Supply Chain Videocast

Optimization 3.0: IBM's Guide to Leveraging the New Wave of Business Analytics for Next Generation Optimization-Based Decision Support

SupplyChainDigest™

NEW IDEAS

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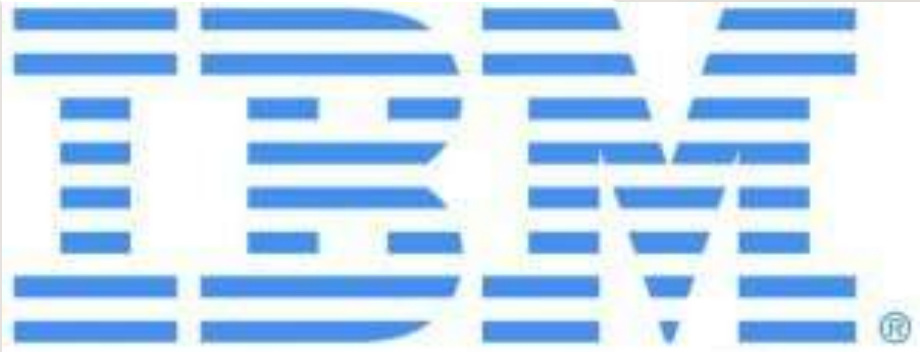
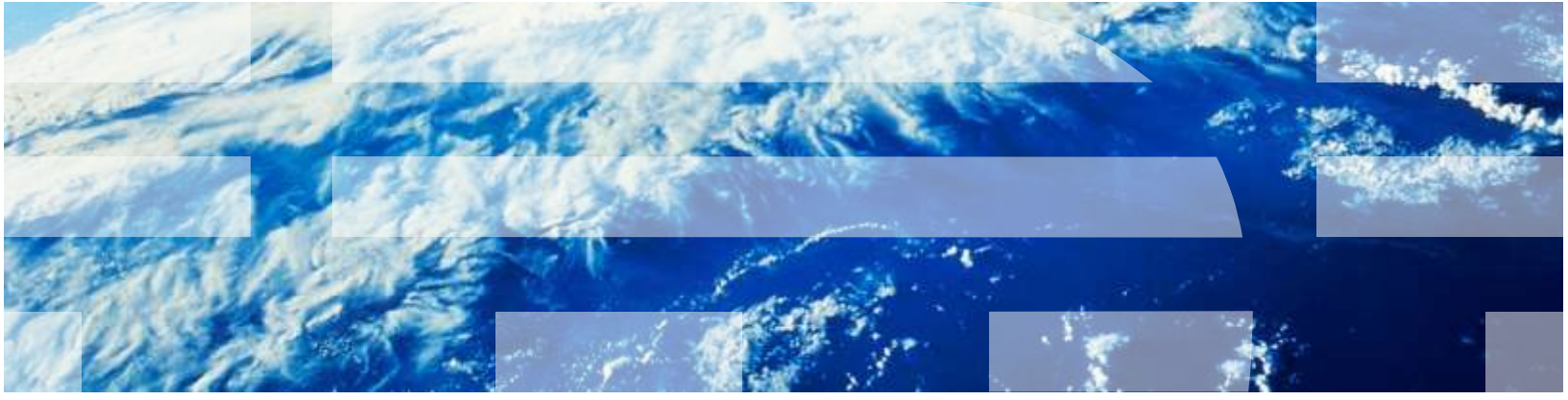


“Optimization 3.0”:

Closing the Gap between Planning & Execution to Create a Truly Adaptive Supply Chain

