Requirements and Testing as Risk Minimisation

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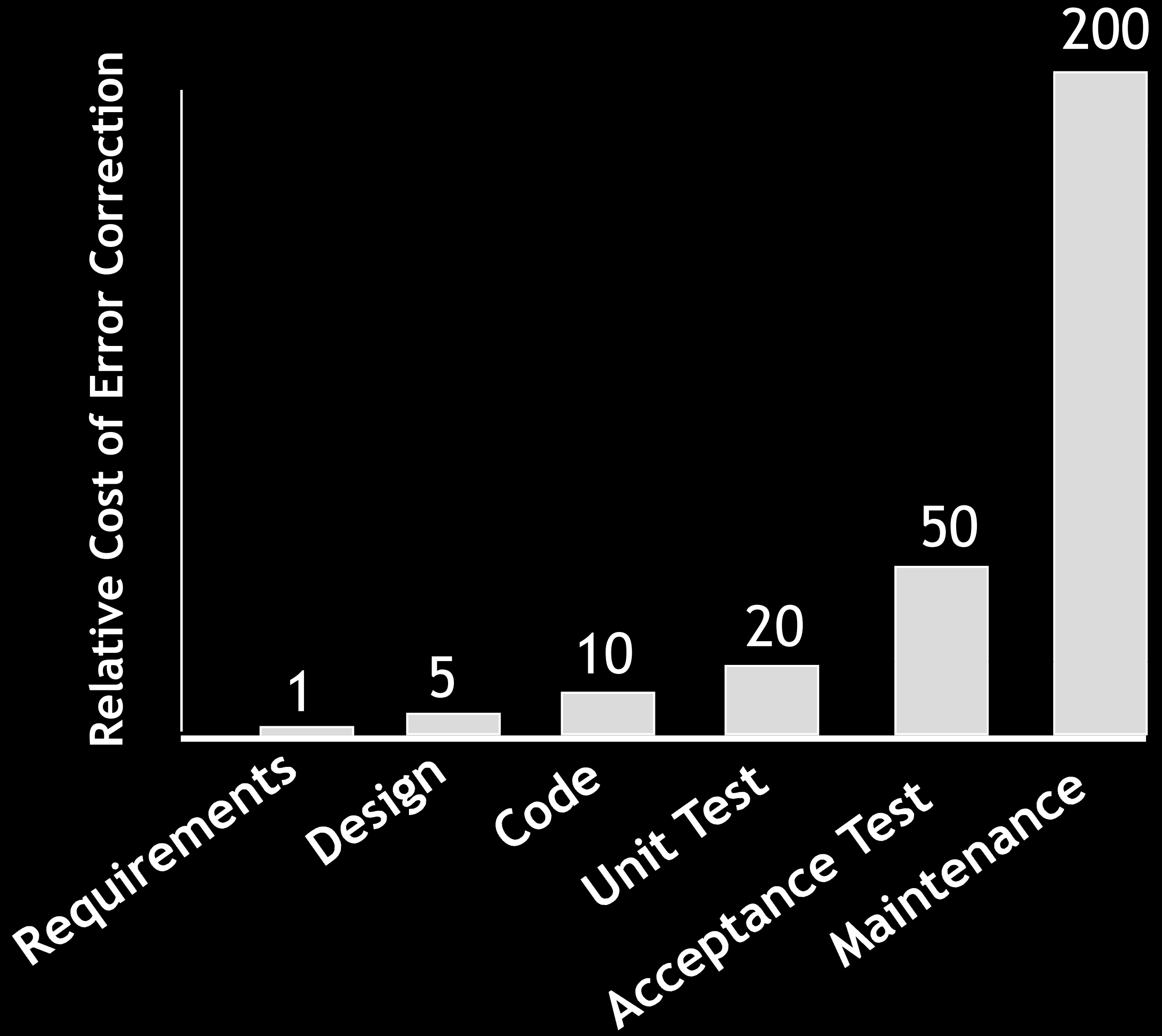
Engineering has fundamental laws

“Every body perseveres in its state of being at rest or of moving uniformly straight forward, except insofar as it is compelled to change its state by forces impressed.”

