway's Law at a Distance

Building Teams in a Distributed World

Mike Amundsen CA Technologies @mamund



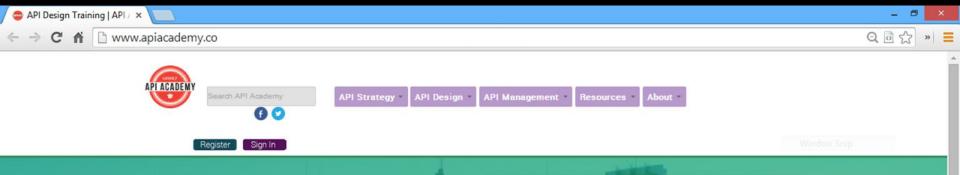
Cover slide : Barn Raising

A collective action in which a barn for one of the members is built by all the members of the community.



Introduction





Your Guide to API Design & Implementation Best Practices

API Academy delivers free online lessons and in-person consulting services covering essential API techniques and tools for business managers, interface designers and enterprise architects





What is an API?

Get an overview of what an API is and what it does, to help you realize the business value of APIs



API Design Basics

Understand the API architecture process and learn basic design and implementation best practices



Web API Architectural Styles

Get a detailed overview of the main architectural styles for Web and mobile API design



Choosing a Solution

Choose between the various solutions that offer the basic components for enterprise API Management Creating Evolvable Hypermedia Applications

Building Hypermedia APIs with HTML5 & Node

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Mike Amundsen

Creating Evolvable Hypermedia Applications

Building

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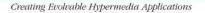
Mike Amundsen

