

Why not ... Purposeful Design

*Prof A K Rao Memorial Lecture
Bangalore India, Dec 02, 2022*

Host:

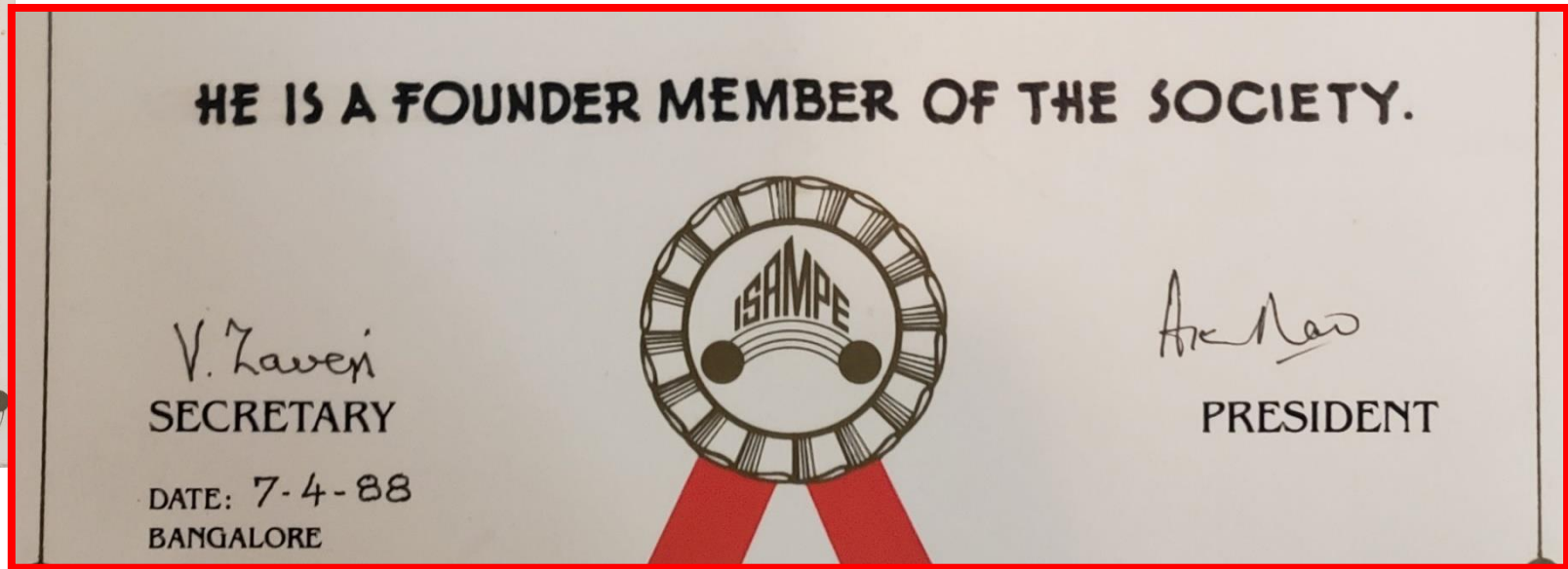
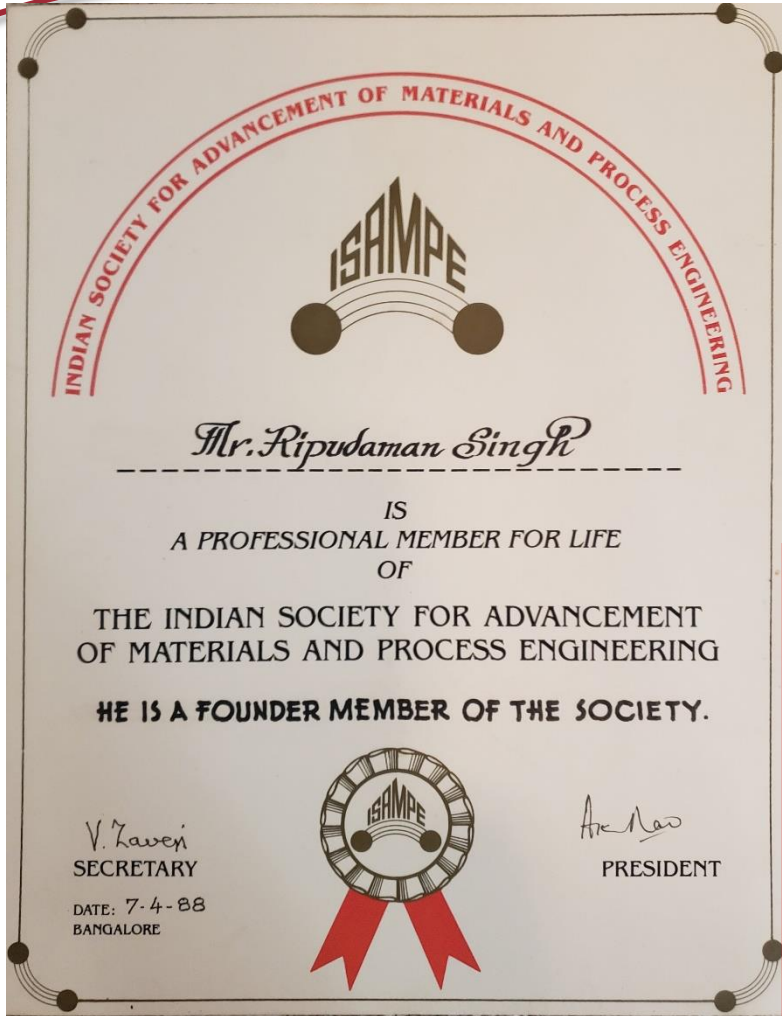


