



# Automotive Application Tips and Techniques

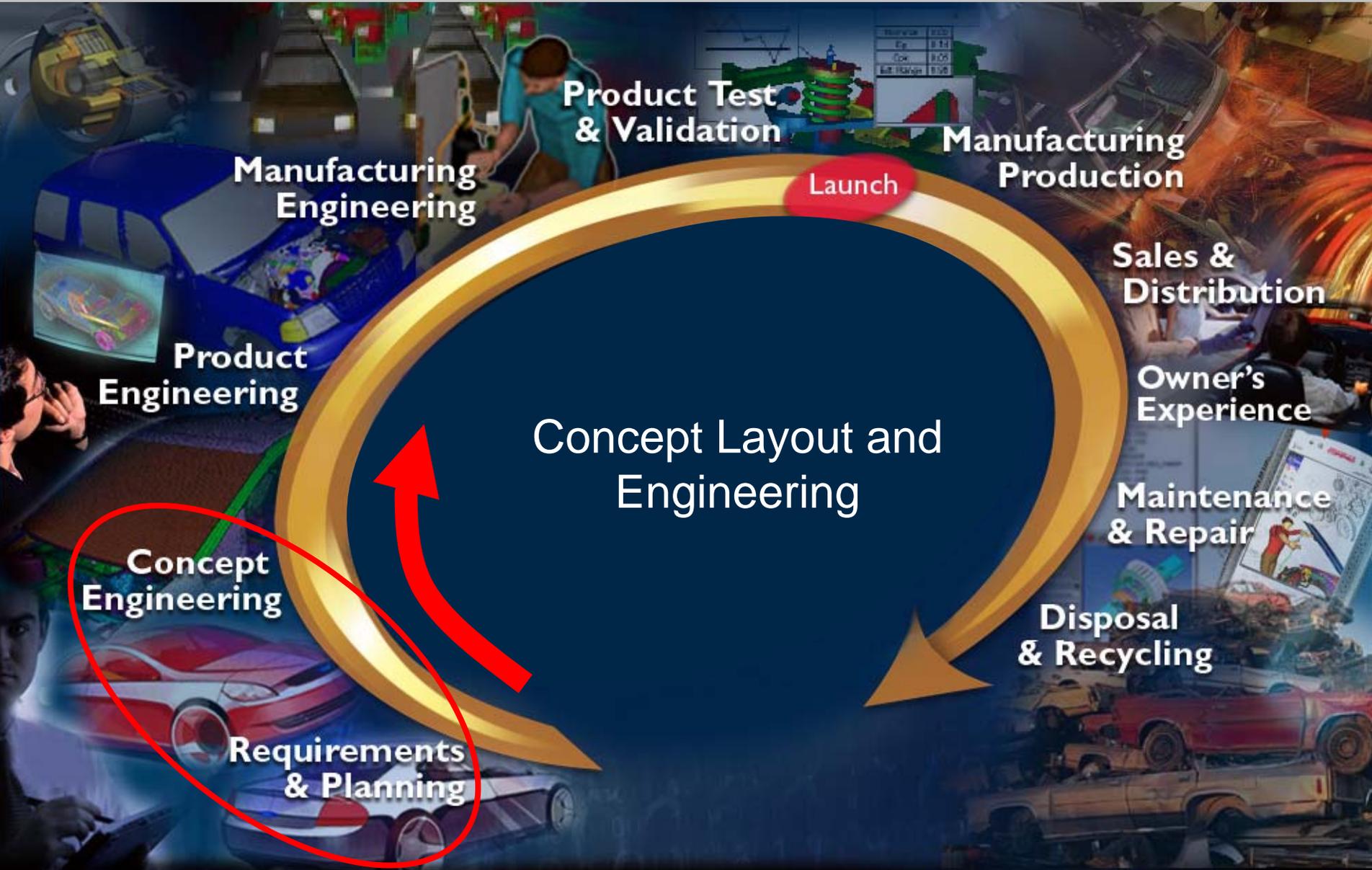
Xiaoxiang Shi  
May 9<sup>th</sup>, 2006



- ▶ Knowledge Driven Vehicle Layout and Engineering
- ▶ Enabled Techniques and Automotive Applications
  - ▶ Knowledge Enabled Archetype
  - ▶ Multi-Disciplinary Validation
- ▶ Summary



