

14th ISPE International conference on Concurrent Engineering
CE2007, Sao Jose dos Campos, SP, Brazil

July 16-20, 2007



**The Collaborative Digital
Process Methodology
achieved
the half lead-time of new car
development**

**Hiroshi Katoh
Digital Process Ltd.**

Super Shortened Development Process Of Nissan Motor



日刊自動車新聞 (2005/1/18)

新小型車ノート開発期間

最短の10カ月に短縮

日産

日産自動車は今日発売する小型乗用車「ノート」の開発期間（デザインから生産開始までの期間）を、同社としては最短の10カ月に短縮し

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日刊工業新聞 (2005/1/18)

技術者
ノウハ
技ノウ

日産がデジタル化

コンパ
トカー
開発期間を半減

日産自動車は20日に発売するコンパクトカー「ノート」で、全面的な

デジタル開発を実施した。デザインだけでなく、技術者のノウハウなどもデジタル化し、開発期間を半減。デザイン決定から生産開始までの期間を最短10カ月前後に縮められる。今後、価格競争が激しい小型車分野を中心に活用を広げていく。新しい開発システム「V-3P」は、01年2

月から稼働に着手。総投資額は10億円以上に達する。従来も形状データのデジタル化は行っていたが、今回は技術者が持つノウハウを洗い出し、2万ステップを標準化してデジタルデータ化した。開発期間の短縮とともに技術の伝承や水平展開などにも役立つ。同システムの導入で従

来3回程度だった試作をノートでは1回に集約。デザイン決定から10カ月前で生産に引き寄せた。主にボディー上部など約4割の工程で部品設計を標準化できるといふ。

プロダクト・プロセス・プログラムの構築、ノートで開発期間10カ月を実現した。現状、開発工数の4割程度はデジタルデータ活用が可能で、さらに拡大できるとしている。

自動車各社は開発期間の短縮によって、より鮮度の高い車種企画やデザインの世界投入を目指している。開発期間10カ月はトップレベルと見られる。

Outline of News

V-3P : Value Up Innovation of Product, Process, Program

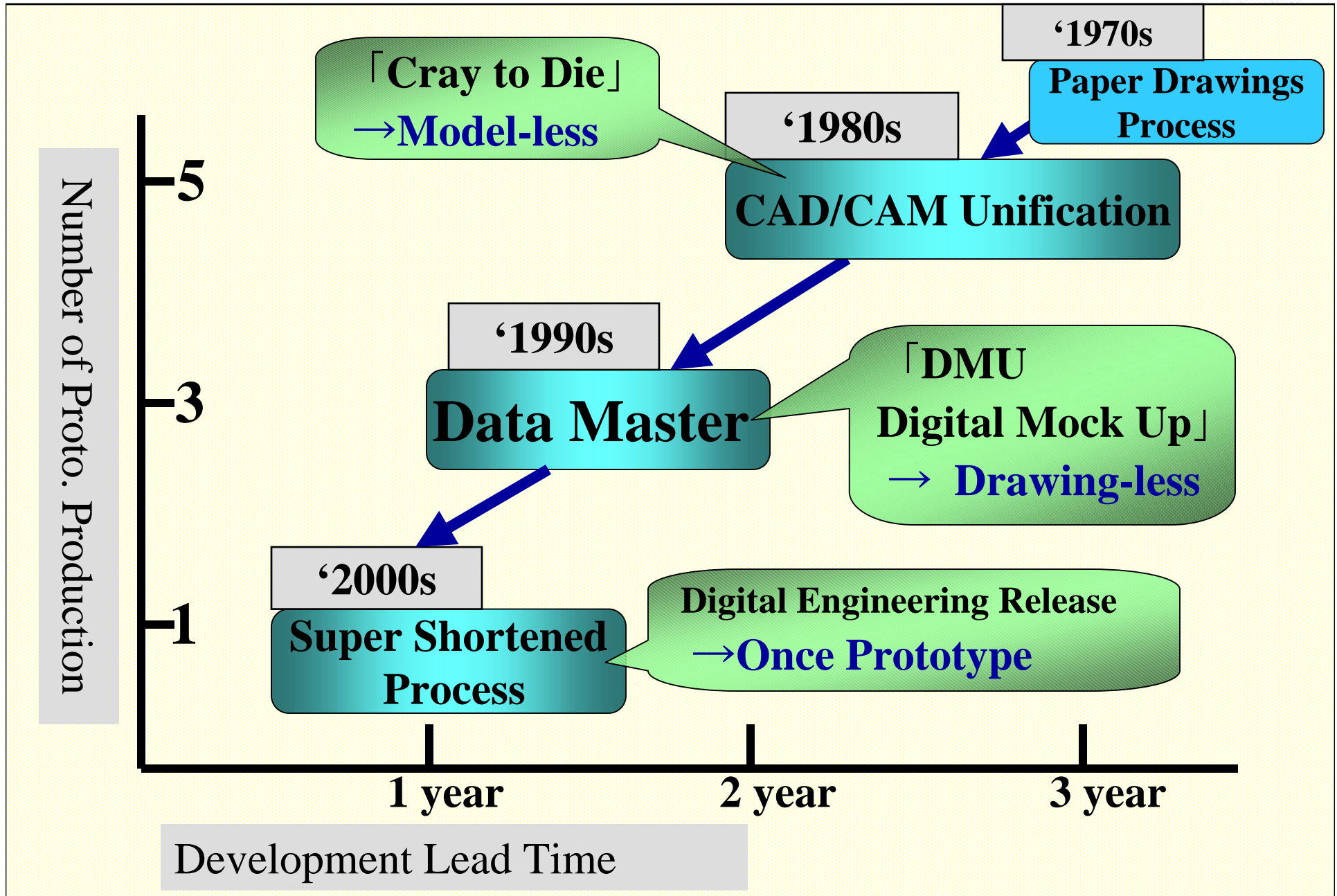
- **Nissan achieved 20 months process by New CAD “I-deas” in the end of 1990’s**
- **New Process “V-3P” achieved 10.5 months and once prototype**
- **V-3P activity has started in 2001**
- **Main three methods are “Know-How CAD”, “Expand Simulation”, and “100% CAPE simulation”**
- **First V-3P new Car released in January 2005**

Three Process Innovations



- **CAD/CAM unification**
- **Data Master Process**
- **Digital Engineering Release Process**

History of Development Process Innovation in Automotive Manufacture



Three Process Innovations



- **CAD/CAM unification**

- **Data Master Process**

- **Digital Engineering Release Process**

From “Model Master” to “Data Master”

