Pitfalls of Historical Data Use in Software Estimation
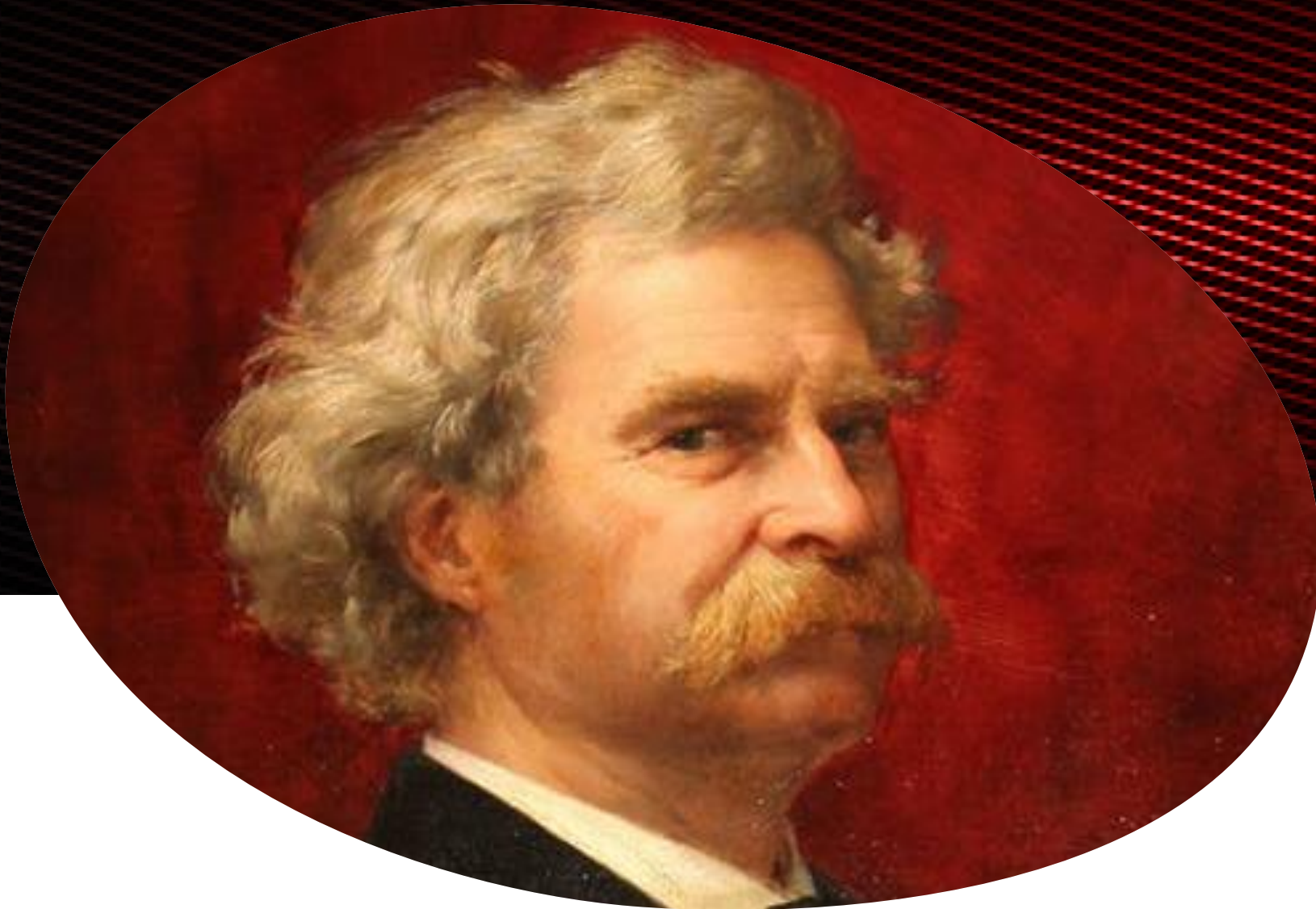

