June 15, 2009 | Updated: June 25, 2009

The ROI Of Product Life-Cycle Management

by Roy C. Wildeman

for Application Development & Program Management Professionals

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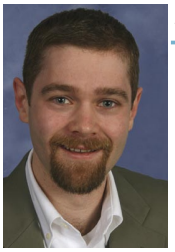

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The ROI Of Product Life-Cycle Management

A Total Economic Impact™ Analysis Uncovers Extended Rewards Alongside Risks

by Roy C. Wildeman
with Mike Gilpin and Justinas Sileikis

EXECUTIVE SUMMARY

As companies pursue a broader agenda for product life-cycle management (PLM), the scope and complexity of their application implementations can make it harder to track, or even realize, the business value of those investments. A Total Economic Impact (TEI) analysis of core product data management (PDM) functionality across product development users with minimum collaboration by outside functions shows a very solid investment return with modest risks. However, extending the PLM initiative to downstream operations users — whether in manufacturing or services environments — produces a comparable return but has a larger range of possible outcomes due to the larger risk of encountering issues with organizational alignment, application integration, and change management.

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NOTES & RESOURCES

Forrester interviewed more than 14 vendor and user companies, including Accenture, Aras, Arena Solutions, Autodesk, Capgemini, Datastay PLM, Infor, Infosys Technologies, ITC Infotech, PRTM, Larsen & Toubro Infotech Parametric Technology Corporation (PTC), SAP, Syntel, and Tata Consultancy Services. We used this information to create an ROI model based on our Total Economic Impact™ (TEI) analysis framework.

Related Research Documents

"Forrester's Best Practices Framework For Adopting PLM In Services Organizations"
April 10, 2009

"An App Dev Introduction To A Process Overview Of Product Life-Cycle Management"
February 11, 2009

"The State Of Product Life-Cycle Management 2009"
February 6, 2009

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WHAT IS THE BUSINESS VALUE OF PRODUCT LIFE-CYCLE MANAGEMENT? "IT DEPENDS . . ."

Over the past decade, product life-cycle management (PLM) has matured beyond its engineering product data management (PDM) origins into a proven management approach relevant to a wide variety of business functions and operating environments.[1] Amid this growth, however, both executives and managers often struggle to articulate the business value of PLM in their environments, wrestling with a few strategic parameters that can widely affect the business viability of the initiative, including:

- **Wide breadth of users.** From its roots in product design, PLM has expanded to a veritable cross-functional, *life-cycle* management process that often involves stakeholders from sales, marketing, sourcing, manufacturing, quality, and aftermarket services. This means that firms often struggle not only to prioritize which users receive functionality first but also to deliver the necessary training, coaching, and leadership attention to ensure a successful change.

- **Variable process scope.** As part of this user expansion, manufacturing and service firms alike are seeking out expanded PLM application functionality in order to better integrate product development activities with these constituents and deliver real improvements in product development effectiveness. But although PLM is a comprehensive process by definition, the *individual* limits and scope of PLM expansion tend to vary widely based on industry, process maturity, and specific company objectives.

- **Disconnected measures of success.** When seeking to improve a company's product development effectiveness, executives commonly consider strategic measures such as time-to-market, design efficiency, and production costs as critical to program success. However, all too often, measurable impact on these high-level metrics proves elusive to managers seeking to drive more-pragmatic improvements such as speeding change-order cycle times, reusing a larger percentage of designs, and reducing product defects and rework.

THREE FACTORS DETERMINE THE ROI OF PRODUCT LIFE-CYCLE MANAGEMENT

When scoping a PLM initiative, it is imperative to objectively evaluate the financial impact that initiative will have on the business. How? Companies can use a simplified version of Forrester's Total Economic Impact™ (TEI) model to systematically consider:

1. **Benefits.** How will your company benefit from PLM?

2. **Costs.** How will your company pay, both in hard costs and resources, for PLM?

3. **Risks.** How might uncertainties change PLM's total impact on your business?