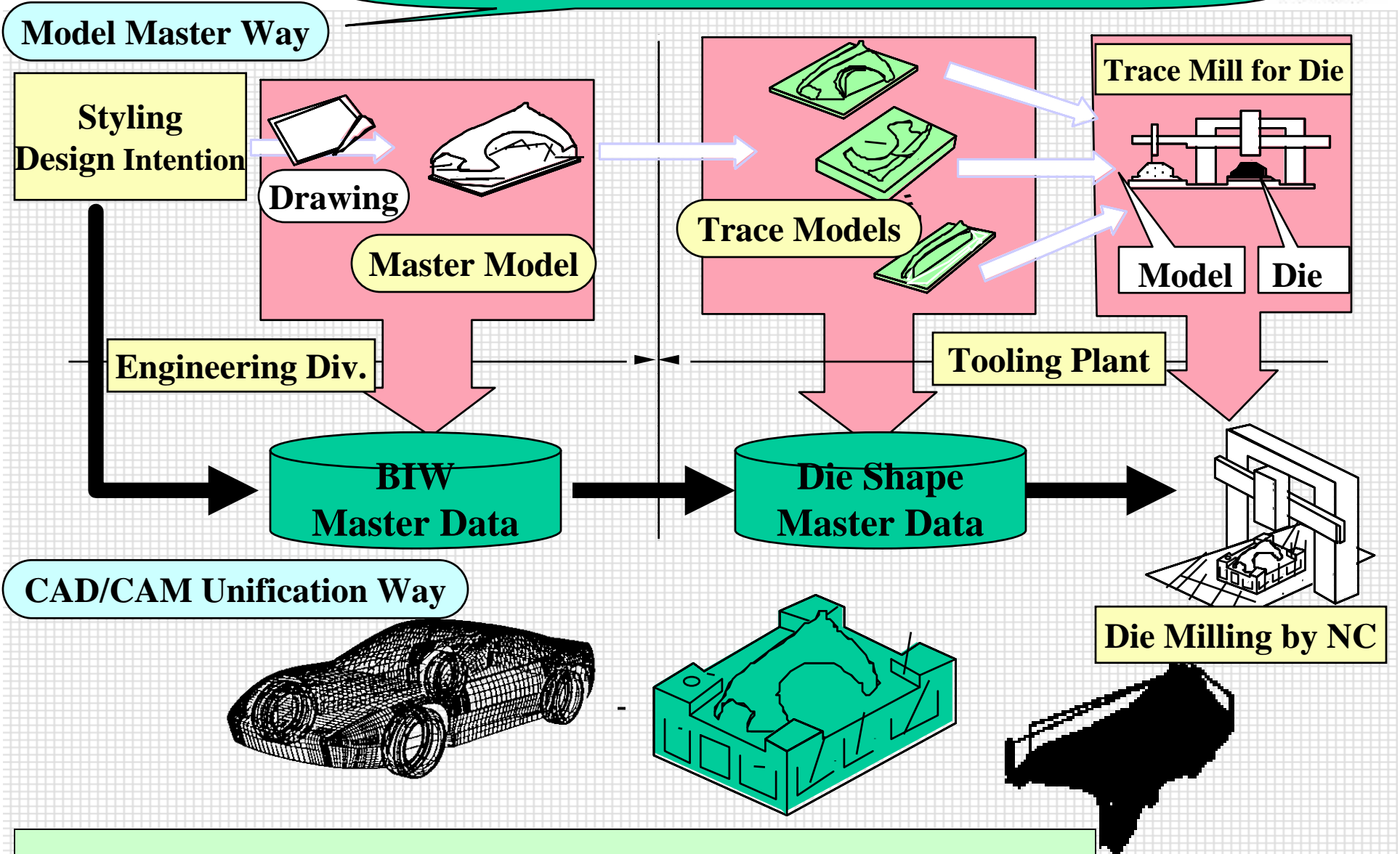


Fig. 2. Die Production in CAD/CAM Unification

Three Process Innovations

- **CAD/CAM unification**
- **Data Master Process**
- **Digital Engineering Release Process**