*Ripi Singh, Ph.D., MBA.
Chief of Innovation & Strategy*

*Ripi@InspiringNext.com
+1 (860) 816-4420*



AKR had pulled me into ISAMPE



Three Things that I learned from Prof A K Rao

Three Things Professionally

- Think Big & Far-ahead
- Develop Others
- Define the Problem



Three Things Personally

- Generosity, Inclusion
- Optimum use of Ego
- Value of Time



My last picture with him



A Lot of me Today is because of Prof AK Rao & his Students

ASNT's Robert McMaster Gold Medal for NDE 4.0

Currently – Dual Transformation

- WHY – Purpose & Value Prop
- HOW – Innovation & Strategy
- WHAT – Reliable Technology
- HUMAN – Ethics, Diversity, Co-working



19+ Books

150+ Publications

300+ Lectures

10+ Failures

NDE 4.0
Global Technology
Community Effort
ICNDT SIG

2019
ISO 56000
US Expert

2018
NDE 4.0 – Vrana

2016
Industry 4.0

2014
Innovation
Coaching
Practice



2006
MBA

2014
**Fortune 500
Small Business
Asst Professor**

Technology Leadership, Jet engines, renewables
Engineering consulting, Y2K, NDE-POD
Damage Tolerance, Aging Airplane, Life extension, NDE

1987

1990



New Product Design – How Innovative are You?

Where do YOU stand, today? Sure?
Where do YOU want to be NEXT?
How do you transition?



★★★★★
Resilient Presence

★★★★
Visionary Trendsetter

★★★
Smart Forecaster

★★
Agile Follower

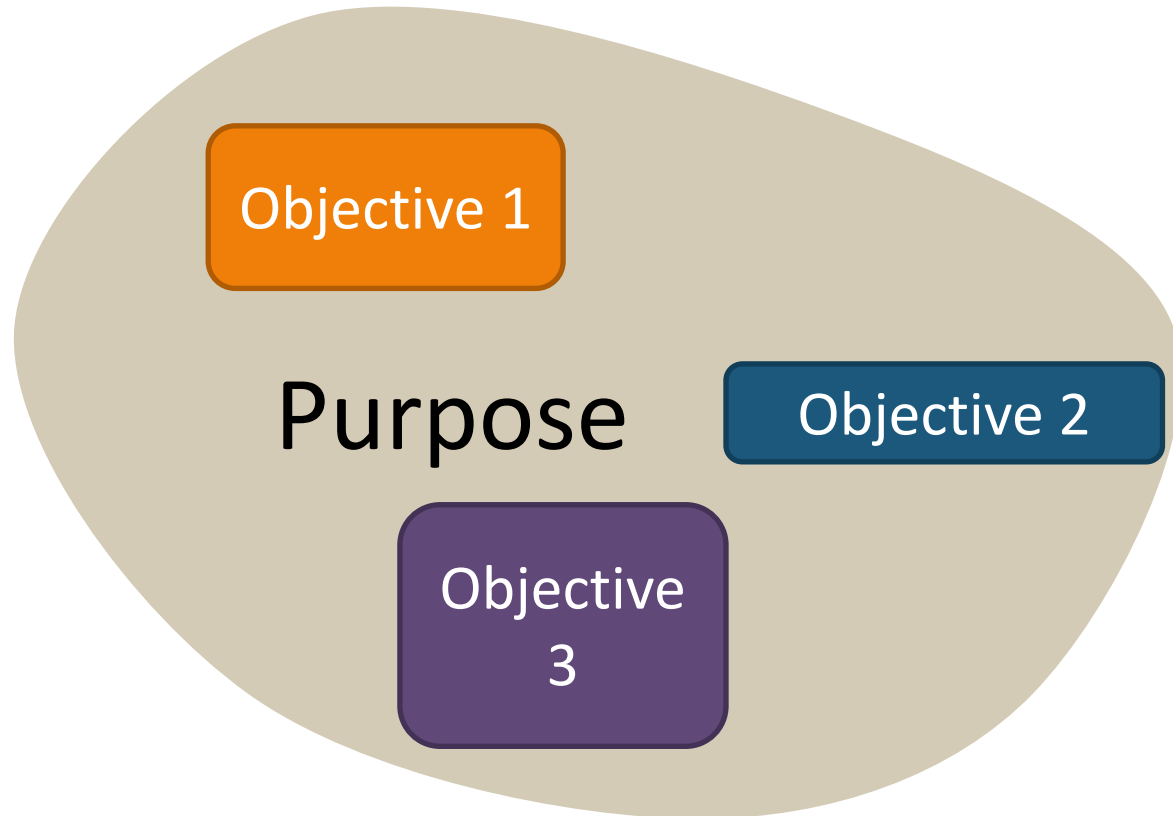
★
Endangered Species



Innovation Profile



Design Optimization – Generally Objective(s) Driven



Objective	Purpose
Precise goal(s) to achieve a purpose	Meaningful end result
Narrow Plural Near Term Based on facts	Broad Singular Far Term Based on ideas
Flexible to achieve the purpose	Rigid
Achievable	Generally pursue

Defines WHAT

Establishes WHY



Design Optimization Topics

- Size, shape and topology optimization
- Materials selection
- Systems design and optimization
- (Hyper) Parametric designs
- Uncertainty quantification
- Sensitivity analysis methods and applications
- Design for manufacturing and maintenance
- Design and optimization in additive manufacturing

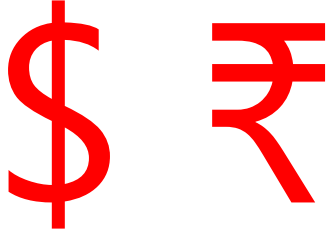
• ...

