

Product Development Delphi

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Funded by:



- ♦ 23 questions
 - Weighted ranking questions
 - Independent questions
 - Open ended questions
- ♦ 11 responses
 - 2 OEM
 - 6 Tier 1
 - 3 Tier 2 and above
- ♦ Analysis
 - Median response
 - Weighted analysis
 - Robustness analysis

Questions

- I. BUSINESS PHILOSOPHY, ORGANIZATIONAL FACTORS AND SUPPLIER CAPABILITIES
 - I.1. Business Philosophy Focus
 - I.2. Impact of Organizational Factors
 - I.3. Impact of Supplier Capabilities
 - I.4. Influence of Business Philosophy, Organizational Factors and Supplier Capabilities
 - I.5. Allocation of development resources
 - I.6. Sources of innovation

- II. DESIGN METHODS, TOOLS, AND CRITERIA
 - II.1. Impact of Design Methods
 - II.2. Impact of Design Tools
 - II.3. Influence of Design Criteria
 - II.4. Impact of product design methods, tools, and design criteria
 - II.5. Engineering Efficiency Improvements
 - II.6. Engineering Efficiency Metrics

- III. INTERACTIONS AND COLLABORATION
 - III.1. Interactions
 - III.2. Communication Methods
 - III.3. Impact of Organizational and Human Resource Management Factors
 - III.4. Impact of Communication Methods and Impact of Organizational and Human Resource Management Factors

- IV. GENERAL
 - IV.1. PD&D Development Time (New Platform)
 - IV.2. PD&D Development Time (Carryover Platform)
 - IV.3. Tool Release Time
 - IV.4. Impact of Design Philosophy, Design Systems, and Collaboration

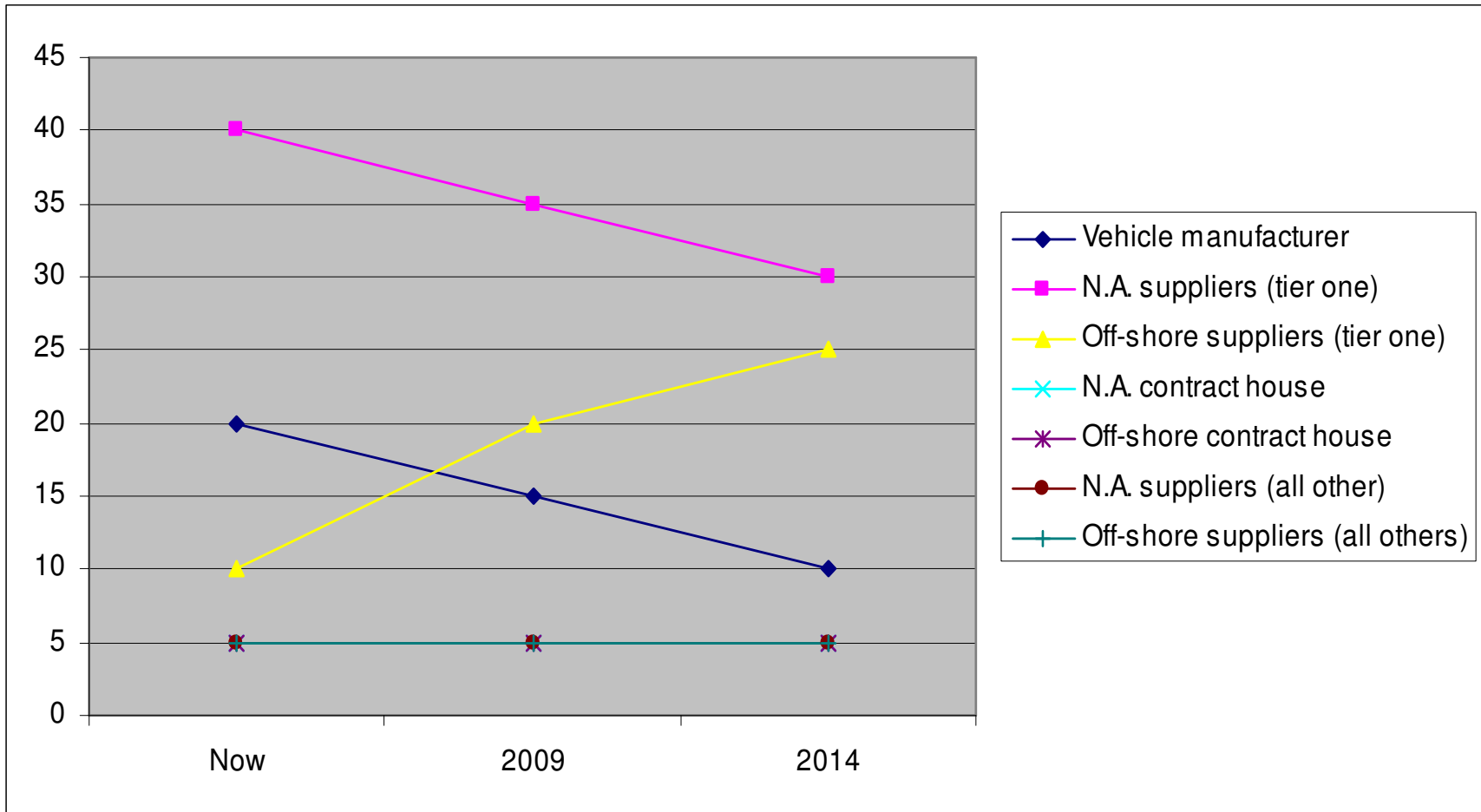
Allocation of Development Resources

- ♦ For the following question, please choose the system or systems you are most familiar with.
 - Body
 - HVAC
 - Chassis / Suspension
 - Electrical / Electronics
 - Engine / Transmission
 - Test / Validation / Certification
 - Interior
 - Other (specify)

