

INCORPORATING A 5S STRUCTURED APPROACH TO THE PLANNING AND DELIVERING OF A FINAL YEAR DESIGN PROJECT

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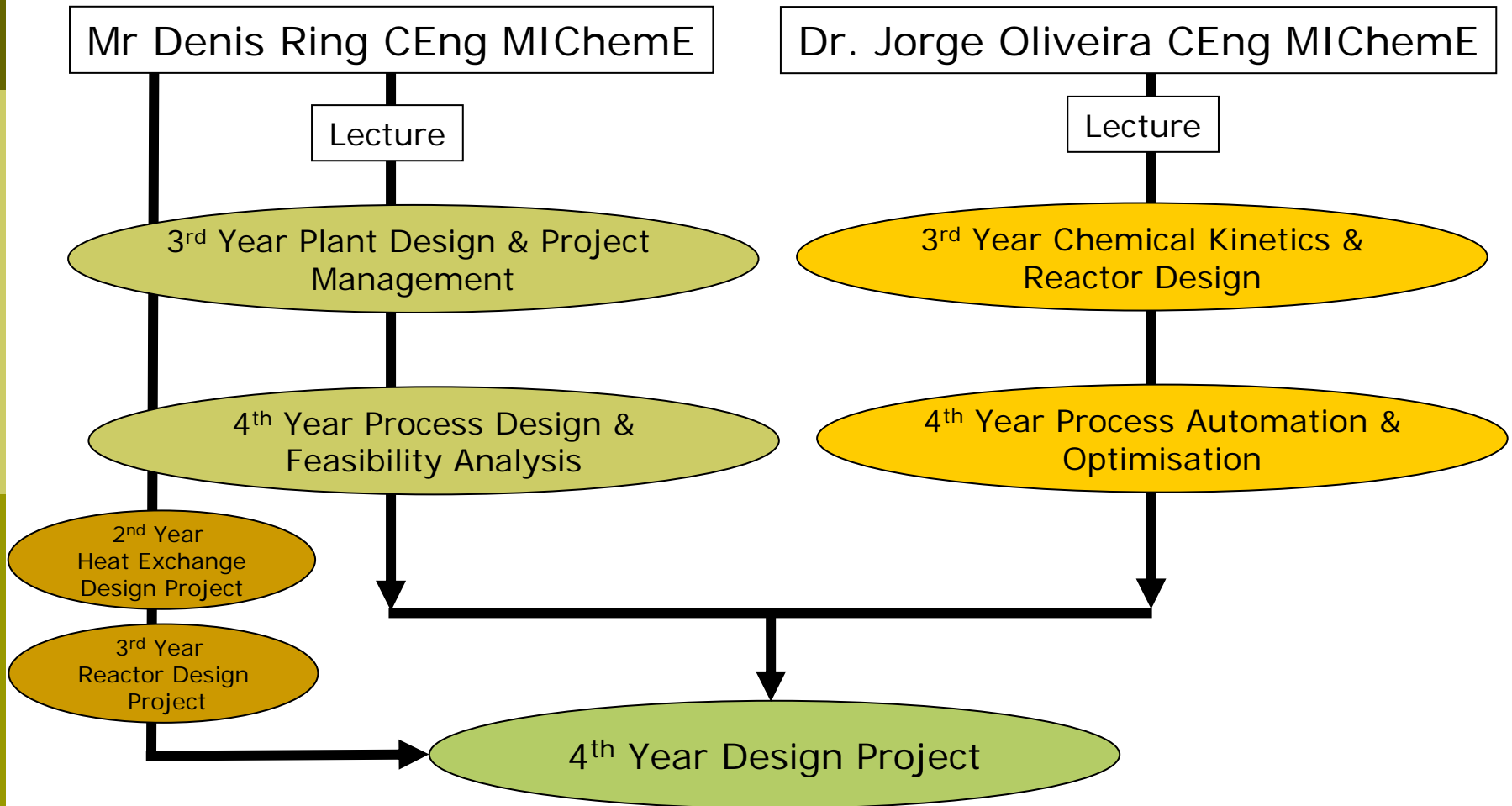
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Contents of Presentation

1. Background Information
2. What Is "Chemical Engineering Design"
3. Future Design Expectations
4. Teaching Design
5. Learning Design
6. Change for the Better (KAIZEN)
7. The 5S
8. 5S Concept Implementation
9. Conclusion

Background Information



What Is “Chemical” Engineering Design

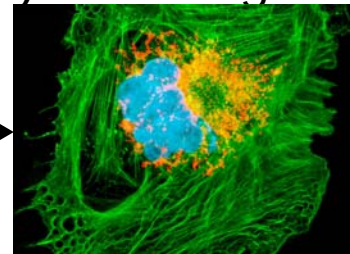
AVASTIN

tumour-starving therapy



Design is where engineers can best display: -

- Technical mastery
- Creativity
- Capacity for using new concepts
- Capacity for using new technologies



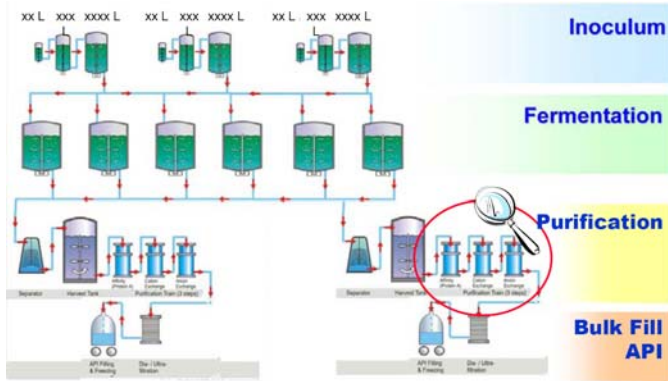
- Metastatic Colorectal Cancer (mCRC)
- Metastatic Breast Cancer (MBC)
- Glioblastoma (GBM)
- Metastatic Kidney Cancer (mRCC)

