

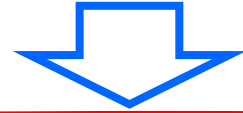
# Repurposing Traceability

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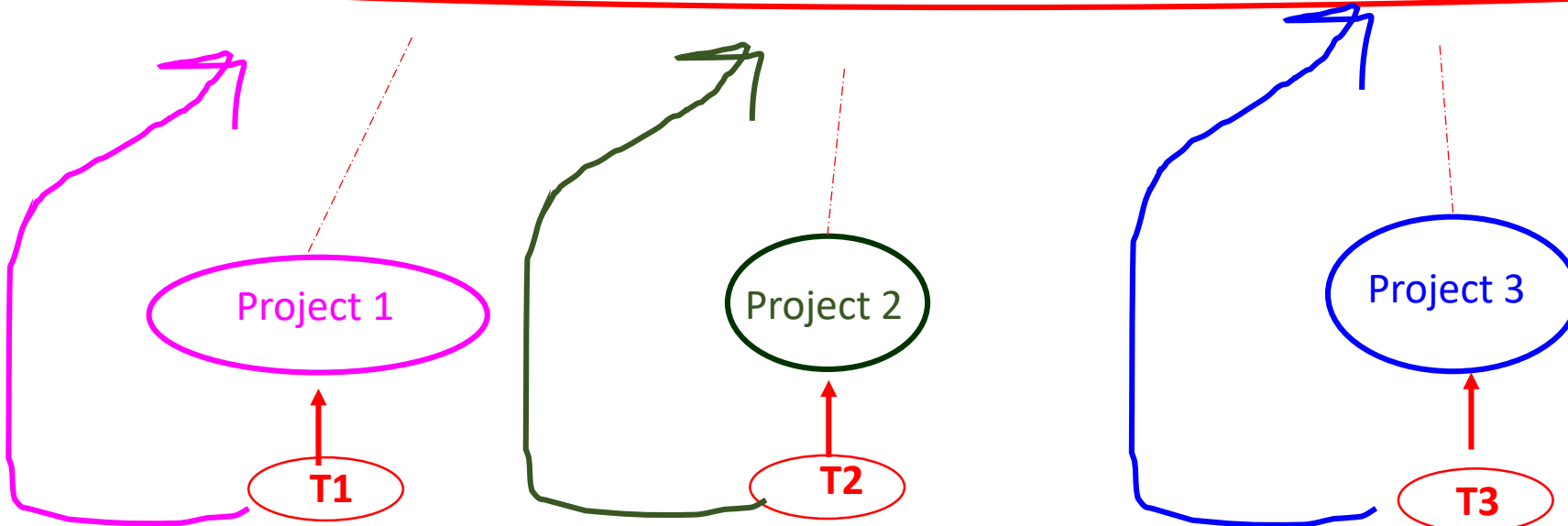
Traceability: the thousand lenses in your system

# Traceability from the trench to the bird view

Industry trends, AI, data trends, MBSE, Large Global Diversified Lessons  
Learned from all disciplines-industries



- Traceability seen as an enterprise sub-discipline



Organization Reliability => Product Reliability => Process Reliability with strategic centralization and strategic decentralization

## What Traceability is Not (from Fred Schramm):

“Traceability May Be Best Defined By What It is Not  
Logistics, Inventory Control, Tracking Movement,  
Networks, Databases, Product ID, Spec ID, Standards,”  
Data Matrix, System Elements Relationships..... Big  
Data

“But These Are Enablers in the Environment Through  
Which a Product Progresses”

# Simplest Definition For Traceability (from Fred Schramm):

“A Better Way To Look at Traceability Is:  
As Two Words  
Trace Ability:  
.... Or having the ability to determine  
the quality, quantity, characteristic, and  
course or development **history** of  
something...to its point of origin if  
Required....IT'S **PEDIGREE**”

## **Definition of *pedigree***

**1:** a register recording a line of ancestors The *pedigree* traces the family back to the 18th century. **2a:** an ancestral line : [LINEAGE](#).