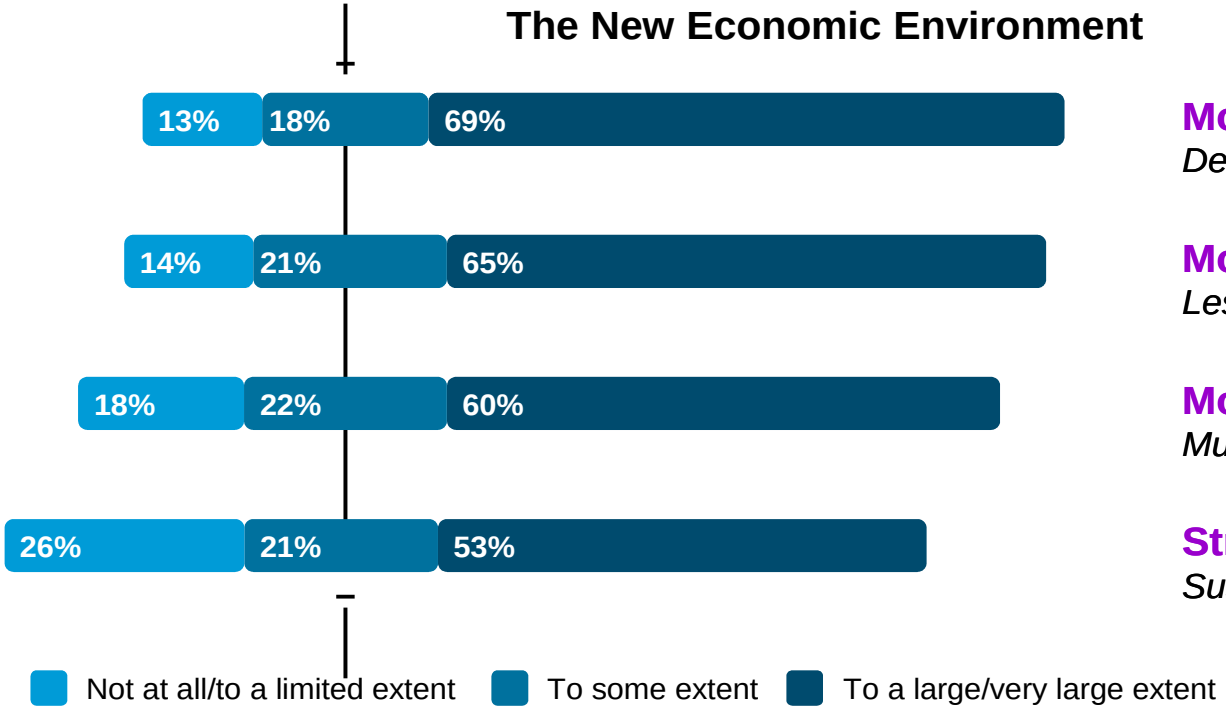


Agenda

- Global Business Trends & Challenges
- Evolution of Optimization Technology
- Case Studies
  - Real-time scheduling
  - Extending Supply Chain Planning & Execution solutions
- The Smarter Supply Chain of the Future

Global Business Trends & Challenges

Clients see the impact of global trends in terms of volatility, uncertainty, complexity, and impact to their business models



More volatile
Deeper/faster cycles, more risk

More uncertain
Less predictable

More complex
Multi-faceted, interconnected

Structurally different
Sustained change

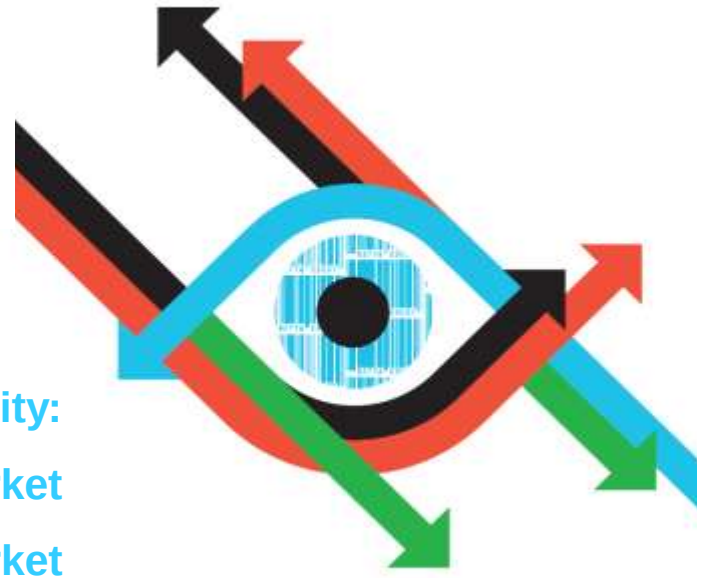
Source: IBM 2010 Chief Executive Officer (CEO) Study

New Rules for a New Decade

Volatility:

Know the Market

Complex market conditions are causing constant flux in demand



Visibility:

See what others don't

The need for integrated, timely information to make rapid decisions

Value:

Exploit global efficiencies

constant pressure for the supply chain and operations to create enterprise value

Source: IBM 2010 IBV: New Rules for a New Decade,

Emerging Supply Chain Requirements

"When we talk about supply chain visibility, it does not simply mean visibility into your own supply chain and your own shipments. It means visibility among partners, which enables collaborative decision making closer to the customer. This is both a science (managing the technology) and an art (using the information and metrics for competitive advantage)."

