



Universidad de Oviedo



Software Architect role and Stakeholders



SOFTWARE
ARCHITECTURE

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Jose E. Labra Gayo

Role of software architect



Role of software architect

Expectations of an architect

Make architectural decisions

Continually analyse the architecture

Keep current with existing trends

Ensure compliance with existing decisions

Diverse exposure and experience

Have business domain knowledge

Possess interpersonal skills

Understand and navigate politics

Software architect is a role, not a rank



Make architectural decisions

Define architecture decisions and design principles

Architect should guide technology decisions

Keep decision records

Analyse pros and cons



Continually analyse the architecture

Continually analyse the architecture and technology

Being responsible for technical success of project

Be aware of structural decay

Strive for consistency

Organize the code into packages, folders, modules, ...

Define boundaries, guidelines, principles,...

Include testing and release environments into projects



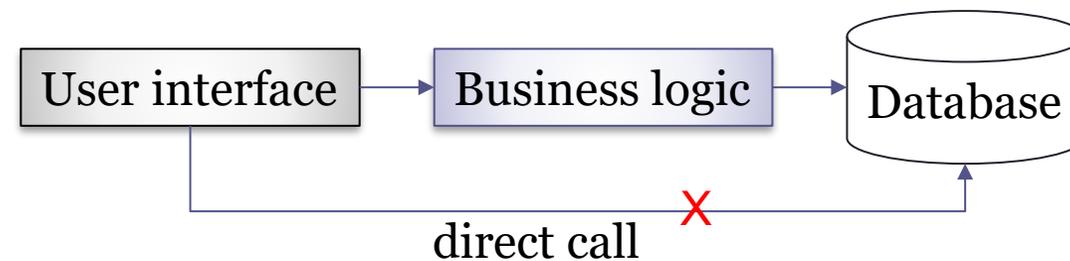
Ensure compliance with existing decisions

Architects usually impose some constraints

Example:

Database access from User Interface constraint

Developers could bypass it

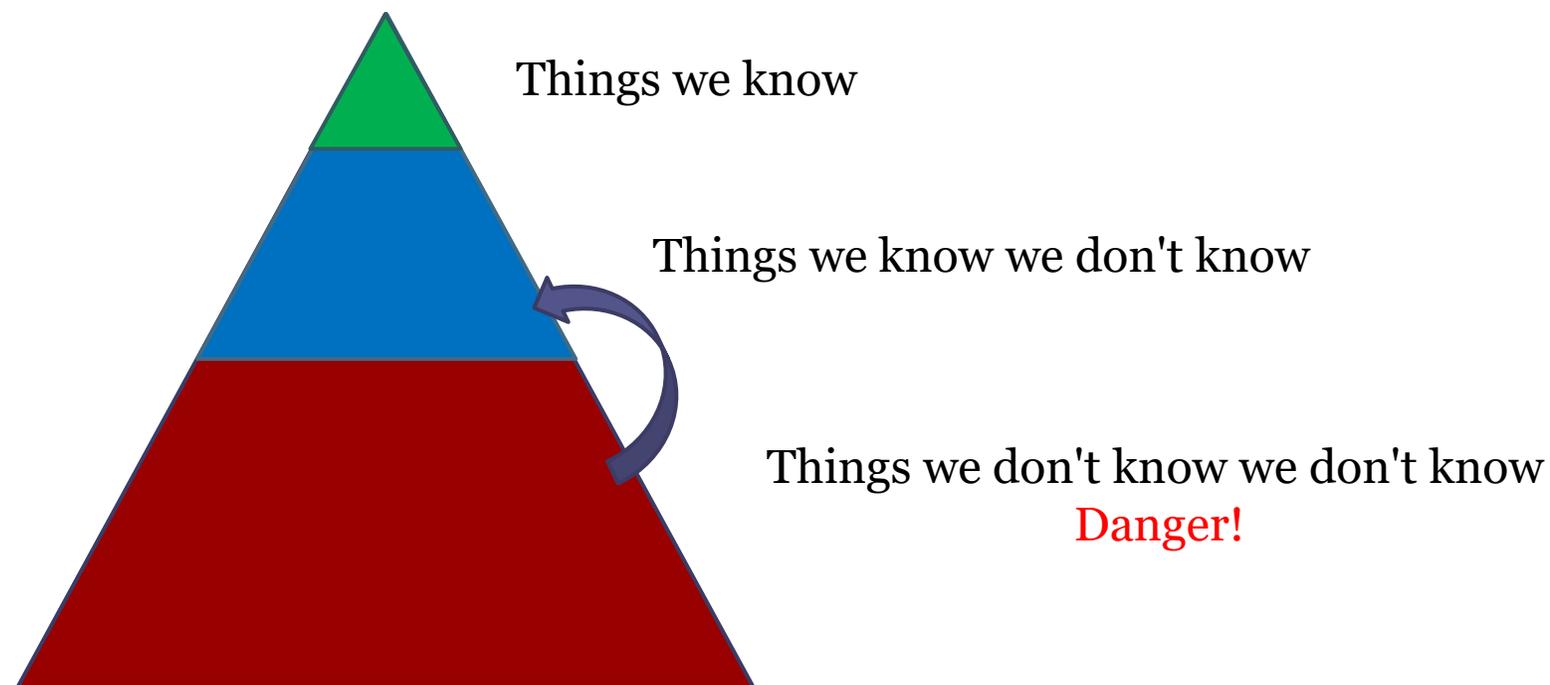


Keep current with existing trends

Be aware of latest technology and industry trends

Decisions made by architect = long lasting and costly

Good architects know what they know and what they don't know



Diverse exposure and experience

Have exposure to multiple and diverse technologies, frameworks, platforms, environments,...

It doesn't mean being an expert in each of them

...but at least be familiar with varying technologies

Technical breadth better than technical depth



Business domain knowledge

- Architect expected to have certain level of business domain knowledge
- Understand business problem, goals and requirements
- Effectively communicate with executives and business users using the domain language



Possess interpersonal skills

Software architect = leader

Teamwork and leadership skills

Technical leadership

Be inclusive and collaborate

Help developers understand *the big picture*

Get hands-on

Be engaged in the delivery

Low-level understanding

Coding as part of the role

Code reviews and mentorship



"no matter what they tell you, it's always a people problem", G. Weinberg

Understand and navigate politics

Understand the political climate of the enterprise and be able to navigate the politics

Architectural decisions affect stakeholders

Product owners, project managers, business stakeholders, developers...

Almost every decision an architect makes will be challenged

Negotiation skills are required

Present and defend the architecture

The software architect's elevator

Communication with the different layers



Main concerns of software architects

Determine trade-offs and decisions

Why to do something

Prioritize quality attributes

How to do something and why

Contain entropy

Define standards, conventions, toolsets for teams



Working in teams

Software engineering is a team endeavour

Social interactions

Architect personalities

Team topologies

Team size

Some tips:

Hiding & the genius myth

The Bus Factor

3 pillars of social interaction



Hiding & the genius myth

Insecurity

People are afraid of others judging their work in progress

Attempts to hide code

The genius myth:

Tendency to ascribe success of team to a person

Examples: Bill Gates, Linus Torvalds, etc.