• ?

Excellent list of
WHAT and HOW

WHY ?

Life Cycle Cost



Financial

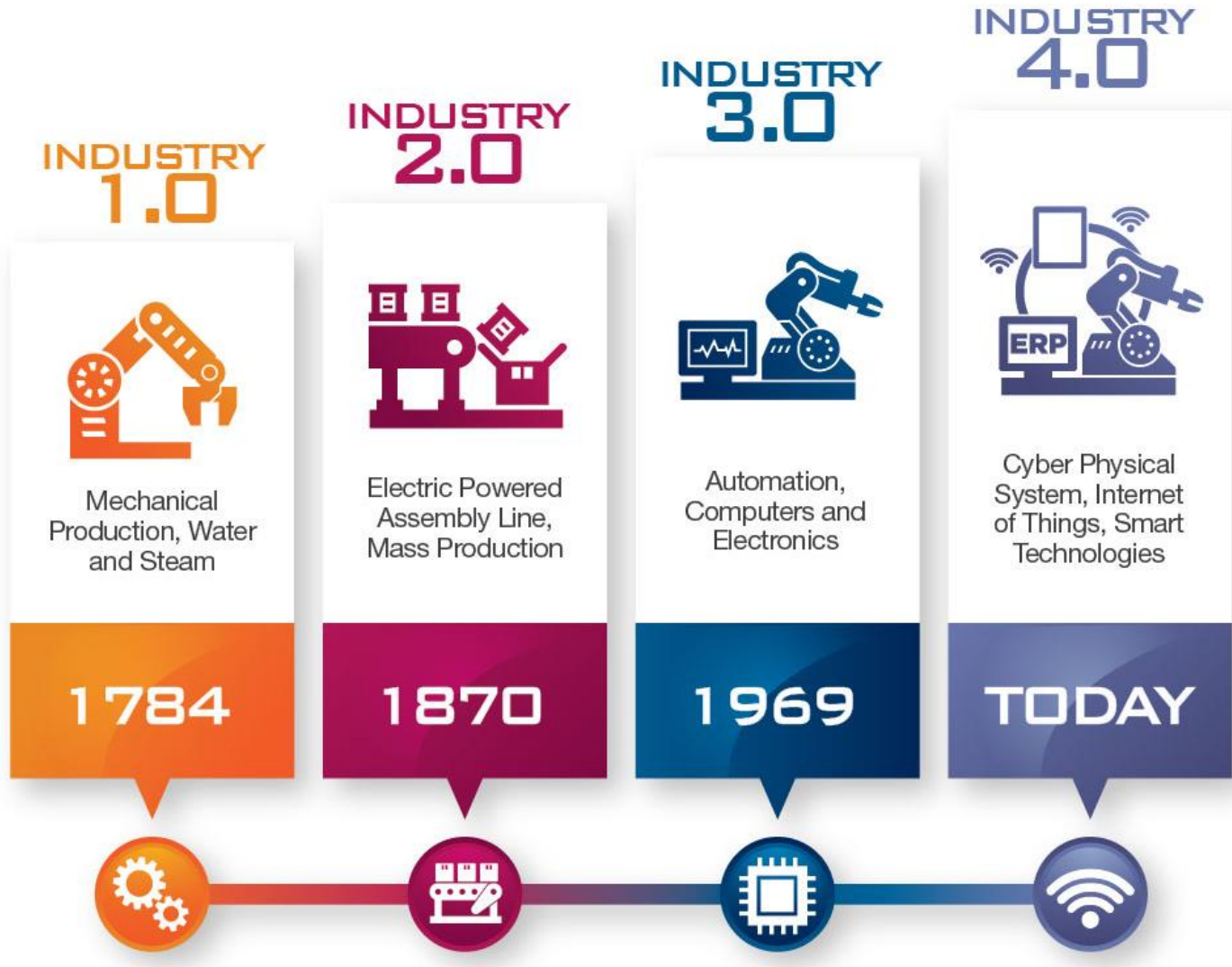
Unaware



The Fourth Industrial Revolution

WHY ?

Massive Opportunity
For Superior Design
New Digital Disciplines

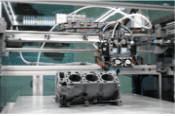







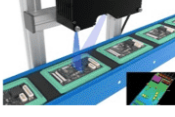










Financial
Unaware

The Fourth Industrial Revolution – Technology Suite

WHY ?

17 technologies explored in the Industry 4.0 Adoption Report 2020

- | | | | | | | | | |
|----------|---|----------------------------------|-----------|---|-----------------------|-----------|--|--------------------------|
| 1 |  | 3D Printing | 7 |  | Cloud | 13 |  | IoT |
| 2 |  | 5G | 8 |  | Cobots | 14 |  | IoT Platforms |
| 3 |  | Artificial Intelligence | 9 |  | Cybersecurity | 15 |  | Machine Vision |
| 4 |  | Augmented Reality | 10 |  | Digital Twin | 16 |  | Quantum Computing |
| 5 |  | Automated Guided Vehicles | 11 |  | Drones | 17 |  | Virtual Reality |
| 6 |  | Blockchain | 12 |  | Edge Computing | | | |