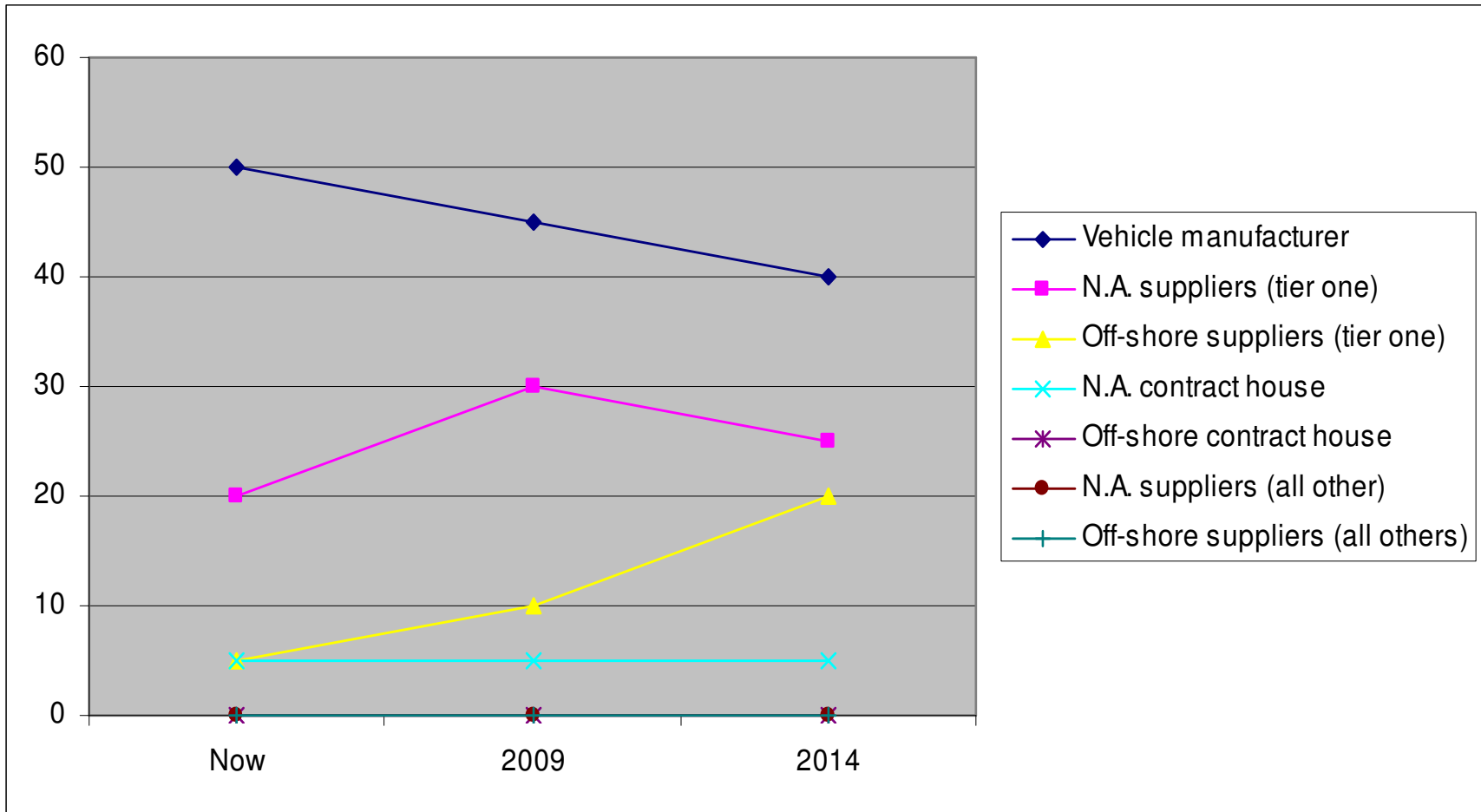
- ♦ What percentage of product-design-and-development, in terms of percent of product development budget expended, do you think is currently performed and will be performed by each organization?
 - Vehicle manufacturer
 - N.A. suppliers (tier-one and system integrators)
 - Off-shore suppliers (tier-one and system integrators)
 - N.A. contract house (engineering services firms)
 - Off-shore contract house (engineering services firms)
 - N.A. suppliers (all others)
 - Off-shore suppliers (all others)

- ♦ Subsystems analyzed only if there were sufficient responses
 - Engine / Transmission (7 responses)
 - Interior (5 responses)
 - All other systems(5 responses)

