ScopeMaster

Hyper-automation of requirements analysis
Helping Software Architects

Colin Hammond

Agenda

1. What is hyper-automation of requirements analysis?
2. What does it look like?
3. What can it do for you as an architect?
4. Why does it matter?

About

Presenter
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30 Years student of IT

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Over 28 years of seeing repeated pattern of Root Cause Problems
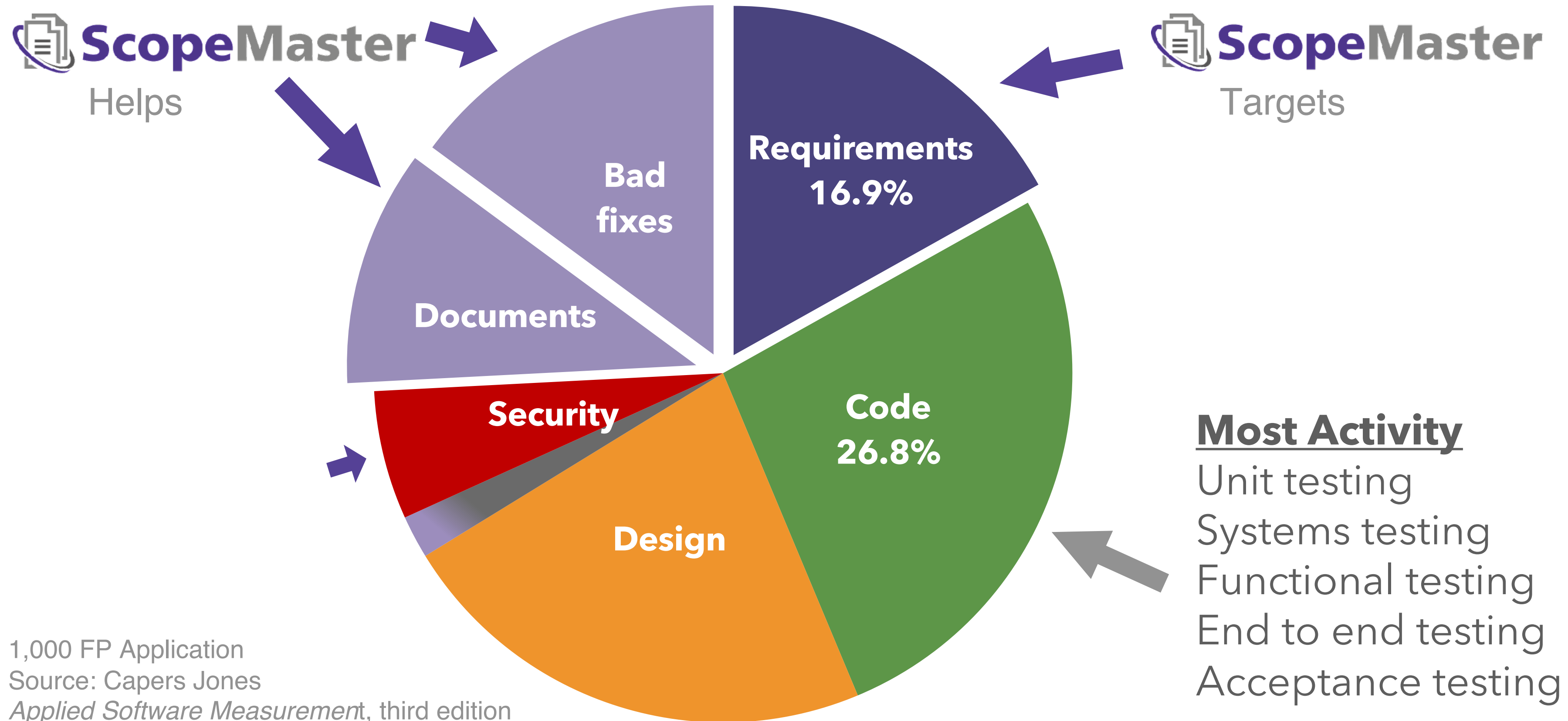
Large Projects

- Requirements poor quality
- Requirements incomplete
- Requirements not sized

Terrible Record

- 71% cancelled or challenged (~$180Bn)*
- 19% cancelled
- It's actually worse than this

*Standish report 2020, USA)

Root Cause of Defects Found in Production

ScopeMaster Helps

ScopeMaster Targets

Requirements 16.9%

Bad fixes

Documents

Security

Code 26.8%

Design

Most Activity
Unit testing
Systems testing
Functional testing
End to end testing
Acceptance testing

1,000 FP Application
Source: Capers Jones
Applied Software Measurement, third edition

Hyper-automation what is it?

Hyper-automation

- Using technology to bring orders of magnitude improvements to **hitherto manual work**.

Functionality requirement or User Story

A typical agile user story:

Add Delivery Details

As a ...   Site visitor

I want ...   Add my delivery addresss

So that ... I can receive my goods
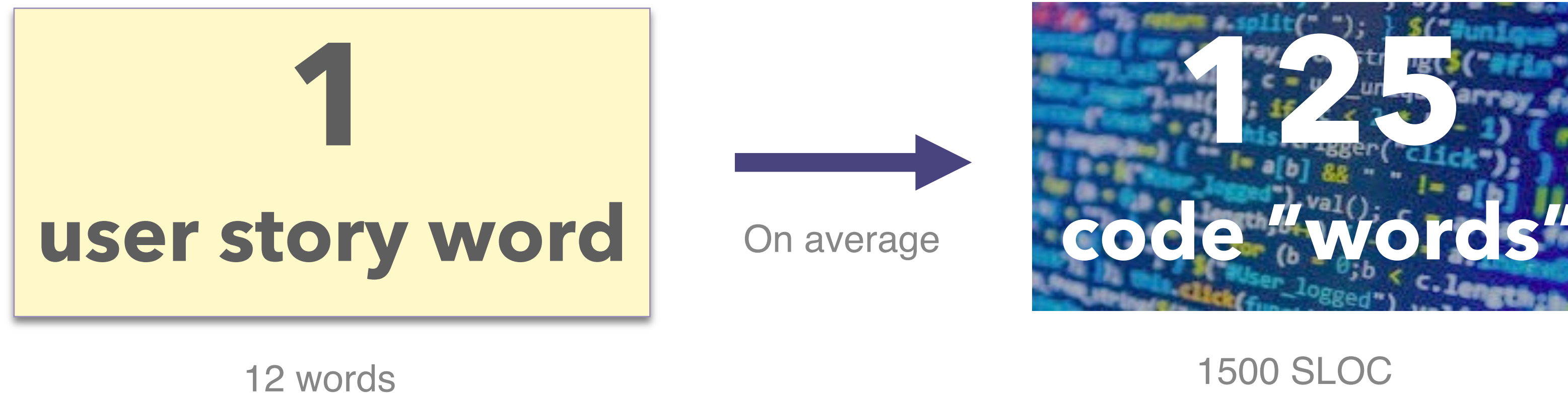
Acceptance/Test Criteria ...