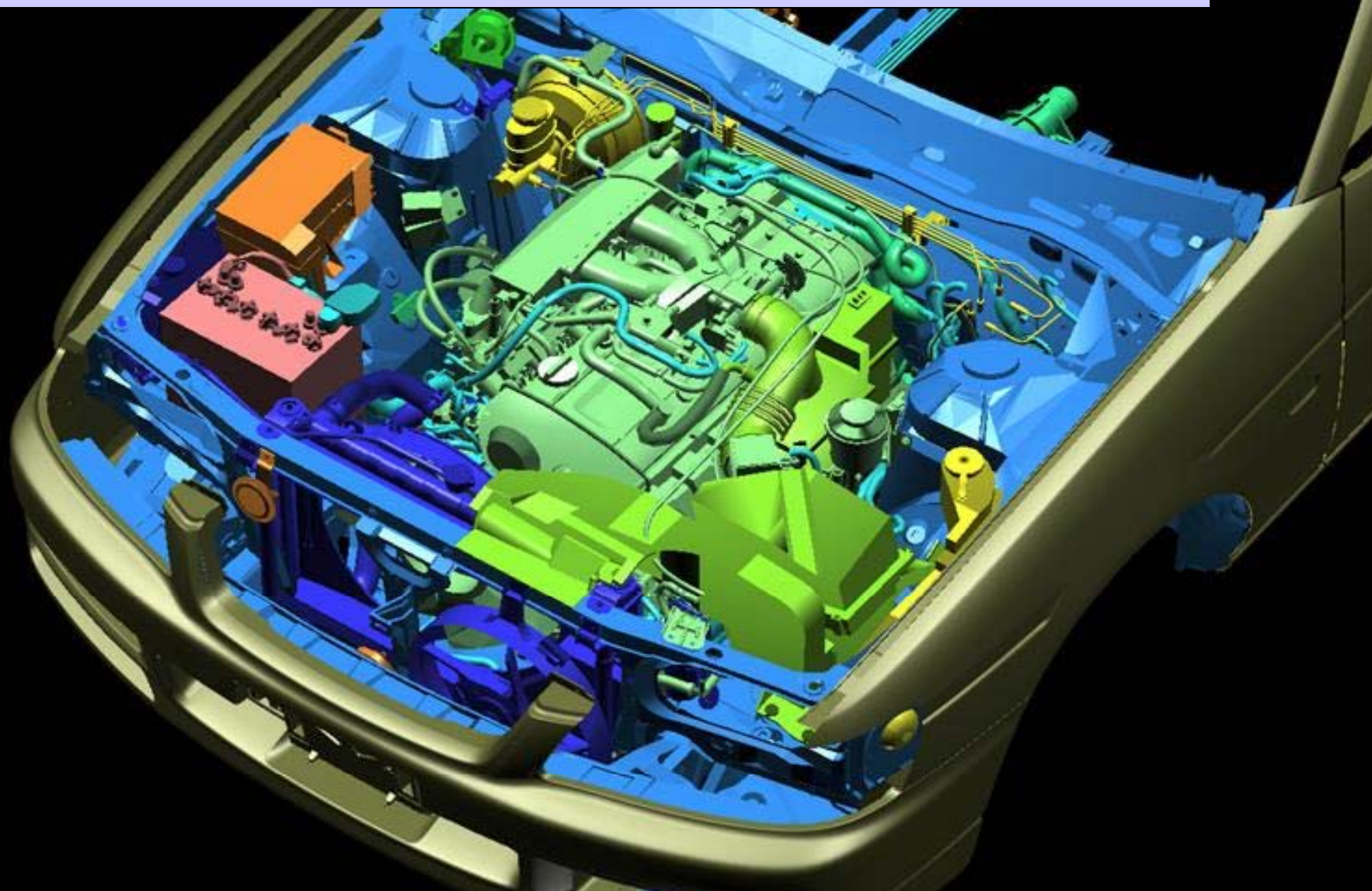


Fig. 3. Digital Mock-Up by Solid Models

Three Process Innovations

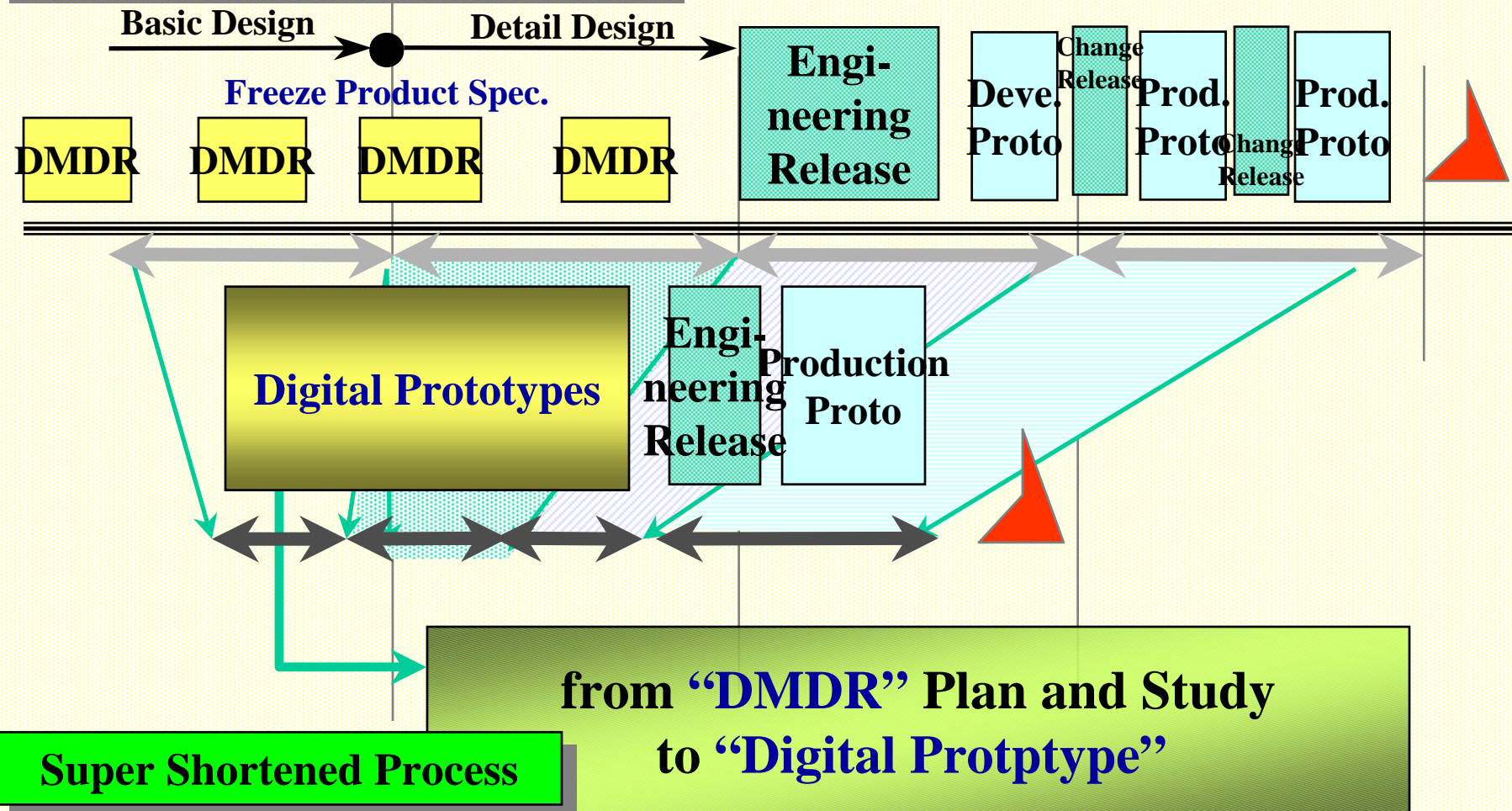
- **CAD/CAM unification**

- **Data Master Process**

- **Digital Engineering Release Process**

Digital Prototype

DMU(Drawing-less)Process



Seven countermeasures for digitalization



- **Realization of Styling CAD**
- **Body structure master data method, "KOGEN method"**
- **Basic design work by DMU (Digital Mock Up)**
- **Drawing-less process**
- **Knowledge CAD**
- **Use of analysis simulation**
- **Digital production process verification**

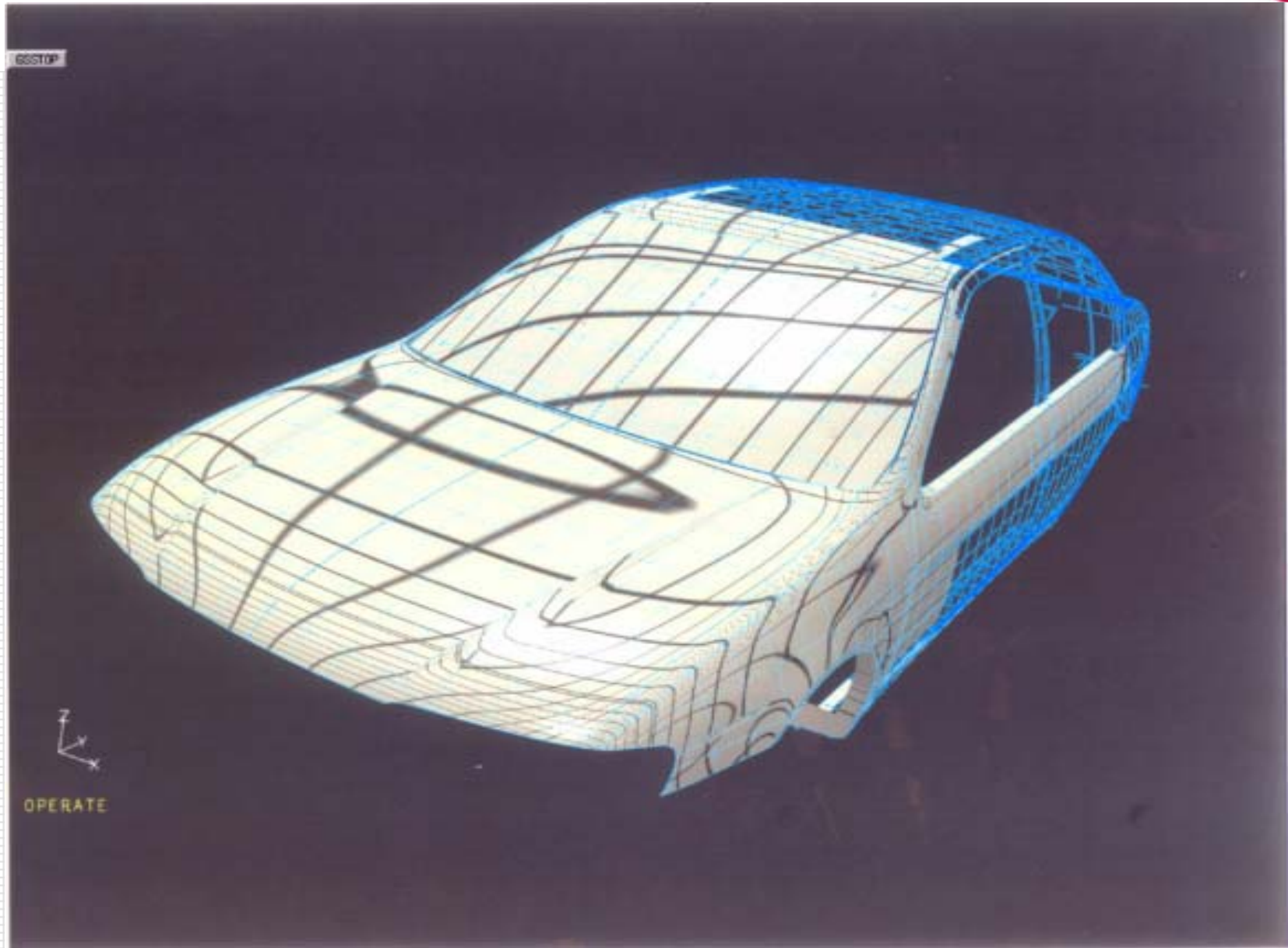


Fig. 5. Styling CAD (Exterior High-Light Simulation)

Seven countermeasures for digitalization



- Realization of Styling CAD
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- Use of analysis simulation
- Digital production process verification

