Model-Based Engineering: Opportunities, Risks, and Best Practices

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Research Vice President

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Model-Based Engineering

Using idealized representations of technical content as significant support of engineering reasoning, evaluating, decision making, and creating.

The representations and the infrastructure that supports them are convenient for sharing, collaborating, adapting, innovating, and re-using

Key Issues

- What economic, business, and technology factors currently make model-based engineering a significant opportunity?
- What are today's major challenges at enabling model-based engineering?
- What top priorities for planning model-based engineering and best practices for implementing it?

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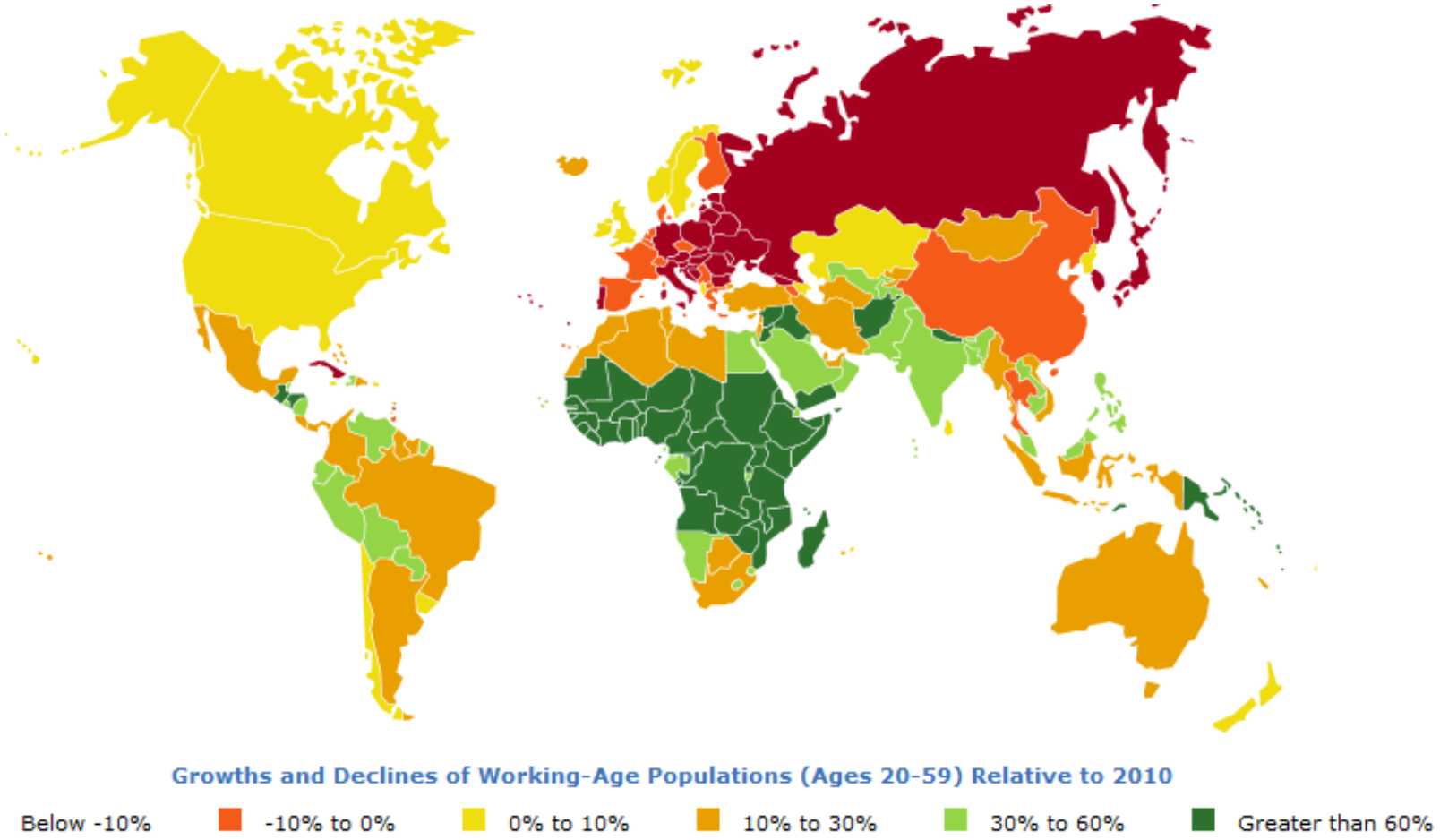
Organizations Need Agility to Address Changing Global Business Conditions

Changing Demographics



http://www.rand.org/publications/randreview/issues/2011/winter/world.html

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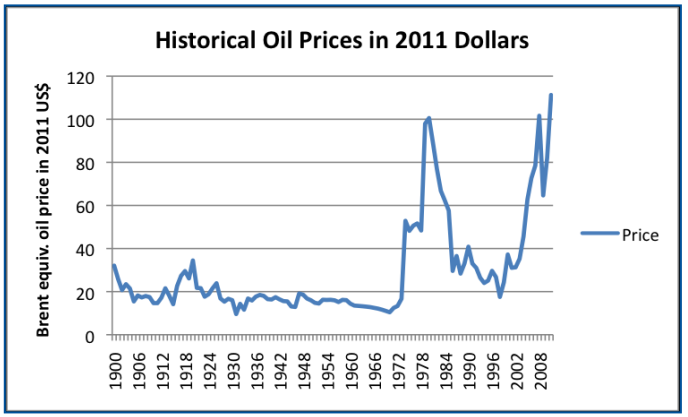
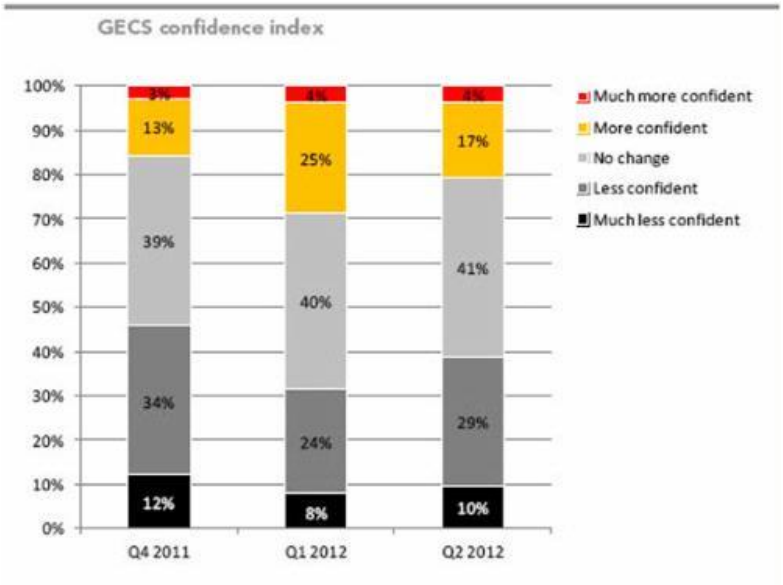
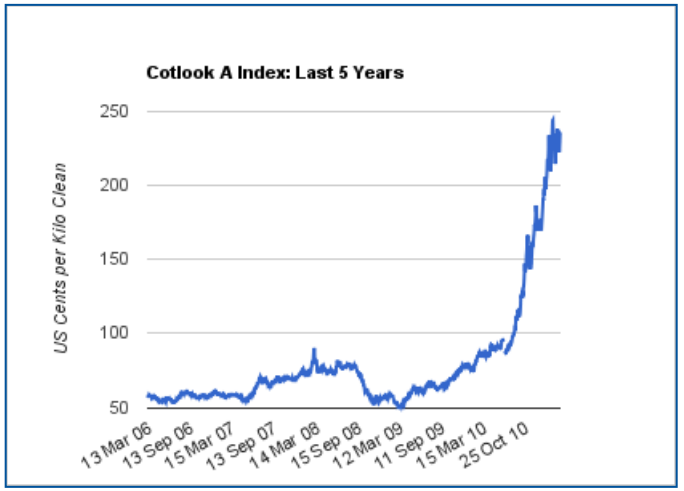
Organizations Need Agility to Address Changing Global Business Conditions

Source: U.S. Energy Information Administration, U.S. Bureau of Labor Statistics

Uncertain Materials Pricing







Source: http://www.emergingtextiles.com

Source: The Association of Chartered Certified Accountants(ACCA), Global economic conditions survey report: Q2, 2012

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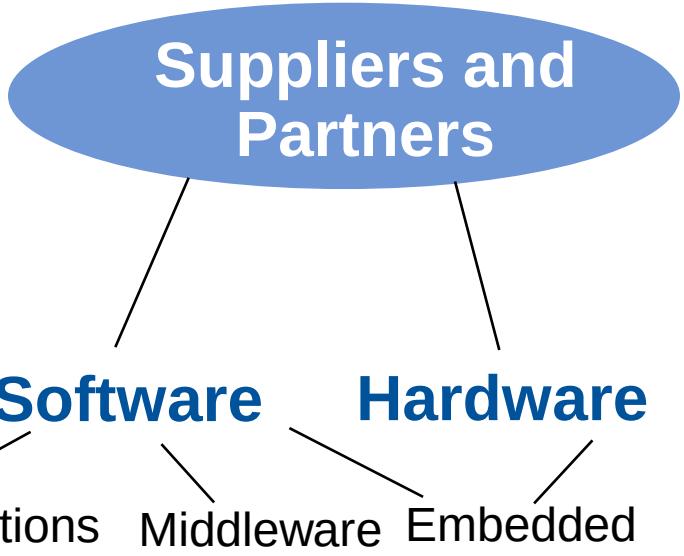
Embedded Software Increases Complexity of Product Design and Quality Risks

Cars

Smart Devices



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Even Computerized Clothing

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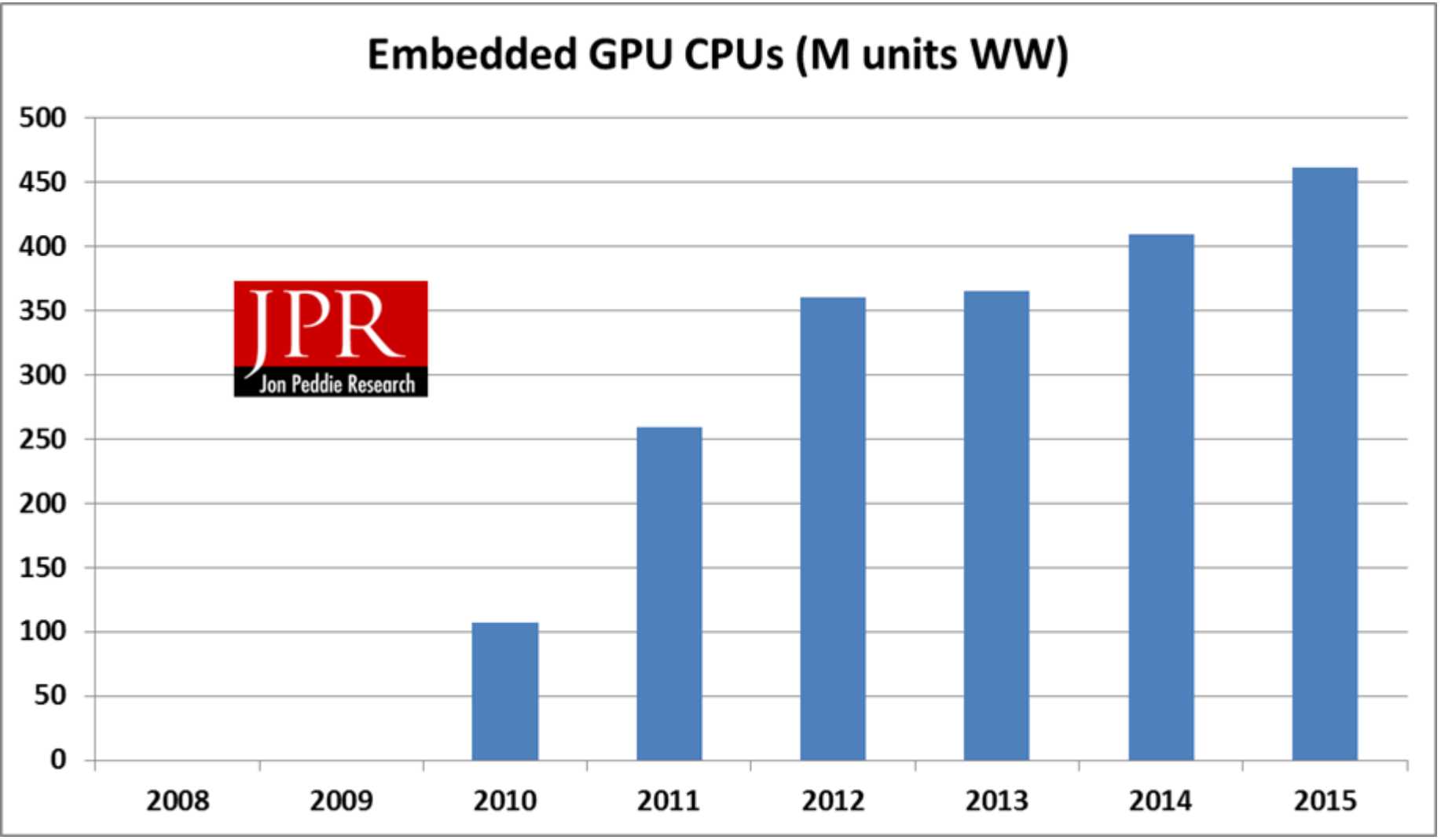
HPU/GPU Will Further Accelerate Ongoing Hardware Price / Performance Advances