I can click pencil to enter my
zip code and full home address

Back

"Who & What"
- Using NLP and more. Automate sound software practices.
- Flexible, any phraseology, any taxonomy

Requirements Quality Really Matters

Poor user stories lead to waste and amplified rework

1
user story word

On average →

125
code "words"

12 words

1500 SLOC

Based on analysis of over 100,000 user stories by ScopeMaster

Case study to compare SP vs COSMIC Function Points

Story points vs actual effort
R² = 0.33

CFP vs actual effort
R² = 0.97

$$Effort = 0.47 \times Story\ Points + 17.6\ hours \qquad and\ R^2 = 0.33)$$

Actual Effort (hours) vs Estimated Effort (Hours)

$$Y = 2.35 \times CFP - 0.08hrs \qquad and\ R^2 = 0.977)$$

Actual Effor (Hours) vs Functional Size in CFP
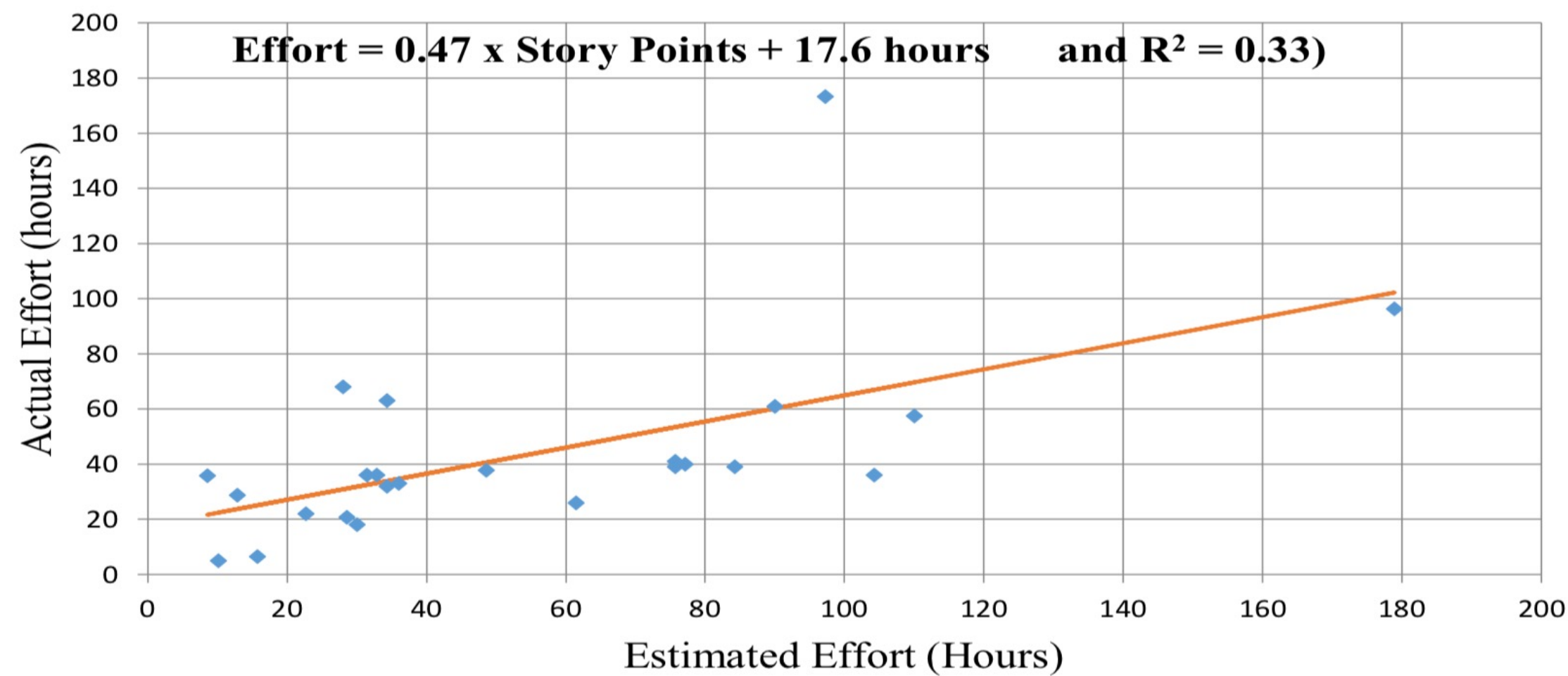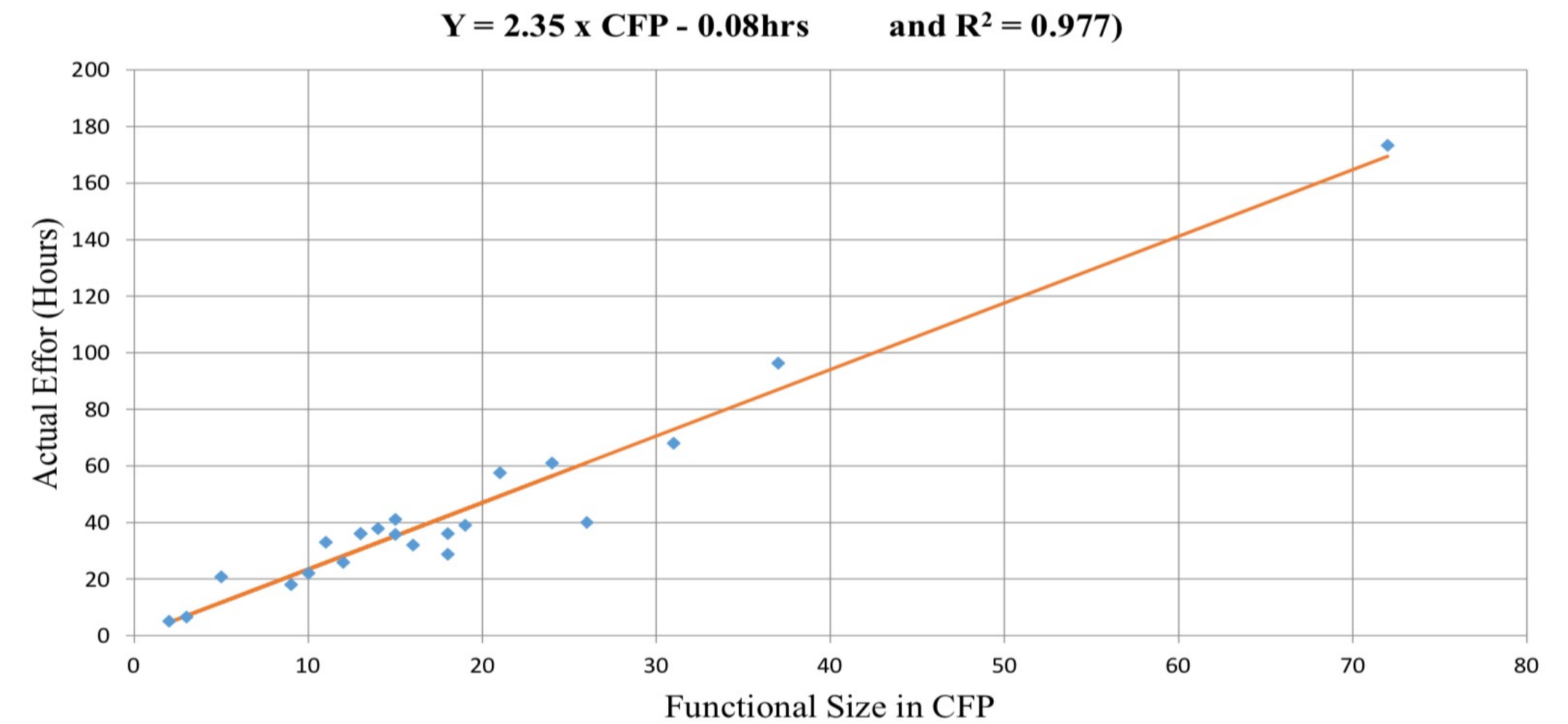
CFP a Reliable Predictor of Effort

