

WholeView™ TechStrategy™ Research

May 2002

## The Collaborative Product Life Cycle

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MAY 2002

# The Collaborative Product Life Cycle

To continually improve the quality and cost structure of their products, manufacturers must ditch their linear product development practices -- and tap XRM apps to make the entire life cycle of their products collaborative.

## 2 INTERVIEWS

- Outsourced manufacturing and demand for custom products stretch sequential product development processes.

## 4 ANALYSIS

- Collaborative product life-cycle management (CPLM) pumps efficiencies into outsourced partnerships.
- XRM apps monitor, manage, and optimize CPLM activities.

## 8 WHAT IT MEANS

- Software development: General Electric's new core competency in 2008.

## 9 RELATED MATERIAL

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## INTERVIEWS

### COMPANIES STRUGGLE TO MAINTAIN CONTROL OF PRODUCT

To gain insight into current practices for managing product life cycles, Forrester spoke with 20 executives in discrete manufacturing who are responsible for product development.<sup>1</sup> We found that while the product development landscape encourages outsourcing, partner collaboration wanes once the product is introduced to market.

#### Fickle Customers' Product Needs Are Tough To Anticipate

The shift to custom products and their associated service issues is making it more difficult for manufacturers to anticipate -- let alone promptly respond to -- rapidly evolving customer requirements (see Figure 1-1).

“As the percentage of our engineered-to-order products -- 25% today -- grows, skill shortages may become a bottleneck.” (Aerospace company)

“If we don't rapidly fix a problem in a customer's built-to-order equipment, his CEO will directly call our CEO!” (Aerospace company)

#### Collaboration Suffers As Outsourcing Grows

Product development chains are not only becoming demand-driven, but they are also less vertically integrated; 65% of firms already outsource at least 20% of manufacturing, and most companies expect outsourcing to increase or remain the same in the next two years (see Figure 1-2). But firms mostly rely on offline tools to sustain collaboration with outsourcing partners throughout the product life cycle (see Figure 1-3). As a result, engineering changes are handled haphazardly and manually (see Figure 1-4).

“Today, 65% of our engineering and manufacturing is outsourced. I expect that number to rise to 100% as collaboration improves.” (Office equipment company)

“We stick with partners through the development process, but all our engineering changes are still managed manually.” (Consumer packaged goods manufacturer)

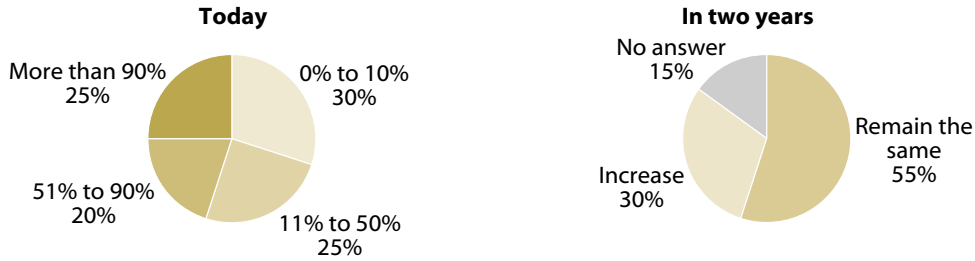
#### Manufacturers Lack Insight Into Post-Sale Performance Of Their Products

When asked to identify the major improvement area, many interviewees cited improved ability to track the performance of their products once they leave the shipping docks.