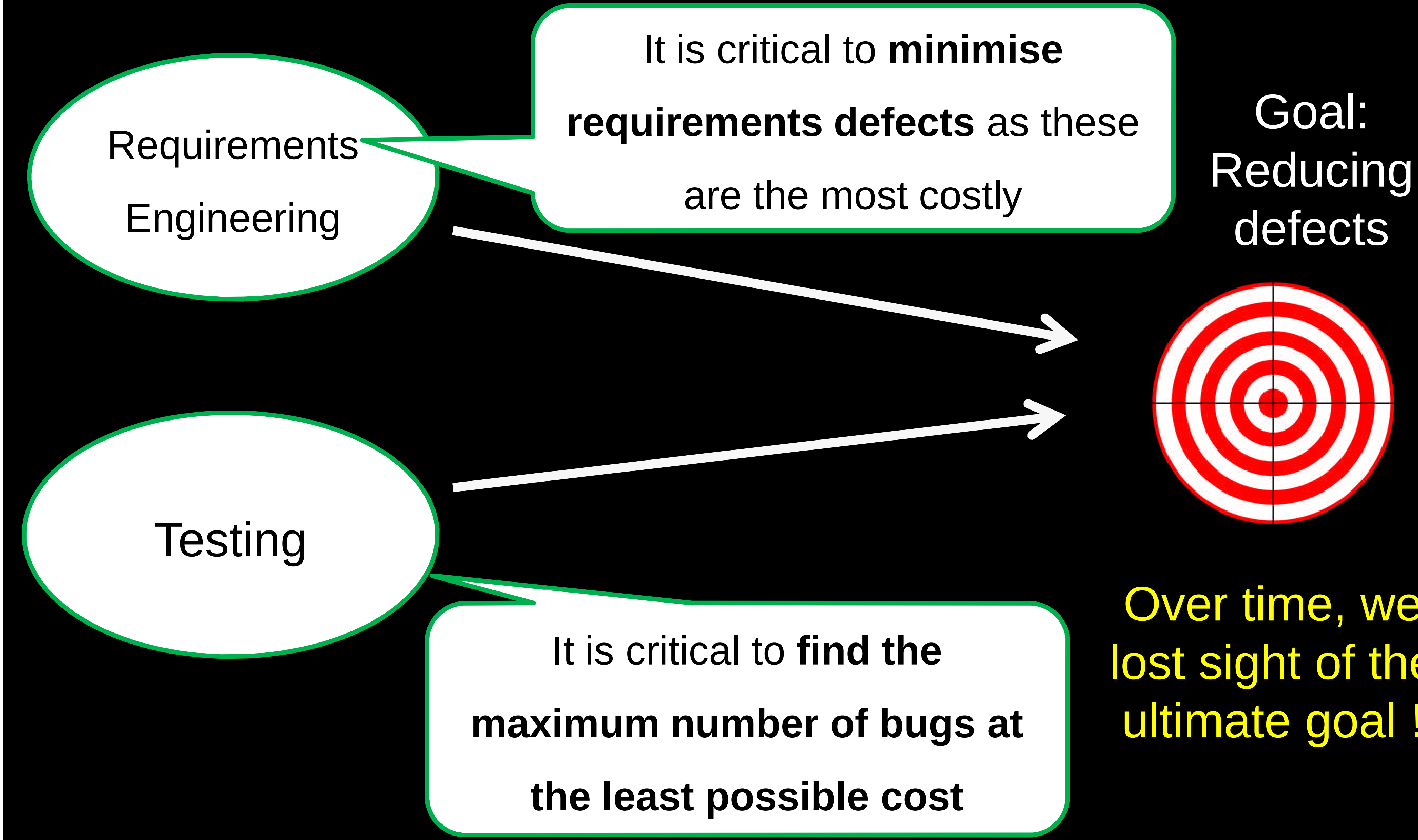
Newton’s First Law of Motion

Law #1: Boehm’s cost-to-fix curve



- Hasty generalisation?
- Misrepresentations?

Influence on Requirements and Testing



Requirements Engineering

It is critical to **minimise requirements defects** as these are the most costly

Testing

It is critical to **find the maximum number of bugs at the least possible cost**

Goal: Reducing defects

Over time, we lost sight of the ultimate goal !

What is the ultimate goal of software engineering?

The ultimate goal of software engineering is ...

A. To deliver software on time

B. To deliver software on budget

C. To deliver software with low number of bugs

D. All of the above

E. None of the above

The ultimate goal of software engineering is ...

A. To deliver software on time

B. To deliver software on budget

C. To deliver software with low number of bugs

D. All of the above

E. None of the above

F. To deliver software that provides value to its clients

(or no software at all if there are better ways to provide value)