C. Commeyne, A. Abran, R. Djouab. "Effort Estimation with Story Points and COSMIC Function Points

- An Industry Case Study", Software Measurement News, Vol 21, No. 1, 2016 *

Fixing bugs in a later phase is VERY expensive
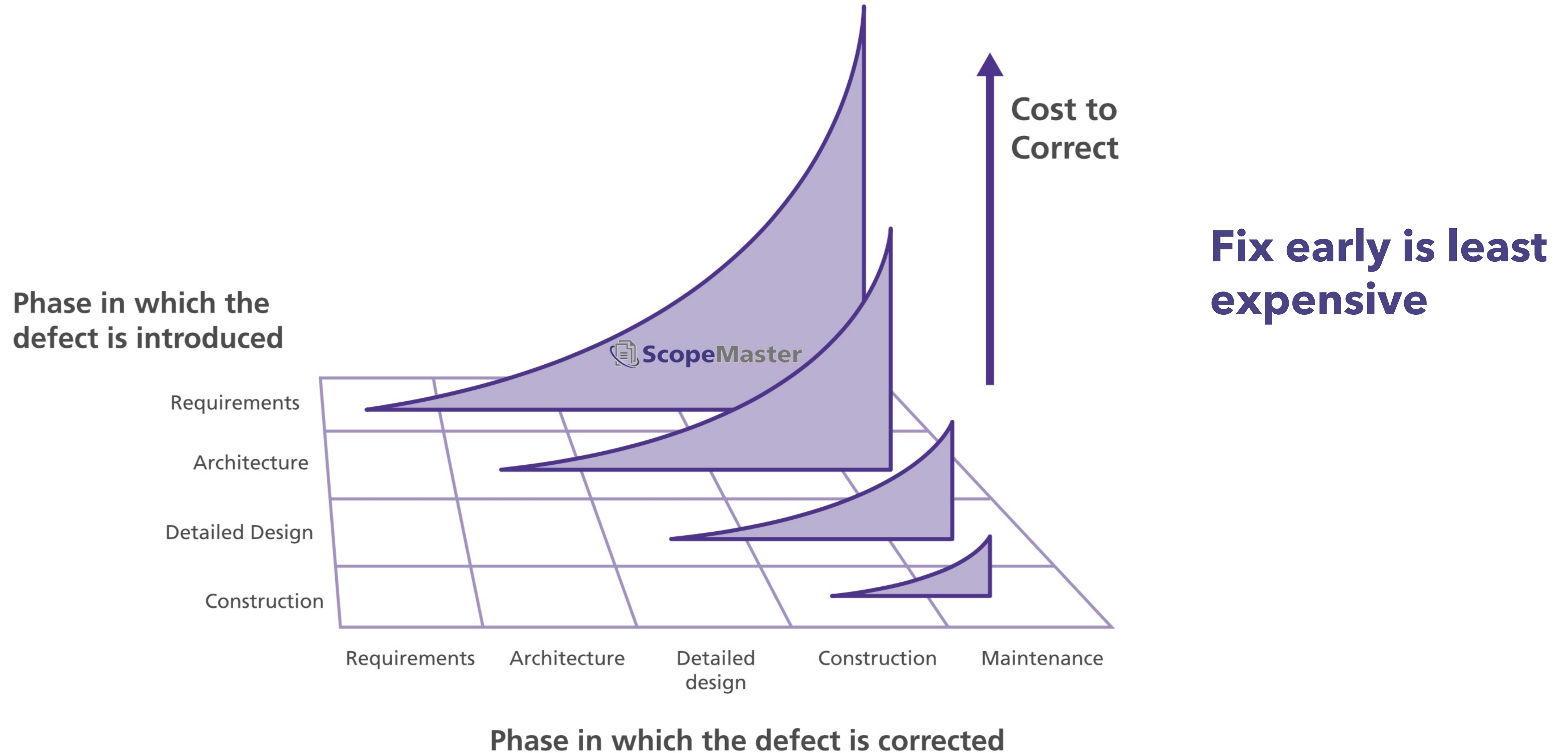
Architects' Concerns on larger projects

Things Many Architects worry about, may be hard to spot and hard to assess:

1. Quality (objectives->req->arch->design->code>test->data)
2. Complexity
3. Size
4. Coupling (between modules) & cohesion (within modules)
5. Traceability - requirements to objectives and code to req.s
6. PM related questions – risk, schedule, cost

Administrator can modify a user's profile

Estimated CFP: **6**

As an **administrator** first validate **superuser permissions** , then I can modify a **user profile**

Edit | Functions **2** | Quality | History **2** | Tests **14** | Related | BDD | Debug

Short title* ⓘ

Administrator can modify a user's profile

Save

Functional Requirement*. ⓘ

As an administrator first validate superuser permissions, then I can modify a user profile

Reference

US05

Requirement type ⓘ

Functional

Benefits ⓘ

Benefits

Labels

Notes ⓘ

All except password.
Demonstrates more than one functional step within a use story.

Last **updated**: + 19 days 20 hours 38 minmutes 58 seconds ago
Last **analysed**: + 22 days 20 hours 59 minmutes 57 seconds ago
Last **estimated**: + 19 days 20 hours 38 minutes 58 seconds ago

Press
Play

ScopeMaster

10 Quality Attributes for Better User Stories

10 Tests for Great User Stories

Clear ✓

Concise ✓

User-oriented ✓

Testable ✓

Measurable ✓

Consistent ✓

Complete ✓ **It even finds missing ones!**

Unique ✓

Valuable

Design-free ✓

✓ **ScopeMaster helps in 9 out of 10** of these categories.
Overall ScopeMaster is able to find and help you fix 50-65% of all requirements defects.

Analysing and cross correlating stories

Analyser

ScopeMaster

Colin

WEBSITE PROJECT ✏

🏠 / MY SOFTWARE / WEBSITE PROJECT / ANALYSIS

Search ...