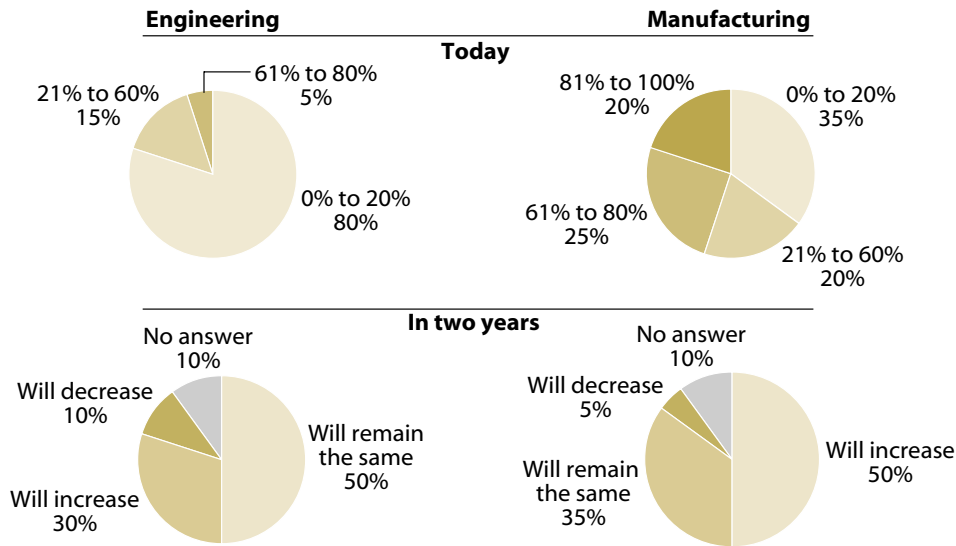
“We service our customers but are still unable to track a product problem down to a particular BOM-level part. That's where CRM fails.” (Electronics company)

**Figure 1** Product Development Is Increasingly Customer-Driven And Outsourced

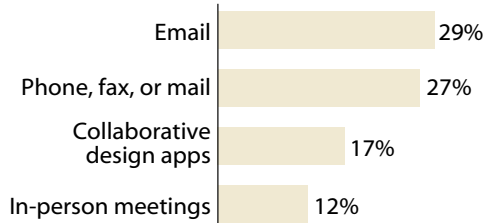
**1-1** "What percent of your products are engineered to order today? In two years?"



**1-2** "How much of your engineering and manufacturing is outsourced today? In two years?"

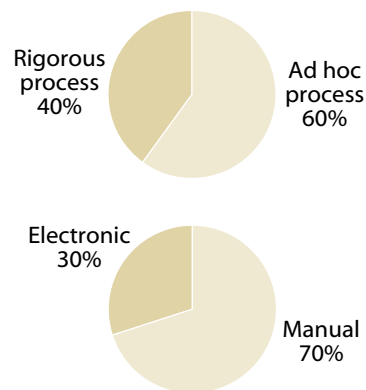


**1-3** The top four tools used to collaborate with outsourced development partners



(multiple responses accepted)

**1-4** "What is your engineering change process like? Is it manual or electronic?"



Base: 20 respondents from manufacturing companies

Source: Forrester Research, Inc.

## ANALYSIS

### CONTINUOUS PRODUCT IMPROVEMENT REMAINS A PIPE DREAM

OEMs' excitement -- "Mission accomplished!" -- the day they launch a new product ignores the fact that products are like *living systems*. Their birth -- or market launch -- is just the starting point in their life cycle. Not surprisingly, the hug-fest with outsourced development partners ends after the product launch. The result? OEMs struggle to track their products' post-sales performance, let alone continually improve them because:

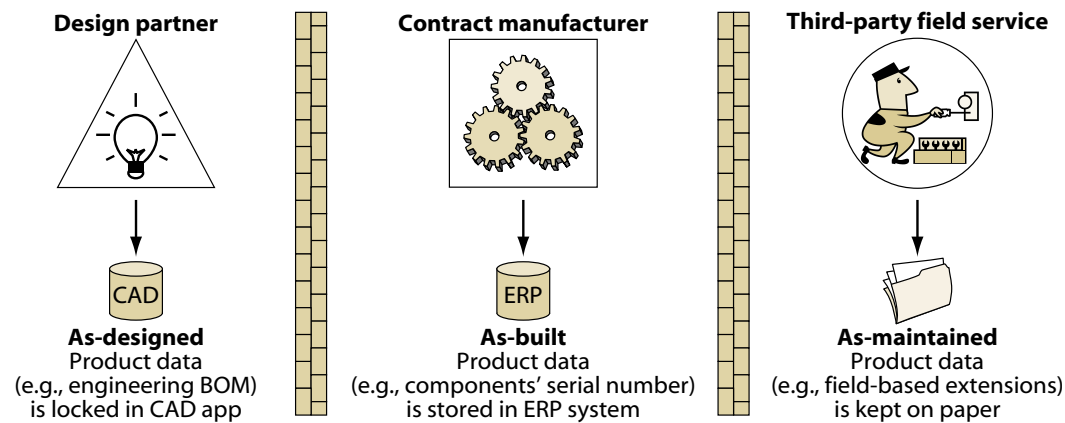
- **Communication is siloed.** OEMs need visibility into shop-floor constraints and customer complaints to keep improving their products' quality and cost structure. But data hoarding among mistrustful value-chain partners prevents such feedback. For instance, Solectron handles repairs for Microsoft's Xbox, which is produced by rival Flextronics. The result? Xbox Revision 1.0 users could defect to Sony's PlayStation if the quality issues they reported in 1.0 still exist in Rev 2.0.
- **Product knowledge is fragmented.** To analyze root causes of design issues and enable design reusability, OEMs need a system of record for all changes made to their products over their life cycle. But in today's outsourced value chain, the as-designed product data is buried in the design partner's CAD app, the as-built bill of materials (BOM) is in the contract manufacturer's ERP, and as-maintained info is in a file on the service partner's dusty shelf (see Figure 2).
- **Change management is manual.** As demand for built-to-order products grows, so do customers' expectations on making changes to their tailored products even *after* they are delivered. But given their reliance on offline collaboration tools, OEMs can't engage partners promptly to address post-sale product change needs. The result? The Mayo Clinic, a CT scanner customer of Siemens Medical Solutions, could sue if Siemens' contract manufacturer couldn't rapidly deliver a redesigned CT scanner that matches the latest FDA requirements.