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Key Benefits: Plm Delivers Both Top-Line And Bottom-Line Opportunities

Organizations implementing PLM can expect both top-line and bottom-line benefits that come from gains in time-to-market, operational efficiency, production costs, and regulatory compliance. Product development professionals can estimate the scale, timing, and duration of these benefits by considering one or more key metrics and the value that improving those metrics over time can provide to the organization (see Figure 1). Benefits include:

- **Improved time-to-market.** Greater centralization and control of product data allows product development teams not only to accelerate their design change review cycle but also to facilitate the transfer of design information to production — operational improvements that help bring new products into the market faster and allow firms to capture more revenue earlier. In markets where the first-mover advantage is a critical differentiator, faster product development speed can also correlate to a firm gaining competitive advantage and increasing market share.[2]

- **Operational efficiencies.** For firms with meager control of their product data, a centralized PLM application can eliminate wasteful activities such as duplicating data across systems, checking for data inconsistencies, and searching for missing information. Moreover, both product development teams and operations personnel are likely to encounter fewer processing errors and associated rework from referencing out-of-date information. Depending on the type of product architecture, some development shops will also stand to reap the dual rewards of faster design time and lower design costs from more design reuse. For example, one Asia-Pacific telecom service provider leveraged centralized product data, standardized reuse methods, and strategic systems integrations to deliver products an average of seven to eight times faster with up to 80% savings in development effort.[3]

- **Lower material and production costs.** With as much as 70% of a product's costs locked down during the design phase, the opportunity to lower material and production costs through collaborative design is large. Some benefits that PLM offers — such as reduced prototype or scrap costs — stem from PLM's role as the "vault of truth" between designers and production staff, while other benefits — such as increased procurement leverage or reduced retooling expenses — depend considerably on the degree and scale of product re-use across product lines. For example, Procter and Gamble's PDM strategy takes advantage of the company's sizeable economy of scope across shared materials, suppliers, and "master" design formats to achieve more than $250 million in direct material savings.[4]

- **Lower compliance risks.** In today's environment of increasing global regulation, PLM's ability to control a single version of the truth for all product-related information can help mitigate compliance risks for companies in a wide variety of industries. Although the benefit is largely one of cost avoidance, many companies recognize the full severity of problems — such as product recalls, scrapped products, civil penalties, legal fees, lost productivity, etc. — that can

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result if compliance risk becomes a real issue. As an example, a manufacturer of orthopedic implants and related orthopedic surgical products chose to implement PLM in order to have a common platform for device master records (DMRs) and change processes to ensure product traceability and compliance to FDA regulations.

Figure 1 Product Life-Cycle Management Can Increase Revenues And Reduce Cost

Dimension	Product life-cycle management helps by . . .
Increased revenues	• Enabling faster product design iterations • Streamlining the flow of product data to downstream applications • Increasing the company's market share from faster new product introduction time
Reduced costs	• Improving product data quality • Enabling greater product development efficiency • Reducing material and production costs • Lowering compliance risks

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Key Costs: System Implementations Dominate Multiyear Costs

Organizations deploying PLM can expect several different costs — the bulk of which usually come from a firm's investment in business, IT, and consulting resources to design, develop, test, and deploy systems functionality (see Figure 2). The costs of implementing PLM include:

- **Initial planning costs.** Firms embarking on PLM for the first time will need upfront time and resources to understand the technology, scope the program, and justify the initiative. After establishing core PDM functionality in the design organization, many firms will also conduct this kind of planning work to define what kind of extended PLM functionality they should deploy to subsequent business functions.

- **Software and hardware costs.** At a minimum, a company will need to purchase software licenses for its product development users and development tool licenses for its application developers. Depending on program scope, firms may need additional software licenses to cover occasional systems use by manufacturing, sourcing, marketing, or other extended personnel. In terms of hardware costs, implementers of PLM may also need to make some infrastructure investments to support increased volumes of centralized, data-heavy computer-aided design (CAD) files being accessed across regional sites.

- **System implementation costs.** The largest component of project costs includes: the combined labor from business, IT, and consulting resources to configure and customize the PLM software system itself; formatting legacy product data and migrating it to the new system's environment; and integrating the new system with downstream applications including enterprise resource

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planning (ERP), supply chain management (SCM), and other industry-specific operational apps. These costs can also vary significantly based on the maturity of the legacy systems environment as well as the overall level of systems integration required.

- **Ongoing support costs.** Four factors contribute to ongoing support costs: software maintenance, hardware maintenance, user training, and the time required from both business and IT heads to champion the change and roll out new PLM processes to users.