Technology

Financial

Unaware



Why

Industry 4.0 making ... Everything Smart ... Improve Life

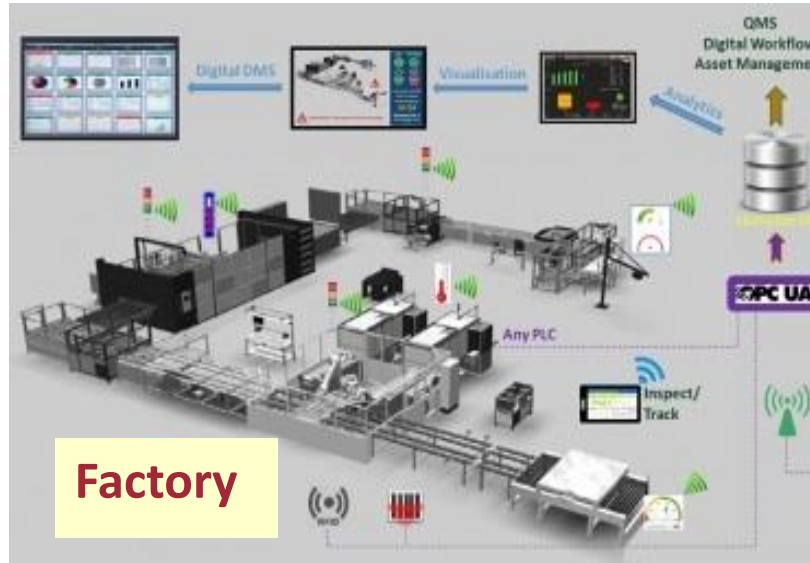


Cities and Infrastructure



WHY ?

Society



Technology

Financial

Unaware

Why

How do you Preserve a Precious Stone ?



WHY ?

Sustainability

Society

Technology

Financial

Unaware



If you Think of it, We are all Trapped

There is no
Planet B

We Must Sustain This



Earth Overshoot Day

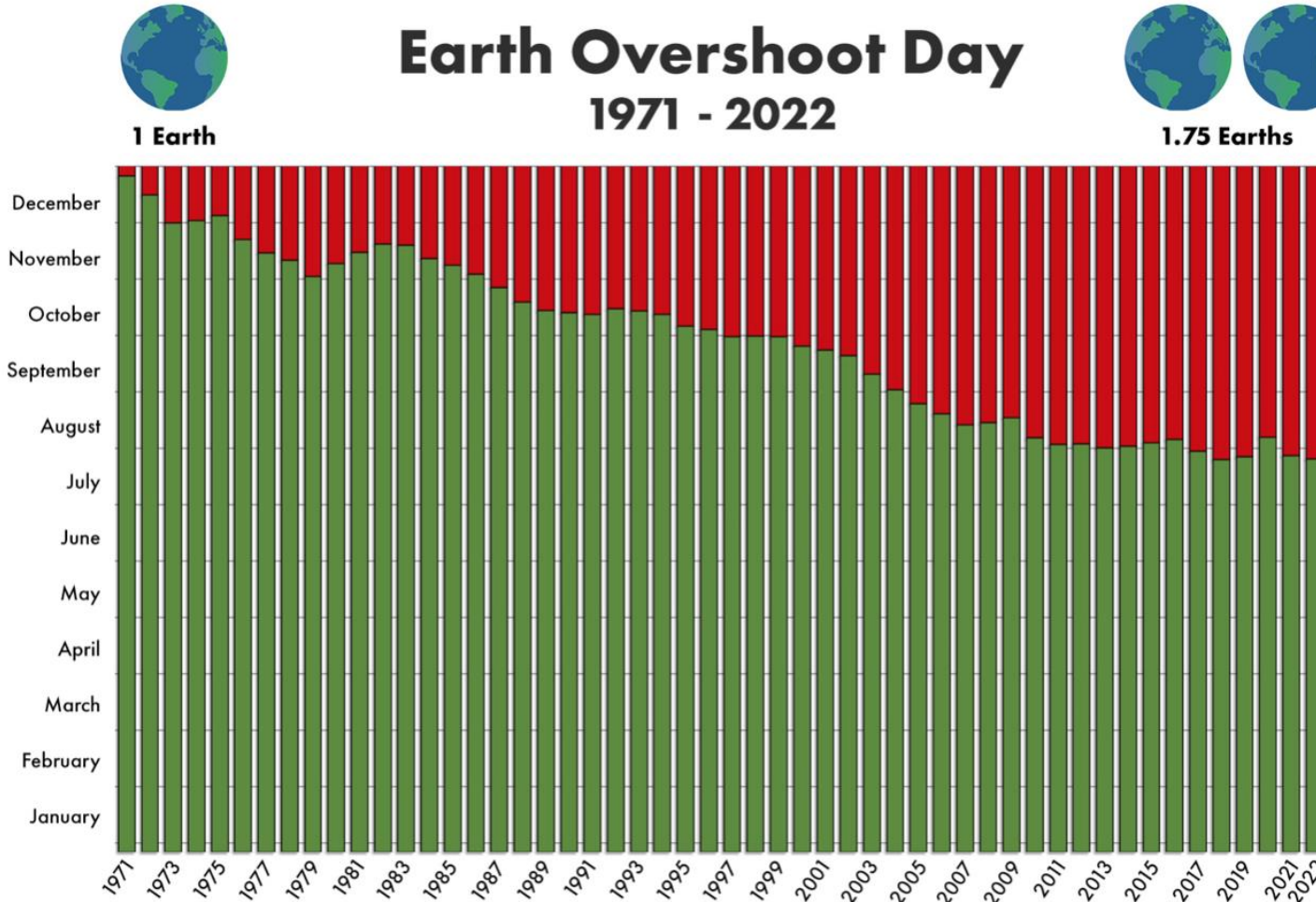
- **Supply (Biocapacity)**
 - Productive land and sea area,
 - Forests, Grazing lands, Cropland, Fishing grounds,
 - Built-up land
- **Demand (Ecological Footprint)**
 - Plant-based food
 - Fiber products,
 - Livestock and fish products,
 - Timber & other forest products,
 - Space for urban infrastructure,
 - Forest to absorb its CO₂ from fossil fuels
- Both these are expressed in hectares



$$\text{Earth Overshoot Day} = \frac{\text{Planet's Annual Biocapacity}}{\text{Humanity's Daily Ecological Demand}}$$



