Visualising Early Design Information

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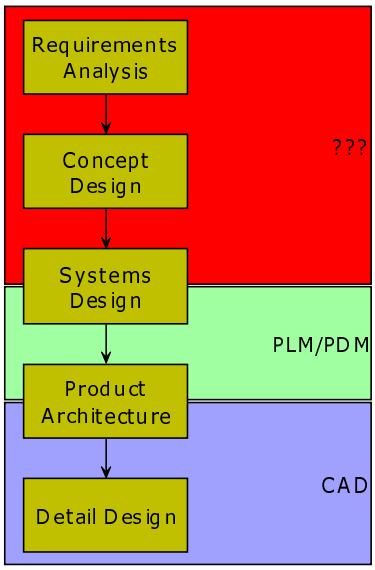
Where do the doodles go?

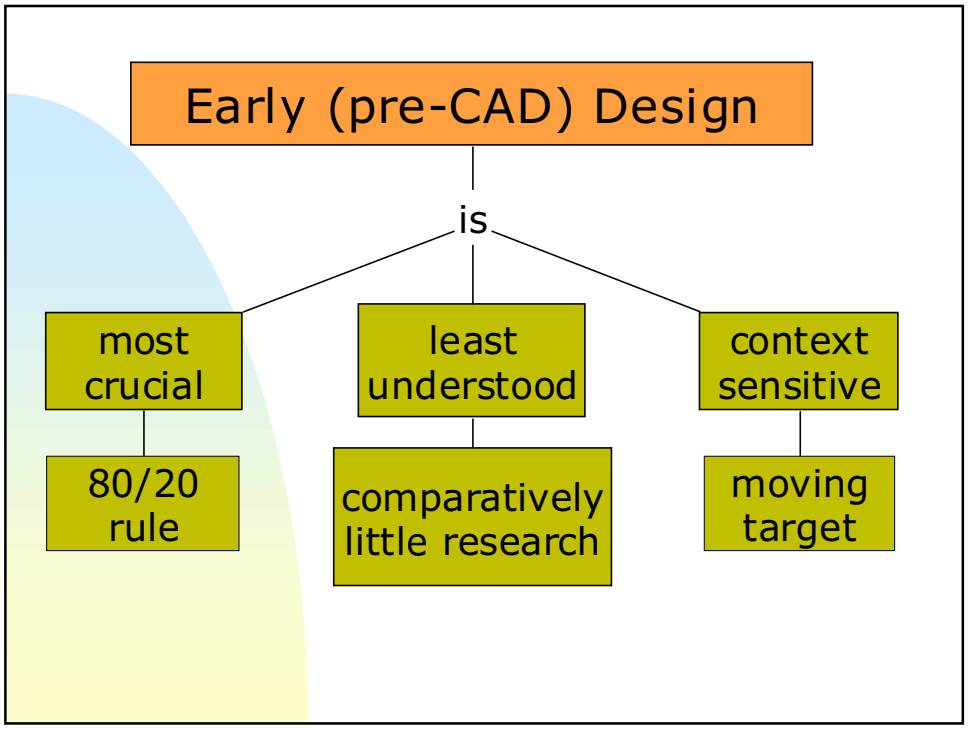
A Vision

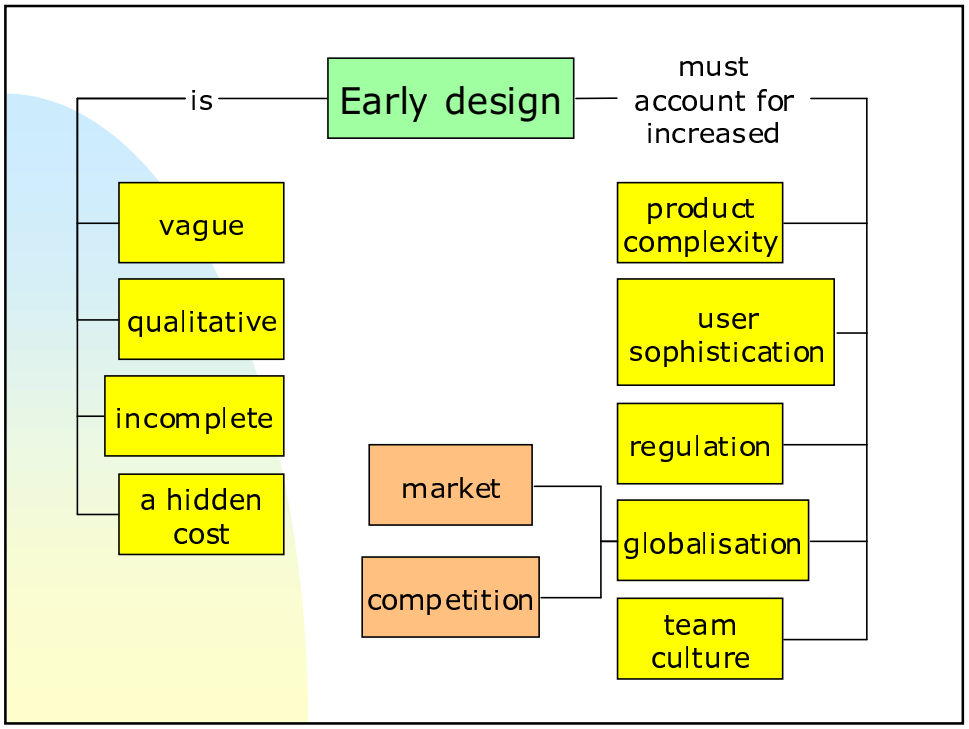
- An electronic white board
- Adaptive UI to respond to state & process
- Automatic & instantaneous layout
- Connected to online documentation facility