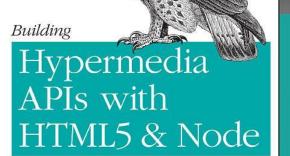
Services for a Changing World

RESTful Web APIs

O'REILLY®

Leonard Richardson, Mike Amundsen & Sam Ruby







Designing APIs for the Web

Mike Amundsen

VIDEO

Services for a Changing World

RESTful Web APIs



O'REILLY®

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Mike Amundsen

Conway's Law

Conway's Law at a Distance

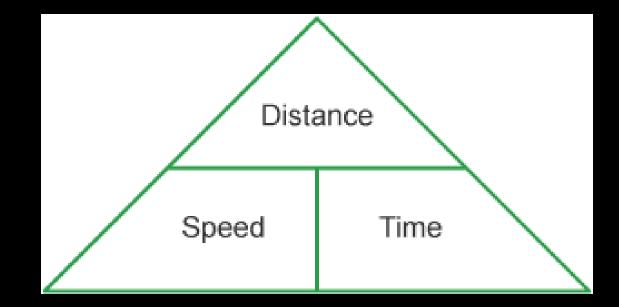
11,766 km

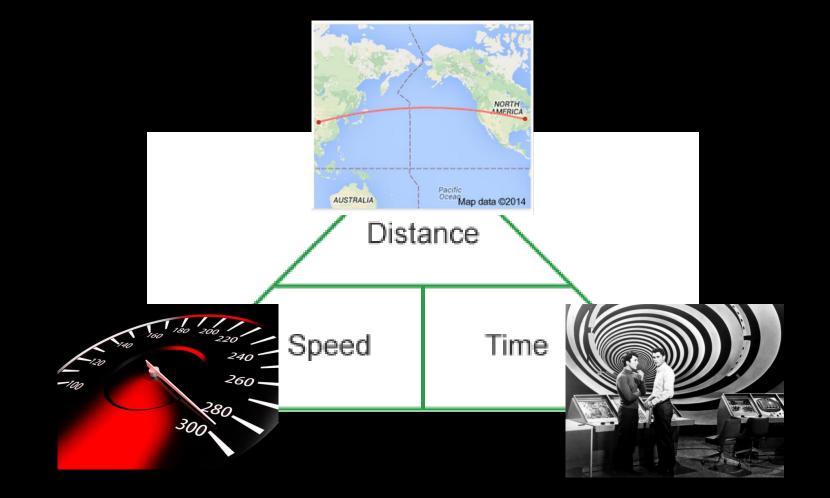
Distance from China to Kentucky



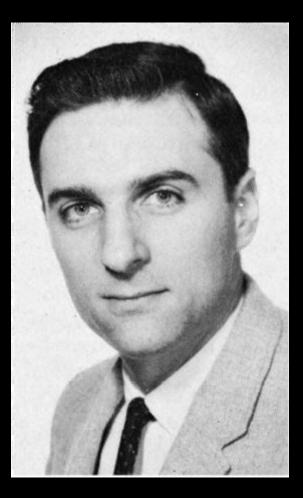


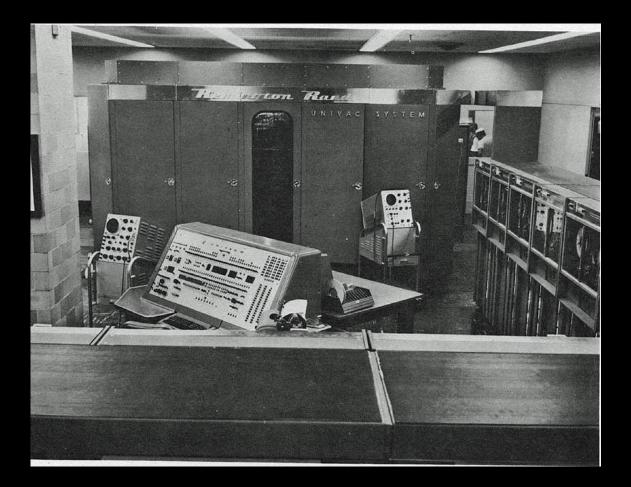






Melvin Conway





Project-Based Organizations

Volume 1 Issue 1 2011

ISSN: 2157-372

Engineering Project Organization Journal

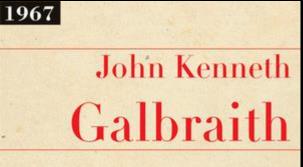
Editor: Paul S. Chinowsky, University of Colorado , USA



"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?"



The NEW INDUSTRIAL STATE

> With a new foreword by James K. Galbraith

Janu Madin

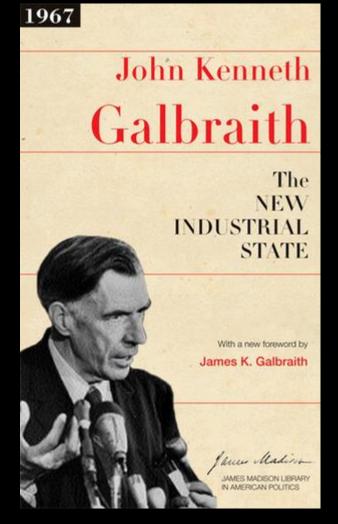
JAMES MADISON LIBRARY IN AMERICAN POLITICS

Technostructure



The group of technicians within an enterprise with considerable influence and control.

-- John Kenneth Galbraith



"How Do Committees Invent?"







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 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 programming of a computer, the general activity is largely the some

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The design organization may or may not be involved in the construction of the system it designs. Frequently, in public affairs, there are policies which discourage a group's acting upon its own recommendations, whereas, in private industry, quite the opposite situation often prevails.

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 continually making choices. Many of these choices may be more than design decisions; they may also be personal decisions the designer makes about his own future. As we shall see later, the incentives which exist in a conventional management environment can motivate choices which subvert the intent of the sponsor.1

stages of design

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The initial stages of a design effort are concerned more with structuring of the design activity than with the system itself.2 The full-blown design activity cannot proceed until certain preliminary milestones are passed. These include:

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design organization criteria

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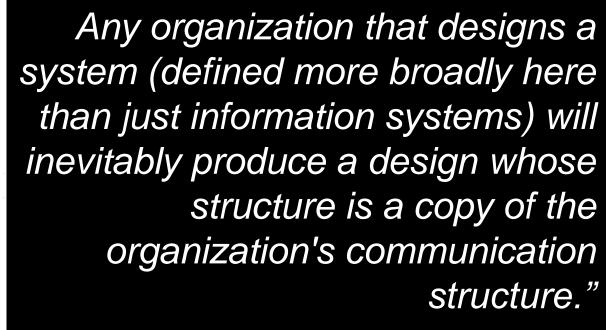
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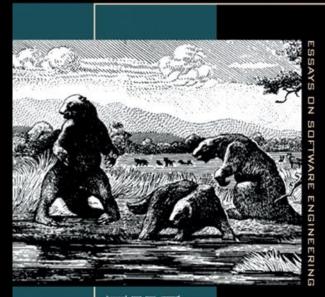
DATAMATION

Communication dictates design.