Views

Analysing the text of software requirements
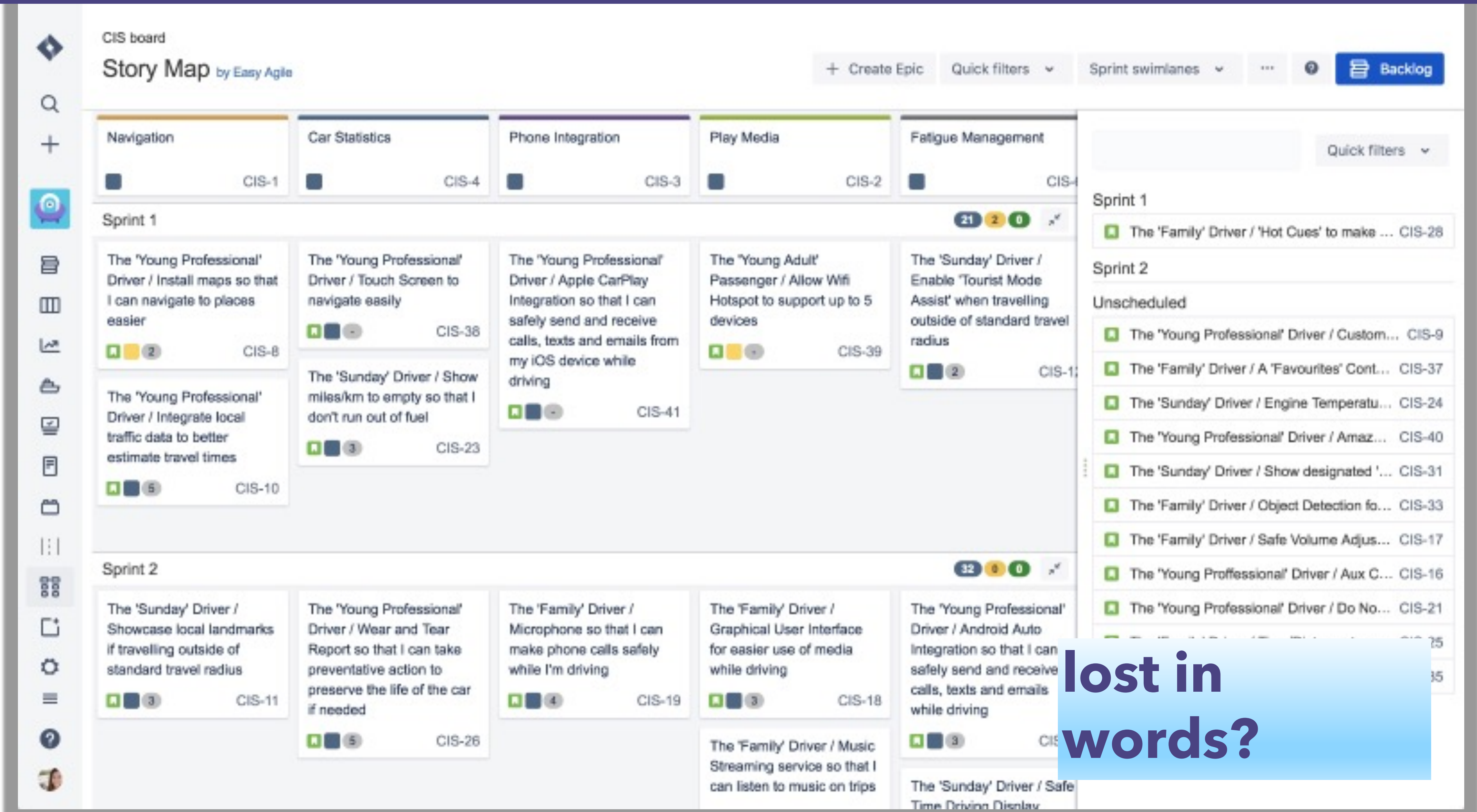
⚙ Analyse 2 stories | cancel

This will take about 1-5 seconds per story.
You will only consume credits for requirements that have not been previously analysed.