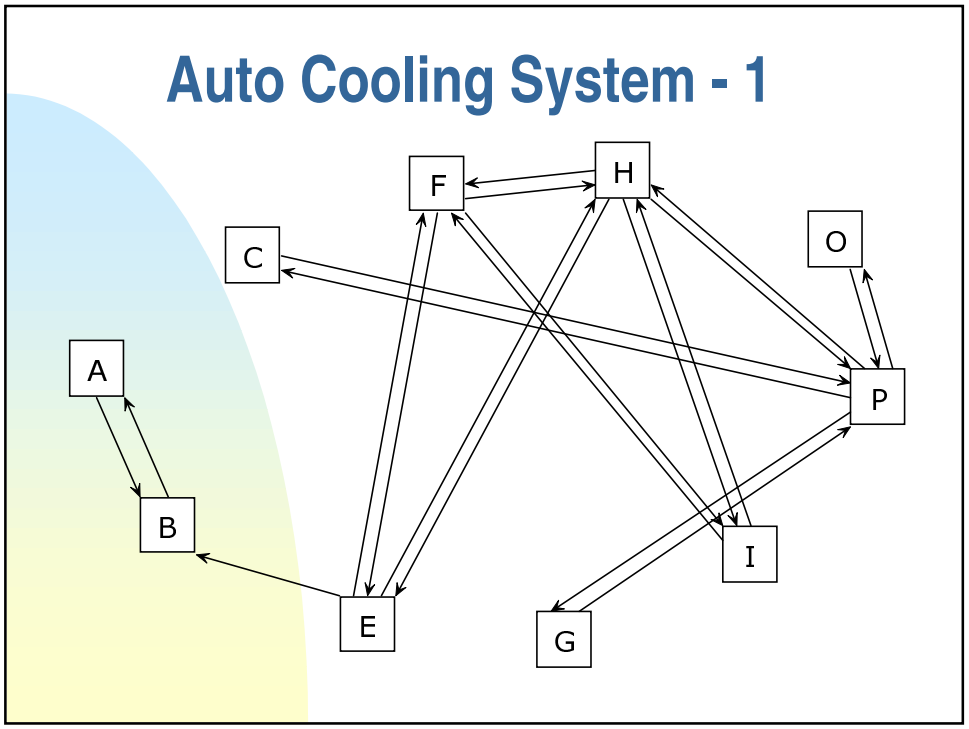
Diagrams in Design

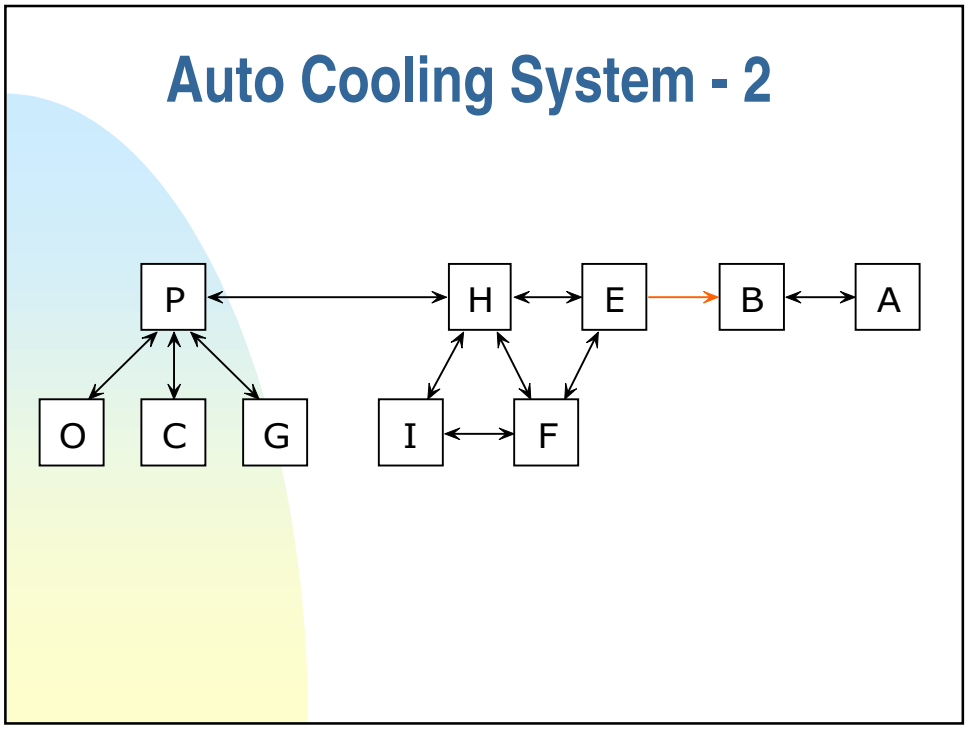
- What We've Got:
  - Downstream stages well served by CAD
  - Virtually nothing for the early stages.
- How Things Are:
  - Diagrams often used in early design to visualise, communicate, and record.