Source: Jon Peddie Research, 2012

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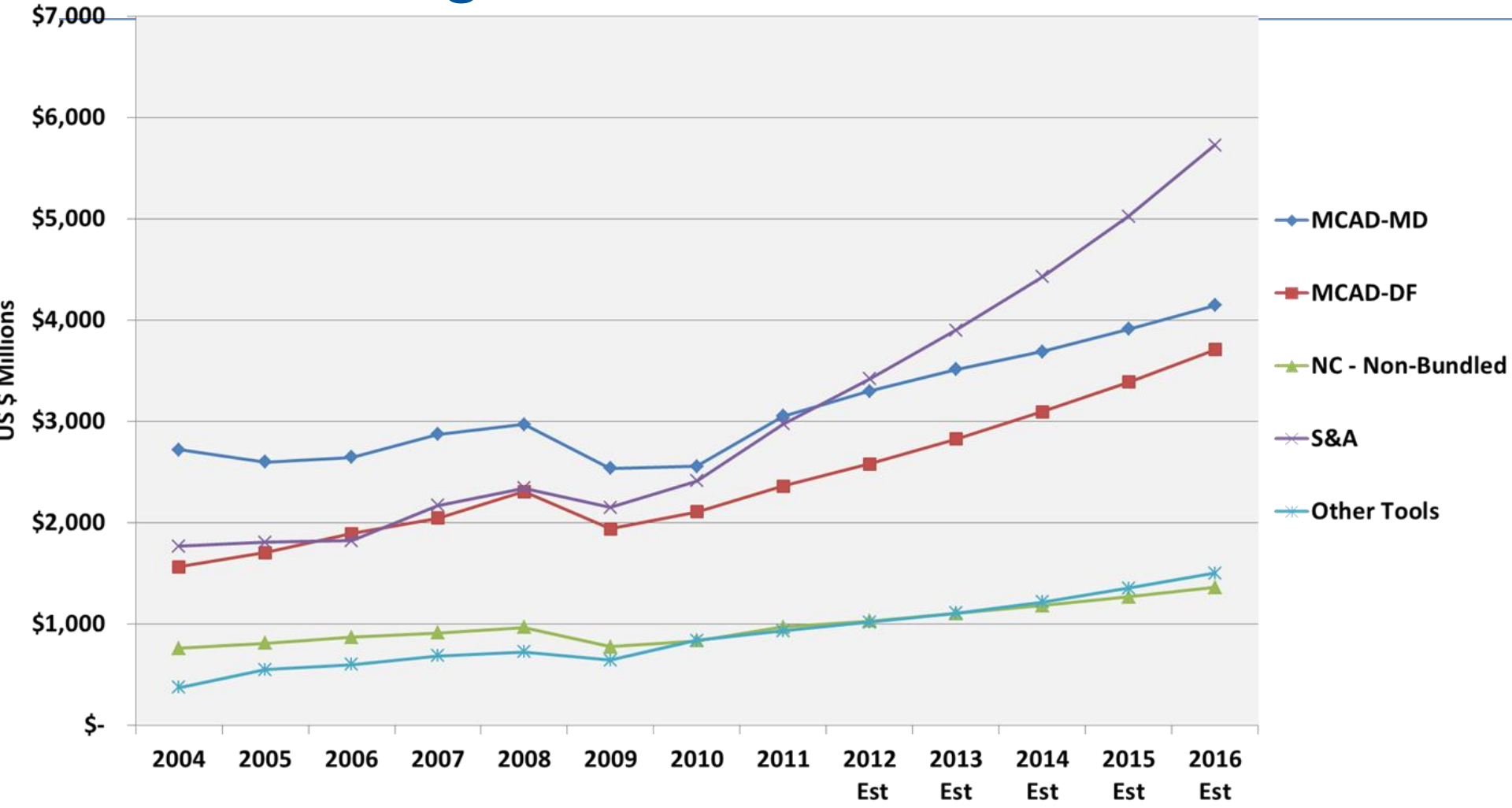
Enabling Software Markets are Growing and Maturing



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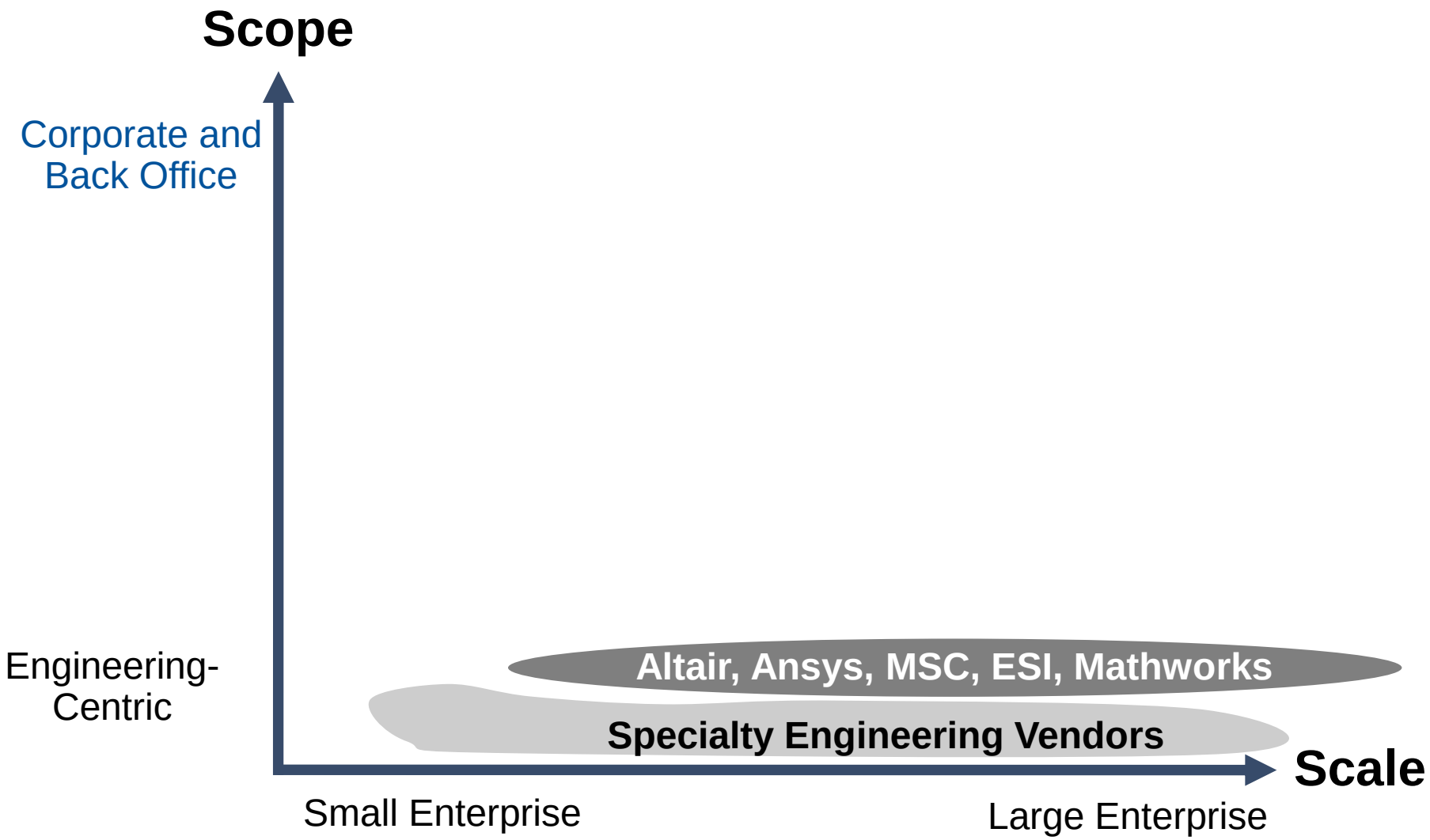
Maturing Market of Commercial Vendors with Ongoing Innovation



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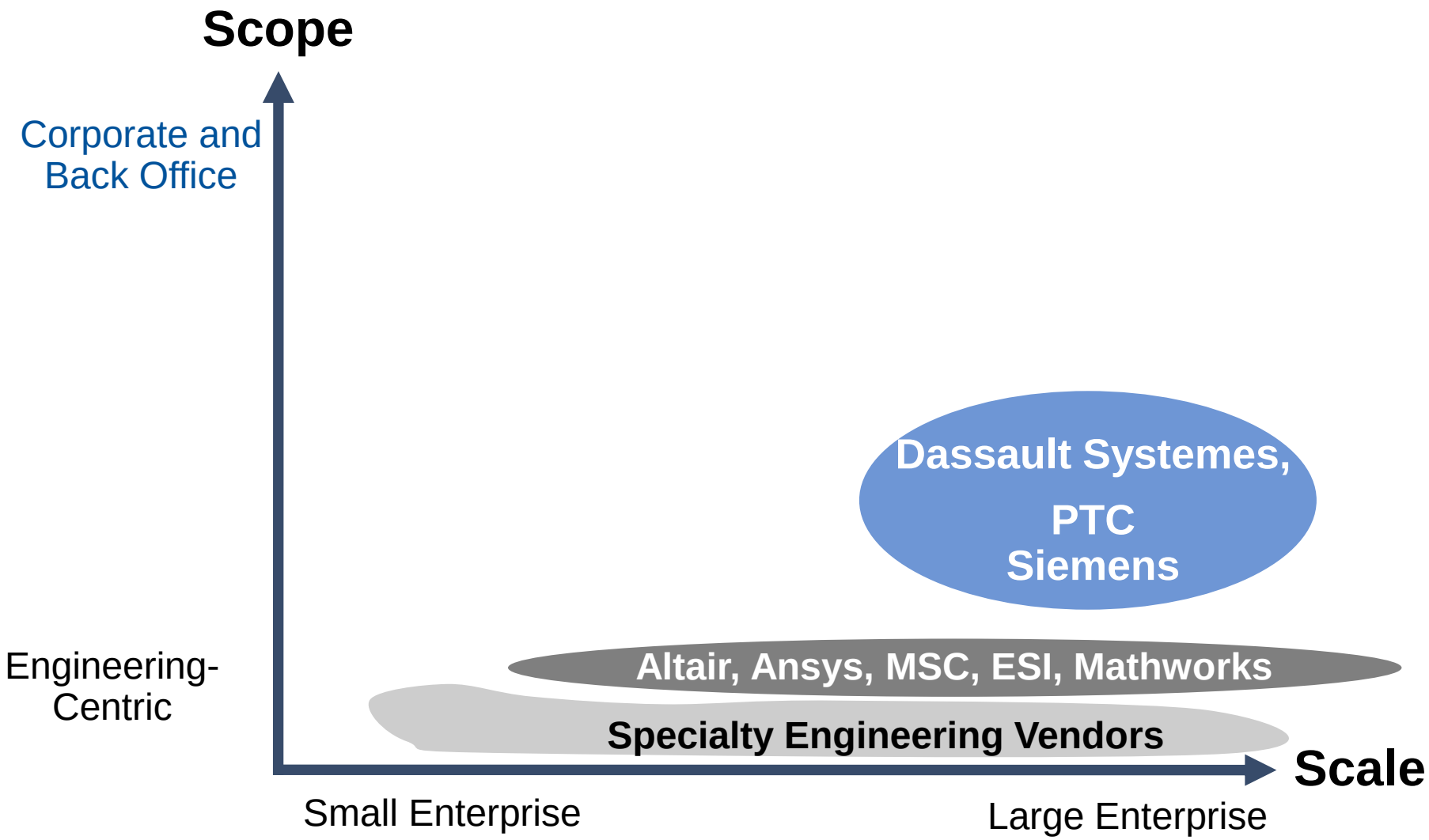