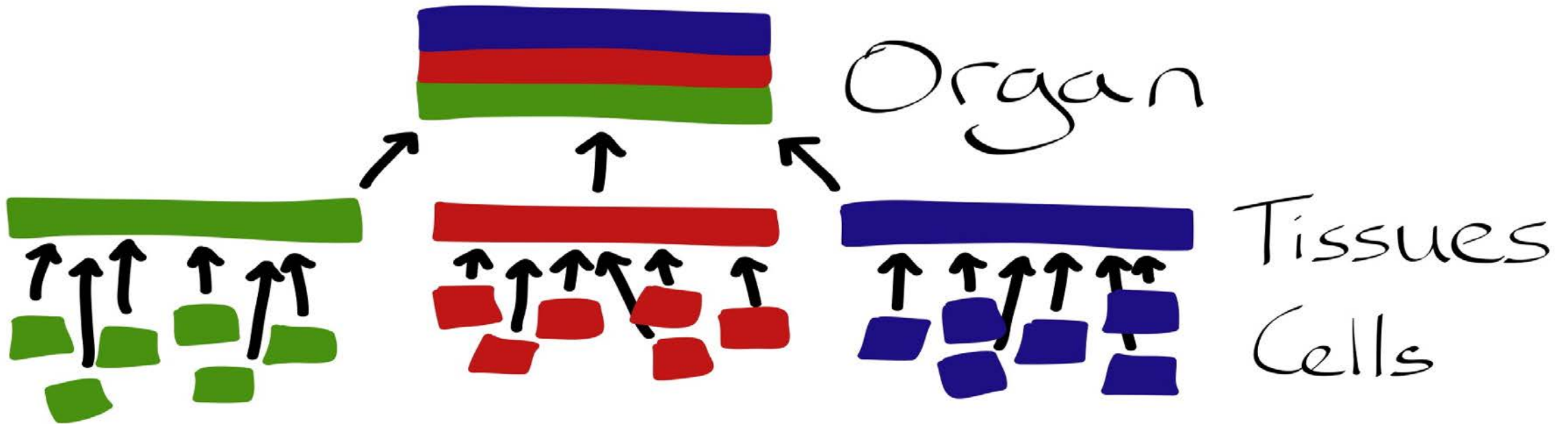
**b:** the origin and the history of something [BACKGROUND](#), [HISTORY](#)

**3a:** a distinguished ancestry, Example: actions spoke louder than *pedigrees* in the trenches— Dixon Wecter

# Definition 3

- “Requirements traceability (RT) can be viewed as the **ability** to describe and follow the **life of a requirement, in both the forward and backward direction**”
- “It is used to capture **the relationships between requirements, design, and implementation of a system.**”
- “RT not only can be a useful solution to **align system evolution with changing stakeholder needs** but also helps in finding:
  - \_unexpected problems, \_innovative opportunities and
  - \_laying the groundwork for corporate knowledge management”

# Micro Behaviors and Macro Behavior



Micro Behaviors : From **living cells to living requirements**, to living code, to living tests injected in your functioning No Rather LIVING system..... Living System is not just a Biological System.....Yes the Rocket or the Automobile are LIVING systems from prototyping to deployment (Though life show most in OPERATION)

<https://sites.google.com/a/edubuzz.org/nat5biopl/unit-2-multicellular-organisms/1-cells-tissues-organs>



# Supply Chain, Data Chains, System Element Chain

- A medication recall (Tylenol Scare in 1982), an automobile recall (disturbed supply chain)
- An industrial accident (disturbed system behavior)
- A failure on the day of launch (disturbed operation)

How do you quickly and effectively dive in the system to find all related causes to the problem ?