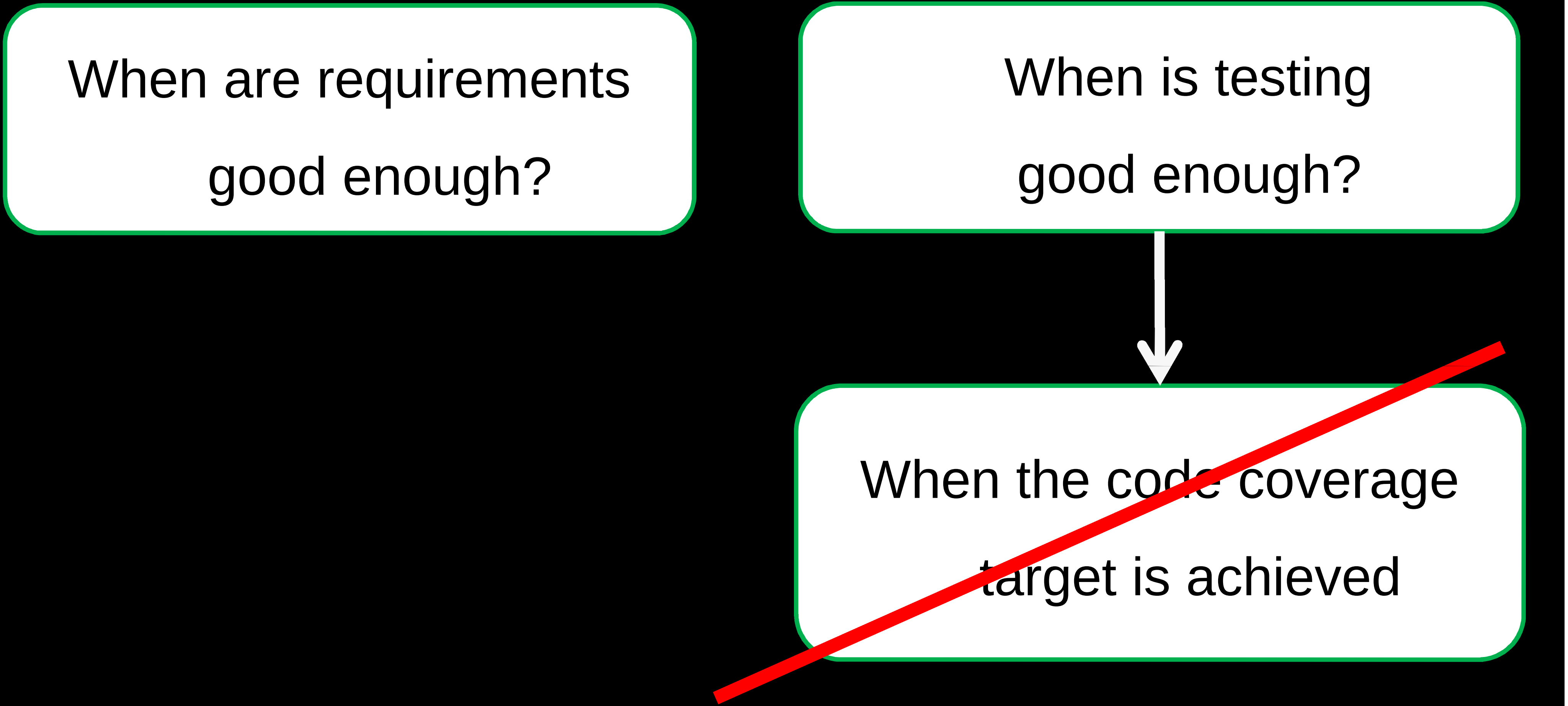
Beware of local optimisations

Delivering on time, on budget, with low defect rate doesn’t necessarily provide value (e.g. UK police mobile handsets)

Minimising requirements defects (ambiguity, incompleteness, etc.) doesn’t necessarily yield the most valuable system