# Vehicle Development Lifecycle





# Knowledge Driven Design

## Strategy and Direction



Kick-Off

Launch

**Sequential**

Concept

Engineering

Manufacturing

**Concurrent Engineering**

Concept

Engineering

Manufacturing

Launch

**\$ Saving**

**Next Generation**

**Knowledge Driven Design**

**Knowledge**

Capture Knowledge

Apply Knowledge  
Propagate Change

before program execution

during program execution

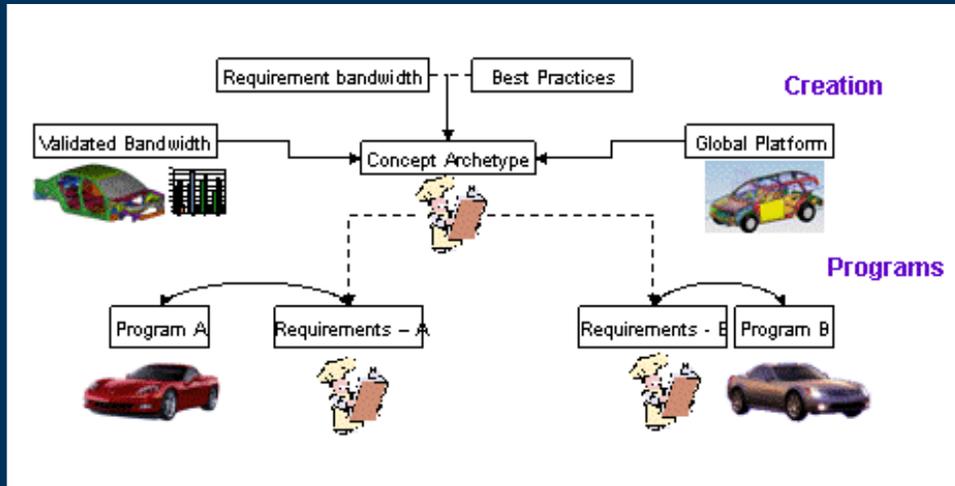
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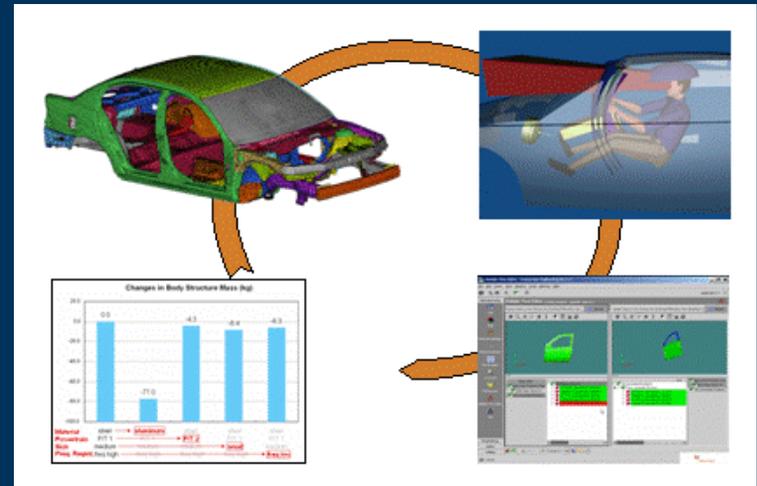
# Elements for successful Knowledge Driven Design in Vehicle Concept