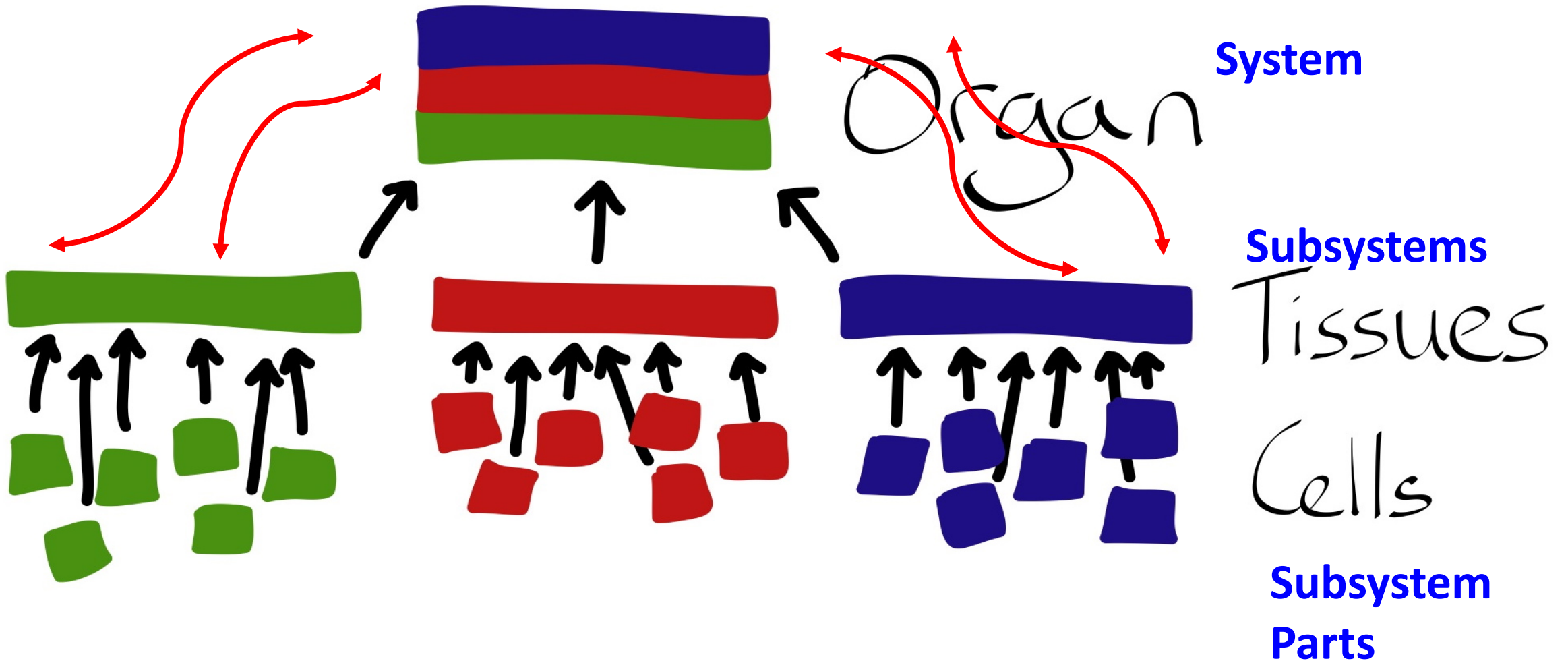
Traceability thru its matrix is the thousand prepared and pre-processed lenses to quickly query and trace thru the complex system elements to zoom in on the relevant information-for-solution

[https://en.wikipedia.org/wiki/Camera\\_lens](https://en.wikipedia.org/wiki/Camera_lens)





# Biological View of Traceability



# Fast and Slow Traceability

Do we all understand and agree on Fast/Slow change => Traceability connector visualizer for all micro-behaviors, within and above to the Macro System Behavior

-Slow Traceability serves both controlled change, baselined - semi-programmed change-project mode

-Fast Traceability: uncontrolled change (accident, crisis, etc...)

innovative-project-mode, fast thinking : “Quick show me all the micro-behaviors that contributed to the macro-unusual behavior ?”

Managing with a sense of urgency

Prevents the bad emergency

<http://iancleary.com/5-stages-of-change/>



# Traceability: “MisGranularity” Gaps

- When “too many connections” becomes a gap
- Linking too many system engineering elements to a single element

## Bad Examples:

- Linking a lower level RQT to a whole DB File or to 5000-lines code file
- Linking a lower level RQT to a whole 1000-page document spec

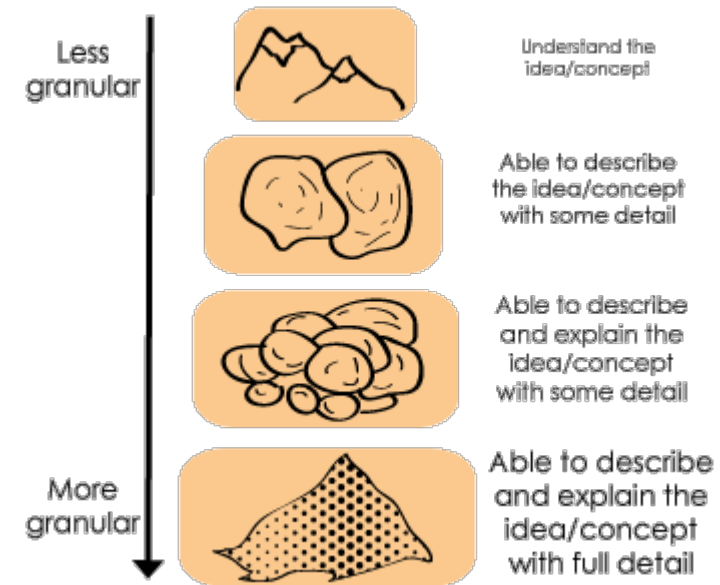
“Trace for a purpose. That is, determine which linkages are truly important; otherwise, a large number of extraneous links will be generated.”