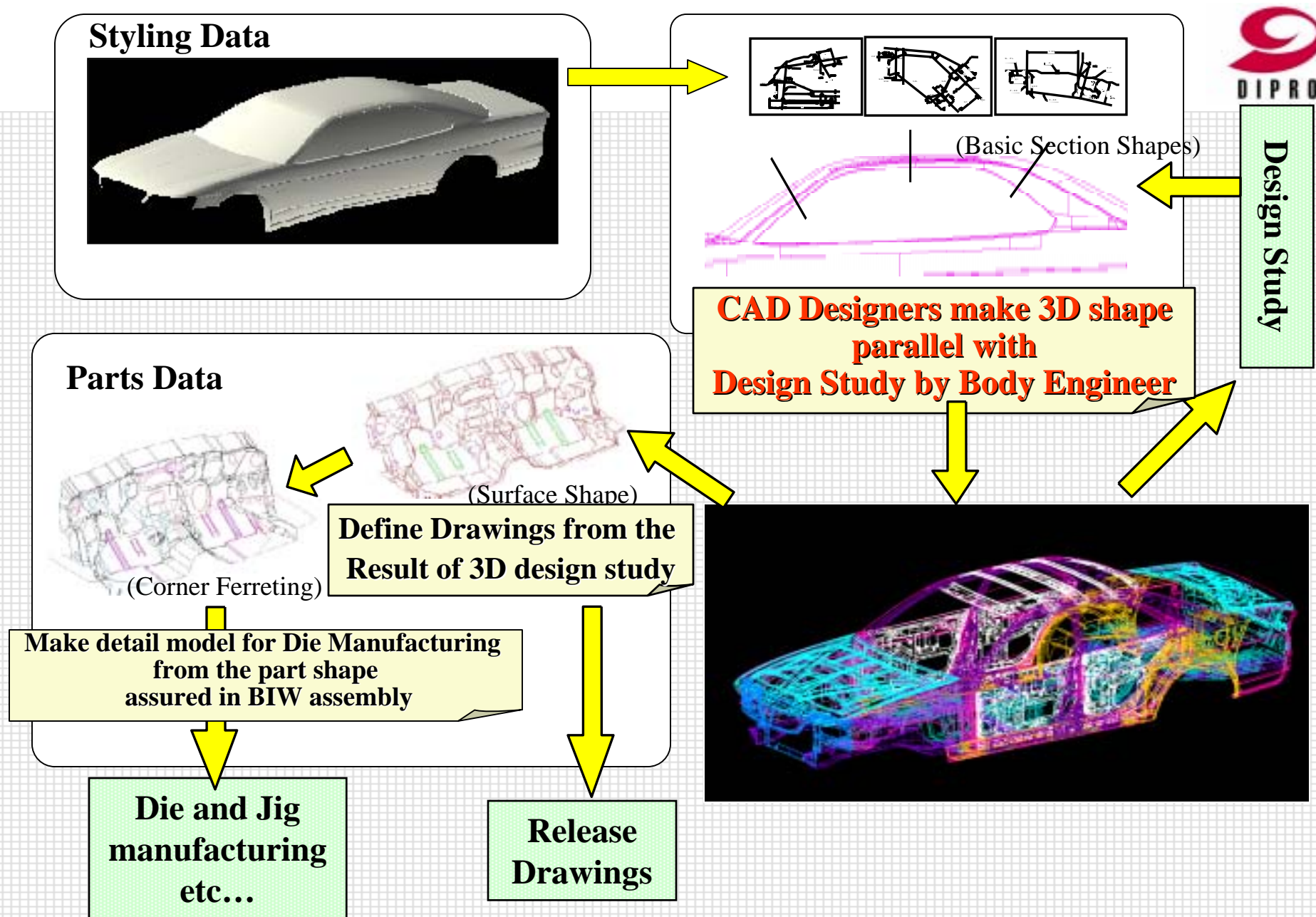


Fig. 6. KOGEN Way

Seven countermeasures for digitalization

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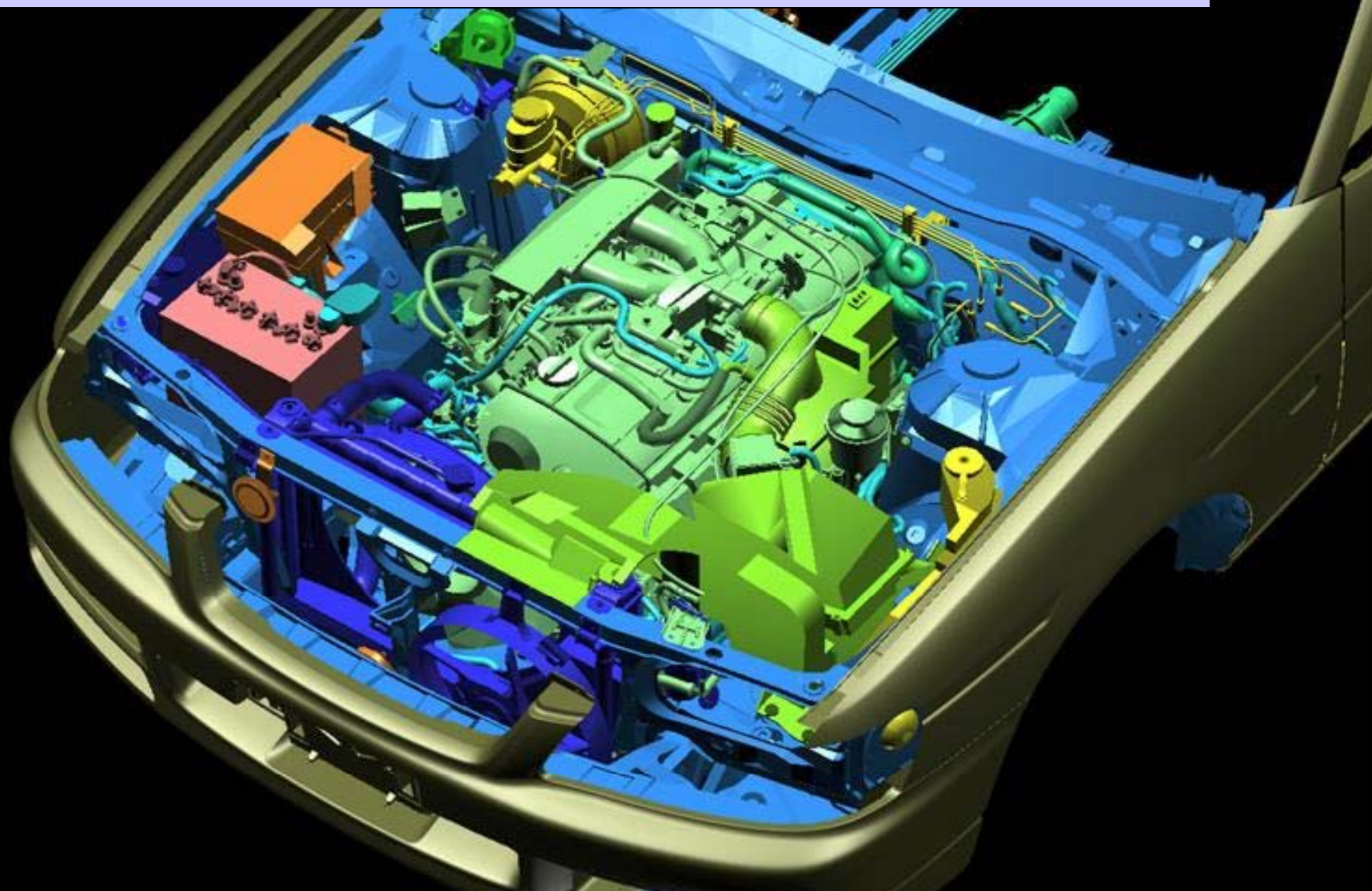


Fig. 3. Digital Mock-Up by Solid Models

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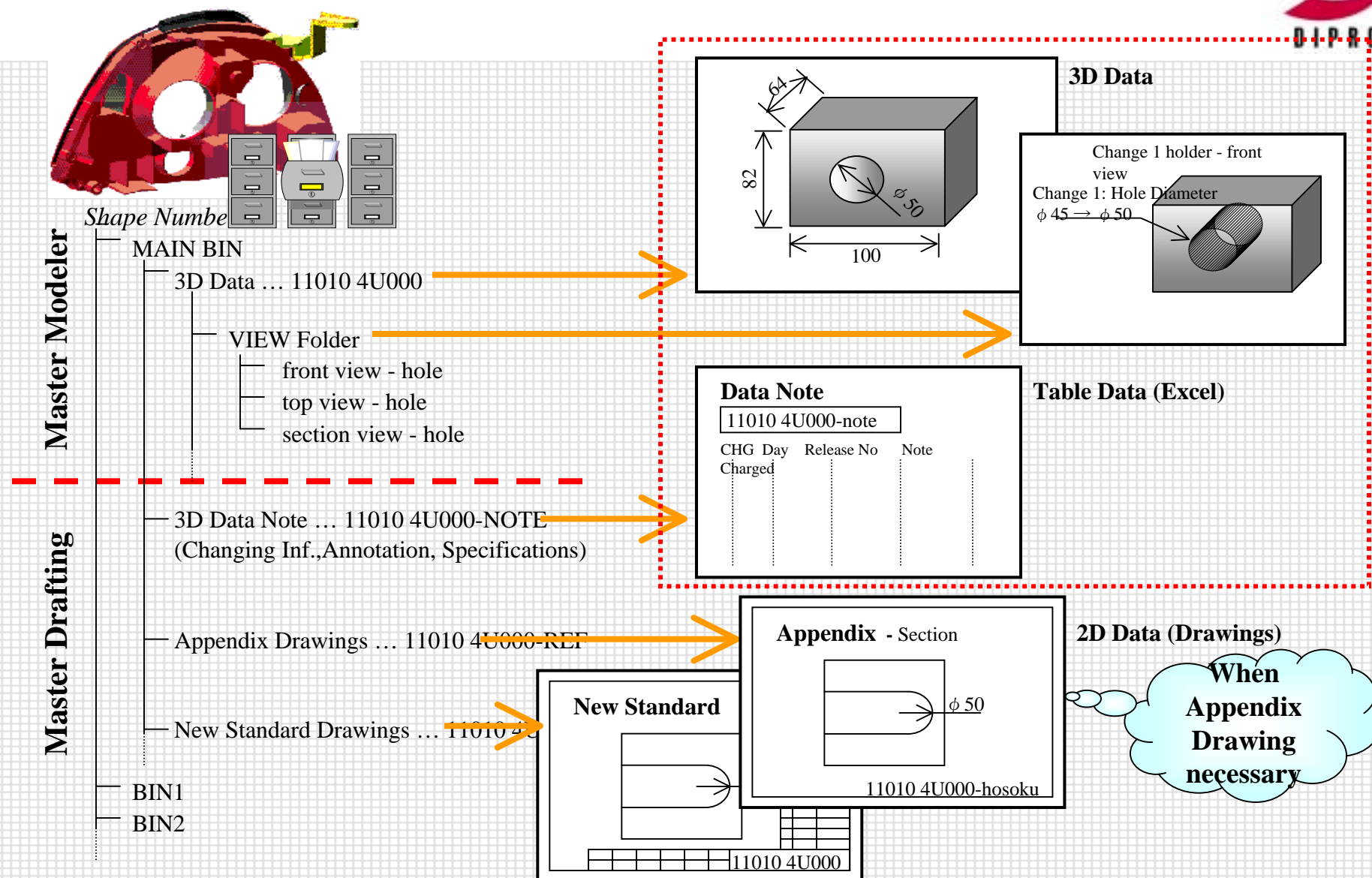