Figure 2 PLM Incurs Initial Planning, Implementation, And Ongoing Costs

Project phase	Key costs
Initial planning	• Scope the program and align stakeholders • Justify the investment
Implementation	• Software licenses • Hardware infrastructure • Configure and customize the application • Format and migrate legacy data • Integrate to downstream applications (e.g., ERP, SCM, etc.)
Ongoing expenses	• Software maintenance • Hardware maintenance • User training • Change management costs

54690 Source: Forrester Research, Inc.

Risk Analysis: Expanded Scope Presents More Implementation Challenges

No change — or avoidance of change — is without risk. Factoring this uncertainty into the analysis converts an optimistic and potentially unachievable plan into one with higher accuracy. Initial estimates can be refined by factoring in a few key risks that tend to rise alongside the number of different divisions, stakeholder functions, and users included in the program's scope. In fact, nearly three-quarters of the respondents to Forrester's November 2008 Global State Of Product Life-Cycle Management Online Survey found four risks either somewhat challenging, fairly challenging, or extremely challenging in achieving expected return on investment (ROI) from their PLM solutions (see Figure 3). These four risks are:

- **Application integration issues.** Companies we interviewed cited the insidious costs of extensive, complex integrations to their PLM systems. These issues not only place additional support strain on IT for the lifetime of the app, but they can ultimately rob business process owners of critical insight into which product information is managed in which application — limiting the effectiveness of both systems.

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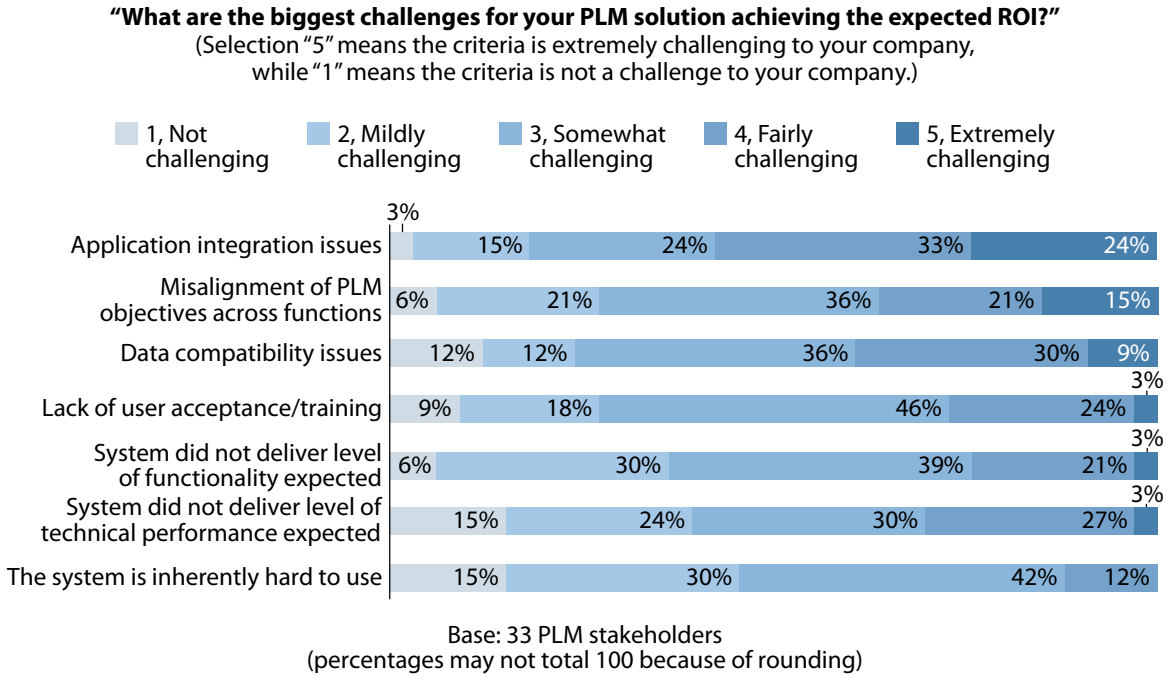
- **Misalignment of PLM objectives across functions.** Business stakeholders not only have different PLM information needs, skills, and access rights; they also have different perspectives on how the data should be organized and managed, which often creates a rocky political topology for PLM champions to navigate and harmonize.