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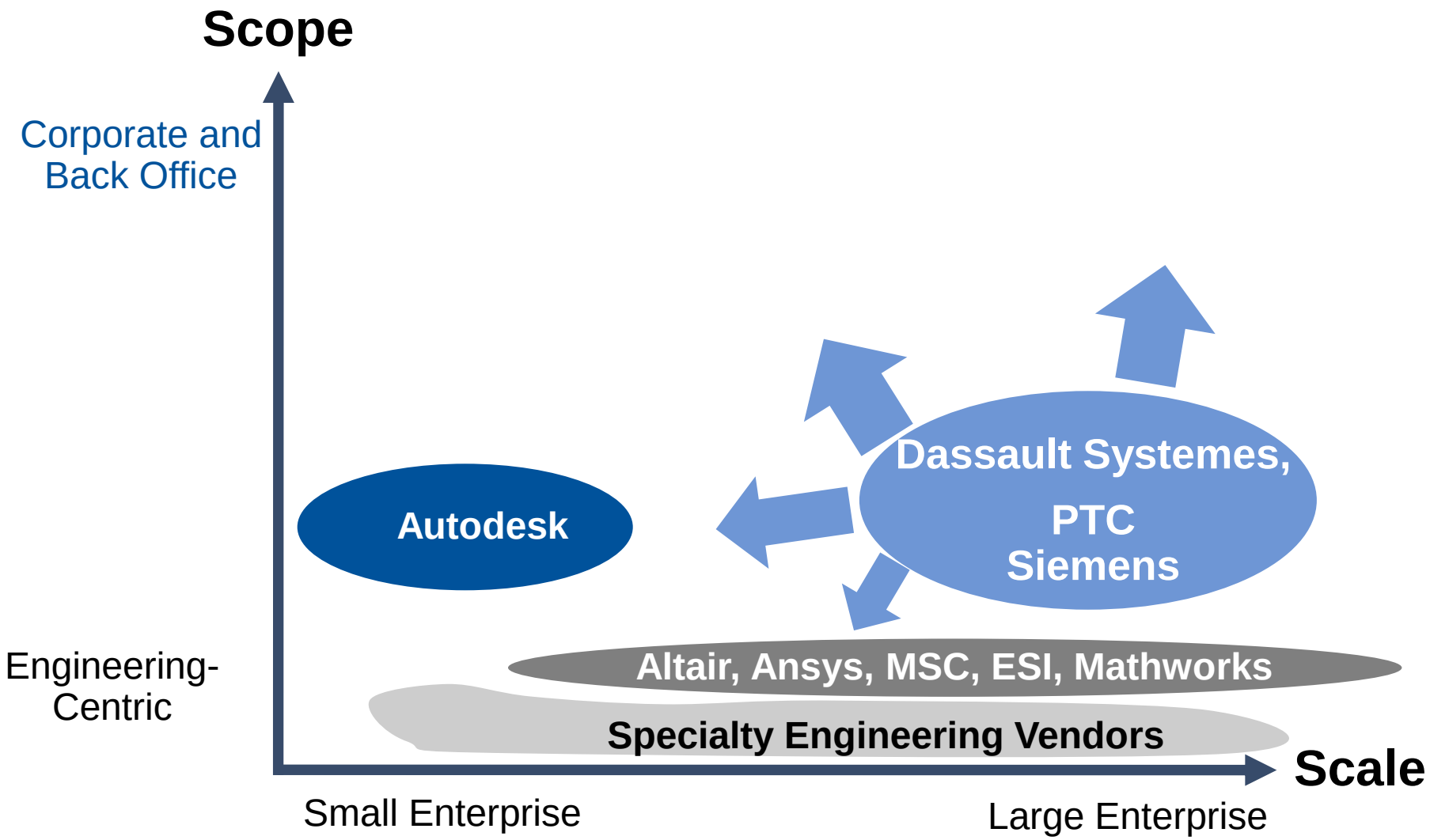

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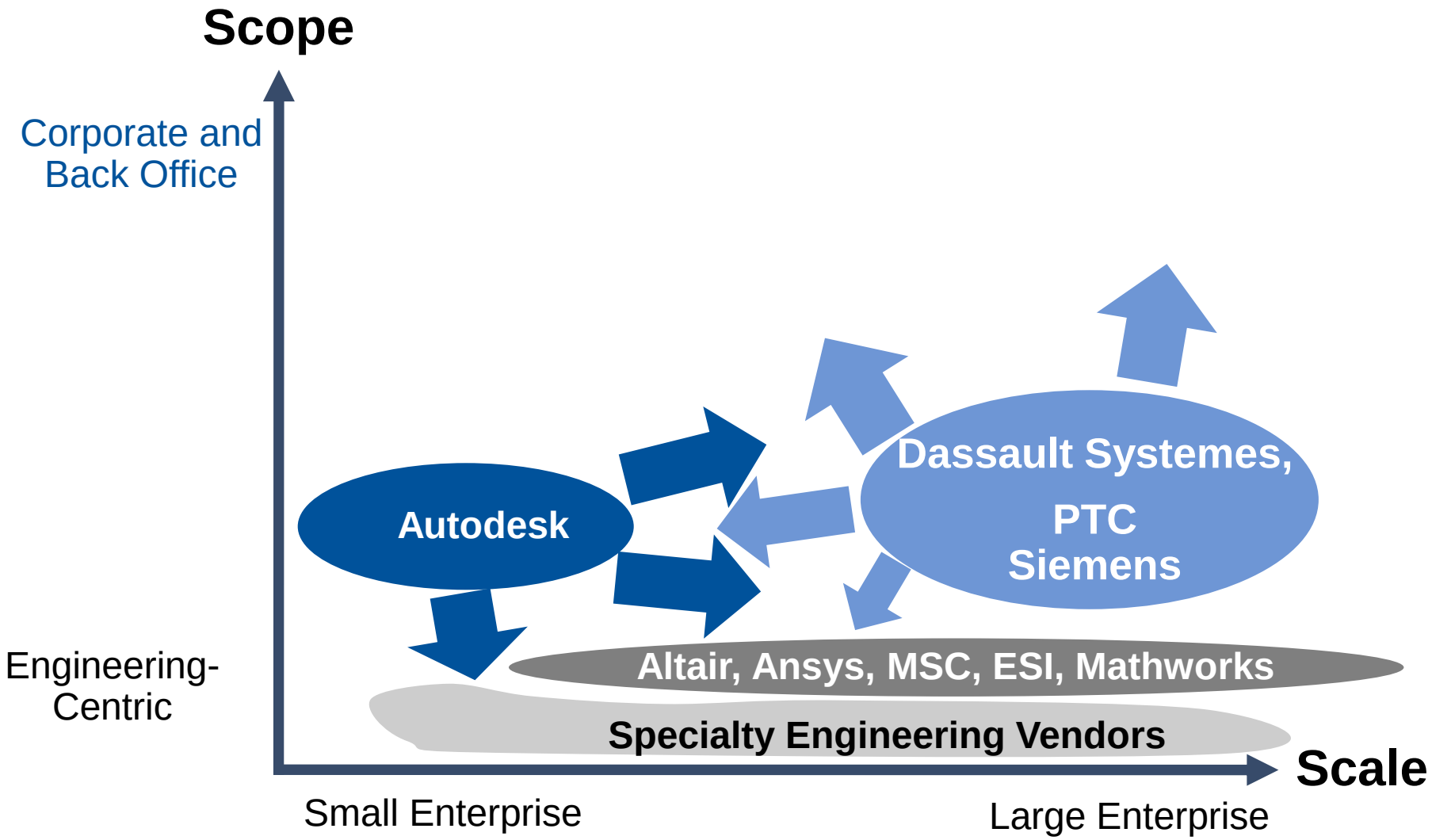

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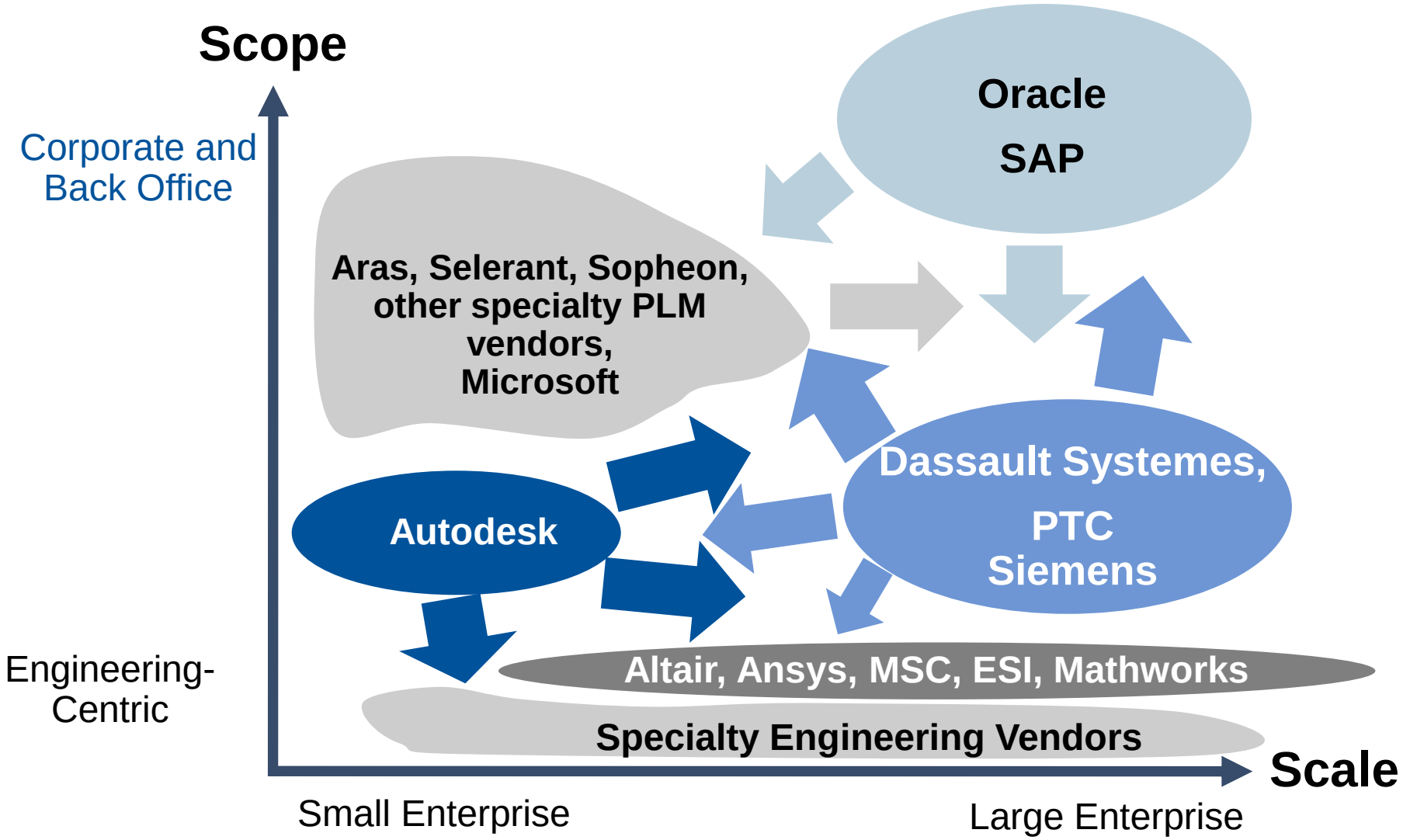