Press
Play

A set of user stories

Explore your user stories visually

Stimulates critical thinking:
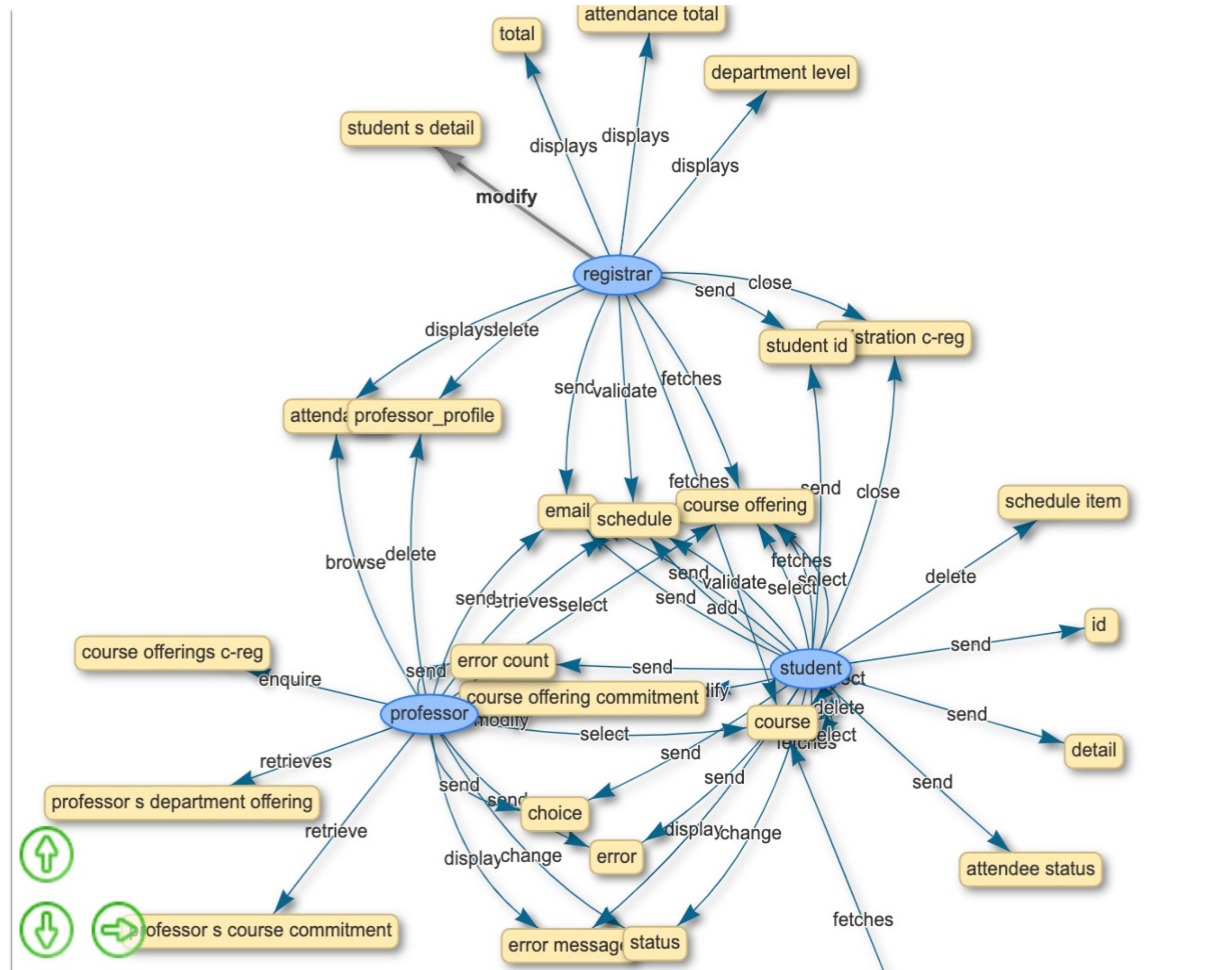
Exposes Complexity & Coupling
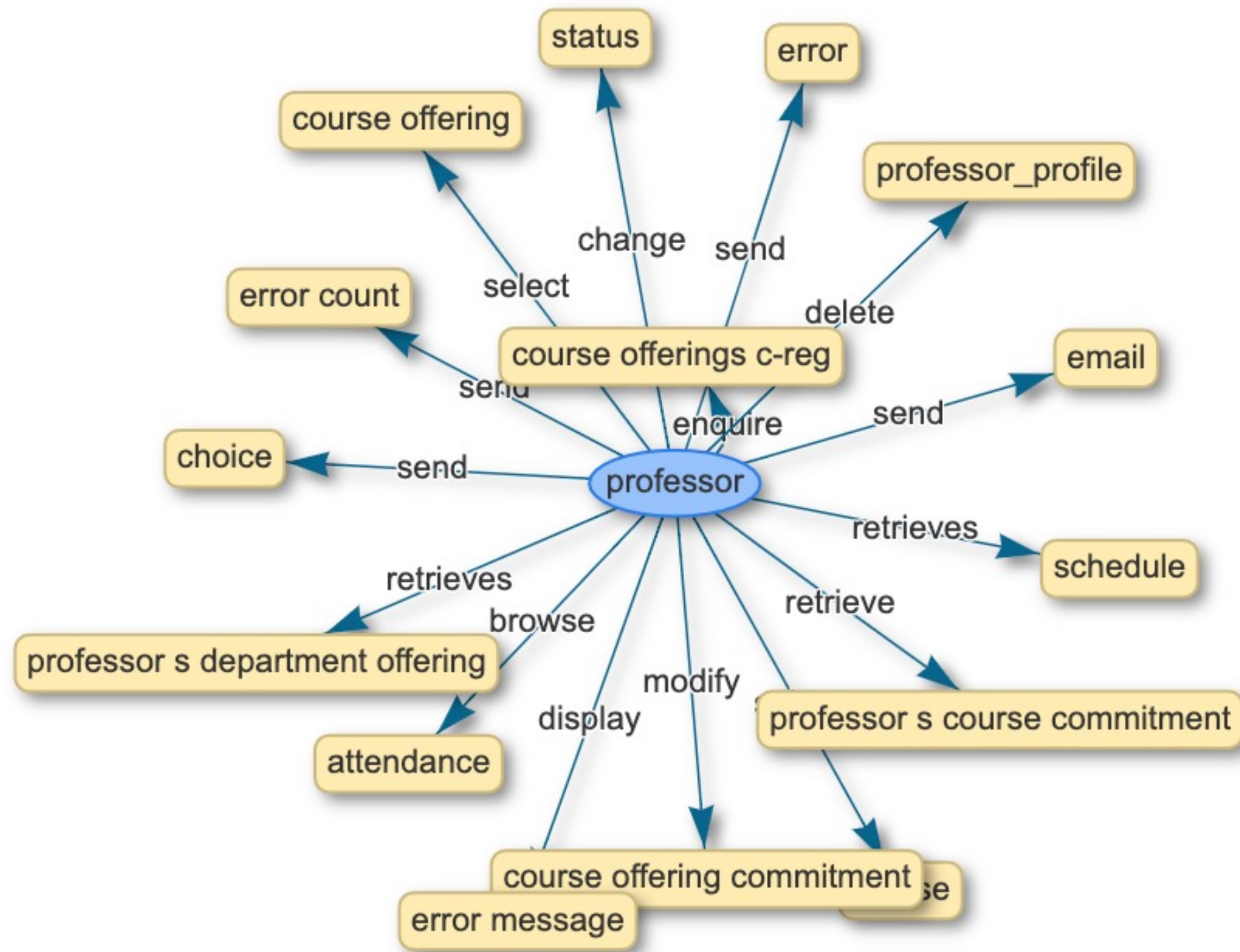
Automated Visualisations
Promotes critical thinking
Validate and Verify - visually

Finds and helps Fix Problems - FAST!

Press Play

ScopeMaster

☰   ScopeMaster   ⊙ Colin

EXAMPLE WEB SHOPPING CART 5 ✏
🏠 / MY SOFTWARE / EXAMPLE WEB SHOPPING CART 5 / QUALITY REPORT

Search ...

🎬 Tour

1 of 14	52	2	3.93	0.58	51.9
Ambiguous	Missing*	Duplicates*	Defects per Story*	Defects per CFP*	Quality Score

+ requirement ⌄   * Potential defe

Data maintenance analysis

Find and fix potential missing and duplicate requirements. Each maintained object of interest usually has one **C**reate, **R**ead, **U**pdate and **D**elete

Object (19) confirm	Create (8)	Read (12)	Update (3)	Delete (1)
address⌄	Missing +	address lookup	Missing +	Missing +
cart⌄	Missing +	Display cart	Missing +	Missing +
cart_item⌄	add to cart	display cart_item	Missing +	Missing +
delivery_address⌄	add delivery address	display delivery_addre	Missing +	Missing +

Tracing code to requirements – Suggested Class diagram

product

maintain_products(C)()

create product   Maintain products

maintain_products(R)()

read product   Maintain products

search_products()

read product   search

search_products()

read product

    Search (Alternative Bad story example)

maintain_products(U)()

update product   Maintain products

maintain_products(D)()

delete product   Maintain products

product category

add_product_categories()

create product category

    add product categories

profile

authenticate_profile()

update profile   Login

search

add_search()

create search

    Search (Alternative Bad story example)

search_display()

read search

    Search (Alternative Bad story example)

search term

add_search_term()

create search term

    Search (Alternative Bad story example)

superuser permission

validate_superuser_permissions()

read superuser permission

Administrator can modify a user's profile [FINAL]

Example outputs

ScopeMaster

Story Sizing / Quality

address lookup — 6 CFP

Functional User Story

The Postcode_lookup_service will retrieve my full address, then it will display address_options

Functional Steps

Steps	Object	Action	Data Movements
retrieve **address**	address	read	E input address id / R read address from storage / X return address or error
display **address_options**	address_options	read	E input address_options id / R read address_options from storage / X return address_options or error

Quality — Score: 72%

	Severity	Explanation
✔ Functional size		Suitable size **6 CFP**
✔ Objects confirmed		Contains a confirmed object **address**
✖ Potential missing	M	Potentially missing from this set of requirements: Delete *address*
✖ Potential missing	M	Potentially missing from this set of requirements: Delete *address_options*
✖ Reference	M	It is advisable to assign a unique reference/ID for each requirement

Test Scenarios

Suggested Test Scenarios 55

These are **suggested** tests to help you get started with your functional testing, they are not an exhaustive test set.