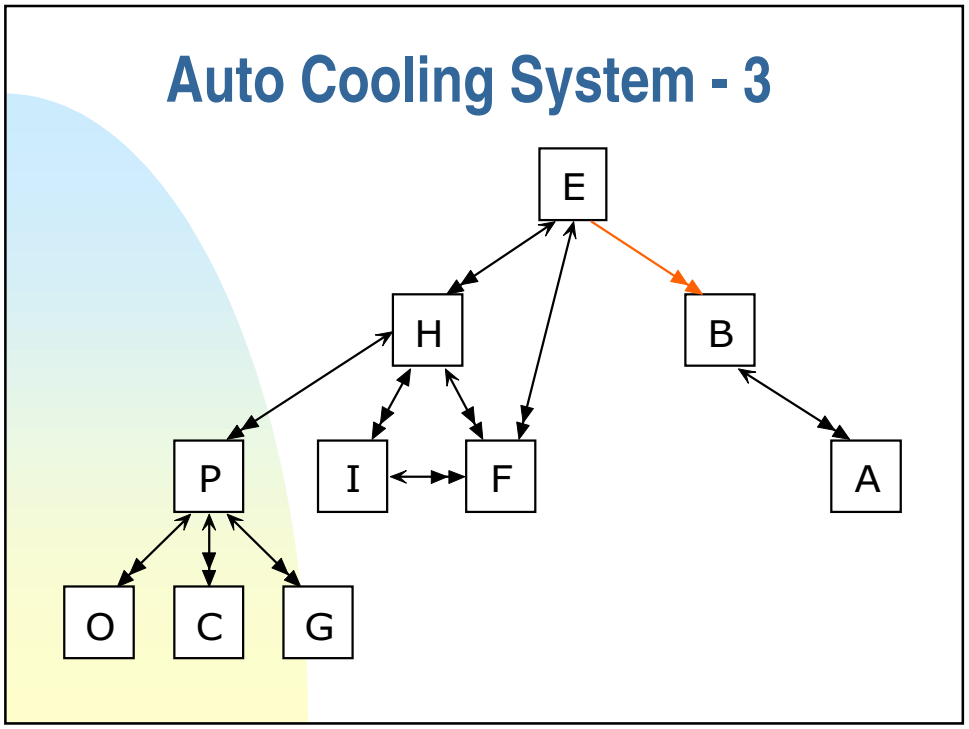


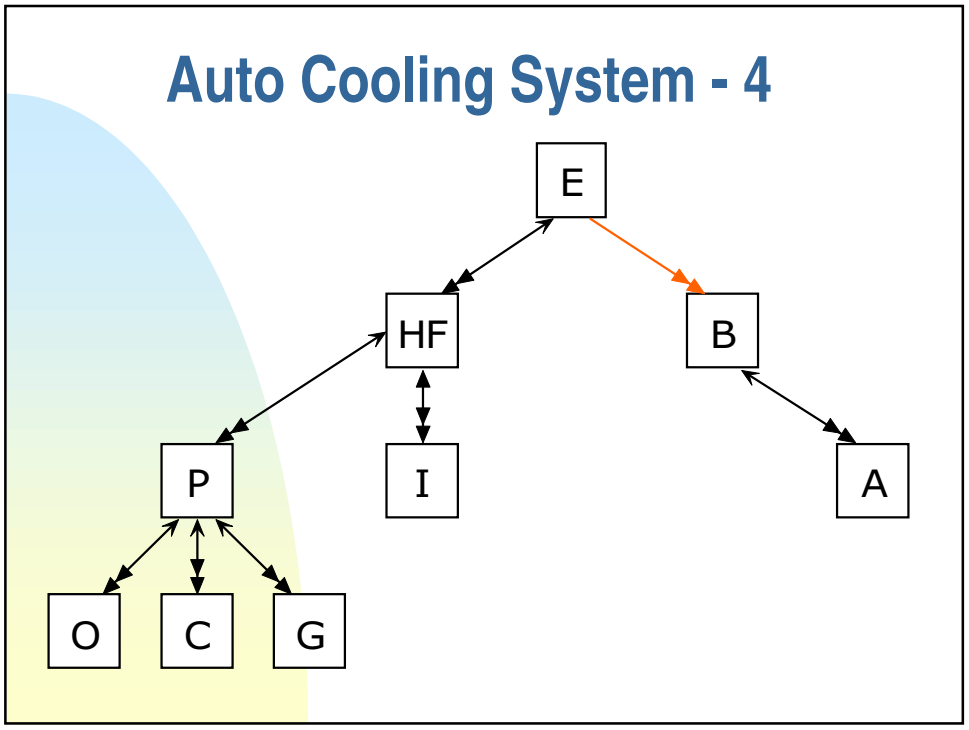

Early (pre-CAD) Design
is
most crucial
least understood
context sensitive
80/20 rule
comparatively little research
moving target