-- Mel Conway, 1<u>96</u>7

Conway's Law

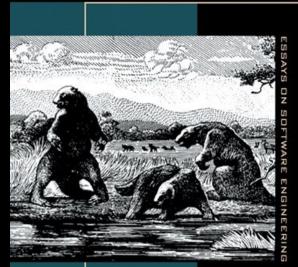
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THE MYTHICAL MAN-MONTH

FREDERICK P. BROOKS, JR.

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Brooks' Law

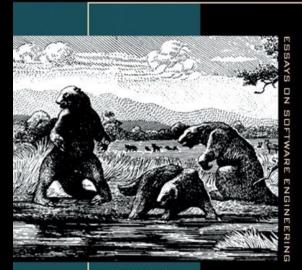
"Adding manpower to a late software project makes it later."

THE MYTHICAL MAN-MONTH

FREDERICK P. BROOKS, JR.

-- Fred Brooks, 1975

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THE MYTHICAL MAN-MONTH

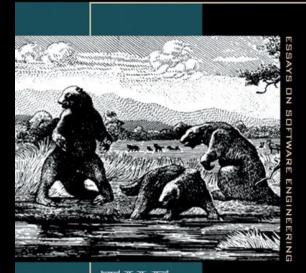
FREDERICK P. BROOKS, JR.

Intercommunication formula

n(n - 1) / 2

-- Fred Brooks, 1975

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FREDERICK P. BROOKS, JR.

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5*(5-1)/2 = 10 15*(15-1)/2 = 105 50*(50-1)/2 = 1,225 150*(150-1)/2 = 11,175