⬇ download all 55 scenarios (165 tests)

add address — 4

As a user I want to add address

Suggested Functional Test Scenarios

Test Scenario	Steps	Tests
positive add a valid address	**add** a complete and valid **address**	1: Check that the **address** data has been correctly stored / 2: Check on the creation of duplicates, if allowed / 3: Check that no errors have been returned / 4: Check that a confirmation message was generated / 5: Check that subsequent navigation is correct
negative add an invalid address	**add** an invalid **address**	1: Check that correct errors have been returned / 2: Check that the **address** data has not been stored / 3: Check that subsequent navigation is correct

8 suggested tests.

add address_options — 4

Quality Analysis

EXAMPLE WEB SHOPPING CART FOR DEMO (KEEP) ✏

🏠 / MY SOFTWARE / EXAMPLE WEB SHOPPING CART FOR DEMO (KEEP) / QUALITY REPORT

≣15 Requirements	94 CFP Total Size	👥 1 Users 1	☐ 1 Objects 1	Ambiguous :1 Missing :37 Duplicated :2	☑ 55 Quality Score

+ Story ⌄

Data maintenance analysis Find and fix potential inconsistencies, missing and duplicate Stories.

Object (15) confirm	Create (10)	Read (9)	Update (3)	Delete (1)
address	add address	address lookup	update address	Missing ⌄
address_options ⌄	add address_options	address lookup	Missing +	Missing +

Modelling

ScopeMaster
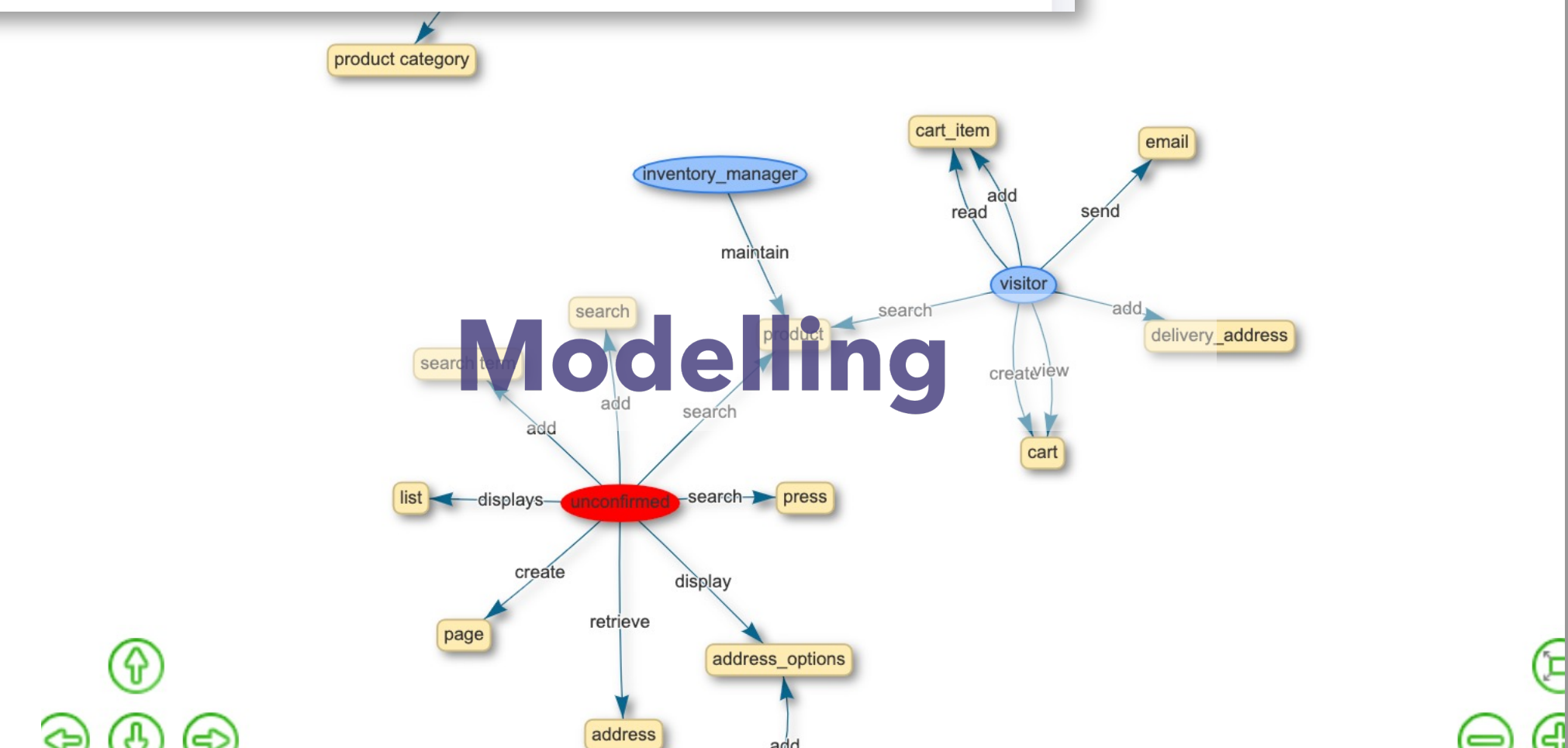
Large Projects / Transformations

- Poor requirements cause quality and rework problems & delays
- Agile doesn't scale easily – artful architectural separation
- Size matters
- Valid measurement - greater transparency and predictability

Benefits

Requires no set up, just import your requirements and press "analyse"

1.

Better User Stories

Find and fix problems fast

2.

Instant Estimates

ISO standard sizing

3.

Auto Test Creation

Huge time-saver

Automated: Interprets stories
Tests stories ~700 per story.
Builds a data dictionary

Estimates functional size
Finds missing requirements!