Earth Overshoot Day



Recessions & Covid

July 28, 2022



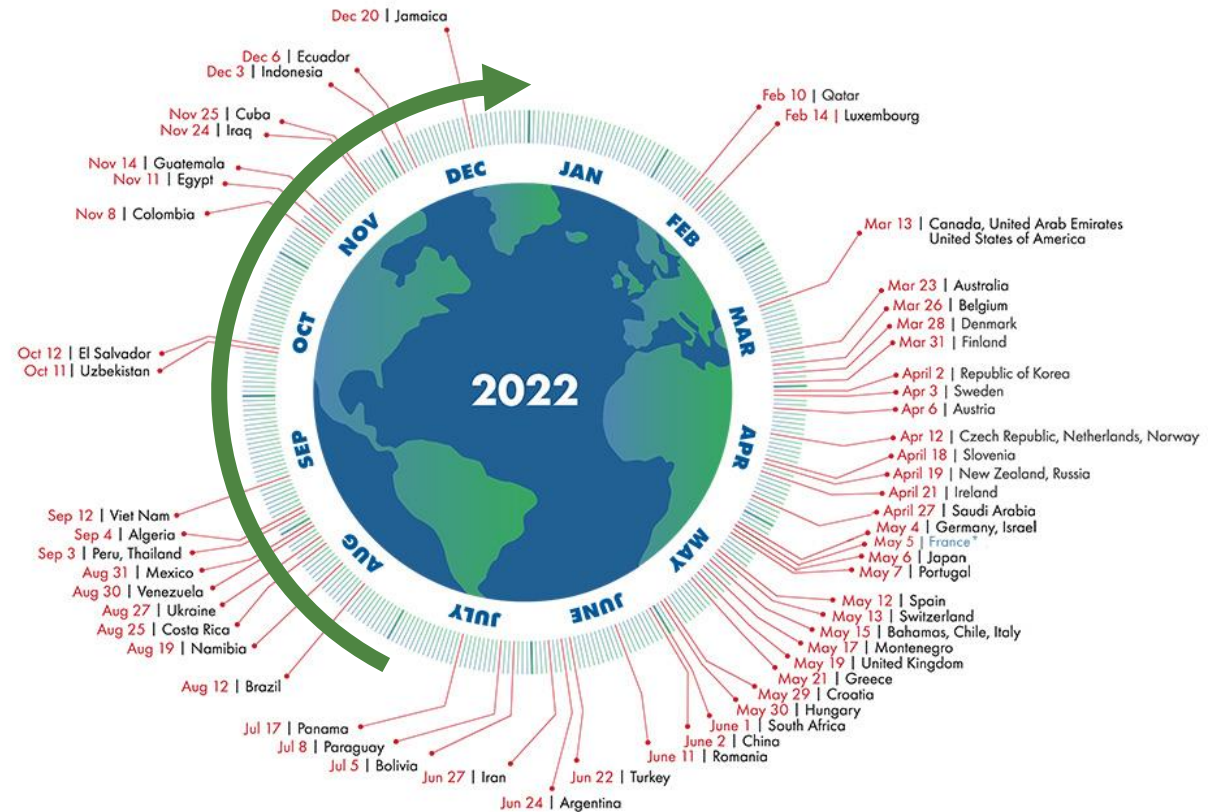
Source: National Footprint and Biocapacity Accounts 2022 Edition
data.footprintnetwork.org

Earth Overshoot Day

- Days it takes for us to use annual available resource
- Primary sources
 - *Overharvesting of forests,*
 - *Overfishing, and*
 - *Carbon emissions*
- World – July 28, 2022

Country Overshoot Days 2022

When would Earth Overshoot Day land if the world's population lived like...



For a full list of countries, visit overshootday.org/country-overshoot-days.

*France Overshoot Day updated April 20, 2022 based on nowcasted data. See overshootday.org/france.

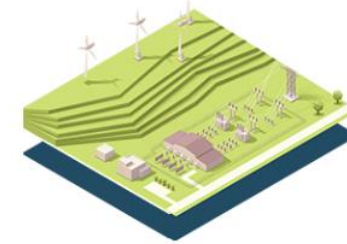
Source: National Footprint and Biocapacity Accounts, 2022 Edition
data.footprintnetwork.org



What can we do – #MoveTheDate

- 114 Days: Energy Generation
 - *Renewables vs fossil fuels*
- 49 days: Population Control
 - *Empowering women and girls, family planning*
- 30 days: Food Choice
 - *Local, vegetable-based diets vs industrial animal-based diets*
- 13 days: Sustainable Cities
 - *Compact, integrated versus sprawling, segregated*
- 8 days: Planet Resources
 - *Conservation, reforestation, regenerative farming*

ENERGY



POPULATION



FOOD



CITIES



PLANET



Oh No !

Should we Consider Cost after Useful Life ?



*Landfills
At what cost ?*



What is an ocean garbage patch?

WILL RETIRING SOLAR
ARRAYS OVERRUN OUR
FUTURE LANDFILLS?



