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Innovative ICT Tools & Methods for Mass Customization of Vehicles

CATER – Online Automotive Mass Customization

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Supported by
the European Commission

European Commission

Information Society and Media

Overview

- Introducing CATER
- A framework for Mass Customization
- Affective Design and Citarasa Engineering
- Innovations in Vehicle Configuration
- Find Information and Get Connected

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- **Introducing CATER**
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CATER Data Sheet

- **Full Name**
  - Computerized Automotive Technology Reconfiguration System for Mass Customization
- **Contract n°**
  - IST-5-035030
- **Instrument**
  - STREP (Specific Targeted Research Project)
- **Programme**
  - FP6-2005-IST-5
- **Strategic Objective**
  - 2.5.8 (ICT for Networked Businesses objective of the IST priority)
- **Start date & duration**
  - 01/09/2006 - 36 months
- **Consortium**
  - Coordinated by Fraunhofer IAO
  - 14 European / Asian key players from the whole automotive field

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CATER Consortium

- Consortium
  - 14 European and Asian partners
  - Coordinated by Fraunhofer IAO

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CATER Consortium

CENTRO RICERCHE FIAT
VOLVO
IC:IDO
DAMAI SCIENCES
imartis
SIGMA consultants

CENTRE FOR RESEARCH AND TECHNOLOGY - HELLAS
INFORMATICS & TELEMATICS INSTITUTE
Fraunhofer Institut Arbeitswirtschaft und Organisation

COAT-Basel
Center of Applied Technologies in Neuroscience
UNIVERSITI MALAYSIA SARAWAK UNIMAS
NANYANG TECHNOLOGICAL UNIVERSITY
The University of Nottingham
Universität Stuttgart Germany
UNIVERSITY of VAASA

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The Situation in Automotive Industry

- Dynamic changes of markets, knowledge, organisation, processes, locations / work forces, technology, regulations
- Pressure on time-to-market
- Pressure on delivery times and stock size
- Need of increasing numbers of partners to communicate and collaborate (versus non-disclosure policies)
  - ➢ Deficient ICT infrastructure
- Lack of feedback of user / customer requirements into design processes
  - ➢ Optimisation potential in user-centred design

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Mass Customization

- Mass Customization =
  Mass Production + Individual Customization
  - Advantages of mass production
    (scaling effects, automation, high efficiency…)
  - Fulfill individual needs
- Competing objectives
  - Inexpensive production requires less variants
  - Divergent user needs require more variants
- CATER helps to solve the optimization problem
  - Avoid unwanted variants
  - Find the real user needs

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CATER Objectives

- Facilitate N-business in the vehicle industry
- Facilitate mass customization in vehicle industry
- Develop *citarasa* (affective design)methodology and database
- DIYD database structure and functionality
- Web interface for vehicle configuration based on citarasa technology
- VR interfaces for vehicle planners (reconfiguration) and custumers (configuration, DIYD)
- Middleware for Aggregated Knowledge (MArK) Representation, Access and Retrieval
- Inter-linked database structure and software architecture for N-business

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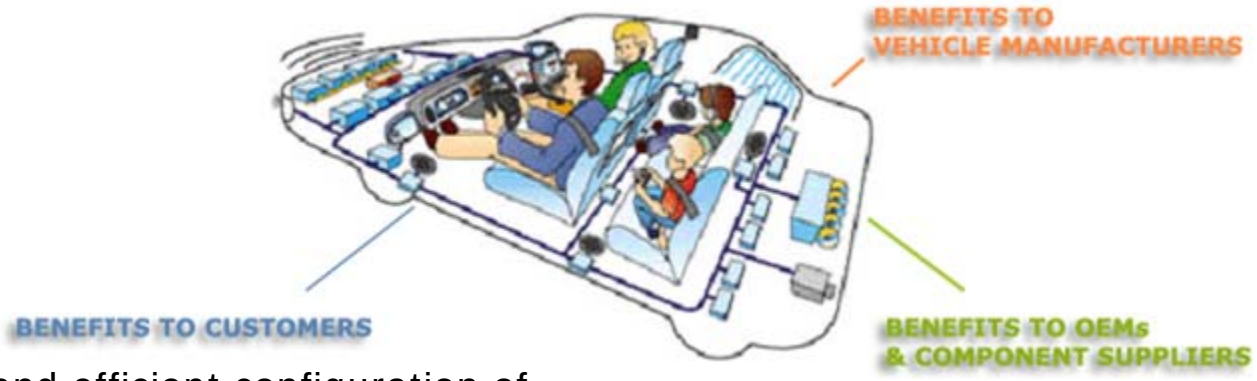
CATER Benefits

- N-business model for global supply chain
- Semantic notation system
- A Citarasa engineering methodology
- 3D do-it-yourself design with VR



- Easy and efficient configuration of vehicles through VR interface
- Vehicles personalised to customers citarasa need
- Better designed vehicles

- Early involvement by n-business
- A unified semantic e-database
- A retrieval module (MArk) for automotive databases and benchmark