### Unmanaged Product Life Cycles Cost OEMs Dearly

Because of their "ship and lose track" attitude toward their products, OEMs fail to garner the major rewards that come from cradle-to-grave product management.

- **Boosting the bottom line.** Firms now rely on cost of goods sold (COGS) as a sound metric to measure their products' cost-effectiveness. But COGS doesn't factor in warranty costs. For example, whatever savings Dell achieved in buying cheaper batteries evaporated in 2000 after one in a Dell laptop was reported to have short-circuited and caught fire. Dell had to recall 300,000 batteries.

**Figure 2** Data Fragmentation Hampers Product Life Cycle Management



Source: Forrester Research, Inc.

- **Growing customer loyalty.** Hoping to curb the delivery cycle for their engineered-to-order products, OEMs like B/E Aerospace are moving the engineering change order (ECO) process online. But B/E Aerospace's revamp of presale ECO will be futile if it can't quickly engage its suppliers to respond to United Air Lines' request to re-engineer its interior systems for more legroom.
- **Growing market share.** The design insights needed to perfect *new* products' cost structure and quality can only be gleaned from dealing with *existing* products' lifelong manufacturing and serviceability issues. But 61% of OEMs lack visibility into assembly constraints (see the May 2002 Forrester Report "The X Internet Makes Manufacturing Flexible").<sup>2</sup> So Caterpillar's R&D may approve features in its new excavator that have proven to hinder the manufacture of other models.

### INTRODUCING COLLABORATIVE PRODUCT LIFE-CYCLE MANAGEMENT

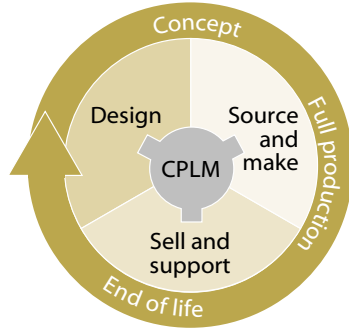
As firms migrate to adaptive supply networks, they will soon find that their linear and siloed approach to managing their products' life cycles hinders their ability to rapidly adapt existing products to meet shifts in demand and supply.<sup>3</sup> The result? OEMs will embrace a continuous product improvement strategy built on win-win partnerships called collaborative product life-cycle management (CPLM), which Forrester defines as:

*An iterative, technology-assisted process to continually improve the cost-effectiveness and profitability of a portfolio of products.*

Firms that adopt CPLM will internalize three principles (see Figure 3):

**Figure 3 CPLM Boosts Products' Cost-Effectiveness And Profitability**

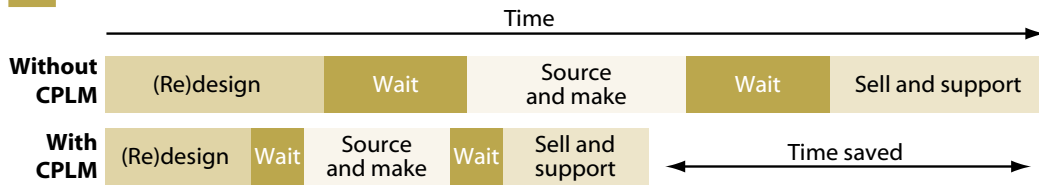
**3-1 CPLM**



**3-2 Three principles of CPLM**

- 1. Sourcing accompanies parts.**  
Sourcing constraints are exposed to engineers, manufacturing, and field service.
- 2. Plant assets notify engineering.**  
Limits of manufacturability are made visible to R&D.
- 3. Products converse with OEMs.**  
Customer-defined attributes drive product development; R&D and manufacturing have real-time access to post-sales product performance.