UN's 17 Lofty Sustainable Development Goals



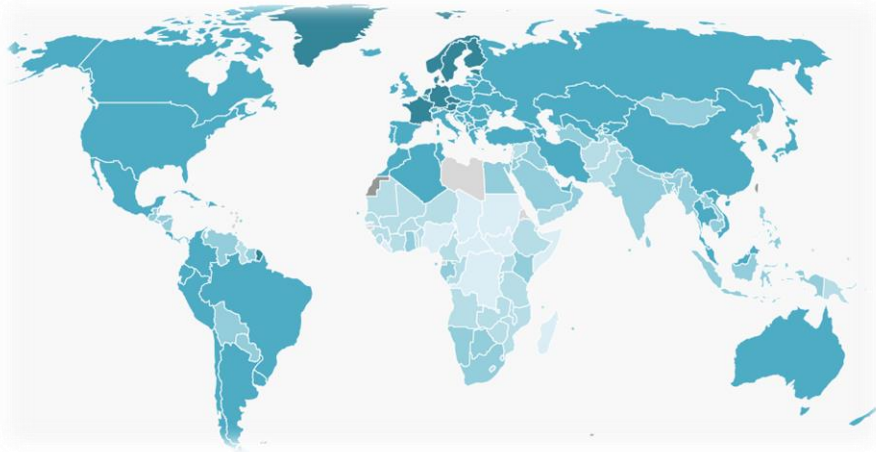
Quick Discovery - How many of these can you claim to be in your focus ?

And... How many of these you might be adversely effecting, unknowingly ?



Worldwide Rank

121 out of 163



India

East and South Asia



OVERVIEW

INDICATORS

POLICY EFFORTS

SDG Index Rank

121 /163

SDG Index Score

60.3

Spillover Score

99.3

SDG Dashboards and Trends

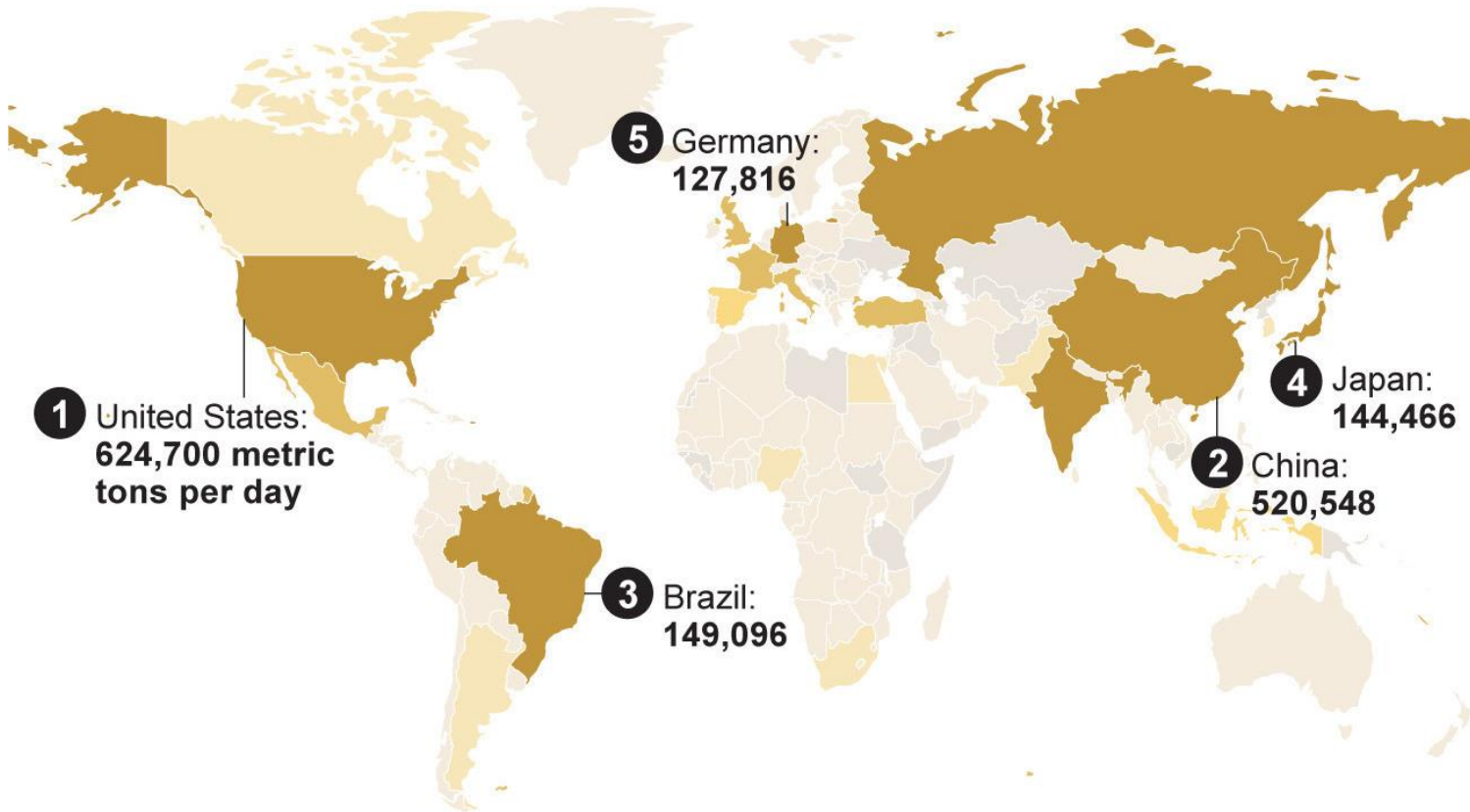
Click on a goal to view more information.