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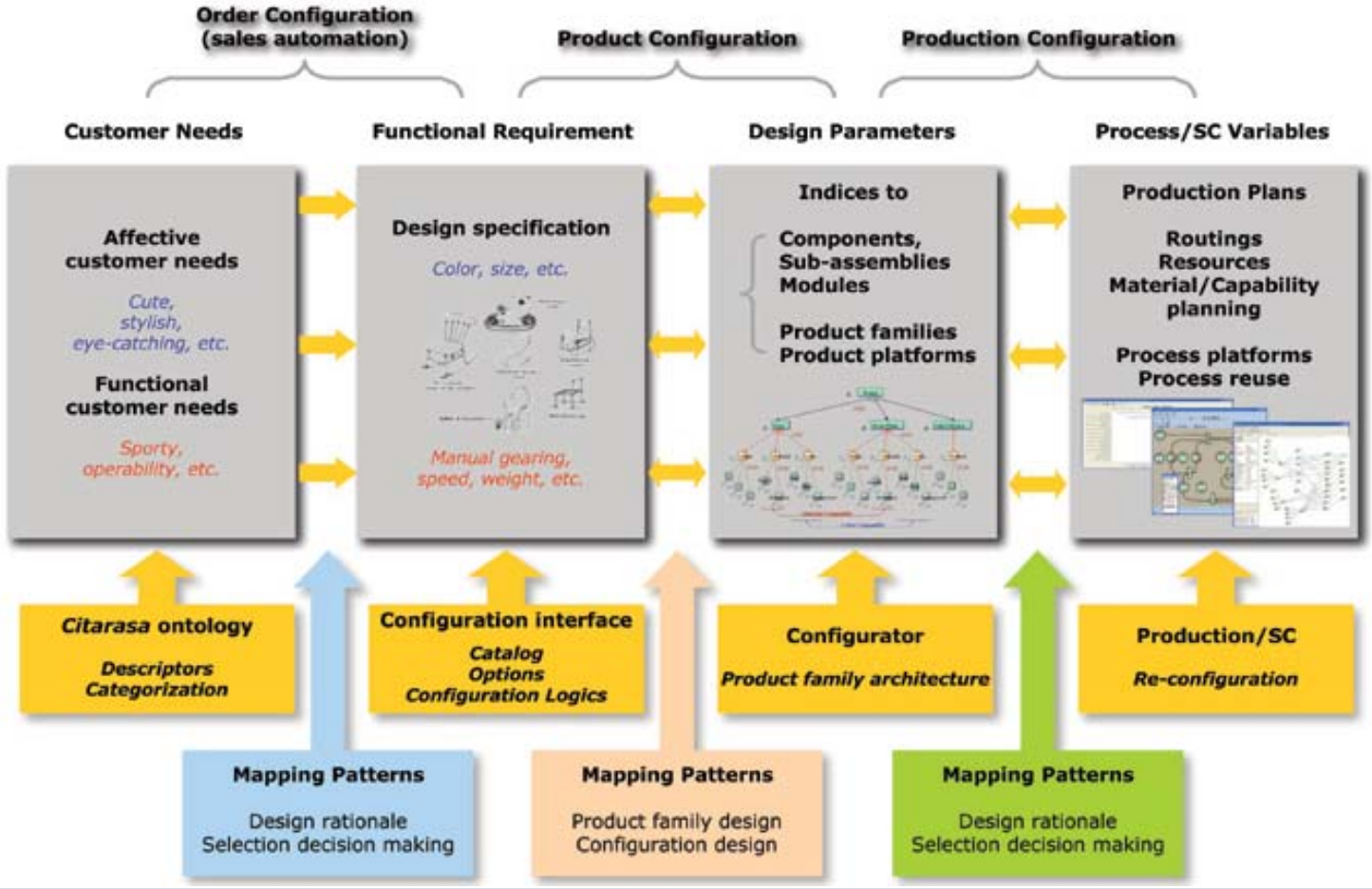
CATER Overview