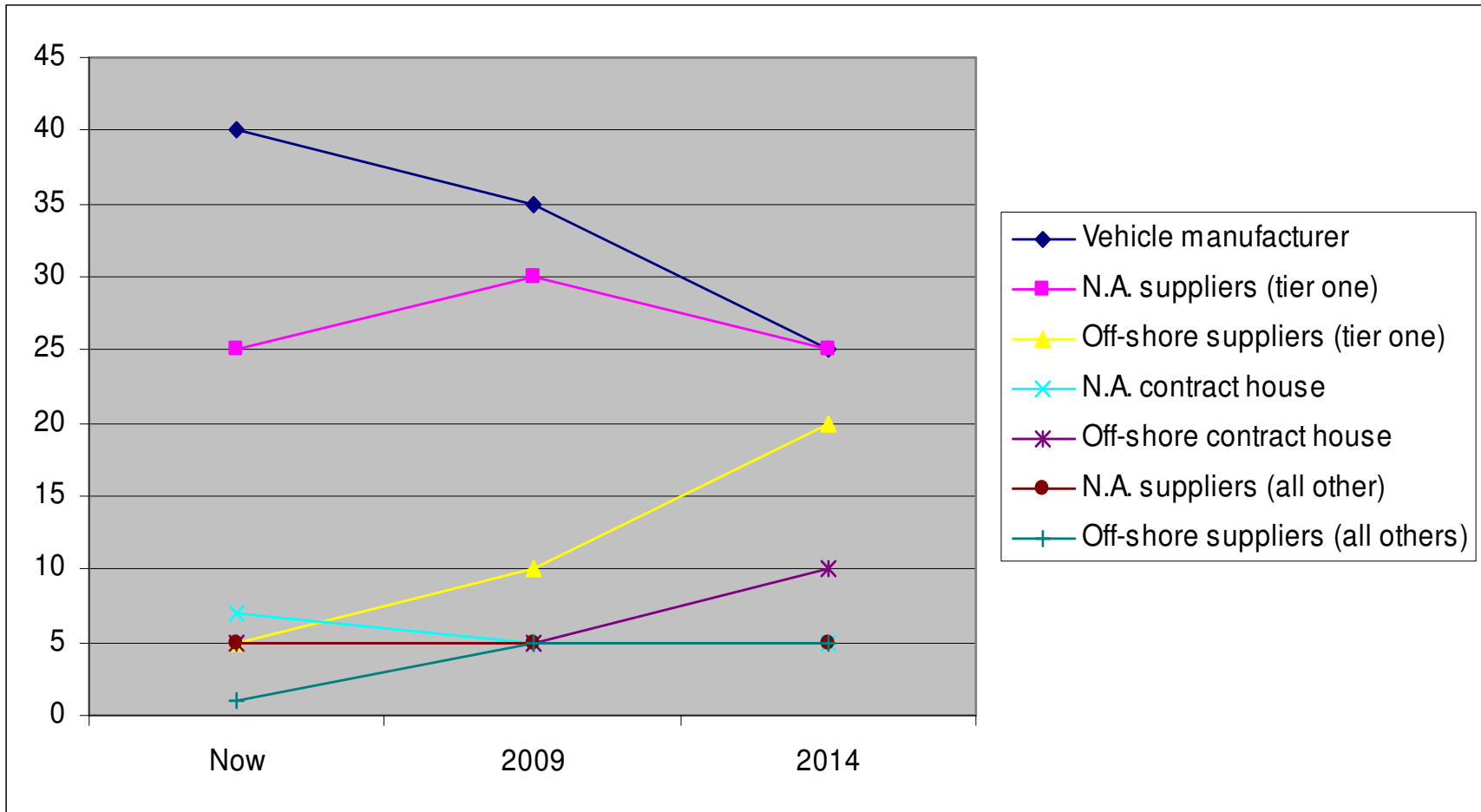
Interior



Engine / Transmission



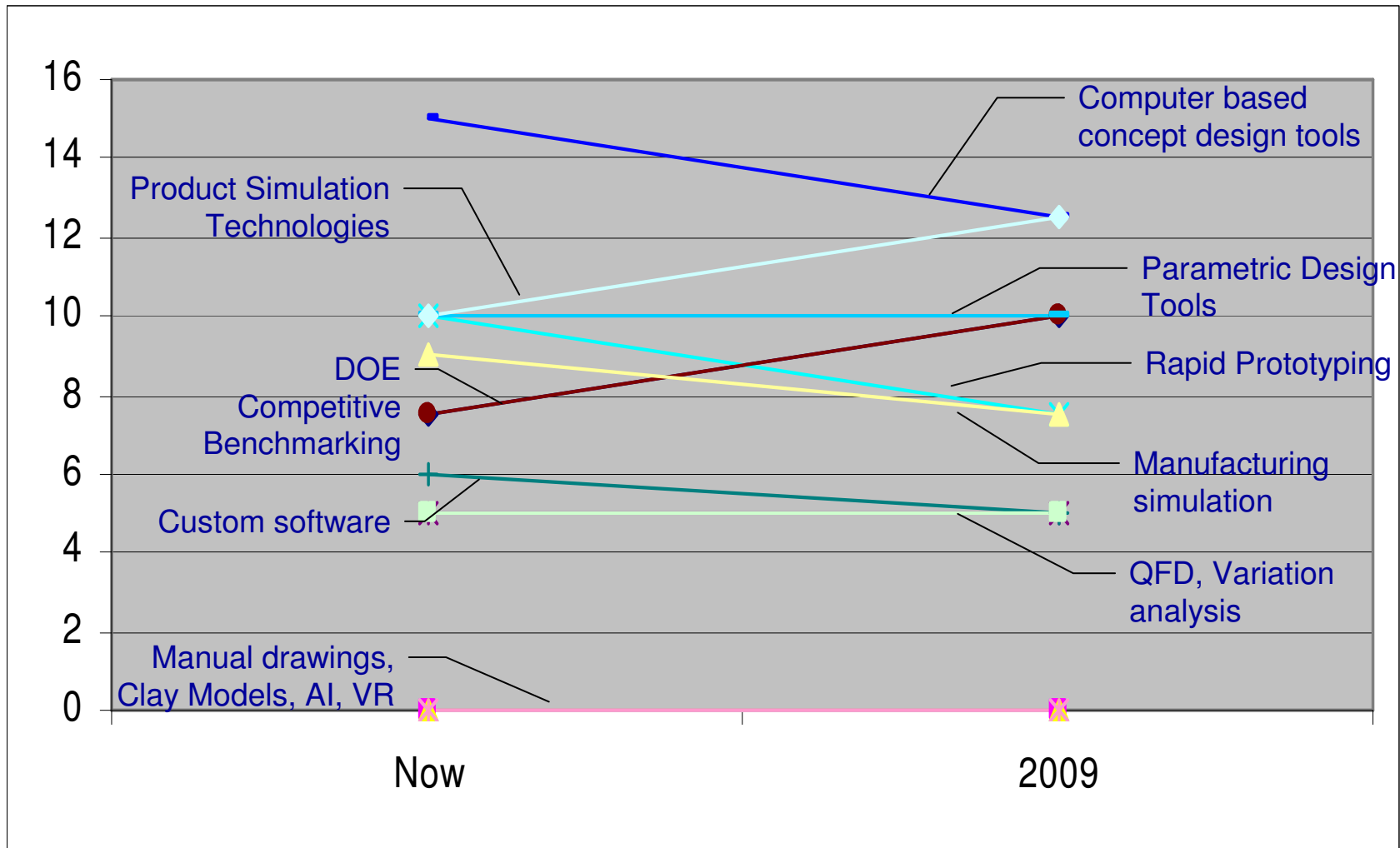
All Other Systems



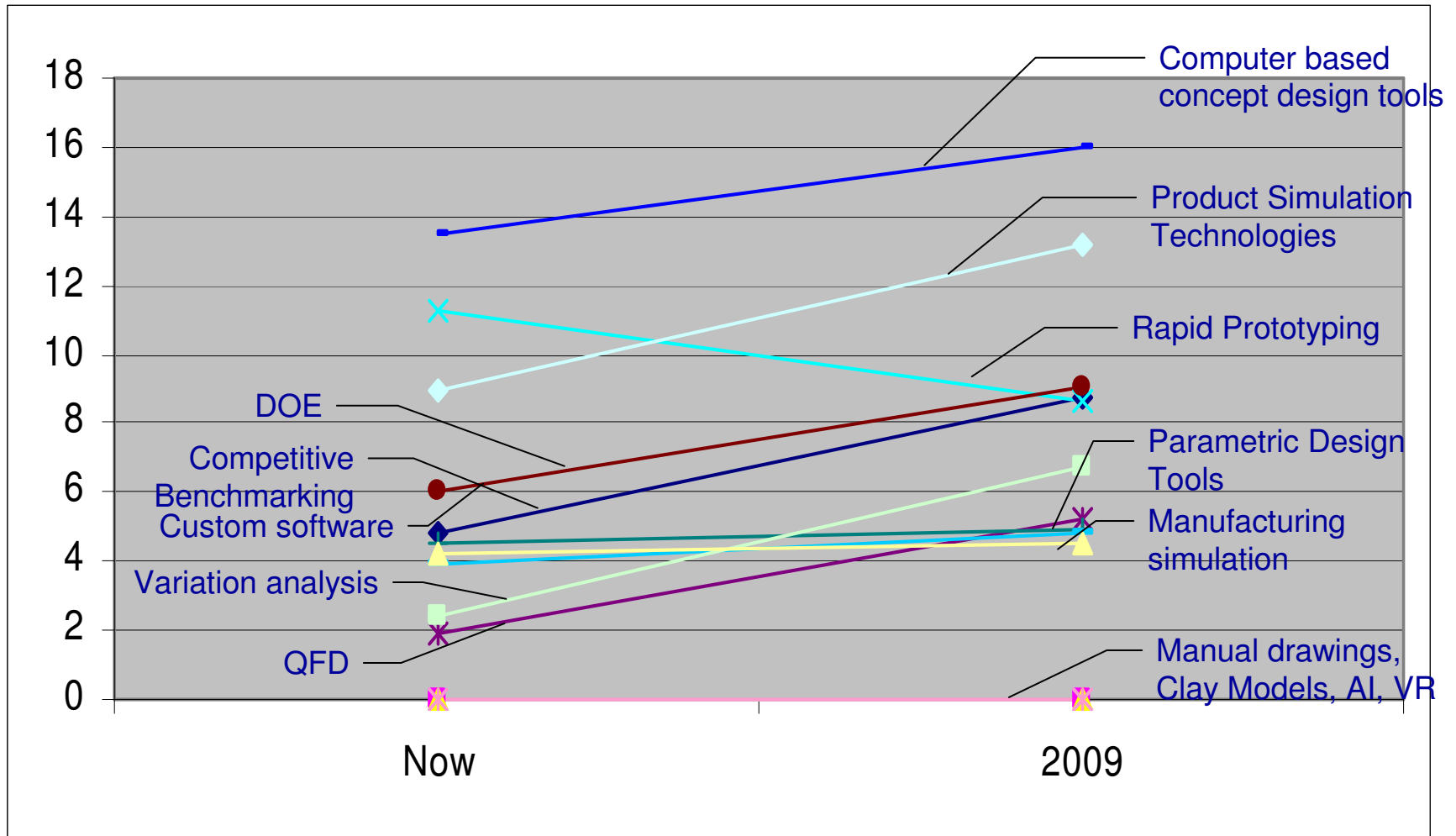
Design Tools

- ◆ Please prioritize the current and future influence of each of the following Design Tools on your company's product design and development success by distributing 100 points in each column.
 - Competitive benchmarking
 - Manual drawings / sketches
 - Clay models
 - Rapid prototyping / physical prototyping