Senior Vice President, Engineering, Strategy & Supply Chain, A Major Parcel Company, IBM CSCO Study 2009

Multi-enterprise – Beyond "four walls" of the enterprise

"Supply Chain leaders are further along on their journeys towards a demand-driven value network and they are building a network of functionality including: supply chain planning, S&OP, supply chain analytics and collaboration."
Gartner, Hype Cycle for Supply Chain Management, 2010

Demand Driven Network

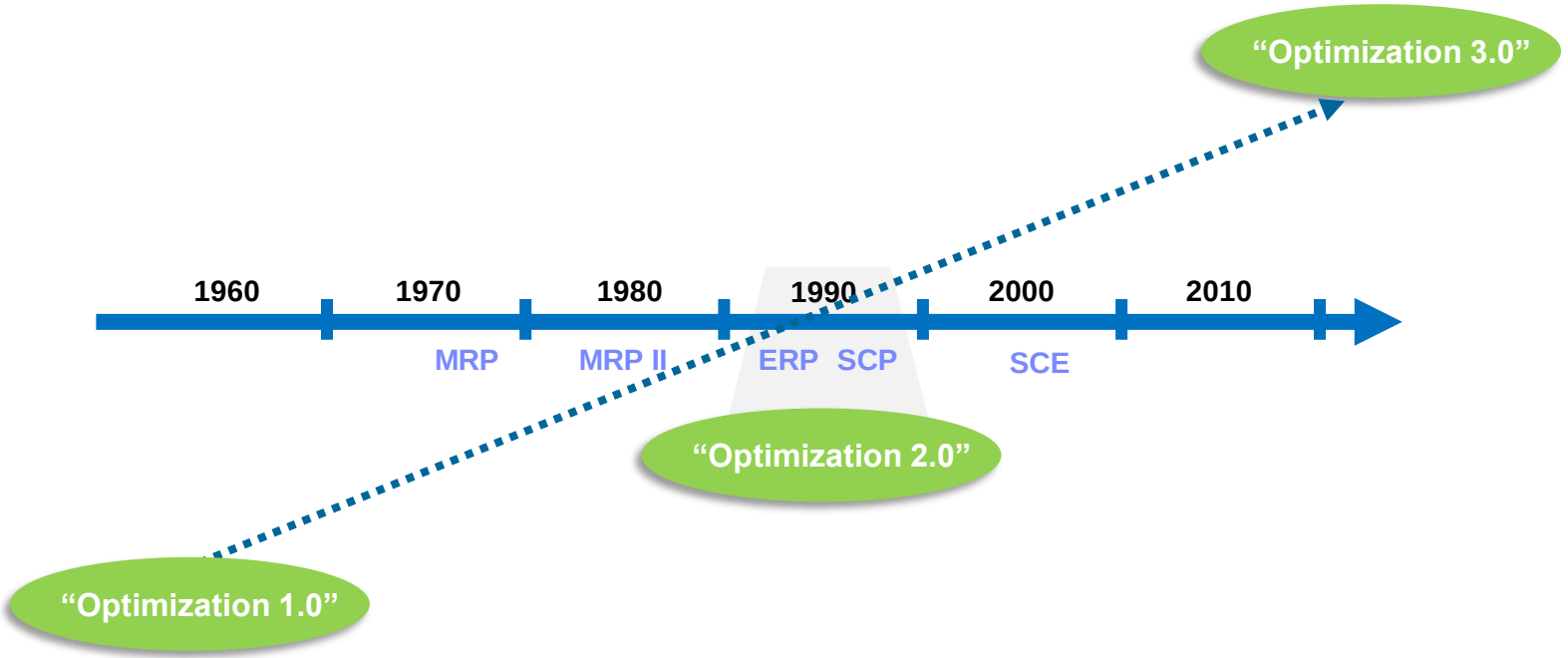
"Traditional supply chain processes that rely on historic orders can be thrown out the window. For this reason it is more critical than ever for cross functional teams to work together to sense, shape, and drive a profitable demand response."