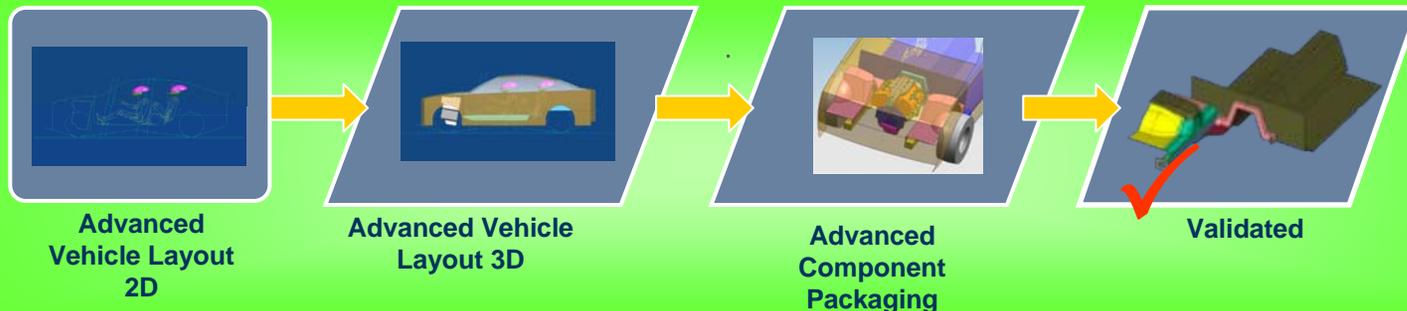
## Knowledge Enabled Archetypes



## Multi-Disciplinary Validation



## Complete management of the Concept Processes





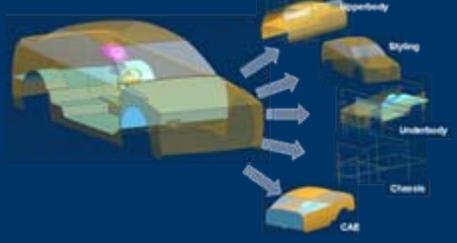
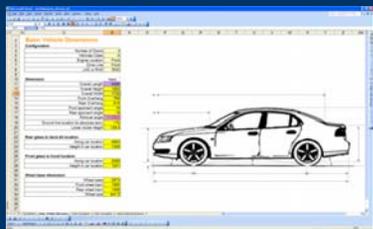
# Vehicle Concept Design Process



Iterate

External data file

Manual input of carryover data



Mirror Certification



Windshield Vision Zone



Head zone and Eyellipse

Validation



Direct Field of View



Instrument Panel Visibility

spreadsheet

2D Layout

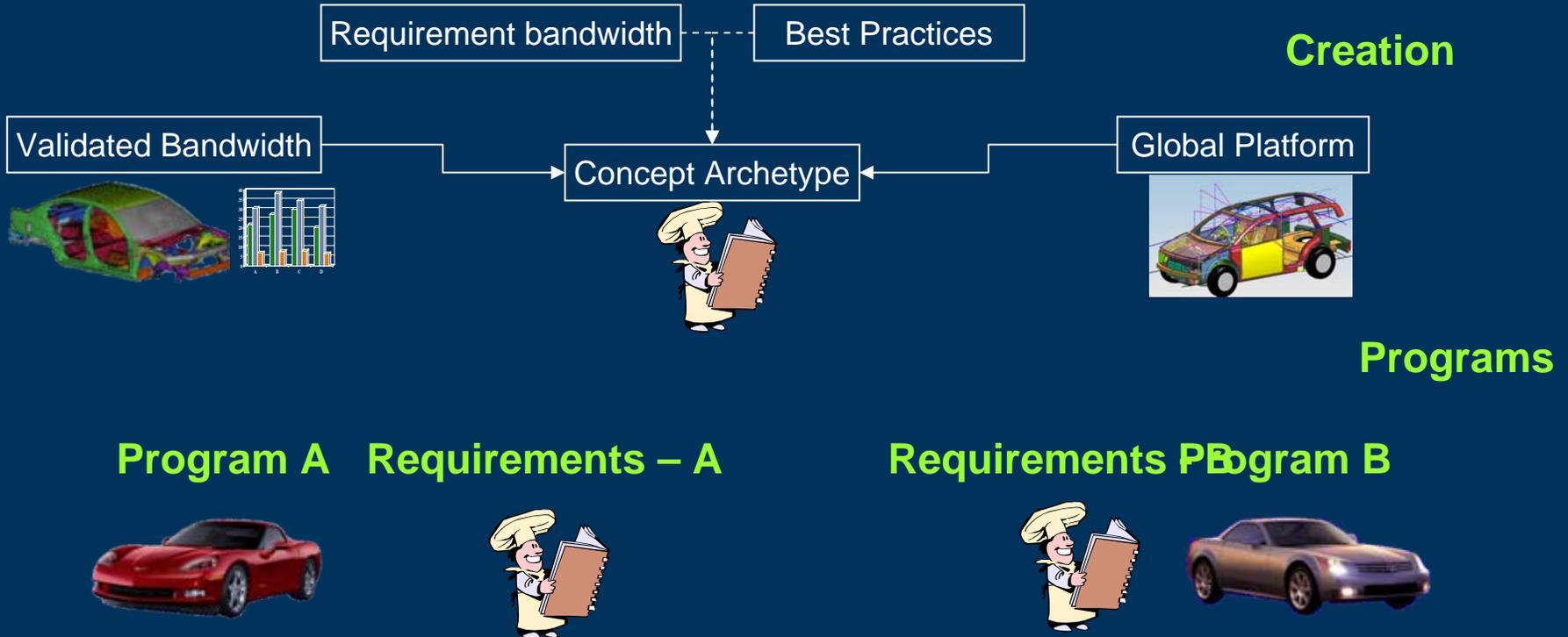
3D Layout

Validation

Using a Concept Architecture it is possible to automate the generation of concept vehicle deliverables to shorten the concept vehicle development time