Fig. 7. Drawing Less release

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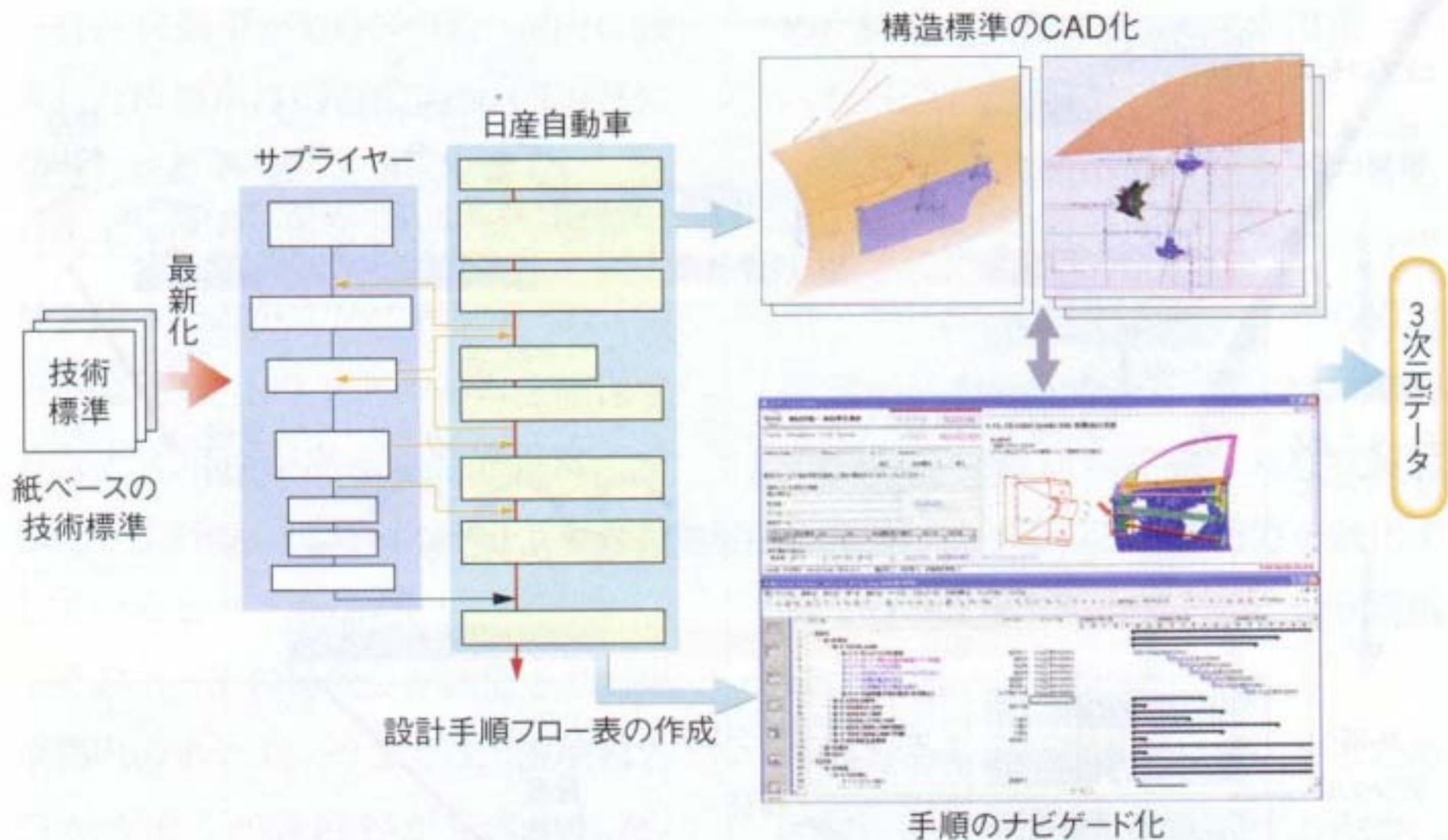


図3●ノウハウを組み込んだ設計支援システムの考え方

従来の技術標準書を基に、ベテラン設計者の設計の進め方をすべてフロー表として作成してある。設計者がこれから実施しようとする作業を指定すると、この手順がWebブラウザで参照でき、ひな型となる3次元データが提供される。設計者は手順に従って3次元データを改良していく。部品の位置関係が成立しない場合などは、警告を出す仕組みもシステムに盛り込んでいる。

Seven countermeasures for digitalization

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Some Simulation Examples in Automobile

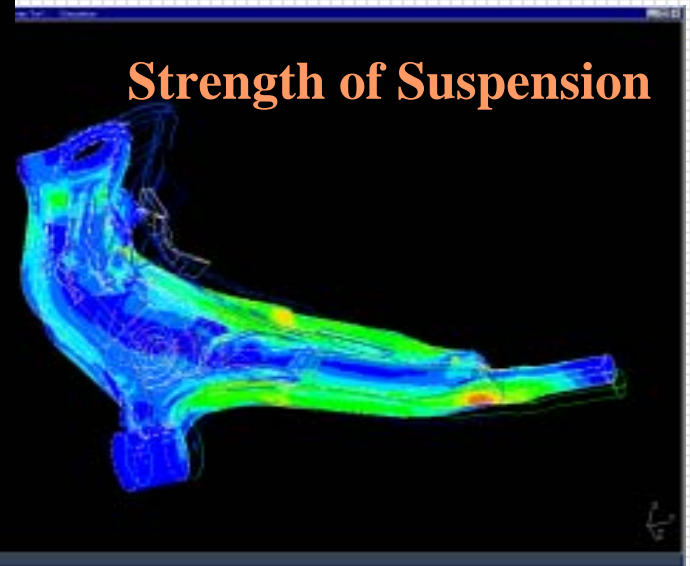
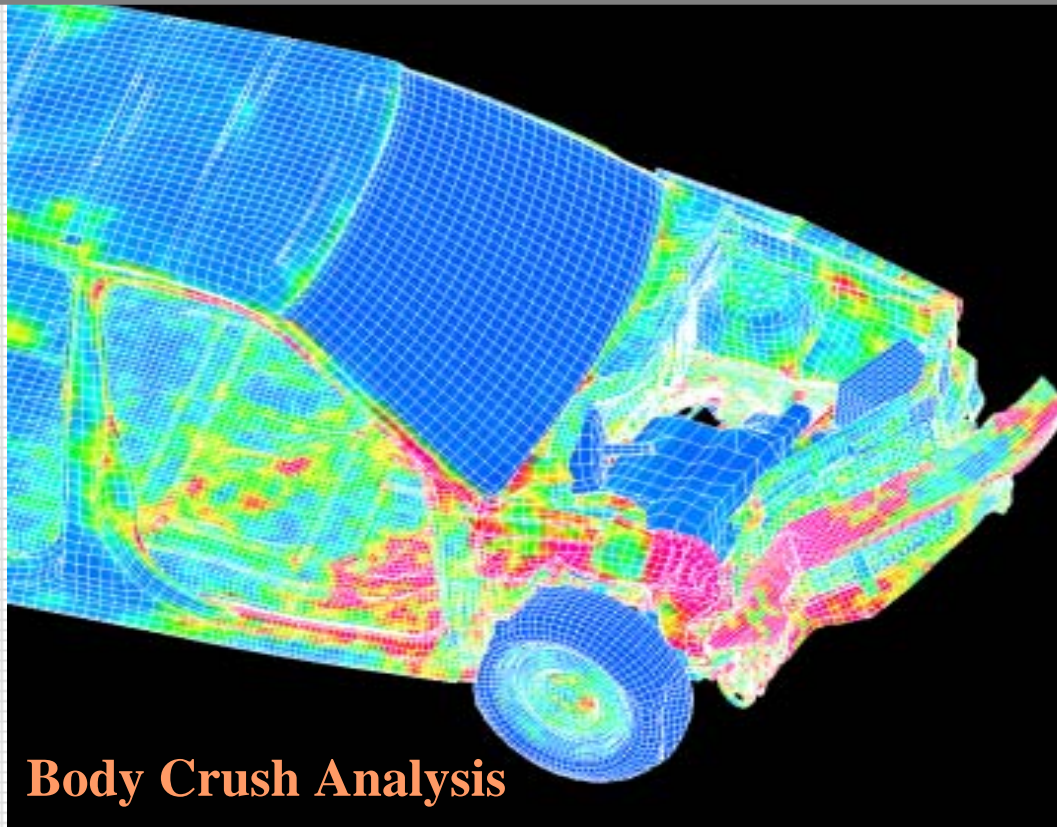