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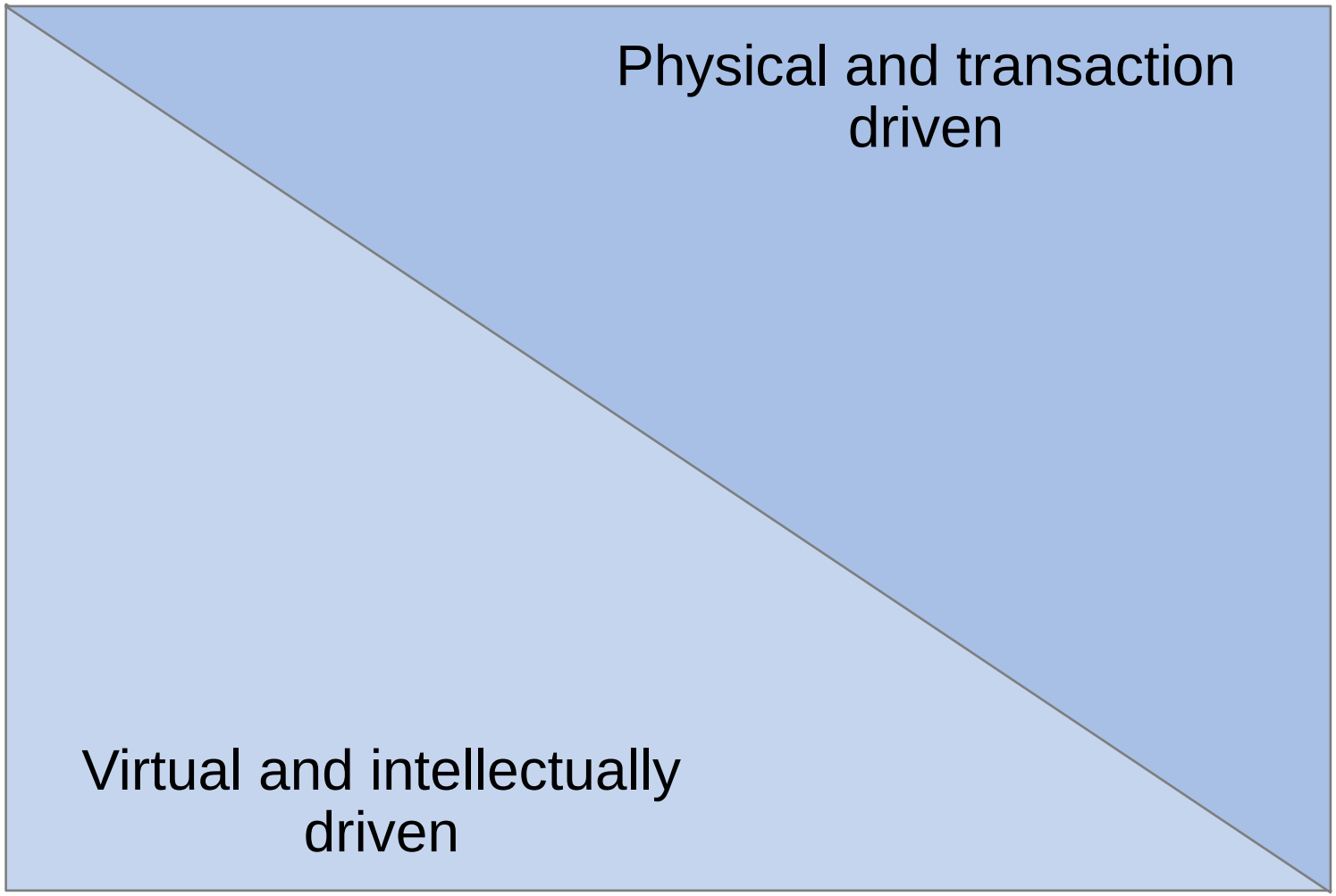
Positioning MbE and MbM in the Business Application Landscape



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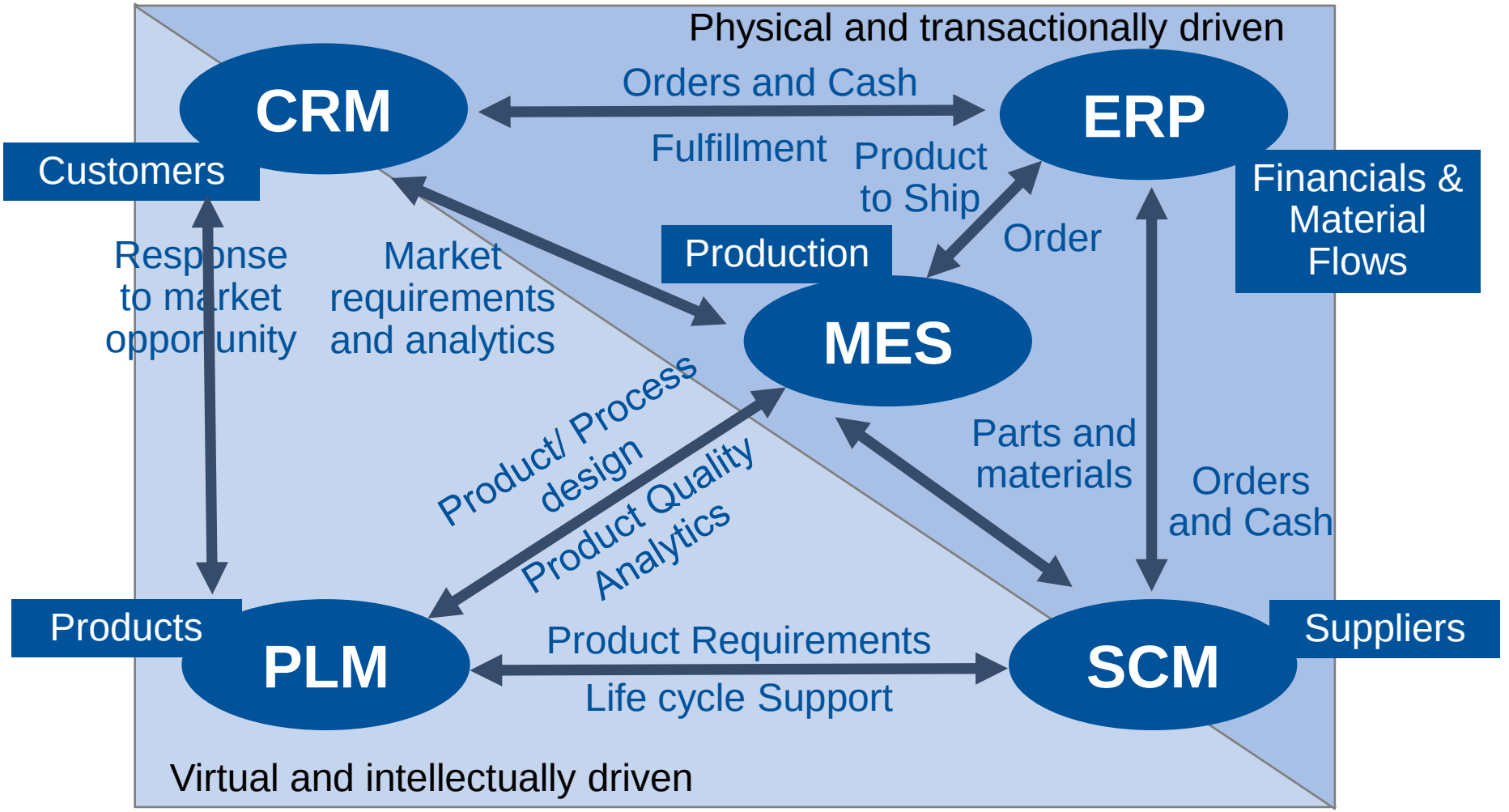

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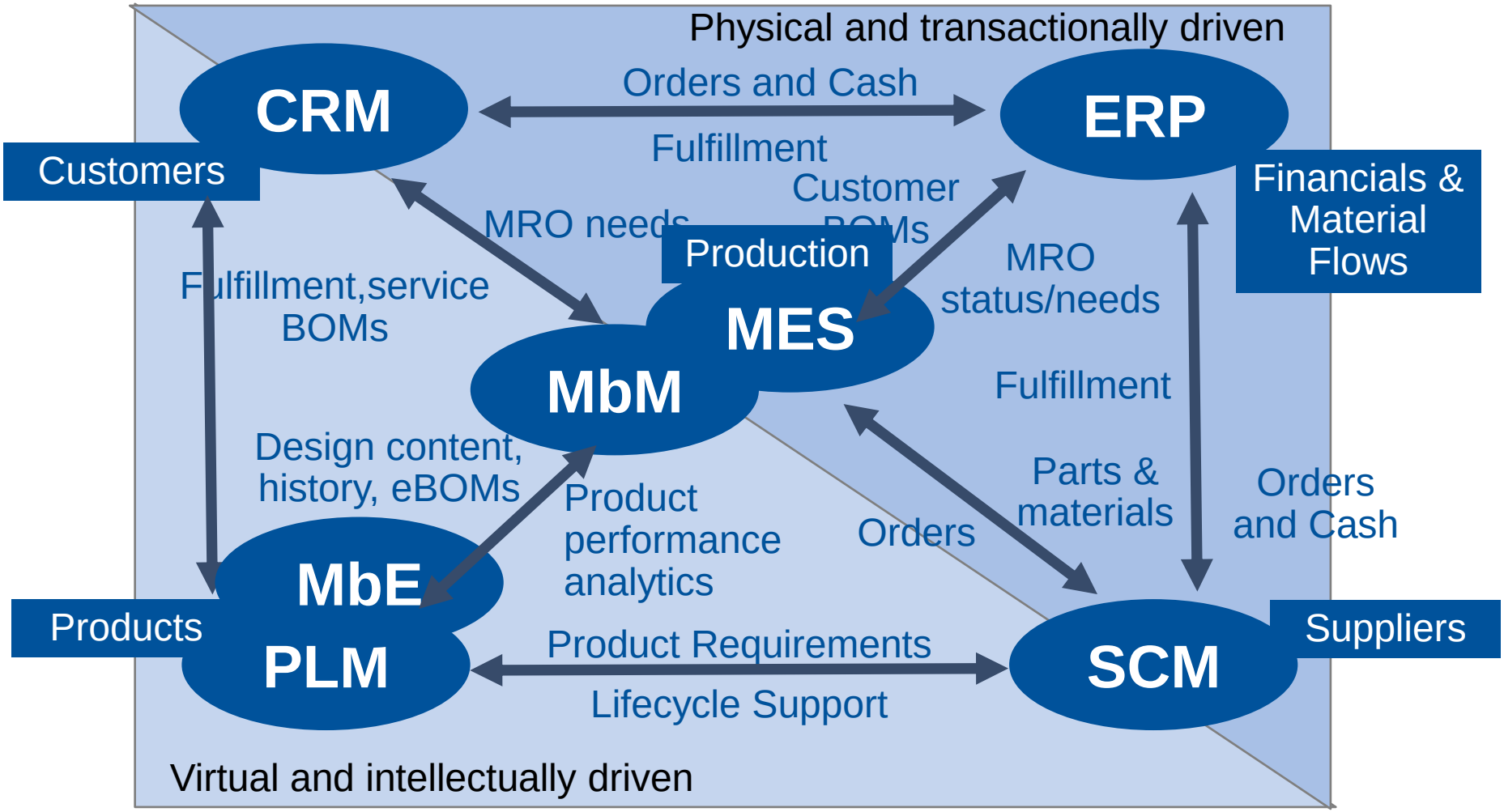