**3-3 CPLM compresses time to resolve product failures.**



Source: Forrester Research, Inc.

- **Sourcing accompanies parts.** CPLM exposes to R&D the sourcing constraints it must heed -- so that Celestica's engineers select only IBM-approved parts, for example. CPLM will also optimize sourcing in the post-sale phases of a product life cycle -- for example, in encouraging Bombardier's service partners to only use replacement parts preapproved by the aircraft maker.
- **Plant assets notify engineering.** CPLM tightens R&D/manufacturing integration -- proactively addressing design-for-manufacturability issues. The upside? Rather than unilaterally pushing an ECO to Visteon, Ford's R&D can first run the marketing-requested design change against Visteon's virtual assembly sequencing model and drop it if it calls for extensive shop-floor retooling.
- **Products converse with OEMs.** As outsourced servicing increases, so will the lead time for product quality issues to filter back through a complex service net (see the February 2002 Forrester Report "US Outsourcing Decelerates").<sup>4</sup> But CPLM will use X Internet technologies like sensors to let R&D track the physical performance of products deployed in the market. So Magna could initiate a revision to BMW's brake systems once its sensors report a performance decline.

**Figure 4 XRM Apps Support CPLM Activities**

**4-1 XRM apps support multiple levels of collaboration.**

	Feedback loops	Characteristics and benefits
More complex <b>Optimize</b>	<b>Redirecting</b> Global optimization and hands-free decision-making	<b>Recommend actions and redirect resources</b> <ul style="list-style-type: none"> <li>OEMs can revise pricing of custom-built products continually.</li> <li>Collaborative portfolio management allows OEMs to negotiate with trading partners the right timing for product retirement.</li> </ul>
<b>Manage</b>	<b>Automatic</b> Joint decision-making and process synchronization	<b>Aggregate, syndicate, and transact data across multiple firms</b> <ul style="list-style-type: none"> <li>Looming product failure triggers exception management session involving suppliers, OEM, and service partners.</li> <li>RFQs for new part are issued when obsolescence is detected.</li> </ul>
Less complex <b>Monitor</b>	<b>Manual</b> Passive, one-way monitoring of partners' activities	<b>Provide and gain visibility into shared processes</b> <ul style="list-style-type: none"> <li>OEMs can simulate impact of client-requested engineering changes on inventory and customer service.</li> <li>Rising warranty costs can be traced back to suppliers.</li> </ul>

**4-2 A mix of vendors enables CPLM.**

Vendors	Forrester's take
<b>ERP</b>	
Baan	Should pitch its iBaan for PLM solution to top high-tech contract manufacturers -- of whom half are Baan-ERP users. Should tap spinoff Xebic to XRM-enable its PLM app.
PeopleSoft	It must use its Agile Software and Vigilance partnerships to tie field service back to sourcing and R&D.
SAP	Partnership with Tecnomatix and ownership of R/3-resident manufacturing BOMs are big assets. Must partner with Opto 22 to help R&D track product performance.
<b>SCM</b>	
i2	Its buy-side app supports CPLM's "sourcing accompanies parts". i2 should tap Axeda to enable design-for-maintainability.
Manugistics	Its revenue optimization app helps manufacturers' profitably sell custom-built products. Must link up with MatrixOne for post-sales product change support.
webplan	Its PLM Insight app helps firms time ECO releases to the shop floor. It needs to partner with MES vendors to enable design-for-manufacturability.
<b>Sales and support</b>	
NetVendor	Engineered-to-order manufacturers use its XRM app to collaborate with suppliers, channel partners, and end customers.
Siebel	Partnered with Axeda Systems to help manufacturing clients address equipment glitches at customer site. It needs to link up with design app players.
<b>New product introduction (NPI)</b>	
Agile	High-tech and medical device OEMs use its app to manage outsourced NPI. But to crack auto and aerospace, it must beef up support for complex, multilevel BOMs.
MatrixOne	With its CAD-agnostic PDM tool, it must buy a strategic sourcing app vendor like Emptoris.
PTC	Alliance with Groove Networks is a big plus. Should partner with channel management vendors like Click Commerce and InfoNow to support channel-reliant manufacturers.
<b>Promising pure plays</b>	
Annexient	Three major CPG OEMs use its XRM app to manage codeveloped products' life cycle.
bom.com	Agile's rival; its app supports multilevel-deep BOMs. Early customers include IDEO.
Syncron	LG Electronics uses its app to optimize its products' design-for-manufacturability.
Tecnomatix	Airbus, Ford, and BMW are blue-chip customers of its bill-of-process management app.