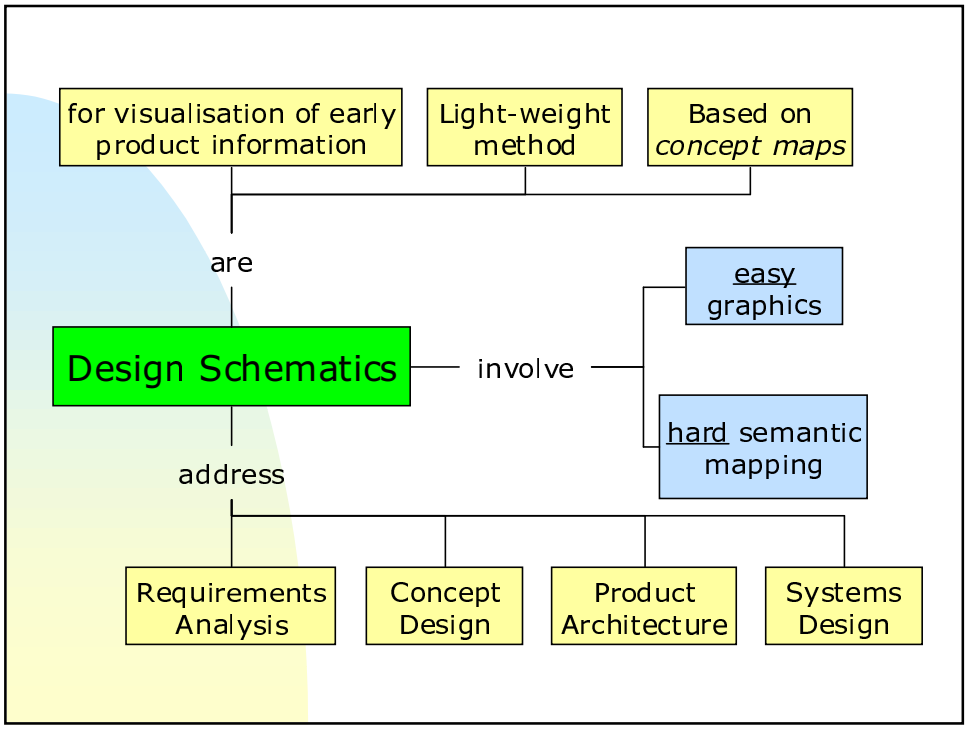

Early design
is
must account for increased
vague
qualitative
incomplete
a hidden cost
market
competition
product complexity
user sophistication
regulation
globalisation
team culture