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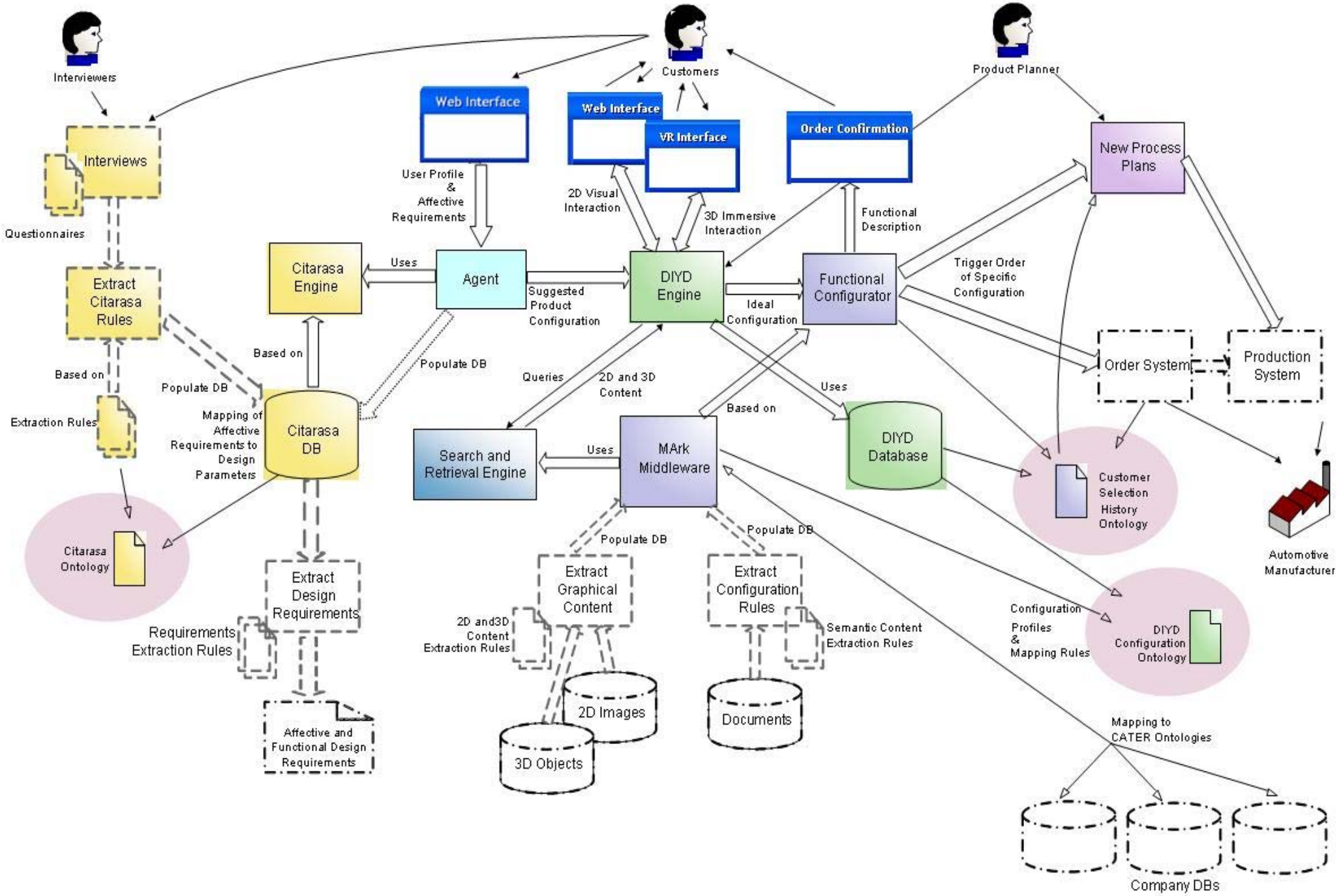
Interviewers
Customers
Product Planner
Web Interface
Web Interface
VR Interface
Order Confirmation
Interviews
User Profile & Affective Requirements
2D Visual Interaction
3D Immersive Interaction
Functional Description
New Process Plans
Questionnaires
Extract Citarasa Rules
Citarasa Engine
Uses
Agent
Suggested Product Configuration
DIYD Engine
Ideal Configuration
Functional Configurator
Trigger Order of Specific Configuration
Based on
Populate DB
Queries
2D and 3D Content
Order System
Production System
Based on
Extraction Rules
Mapping of Affective Requirements to Design Parameters
Citarasa DB
Search and Retrieval Engine
Uses
MArk Middleware
Based on
DIYD Database
Customer Selection History Ontology
Automotive Manufacturer
Citarasa Ontology
Extract Design Requirements
Requirements Extraction Rules
Affective and Functional Design Requirements
Populate DB
Extract Graphical Content
2D and3D Content Extraction Rules
2D Images
3D Objects
Extract Configuration Rules
Semantic Content Extraction Rules
Documents
Configuration Profiles & Mapping Rules
DIYD Configuration Ontology
Mapping to CATER Ontologies
Company DBs

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Citarasa Engineering

- Citarasa [Malay]
  - Cita denotes intent, hope, aspiration and expectation
  - Rasa indicates taste and feel
  - Citarasa = strong intent

- Questions
  - How to measure and analyze human reactions to affective and pleasurable design of vehicles?
  - How to assess the corresponding affective design features of products?

- Citarasa methodology
  - integrates cognition/thinking and emotion/affect in uncovering customer needs
  - supposed to be more efficient than Kansei engineering