-- Fred Brooks, 1975

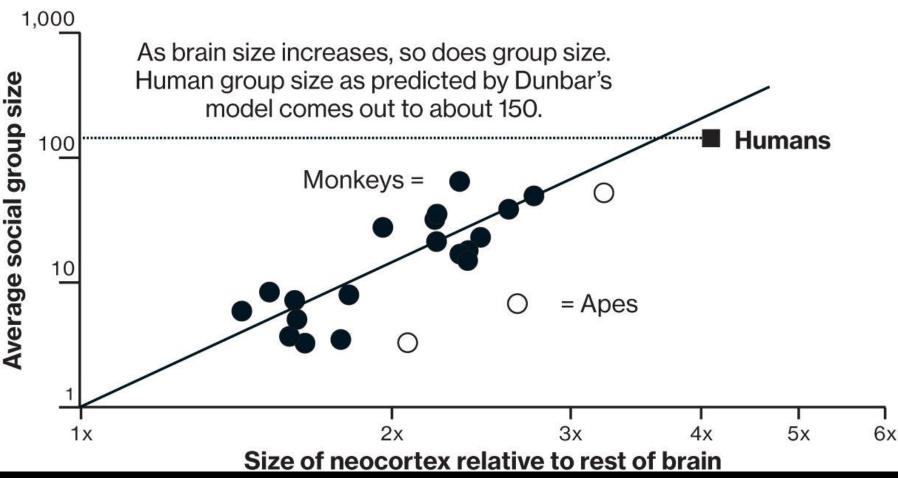
Dunbar's Number

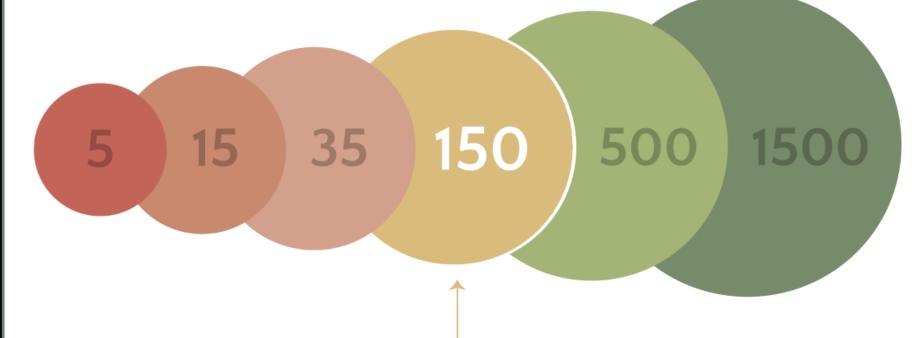
A measurement of the "cognitive limit to the number of individuals with whom any one person can maintain stable relationships."





The Social Cortex





Dunbar's Number

the max number of relationships a person can maintain

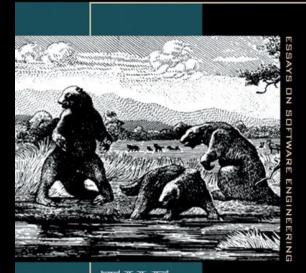
Dunbar Groups

Intimate friends: 5 Trusted friends: 15 Close friends: 35 Casual friends: 150

-- Robin Dunbar, 1992



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DATAMATION

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Conway's (first) Law

So... what about other Conway Laws?

Conway's Second Law

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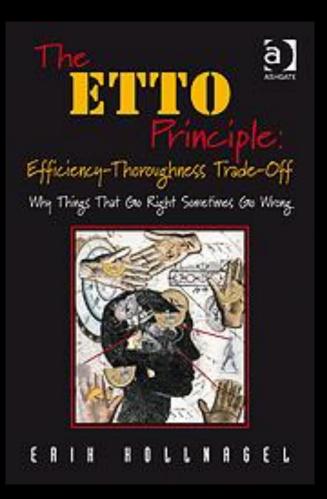
Doing it Over

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



Trade Offs

Efficiency-Effectiveness Trade Offs (ETTOs)



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

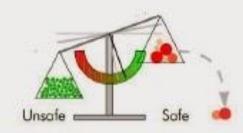
ETTOs are "normal" and result in success more often than failure.

Two interpretations of safety



Safety-I

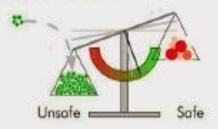
Safety means that the number of things that go wrong (accidents / incidents / near misses) is as low as possible.



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

Safety-II Resilience

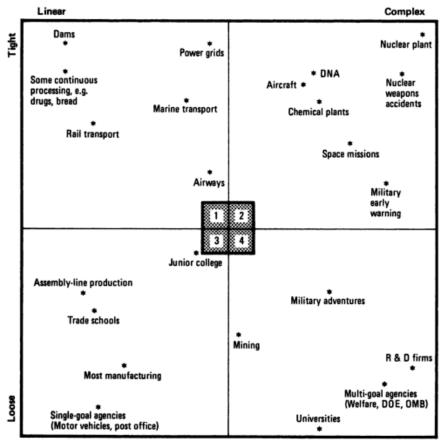
Safety means that the number of things that go right is as high as possible. Safety is the ability to succeed under varying conditions.



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

FIGURE 3.1 Interaction/Coupling Chart

INTERACTIONS



COUPLING

The enemy is intractability.



Increasing Intractability

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

-- Eric Hollnagel, 2009



Conway's Third Law

design organization criteria

HOW DO COMMITTEES INVENT?