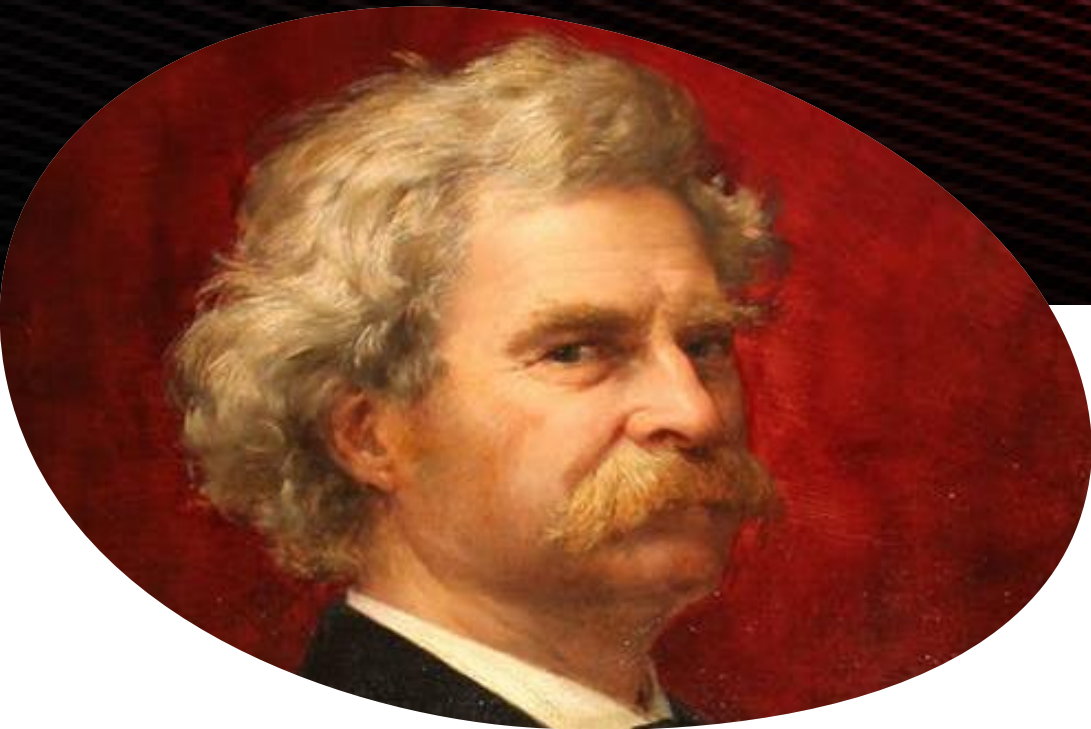GALORATH

David DeWitt – Director Commercial and International Programs
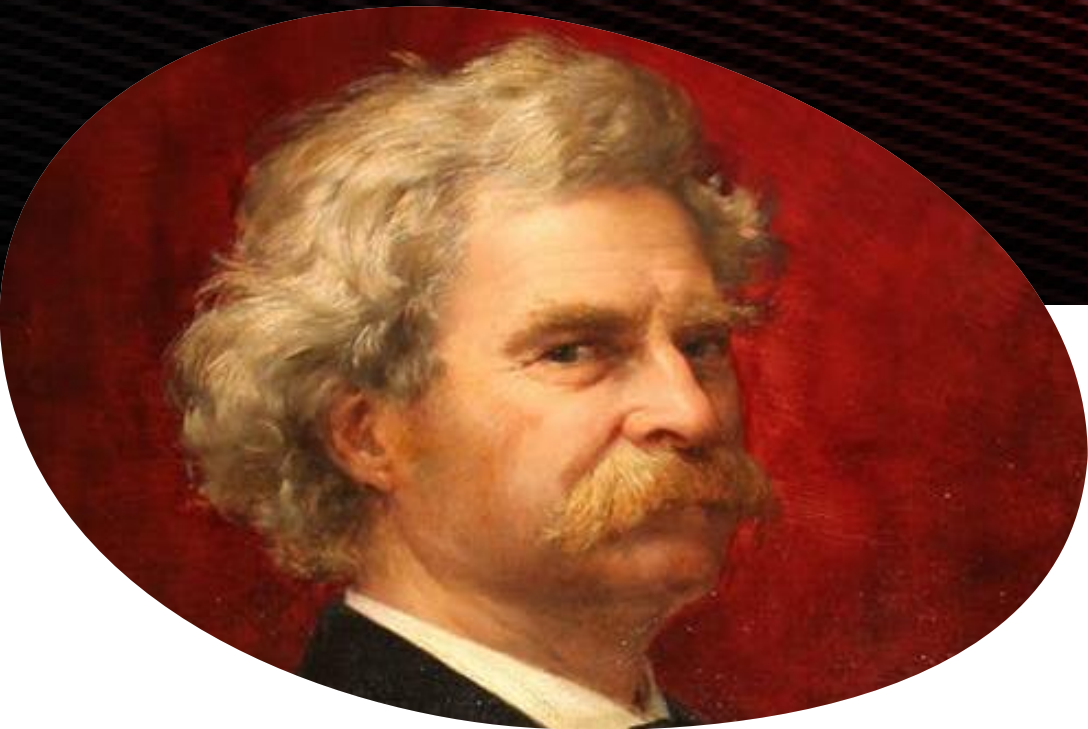Presented by: Brian Glauser – V.P. Business Development

Mark Twain Famously Said…

'There are three kinds of lies: lies, damned lies, and statistics'

Problem Is – He Never Said it… His Autobiography Quotes Benjamin Disraeli, a 19th century British Prime Minister

It was Prime Minister Arthur Balfour Quoting Professor Joseph Munro!

Around the Same Time Mark Twain was Misremembering a Famous Quote

"Let data and facts do the talking"

Frederick Taylor: The Principals of Scientific Management 1901.

Can We Trust the Data?

Maybe… But People Can be A Bigger Problem

"In God We Trust… all Others Bring Data"

- W. Edwards Deming

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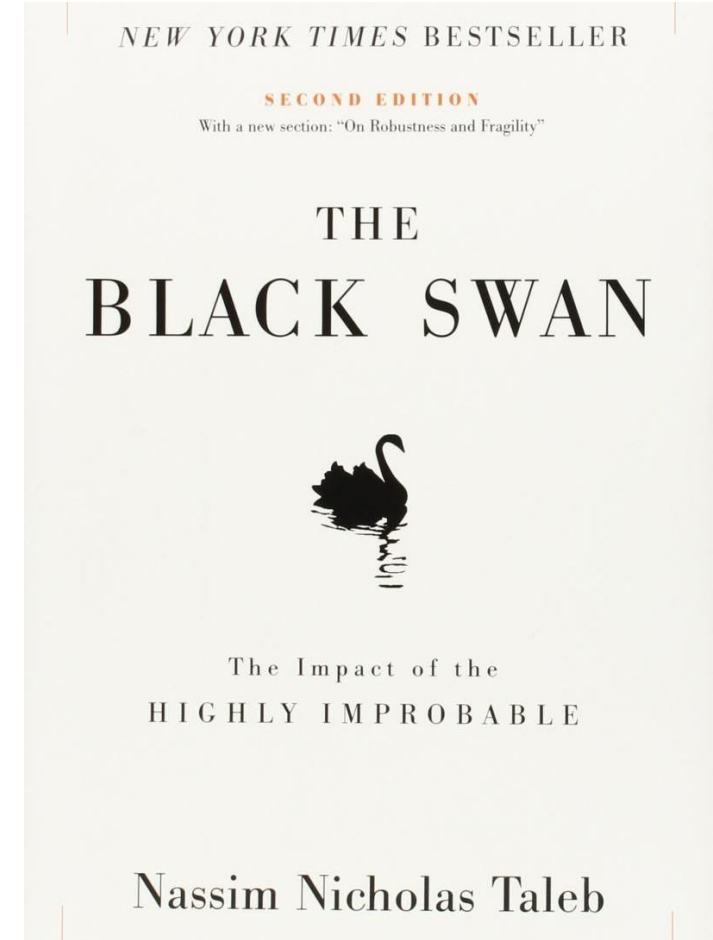# Four Common Fallacies Made in Historical Data Selection