CHEMICAL ENGINEERING ↔ TECHNOLOGY TRANSFER

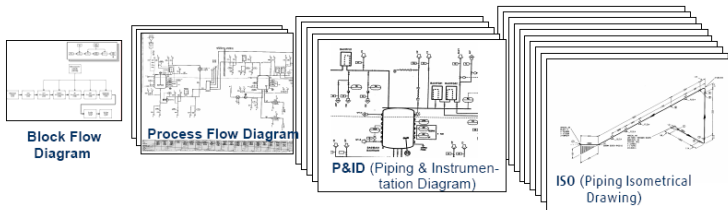
What Is “Chemical” Engineering Design



Roche (MAB) 95 Facility winner of the IPSE 2009 Facility of the Year Awards program



Design phases for Process



■ Planning progress: from Concept to Detail

Time

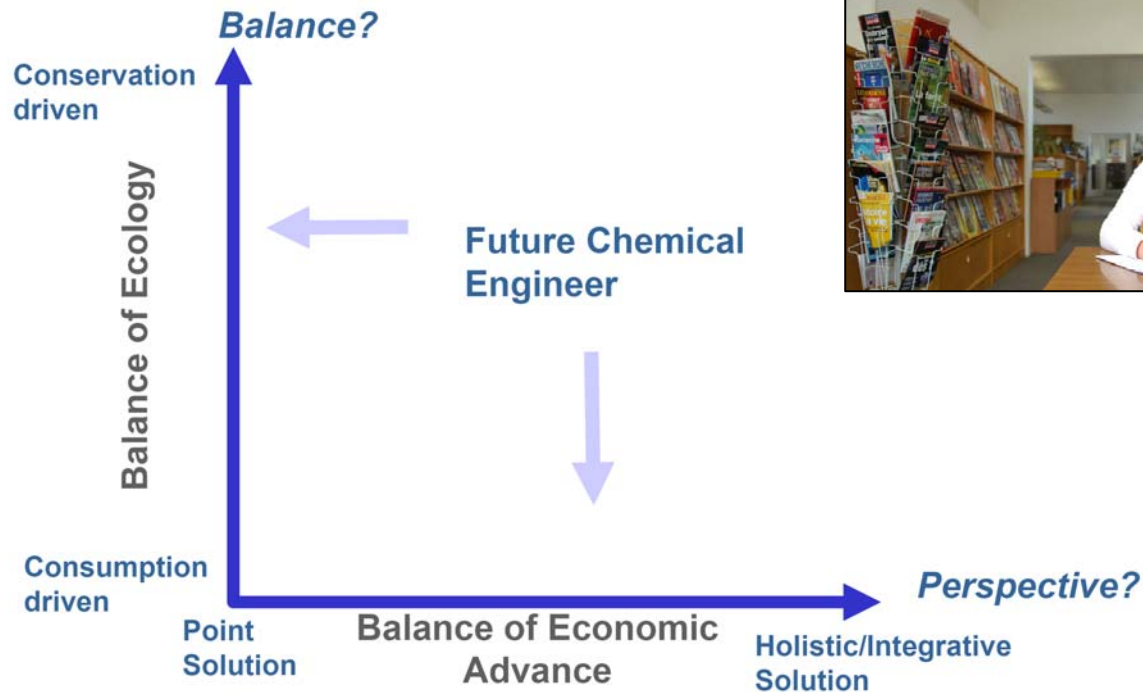
**March 2009
Roche Merges With
Genentech**