 - Quality Function Deployment
 - Designed experiments (DOE)
 - Customized in-house software tools
 - Computer based tools for conceptual design
 - Parametric design tools
 - Product simulation technologies (crash, heat flow, dynamics etc.)
 - Computer aided tolerancing / variation analysis
 - Simulation of manufacturing and assembly activities
 - Virtual reality
 - Artificial intelligence / expert system / neural network

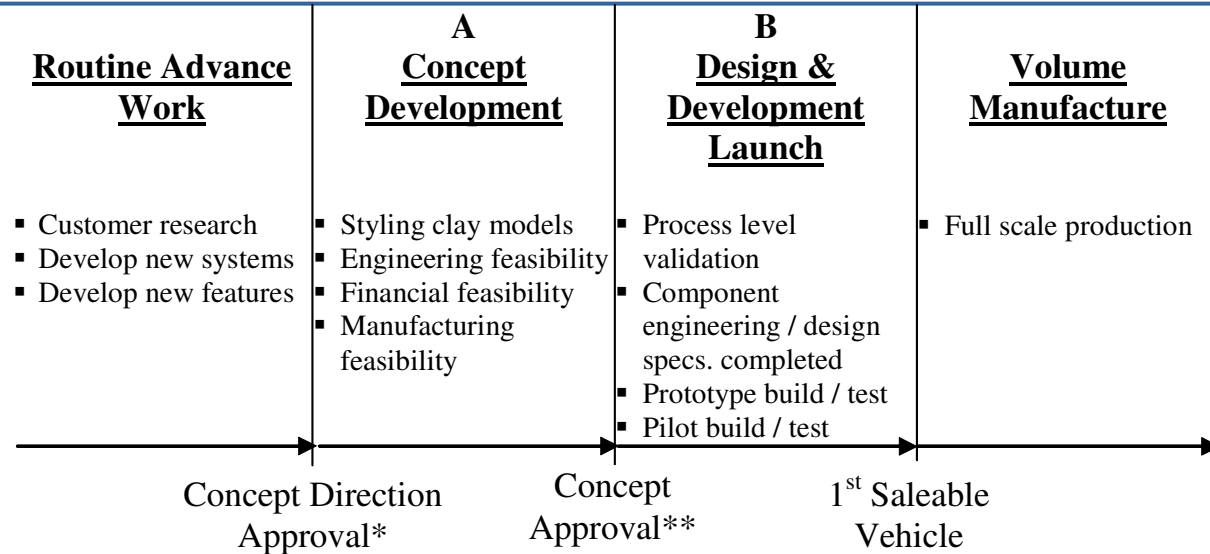
Impact of Design Tools (raw analysis)