AMR, Sales and Operations Planning: Transformation From Tradition, 2009

Narrowing the Gap Between Planning and Execution

Evolution of Optimization Technology

Supply Chain



Optimization Defined

How to best allocate aircrafts and crews?

Inventory cost vs. customer satisfaction

What to build, where and when?

Optimization helps businesses:

- create the best possible plans
- explore alternatives and understand trade-off
- respond to changes in business operations

Risk vs. potential reward

Cost vs.carbon emission

“Optimization 1.0” – WWII Through Late 1980’s

- World War II
  - Modern field of Operations Research/Management Science emerged
- 1947
  - George Dantzig invented the Simplex method, the foundation of Linear Programming (LP) and more generally mathematical optimization today
- Mathematical optimization soon revolutionized several industries, including:
  - *Airlines with yield management*
  - *Telecommunications with topological network design*
  - *Energy & Utilities with unit commitment*
- **Several key developments**
  - ***IBM PC introduced in 1981***
  - ***Relational databases developed***
    - ***Separation of logical and physical allocation of data***
    - ***ERP systems introduced***
  - ***CPLEX developed in 1988***

“Optimization 2.0” – 1990s and Supply Chain Wave

- LP performance takes off
  - *Computation times cut from weeks and days to hours, enabling overnight batch planning*
  - *LP software becomes embeddable and flexible and applied to difficult, real-world problems*
- Data became plentiful and accessible
  - *ERP systems became commonplace*
- **ILOG CPLEX becomes de facto standard in Supply Chain Planning solutions**
  - **Supply Chain Network Design**
  - **Advanced Planning and Scheduling**
  - **Transportation Planning**

"Optimization 3.0" – Real-time Analytics Today

- LP progress 1988-2004 (Operations Research, Jan 2002, pp. 3—15, updated in 2004)

Algorithms (*machine independent*):		
Primal ***versus*** **best of** Primal/Dual/Barrier		3300x
Machines (workstations →PCs):		1600x
NET: Algorithm × Machine	5 300 000x	

- Since 2004, another 4 releases and 100x on the hardest problems!

- **Hypothesis Revisited: Can these performance gains be leveraged to redesign traditional supply chain planning applications for operational use?**

Case Studies

IBM Microelectronics

Automates and optimizes production schedules with increased process visibility

The Need:

IBM had noted an opportunity to improve the efficiency of its production efforts at its semiconductor manufacturing facility in East Fishkill, New York. The site lacked a robust enough scheduling agent to effectively coordinate the multiple, intricate production processes while obtaining high utilization of capital intensive equipment. As a result, raw materials and manufacturing assets (such as the chemicals used in cleaning processes) were being inefficiently utilized, and time-sensitive procedures were being delayed.

The Solution:

The site integrated a near-real time optimization based scheduling system into its manufacturing execution system to drive more efficient management of site resources. Leveraging IBM ILOG® software, the solution models existing business rules and creates optimal manufacturing schedules which are then automatically executed. Facility staff can also analyze these schedules over time to identify patterns and recommend process improvements

What Makes It Smarter:

- Innovates scheduling processes by leveraging near-real-time business data to automate manufacturing processes
- Obtain high utilization of capital intensive equipment while improving product quality thanks to increased visibility into manufacturing efforts
- Cuts production cycle times and increases manufacturing throughput by optimizing resource and tool utilization

"By increasing visibility into our production processes, we can optimize schedules to respect our various priorities without wasting time or resources."

— IBM Microelectronics

Solution components:

- **IBM ILOG CPLEX**
- IBM WebSphere® ILOG JRules
- IBM ILOG JViews
- **IBM SiView**
- IBM DB2®
- IBM System p®

Major Brewery

Optimize loading while increasing vehicle utilization and improving client satisfaction

The Need:

- 15 packaging lines
- Ships to 15 Distribution Centers and hundreds of Customers
- Loads 1.2 mil shipment lines into over 800 trucks & rail cars per week

- **Challenge:** Optimize the loading of pallets & kegs to maximize direct loading from the packaging lines while increasing vehicle utilization and improving client satisfaction.