~ \$46.8bn



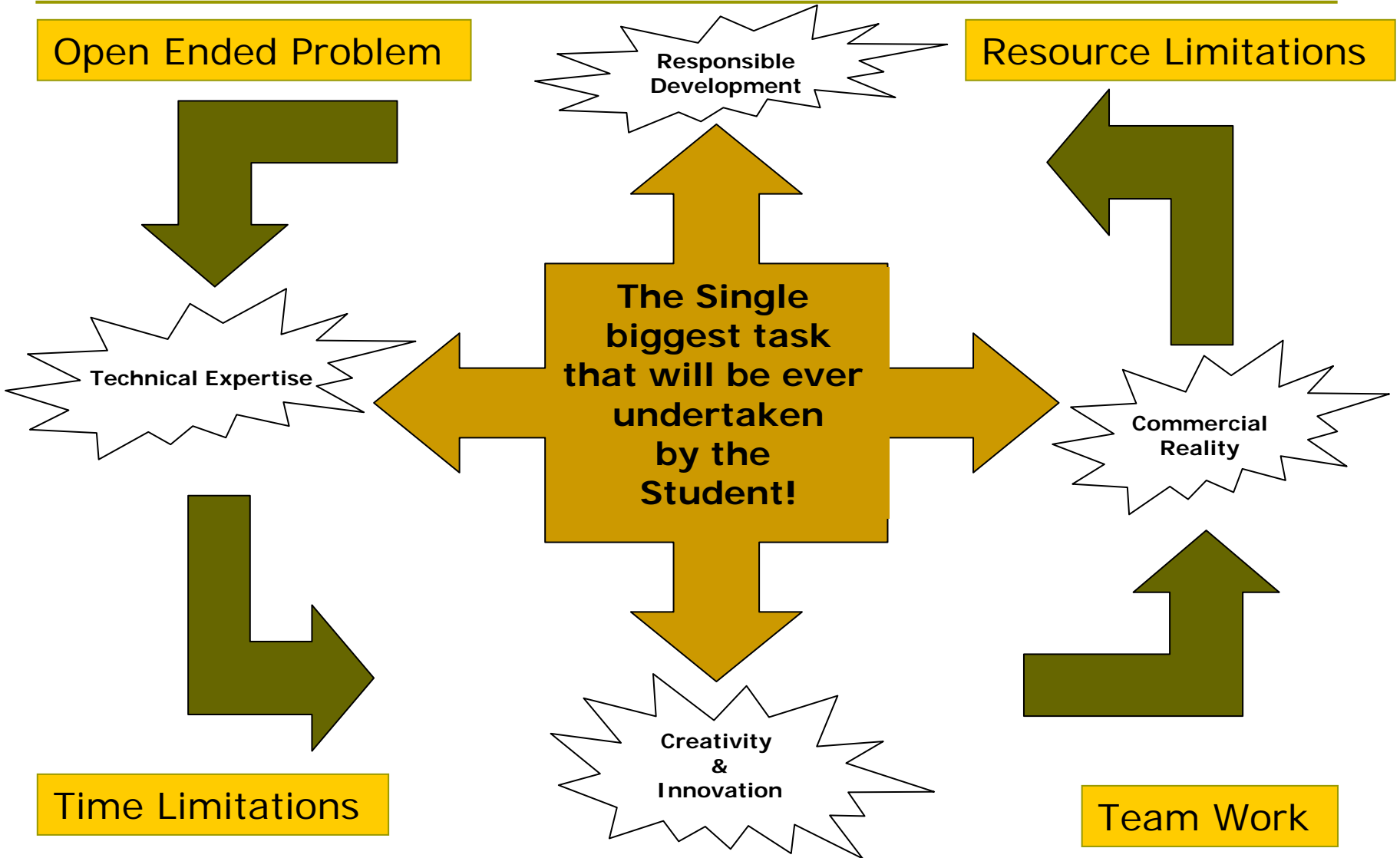
Future Design Expectations

Future will be dominated by a need to **REDEFINE** what makes engineering and technology graduates successful !



Can we structure our approach to continuous change?

Teaching Design



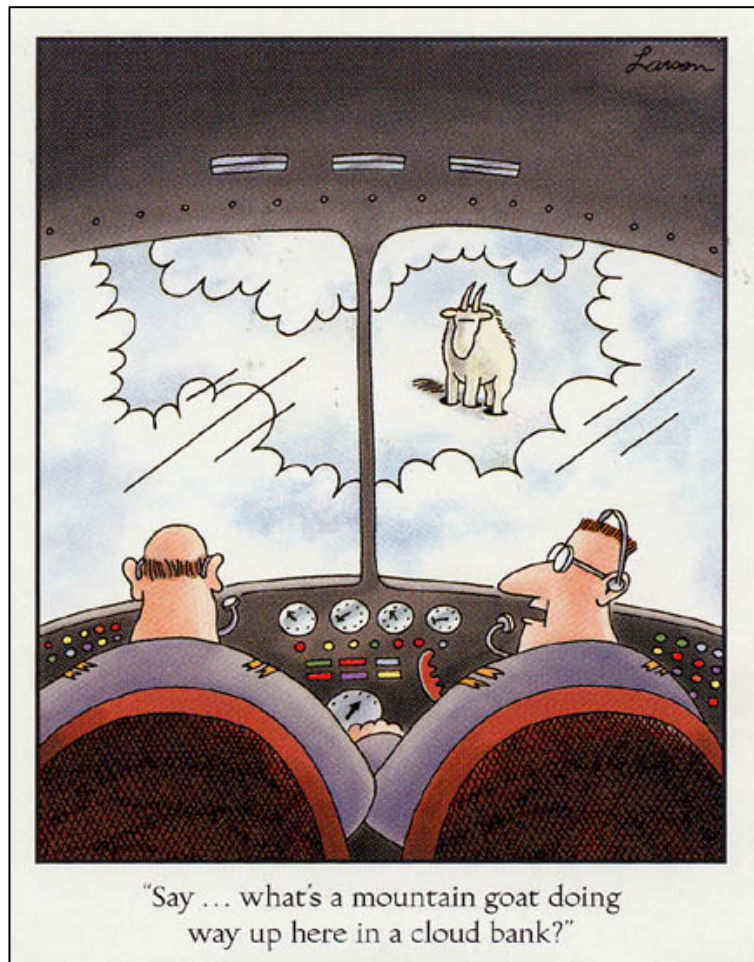
Teaching Design

- Production of Antihistamine
- Production of Chitosan Biofilm
- Production of Mebendazole
- Production of Bioethanol
- Production of Sodium Saccharin