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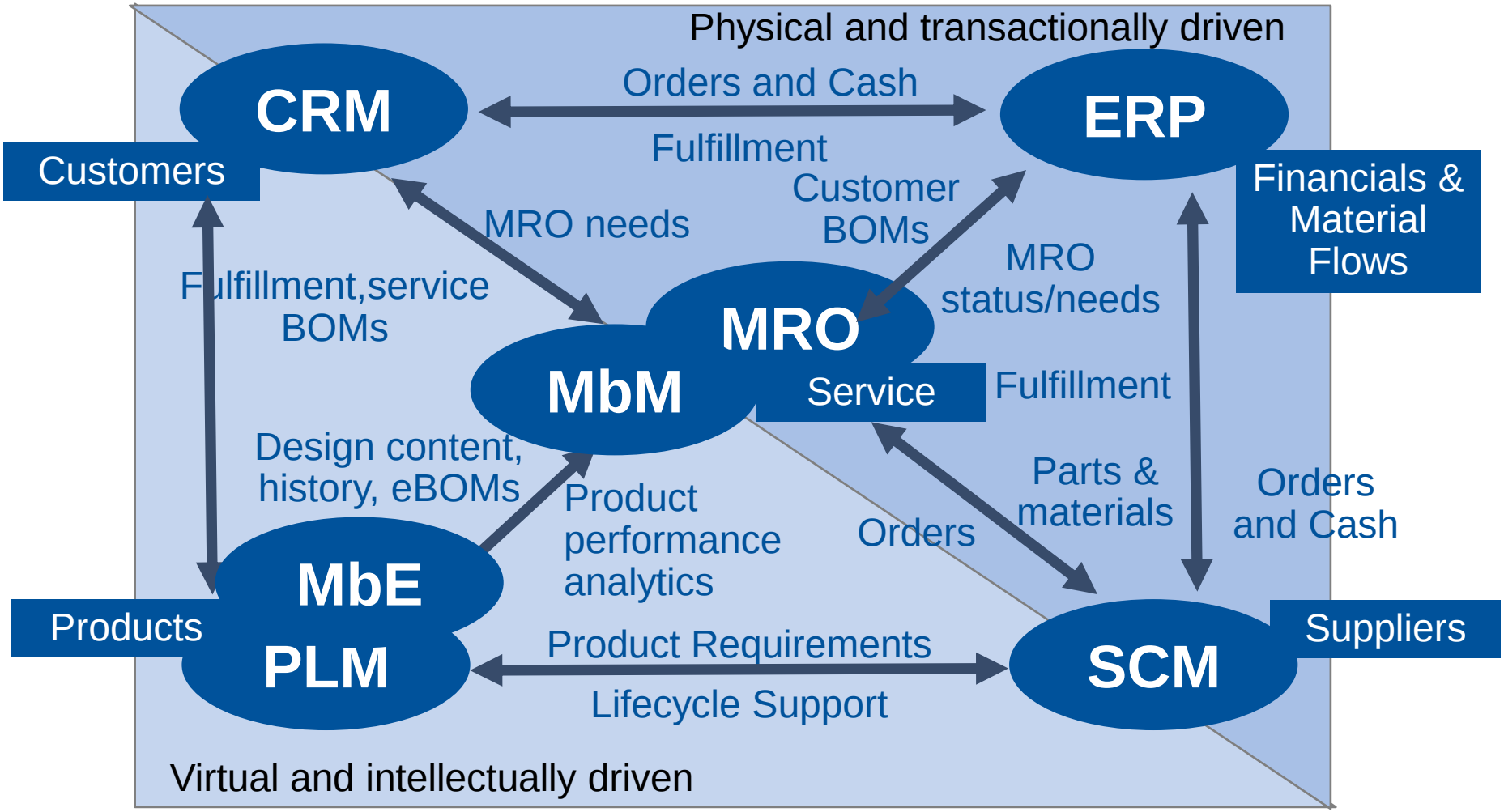

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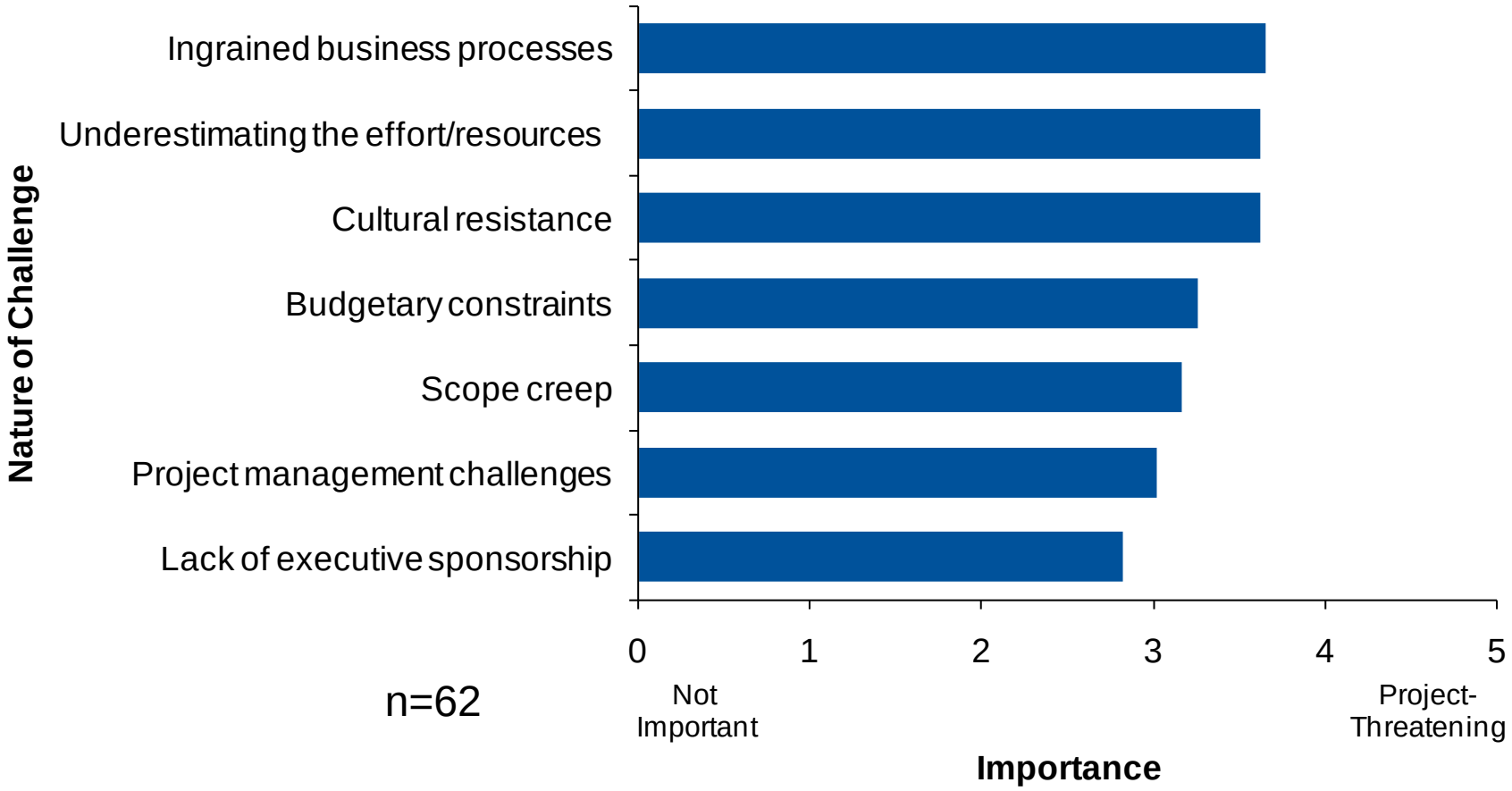
Key Model-Based Engineering Challenges That Organizations Face

- Change management
- Knowledge transfer
- Defining data architecture
- Redundant application architectures
- Data/drawing/document synchronization
- Synchronizing role-based views of content
- Sharing data
- Enabling models with sufficient fidelity for needs
- Defining user environments (e.g. 2D/3D harmonization)

Management Challenges Deploying PLM Are Relevant to ERS

Question: How would you characterize the potential/actual impact of these managerial challenges on your PLM implementation?



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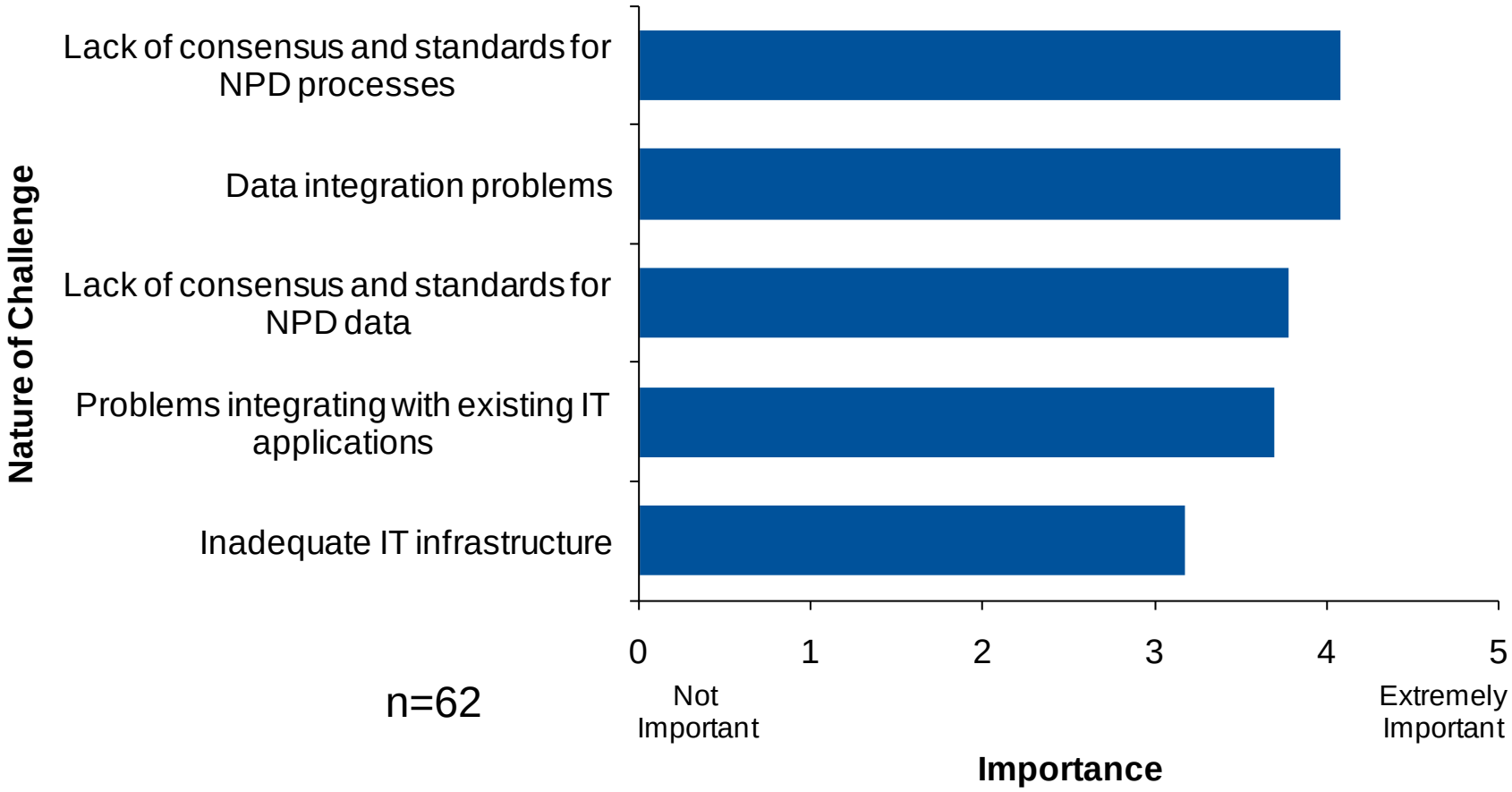
Technical Challenges Deploying PLM are Relevant to ERS

Question: How would you characterize the potential/actual impact of these technological challenges on your PLM implementation?



