



IBM PLM Relational Product Development (RPD)

*A PLM methodology to optimise the business value
of relational design*



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Executive summary

Growth is leading the CEO's agenda for business success. To fuel that growth, CEOs are looking to innovate. A key driver of innovation is the knowledge that resides in an organisation's people, its business partners and its customers. The question is how this knowledge can be captured and efficiently reused to enable innovation.

The past 30 years have seen the evolution of the tools and techniques available for knowledge capture and reuse. Today's digital design technologies mark the shift towards a product synthesis design approach. This approach captures and leverages a company's knowledge of the product, plus product data behaviour and relationships that optimise the product development process. Known as relational product development (RPD), this approach supports accelerated product delivery at optimised costs, with improved quality.

Investment in RPD technologies alone is insufficient to achieve innovation, and ultimately world-class product lifecycle management (PLM) capability. The technologies are purely the enablers. Realising the full potential of an RPD investment demands fundamental organisational, process and cultural changes, made cohesively to support the enhanced technology level.

Presented within this whitepaper is a holistic RPD methodology developed by IBM, to optimise a company's PLM investment. The methodology goes beyond the enabling technologies to help create a business value that supports change, provide the tools and infrastructure needed to enable innovation, and ensure the correct processes are in place to achieve business success. RPD is more than technology: it is a business transformation opportunity to reach new levels of performance.

Background

For years, maximising productivity and improving the bottom line led the CEO's agenda for realising business success. However, the IBM Global CEO study 2004¹ revealed this has been superseded by a shift in priorities towards business growth. In the more recent IBM Global CEO study 2006², two-thirds of respondents cited innovation as the key to achieving this growth.

A key driver of innovation is an organisation's knowledge, or intellectual capital. More critical is how this knowledge is captured, managed and leveraged to optimise business value. The past 30 years have seen the evolution of product innovation tools and technologies to support knowledge capture and reuse.

The earliest computer-aided design (CAD) systems functioned as drawing and 3D rendering systems focused on work task automation. These systems were developed to help the designers define increasingly complex and innovative products more efficiently. However, on their own they did not fundamentally improve business process effectiveness.

These early systems supported the manual production of change modifications as a single transaction one part at a time, through every stage of the development. To implement changes, designers had to return to the basic geometric level and re-engineer at each subsequent level in sequence, thereby necessitating substantial and costly rework.

A shift in design paradigm

The introduction of advanced modelling techniques and capabilities in the design process promotes a shift away from the traditional sequential approach to design (when appropriate PLM practices are employed). Product development tools such as CATIA V5 now embody an underlying information architecture that can capture all information relevant to a product definition, including all the specifications, constraints and relationships that might affect it.

CATIA V5 employs this built-in capability to exploit the behavioural relationships within product data, establish data links and manage imbedded knowledge. However, to successfully manage the relationships introduced through the RPD approach demands a deeper level of capability.

Virtual product data management (VPDM) solutions evolved in response to this need. For example, the Dassault Systèmes ENOVIA V5 VPM solution can capture, manage and expose engineering design intent. This enables engineers to analyse design change quickly and accurately to optimise product performance and costs, while ensuring a smooth transition from engineering to manufacturing.

Together, the advanced digital product definition and simulation capabilities of CATIA V5 and the data management capabilities of ENOVIA V5 VPM facilitate an RPD structure that supports dynamic design, analysis and manufacturing. Under this new paradigm, previous design knowledge and specifications can be captured and reused flexibly for future efforts, supporting increased productivity and reduced overall design cycle times.

Using the dynamic capabilities of VPDM and the relationships within product data, relational development transforms the traditional sequential product development model into a dynamic, concurrent development paradigm. This enables periodic review processes to be completed formally or informally, and concurrently in realtime, for continuous feedback and visibility of change at every stage of development. Aspects of development can be considered earlier in the process for an improved understanding of product and product data behaviour. The result is a dramatic reduction in, or elimination of, costly rework.

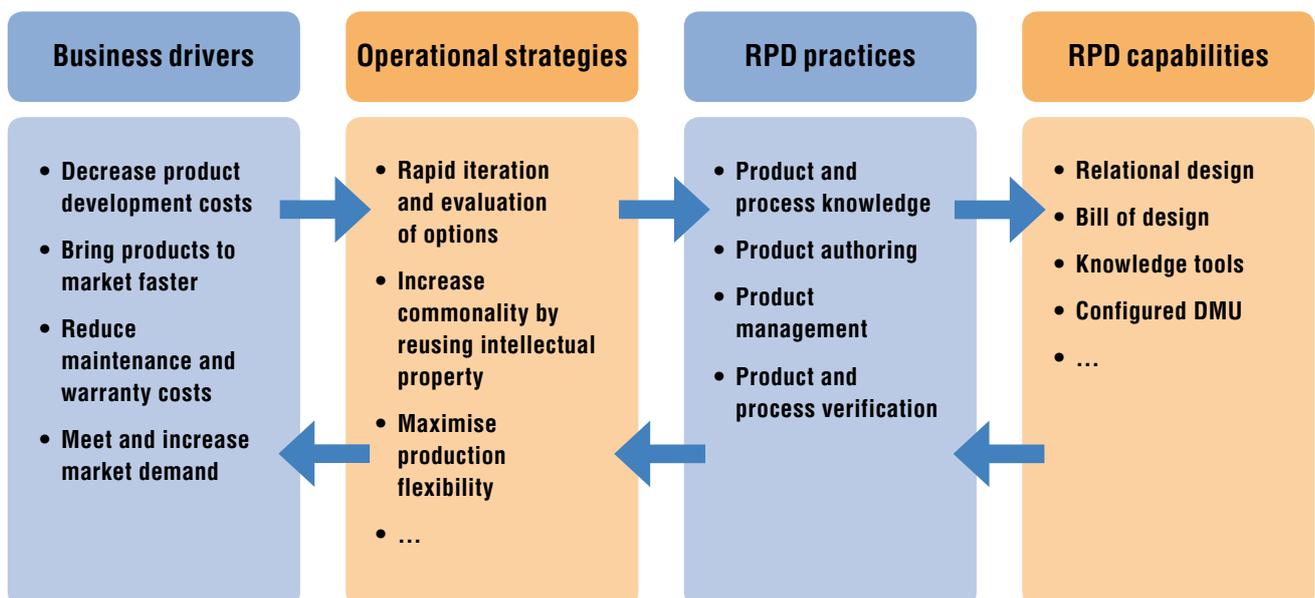
Realising the full potential of relational design may rely on major changes in an organisation’s constructs. The recent IBM PLM Capability Benchmark³ revealed ‘world-class PLM capability’ status can only be achieved by those organisations that combine advanced technologies with fundamental business processes, systems and cultural changes – a business transformation.