And You Won't Even See It Coming

Narrative Fallacy

Causal Analysis

Silent Evidence

Ludic Fallacy

Narrative Fallacy

"...limited ability to look at sequences of facts without weaving an explanation into them, or, equivalently, forcing a logical link, an arrow of relationship upon them"

NEW YORK TIMES BESTSELLER

SECOND EDITION
With a new section: "On Robustness and Fragility"

THE
BLACK SWAN

The Impact of the
HIGHLY IMPROBABLE

Nassim Nicholas Taleb

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The Narrative Fallacy

A Quick Example

> **Sort Pieces**

> **Build The Frame**

> **Assemble Large Parts**

> **Fill In The Holes**

> **Hunt for Missing Pieces**

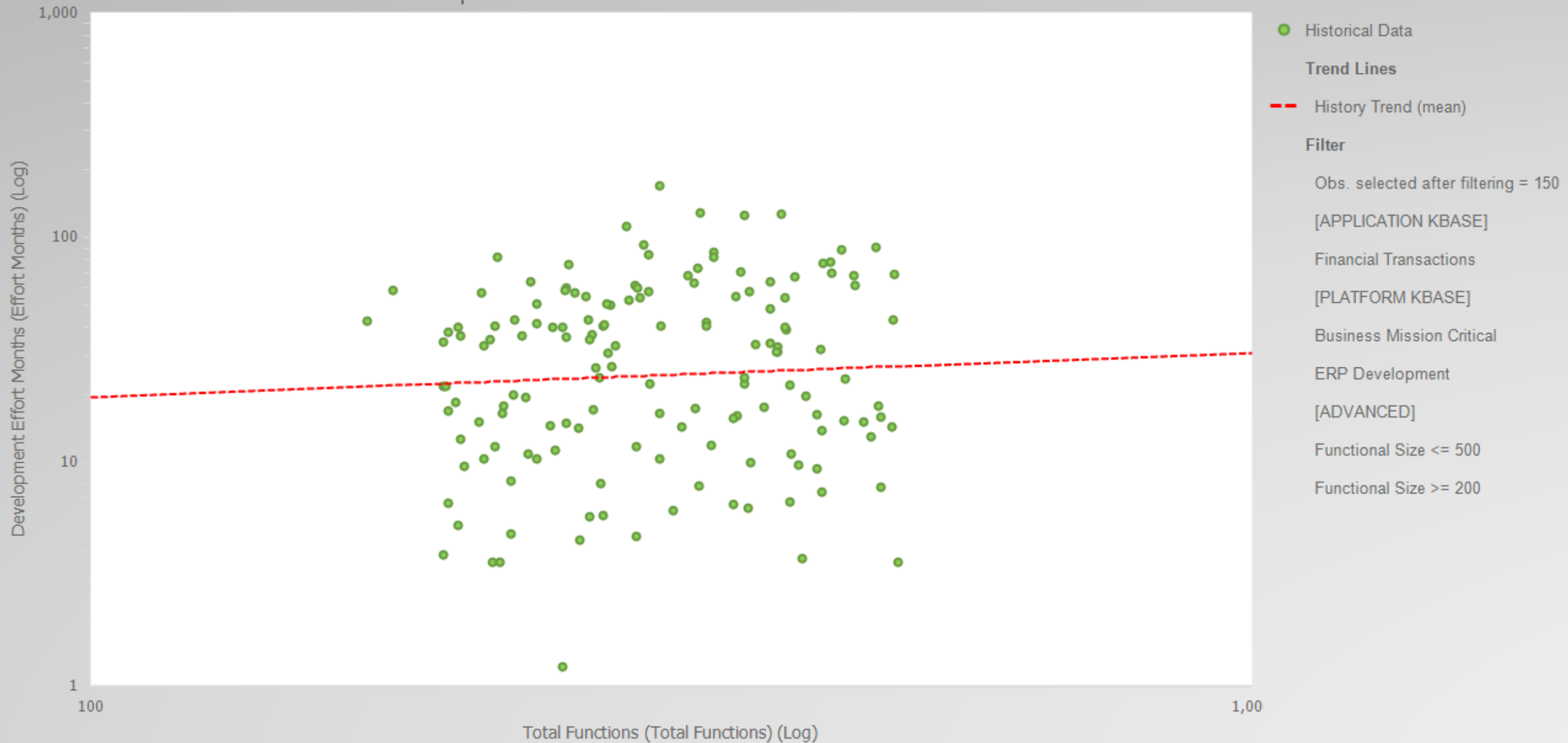> **Assume Some Missing**

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1. Neckerchiefs
2. Dogs Paws
3. Tower
4. Umbrellas
5. Sunglasses

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Development Effort Months vs Total Functions