Law #2: Wieger’s Law of Requirements Ambiguity

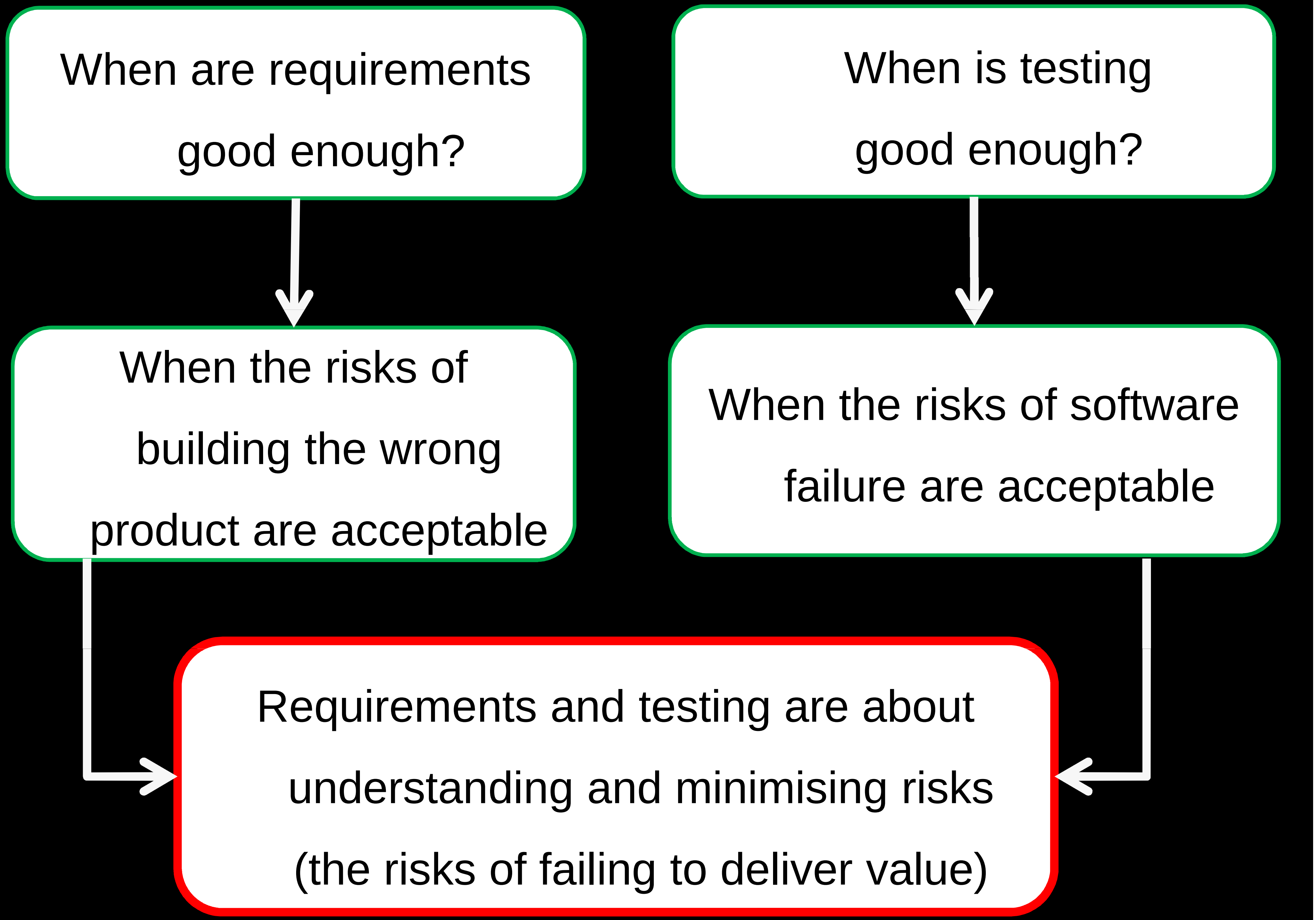
“The requirements may be ambiguous but the product will be definite”



When are requirements good enough?

When is testing good enough?

~~When the code coverage target is achieved~~



When are requirements good enough?

When is testing good enough?

When the risks of building the wrong product are acceptable

When the risks of software failure are acceptable

Requirements and testing are about understanding and minimising risks (the risks of failing to deliver value)

Question: What comes next in the talk ?

A. Testing as risk minimisation

B. Requirements as risk minimisation

C. All of the above

D. None of the above

Testing as Risk Minimisation

“*All bugs are equal, but some bugs are more equal than others*”

Severity of failure

caused by fault

- Safety or business critical failure

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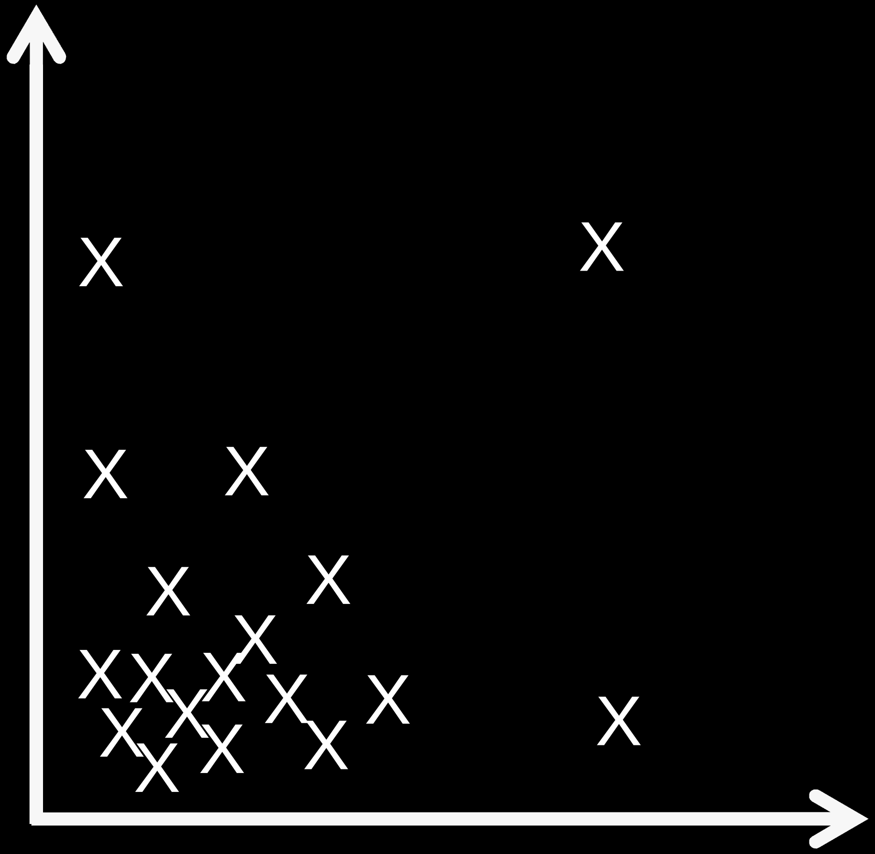
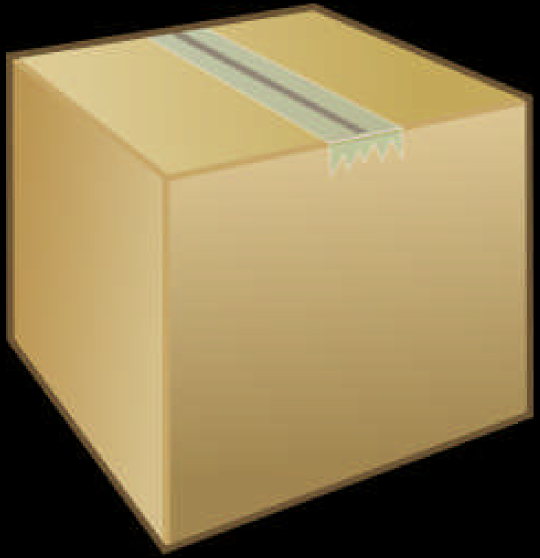
- User annoyance



