Understanding and Predicting Delays in Large-Scale Software Development

Lightning Talk

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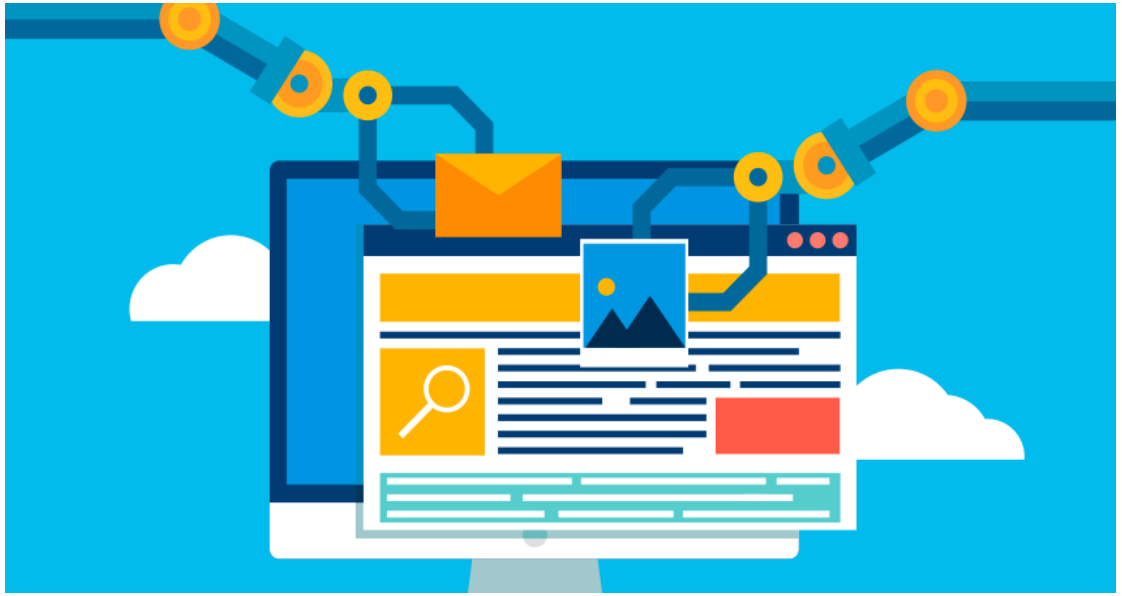
The Case for Software Effort Estimation

Late delivery and **cost overruns** have been common problems in the software industry for decades (average overrun of 30%).

With software projects being complex **socio-technical systems**, a large pool of interrelated factors can affect the development effort.



Rule of thumb and general models do not work!

A Series of Case Studies at ING

Mixed-methods approach

RQ1: What factors affect on-time delivery?

RQ2: How are these factors related to each other?

Extract influential factors from > 600 teams:

Survey data from 631 participants

An analysis of years of backlog data

An analysis of years of code quality and deployment data

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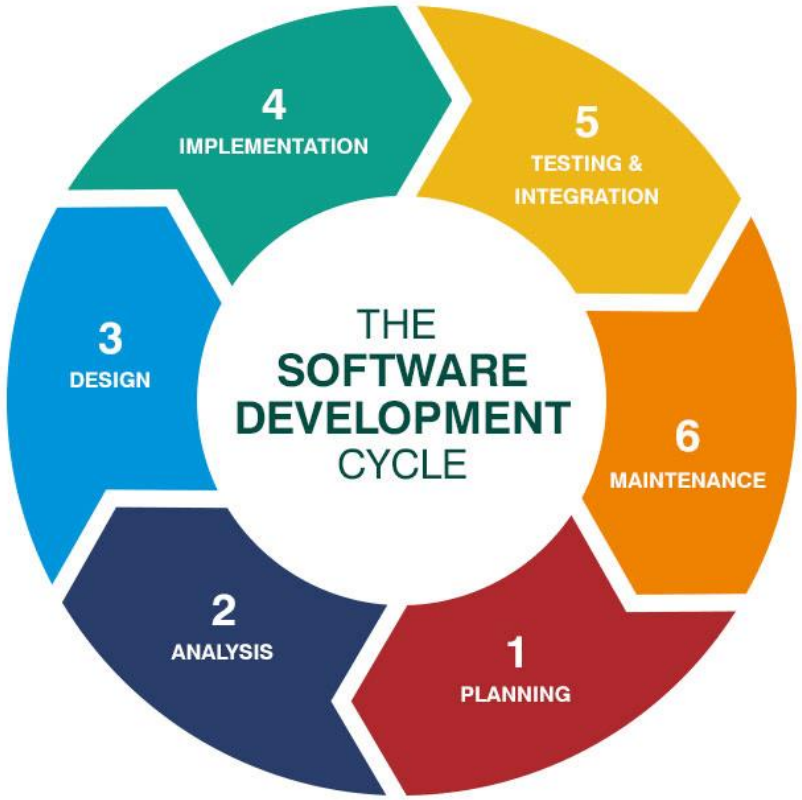
Factors and Factor Relationships