Solution components:

- **IBM ILOG Optimization**
- SAP APO

The Solution:

SAP APO Extension Solution built by IBM resulted in:

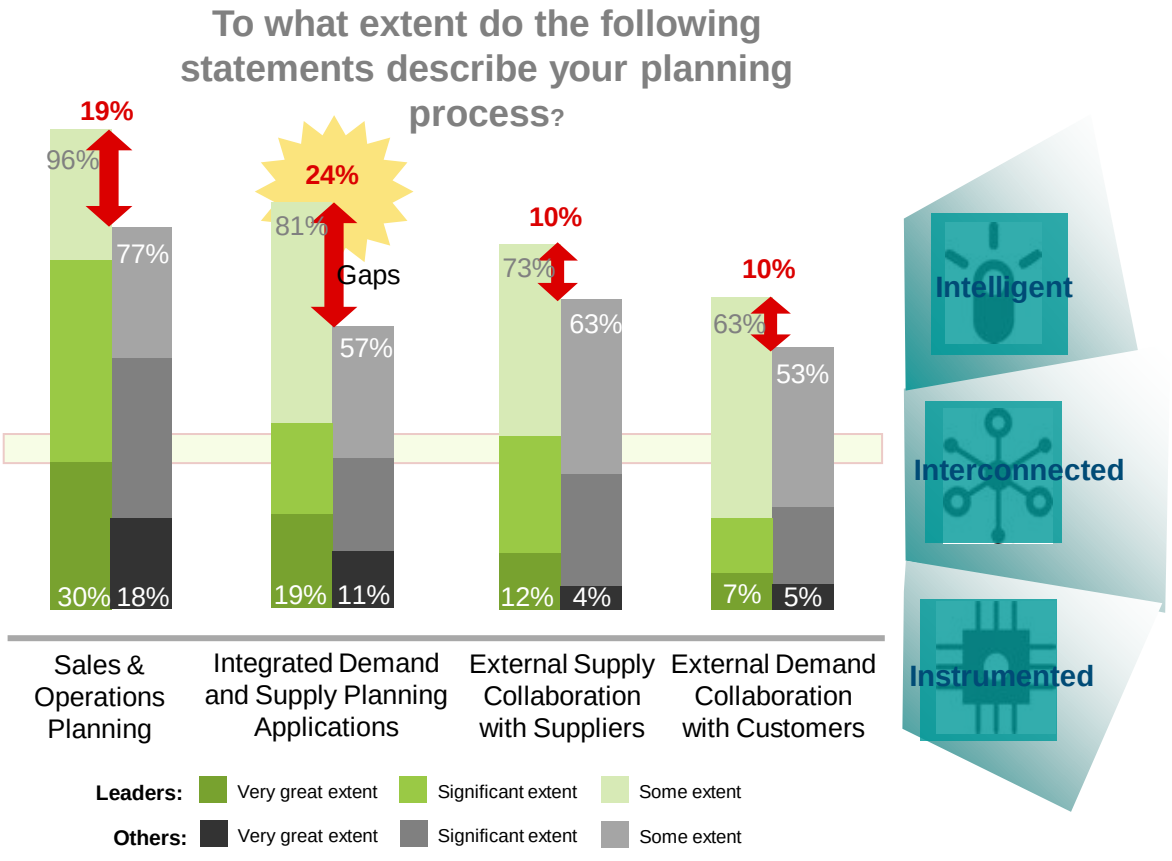
- Lower finished-goods inventories with lower inventory carrying costs
  - Reduced product handling costs & reduced waste
  - Deferred warehouse expansion costs
- Reduced transportation costs from fuller vehicles
  - 98-99% full is materially better than 96% full
  - 2% of shipments “free” relative to un-optimized vehicle loading

What Makes It Smarter:

- Advanced Analytics on top of existing supply chain planning solution
  - Improved customer service
  - Fewer unfilled orders
  - Balanced deliveries

The Smarter Supply Chain of the Future

Future Outlook: Further integration of customer demands from inception to delivery – the entire global network focused on the end consumer.