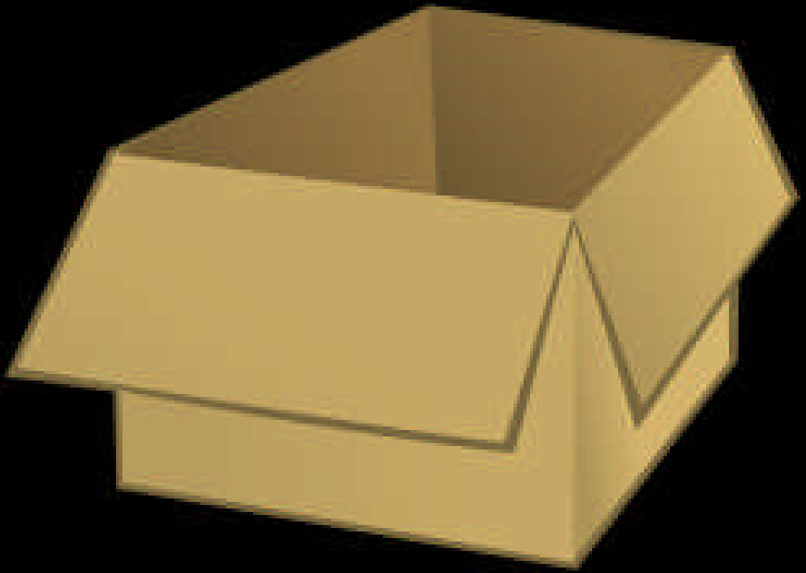
Likelihood that fault will cause failure

Take testing out of its boxes

Optimising testing for code coverage or bug counts



Optimising testing for bug severity by looking at impact of bugs in the World



Requirements as Risk Minimisation

“*All requirements defects are equal, but some requirements defects are more equal than others*”

