CLOC
(Class List Of Characteristics)
Improving Design through automated cost driver analysis

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Bio: Paul Breon

Background

Nearly 30 years in aerospace

- Currently Aerospace Estimating Mgr.
- Design/Manufacturing/Estimating/Procurement SME
- Owned mid-size Engineering & Manufacturing company

Creator of automated CLOC theory
CLOC (Class List Of Characteristics) coding is a way to identify a part assembly or activity by it’s attributes and therefore it’s cost drivers

- Intentionally free of Bias
- Breaks language Barrier between Functions
- Potential Automated Enterprise solution
Class listing has been in use for a long time
You might not have noticed that it is all around you

Decoding Your VIN...
Learn what the 17 characters in your VIN are telling you.

What does this VIN say?
This VIN belongs to a 1993 Corvette ZR1 2-door Hatchback with 3 manual seat belts that was made in the USA at a plant in Bowling Green, Kentucky!
Your cars VIN number means something different to everyone based on their needs.

Decoding Your VIN...
Learn what the 17 characters in your VIN are telling you.

1 G 1 Y Z 2 3 J 9 P 5 8 0 0 0 0 1

- Character 1: Country vehicle made in
- Character 4-8: Vehicle description, safety, engine
- Character 9: Manufacturer security code
- Character 10: Year of manufacture/model year
- Character 11: Assembly plant identifier
- Character 12-17: Plant sequential number/vehicle serial number

What does this VIN say?
This VIN belongs to a 1993 Corvette ZR1 2-door Hatchback with 3 manual seat belts that was made in the USA at a plant in Bowling Green, Kentucky!

Quality: what plant?

Government: Country of Manufacture

Police Officer: Exact vehicle

Auto Shop: Which engine

Dealer: Do the numbers match?

Consumer: Genuine article?
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Why CLOC?

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Design Engineer
- Part weighs xx Lbs.: Less matl. = less cost right?
- Part looks fairly simple: Simple is good right?
- Copied similar design: Replicate success right?
- Meets requirements: Most important

Cost Created Here

Estimating/Procurement
- Part should cost xxx
- Forecasting
- Prod. Qty. / type / application etc.
- Supply chain alignment

Cost Projected Here

Manufacturing/Subcontractor
- Matl.
- Size.
- Work center requirements
- Complexity
- Off axis holes
- Ruled surfaces
- Tight tolerances
- Etc.

Cost Spent Here

This part means something different to every part of your company

Traditionally, the effects of design decisions are not known until it is too late!
Class List of Characteristics

Why CLOC?

Design Engineer

What if Design Engineers were able to fully understand ALL of the impacts of design decisions real time and become able to design for best function and value up front?

Estimating/Procurement

What if Estimating/Procurement was able to fully understand the cost impacts of the design and be able to accurately forecast and procure for best value up front?

Manufacturing/Subcontractor

What if Manufacturing & Subcontractors were able to communicate with all business functions at a detailed technical level?

To design for value, critical cost driver information must be driven upstream
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How CLOC works

- CLOC code works like a funnel
  - User can use as little or as much as needed
- Each digit gives cost driving info about a feature
- Based on Binary rules set by creator
- Free of Bias = Pre-normalized
Class List of Characteristics

Class List code

Because all functions derive what they need from the same code, they can all speak to each other and work together.

Quality Assurance
- Resource req.
- Sampl. Plans
- Qual. metrics

Shipping & Receiving
- Packing type
- Weight
- Fragility Req.
- Insur. Value req.

Design Engineering
- Design for value
- Commonality
- Design Trades

Estimating/Finance
- Cost Drivers
- Data Driven Estimating
- Hist. & Proj. cost data

Procurement
- Bid Packaging
- Core Comp. Align.
- Supplier Negot.

Manufacturing
- Auto Resource loading
- Consum. kitting
- Run batching

Manuf. Engineering
- Automate planning
- Work Grouping
- Process Improv.

Because all functions derive what they need from the same code, they can all speak to each other and work together.

CLOC makes complete interconnection a possibility.
• This is great! Why isn’t everyone doing this?
• 2 BIG problems
  • It’s Manual
    – It’s slow
    – Impossibly slow
  • It’s US
    – Prone to error
    – Opinion, the worst kind of Bias
• Enter, the computer…
  • There is now COTS software can interrogate a solid model
    – Extract Physical Part Information
    – No Bias
    – Extremely fast
  • Makes nearly instant coding possible

One of the current model interrogation software solutions
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Automation empowers holistic design decisions

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CODE: XYZ123

Logistics
Quality Assurance
Procurement
Estimating
Manufacturing Eng.
Manufacturing

CLOC automation enables real-time design decisions for the better of the whole business
Class List of Characteristics

Summary

- Class listing as a function is nothing new
- Creates a universal language
- Enables first time design for value
- Massive downstream benefit potential
- Automation + Implementation gives the design engineer a holistic view
- Unlimited possibilities with current software maturity
Questions?

Paul will be avail. for further discussion at the aPriori booth following this presentation
Backup
• Future state design trade studies

• Completely automated coding

• Product Commonality

• Product line improvement (common problems)

• Automate other functions (Estimating/Planning/Resource loading)