Fig. 8. Apply and Establish CAE Simulation

Seven countermeasures for digitalization



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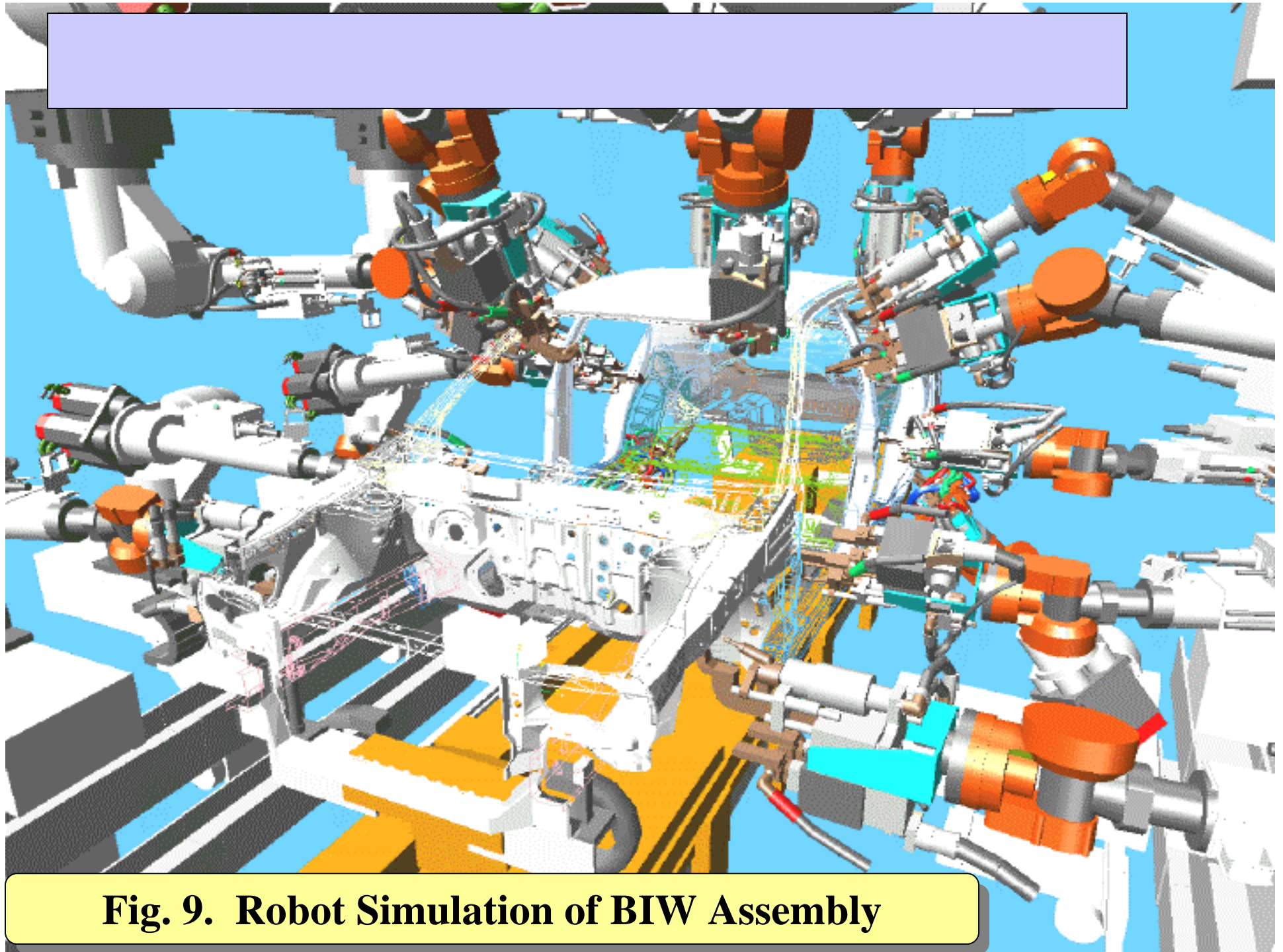


Fig. 9. Robot Simulation of BIW Assembly

**Table 1. “Seven countermeasures for digitalization”
and contributions for “Three Process Innovations”**

Process Innovations Countermeasures	CAD/CAM unification	Data Master Process	Digital Engineering Release Proces
(1) Realization of Styling CAD	◎	○	
(2) Body structure master data method, “KOGEN method”	◎	◎	
(3) Basic design work by DMU (Digital Mock Up)		◎	◎
(4) Drawing-less process		◎	◎
(5) Knowledge CAD			◎
(6) Use of analysis simulation		○	◎
(7) Digital production process verification		○	◎



Table 2. “Seven countermeasures for digitalization” and its Details

Countermeasures and effect		Detail countermeasures
(1) Realization of Styling CAD		(a) Establish Styling CAD system
	Assure initial 3D data of styling parts	(b) Train Styling CAD modeler
		(c) 3D shape measurement machine for full size clay model and deployment
(2) Body structure master data method, “KOGEN”		(a) Establish the work division of Engineer and CAD designer
	Assure “Growth of 3D Data” of auto body	(b) Train CAD designer
	combined by Styling and Structure	(c) Create the detail parts shape and assure for Tooling Division
		(d) Release simplified drawing from Body master data
(3) Basic design work by DMU		(a) Establish DMDR
	Concurrent engineering with collaboration of designer, analysis and production engineer	(b) Keep DMU experts team and data creation organization
		(c) Make the rule of DMU-BOM and apply practically.
		(d) DB system which create and maintain DMU BOM structure and parts 3D data
(4) Drawing-less process		(a) Make rules for three items, 3D-data, assistant drawings, data notes
	Speedup of technical information flow from design division to downstream division	(b) Establish the system to connect several division and several companies.
		(c) Establish the delivery rules of Proposal drawing data with suppliers
		(d) Develop and promotion of simple CAD system which is able to receive Drawing-less data.
(5) Knowledge CAD		(a) Standardization of design procedure and its digital description
	Speedup of design study and keep design quality	(b) Establish “Design guidance system” and penetration
		(c) Develop 3D-CAD Template and penetration for actual work
(6) Use of analysis simulation		(a) Develop technology to evaluate the performance in experiments experience.
	DMU performance evaluation instead of physical experiments	(b) Improve the accuracy of Body structural analysis which require longest lead-time.
		(c) Shorten the lead-time to prepare the final DMU.
		(d) Establish the dedicated body structuring Man-power,
(7) Digital engineering process verification		(a) Introduction CAPE systems and promote
	DMU productivity evaluation instead of physical models	(b) Training of Dedicated CAD designers process in German.
		(c) Standardization items should be defined, and satisfy for 1 day stay/

The Collaborative Digital Process Methodology



- **Growth and Utilization of Data**
- **Concurrent Engineering with DR(Design Review)-events**
- **Procedure to make "The Collaborative Digital Process"**

Make 3D model in detail planning phase and apply layout design and structural analysis. Add productivity specifications to design model and develop model finally to the CAM model for die manufacturing.