Organizational Factors

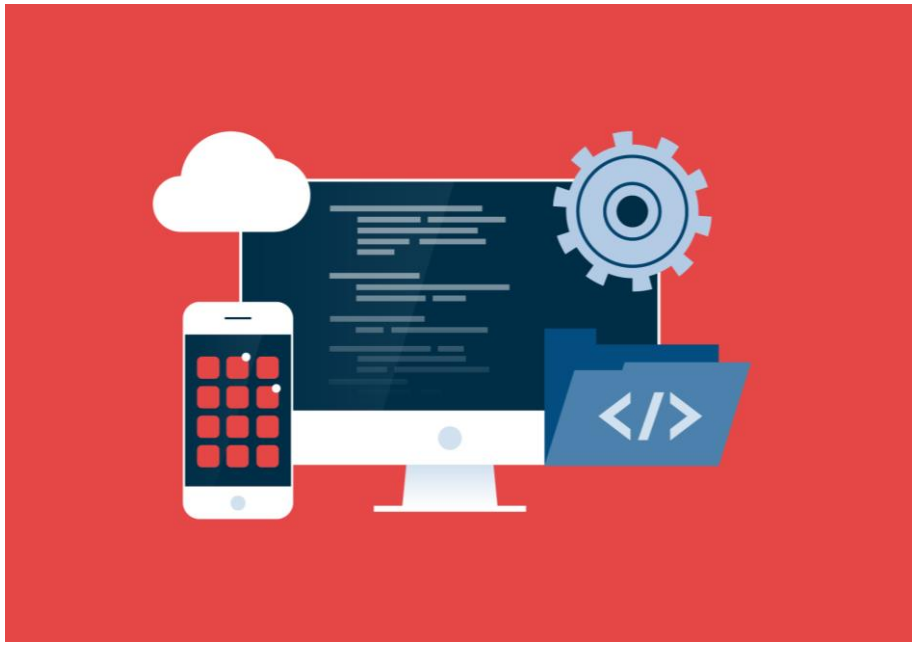
Factor	Top 2	Rank
Organizational alignment	90%	#3
Organizational politics	86%	#4
Geographic distribution	83%	#5
Executive support	77%	#14
Organizational stability	66%	#20