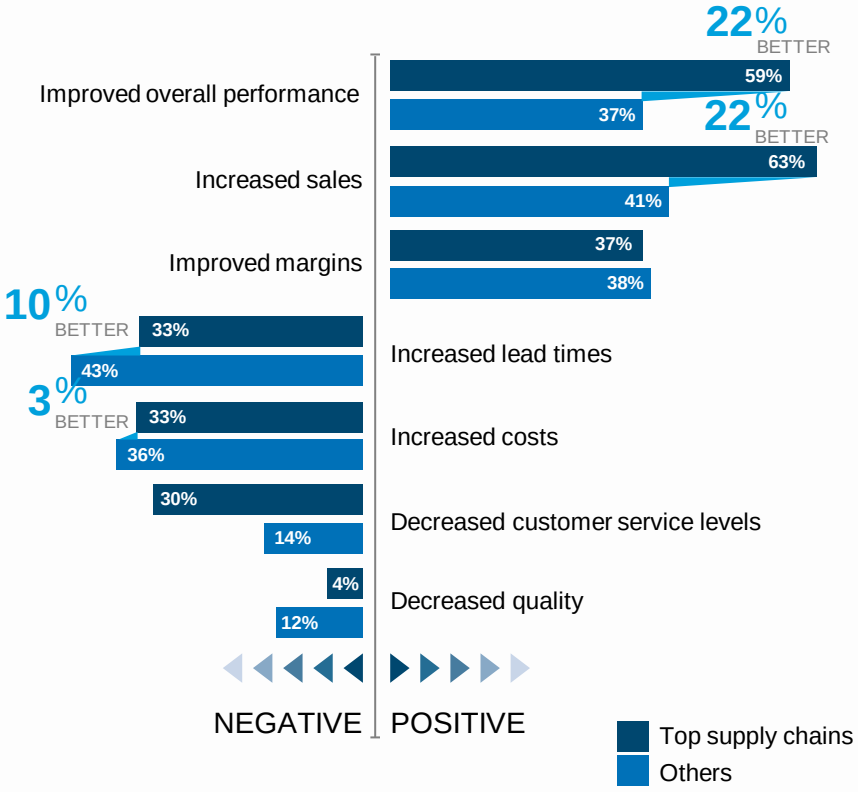
Key Capabilities

- **Simulation models of customer behavior, buying patterns, and market penetration applied to planning and operations volumes**
- **Cost to service models and analysis**
- **Networked S&OP with optimized forecast, buy/sell decision support**
- **Customer collaboration throughout all SC processes**
- **Embedded software & analytics for automated product defect and service alerts**

* Leaders determined based on respondents found in AMR Research Supply Chain Top 25 for 2008

Future Outlook: The positive advantages of globalization of markets & operations, outweigh the negatives

Percentage who have experienced these outcomes as a result of globalization over the past three years

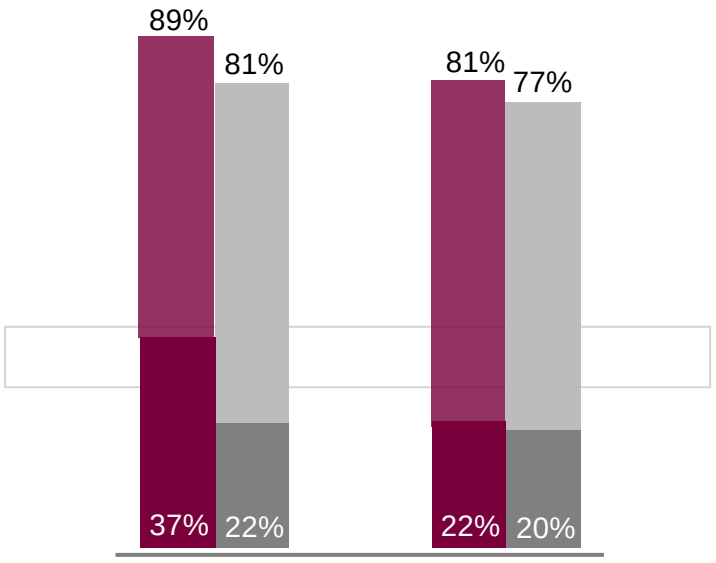


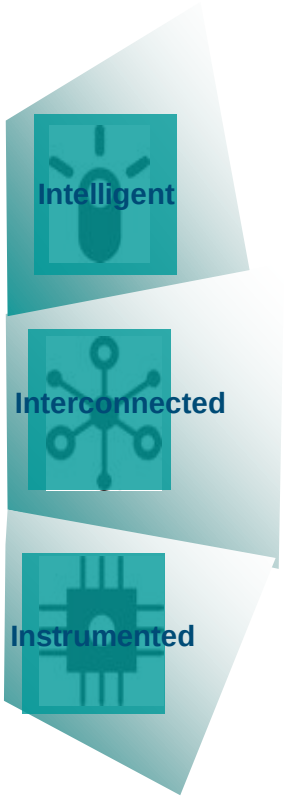
Key Capabilities

- **Leveraged global "centers of excellence" to optimize capability and delivery**
- **Sensor solutions connecting the expanding global trading partner infrastructure for increased supply chain visibility**
- **Demand, supply & distribution network planning & execution**
  - **Scenario-based planning and execution**
  - **Optimization of inventory throughout all phases of pipeline activity**
  - **Integrated production planning & execution**

Future Outlook: Responding to new cost pressures will always be a challenge. What will tomorrow bring?