Hiding considered harmful

Working alone increases risk



The Bus factor*

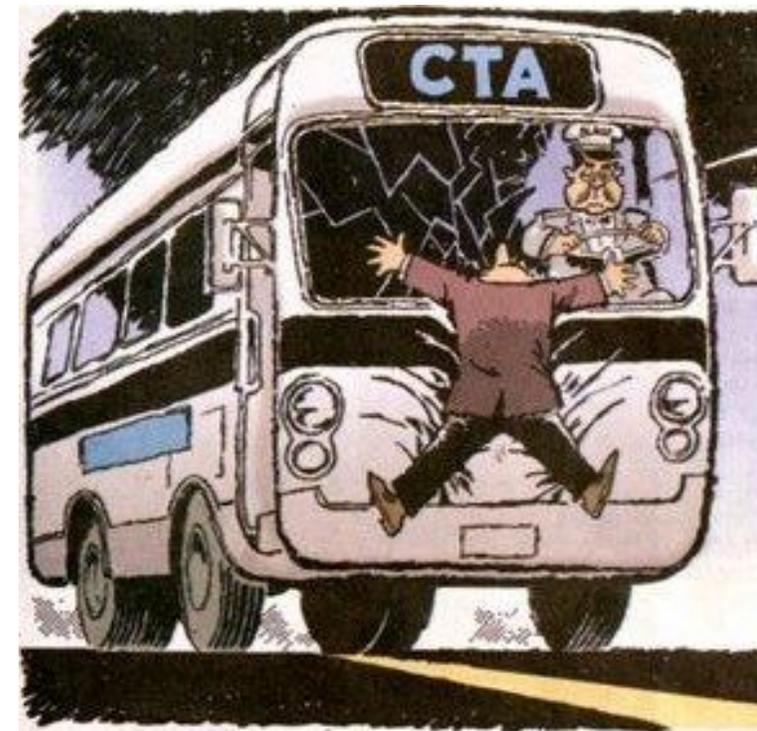
Number of people that need to get hit by a bus before your project is completely doomed