Process Factors



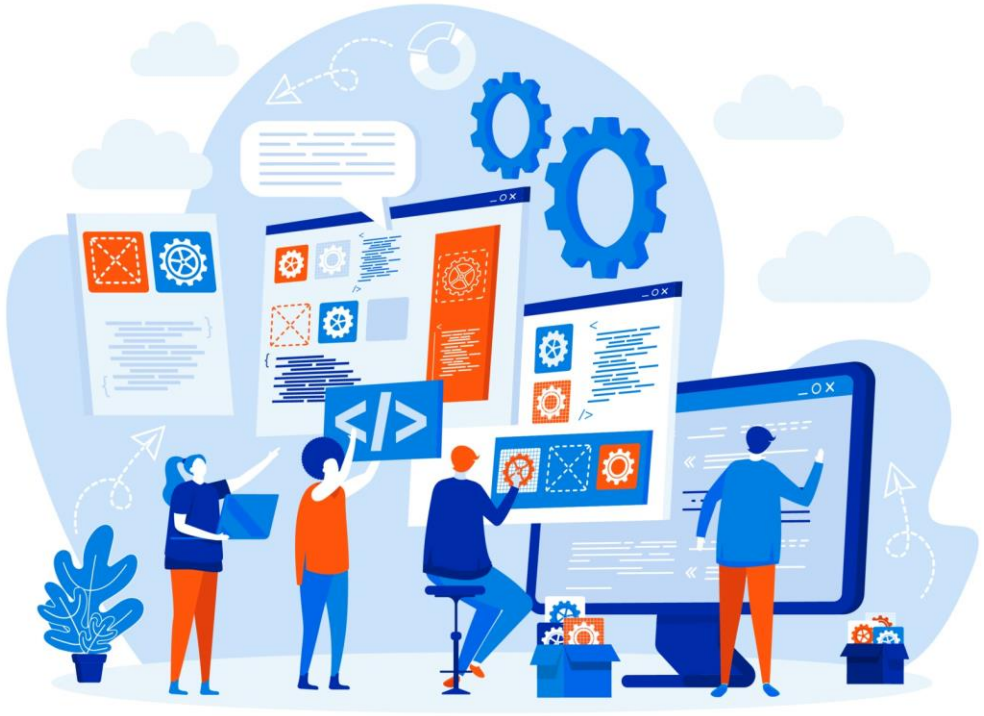
Factor	Top 2	Rank
Requirements refinement	91%	#1
Agile maturity	84%	#7
Regularity in delivery	87%	#8
Work in progress	75%	#16
User involvement	71%	#19

Project Factors



Factor	Top 2	Rank
Task dependencies	92%	#2
Project size	84%	#11
Project newness	83%	#13
Project security	65%	#22

People Factors



Factor	Top 2	Rank
Team stability	85%	#9
Skills and knowledge	83%	#10
Team familiarity	76%	#15
Team commitment	69%	#18
Communication	47%	#25

Technical Factors

Factor	Top 2	Rank
Technical dependencies	89%	#6
Poor code documentation	82%	#12
Unreliable infrastructure	70%	#17
Bugs or incidents	68%	#21
Lack of code quality	65%	#23
Insufficient testing	62%	#24

Top Influential Factors

The top influential factors are not in software and they are controllable

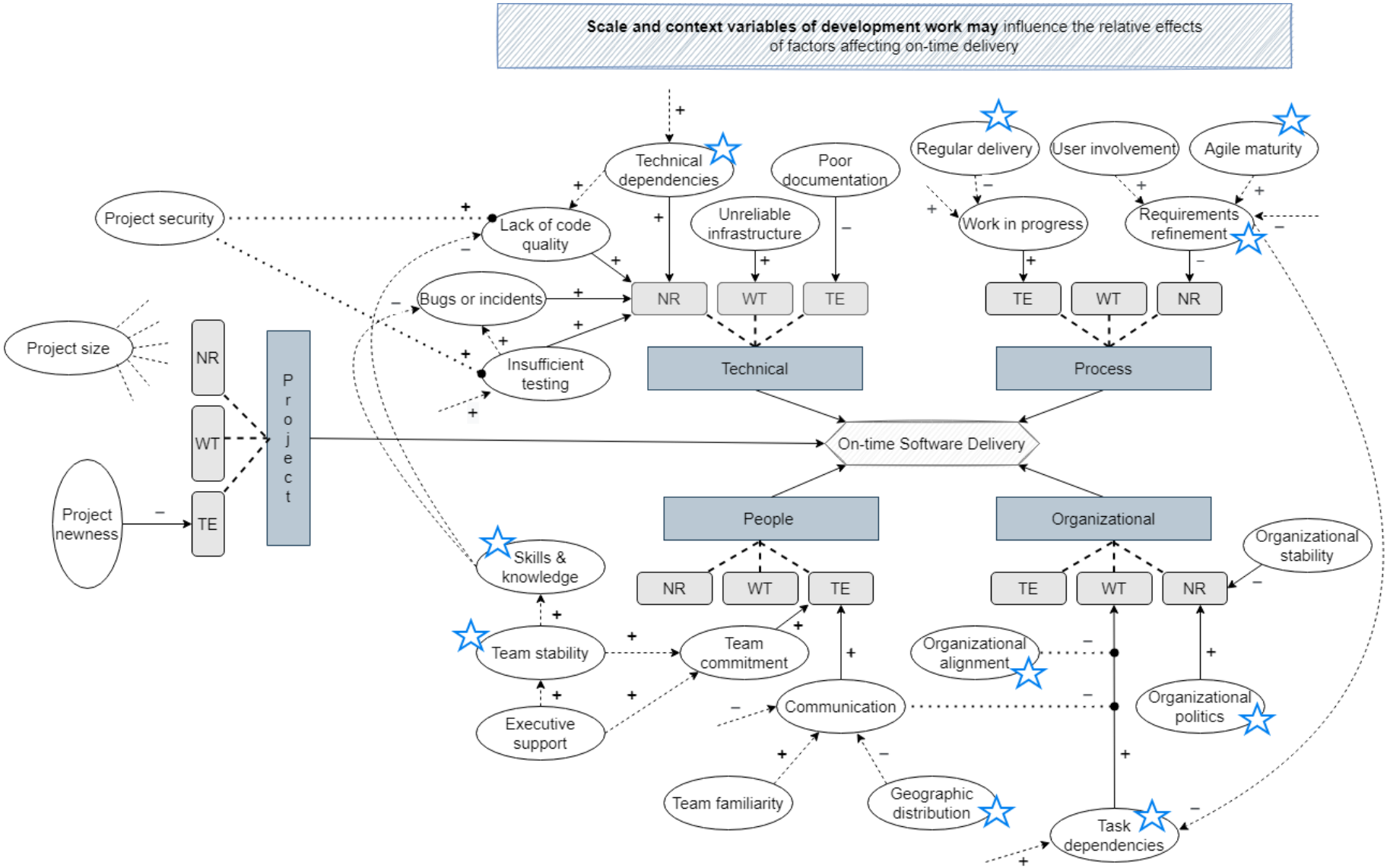
Factor	Top 2	Rank
Requirements refinement	91%	#1
Task dependencies	92%	#2
Organizational alignment	90%	#3
Organizational politics	86%	#4
Geographic distribution	83%	#5