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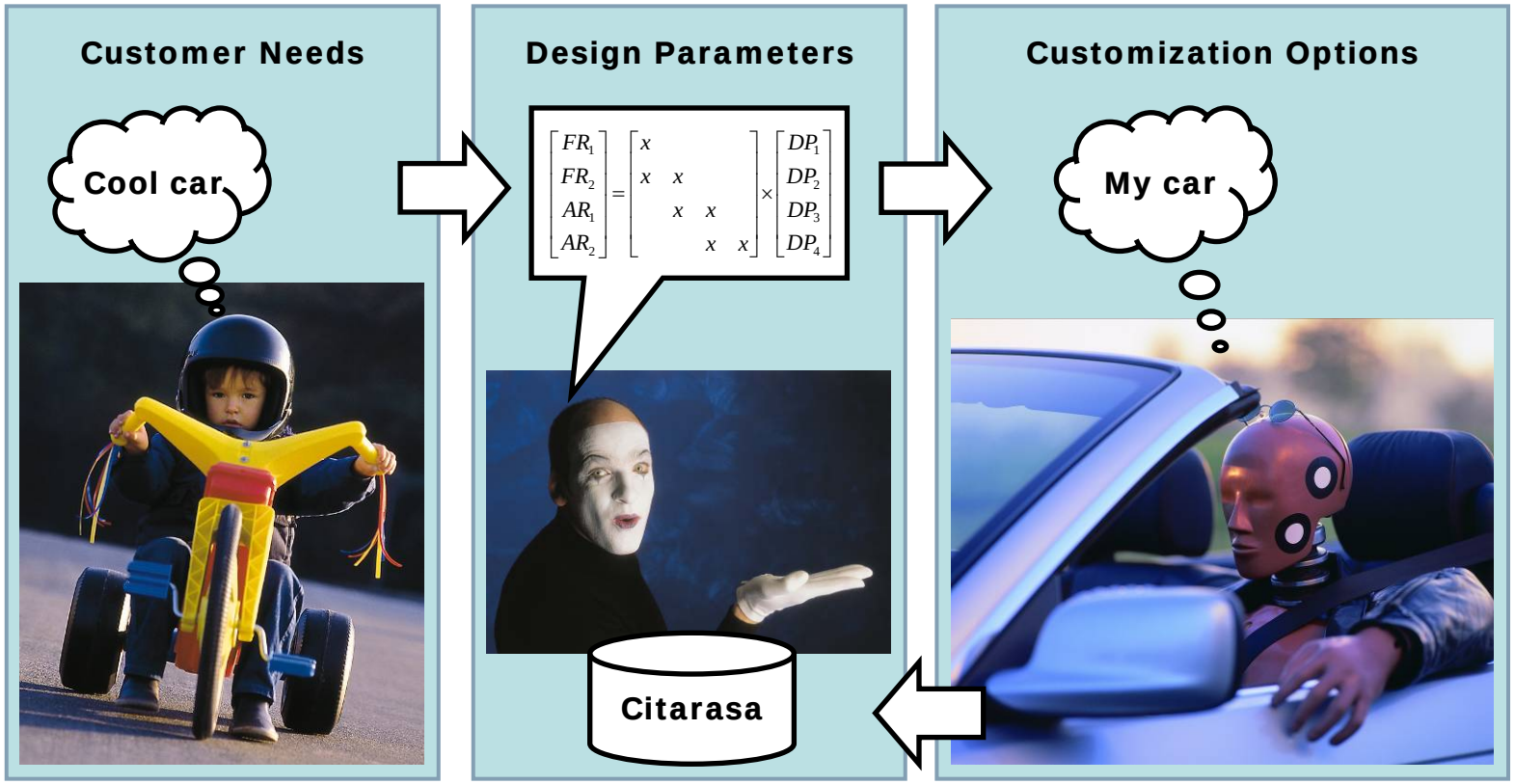
Citarasa Concept



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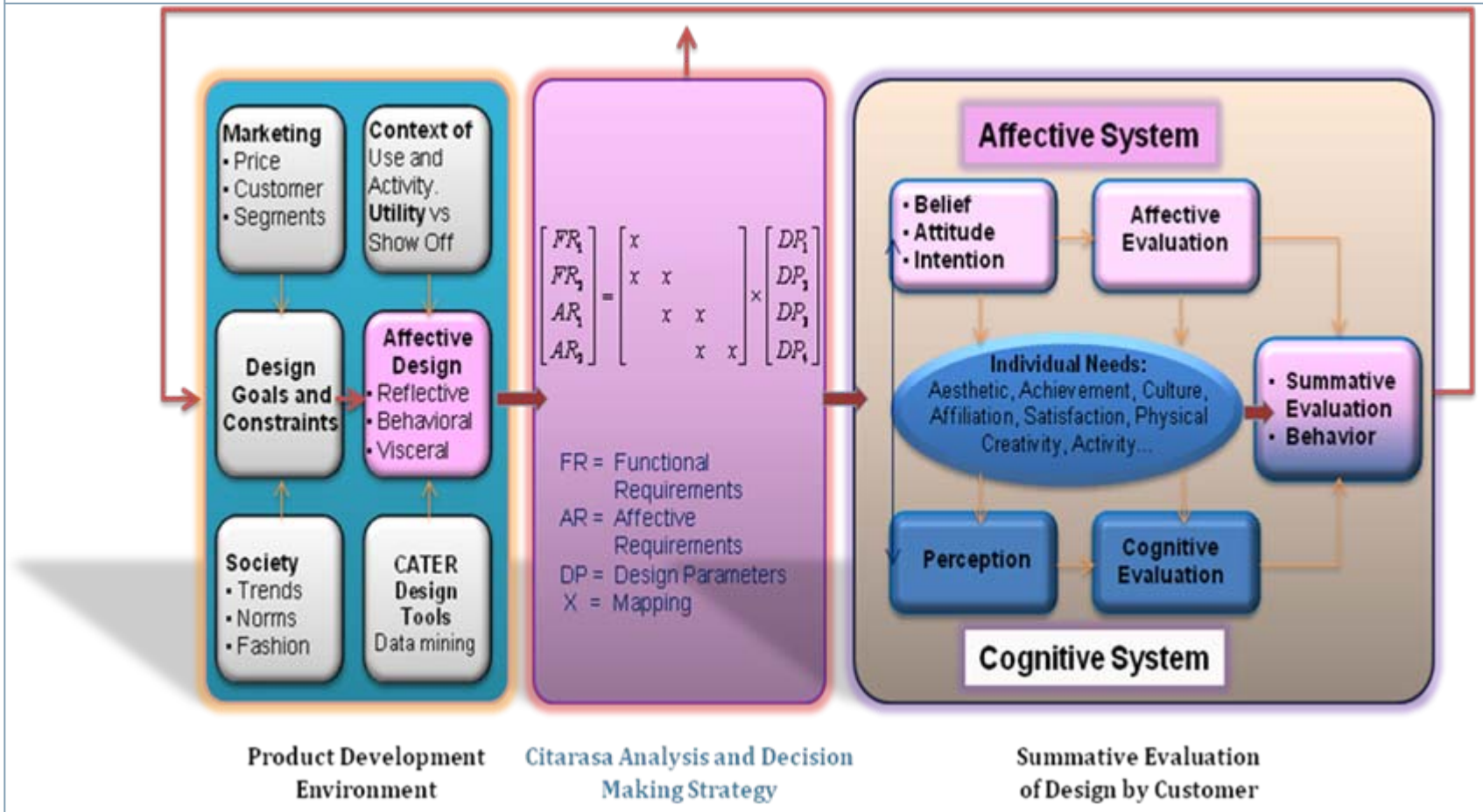
Citarasa Engineering Model