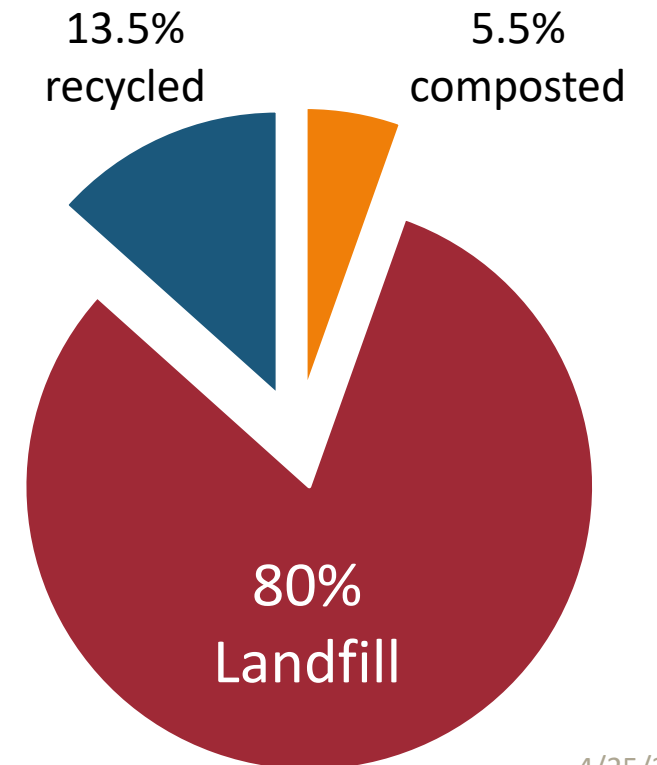
Dashboards: ● SDG achieved ● Challenges remain ● Significant challenges remain ● Major challenges remain ● Information unavailable

Trends: ↑ On track or maintaining SDG achievement ↗ Moderately improving → Stagnating ↓ Decreasing •• Trend information unavailable

1000s Metric TONS of Solid Waste EACH DAY



2+ Billion TONS Annually



*Figures are from a 2011 report that compiled data from earlier years.

Source: World Bank

Angelica Quintero / @latimesgraphics

Circular Economy



RESOURCES



MANUFACTURING



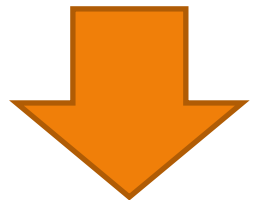
RECYCLING



WASTE



CONSUMPTION & USE



Hierarchy of Innovation Purpose

New Product Development

Should Sustainability be

One of the **Objectives** ?

One of the **Constraints** ?

One of the **Disciplines** ?



Example – Plastic Enclosure for a Healthcare Device

Product – Use of Bio Plastic

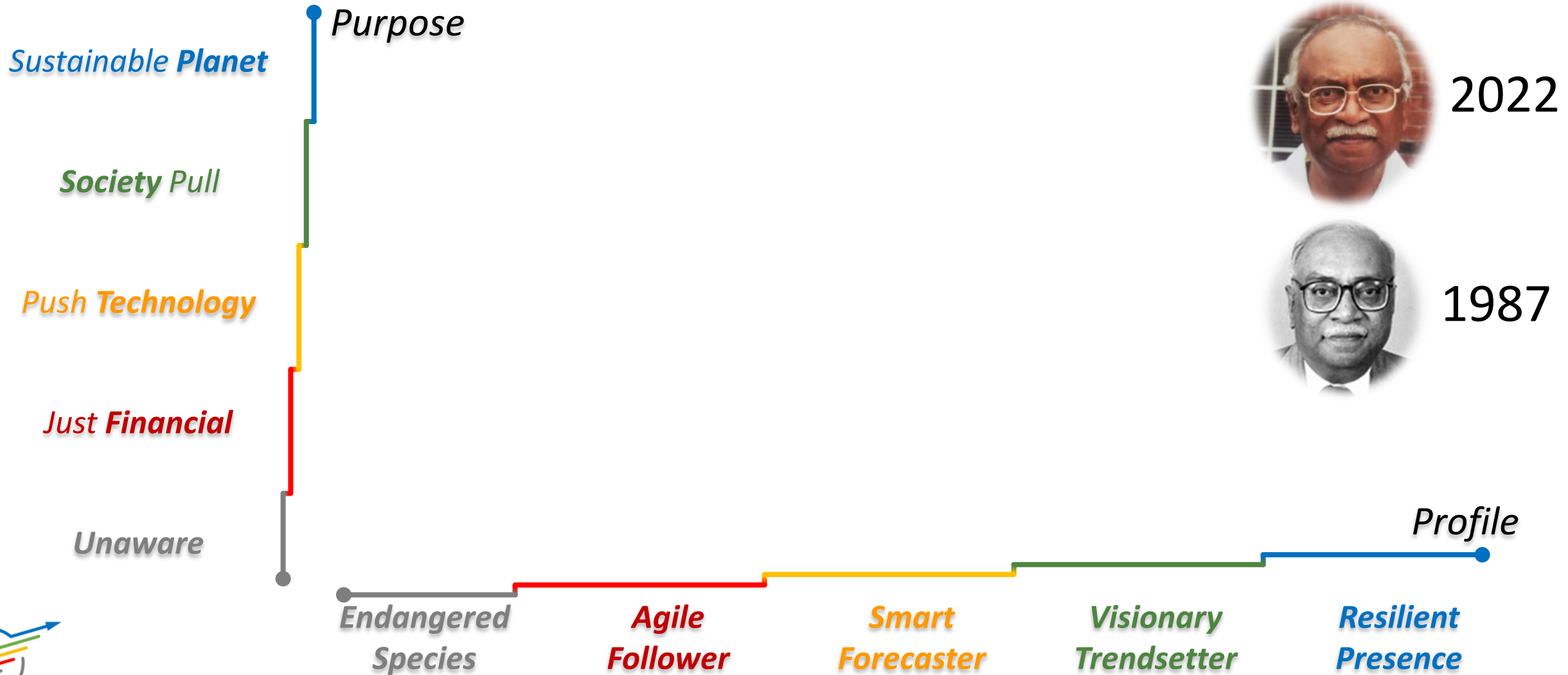
- Before
 - PC/ABS as cost effective material
 - FDA Certified product for health care
- After
 - Replaced PC/ABS C2800 with Arkema's RP-11
 - **11% weight, 22% BOM cost penalty**
 - One-time validation and recert cost
- Optimized for purpose – Health care
+ Employee satisfaction, market PR