Learning Design

STUDENTS OPERATE IN UNCHARTED TERRITORY

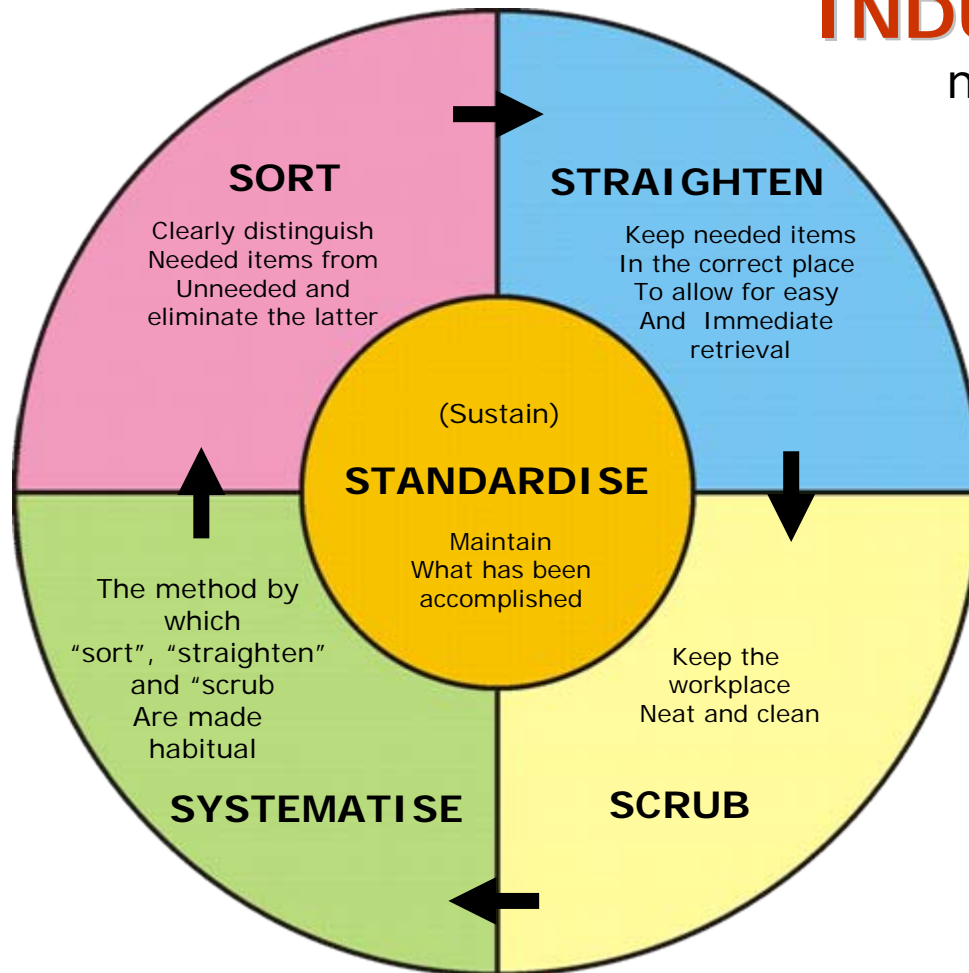


Students need skills
"VISION"
to cope with
multiple and
interacting challenges

Designers must cope with:-

- Team dynamics
- Utilise leading edge technologies
- Economic viability
- Societal needs
- Operational safety
- Ethical Concerns
- Environmental concerns

Change for the Better



INDUSTRY copes with: -
multiple and interacting challenges

Kai Zen
改善
Change Good

KAIZEN

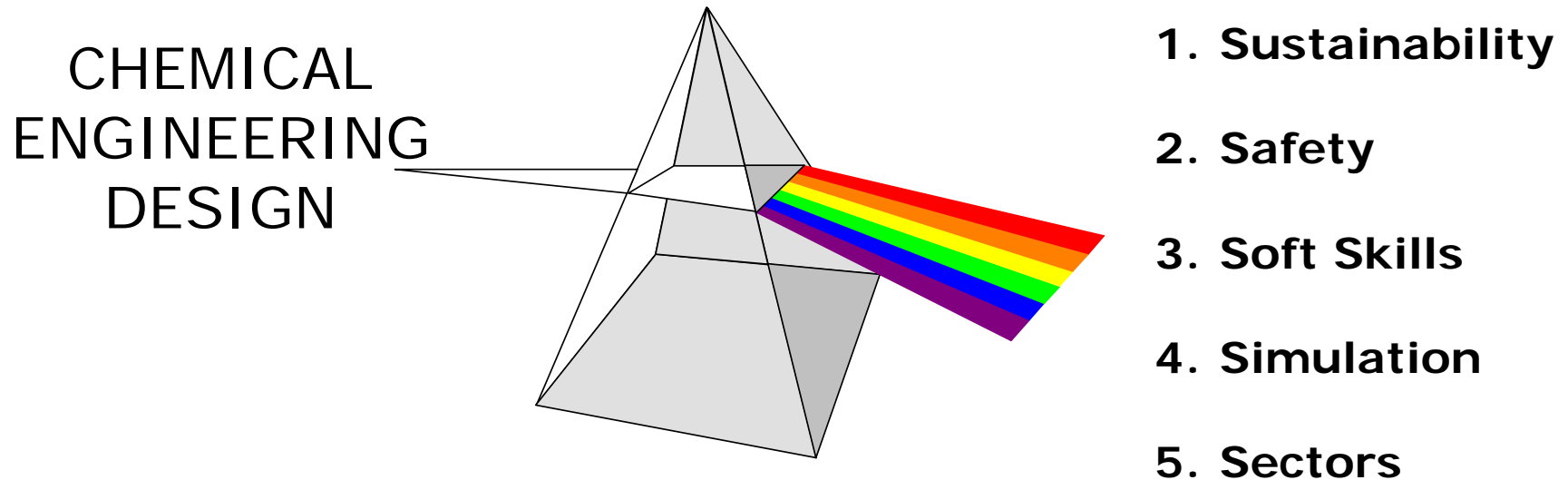
Typically interpreted as
implying a process of :-

**"CONTINUOUS
IMPROVEMENT"**

Change for the Better

Identify a set of elements that do not constitute the basis of the process itself, but that provide innovative features whereby the: -

DESIGN PROCESS IS IMPROVED!