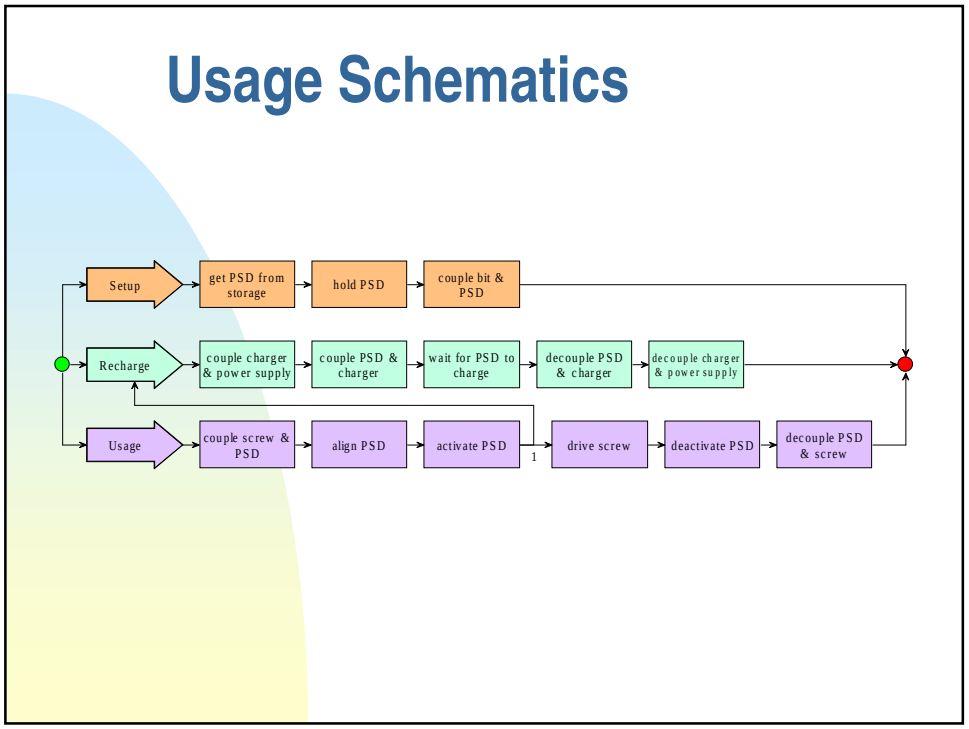

Auto Cooling System - 1
F
H
C
O
A
P
B
I
E
G


Auto Cooling System - 2
P
H
E
B
A
O
C
G
I
F

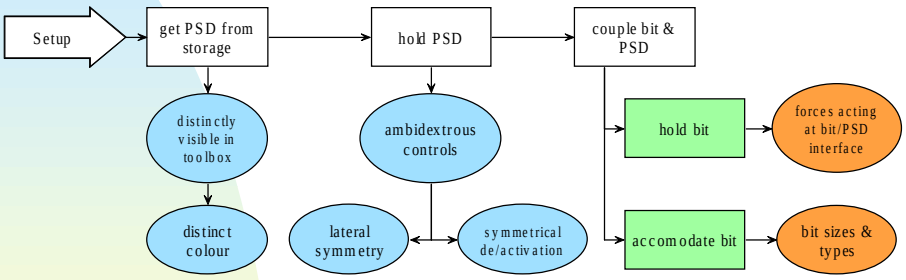

Auto Cooling System - 3
E
H
B
P
I
F
A
O
C
G


Auto Cooling System - 4
E
HF
B
P
I
A
O
C
G

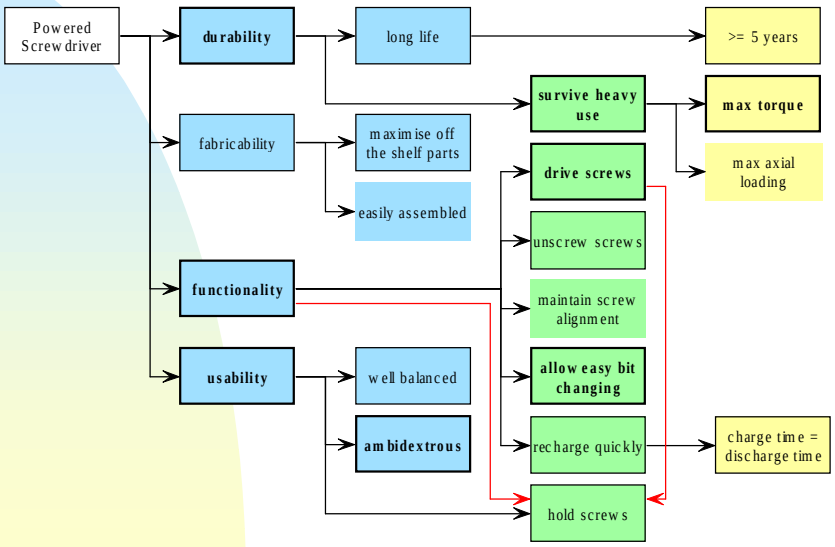

for visualisation of early product information
Light-weight method
Based on *concept maps*
are
Design Schematics
involve
easy graphics
hard semantic mapping
address
Requirements Analysis
Concept Design
Product Architecture
Systems Design


Usage Schematics
Setup
get PSD from storage
hold PSD
couple bit & PSD
Recharge
couple charger & power supply
couple PSD & charger
wait for PSD to charge
decouple PSD & charger
decouple charger & power supply
Usage
couple screw & PSD
align PSD
activate PSD
1
drive screw
deactivate PSD
decouple PSD & screw