Our Trust in Narratives Can Shape How Data is Selected

Development Effort Months vs Total Functions

Legend:
- Historical Data
- **Trend Lines**
- History Trend (mean)
- **Filter**
- Obs. selected after filtering = 150
- [APPLICATION KBASE]
- Financial Transactions
- [PLATFORM KBASE]
- Business Mission Critical
- ERP Development
- [ADVANCED]
- Functional Size <= 500
- Functional Size >= 200

Y-axis: Development Effort Months (Effort Months) (Log)
X-axis: Total Functions (Total Functions) (Log)

Our Trust in Narratives Can Shape How Data is Selected

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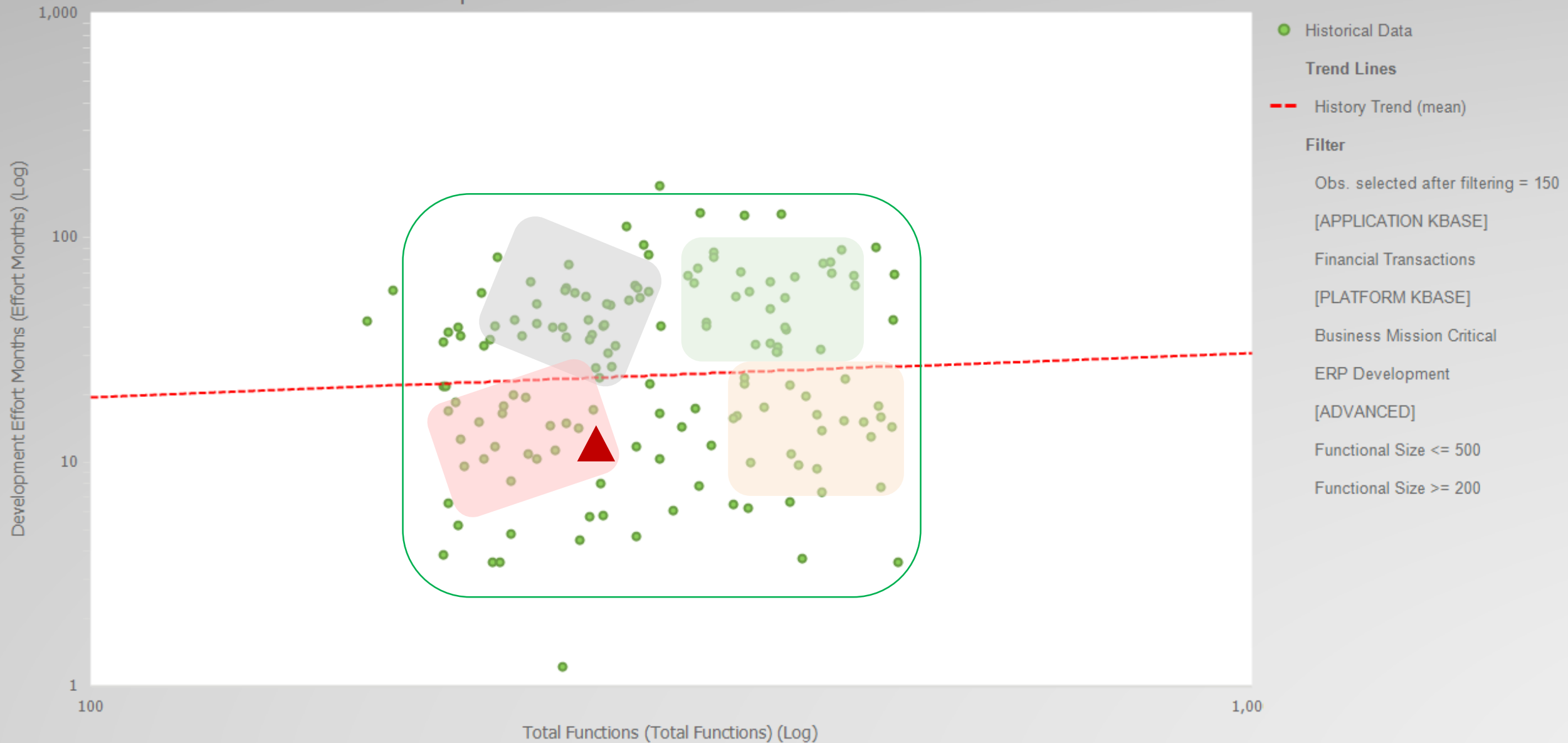
How To Prevent the Narrative Fallacy
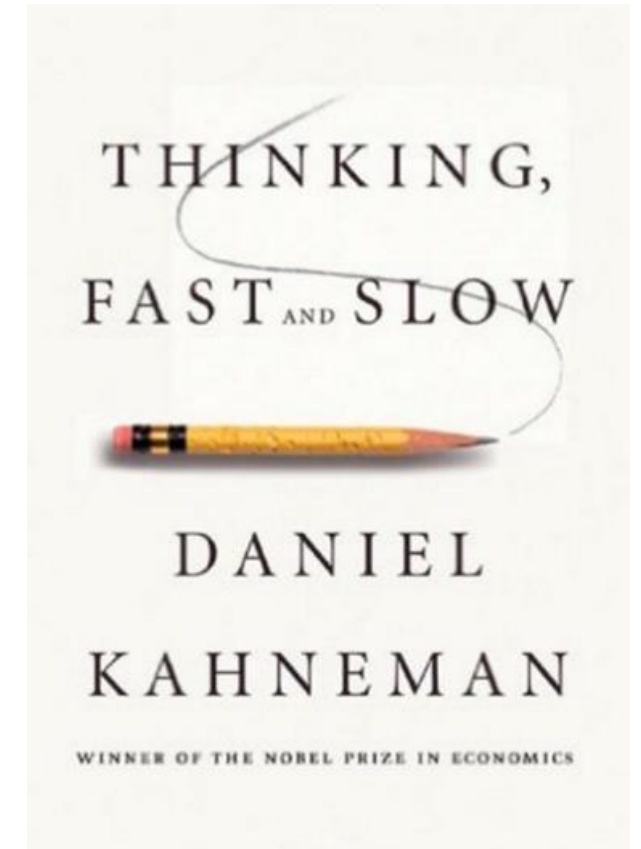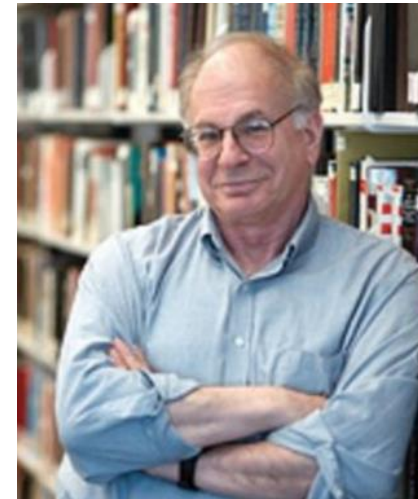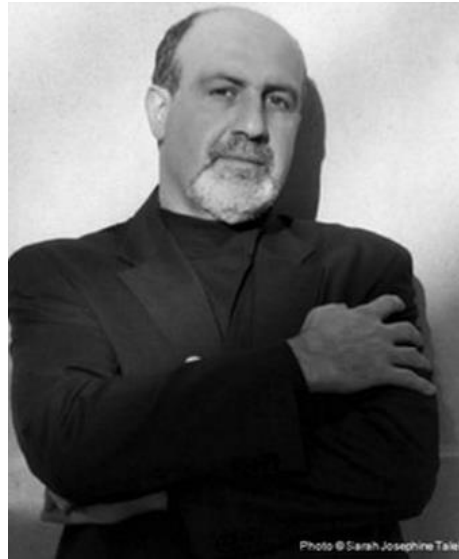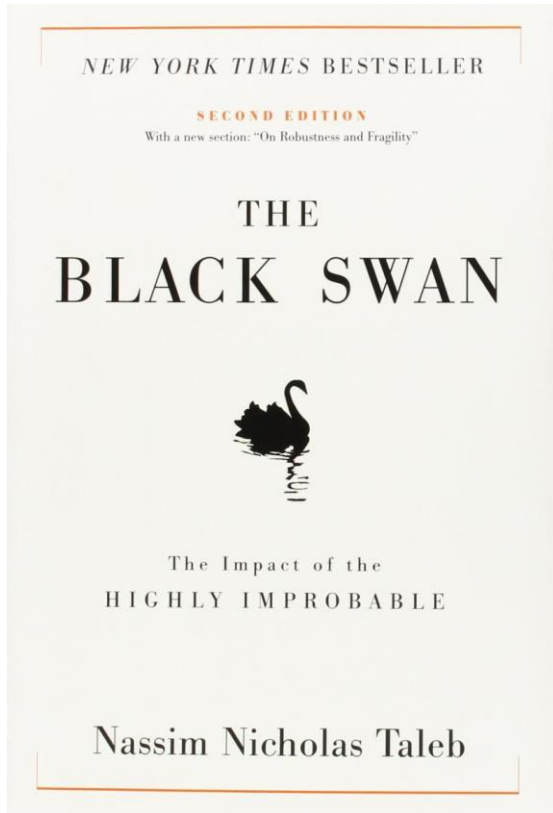
Nobel Prize winner Daniel Kahneman provided a solution to the impact of an "Inside View" in his book *Thinking Fast and Slow*