Impact of Design tools (weighted)



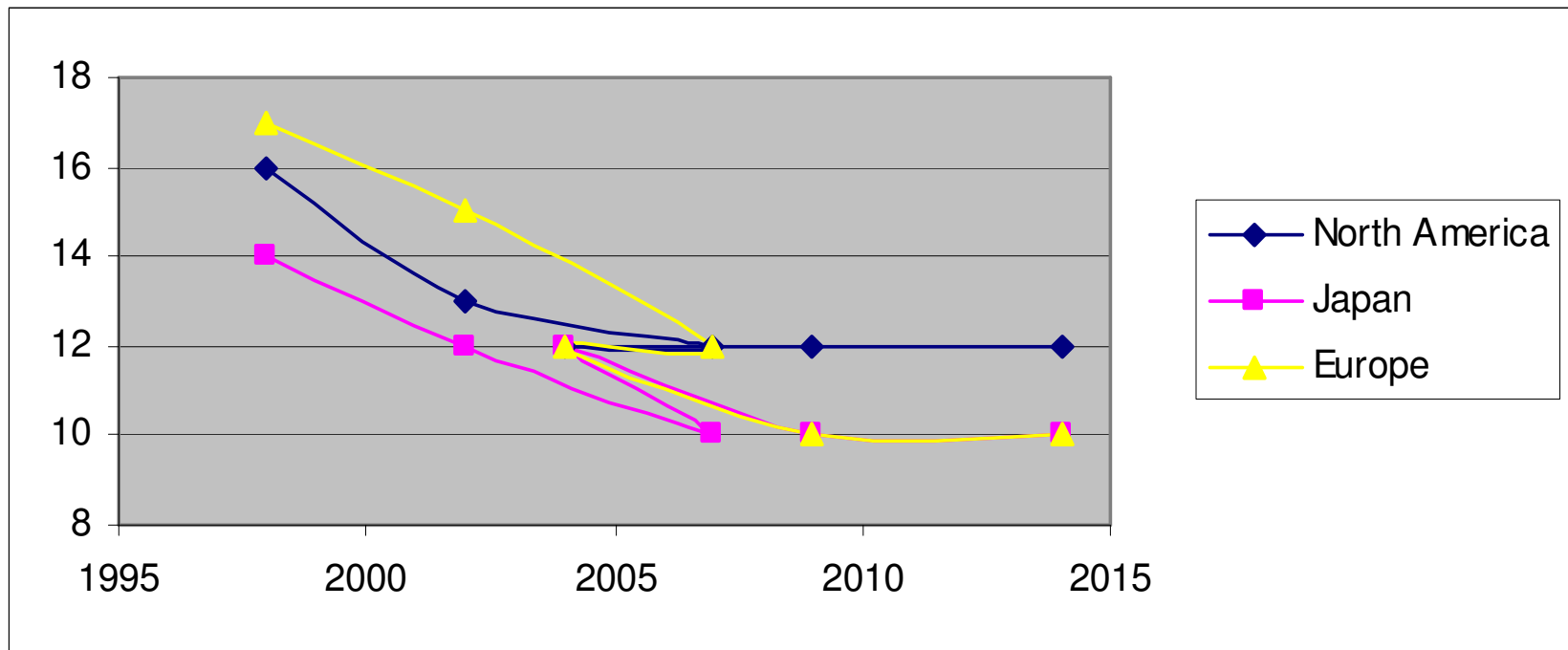
Product Development Time



- ◆ Using the diagram above, please give your expectations, in months, for part “A” (Concept Development period) and part “B” (Design and Development period) of the vehicle development cycle. In this case, base your estimates on new platforms for high-volume vehicles (more than 50,000 units / year), by geographic area. Please estimate for current development cycles, and for development cycles in the year 2009 and 2014 for the manufacturers whose home base is in the geographic areas listed below (e.g., GM-Opel and Honda of America would be included in your estimates for North America and Japan, respectively).