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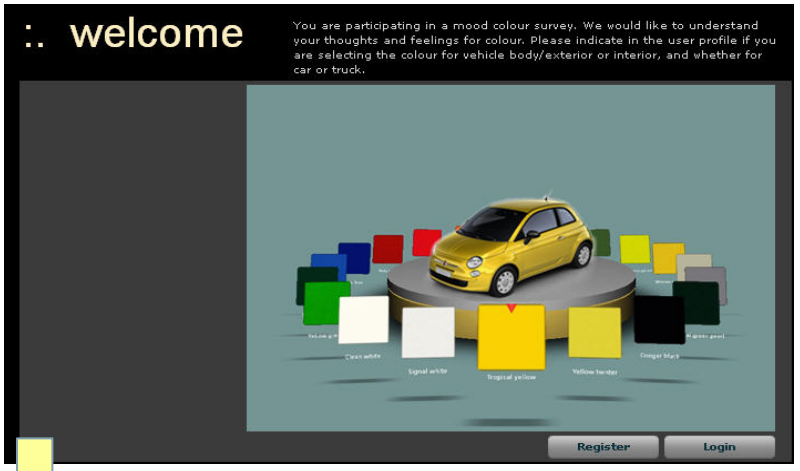
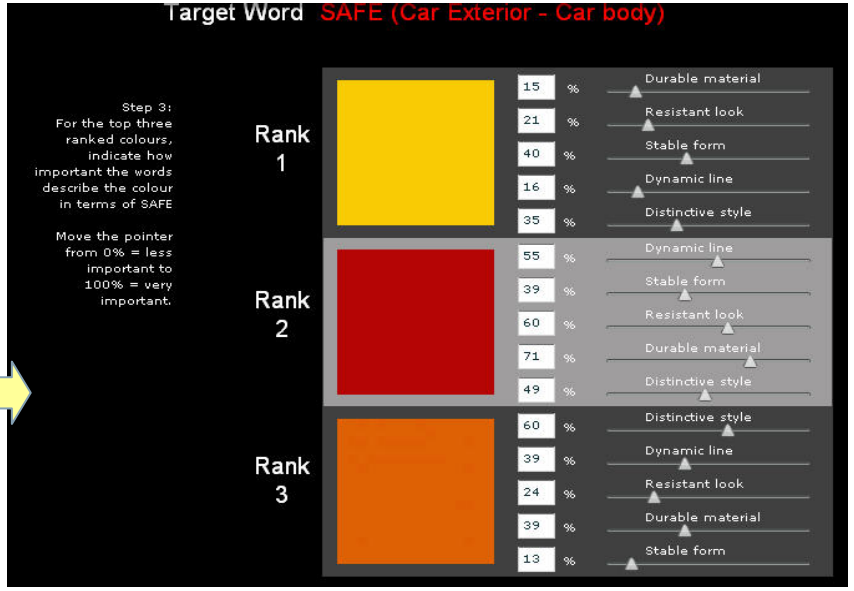
Collecting Citarasa Data





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Mining for Rules (WEKA)

- **Rules for Trucks** (Example for seat)

Conf.	Support	Rule
0,450341	0,302041	Region = Asia and Occupation = Truck driver and Descriptor = Comfortable ==> Attribute = Leather

Region

Occupation

Citarasa Descriptor

Design Parameter

- **Rules for Cars** (Example for wheel rim)

Conf.	Support	Rule
0.417697	0.301761	Gender = Male and Descriptor = Classic ==> Attribute = No spokes