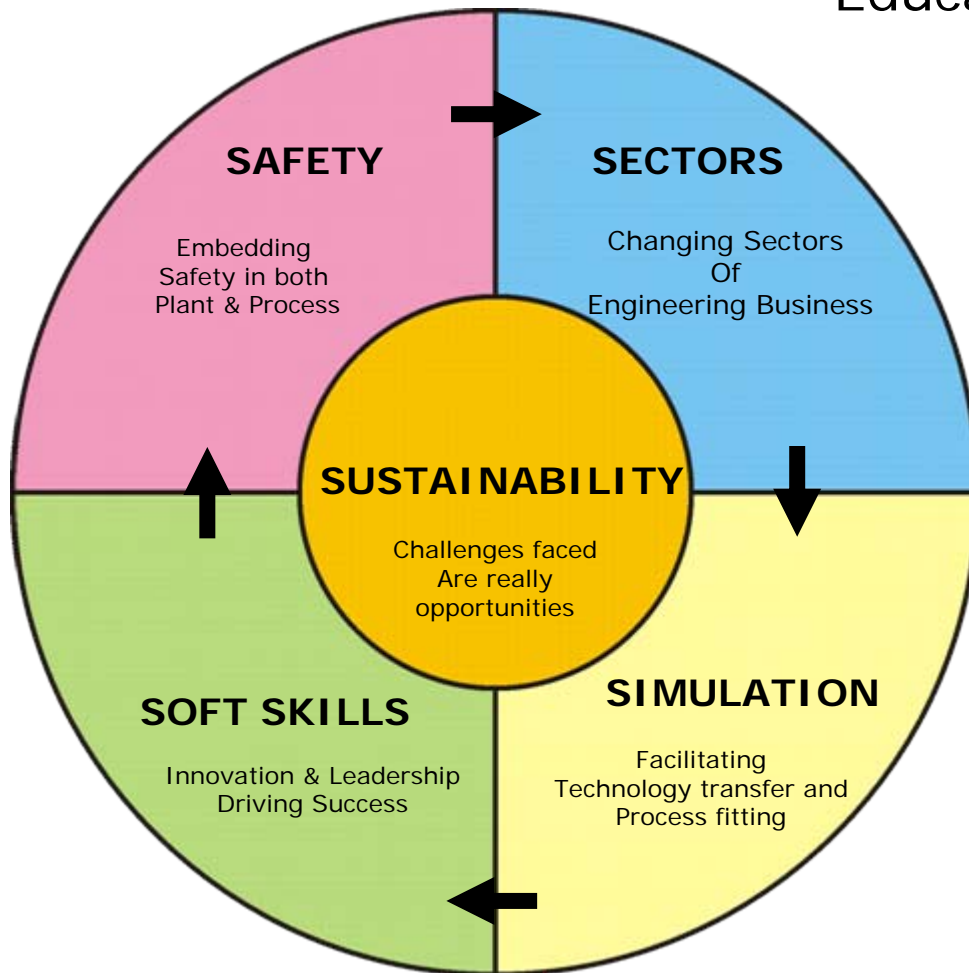


**IDENTIFY 5S
STEP CHANGE FOR IMPROVEMENT!**

Change for the Better

Education & Teaching adopts the Industry method of :-

“CONTINUOUS IMPROVEMENT”



改善

5S:- Safety

- The rig costs about \$1,5m to own & operate per day
- In September 2009, the rig drilled the deepest oil well in history at a vertical depth of 35,050 ft
- On April 22, 2010, Deepwater Horizon sank, leaving its well gushing and causing the largest offshore oil spill in US history

WHO OWNS THE PROBLEM?