Famous Authors Hold Their Heads...

It's Hard to See the Narrative Coming!

Steven King

JK Rowling

Oscar Wilde

Kurt Vonnegut

Truman Capote

Virginia Woolf

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How Can Causal Errors Slip In?

SAME ENVIRONMENT

We specifically selected only ERP and Business Mission Critical Environment data

SAME PROBLEM DOMAIN

We said we were only looking for any projects that were built for Financial Transactions.

SIMILAR SCALE

We limited our data to only completed projects of our anticipated size in Function Points

ASSUMED CORRELATION

The Narrative lead us to believe all these data points were of equal value for analysis. And they may be!

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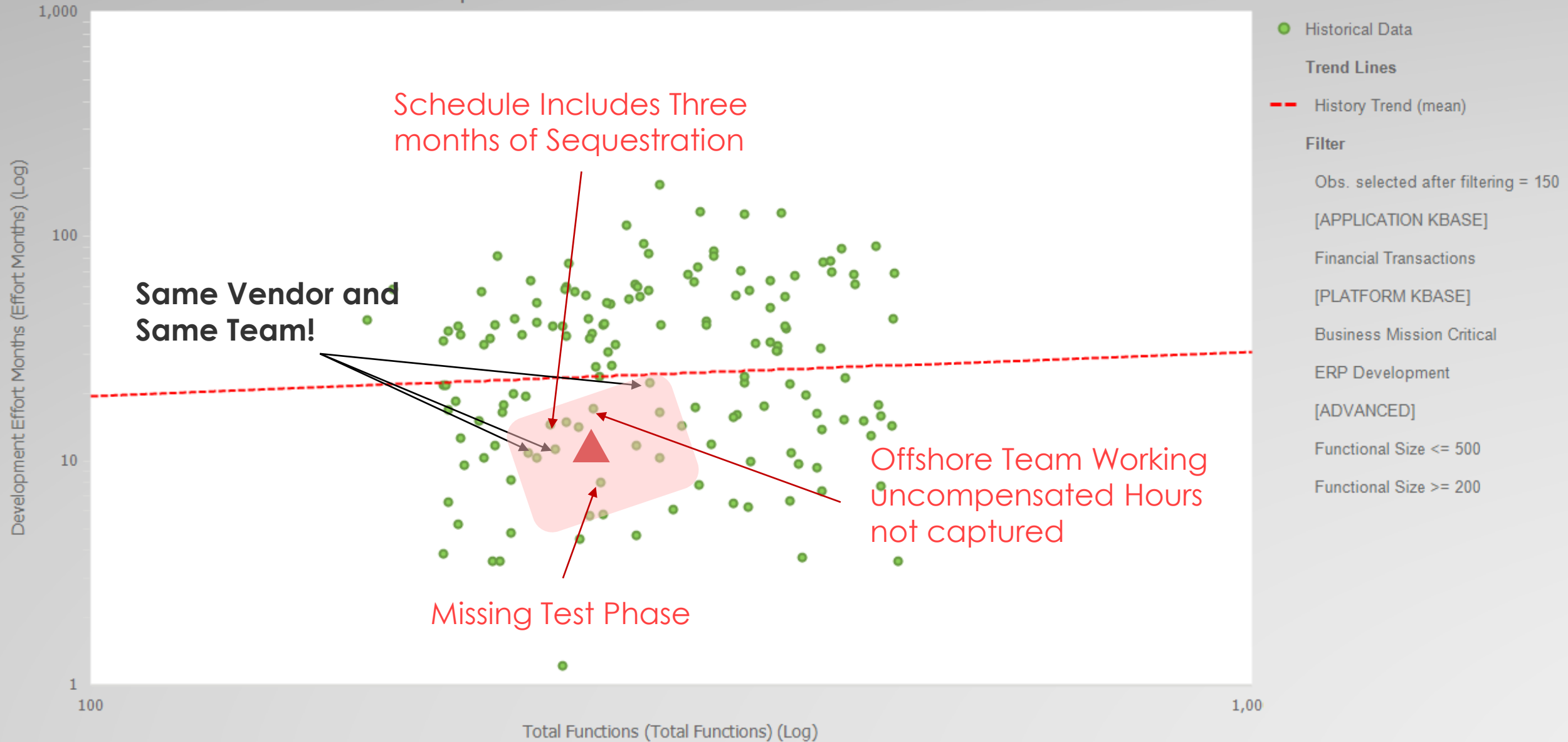
Correlation Can Make Us Assume Causation

How To Prevent Causal Analysis Errors?
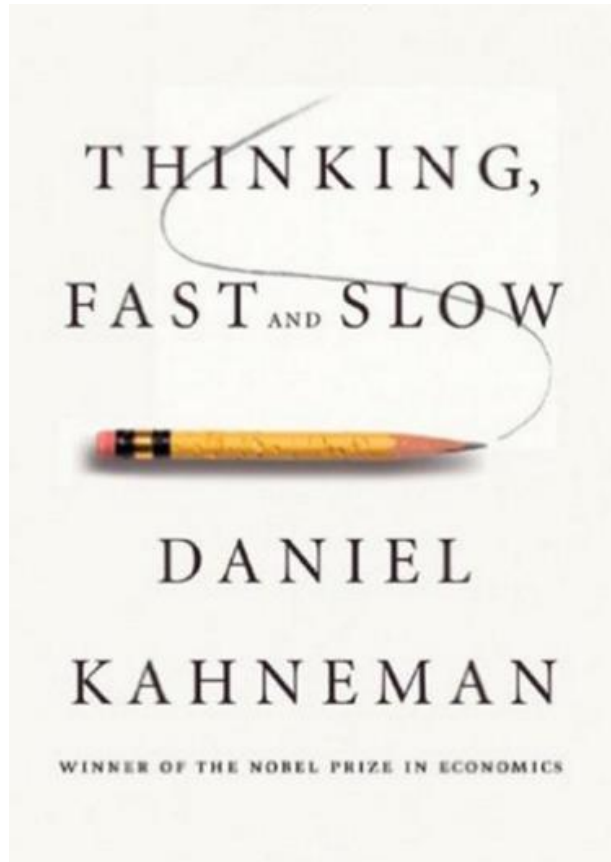
Again we turn to the Outside View. Need to have someone that understands what the data means – not just where it falls in a historical trend line.

How Can We Trust the Data?

Better Question is… Do We Have All the Data?

"In God We Trust… all Others Bring Data"

- W. Edwards Deming

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Building A Historical Data Archive

ID Completed Projects

We look for programs that have a sufficient available data to store in a repository.

Sort Into Domains

We specify what bucket of data the projects belong and we create identifiers for easy extraction.

Grade Data Quality

We provide some indicators as to the integrity of the data and any limitations to usage – typically a quality flag.

Promote the Data

We Notify others of the data availability and encourage usage of the repository.

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Uncomfortable Narratives Are Eliminated

Excluded Failed Projects

Rationalize Buckets When Difficult to Sort

Intentionally Allow Bad Data to Remain Silent

Fail to Mention the Missing Evidence

ID Completed Projects

We look for programs that have a sufficient available data to store in a repository.