Source: Forrester Research, Inc.

## EXTENDED RELATIONSHIP MANAGEMENT APPS MAKE CPLM SING

Existing design-centric, point-to-point apps like product data management (PDM) tools won't deliver CPLM, which spans multiple functions and partners. Instead, firms must augment their existing PDM tools with a new class of business apps known as eXtended relationship management (XRM).<sup>5</sup> XRM apps allow OEMs to (see Figure 4):

- **Monitor multitier partners' status.** OEMs today make unilateral product life cycle decisions without considering the impact on supply or service networks. But using webplan's XRM app, for example, Komatsu's R&D can rapidly assess the impact of the resulting BOM changes on its supply net -- like excess and obsolete inventory exposure -- when field service suggests a product upgrade.
- **Manage networked transactions.** OEMs that sell via multitier channels and rely on third-party field service can't use existing point-to-point collaboration tools to manage customer-requested, post-sale product changes. But NetVendor's app lets Kulicke & Soffa rapidly engage its supply, channel, and service-network members and expedite post-sale changes to its engineered-to-order electronic components.
- **Optimize product portfolio's profitability.** OEMs that outsource must be able to adjust their made-to-order products' price quickly to reflect fluctuating market availability of materials and capacities. For instance, Fairchild Semiconductor, which outsources to design firms like Tality, uses Manugistics' Precision Pricing to analyze market conditions and weekly reprice its custom-made products.

## WHAT IT MEANS



### EMS providers split into three parts.

Electronics manufacturing service (EMS) providers like Flextronics will soon realize that offering engineering, supply chain, and warranty services under one roof makes OEMs paranoid and prevents CPLM partnerships with rivals. The result? A three-way split into *engineering*, *manufacturing*, and *service* firms.



### CMM Level 5 becomes manufacturers' No. 1 obsession.

As more electronics software gets embedded in industrial and office products, firms like GE will outsource all their hardware design and production and dedicate their CPLM initiatives to improving their software development skills -- with the aim to get certified Capability Maturity Model Level 5.<sup>6</sup>

## RELATED MATERIAL

### Companies Interviewed For This Report

Accordia  
[www.accordiasys.com](http://www.accordiasys.com)

Agile Software  
[www.agilesoft.com](http://www.agilesoft.com)

Alventive  
[www.alventive.com](http://www.alventive.com)

BiosGroup  
[www.biosgroup.com](http://www.biosgroup.com)

bom.com  
[www.bom.com](http://www.bom.com)

Cap Gemini Ernst &  
Young  
[www.cgey.com](http://www.cgey.com)

Centric Software  
[www.centricsoftware.com](http://www.centricsoftware.com)

Deloitte Consulting  
[www.dc.com](http://www.dc.com)

eConnections  
[www.econnections.com](http://www.econnections.com)

Framework Technologies  
[www.frametech.com](http://www.frametech.com)

i2 Technologies  
[www.i2.com](http://www.i2.com)

Manugistics  
[www.manu.com](http://www.manu.com)

NetVendor  
[www.netvendor.com](http://www.netvendor.com)

Open Applications Group  
[www.openapplications.org](http://www.openapplications.org)

Parametric Technology  
Corporation (PTC)  
[www.ptc.com](http://www.ptc.com)

PRTM  
[www.prtm.com](http://www.prtm.com)

SAP  
[www.sap.com](http://www.sap.com)

Sierra Atlantic  
[www.sierraatlantic.com](http://www.sierraatlantic.com)