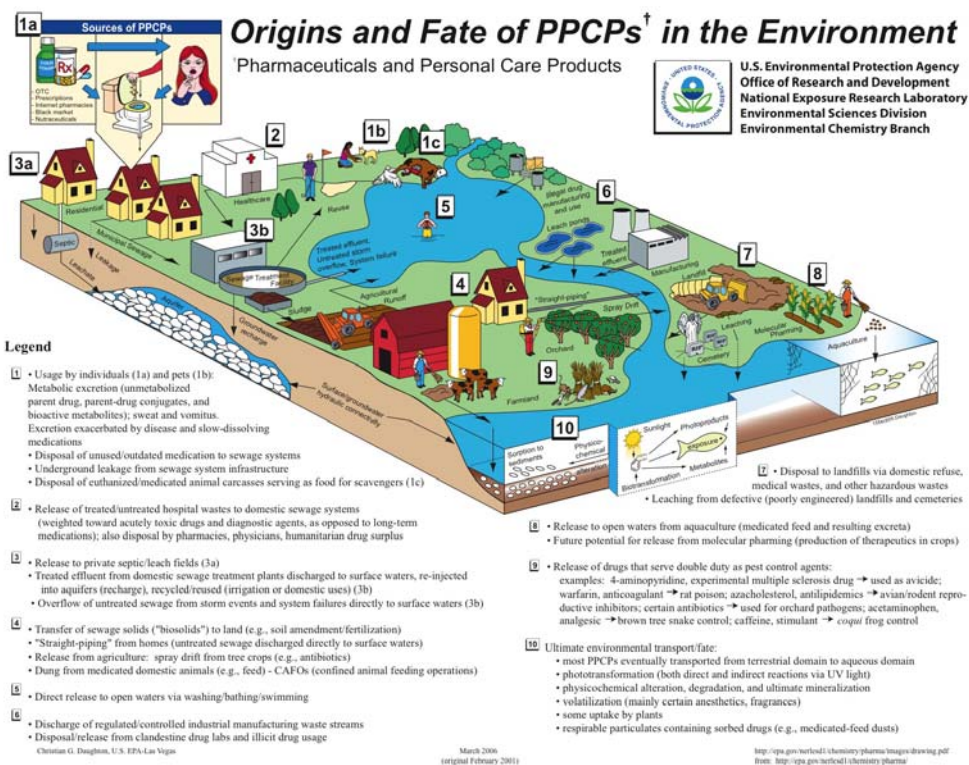


5S:- Safety

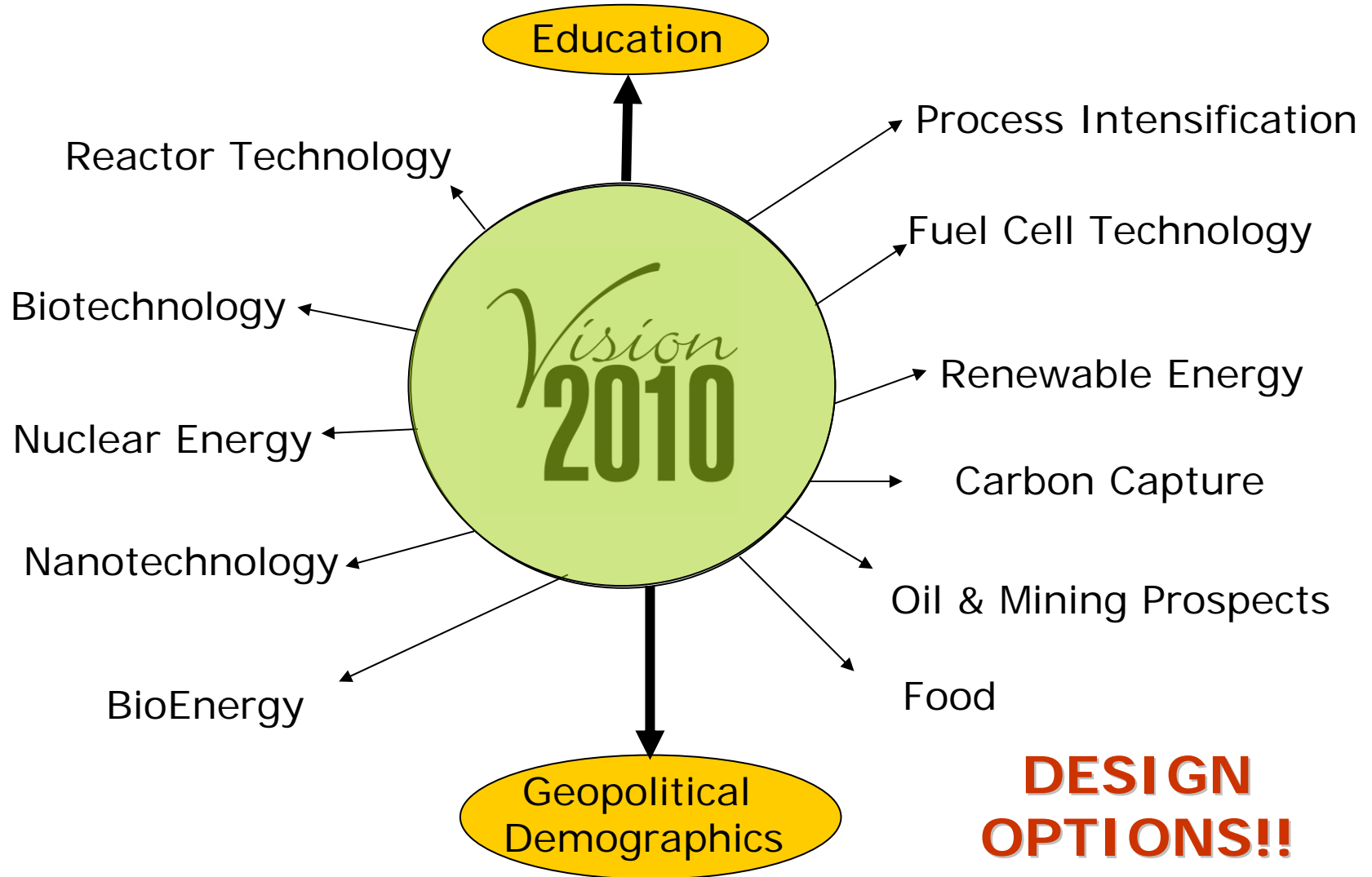
- Total lifecycle issues (product, plant and waste streams)
- Safety is not just a one dimensional facet of design.



HOLISTIC!!



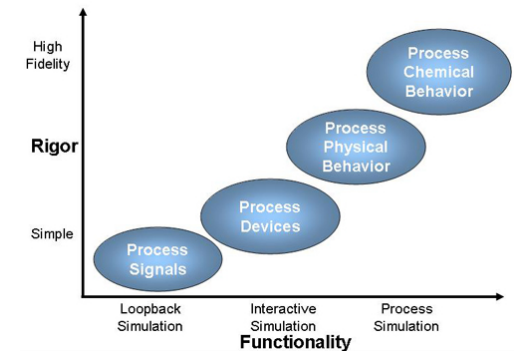
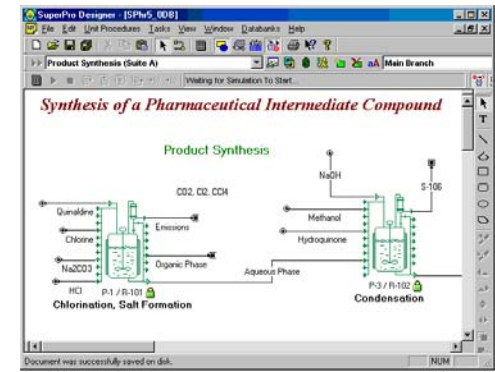
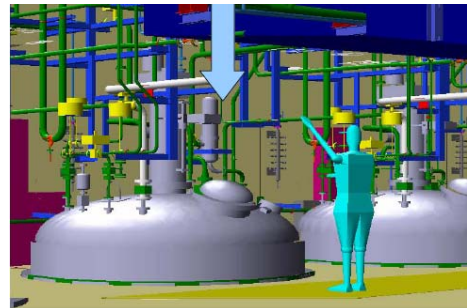
5:- Sectors