Unpredictable life events can happen

Teamwork is mandatory to reduce risk

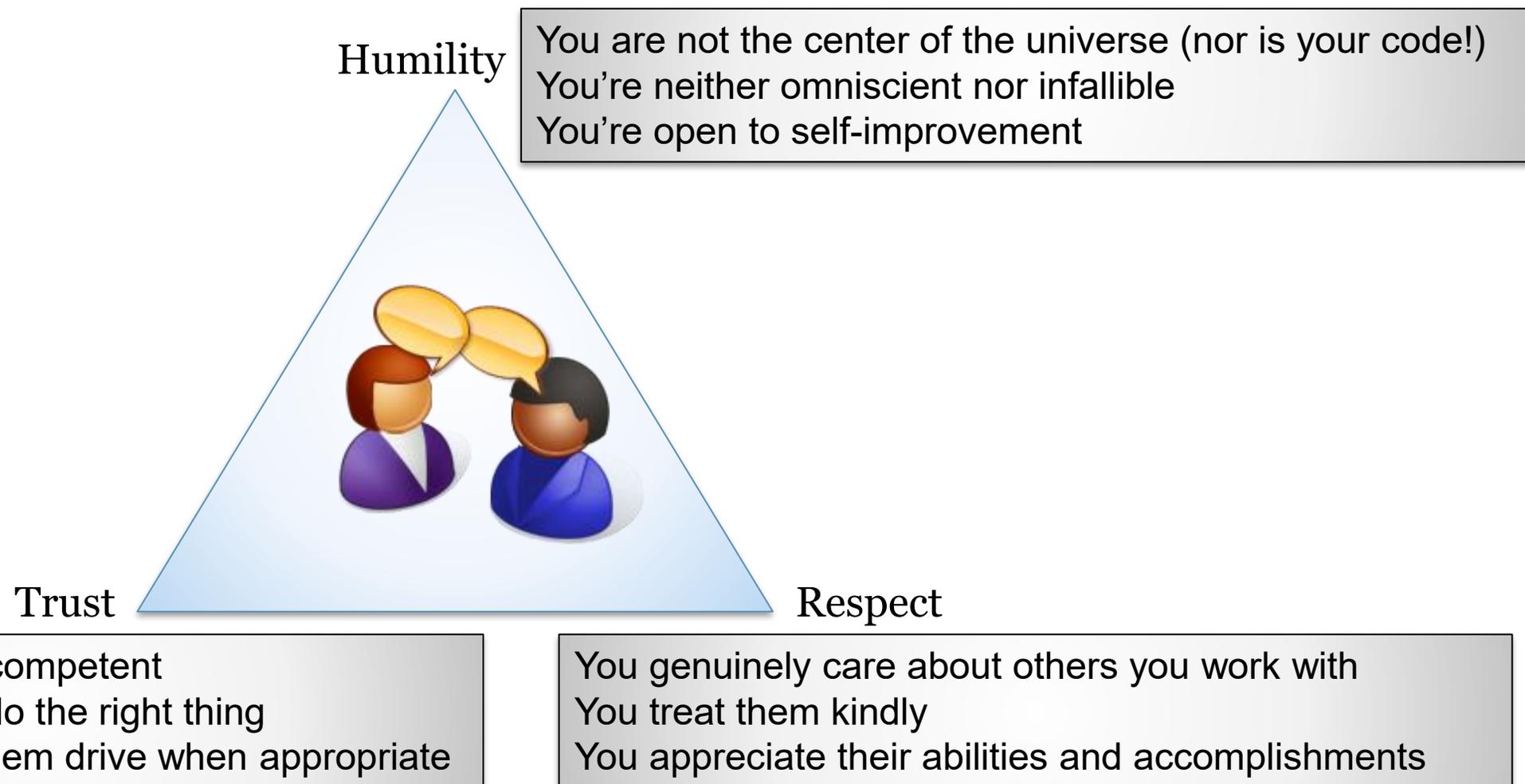
Ensure to have at least 2 people

Good documentation



*Term coined at Google (Software Engineering at Google, 2020)