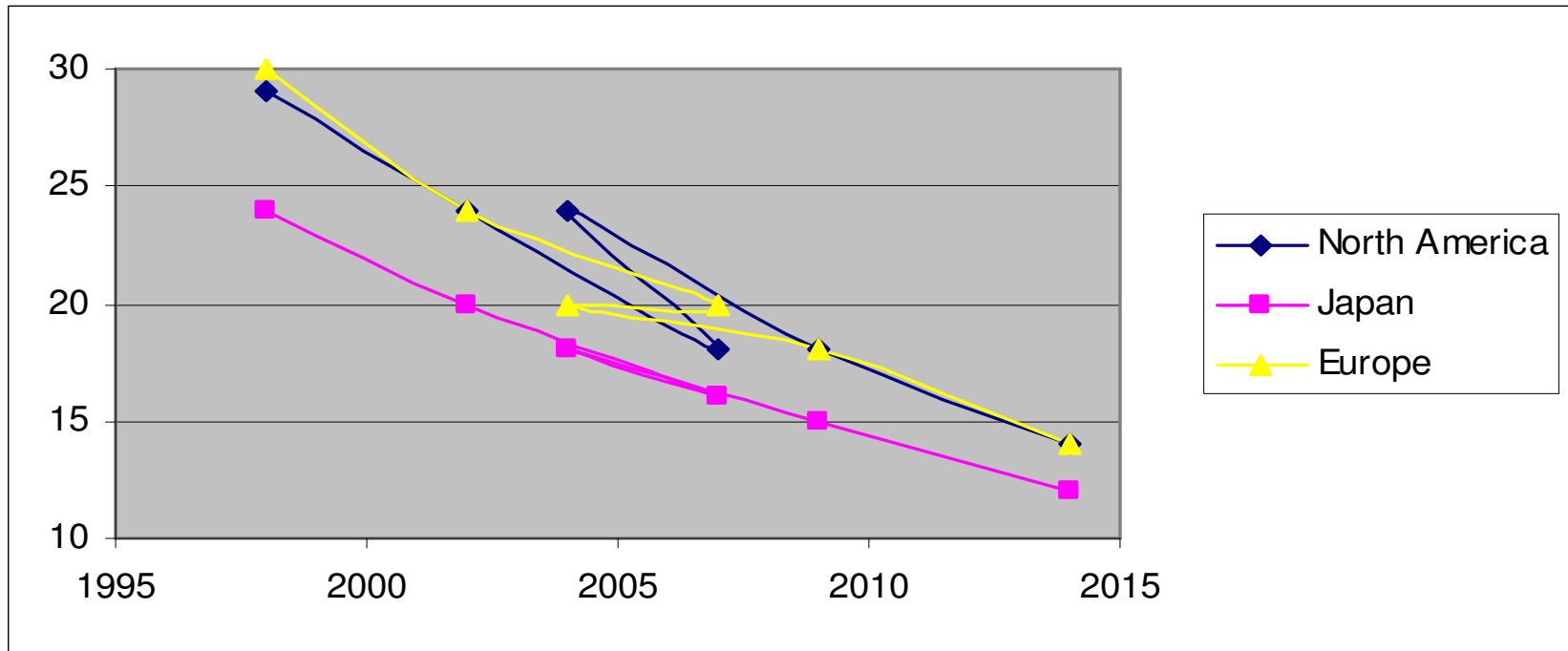
PD&D Development Time New Platform – Concept (A)

	Previous Delphi			Current Delphi		
	1998	2002	2007	2004	2009	2014
North America	16	13	12	12	12	12
Japan	14	12	10	12	10	10
Europe	17	15	12	12	10	10



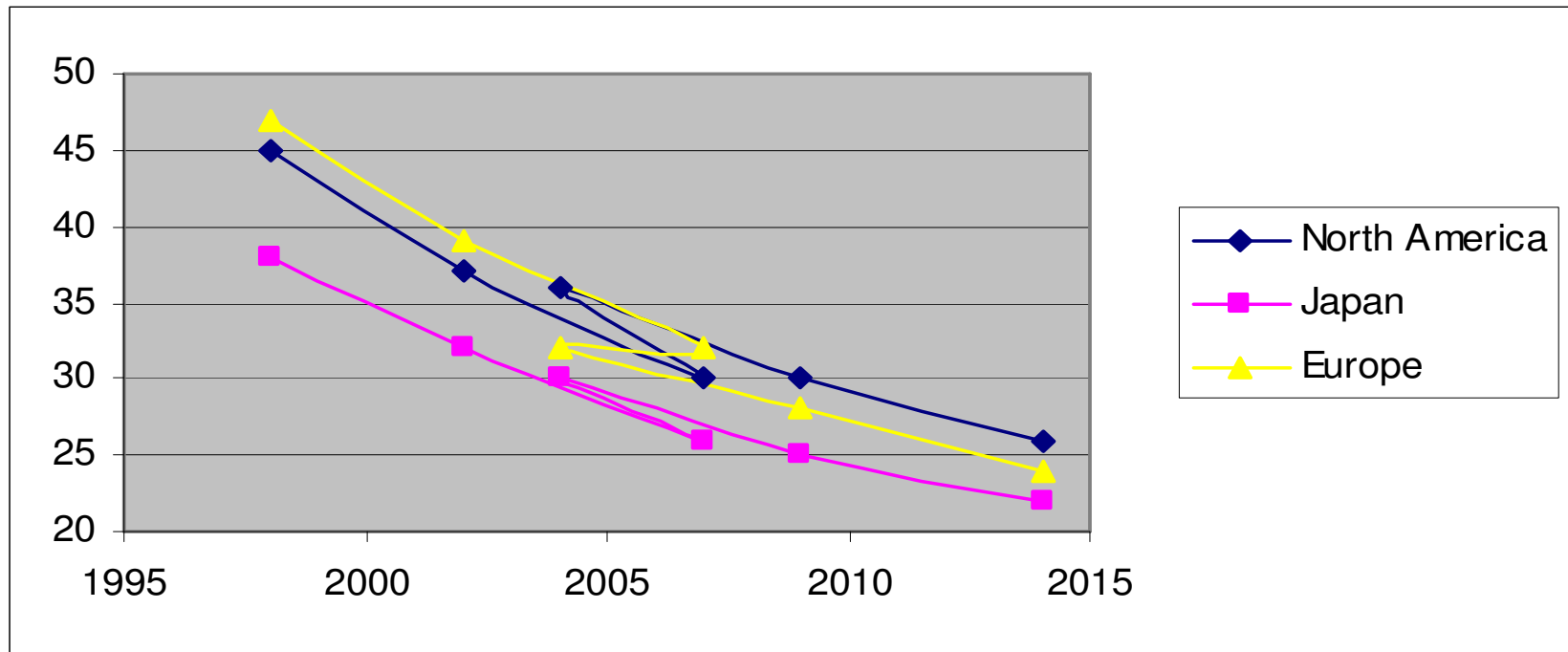
PD&D Development Time New Platform – Launch (B)

	Previous Delphi			Current Delphi		
	1998	2002	2007	2004	2009	2014
North America	29	24	18	24	18	14
Japan	24	20	16	18	15	12
Europe	30	24	20	20	18	14