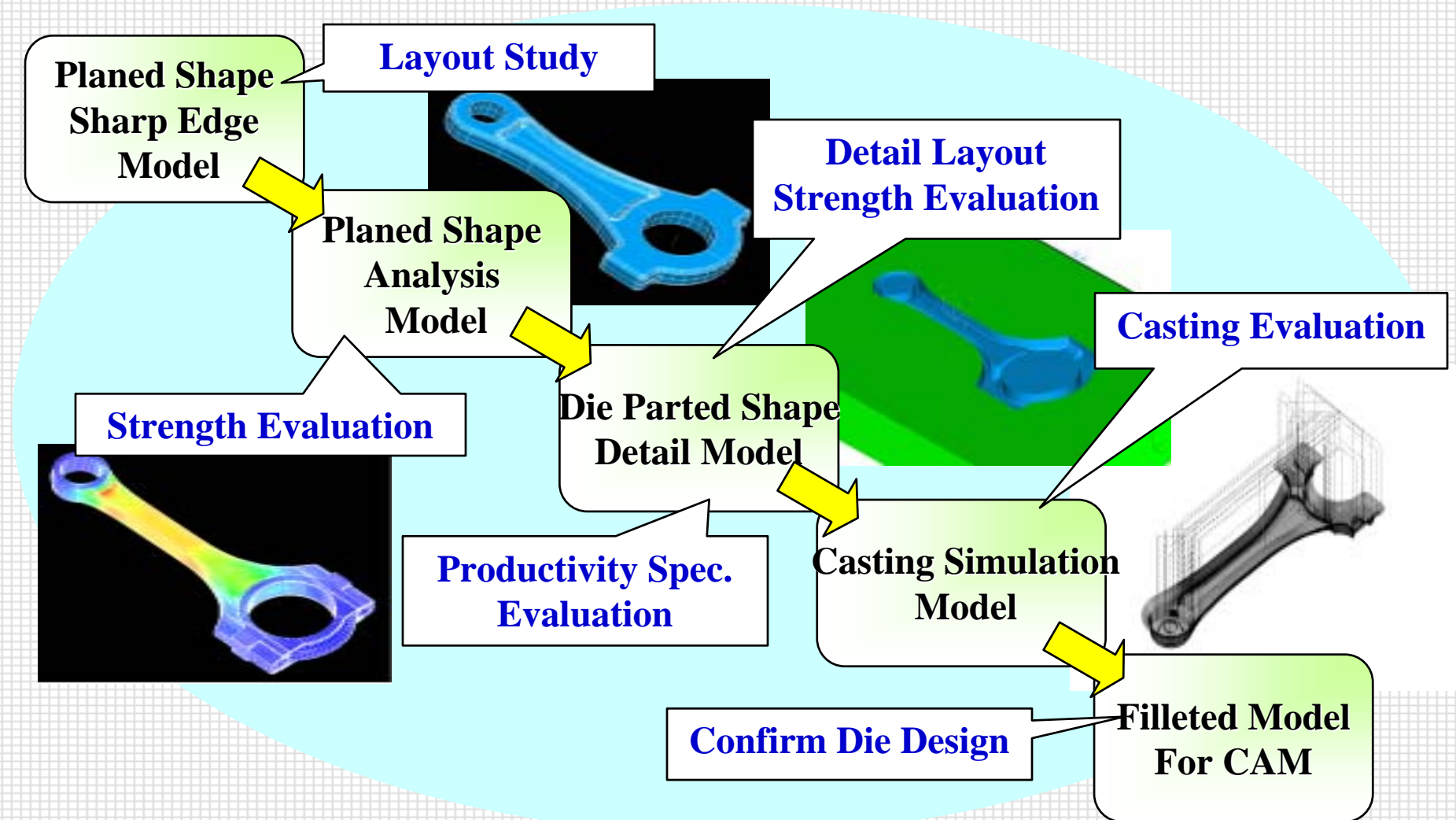


Fig. 10. Growth and Utilization of 3D Model

The Collaborative Digital Process Methodology



- **Growth and Utilization of Data**
- **Concurrent Engineering with DR(Design Review)-events**
- **Procedure to make "The Collaborative Digital Process"**

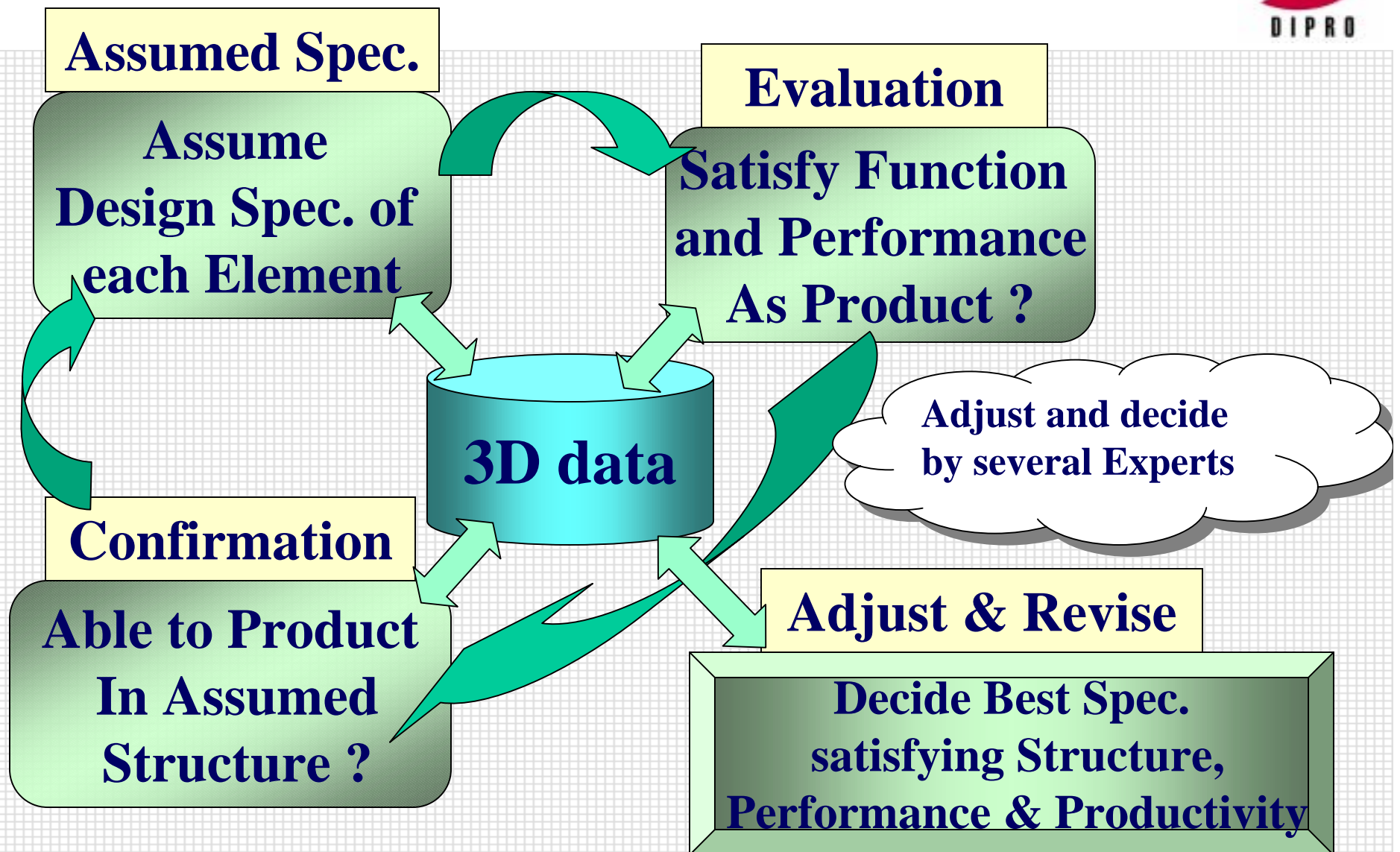


Fig. 11. Design Work with Collaboration



Process to assure "3D Layout", "Function and Performance", "Productivity" and "Design and Productivity in supplier" connecting the responsibilities of "design", "production engineering", "simulation" and "supplier" based on "Growing 3D data".