5S:- Simulation

1. Steady state and dynamics mode.
2. Economic analysis
 1. equipment sizing,
 2. plant cost estimation
3. Sensitivity analysis
 1. Equipment sizes
 2. Heat & Mass transfer
 3. Pressure drops
4. Optimisation case studies
5. Easily customisable
6. 3D Plant Design Tools
7. Documentation/Communication



INTEGRATIVE SOLUTIONS !!

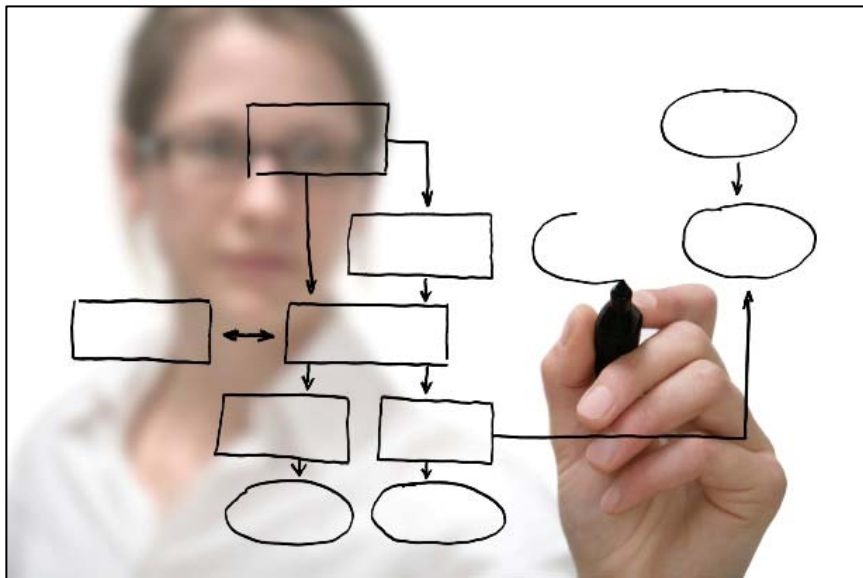
5S:- Soft Skills

Products, which met their development budget but had experienced delayed launch dates

Generated Substantially Less Profit

than those that exceed their budget but come to market on time!

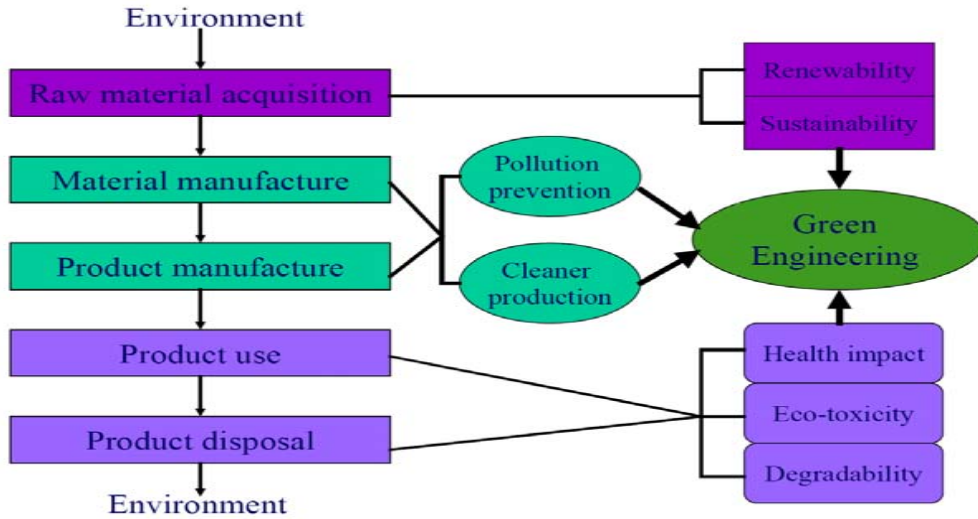
**ITS ALL ABOUT
MANAGING UNCERTAINTY!!**



- Multi-task
- Present written material
- Present material orally
- Manage time
- Deal with problems / complaints
- Coordinate activities
- Manage finances
- Train or teach others
- Identify and manage ethical issues