Baseline tests generated
Perfect traceability

Benefits: Expose problems
Helps fix before coding
Reduce rework

Valid estimates
Better informed decisions

Save on test prep time
Ensure coverage

Conclusion

Key takeaways

- Hyper-automation of requirements analysis exists.
- Brings scrutiny and insight to requirements, reducing waste
- "extreme shift-left testing"
- Built on sound proven methods
- Non-trivial benefits
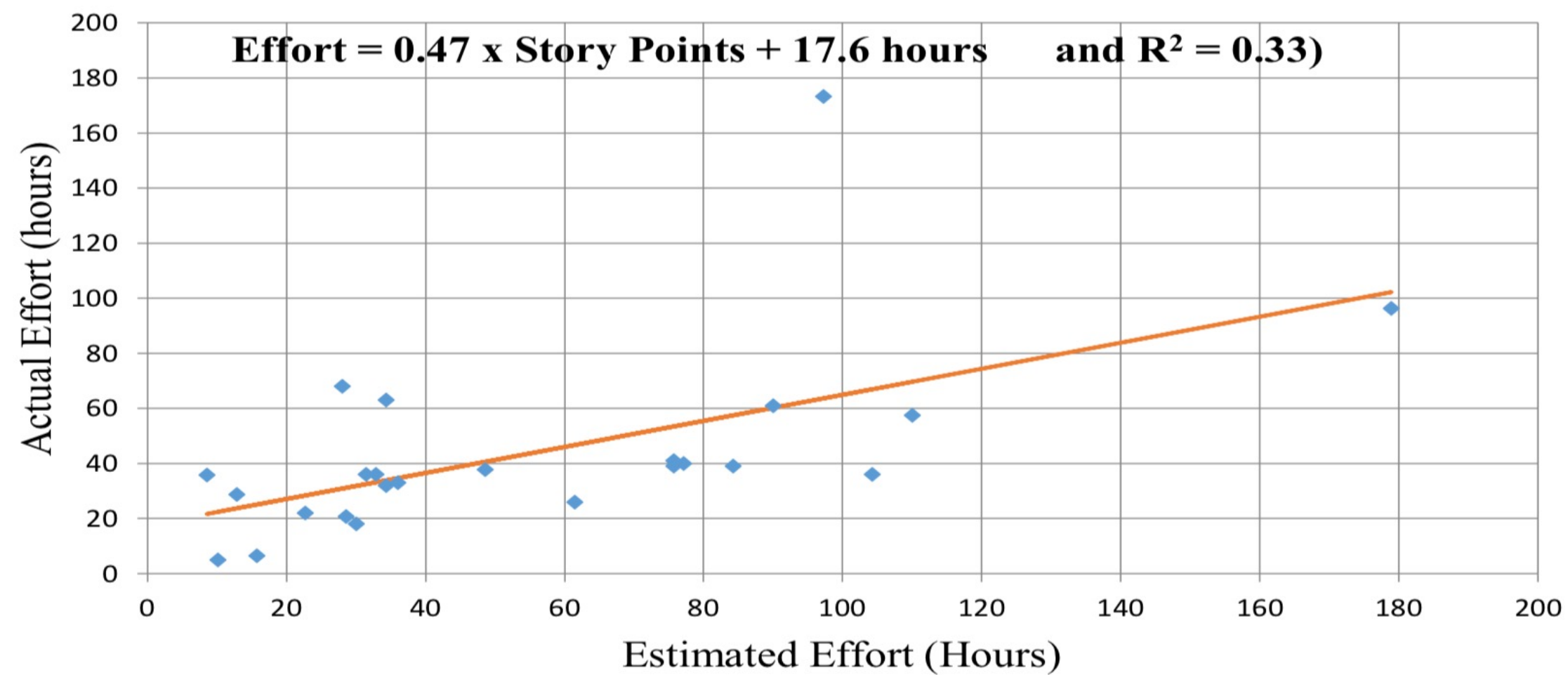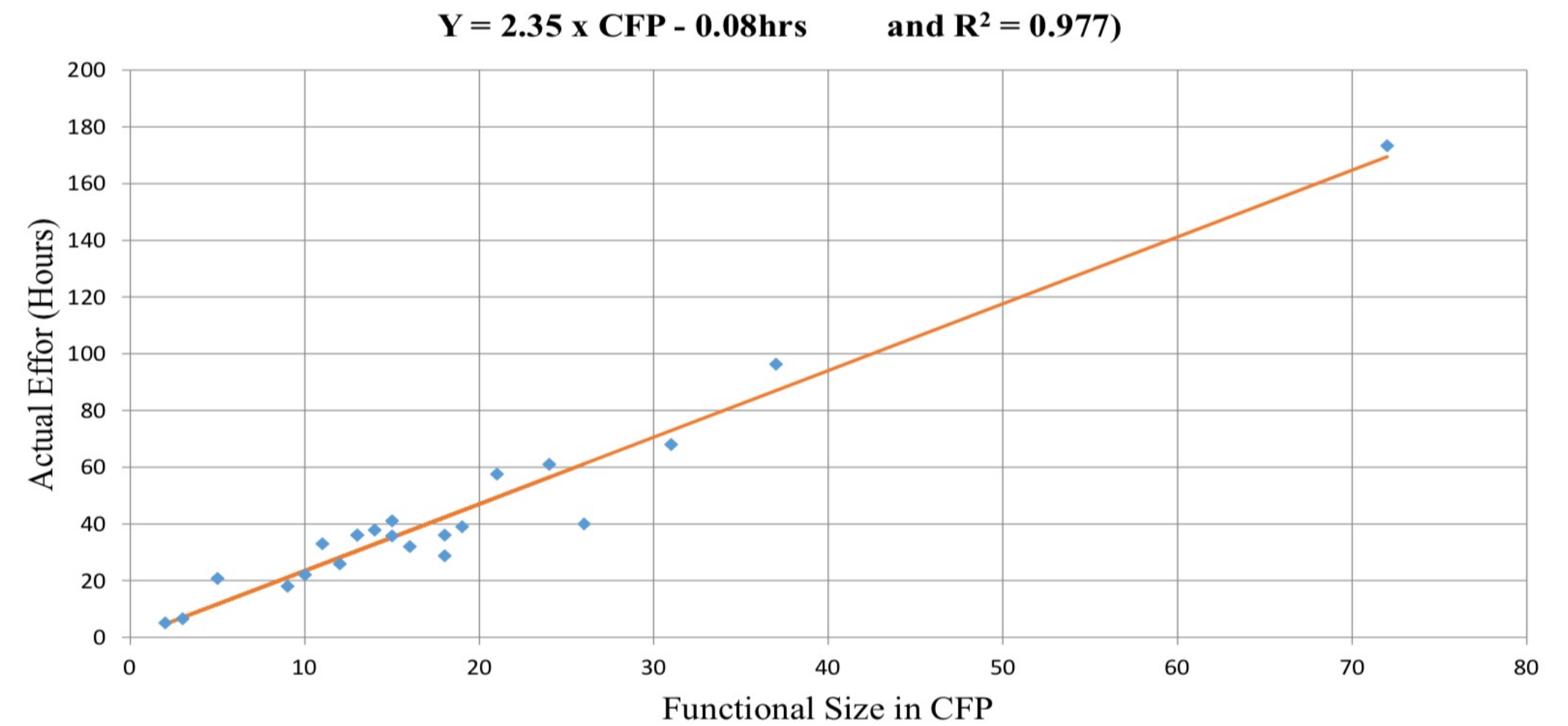
colin.hammond@scopemaster.com.
https://www.scopemaster.com
https://cosmic-sizing.org
https://www.amazon.co.uk/Capers-Jones/e/B000APTHHW?