Severity of problem caused by defect

- Safety or business critical failure, *architecture breaker*

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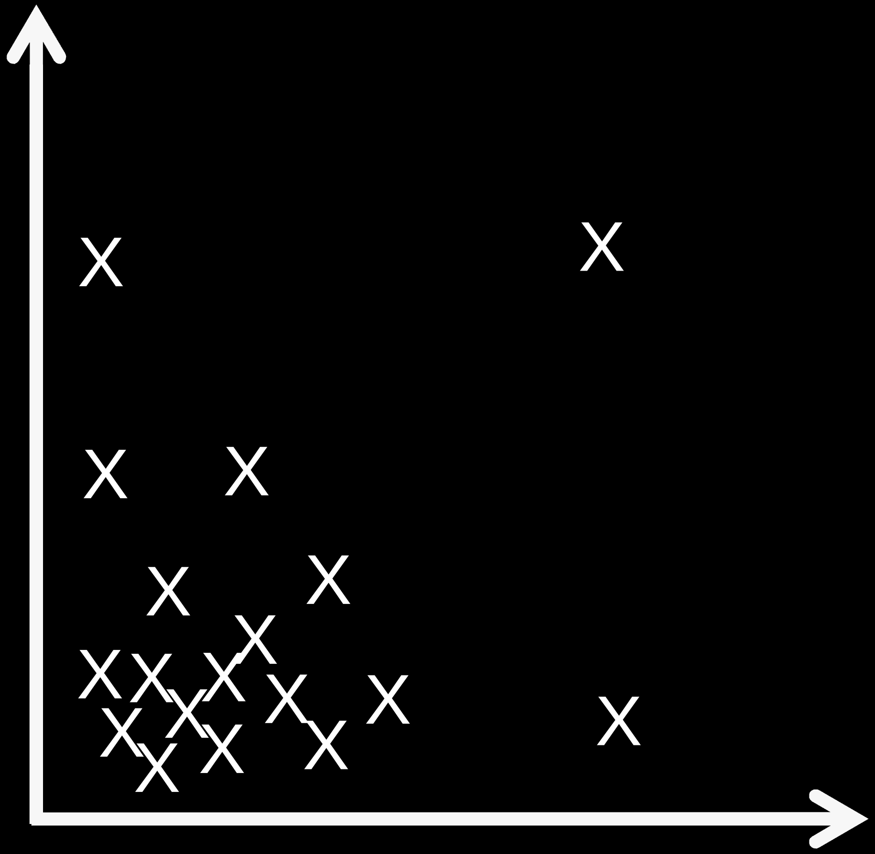
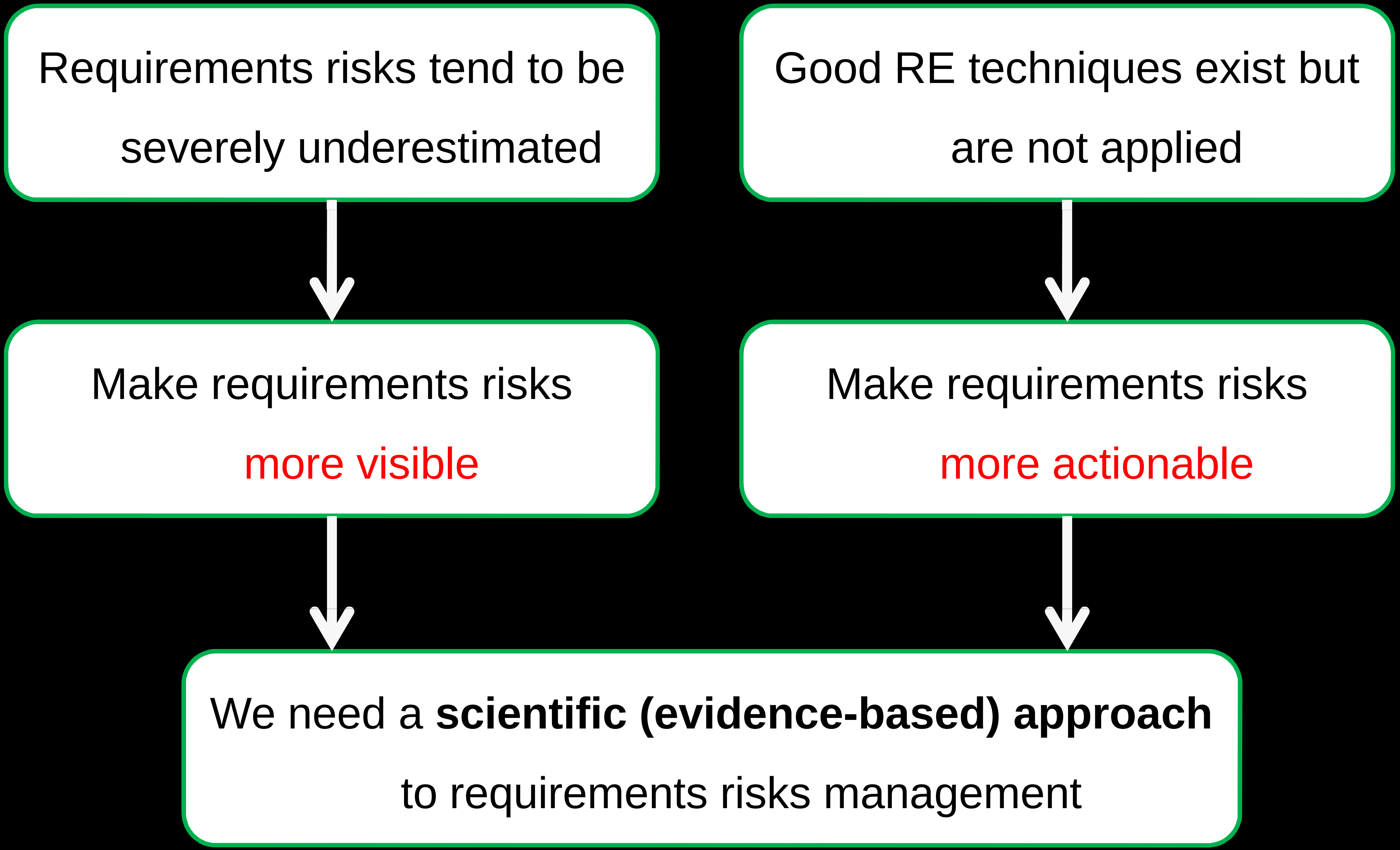
- User annoyance



