

# Architectural Skills

*CSSE6400*

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*Quote*

Architecture is the stuff you can't Google.

– Mark Richards *[Richards and Ford, 2020]*

*Quote*

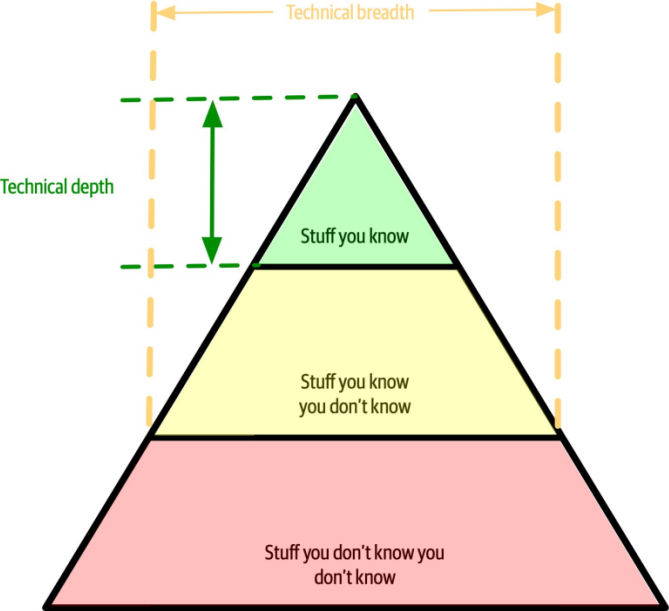
There are no right or wrong answers in architecture—only trade-offs.

— Neal Ford *[Richards and Ford, 2020]*

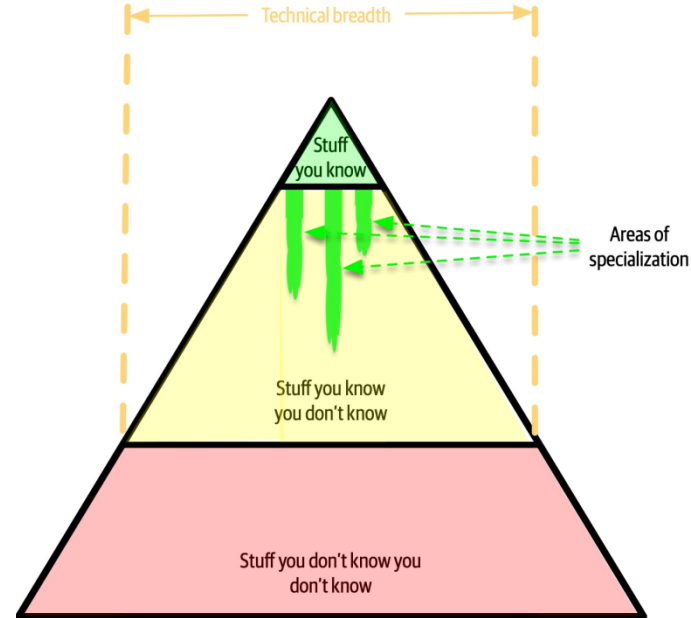
### *Architectural Design*

Architects use knowledge and experience to analyse trade-offs to design architectures appropriate to the system context.

# Developers – Technical Depth *[Richards and Ford, 2020]*



## Architects – Technical Breadth *[Richards and Ford, 2020]*



- Architects need greater technical breadth than depth
- Breadth allows better consideration of trade-offs
- Avoid trying to become an expert across many areas
  - You'll fail
- Don't stop learning – increase your breadth
  - Don't let your knowledge become stale

### *Definition 0. Conway's Law*

Organisations design systems whose structure is inevitably a copy of the organisation's communication structure *[Conway, 1968] [MacCormack et al., 2012]*.

- First citation is original article.
- Second is one of several about MIT and Harvard research into the phenomenon, calling it the *mirroring hypothesis*.
  - Compared open source to commercial packages (e.g. Linux to Solaris).
- Elaborate on this point and Coplien's research into organisational sociology.
- Reasons
  - Governance structures constrain communication paths.
  - This constrains space in which to search for solutions, constraining problem solving approaches.

### *Conway's Law Consequences*

- Business Process Management
  - Microservices to reflect organisation structure
  - Teams formed around services
- BPM: Redesign organisation structure to reflect system you want
  - Microservices: Design system to reflect your organisation
  - Elaborate on benefits of both approaches
  - Comment on benefits of small focused teams



### *Conway's Law Consequences*

Team insularity – more loyal to team than organisation

- Amazon order tracking example from 2022 week 11
  - Negotiation difficulties with other teams
- Need to ensure inter-team cooperation
- Possibly move people between teams
- Microservices can encourage insularity
- Many teams can also encourage insularity
- Intra-team communication becomes more difficult with large teams

## Conway's Law Issues

- Cross-cutting concerns
    - e.g. Security
  - Organisation structure should align with market structure
  - Physical location of teams
- Cross-cutting concerns span services & consequently teams
  - Can't have a "security" service
    - Needs to be part of *every* service
  - Teams solely based around Conway's law and services may not deliver some cross-cutting concerns
  - Cooperation, documentation & audits may be necessary
  - Market structure may complement team structure to place teams closer to their end users
  - Global development & outsourcing mean different teams are likely to be in different locations
  - Requires additional overhead & documentation for cooperation between teams

*Definition 0.* Peopleware<sup>[Neumann, 1977]</sup>

People involved in development of systems.

– Peter G. Neumann

## Stakeholders *[Coplien and Bjørnvig, 2010]*

- End Users
  - Organisation
  - Customers / Sponsors
  - Domain Experts
  - Developers
- Organisation for whom system is being developed
  - Customers / Sponsors are those who are responsible for the end user's work process (e.g. managers)
  - Domain Experts understand details of problem and/or solution domain

## Communication

- Written
  - For those who are not there
- Oral
  - Immediate & interactive
- Both apply to all types of stakeholders
- Time Dimension: Written is available in the future
- Extent of either depends on SE process
- Extent also depends on engagement of each type of stakeholder
- Technical Documentation guest lecture in week 11 only touched on docs written for developers
  - Points about clarity are still relevant

## Circumventing Conway's Law <sup>[Woods, 2017]</sup>

- Cloud Platforms
  - Microservices
  - APIs
  - *Culture*
- Culture is most important
  - Easily deployed & accessible services with good APIs opens possibility of communication outside of organisation silos.

## *Evidenced-Based Software Engineering*

Don't follow fads, seek evidence for good practice.

Elaborate on finding reliable sources of information and confirming facts yourself.

*Let's hear from an expert*

## Software Engineering's Greatest Hits

what we actually know about software development  
and why we believe it's true



**Greg Wilson**

<http://third-bit.com/talks/greatest-hits/>



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