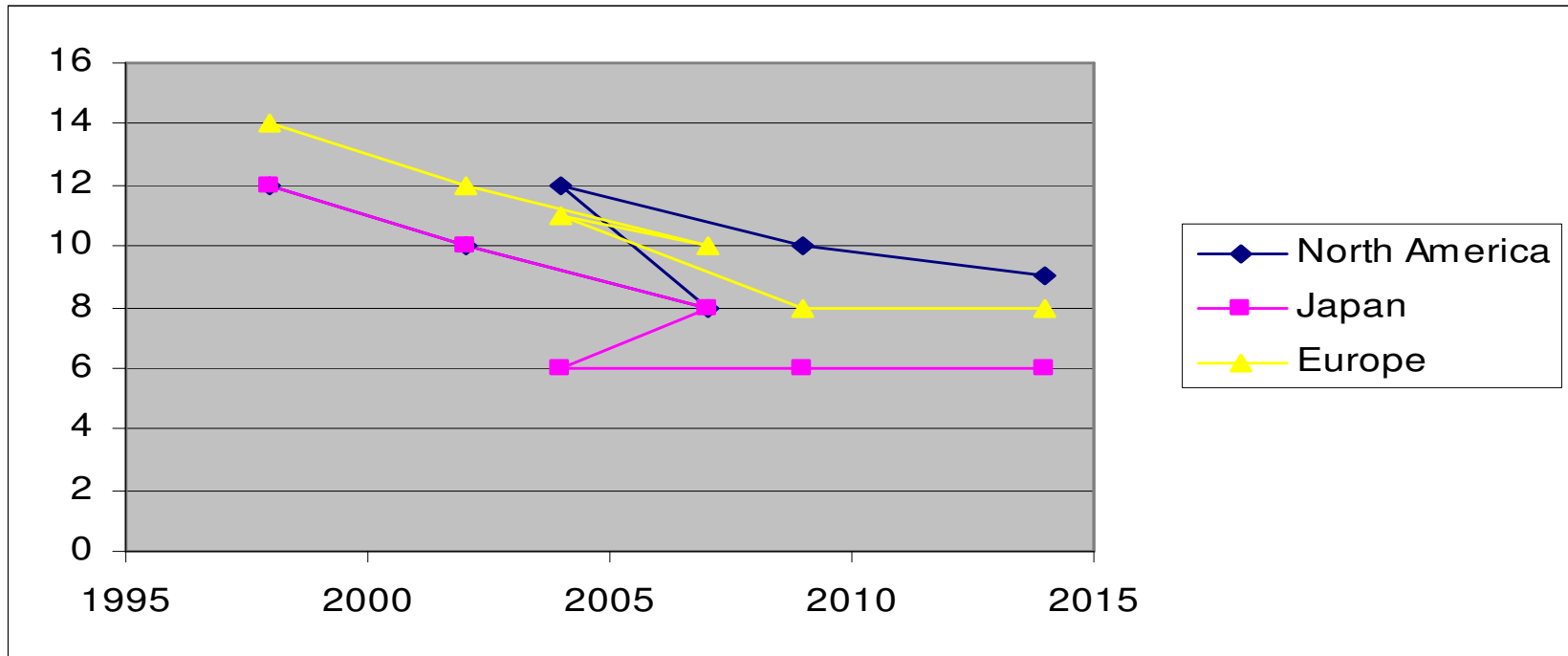
PD&D Development Time New Platform – Total (A+B)

	Previous Delphi			Current Delphi		
	1998	2002	2007	2004	2009	2014
North America	45	37	30	36	30	26
Japan	38	32	26	30	25	22
Europe	47	39	32	32	28	24



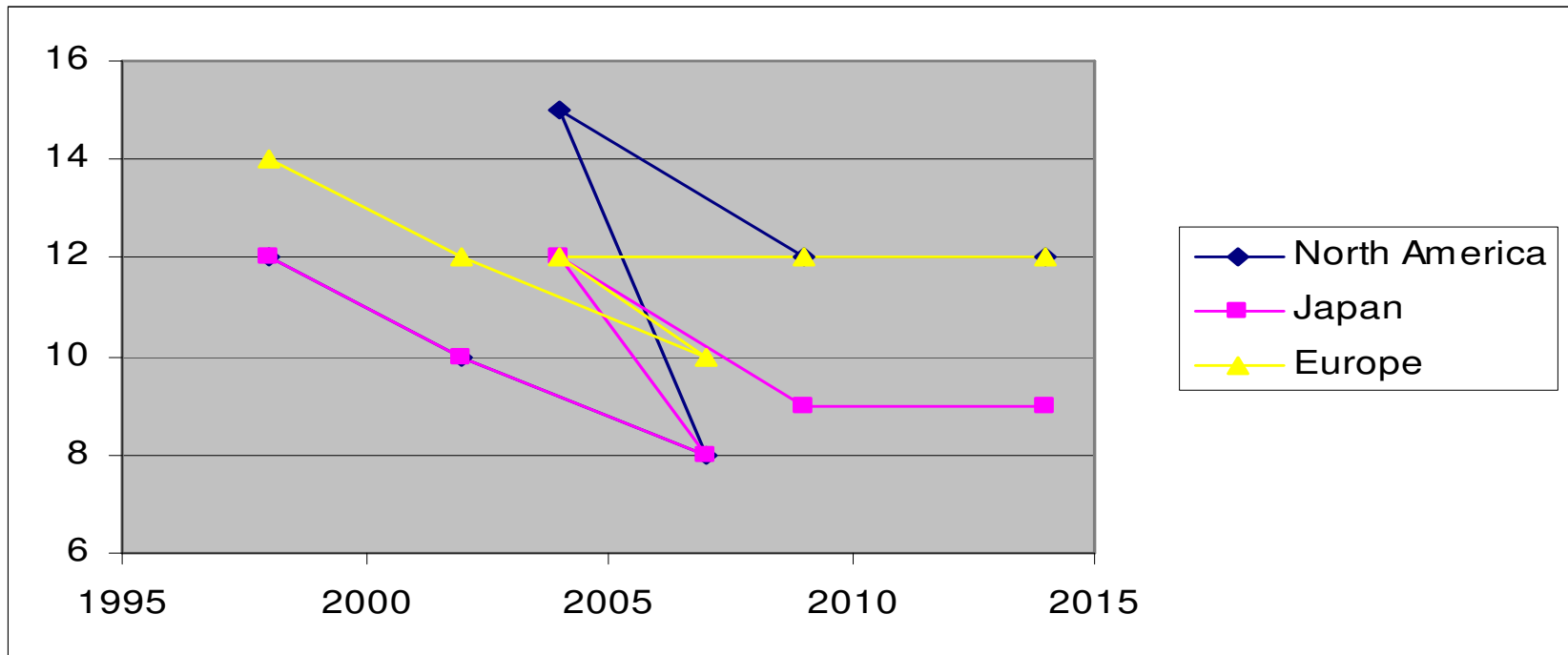
PD&D Development Time Existing Platform – Concept (A)