Likelihood that defect will cause problem

Ideas



Requirements risks tend to be severely underestimated

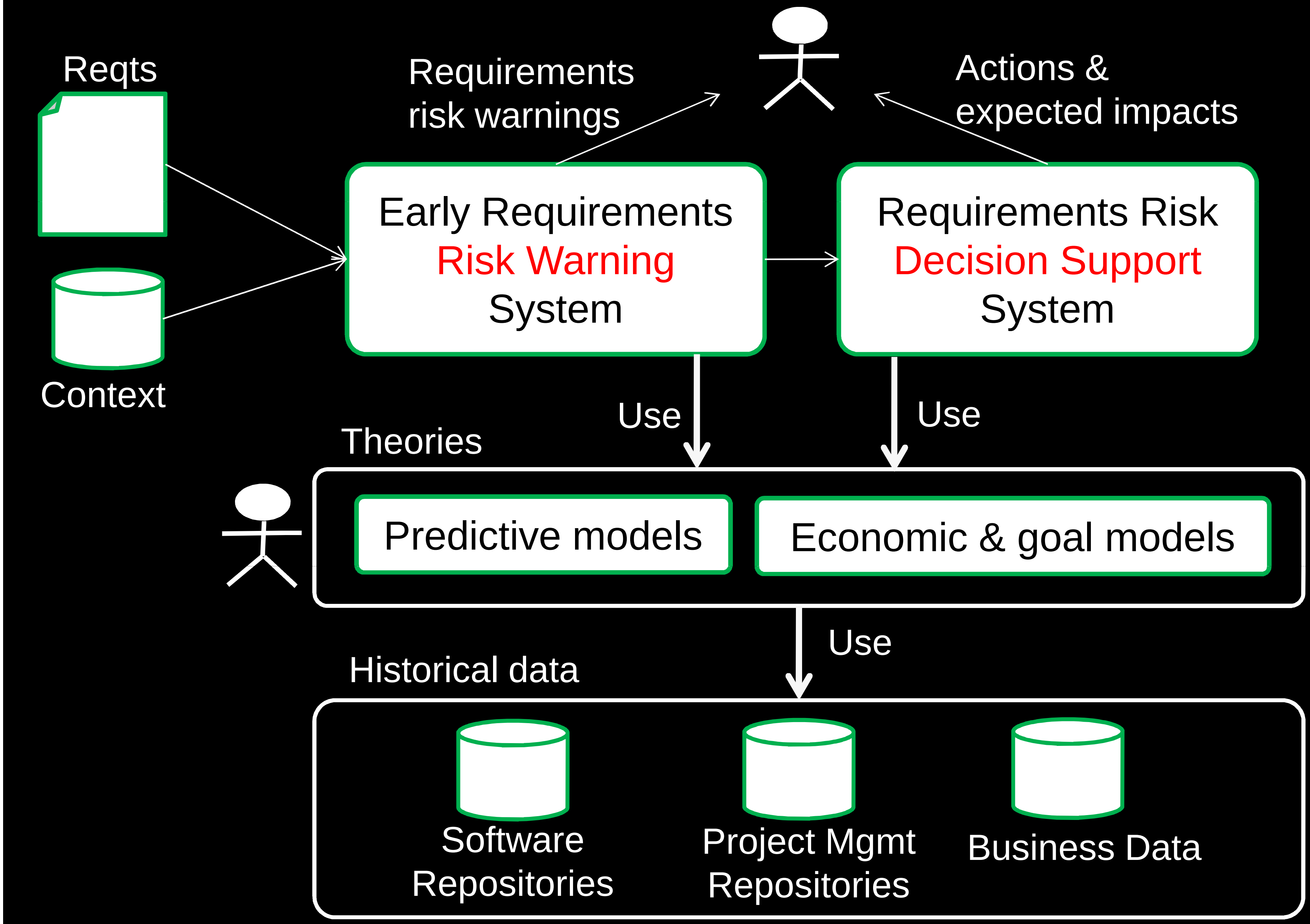
Good RE techniques exist but are not applied

Make requirements risks more visible

Make requirements risks more actionable

We need a **scientific (evidence-based) approach** to requirements risks management