3 pillars of social interaction



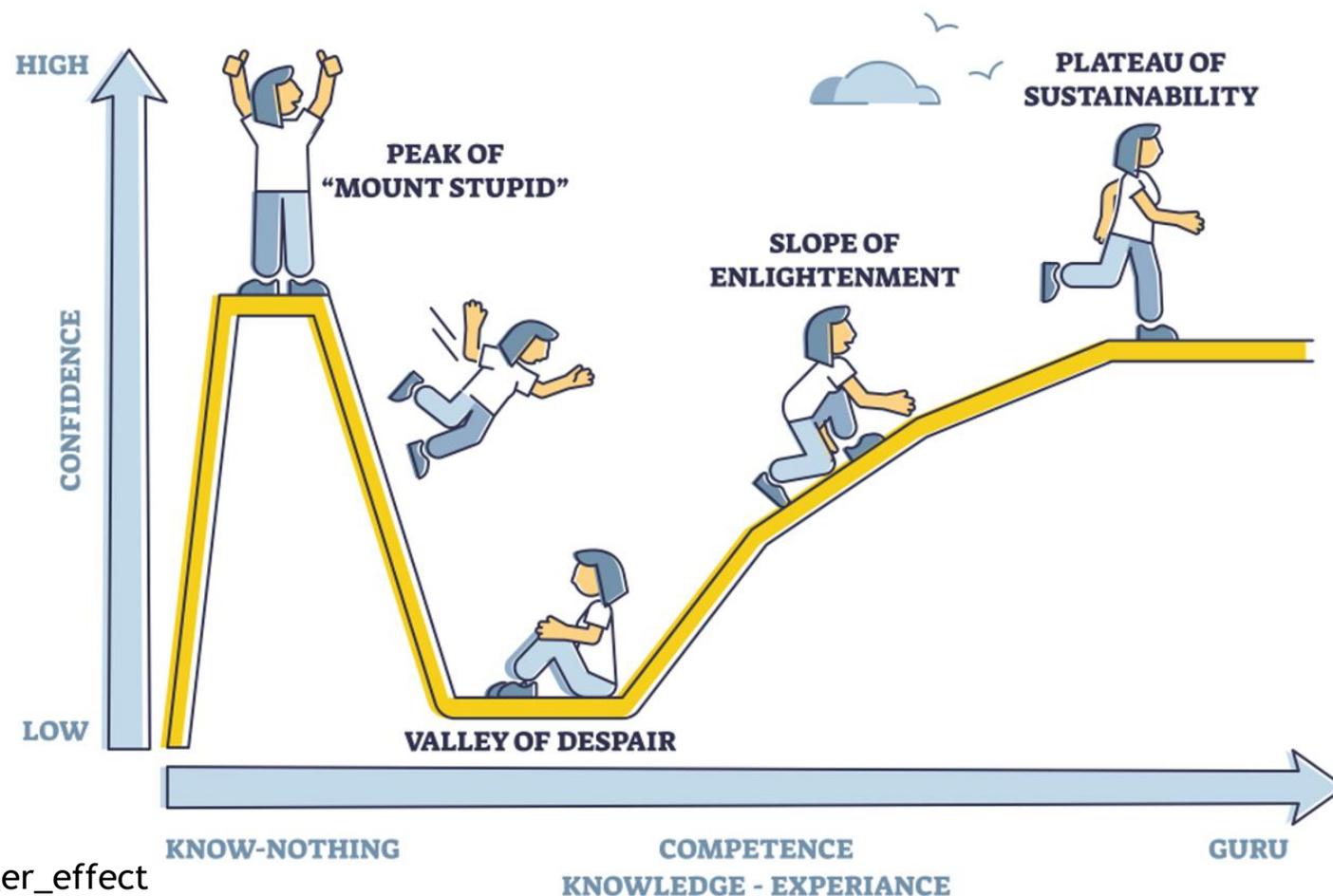
Dunning-Kruger effect

People with limited knowledge overestimate their abilities

Consequences:

- Poor Decision-Making

Confidence \neq Competence



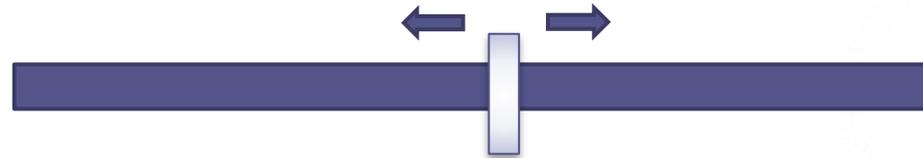
Architect personalities

Effective architect = trade-off between control freak and armchair architect



Control freak

Participate in all decisions
Decisions too fine-grained and low level
Participate in code development (bottleneck)



Armchair architect

Disconnected from development teams
Never around (jump from project to project)
Only participate in initial diagrams

Team topologies

Team topologies affect the systems

Communication structures

Team dynamics

Team size

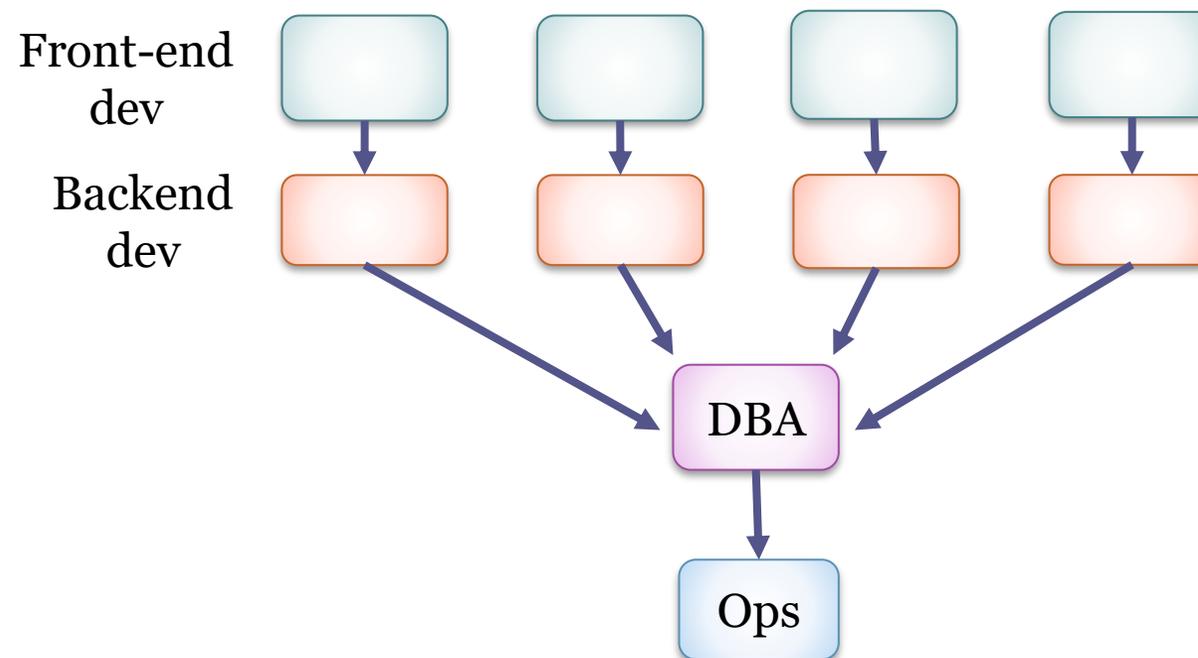
*"Team assignments are the first draft of the architecture",
M. Nygaard*