- **Data compatibility issues.** Mapping legacy product data to new attributes is almost always a time- and resource-intensive process. Despite this pain, companies must validate that the work is complete before migrating any data, or else the system will be as worthless as the data put into it.

- **Lack of user acceptance.** Unlike the case of financial procedures grounded in ERP systems, with PLM, product development professionals can easily conduct development activities outside the company's intended PLM system without notice. Specifically, the half-lives of users' search and reporting behaviors are notoriously long, and they often work to undermine the adoption and effectiveness of the new PLM functionality.

Figure 3 Key Risks Associated With Trying To Achieve ROI From Product Life-Cycle Management



Source: November 2008 Global State Of Product Life-Cycle Management Online Survey

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CALCULATING ROI FOR A MULTIPHASED, MULTIYEAR PLM IMPLEMENTATION

To arrive at a quantitative assessment of the economic implications of PLM, Forrester evaluated the key drivers of benefits, costs, and risks for a hypothetical company with:

- **Typical revenues, margins, and product development operations.** Our sample company currently operates as a single business division with multiple product lines generating $500 million in sales annually. In this scenario, we also assumed that the company operates with 30% gross margin (before accounting for selling, general, and administrative costs), has a product development staff of a 100 people, and counts on 5% of its annual revenue coming from new product introductions.

- **Extended PLM stakeholders in production operations.** Furthermore, we assumed that our sample company has 200 additional operations personnel who need to collaborate periodically on design decisions as well as reference released product data in order to bring products to market.

Company Baselines And Assumptions

For the purposes of conducting the analysis, we established a set of baseline values and assumptions based on conversations with numerous end users and technology vendors. Individual manufacturing or services organizations can adapt these baseline values and assumptions to meet their particular needs. We chose to use the following parameters as the major inputs to the model:

- **A three-year window for the analysis.** Our sample company evaluated its PLM investment scenario over a three-year period in order to account for the initial core PDM deployment (lasting 18 months) and the subsequent extended PLM deployment (lasting 12 months).

- **Software licenses priced by user type.** We priced licenses for PLM software to be $5,000 per core product designer user and $2,000 per extended operations user. For both types of licenses, we estimated ongoing maintenance service fees at 20% of license costs.

Evaluation Time Frame

This analysis assumes that the PLM initiative begins on January 1 of Year 1 and continues until December 31 of Year 3. Based on reports from organizations initiating this type or project, the following phases are likely occur:

- **Initial planning phase.** During the first 90 days, our sample company works to establish the scope of the program, align stakeholders across functions, and justify the investment. While organizations will certainly gain important education on PLM during this phase, we have assumed no financial benefits during this initial phase.

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- **Implementation rollout phase.** This phase, lasting up to 18 months, sees the bulk of the spending required to deliver the core product data management (PDM) functionality across product development users. This phase includes investing in hardware and infrastructure and software licenses, configuring/customizing functionality, migrating legacy product data, and integrating the PLM software with new and legacy design applications such as CAD and other product authoring systems. In parallel, our sample company starts planning and implementing the extended product life-cycle management functionality targeting operations staff in Month 13, with deployment complete in Month 24 and corresponding benefits beginning at the start of Year 3.

- **Ongoing benefits and support phase.** During Month 19 and beyond, our company begins to realize benefits from the core PDM functionality. During Month 25 and beyond, our company begins to realize benefits from the extended PLM functionality, subject to the risk factors defined. For the purpose of this analysis, benefits start alongside ongoing operational costs such as software and hardware maintenance, user training, and support resources from both the business and IT.

Scenario 1: Core PDM Functionality Delivered To Product Development Users

In this scenario, our company implements core PDM functionality, including product data vaulting, item or component classifications, workflows, and other collaboration capabilities to product development users with minimum access or reference by outside stakeholders or functions. In this scenario, we assume:

- **Lower costs.** With a scope targeted at just product development users, this core PLM deployment's program planning costs, software costs, systems implementation costs, and ongoing support costs are all lower. This results in a 23% savings when compared with an extended PLM deployment.

- **Limited benefits.** Without the broader collaboration and integration typical of an extended PLM deployment, this implementation also offers more-limited benefits. The sample company in this case can expect some revenue increase from faster product design iterations and increased market share as well as some cost reductions due to better product data quality and greater product development efficiency.