An evidence-based approach



Reqts

Context

Requirements risk warnings

Actions & expected impacts

Early Requirements Risk Warning System

Requirements Risk Decision Support System

Use

Use

Theories

Predictive models

Economic & goal models

Use

Historical data

Software Repositories

Project Mgmt Repositories

Business Data

Progress

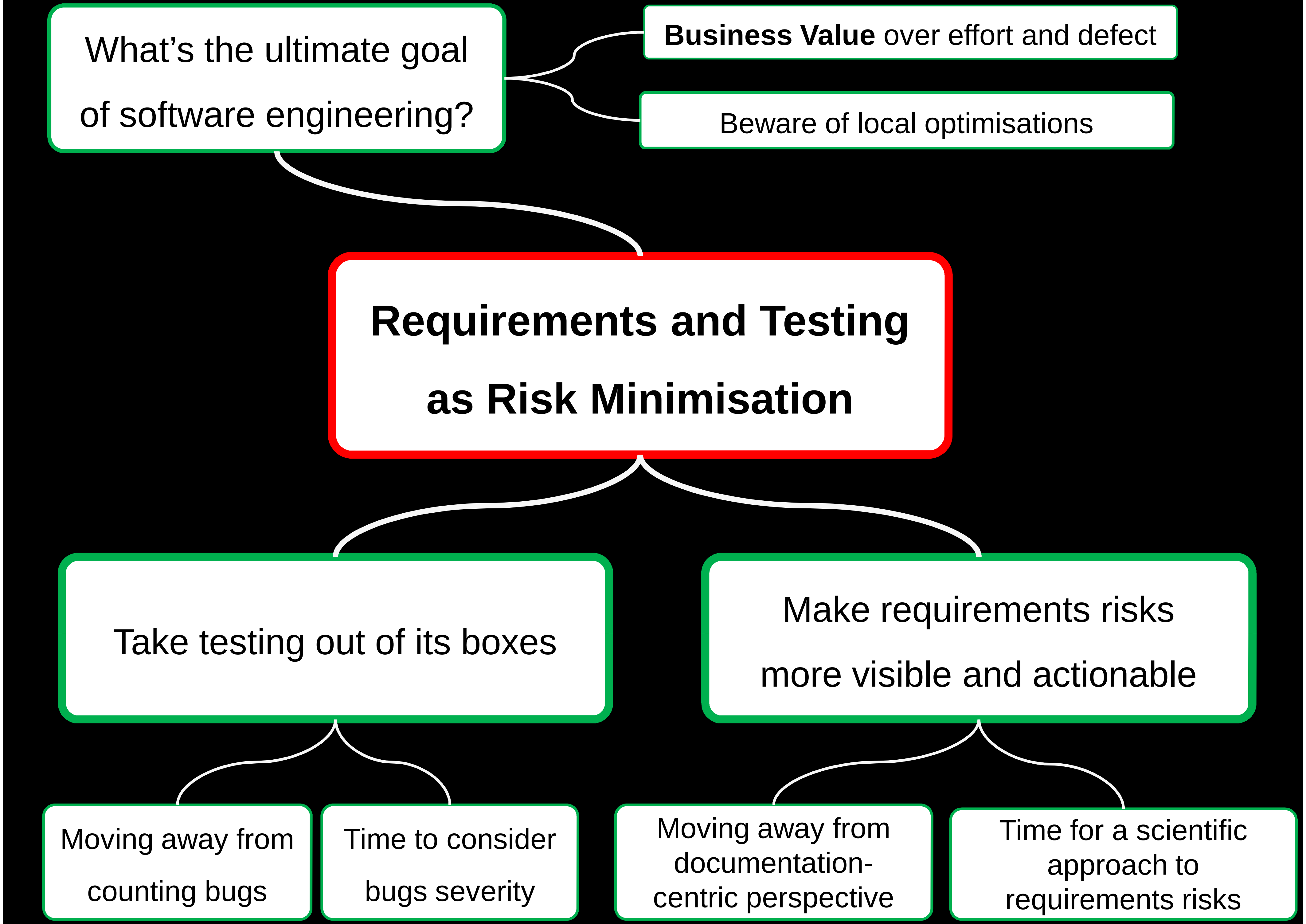
First Step: Failure Prediction in Feature Requests

(Fitzgerald, Letier, Finkelstein @ RE'11, REJ 2012)

- Explored feasibility in 6 open-source projects
- Successful predictions but project-specific and no clear causality
- Only considered very basic predictive attributes (discussion lengths, basic word analysis, etc.) and not impact on project-specific goals

Next Steps

- Extend scope to agile & iterative development in brownfield projects
- Improve risk warning and decision support systems
- Main case study: UCL Information Systems Projects
  - representative of other large organisations, e.g. Gvrt Dprt



What's the ultimate goal of software engineering?

Business Value over effort and defect

Beware of local optimisations

Requirements and Testing as Risk Minimisation

Take testing out of its boxes

Moving away from counting bugs

Time to consider bugs severity

Make requirements risks more visible and actionable

Moving away from documentation-centric perspective

Time for a scientific approach to requirements risks

References

- Boehm, Barry W. "Software engineering economics." *Software Engineering, IEEE Transactions on* 1 (1984): 4-21.
- Wiegers, Karl E. *More About Software Requirements: Thorny Issues and Practical Advice: Thorny Issues and Practical Advice*. Microsoft Press, 2009.
- Fitzgerald, Camilo, Emmanuel Letier, and Anthony Finkelstein. "Early failure prediction in feature request management systems: an extended study." *Requirements Engineering* (2012): 1-16.