Portfolio Overview

Case study to compare SP vs CFP

Story points vs actual effort
$R^2 = 0.33$

Effort = 0.47 x Story Points + 17.6 hours   and $R^2 = 0.33$)

CFP vs actual effort
$R^2 = 0.97$

Y = 2.35 x CFP - 0.08hrs   and $R^2 = 0.977$)

Conclusion:
CFP is a better predictor of effort than story points.

C. Commeyne, A. Abran, R. Djouab. "Effort Estimation with Story Points and COSMIC Function Points

- An Industry Case Study", Software Measurement News, Vol 21, No. 1, 2016 *

About Functional Size

Valid
Standard
Non-gameable
Suitable for agile
Suitable for contracts
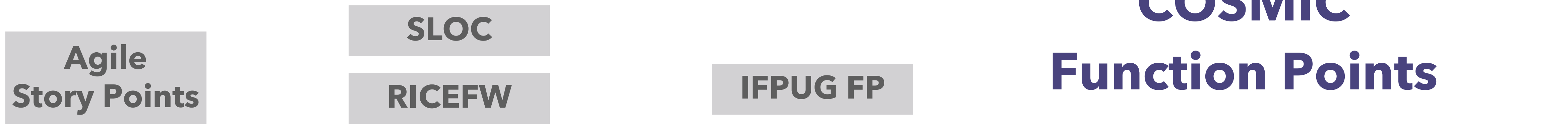Ideal for creating estimates
Manage: Scope, Resources, Schedule and Quality.

Average value of knowing size: 10-40% of total budget.

Functional Size Metrics on Software Projects

Agile Story Points

SLOC

RICEFW

IFPUG FP

COSMIC Function Points

Very Flawed
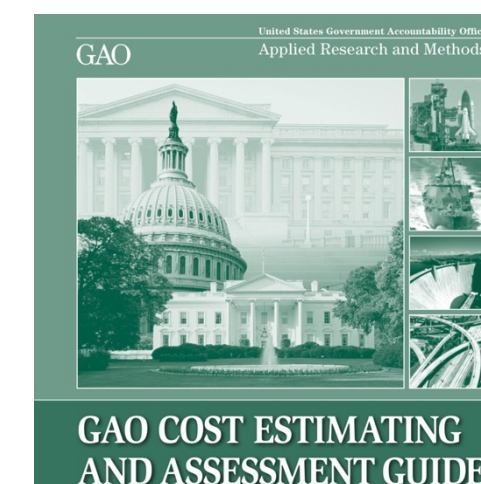
- Not Valid
- Inconsistent
- Easy to game

Flawed
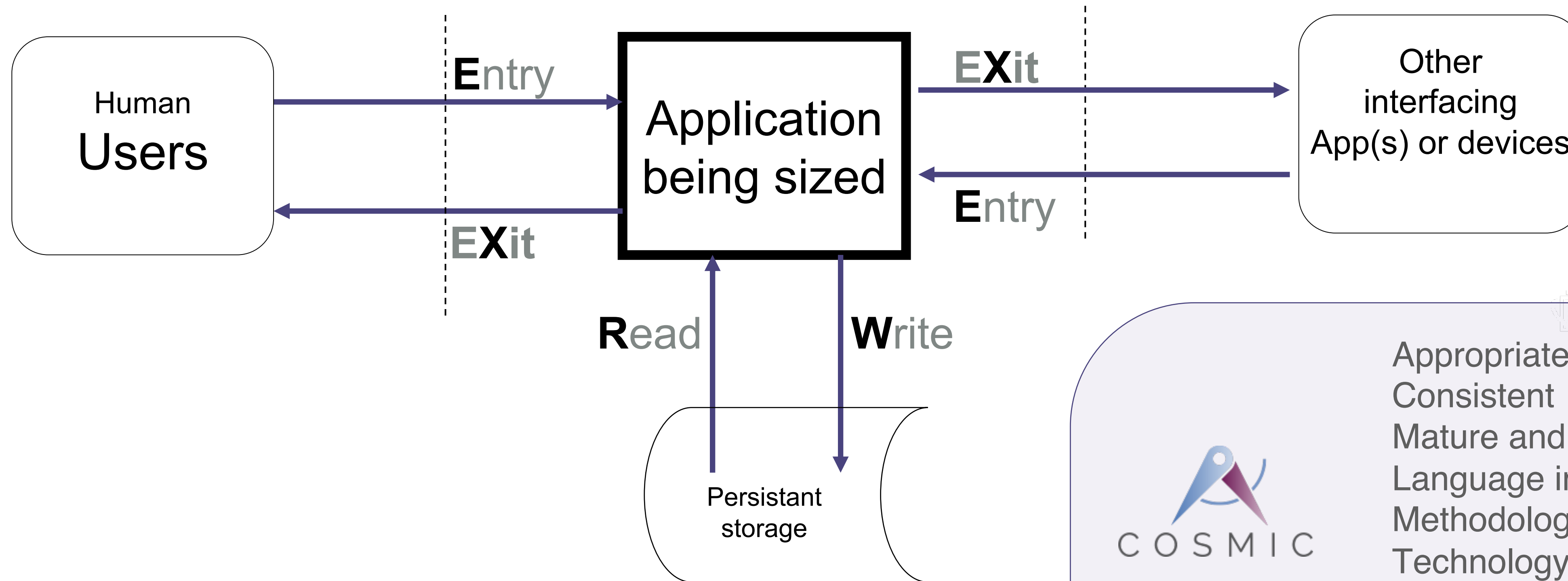
- Not Valid
- Inconsistent
- Easy to game

Good

- ☑ ISO Standard
- ☑ Consistent
- ☐ User stories insufficient
- ☐ Not ideal for embedded

Best

- ☑ ISO Standard
- ☑ Incomplete OK
- ☑ Principle-based
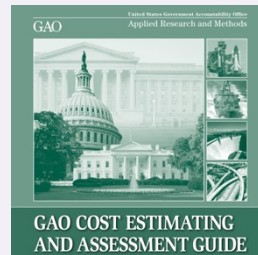- ☑ Automated
- ☑ US. GAO Recommended

GAO COST ESTIMATING AND ASSESSMENT GUIDE

COSMIC Function Points – The best way to measure software work

Human
Users

Entry

Application being sized

EXit

Other interfacing App(s) or devices

EXit

Entry

Read

Write

Persistant storage

$$\sum E, X, R, W = CFP$$

C O S M I C

Appropriate & Valid
Consistent
Mature and stable
Language independent
Methodology independent
Technology Independent
Suitable for all S/W
Open source / **free**
ISO Standard

How ScopeMaster helps reduce Architecture Risk

Architecture attributes that reduce risk:

Coupling
ScopeMaster highlights data coupling between requirements

Cohesion
ScopeMaster highlights data and requirement relationships
Missing, duplicates identification exposes cohesion
Functional size is also a good indication of cohesion

Complexity
ScopeMaster exposing size (an indicator of complexity)
Ambiguity exposure leads to lower complexity