by MELVIN E. CONWAY

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> > DATAMATION

Homomorphism

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



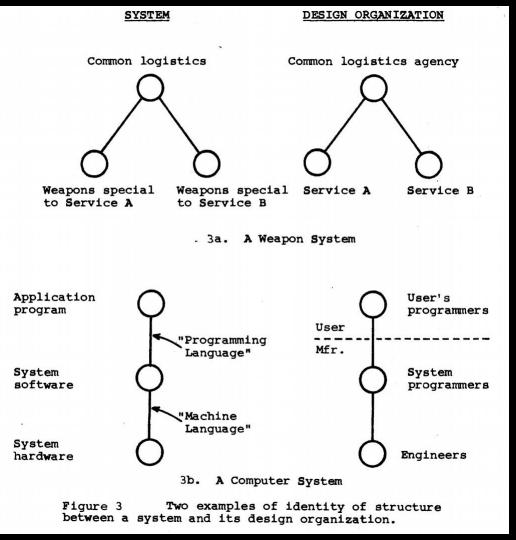


ho·mo·mor·phism

/ homə morfizəm/

noun MATHEMATICS

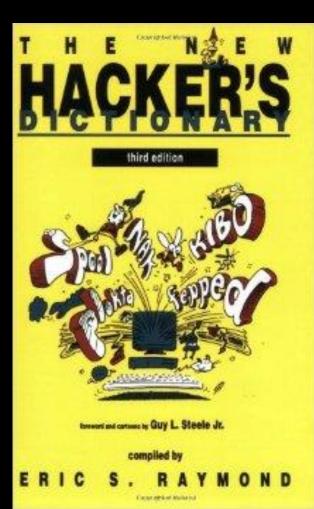
a transformation of one set into another that preserves in the second set the relations between elements of the first.



Homomorphism

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

- Eric S. Raymond, 1991



Conway's Fourth Law

Chapter VI, "The Technostructure." ³ For a discussion of the problems which may arise when the design

Review, March-April, 1967, p. 73.

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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

Three reasons Disintegration occurs...

design organization criteria

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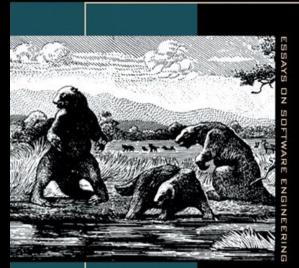
Disintegration: Reason #1

"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



ANNIVERSARY EDITION WITH FOUR NEW CHAPTERS



Brooks' Law

Adding manpower to a late software project makes it later.

THE MYTHICAL MAN-MONTH

FREDERICK P. BROOKS, JR.

-- Fred Brooks, 1975

Disintegration: Reason #2

design organization causes its

communication structure to

"Application of the

disintegrate."

conventional wisdom of

management to a large

-- Mel Conway, 1967

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> > DATAMATION



Dunbar's Number

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





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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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¹ A related, but much more comprehensive discussion of the behaviar of system-designing organizations is found to John Kenneth Galbraith's, The New Industrial State (Boston, Houghton Mifflin, 1967). See extendibly Chapter VI, "The Technostructure."

³ For a discussion of the problems which may arise when the design activity takes the form of a project in a functional environment, see C. J. Middleton, "How to Set Up a Project Organization," Harvard Business Review, March-April, 1967, p. 73.

Dr. Conway is manager, peripheral systems research, at Sperry Rand's Univoc Div. where he is working on reconnition of continuous speech. He has previously been a research associate at Case Western Reserve Univ., and a software consultant He has an MS in obvsics from Callech and a

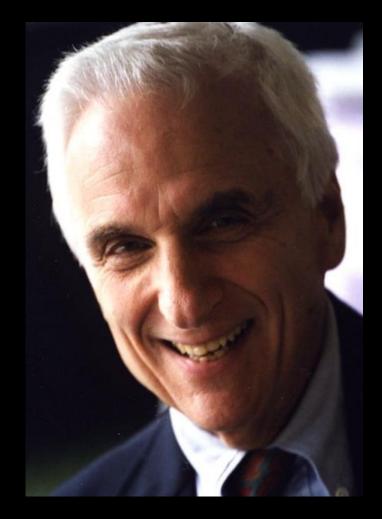
PhD in math from Case.

DATAMATION

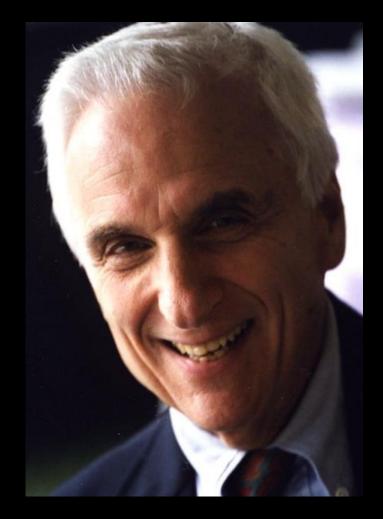
Communication dictates design.