- **Lower risks.** In core PDM implementations, the smaller, targeted PDM scope enables implementers avoid many of the major risks, such as misalignment on PLM objectives, application integration issues, and change management roadblocks.

Scenario 2: Extended PLM Functionality Within A Manufacturing Environment

In this scenario, our sample company implements extend PLM functionality to users managing a physical manufacturing production environment in order to facilitate cross-functional collaboration with product development. In this scenario, we assume:

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- **Higher costs.** In this scenario, our sample company's planning costs, software costs, systems implementation costs, and ongoing support costs are all higher — doubling the total program costs in both Year 2 and Year 3.

- **Full benefits.** As this example implementation offers greater extended functionality, we also assume more top-line time-to-market benefits stemming from an integrated data flow from PLM to downstream production apps. Additionally, our sample company can expect more bottom-line savings from areas ranging from more collaborative opportunities to reduced production and materials costs. This results in a combined gain of about one-third more benefits over the three-year period.

- **Higher risks.** Given this case's larger deployment scope, we assume that major PLM program risks such as misalignment on PLM objectives, application integration issues, and change management roadblocks are higher and thus impact the range of costs and benefits that our company can expect.

Scenario 3: Extended PLM Functionality Within A Services Environment

In this scenario, our company implements extended PLM functionality across product development as well as an extended community of stakeholders responsible for bringing a services offering to the marketplace. In this scenario, we assume:

- **Lower software and hardware costs.** By shedding the need for high-end capabilities to manage CAD and other engineering product data, our services company can expect to save approximately 50% on software and hardware costs relative to its manufacturing counterparts.

- **More top-line benefits but reduced bottom-line savings.** In a services environment, our sample company expects greater time-to-market gains from component reuse and integrated data flow but no reductions in material or production costs. So while total benefits are comparable to a manufacturing deployment, the percentage of increased revenue opportunities will be about 60%, compared with manufacturers, who expect 50%.

CORE PDM OFFERS SOLID VALUE; EXPANDED PLM IS HIGHER REWARD WITH MORE RISKS

In our sample company, implementing core PDM capabilities to product development users with minimum access or reference by outside functions produced an expected return on investment of 80% and a net present value (NPV) of approximately $5,816,200 (see Figure 4). However, the additional investment in extended PLM produces a slightly higher return on investment of 84% and an NPV of $7,904,500 in manufacturing environments as well as an even higher return on investment of 119% and an NPV of $9,103,500 in services environments (see Figure 5 and see Figure 6).

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Notably, these ROI conclusions are simple averages that don't address the variability that comes from the different risk profiles inherent in each of these scenarios. When viewing the best-case, worst-case, and most-likely estimates for each scenario, it becomes clear that extended PLM presents a wider range of possible economic outcomes and is essentially a riskier bet relative to core PDM (see Figure 7).

Figure 4 Model: TEI Analysis Summary — Core Product Data Management

Original estimates	**Year 1**	**Year 2**	**Year 3**	**Total**	**Present value**
Benefit	$0	$5,600,000	$11,200,000	$16,800,000	$13,692,018
Cost	$5,342,308	$1,645,615	$646,000	$7,633,923	$6,870,246
Net cash flow	-$5,342,308	$3,954,385	$10,554,000	$9,166,078	$6,821,772
Cumulative cash flow	-$5,342,308	-$1,387,923	$9,166,078		
NPV	**$6,821,772**				
ROI	**99%**				

Most likely estimates	**Year 1**	**Year 2**	**Year 3**	**Total**	**Present value**
Benefit	$0	$5,343,333	$11,200,000	$16,800,000	$13,064,468
Cost	$5,693,461	$1,707,256	$646,000	$8,046,717	$7,248,236
Net cash flow	-$5,693,461	$3,636,077	$10,040,667	$7,983,283	$5,816,232
Cumulative cash flow	-$5,693,461	-$2,057,384	$7,983,283		
NPV	**$5,816,232**				
ROI	**80%**				
Payback	**More than 2 years**				

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Figure 5 Model: TEI Analysis Summary — Extended PLM (Manufacturing)