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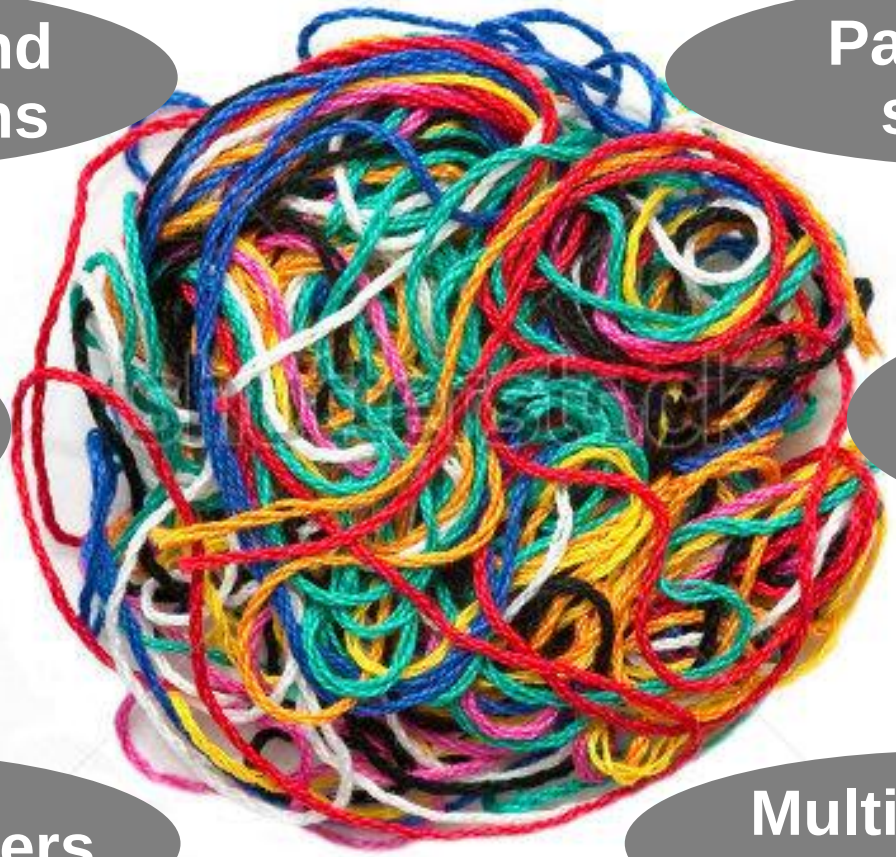
Discordant Formats Will Make Software Support of ERS Challenging

Mergers and acquisitions

Partners and suppliers



Customers

Legacy data

MRO providers

Multiple design applications

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Upgrading Software Can Be Like Re-Wiring Your House with the Electricity On

Training

Adapting to changing business needs

Maintaining business operations

Linking legacy data and applications

Serving expanding user communities

Scope Creep

Containing costs

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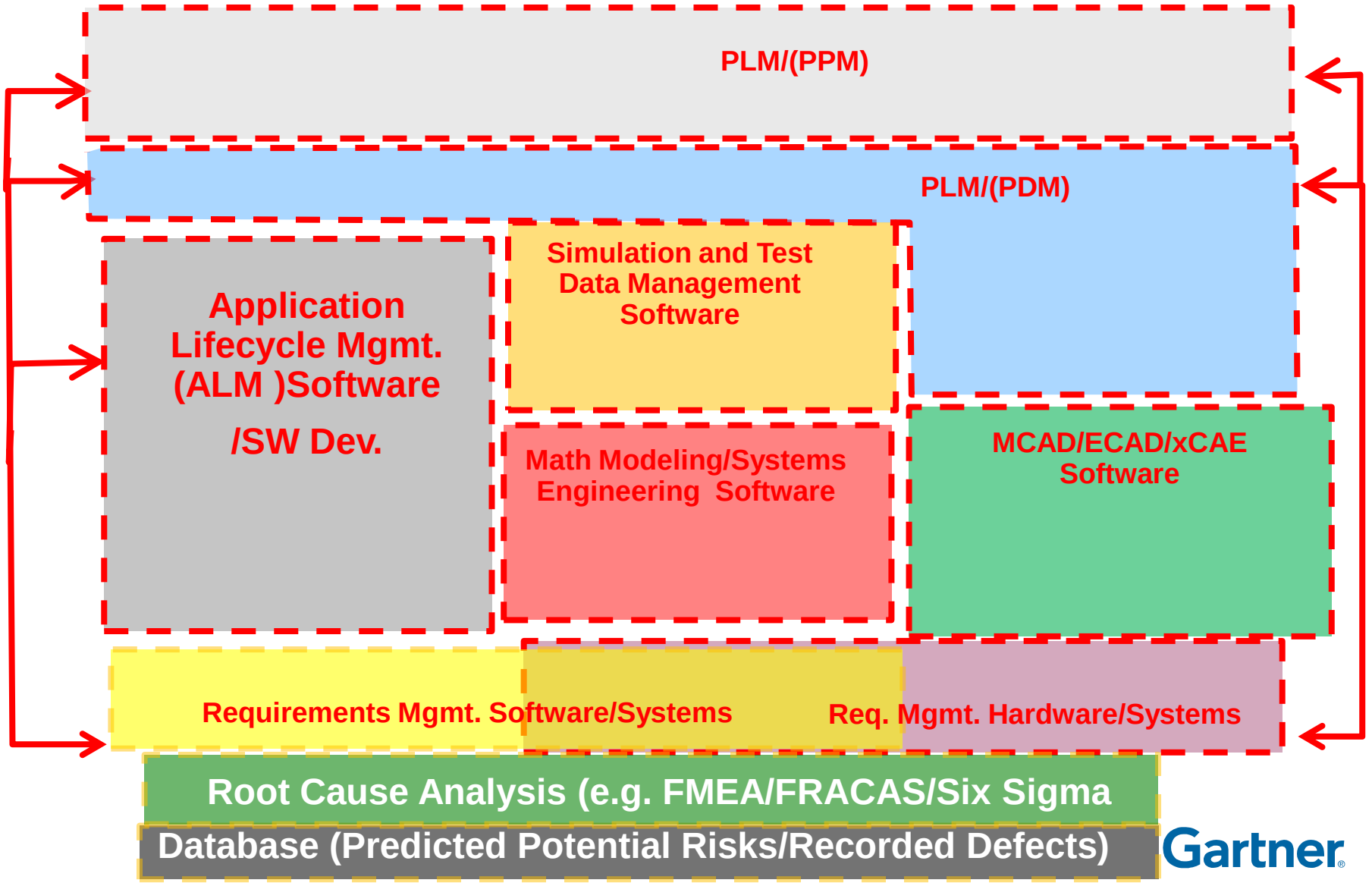
Systems Engineering and Requirements Mgmt. Take "Center Stage" for ERS



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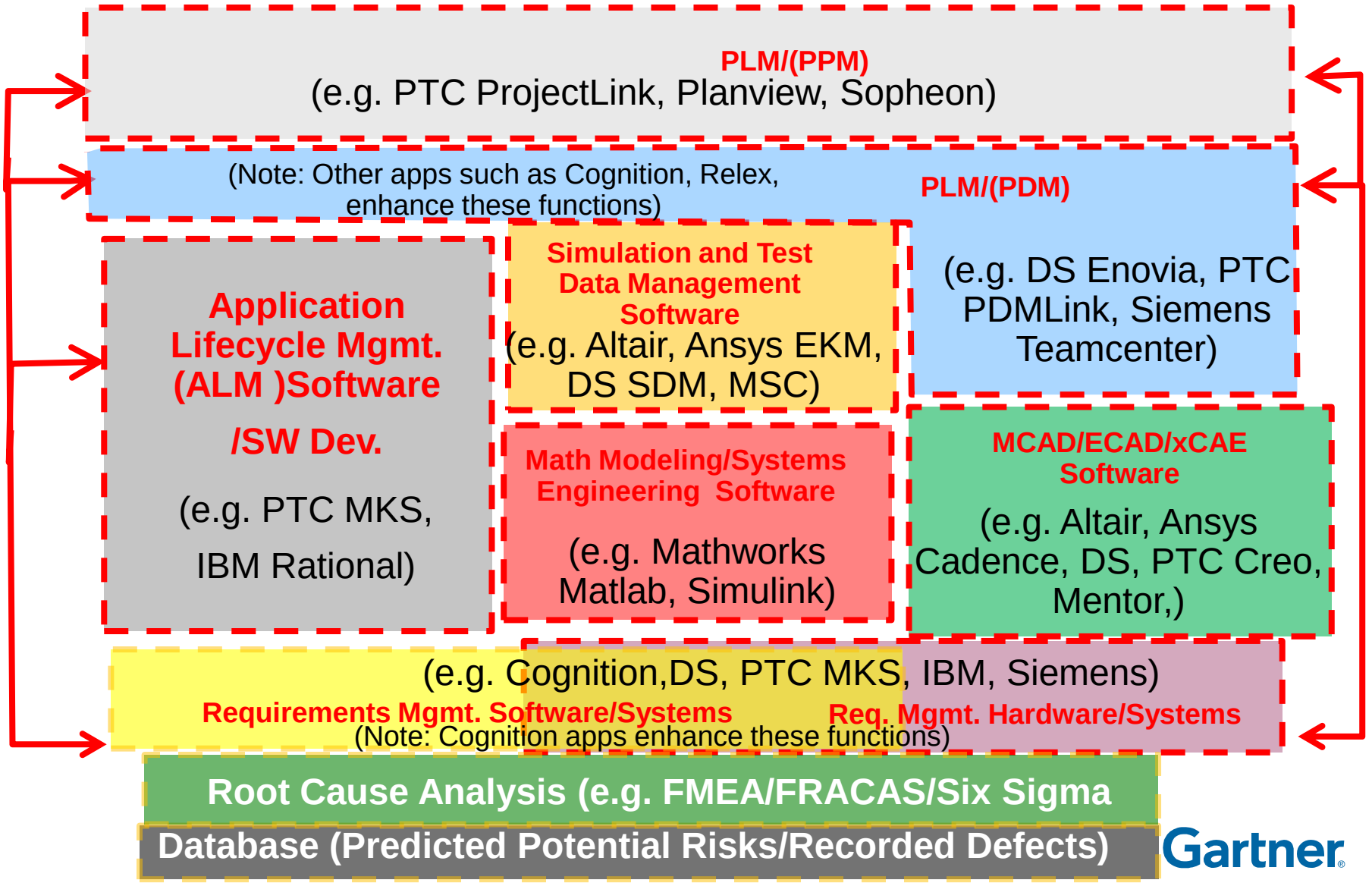

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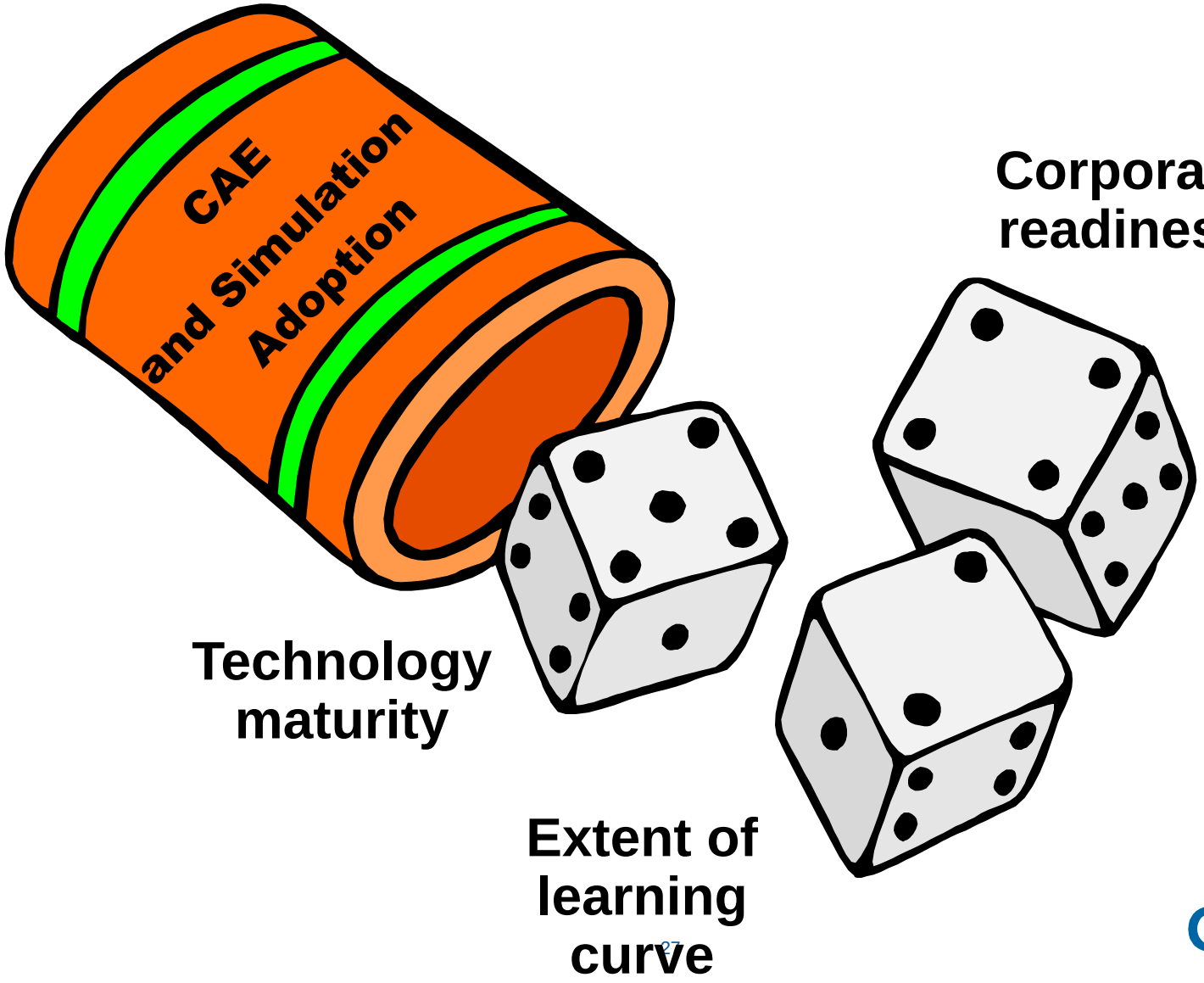
Key Technology Adoption Risks