Process – Repurpose Waste

- Before
 - 1.7% scrap rate – direct to landfill
 - ~10K\$ in waste pick up cost
- After
 - Reground scrap into low tech consumer item
 - Complimentary to primary customer
 - Bible holders for the Church
- Optimized for purpose,
+ Goodwill, public awareness, PR



Where Did AKR Live?



My Plea on Behalf of '



ISAMPE

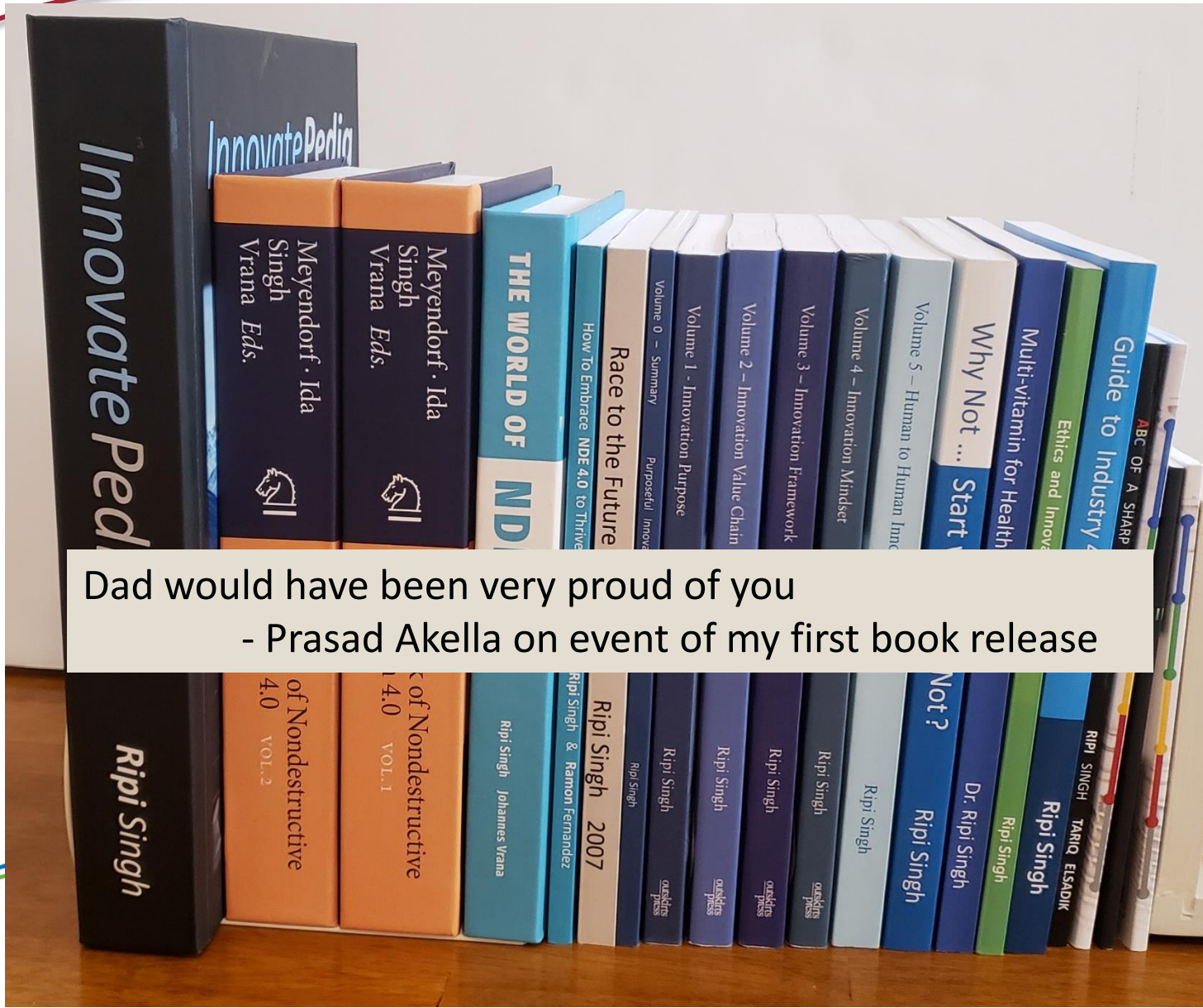
A body of professionals
dedicated to the promotion of
professional and technical excellence
in the field of

EARTH FRIENDLY

materials and process technology
in the country.



Learn More on Innovation and Digital Transformation



Dad would have been very proud of you
- Prasad Akella on event of my first book release

- Books on Amazon
 - Paperback
 - Kindle
- Workshops on all books
 - ½ day to 2 days Onsite
 - 90-minute virtual sessions
- YouTube Videos
 - Inspiring Next Channel

Few pictures from the event – The beginning



Few pictures from the event – The gathering



Few pictures from the event – The Core Message



Few pictures from the event – The closing