“Define a suitable trace granularity. For example, linkages should be placed at the appropriate package, class, or method level.”

**Traceability is Granularity;**

**Don't give me the mountain if I am asking for sand**

MisGranularity: Even dictionaries evolve



# Conclusion 1

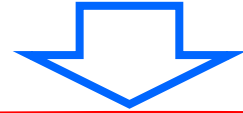
- Redefinition ? : Traceability is an activity, an ability and yes a process to help define, connect and visualize all relevant micro-behaviors and micro-structures defining your large complex system
- Traceability is also: A Fast and Slow Change Management Enabler and Visualizer in Engineering
- With Big Data imposing itself in the Engineering Project, Traceability needs a second look

## Conclusion 2

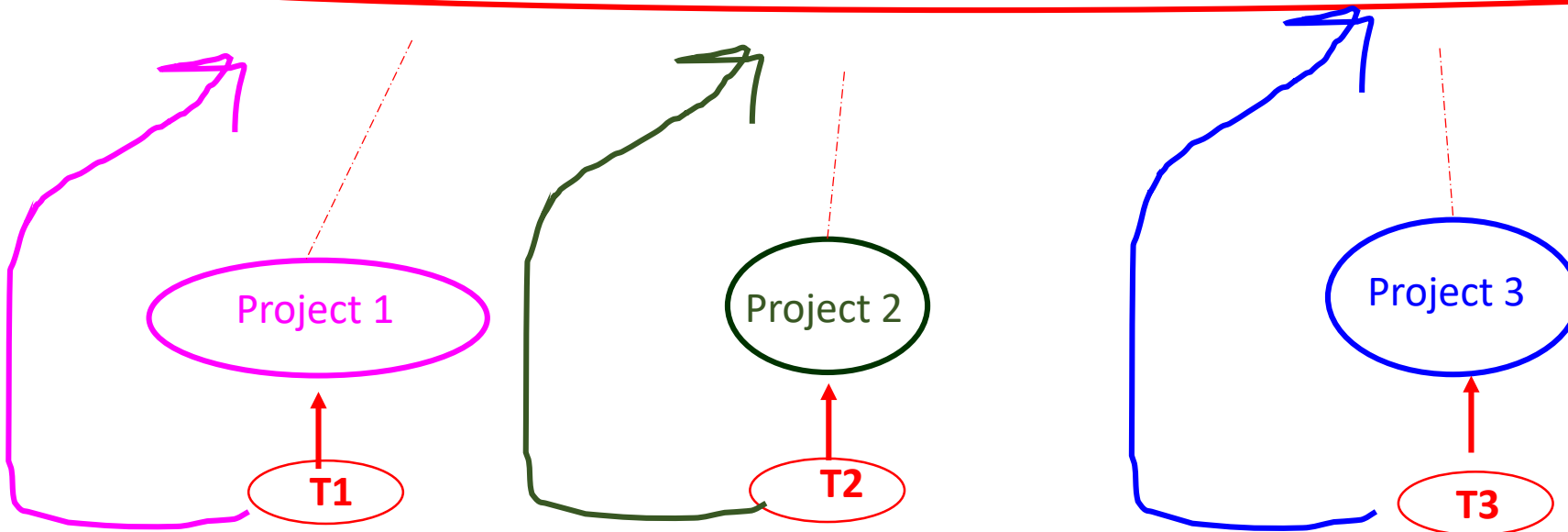
- Traceability can be used for research to develop new products for Knowledge Management beyond change management =>
- Requirements Engineering Process Improvement must include Traceability Improvement => Traceability from a pure adhoc trench activity to an enterprise-matured discipline
- Challenges still “Techniques have been suggested in the research literature to address the Requirements Traceability problem. Their use, however, is still not as widespread as the importance of RT suggests. This is likely because there are still many issues to be addressed, for example, the lack of common definitions and conflicting underlying problems” **“Requirements Traceability :**  
Wei LI Rayford B. Vaughn Hossein Saiedian”

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The strategic Centralization and Decentralization Discipline in every discipline