Original estimates	Year 1	Year 2	Year 3	Total	Present value
Benefit	$0	$6,037,500	$17,175,000	$23,212,500	$18,810,252
Cost	$5,342,308	$3,730,615	$1,066,000	$10,138,923	$8,991,207
Net cash flow	-$5,342,308	$2,306,885	$16,109,000	$13,073,578	$9,819,045
Cumulative cash flow	-$5,342,308	-$3,035,423	$13,073,578		
NPV	**$9,819,045**				
ROI	**109%**				

Most likely estimates	Year 1	Year 2	Year 3	Total	Present value
Benefit	$0	$5,490,833	$15,915,000	$21,405,833	$17,341,345
Cost	$5,491,051	$3,925,269	$1,243,667	$10,659,987	$9,436,855
Net cash flow	-$5,491,051	$1,565,565	$14,671,333	$10,745,847	$7,904,490
Cumulative cash flow	-$5,491,051	-$3,925,487	$10,745,847		
NPV	**$7,904,490**				
ROI	**84%**				
Payback	**More than 2 years**				

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Figure 6 Model: TEI Analysis Summary — Extended PLM (Services)

Original estimates	Year 1	Year 2	Year 3	Total	Present value
Benefit	$0	$6,300,000	$16,500,000	$22,800,000	$18,499,467
Cost	$4,142,308	$3,273,115	$828,500	$8,243,923	$7,299,328
Net cash flow	-$4,142,308	$3,026,885	$15,671,500	$14,556,078	$11,200,138
Cumulative cash flow	-$4,142,308	-$1,115,423	$14,556,078		
NPV	**$11,200,138**				
ROI	**153%**				

Most likely estimates	Year 1	Year 2	Year 3	Total	Present value
Benefit	$0	$5,706,667	$14,980,000	$20,686,667	$16,784,154
Cost	$4,264,384	$3,458,186	$966,583	$8,689,153	$7,680,646
Net cash flow	-$4,264,384	$2,248,481	$14,013,417	$11,997,513	$9,103,508
Cumulative cash flow	-$4,264,384	-$2,015,903	$11,997,513		
NPV	**$9,103,508**				
ROI	**119%**				
Payback	**More than 2 years**				

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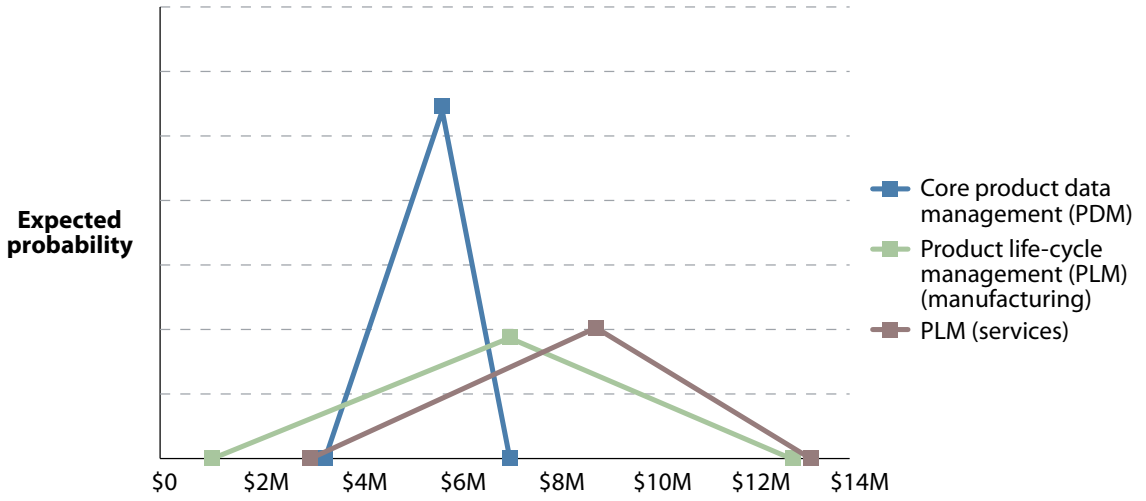
Figure 7 Quantifying The Investment Risks Using A "Triangular" Probability Distribution



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RECOMMENDATIONS

RISK-PROOF YOUR PRODUCT LIFE-CYCLE MANAGEMENT DEPLOYMENT STRATEGY

In the coming year, Forrester expects that business demand for PLM capabilities will be even more compelling — especially as services firms leverage PLM as part of an imperative to import proven product-centric principles and practices from the manufacturing domain into their own development organizations. To navigate the complex PLM solution landscape and get the most value with the least risk from their company's PLM initiative, application development pros should:

- **Strategize to pinpoint quick wins.** Smart companies are selective about how and where they invest resources; they focus their PLM investment on the most critical business capabilities required to meet pressing business goals. By taking a step-by-step approach, successful companies start first with their key pain points, rolling out corresponding systems functionality gradually in "digestible" phases.
- **Justify PLM investments to articulate value.** Although it's hard to find product development executives who don't endorse having a product collaboration platform in theory, it's equally hard to get funding for projects that will turn theory into reality. Do the math that demonstrates the ROI for PLM, and you'll also be formulating the right metrics to instill the management discipline required for success.

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- **Select the right PLM solution.** PLM vendor-selection decisions can have far-reaching and long-term consequences. To determine the best fit for your organization, establish clear evaluation criteria that include vendor information including product functionality, vendors' future strategy and road maps, vendors' market presence, and strength of vendors' customer references.[5]
- **Optimize PLM processes using deployment best practices.** Some of the critical success factors for PLM deployments include: keeping the program manageable; standardizing and externalizing product data into a common repository; driving more collaboration across the development process; and strategically integrating to downstream applications.[6]

SUPPLEMENTAL MATERIAL

Online Resource

The underlying spreadsheets detailing the models in Figures 4, 5, and 6 are available online.

Methodology

Forrester Research uses a defined methodology for analyzing and evaluating the costs, benefits, and risks of a proposed solution. This methodology, termed Total Economic Impact (TEI), provides a holistic view of the decision by including an analysis of costs, benefits, flexibility, and risk. By including an assessment of risk, TEI provides a realistic view of expected outcomes rather than one shaded by early optimism and enthusiasm.[7]

Unlike a cost- or technology-based analysis, TEI does not rely on industry averages or factors that are applied to all organizations but is a methodology for evaluating projects. The TEI methodology forces the determination and quantification of relevant metrics in light of an organization's current state and future goals. Firms can use the TEI model as a proactive and predictive tool.

The November 2008 Global State Of Product Life-Cycle Management Online Survey utilized 130 companies that were either members of its internal research panels or extended contacts. The survey was fielded in October and November 2008 and did not motivate respondents with an incentive.

Exact sample sizes are provided in this report on a question-by-question basis. Panels are not guaranteed to be representative of the population. Unless otherwise noted, statistical data is intended to be used for descriptive and not inferential purposes.

If you're interested in joining one of Forrester's Research Panels, you may visit us at http://Forrester.com/Panel.

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ENDNOTES

[1] For more information on the evolution of PLM processes and applications, please see the February 11, 2009, "An App Dev Introduction To A Process Overview Of Product Life-Cycle Management" report.

[2] Some industry-specific PLM capabilities — such as digital prototyping and simulation — can also help product designers develop better-quality products that are more compelling in the marketplace.

[3] Forrester published a detailed case study outlining an Asian telecom's use of PLM best practices. See the April 10, 2009, "Case Study: Asian Telecom Boosts Its Service Offerings With Product-Centric Practices" report.

[4] Forrester published a detailed case study outlining Procter & Gamble's use of PDM best practices. See the February 12, 2008, "Case Study: Procter & Gamble Masters Enterprisewide PDM" report.

[5] Forrester evaluated leading product life-cycle management (PLM) applications across approximately 70 criteria from the perspectives of both discrete-based and process-based manufacturers. In the established discrete-manufacturing market, we found that Dassault Systèmes, Siemens PLM, and PTC demonstrate frontrunner leadership due to their strong combination of current offerings and strategy. See the April 29, 2008, "The Forrester Wave™: Product Life-Cycle Management Applications, Q2 2008" report.

[6] Forrester interviewed users, vendors, and systems integrators operating in financial services, telecom, and other services industries to research the common principles behind leading methods for the collaborative management of product information where the "product" is not a manufactured good. See the April 10, 2009, "Forrester's Best Practices Framework For Adopting PLM In Services Organizations" report.

[7] For an in-depth discussion of TEI and the individual elements within the methodology, please see the August, 4, 2008, "The Total Economic Impact™ Methodology: A Foundation For Sound Technology Investments" report.

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