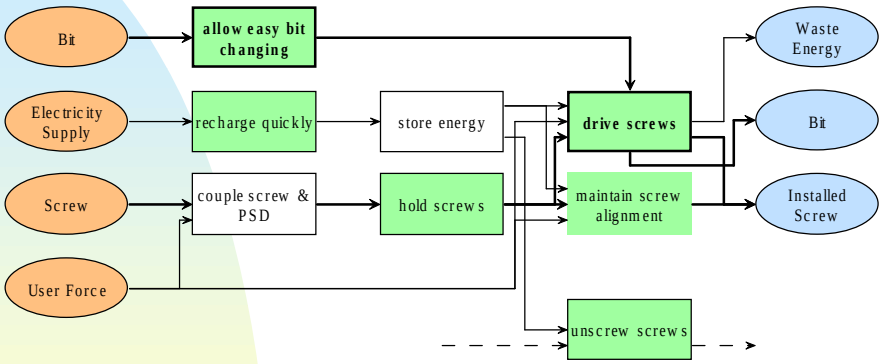
Usage Schematics II



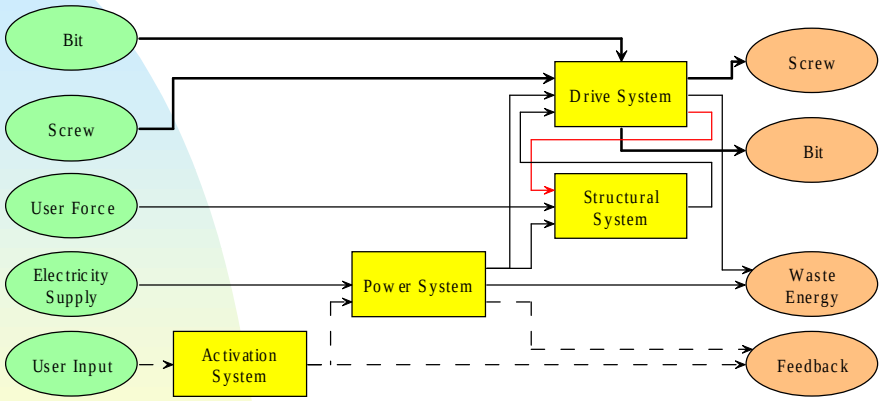
Product Design Schematic

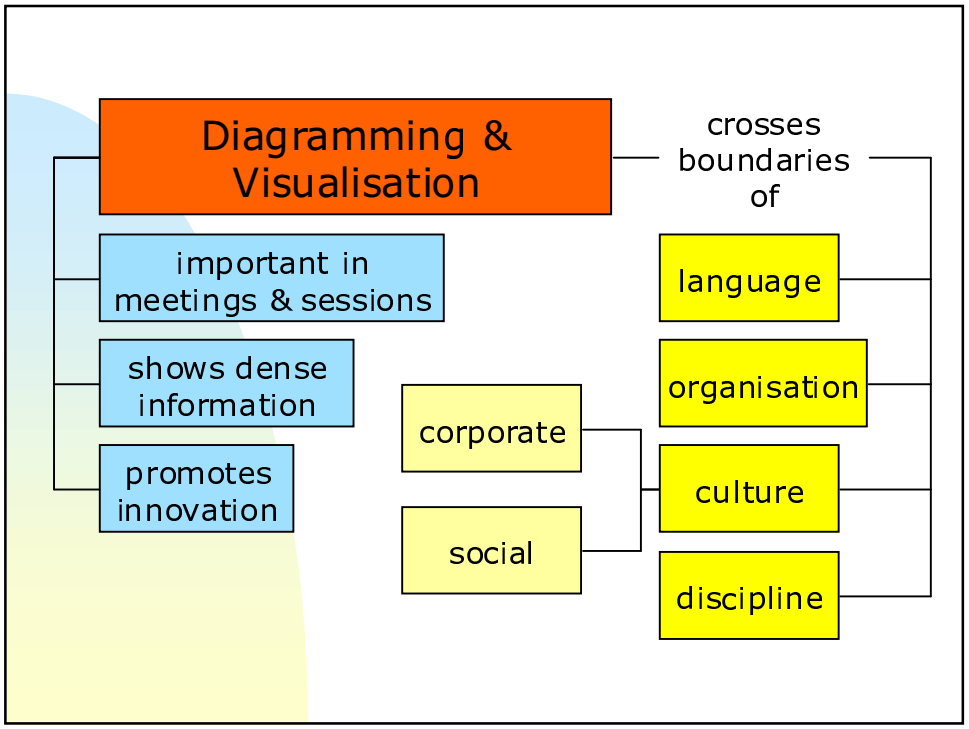


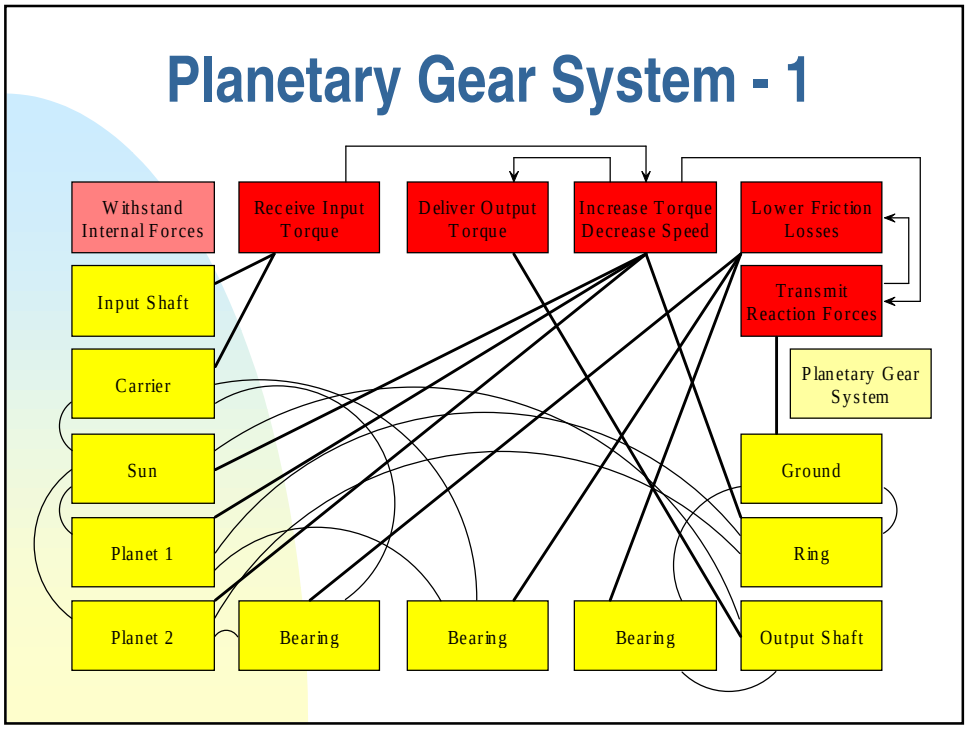
Function Schematic



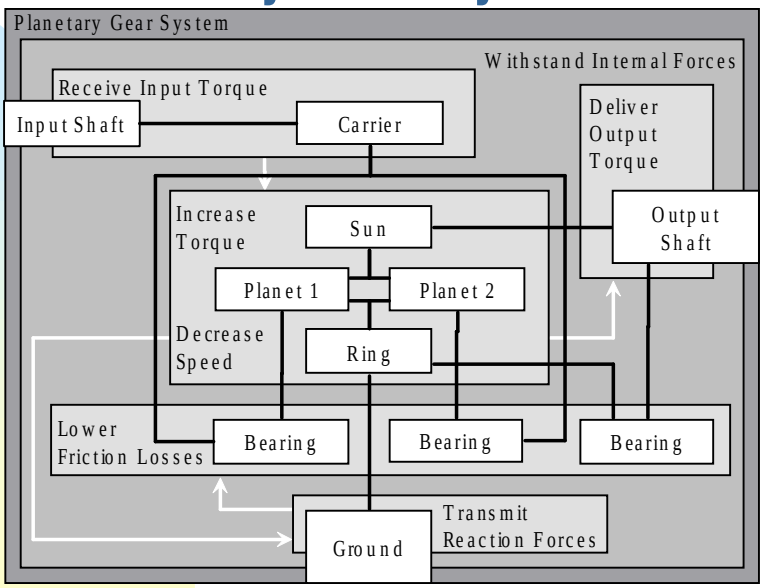
Product Architecture Schematic



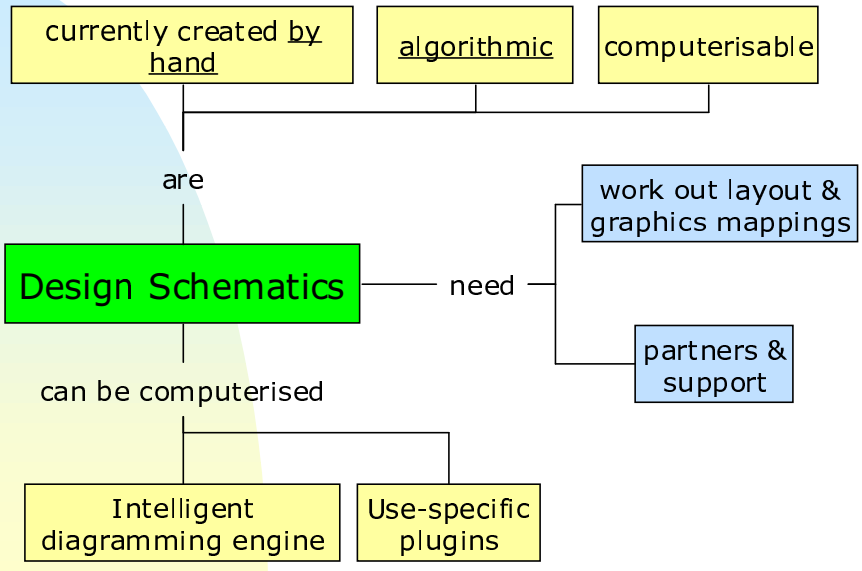

Diagramming & Visualisation
crosses boundaries of
important in meetings & sessions
shows dense information
promotes innovation
corporate
social
language
organisation
culture
discipline


Planetary Gear System - 1
Withstand Internal Forces
Receive Input Torque
Deliver Output Torque
Increase Torque Decrease Speed
Lower Friction Losses
Transmit Reaction Forces
Input Shaft
Carrier
Sun
Planet 1
Planet 2
Bearing
Bearing
Bearing
Planetary Gear System
Ground
Ring
Output Shaft

Planetary Gear System - 2



What's Missing?



Bridging the gulf

- 1999: IEEE Software ripped me apart
- 2003: a different tune
  - IEEE Software 23(2,3)
  - IEEE Computer 36(5)
- Canadian Design Engineering Network
  - http://www.cden.ryerson.ca
- design@ryerson
  - interdisciplinary design community