Traditional team topology

Traditional work allocation:

Existing teams are required for every new project

Example: 4 teams: front-end, back-end, DBA and Ops



Conway's law

Organizations which design systems ... are constrained to produce designs which are copies of the communication structures of these organizations

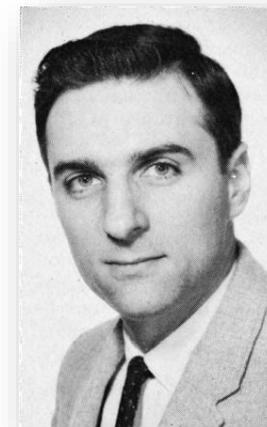
[M. Conway, 1967]

Corollary:

The best structure for a system is influenced by the social structure of the organization

Example:

If there are 3 teams (design, programming, database), the system will naturally have 3 modules

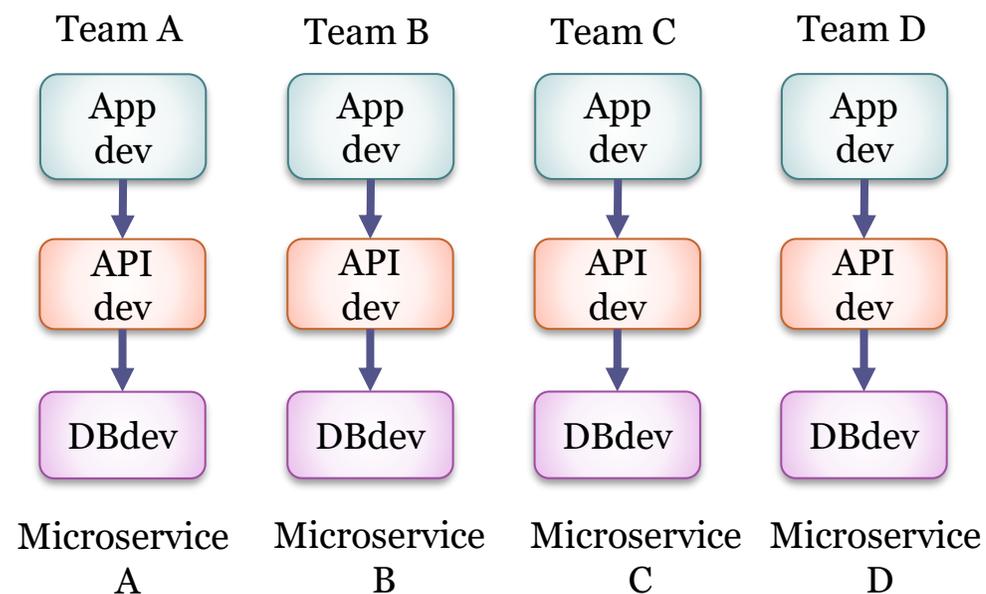


Inverse Conway Maneuver

Evolve teams and organizational structure to promote the desired architecture

Create teams after the modular decomposition

Example with microservices



Amazon's principle: *You build it, you run it*

Team size

Efficient team size can influence project success

Some warnings to be aware of:

Process loss

Pluralistic ignorance

Diffusion of responsibility

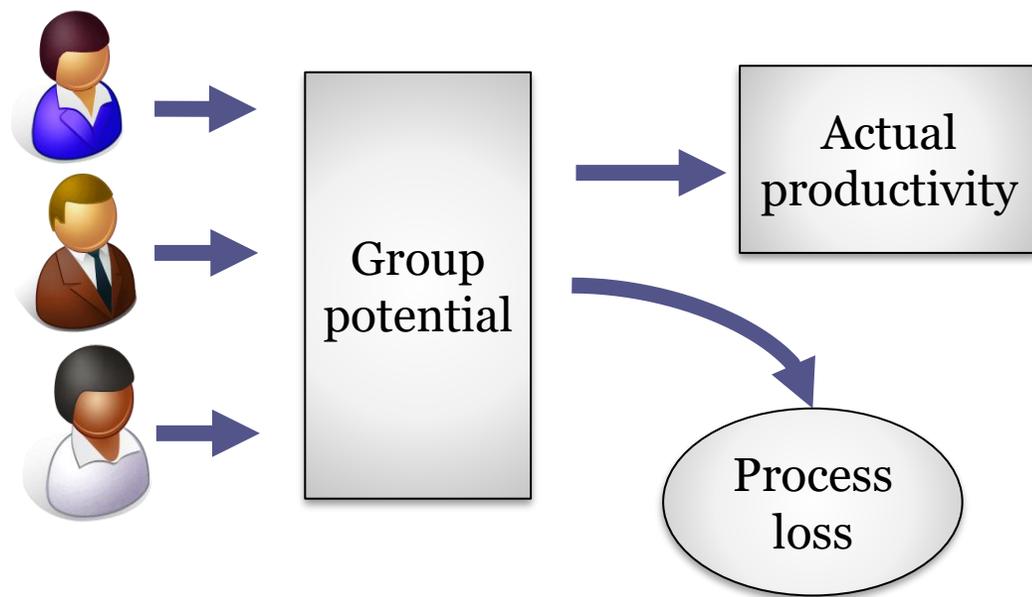


2-pizza rule: "if you can't feed a team with two pizzas, it's too large", J. Bezos

Process loss

Difference between group potential and actual productivity

Some reasons: communication overhead, meetings,...



Brooks's law. Adding manpower to a late software project makes it later

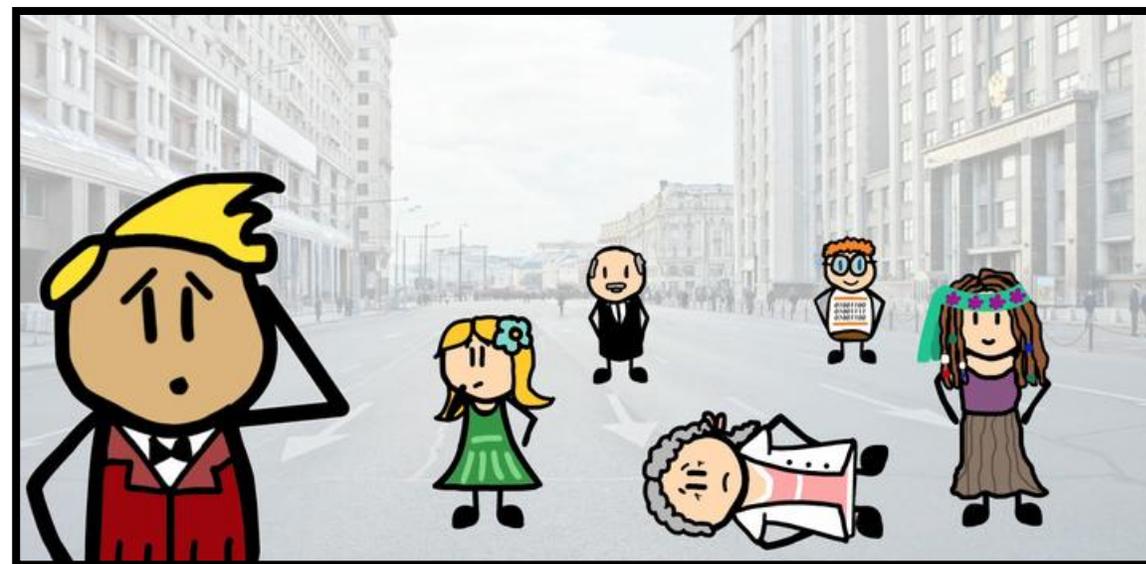
Diffusion of responsibility

Bigger team size negatively impact communication

Some signs:

Confusion about who is responsible for what

Things getting dropped



Pluralistic ignorance

When everybody publicly agree to something, but privately reject it because they think they are missing something obvious

Some architect decisions are not confronted



Emperor's new clothes fable

<http://fablesfairytalsandsocialjustice.weebly.com/the-emperors-new-clothes.html>

Groupthink

Desire for group harmony results in irrational decision-making

Each members adapts his opinion to what he perceives as the group consensus

The team decides an action that each individual considers wrong individually

Some causes

Group isolation

High cohesion in the group

Strong leaders

Prevention techniques

Include one member as devil's advocate

10th man rule



Varied skills vs unified skills

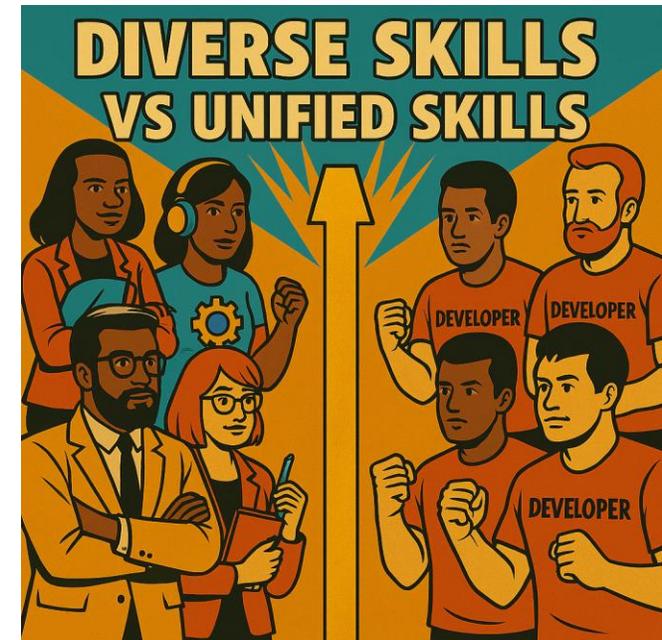
Teams with varied skills outperform unified skills

Leverage each member skills

T shaped members

Horizontal bar: cross-knowledge of different disciplines

Vertical bar: Deep expertise in one area



Leveraging checklists

Checklists = effective means to ensure some tasks are covered or addressed

Error-prone tasks/steps that are frequently missed

Make development teams more effective



Hawthorne effect:

If people know they are being observed their behaviour changes and will generally do the right thing

Stakeholders



Stakeholders

All parties that participate in the development or are affected by the system

Can be person, a role or organization

Typically have different concerns

Sometimes contradictory

It's necessary to

Understand nature, source and priority of concerns

Identify and actively engage with them

Solicit their needs and expectations



Stakeholders (explicitly or implicitly) drive the whole shape and direction of the architecture to serve their needs

Identifying stakeholders

All individuals, roles, organizations that:

Should know the architecture

Have to be convinced of the architecture

Have to work with the architecture or with code

Need the architecture documentation for their work

Have to come up with decisions about the system or its development



Identifying stakeholders

Internal

Analyst
Designer
Business manager
Developer
Product owner
Auditor
UX designer
Project manager
...

External

Customer
End users
Auditor
Public authority
Suppliers
External service providers
...

Stakeholders' expectations

Expectations help to:

Identify specific needs

Goal: achieve greater satisfaction of target audience

Avoid unnecessary work

Avoid documenting irrelevant things

Typical format:

Role/name	Contact	Expectations

Stakeholder Map

Show people/roles involved or affected by a system

Include relationships/interactions

Example for a procurement automation system (*)



(*) Source: Design it!, M. Keeling

Business goal statements

Human-centered business goals

Usually between 3-5

Structure

Subject/stakeholder

Outcome: express the need as a measurable

How will the world change if system is successful?

Context

Some insight about the goal

Subject	Outcome	Context
Mayor of the city	Reduce costs 30%	Avoid making budget cuts to essential services
Office of management	Review historical procurement data for the last 10 years	Historic data can help predict future contracts