Most have adopted these practices widely/comprehensively



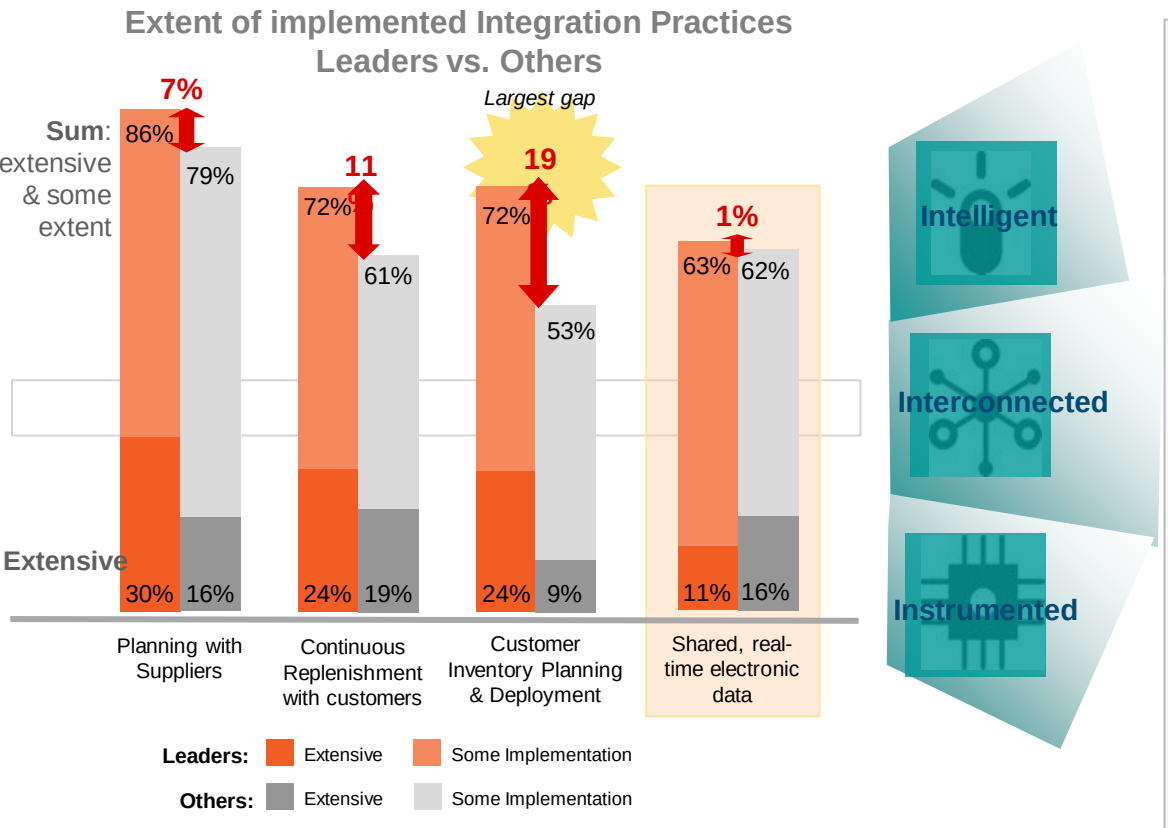


Key Capabilities

- **Variable cost structures that fluctuate with market demand**
- **Analytical models to evaluate flexibility factors: service levels, costs, time, quality w/ inventory synchronization.**
- **Outsourcing non-differentiating functions to share risks across the global network**
- **Sensor-based solutions to reduce inventory costs with increased visibility**

* Leaders determined based on respondents' ranking in AMR Research Supply Chain Top 25 for 2008

Future Outlook: The Smart Supply Chain will require more connectivity, collaboration, and integrated processes to improve visibility among network partners as demonstrated by leaders