Gender

Citarasa Descriptor

Design Parameter

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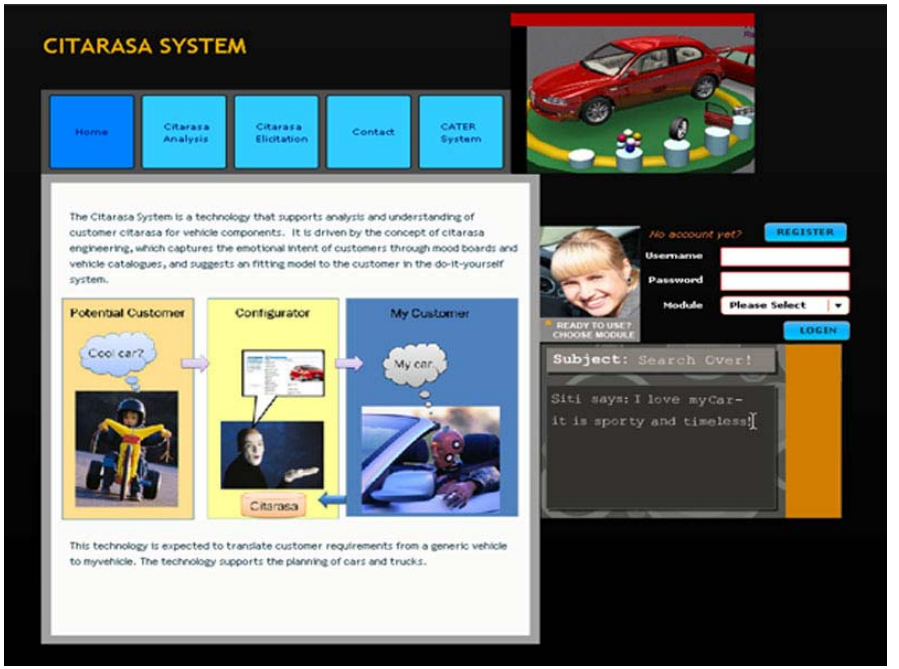
Citarasa Module

- ***Citarasa Elicitation*** to support customer understanding of their own citarasa, and to refine them;
- ***Citarasa Analysis*** to support market analysis by automotive end users, and customers.



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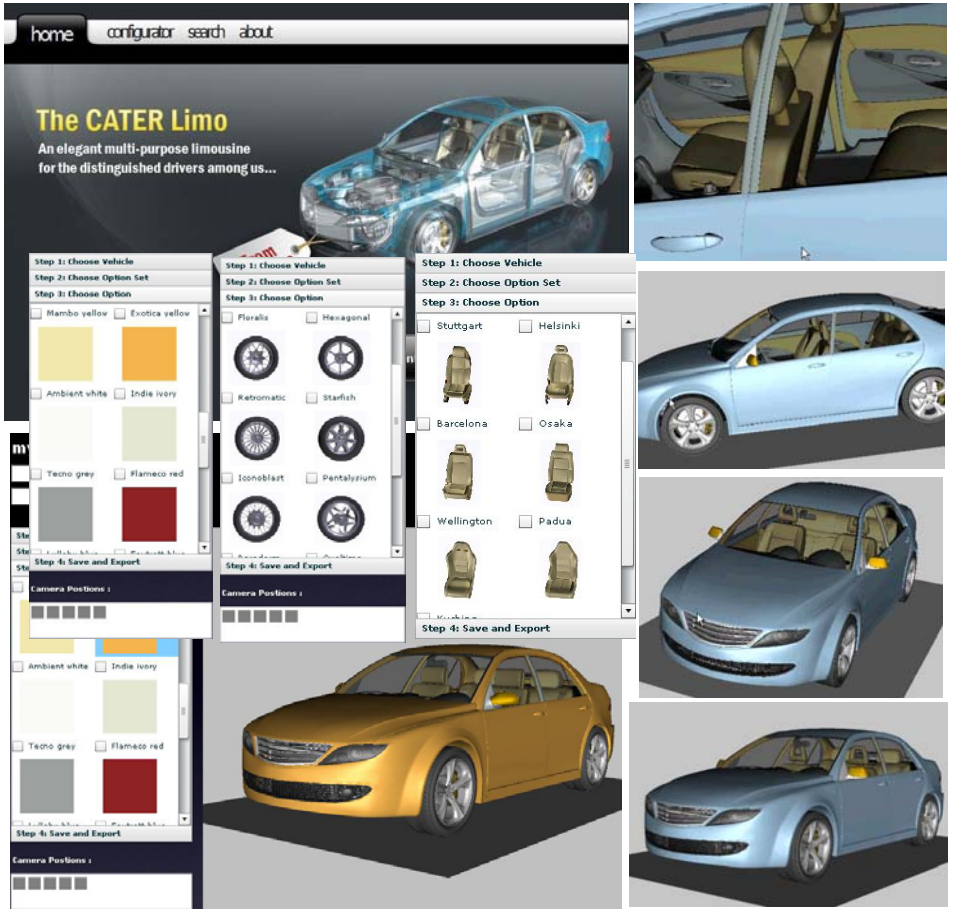
CATER Web Configurator



- Reduced product models from PDM system
- CATER architecture integration (online ordering, CATER selling process, Citarasa recording)
- Application runs locally (client-side solution)
- Simplified interface
- Configurable 3D cars instead of 2D images
- Free choice of view
- Portable configurations for VR