Synchron Technologies  
[www.synchrontechnologies.com](http://www.synchrontechnologies.com)

Technology Solutions  
Company  
[www.techsol.com](http://www.techsol.com)

Tecnomatix Technologies  
[www.tecnomatix.com](http://www.tecnomatix.com)

### Experts Interviewed For This Report

Prof. Marco Iansiti, Harvard Business School

Prof. Eric Johnson, Tuck School of Business, Dartmouth College

Dr. Jay Lee, College of Engineering and Applied Science, University of Wisconsin

### Related Research

May 2002 Forrester Report “The X Internet Makes Manufacturing Flexible”

January 2002 Forrester Report “Standalone Sourcing Apps Vanish”

December 18, 2001 Forrester Brief “Remote Diagnostics Will Soar For Self-Service”

October 2001 Forrester Report “The X Internet Invigorates B2B Apps”

May 2001 Forrester Report “Apps For Dynamic Collaboration”

January 2001 Forrester Report “The Build-To-Order (R)evolution”

## GRAPEVINE

### **Loving Family Doll House gets remodeled.**

Fisher-Price has been producing an estimated 100,000 dollhouses a year, but the mold started to wear. In came Raindrop Geomagic to create replacement mold by using digital modeling technology. All the toy maker had to do was pull a finished dollhouse off the product line, scan it, and send the MCAD file to Geomagic. The result? OEMs like Fisher-Price can save up to eight weeks on an 80-week development schedule.

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### **Don't get too cozy at work: The boss is watching you.**

Don't you wish you could sit back and relax at work? Well, Herman Miller is using PTC's Web-based software to ease product customization, allowing office workers to easily select the shape, size, and material for their office furniture. By integrating the 3-D model created by the customer with its CAD system, Herman Miller is then able to print out a final picture and specs to run by the customer. We expect productivity-obsessed bosses to soon disable employees' access to Herman Miller's design option that turns a swivel chair into a recliner!

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### **Who cares about 0% financing when you can pay by the drink?**

Some i2 execs shared with us their insight into how CPLM will impact capital asset purchasing. The execs told us some of their German clients that supply shop-floor machines now charge customers for uptime only -- and incur a penalty for equipment downtime. Separately, we learned that Whirlpool's commercial laundry strategy includes a pay-per-use component. If this trend goes unabated, not only will it radically change the nature of capital spending, but it will also render metrics like return-on-assets irrelevant.

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### **Hey OEMs: How does it feel to be on the receiving end?**

We recently spoke with the CIO of a major medical device supplier that is using Agile to manage ECOs with its customers on the Net. When asked how often he tracks his OEM customers' responsiveness to ECOs, the CIO noted, "As I am speaking to you, I can see that customer X has just logged into our portal to approve the latest ECOs." While this might sound creepy, Forrester's thinking is that with OEMs now investing in tools that track supplier performance, why shouldn't the reverse be allowed? We expect the more enlightened OEMs to use suppliers' assessments to better partner relationships.

## E N D N O T E S

- 1 Graphically depicted as a bell curve, “product life cycle” designates stages of evolution of a commercial product: concept, introduction, growth, maturity, decline, and retirement.
- 2 In a recent survey with 28 manufacturers, 61% reported having no integration between their shop-floor assets and their enterprise systems, leaving them blind to design-for-manufacturability issues.
- 3 To deal with emerging risks and opportunities, manufacturers must cultivate a portfolio containing coping strategies that boost operational flexibility. Firms will exploit three emerging technologies -- Web services, X Internet, and agent software -- to make supply networks more adaptive.
- 4 In a survey with 85 IT and business executives at firms with \$1 billion or more in revenue, Forrester found that 22% expect to use business process outsourcers to manage their front-office activities, including sales and customer service.
- 5 To collaborate effectively, firms will need a new breed of apps called eXtended relationship management (XRM) to help them speed up and expand the scope of supplier, channel, and customer relationships. XRM apps enable firms to monitor partner status; manage intercompany transactions; and optimize design, production, and service.
- 6 The Capability Maturity Model (CMM) is the Software Engineering Institute’s test of software methodology and process maturity -- used to assess the quality of software development processes. The maturity levels within CMM represent the stages of process maturity. From lowest to highest they are: 1) initial; 2) repeatable; 3) defined; 4) managed; and 5) optimizing. Very few software firms in the world have been certified CMM Level 5.

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