	Previous Delphi			Current Delphi		
	1998	2002	2007	2004	2009	2014
North America	12	10	8	12	10	9
Japan	12	10	8	6	6	6
Europe	14	12	10	11	8	8



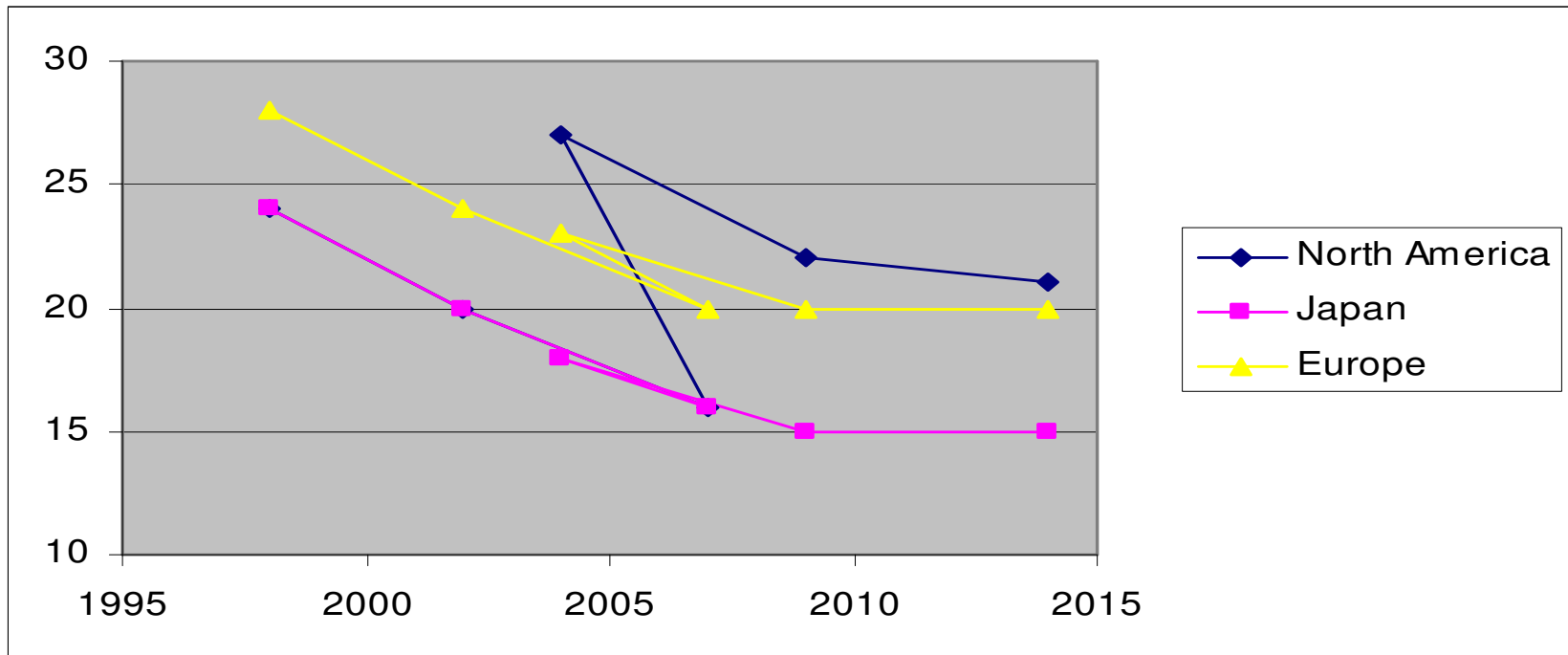
PD&D Development Time Existing Platform – Launch (B)

	Previous Delphi			Current Delphi		
	1998	2002	2007	2004	2009	2014
North America	12	10	8	15	12	12
Japan	12	10	8	12	9	9
Europe	14	12	10	12	12	12



PD&D Development Time Existing Platform – Total (A+B)

	Previous Delphi			Current Delphi		
	1998	2002	2007	2004	2009	2014
North America	24	20	16	27	22	21
Japan	24	20	16	18	15	15
Europe	28	24	20	23	20	20



Other Major Conclusions

- ♦ Communication methods, specifically email and face-to-face meetings, are and will remain the most important factors to product development success.
- ♦ Product design criteria, such as PD time and budget, final product cost, DFMA, and styling rank also very highly. The specific constraints are a function of the vehicle system. Depending on the system, some criteria had greater importance than the communication methods.
- ♦ Increased design discipline is currently the most important business strategy for product success. However, it is anticipated that this will likely improve over the next 5 years such that emphasis can be shifted to the second most important factor: math based engineering.
- ♦ Product innovation will become one of the most important supplier capabilities for product design
- ♦ DFMA and design for durability and reliability are the most important design methods.
- ♦ While the organizational factors presented to the respondents were generally not as important to product development success, organizational and project management factors were the most often listed as the barriers to product development success.

Conclusion/Summary

- ◆ Outsourcing and off-shoring will continue.
- ◆ Computer based tools (concept, product, variation) will gain in importance.
- ◆ Japanese are fastest, Europeans second, US third.
- ◆ Communication methods (electronic and direct face-to-face) are the most important factors to product development success and will remain so.

Thank you

END