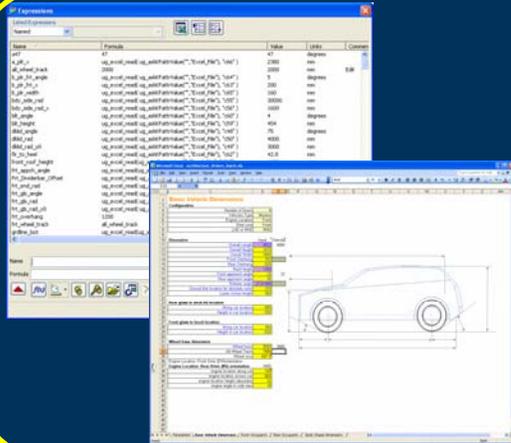


# Knowledge Enabled Archetypes

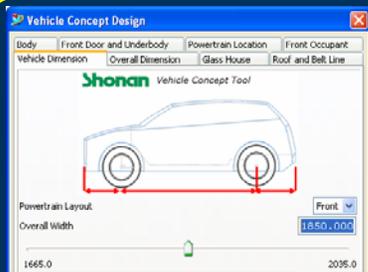




# Technical Enablers



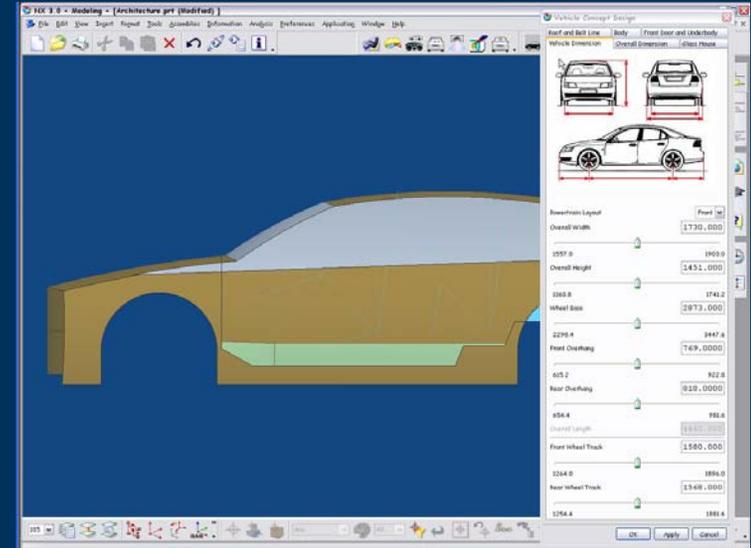
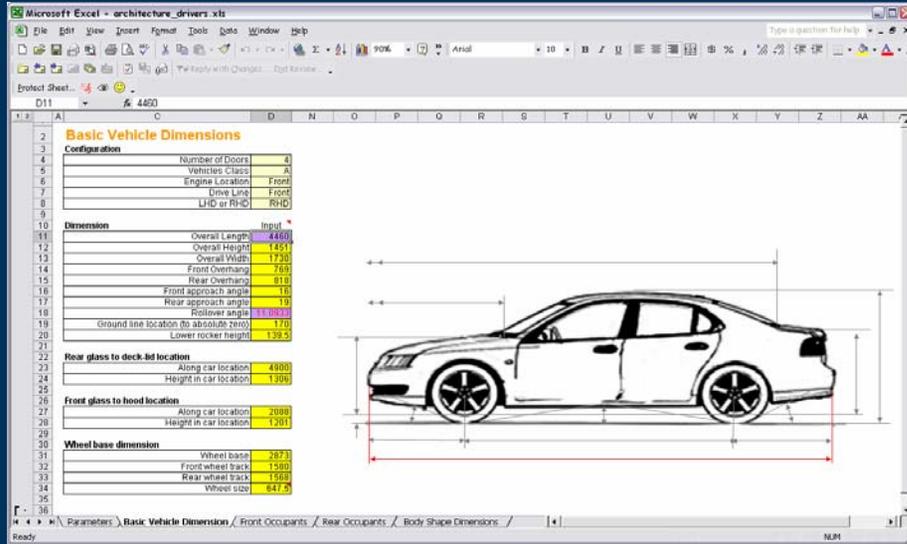
- ▶ **DesignLogic**, provides access to Knowledge for Designers
- ▶ **WAVE** provides the ability to create interpart relationships