-- Mel Conway, 1<u>96</u>7

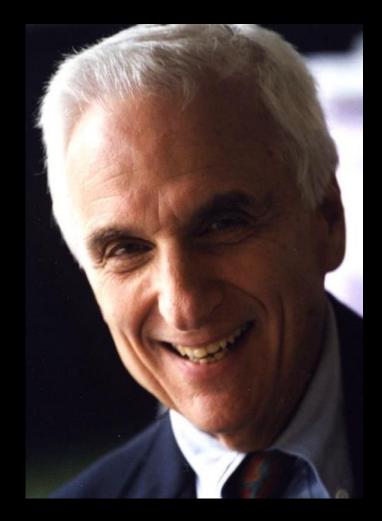
So, what can we do about this?



Conway's Laws can help us succeed

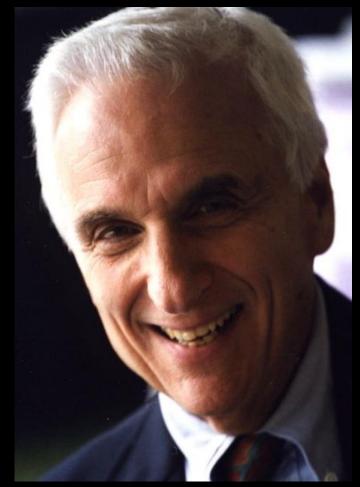


Conway's Laws can help us succeed when working with distributed teams.



Conway's First Law

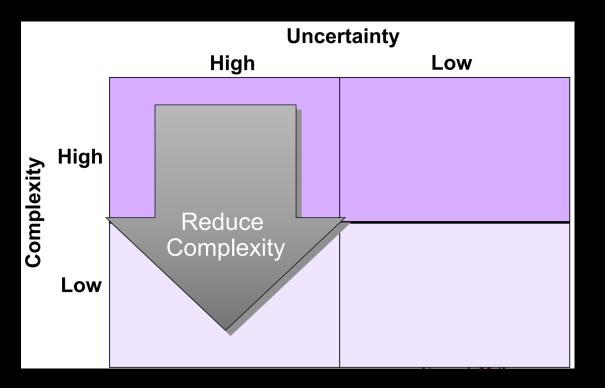
A system's design is a copy of the organization's communication structure.



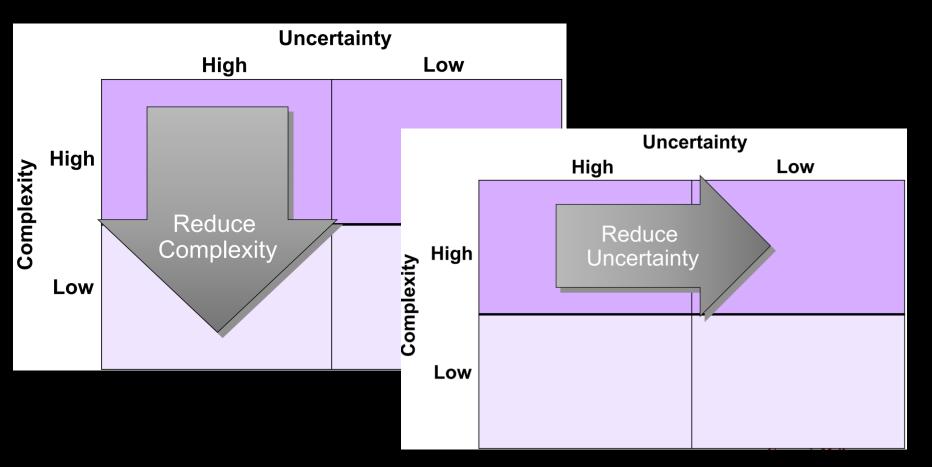
Conway's First Law

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"