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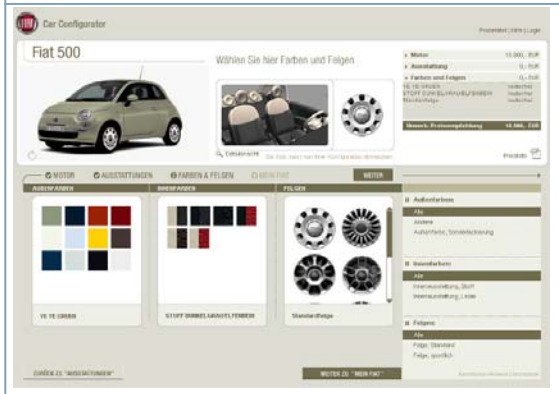
Do-it-Yourself Design Today



Internet Car Configurator:

- All options visible
- Visualization of personal choice
- Reduced visualization quality
- Poor product experience

Dealer's Showroom:

- Few options visible
- Best-selling configurations visible
- High "visualization" fidelity
- Real-life product experience

How to combine the the best of both worlds?

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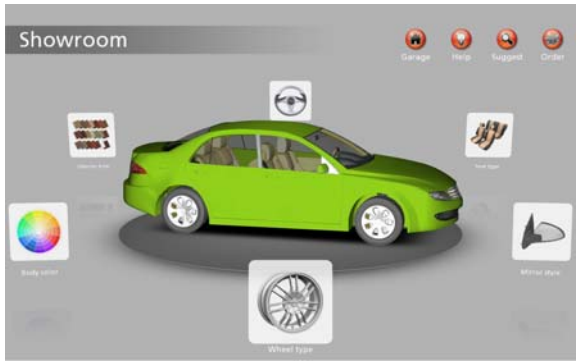
Do-it-Yourself Design in VR



Virtual Reality Car Configurator:

- All options visible
- Visualization of personal choice
- High visualization fidelity
- Compelling product experience

Features:

- Easy and fun to use
- Photo-realistic visualization
- 1:1 Product experience
- Virtual interactive try-out

VR Systems from low-cost to high-end depending on environment

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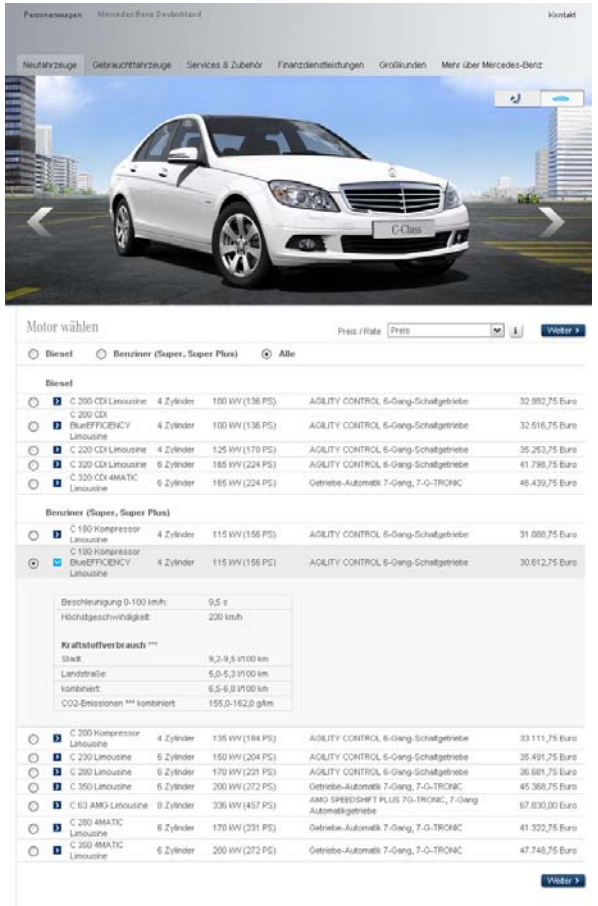
Capturing the Customer Needs



Customer stereotypes:

- Automobilista
- Family guy
- Ecologist
- ...

Know the customer:

- What does he need?
- What does he want?
- What to offer to make her happy?
- How to keep making money in the light of that?