- ▶ **Knowledge Fusion** and **UI Styler** allow the creation of simple custom applications linked to requirements



# Architecture Model Interaction



**Familiar Excel UI**  
**NX expertise not required**

**Interactive NX Interface**  
**Immediate Visual Feedback**

**One set of parameters**

**Two User-Interfaces**



# Vehicle Concept Design Tool

## Edit the architecture shape



- ▶ A tool supplied to edit & fine tune the vehicle size from within the Nx Cad model.
- ▶ A slider bar interface
- ▶ Dynamic model update
- ▶ Updates the spreadsheet on exit to new dimensions

The screenshots show the following panels:

- Vehicle Dimension Panel:** Shows front and rear views of a car with dimension lines. Parameters include Overall Width (1730.000), Overall Height (1451.000), Wheel Base (2873.000), Front Overhang (769.0000), Rear Overhang (818.0000), Overall Length (4460.000), Front Wheel Track (1580.000), and Rear Wheel Track (1568.000).
- Front Glass Location and Dimension Panel:** Shows a side view of a car with dimension lines for the front glass. Parameters include Front Glass Location along Car (2088.000), Front Glass Height in Car (1201.000), Hood Angle (10.1000), and Front Glass Angle (28.6000).
- Rear Glass Location and Dimension Panel:** Shows a side view of a car with dimension lines for the rear glass. Parameters include Rear Glass Location along Car (4712.000), Rear Glass Height in Car (1306.000), Deck Lid Angle (5.8000), and Rear Glass Angle (25.4000).
- Hood Dimension Panel:** Shows a 3D wireframe model of a car with dimension lines for the hood. Parameters include Hood Radius at Centerline Section (7492.000), Hood Radius across Car (6000.000), and Front End Radius (3000.000).
- Deck Lid Dimension Panel:** Shows a 3D wireframe model of a car with dimension lines for the deck lid. Parameters include Deck Lid Radius at Centerline Section (4495.000), Deck Lid Radius across Car (12660.00), and Rear End Radius (2850.000).
- Body Side Dimension Panel:** Shows a 3D wireframe model of a car with dimension lines for the body side. Parameters include Body Side Radius along Car (58787.00) and Body Side Radius at SgRP X-Section (1469.000).



# Knowledge Enabled Archetype



Best Practices



- ▶ Best practices



- ▶ Increased quality



- ▶ Time and skills reduction

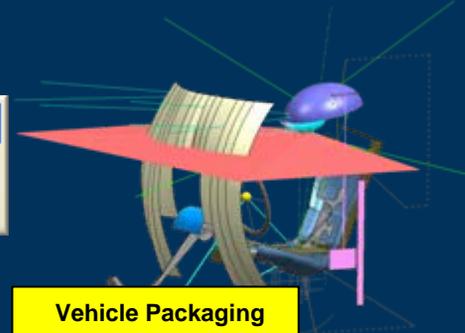


- ▶ Decreased investment



# Multi-Disciplinary Validation

## Occupancy & Mechanical Packaging for Concept Layout



Vehicle Packaging

### Business Value

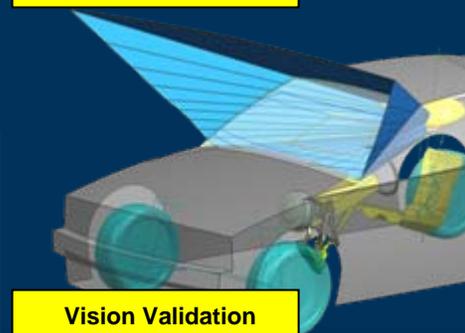
- ▶ Tools ready to go out of the box requiring no customisation costs
- ▶ Simple and intuitive wizards reduce training costs
- ▶ Industry standards and process knowledge stored for repeatability and standardisation

### Technology Enablers

- ▶ NX General Packaging Module
  - ▶ Hip Point Design, Vision Zone, Reach Zones ...
- ▶ NX Human Modelling and Posture Prediction
- ▶ Embedded Knowledge;
  - ▶ Industry Standards (SAE, EEC...)
  - ▶ Empirical Research (University of Michigan)



Integrated Human



Vision Validation



# Multi-Disciplinary Validation



- ▶ Catch problems early



- ▶ Improve quality and innovation



- ▶ Increase build confidence



# Summary



- ▶ Management of the Concept process
- ▶ Knowledge Enabled Archetype
- ▶ Multi-Disciplinary Validation



Thank you !!

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