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Lessons Learned From Best PLM Software Deployments Apply to CAE

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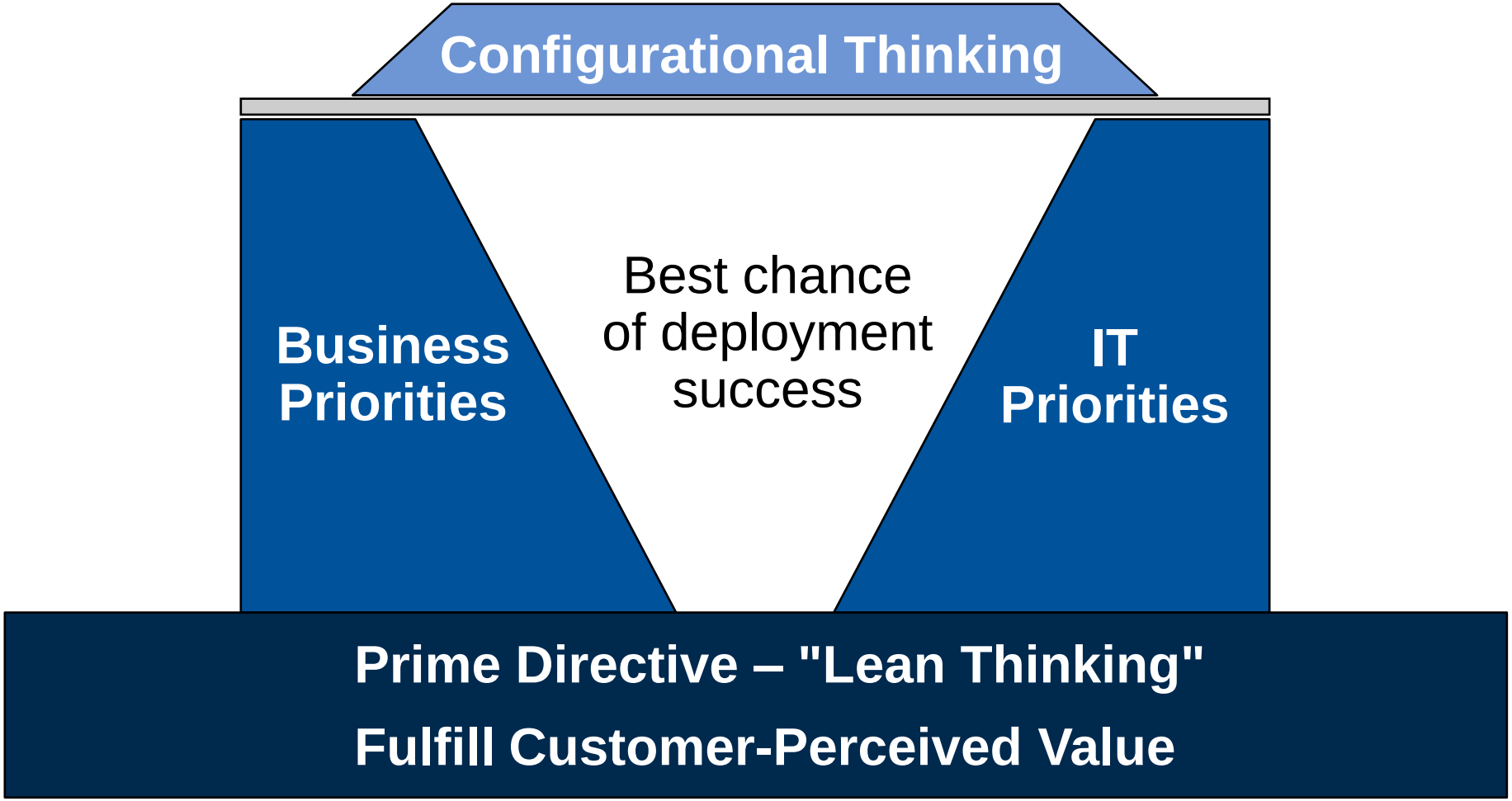
Leveraging Configurational Thinking and Lean Principles



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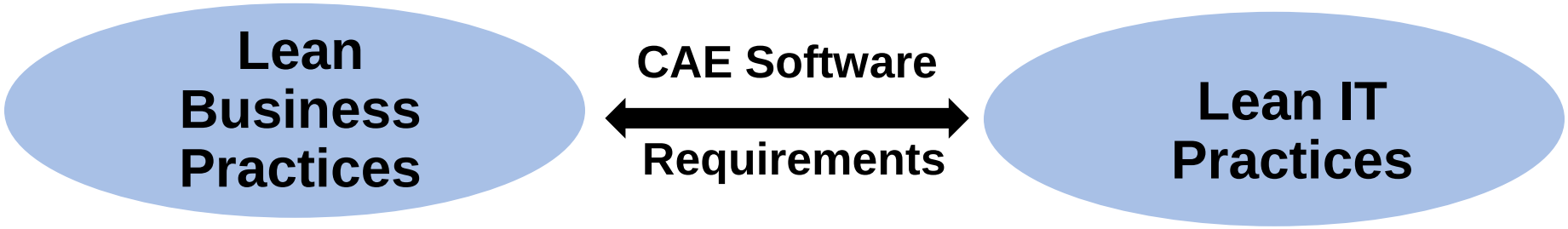
Best Practice: Lean Thinking for CAE

All Investments and Activities That Do Not Deliver Value Are Waste



External Customer Priorities

- Product reliability
- Product quality
- Timeliness to market
- Product cost

Internal Customer Priorities

- Software performance
- Access to CAE applications
- HW/SW infrastructure Costs
- Access to data/models/other content

Lean Principles

Elevate Customer Perceived Value

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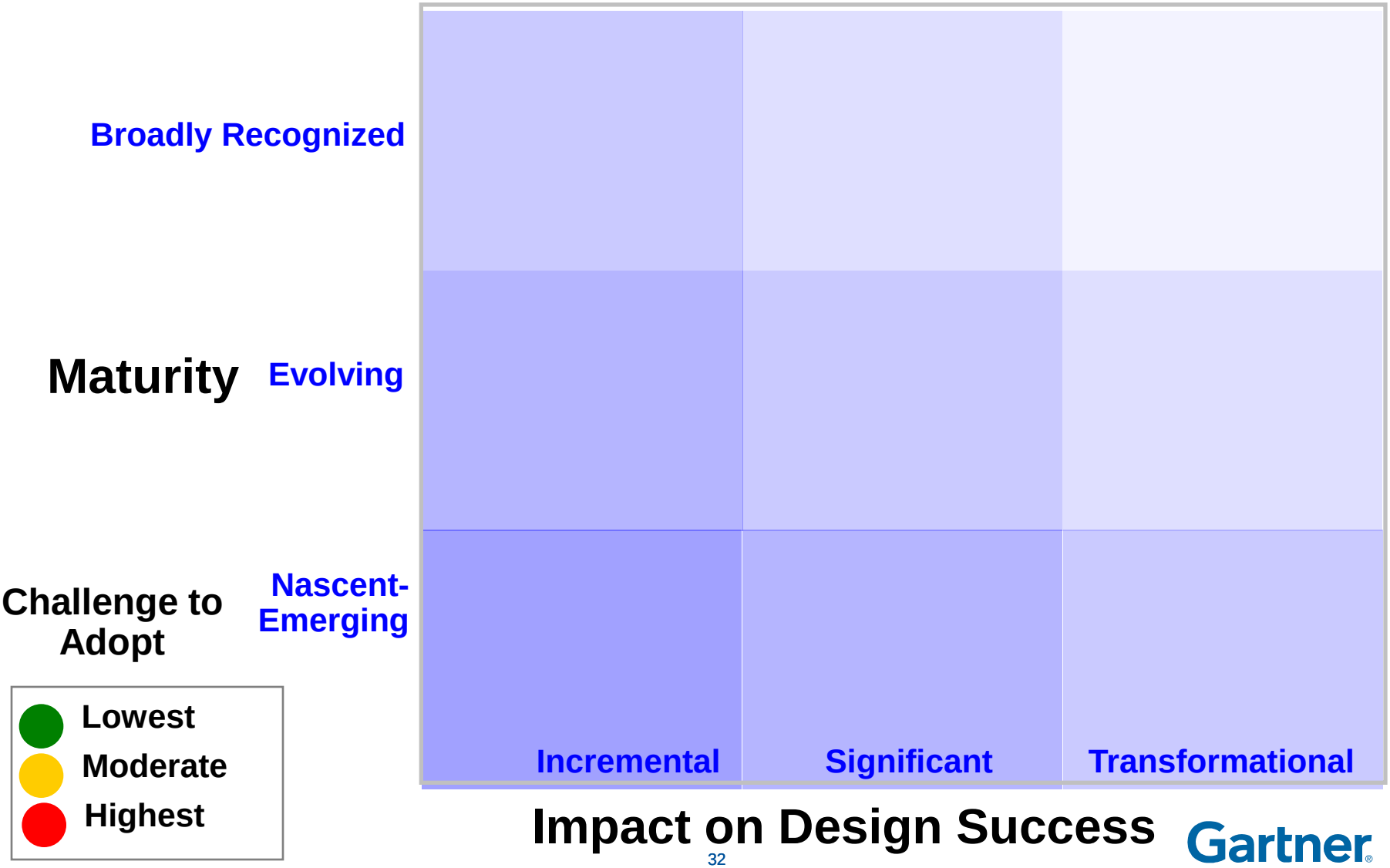
Best Practices Uncovered from PLM Deployments Apply to ERS

No.	Best Practice	Manufacturer	Benefits Achieved
1	Focus on building business capability at the mindset layer	U.S.-based healthcare manufacturer	More systematic team-centric NPD processes with less dependence on skilled individuals
2	Mind-set layer of "macro" level elements	International beverage company	Instituted phase-gate process, yielding major quality advances
3	Evangelize the "configuration" mind set broadly	Parts and equipment supplier	Removed redundancy from product portfolio accelerated growth
4	Don't outsource configurational thinking	Parts and equipment supplier	Clear corporate thought leadership cultivated greater global cooperation
5	Triangular governance for IT implementation activities	Apparel and footwear company	Streamlined NPD processes yields shorter time to market
6	Engage suppliers in the PLM business transformation	European machinery manufacturer	Reduced incompatible and redundant product data improved NPD collaboration
7	Continue configurational thinking during change management	U.S.-based healthcare manufacturer	Helped institutionalize processes for capturing and reusing produce content