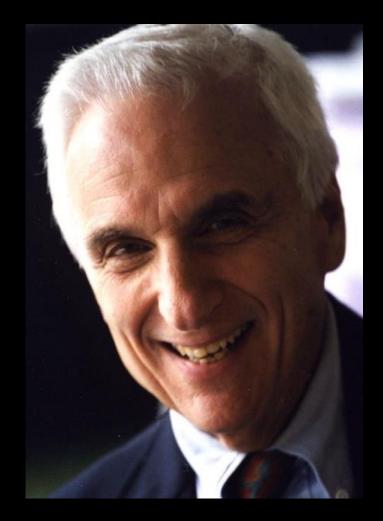


James Herbsleb: "Tactics for Global Software Development"

Increase communications

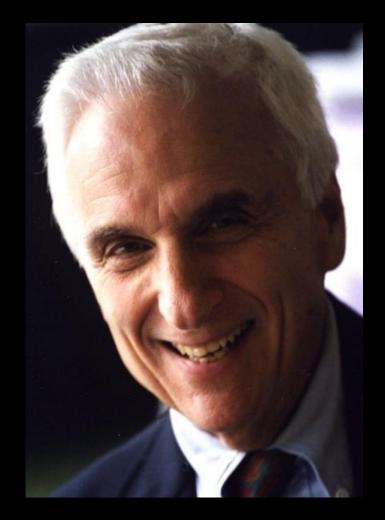
- Real-time Chat Tools
- Video Conferencing
- Online Forums/News Groups
- Wiki and Web Sites

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 Addison Wesley Signature Series

RELIANCE SOFTWARE RELEASES THROUGH BUILD. THST, AND DUPLOYMENT AUTOMATION

Foreword by Martin Fowler

*

Jez Humble David Farley

Continuous Delivery

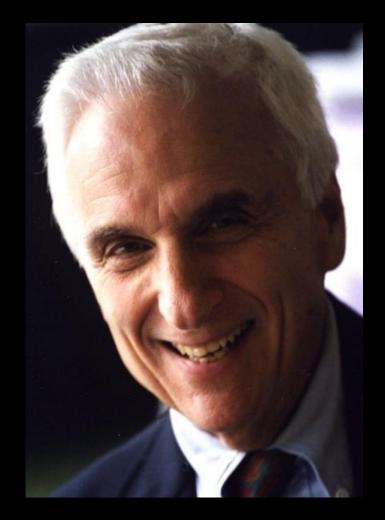
"The core concept of making small frequent changes, and testing at every step, reduces the risk inherent in deploying new code."

Jez Humble, Thoughworks.

Support continuous processes

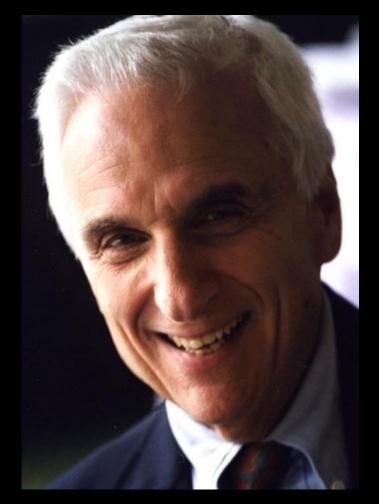
- Implement small changes
- Test immediately
- Deploy constantly

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.

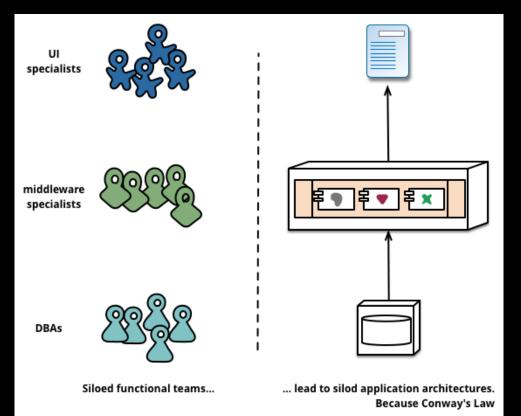
Organize teams in order to achieve desired system.