Sort Into Domains

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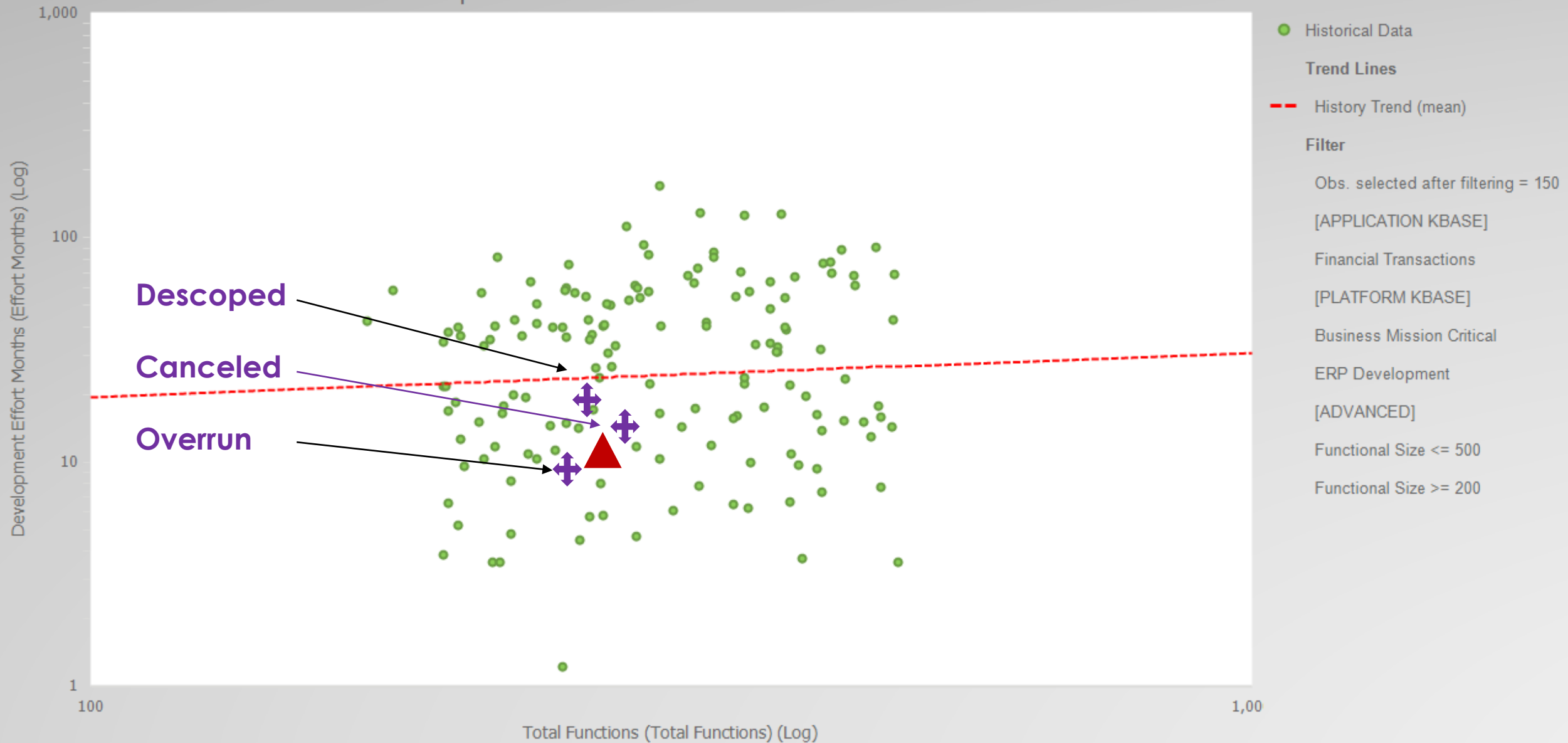## Promote the Data

We Notify others of the data availability and encourage usage of the repository.

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Development Effort Months vs Total Functions

Transparency Into All the Evidence Forces Difficult Conversations

Fundamental Problems With Historical Data
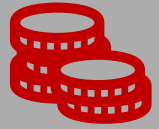
It's costly to obtain

Difficult to catalog and store

Can often be wrong

Can be intentionally laced with inaccuracies

Fallacy of Silent Evidence

Drives the conversation about data quality

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Ludic Fallacy – Latin for Games

"basing studies of chance on the narrow world of games and dice"

NEW YORK TIMES BESTSELLER

SECOND EDITION
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THE BLACK SWAN

The Impact of the HIGHLY IMPROBABLE

Nassim Nicholas Taleb

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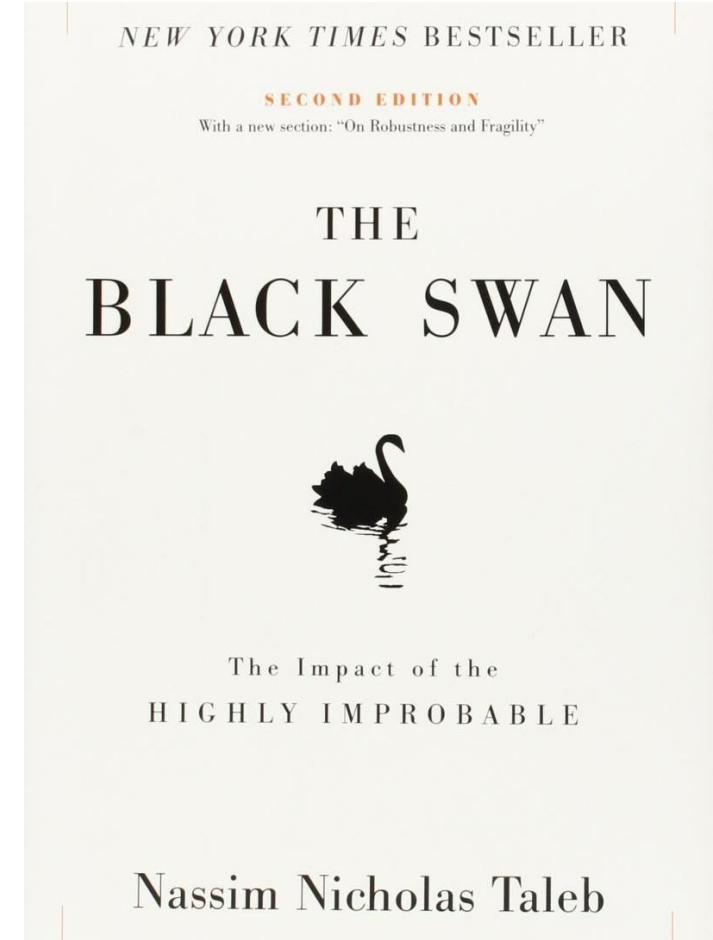
The Pareto Principle:

80% of Results Come from 20% of the Production

Life is not Fair

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Has The Historical Data Been Gamed?

"Randomness has an additional layer of uncertainty concerning the rules of the game in real life."

"Men follow their sentiments and their self-interest, but it pleases them to imagine that they follow reason."

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Most Common Omissions From Historical Data Ranked In Order Of Significance

Sources of Cost Errors

1) Unpaid overtime by exempt staff
2) Charging time to the wrong project
3) User effort on software projects
4) Management effort on software projects
5) Specialist effort on software projects
   - Human factors specialists
   - Data base administration specialists
   - Integration specialists
   - Quality assurance specialists
   - Technical writing specialists
   - Education specialists
   - Hardware or engineering specialists
   - Marketing specialists
   - Metrics and function point specialists
6) Effort spent prior to cost tracking start up
7) Inclusion/exclusion of non-project tasks
   - Departmental meetings
   - Courses and education
   - Travel

Source: Capers Jones, *Errors And Omissions In Software Historical Data: Separating Fact From Fiction,* August 17, 2009

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Typical Results Reviewing Customer Historical Data

Activities Performed	Completeness of historical data
01 Requirements	Missing or Incomplete
02 Prototyping	Missing or Incomplete
03 Architecture	Missing or Incomplete
04 Project planning	Missing or Incomplete
05 Initial analysis and design	Missing or Incomplete
06 Detail design	Incomplete
07 Design reviews	Missing or Incomplete
08 Coding	Complete
09 Reusable code acquisition	Missing or Incomplete
10 Purchased package acquisition	Missing or Incomplete
11 Code inspections	Missing or Incomplete
12 Independent verification and validation	Complete
13 Configuration management	Missing or Incomplete
14 Integration	Missing or Incomplete
15 User documentation	Missing or Incomplete
16 Unit testing	Incomplete
17 Function testing	Incomplete
18 Integration testing	Incomplete
19 System testing	Incomplete
20 Field testing	Missing or Incomplete
21 Acceptance testing	Missing or Incomplete
22 Independent testing	Complete
23 Quality assurance	Missing or Incomplete
24 Installation and training	Missing or Incomplete
25 Project management	Missing or Incomplete
26 Total project resources, costs	Incomplete

Source: Capers Jones, *Errors And Omissions In Software Historical Data: Separating Fact From Fiction,* August 17, 2009

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Incentives For Fraud Have Been Somewhat Mitigated

OPERATIONS EMPLOYEE TIMESHEET

Joe Coder

Employee Name

Payroll Ending Date | June 14, 2025

Employee Number 1234674

Joe – Please Move hours for task 1 across task 4 and 5.

The Boss

						Date:	6/1	6/2	6/3	6/4	6/5	6/6	6/7	Total Week 1
REGULAR HOURS:							Sun	Mon	Tue	Wed	Thu	Fri	Sat	
Task	Loc	WO#	Work Description	Job Title	Title #		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Regular
1	SD	32984	Coding Optical Scanner CSC#3	Programmer	SW			6.00	7.00	7.00	5.00	8.00		33.00
2	SD	32984	Unit Testing CSC #3	Programmer	SW			1.00			2.00			3.00
3	SD	32985	Bug Fixing CSC #3	Programmer	SW			1.00			1.00			2.00
4	SD	400329	Design Support	Programmer	SW									
5	SD	400329	Requirements Review	Programmer	SW				1.00	1.00				2.00
			Total Regular Hours					8.00	8.00	8.00	8.00	8.00		40.00

Fixed Price

Cost Plus

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Overcoming Four Fallacies Made in Historical Data Selection
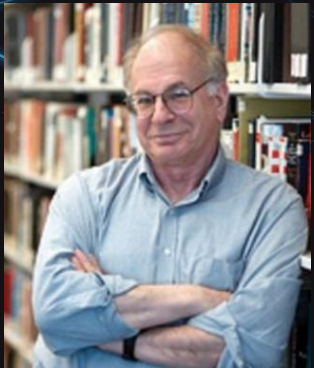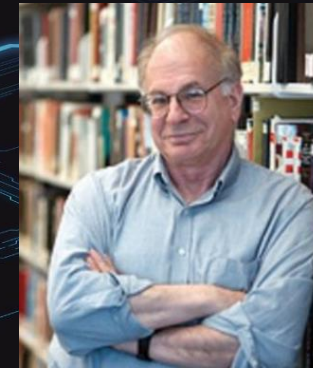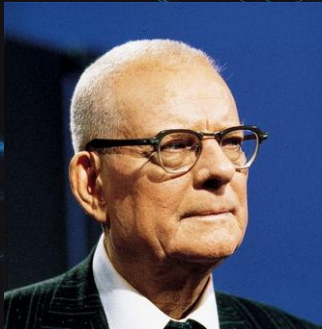
Thank For Your Time Today

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