Not all customers love to dive into catalogues

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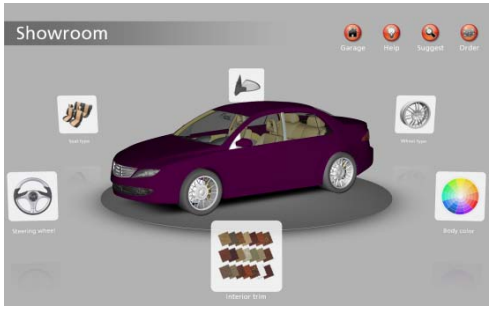
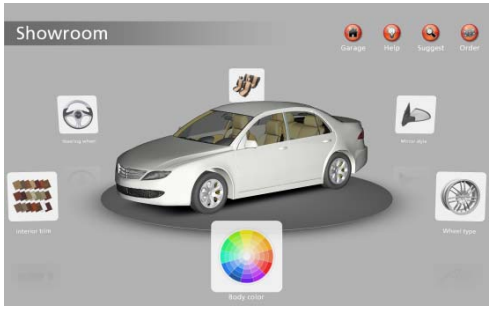
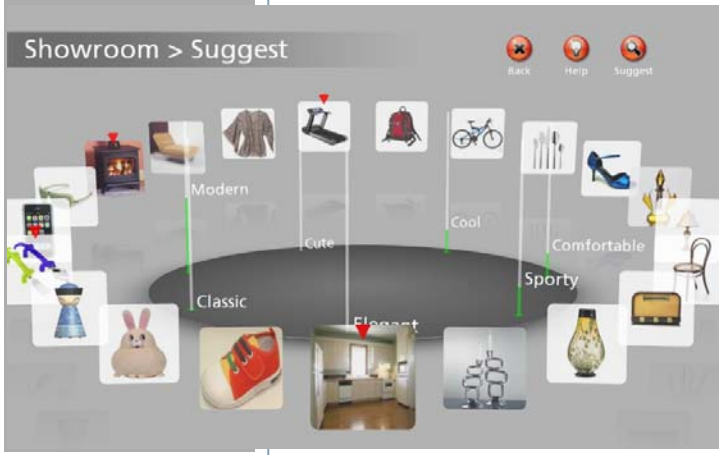
Moodboard Configuration in VR

Moodboards:

- Collage of snippets
- Provides a visual impressions
- Easy to create and understand
- Established designers' tool







Moodboard configuration:

- Selection of stylistic images
- Customers choose favorites
- Mapping of customer style to product configuration
- Customers refine suggestion

Demo and User Testing at IAA Frankfurt 2007

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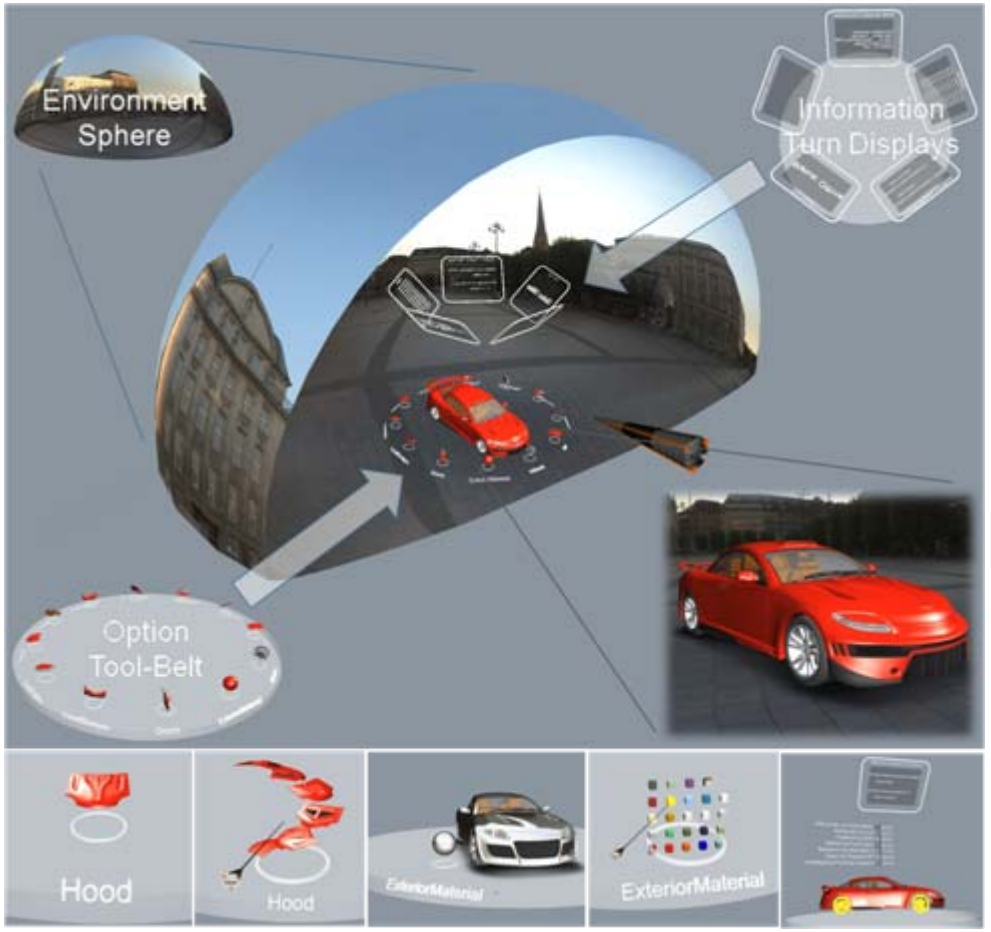
Vehicle Planner Interface



Users and purpose:

- Vehicle Planners
- Information combiner
- Reconfiguration of vehicles

Features:

- Metadata concept (turning 3D display)
- Environment sphere
- Tool belt metaphor for options
- 3D preview menus
- Integrated 2D/3D similarity search

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CATER Access

- CATER Website
- CATER RSS Newsfeed
- CATER eNewsletter
- CATER Dissemination Workshop
  - March 25-28, 2009 – KLCC, Kuala Lumpur, Malaysia

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