This research was conducted in collaboration with Satish Nambisan, Lally School of Management, Rensselaer Polytechnic Institute and Robert G. Fichman Carroll School of Management ,Boston College

Top 13 CAE and Simulation Opportunities



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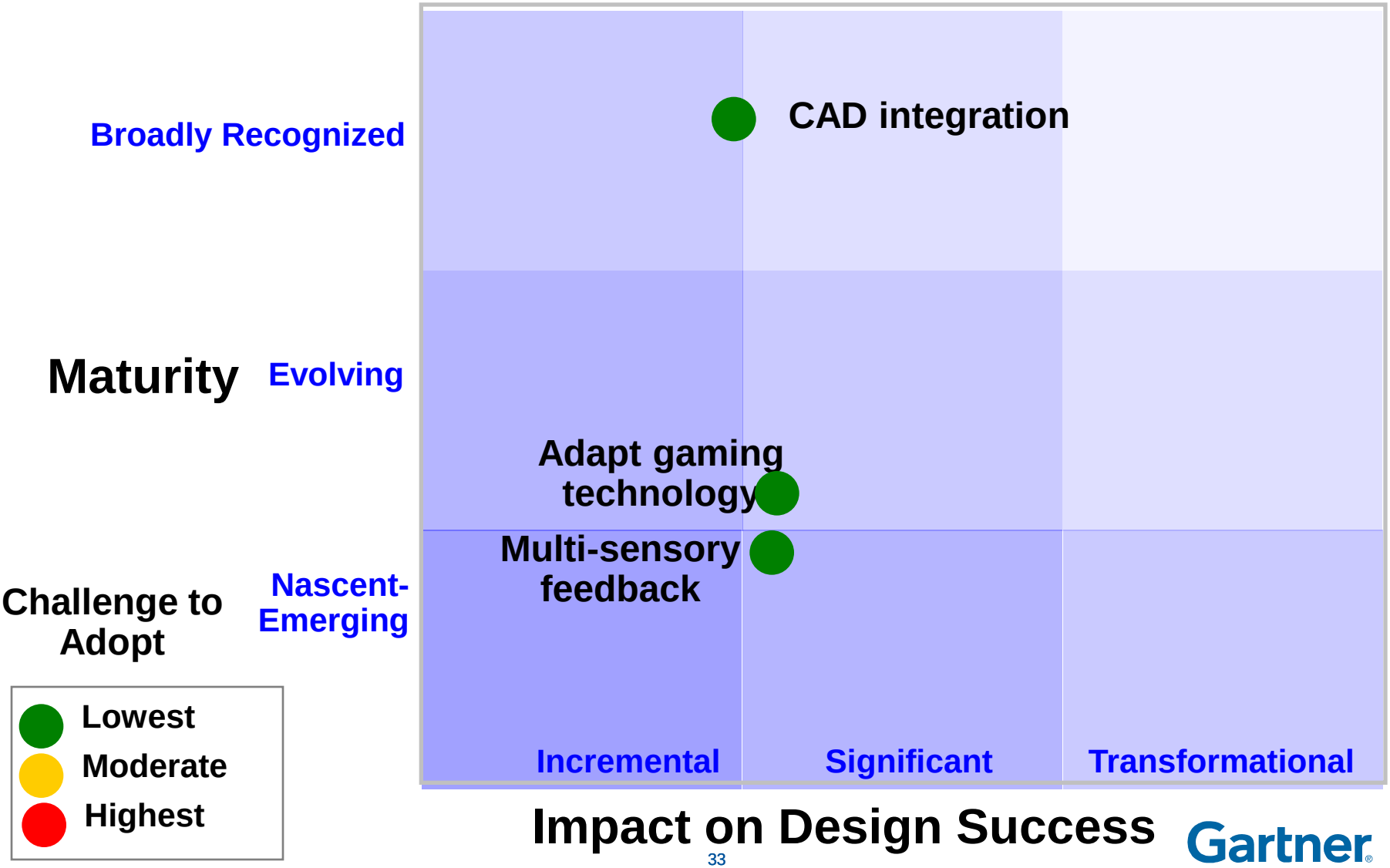

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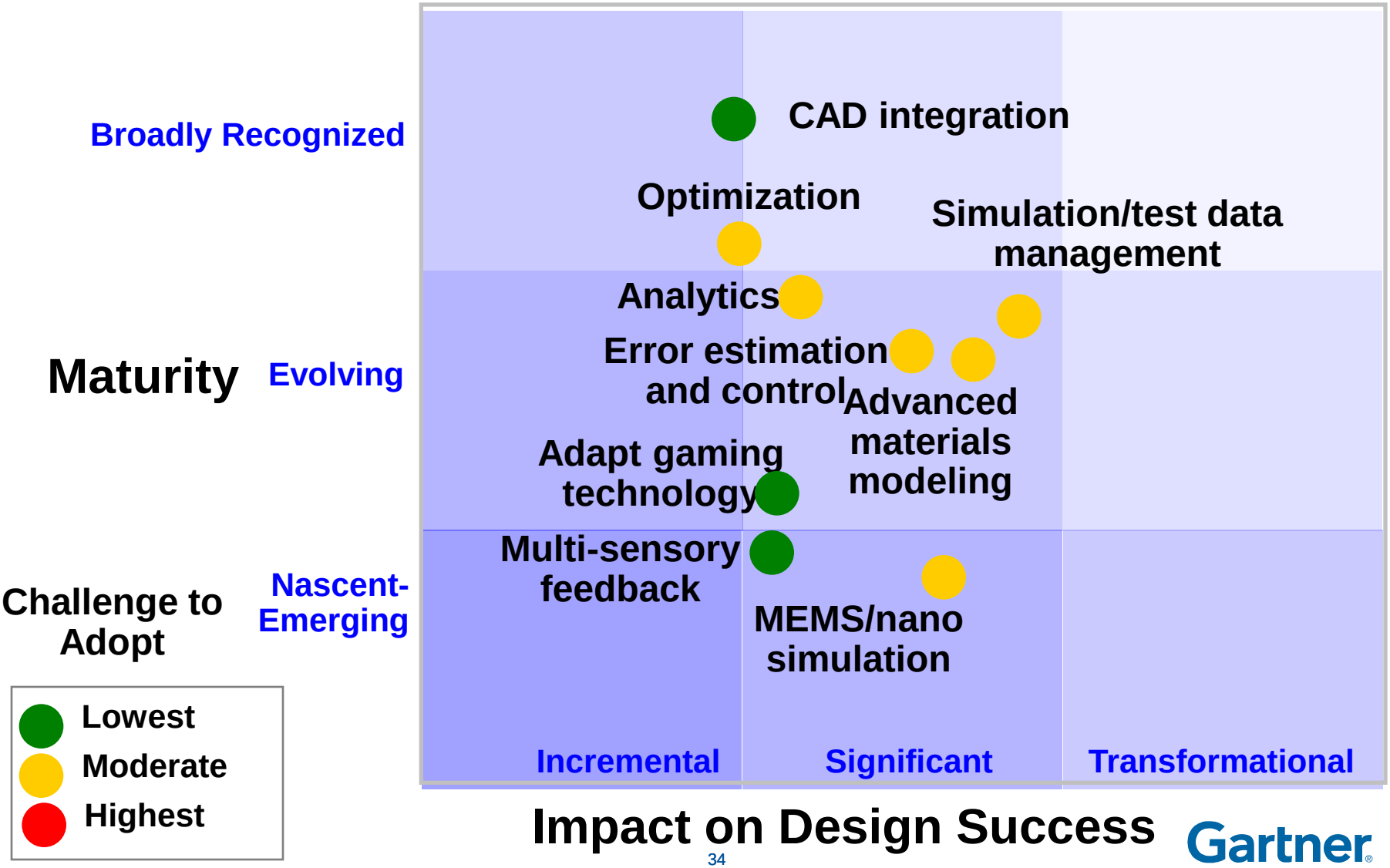

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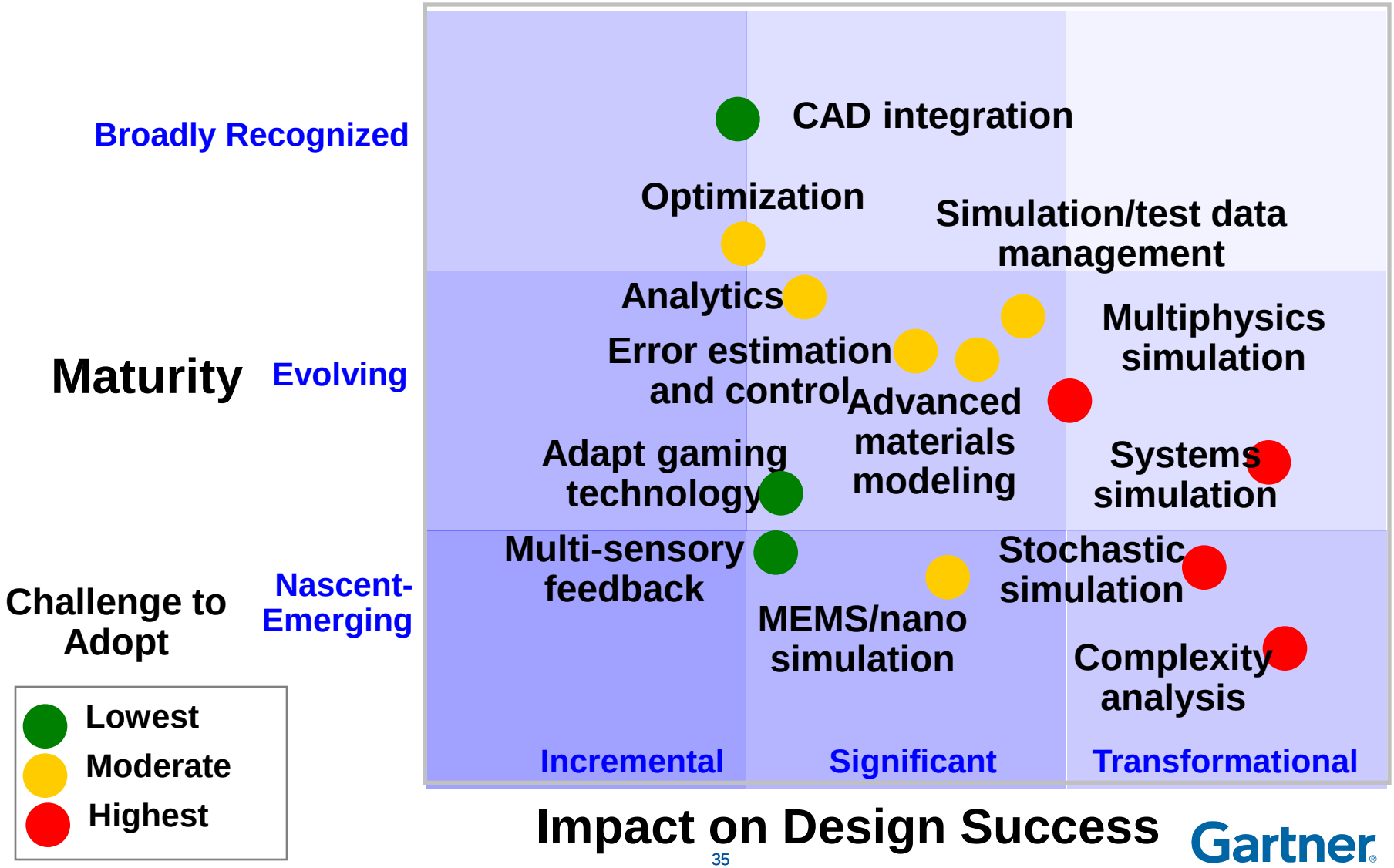

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Summary

- What factors currently make model-based engineering a significant opportunity?
  - -leverage evolving technology to accelerate engineering and transfer knowledge
- What are today's major challenges at enabling model-based engineering?
  - - Change management; consensus on data architecture; evolution to a new data architecture and infrastructure
- What top priorities for planning model-based engineering and best practices for implementing it?
  - - Aligning technical opportunities to business priorities tempered by risk factors

Thank You!!

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