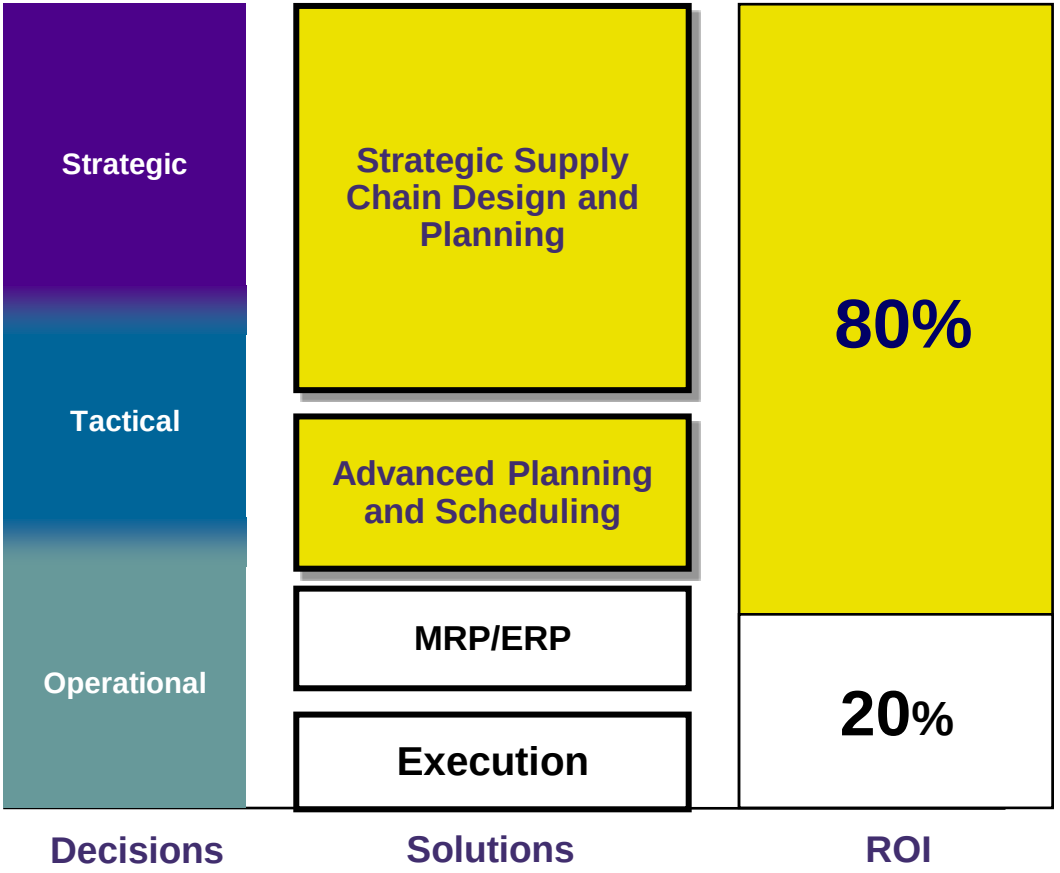


Key Capabilities

- **Smart devices & sensors (RFID) to capture real-time visibility:**
  - **Shelf-level replenishment**
  - **forecasts/orders**
  - **schedules/commitments**
  - **pipeline inventory**
  - **shipment lifecycle status**
- **Analytical decision support to automate and self-actuate supply chain transactions**
- **Sense-and-respond demand & supply signal notification**
- **Multi-partner collaborative platform**

* Leaders determined based on respondents' ranking in AMR Research Supply Chain Top 25 for 2008

Adding Value to Existing Supply Chain IT Investments



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  - Watch the recorded webcast:
  - http://www-01.ibm.com/software/websphere/optimization/advanced-analytics/

- Learn more about IBM's view of Business Analytics
  - **White Paper: Analytics: The New Path to Value:**
  - http://public.dhe.ibm.com/common/ssi/ecm/en/gbe03382usen/GBE03382USEN.PDF

  - **Interactive IBM Institute for Business Value 2010 Executive Report:**
  - http://cde.cerosmedia.com/IBM-Institute-for-Business-Value-Analytics/1Y4d396ece0b087012.cde

  - **Video: Smarter Analytics:**
  - http://mfile3.akamai.com/9039/wmv/ibmvancouv1.download.akamai.com/9039/wmv/chq/sis/balboni.asx

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More Resources

- **Thomas Dong, IBM**

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- **www.ibm.com/optimization**
- **Dan Gilmore, SCDigest**
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