5S:- Sustainability

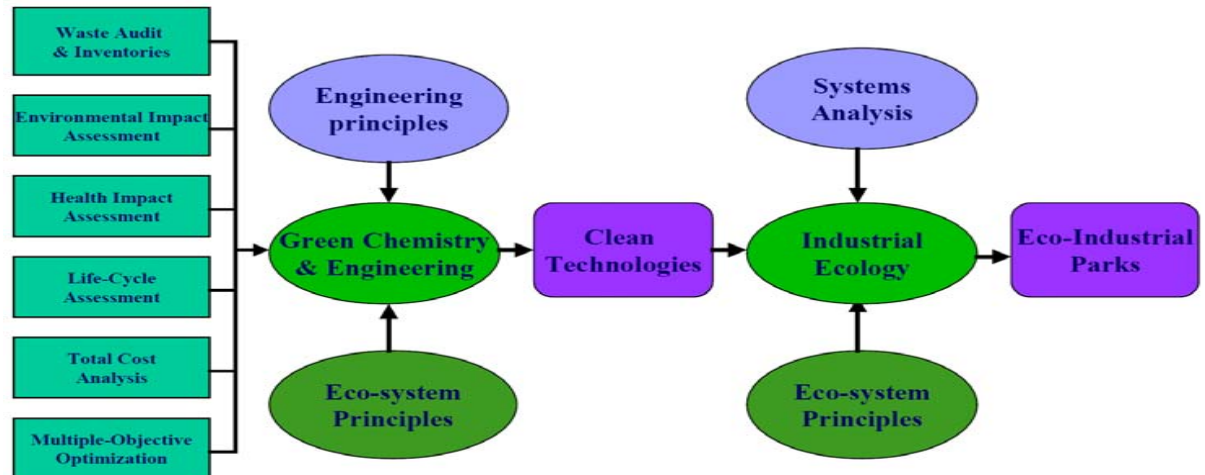


Relationships between:-

- Pollution prevention
- Cleaner production
- Green Engineering

Pathways leading to:-

- Clean Technologies
- Eco-Industrial Parks



5S Concept Implementation

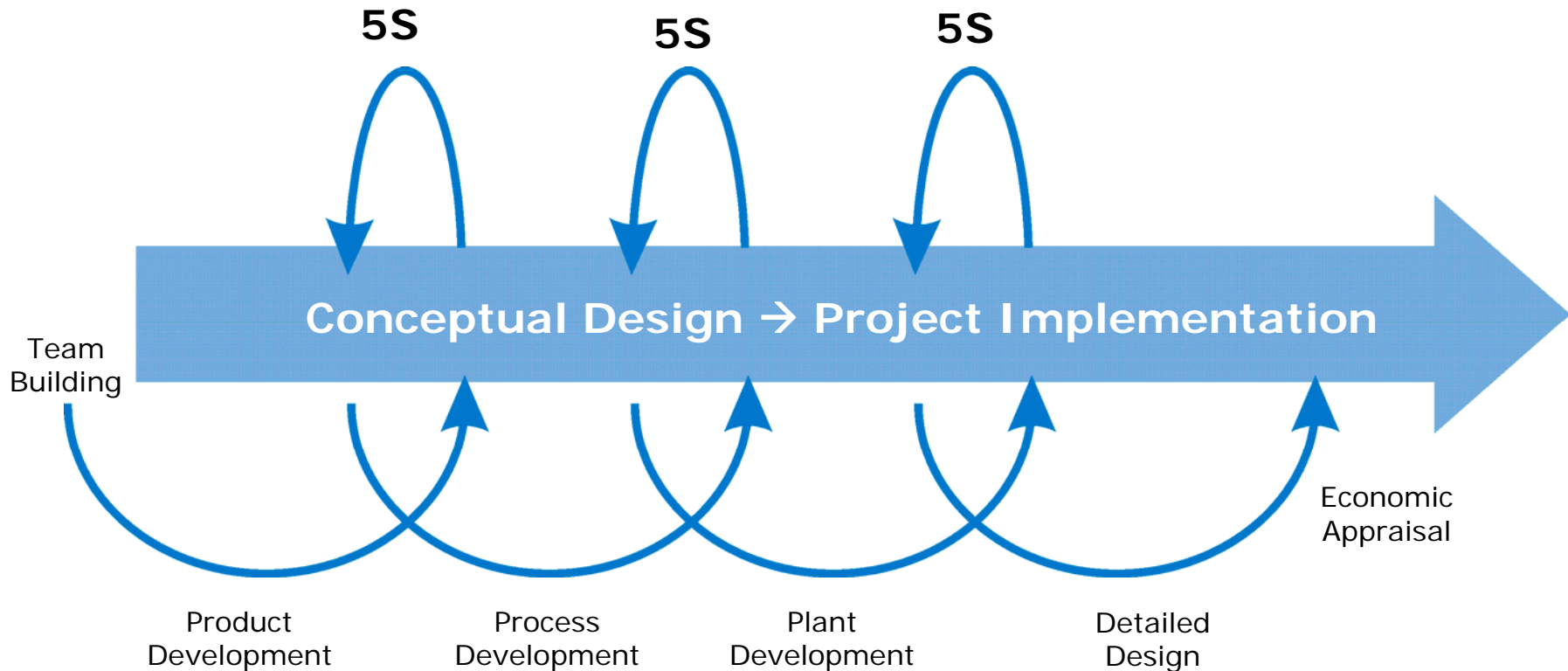
- 5S approach requires commitment from the teacher and the student
- Develop a plan for each S
- 5S cannot be implemented using a:
“one-size-fits-all” approach.
- 5S is best implemented continuously over the life time of the “Degree” “Module” & “Project”
- Make use the original 5S

5S is not
Just
Housekeeping →



- **Sort:** Organise the design in rational manner.
- **Straighten:** Put essential tasks in order.
- **Scrub:** Have clarity of thinking
- **Systematise** Make checking the design a routine
- **Standardise:** Maintain and improve what has been achieved

5S Concept Implementation



CLEAN – REFOCUS – REORGANISE

Conclusion

It is appropriate that students are given the opportunity to learn their engineering design skills in a measured and consistent fashion.

NO MAN WAS EVER WISE BY CHANCE !

Lucius Annaeus Seneca 4BC- AD65

Thank You!

Any Questions ?