Factor Interactions

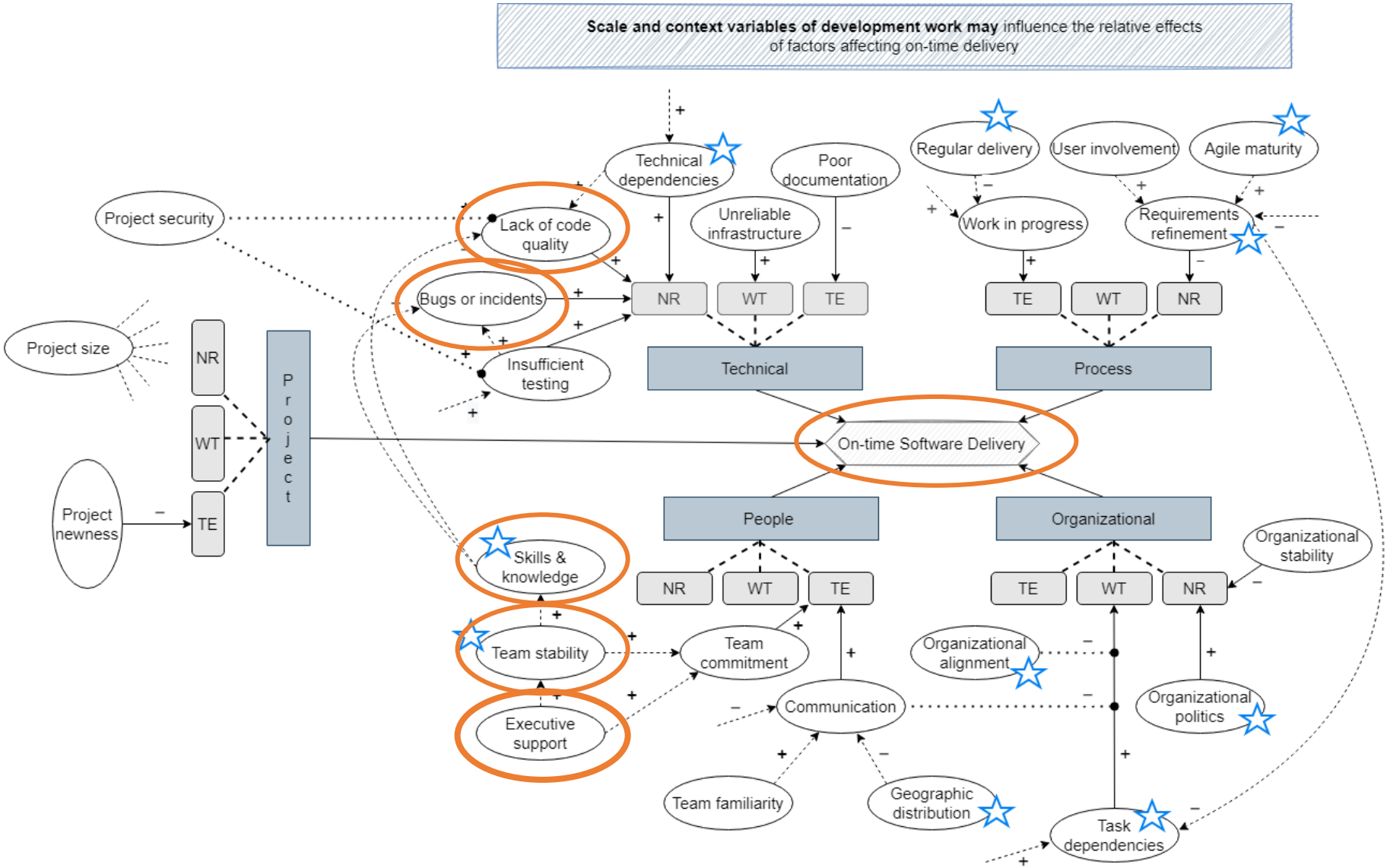
We focused on **three types of relationships** between factors:

- **Direct relationship** (X → delay): X is an immediate reason for delay
- **Indirect relationship** (X → Y → delay): X leads to events that, in turn, lead to delay
- **Contributory relationship** (Y (+ X) → delay): X is a necessary condition for Y to lead to delay

Conceptual Framework



Factors interact **hierarchically**;
organizational factors interact with people factors, which in turn impact technical factors.

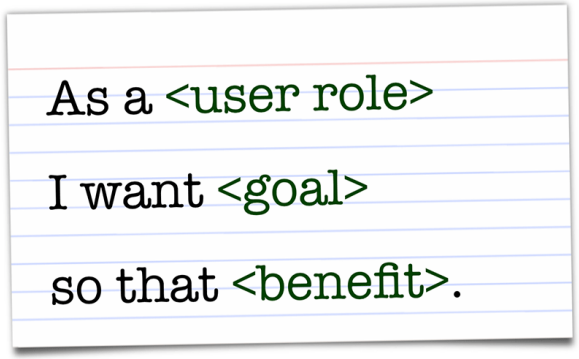


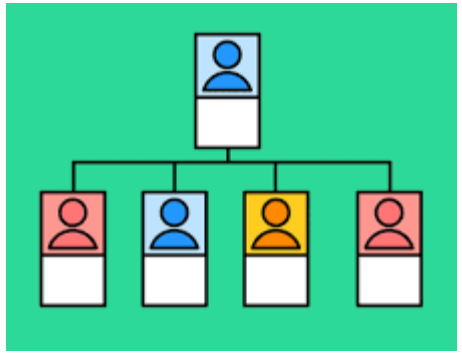
Factors interact **hierarchically**;
organizational factors interact with people factors, which in turn impact technical factors.

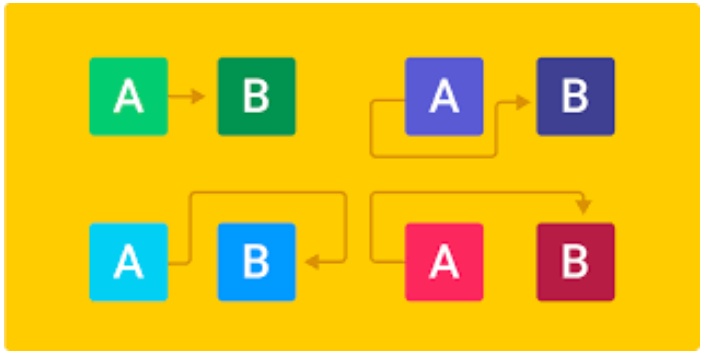
How to apply this in practice?

- On-time software delivery requires a **holistic approach**

- The top most influential factors are not in software!







Invest in your requirements refinement, organizational environment, dependency management

Interested? Contact me!

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