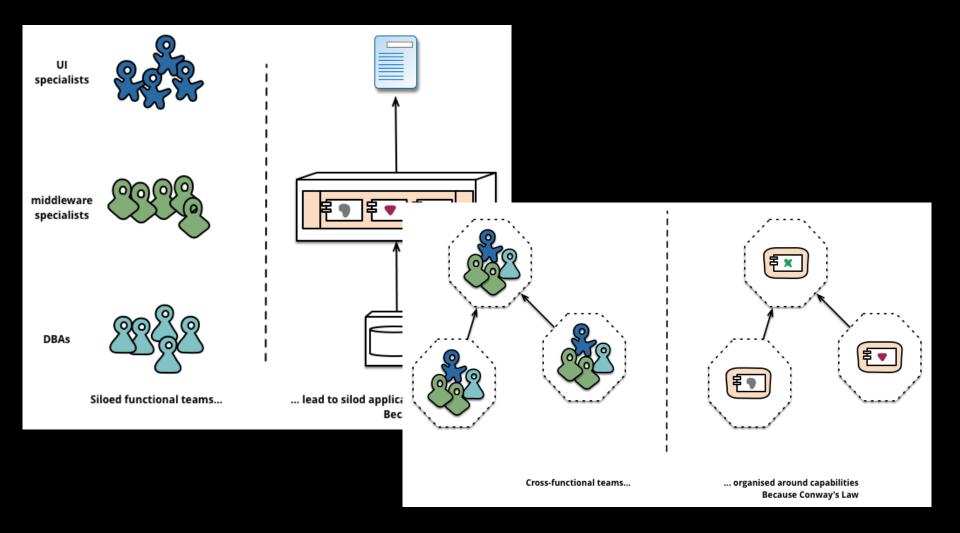
Microservices

Organized around business capabilities.

Products, not projects.

Martin Fowler, Thoughtworks

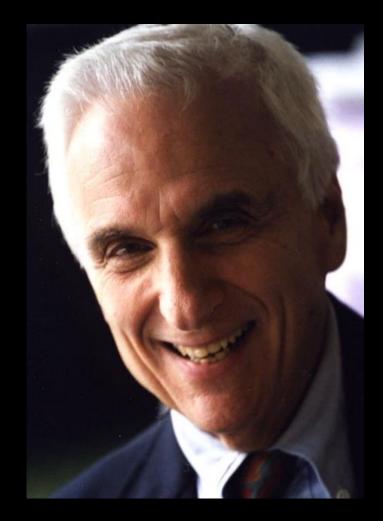




Organize teams by product or BU

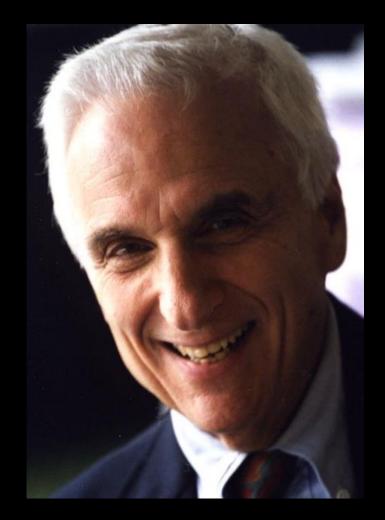
- Combine design, develop, test, & deploy
- Include storage, business process, & UI
- Allow teams autonomy within their boundary
- Require teams to inter-operate, not integrate

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

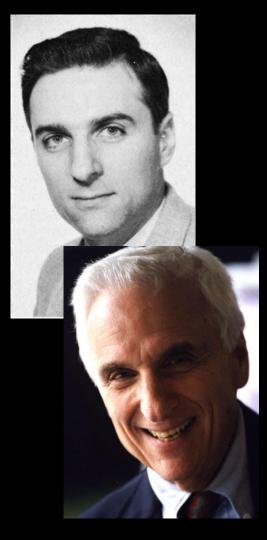
If a team can't be fed with two pizzas, it's too big.

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

Increase communications
 Support continuous process
 Organize teams by products
 Make teams as small as necessary

Conway's Law at a Distance

Building Teams in a Distributed World

http://g.mamund.com/2014-archsummit

Mike Amundsen CA Technologies @mamund