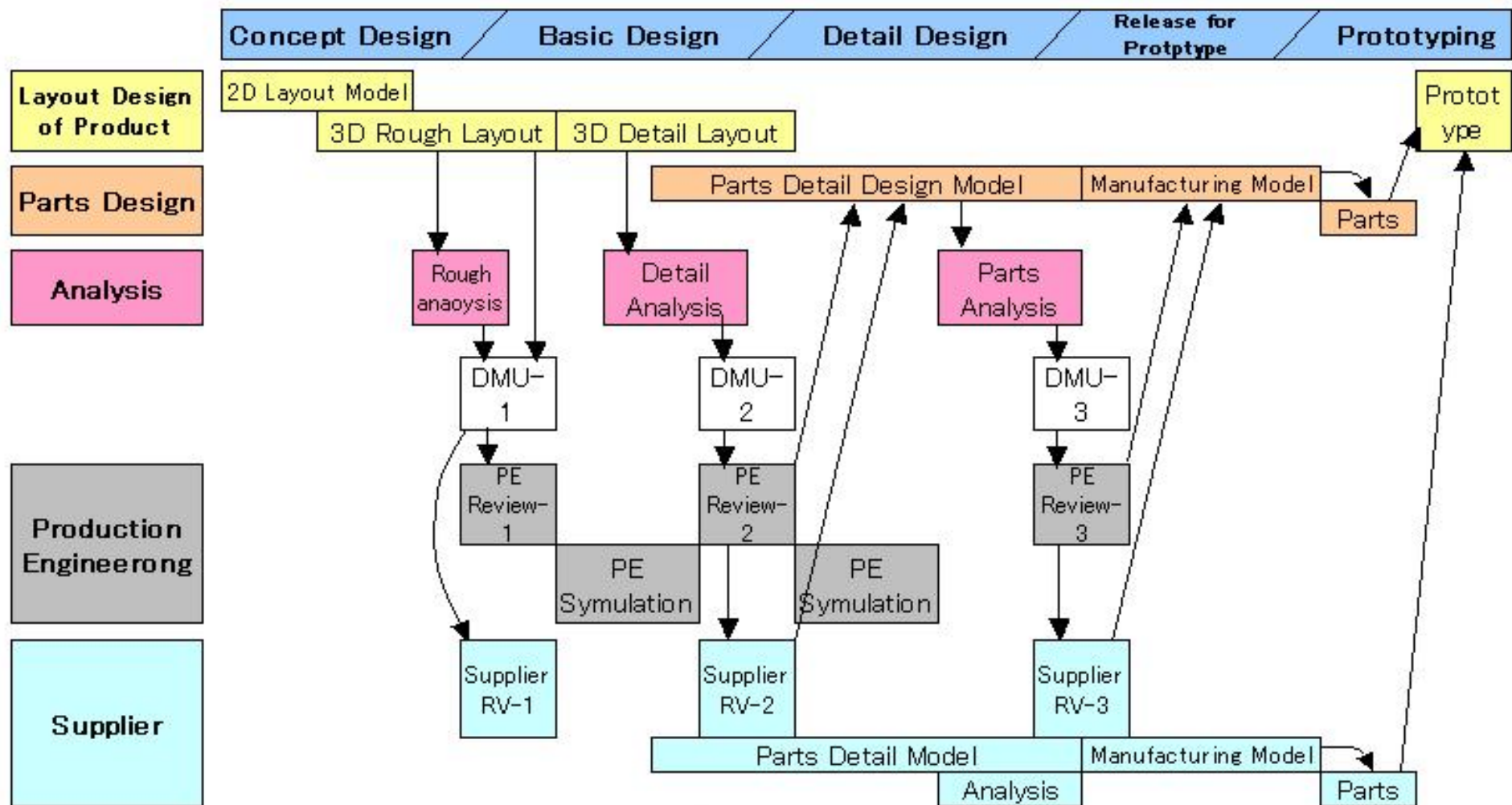


Fig. 12 Digital Collabolation Process

Table 3. “The Collaborative Digital Process Methodology” and “Seven countermeasures for digitalization”

Process Innovations Countermeasures	Growth and Utilization of Data	Concurrent Engineering with DR(Design Review)-events
(1) Realization of Styling CAD	⊙	
	Create Initial 3D data of styling parts	“Early design feed back” and “early start to manufacture die”
(2) Body structure master data method, “KOGEN method”	⊙	○
	Assure “Growth of 3D data” of Body	Biggest contribution to realize “concurrent Engineering”
(3) Basic design work by DMU (Digital Mock Up)	○	⊙
	Assure component 3D data and “Growth of 3D data” of Body	Realize concurrent engineering by collaboration with several division.
(4) Drawing-less process	○	
	Assure 3D data	Share technical data by several division
(5) Knowledge CAD		⊙
	Assure “Parts data”, “DMU data” in recent	“Early styling feed back” and “early manufacturing feed back”
(6) Use of analysis simulation	○	⊙
	Achieve Digital experiment car	Collaboration of “Design spec.” and “Evaluation by Productivity”
(7) Digital production process verification	○	⊙
	Achieve Digital production car	Collaborative Process for “Design Specs.” and “Productivity confirmation”

The Collaborative Digital Process Methodology



- **Growth and Utilization of Data**
- **Concurrent Engineering with DR(Design Review)-events**
- **Procedure to make "The Collaborative Digital Process"**

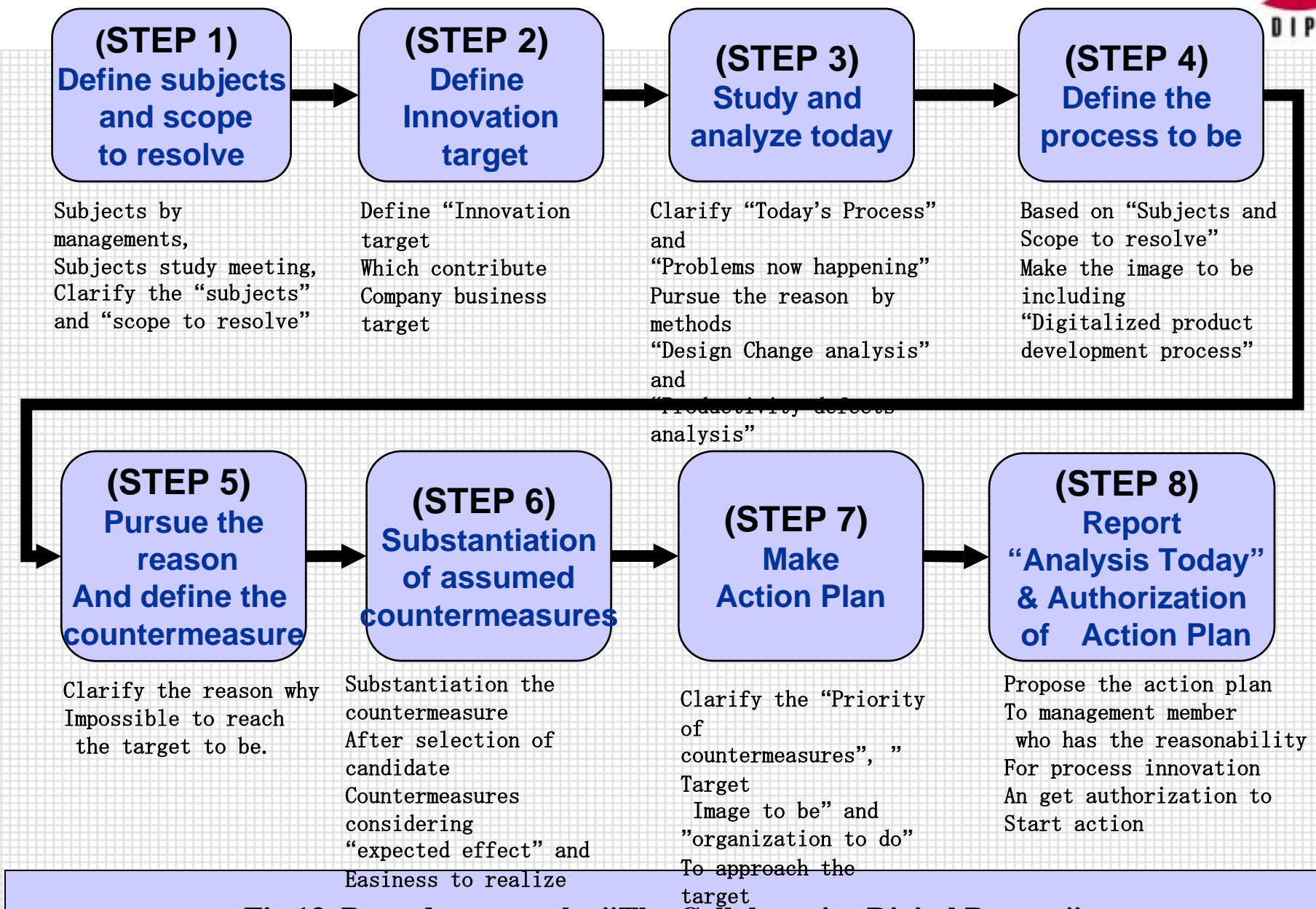


Fig.13 Procedure to make "The Collaborative Digital Process"

Thank you for your attention!