Realising the value of RPD: a methodology

To address the required fundamental changes, IBM has developed a state-of-the-art RPD methodology. The methodology uses assessments, tested deployment methods, proven tools for solution optimisation, customer-specific roadmaps, and implementation and integration assistance to appropriately enable the advanced Dassault Systèmes’ CATIA V5 and ENOVIA V5 VPM technologies.

The methodology is two-pronged. A top-down approach uses an established RPD framework, drawing on RPD practice domains matrixed across common organisational work streams found in all new product introduction processes. This provides a high-level view of product development to allow the identification of an organisation’s key investment areas, or business drivers. Subsequently, a strategic bottoms-up, phased implementation methodology aligns the RPD capabilities with the organisation’s business drivers for an optimised performance improvement and return on investment (ROI).

Linking RPD with an organisation’s critical business drivers



The RPD framework

The RPD framework is the organising principle that underlies the implementation methodology.

The RPD framework

RPD practice domains	Product and process knowledge	Product authoring	Product management	Product and process validation
Work streams				
Business management	Programme management	Programme notebook	Sales configuration control	Product assurance
Product portfolio management	Product architecture specification	Market driven dimensional specifications	Options and variant management	Regulatory compliance and homologation
Product architecture and integration	Product consolidation and variation	Zone definition and product specifications	Systems integration and management	Physical integration confirmation
Product systems engineering	Subsystem outsourcing and variation	Component and system definition	Functional integration of systems and components	Component and system confirmation
Performance analysis	Certification reuse	Analytical modelling	Analytical BOM	Certification/validation
Assembly analysis	Flexible manufacturing	Assembly modelling	Manufacturing process management	Try-out and prove-out simulations

The framework comprises four key RPD practice domains which encapsulate the advanced product design, simulation and data management technology capabilities:

- 1. Product and Process Knowledge:** Captures business, process and product knowledge logic into a consistent and cohesive thread which weaves together corporate assets relevant to RPD, and supports knowledge reuse
- 2. Product Authoring:** Focuses on a set of cohesive authoring practices to capture and structure critical details required when designing, integrating and implementing an RPD-based solution

3. Product Management: Provides synchronous and asynchronous data management to support product creation and relational management

4. Product and Process Validation: Ensures a consistent set of integrated practices to support and confirm product and process engineering intent.

Each RPD practice domain in isolation delivers an important set of capabilities to support the product development process. However, to completely address most business requirements calls for elements to be leveraged across multiple practice domains. The business value of

RPD lies in the interaction of the domains with six work streams. These streams represent common work threads that apply to all businesses: business management, product portfolio management, product architecture and integration, product systems engineering, performance analysis and assembly analysis.

The intersections between the four RPD practice domains and the six work streams are the key RPD practice themes. These themes form the framework used to identify a specific organisation's key investment areas, and architect a unique RPD deployment to optimise the business value of relational design technologies.

The RPD deployment methodology

Key to optimising the business value of RPD is the phased implementation approach which is uniquely applied to each company. This enables a deep understanding of an individual organisation's business needs, and identification of the RPD practices that will have the greatest impact on that particular organisation's business strategy.

A full understanding of a company's RPD capabilities and needs, achieved through an assessment, indicates the correct infrastructure and technology required to support that company's specific initiatives. A customised solution is then built, aligned with the key business drivers identified, providing a company-specific design paradigm for optimised product development. This customer-centric implementation process is structured around five customisable phases:

RPD solution phases



1. Executive workshops

True business transformation can only succeed when embraced from the top down. Flexible RPD executive workshops are designed to help senior executives understand the business and financial potential of an RPD-driven PLM implementation.

Customisable modules link a company's key business drivers to the technology enablers to demonstrate the efficiency gains available through RPD, and discuss the RPD roadmap to ensure a clear understanding of the value of RPD.

2. Capability and needs assessment

RPD is not a one-size-fits-all solution. It is critical that an individual company's engineering needs are fully understood. This is achieved using the RPD capability and needs assessment. The assessment uses a predefined set of product development practices to assess a specific company's current PLM environment. The aim of this phase is to establish a compelling recommendation for a transformation plan that is economically feasible and achieves a company's business objectives.

During the assessment, company data is collected via executive interviews and workshops and mapped against the established RPD capability matrix. This allows an organisation's current RPD capabilities to be assessed, and any gaps and capability dependencies to be identified. This flexible process can be adapted to accommodate any company's business environment.

Organisations receive a customised report on capability findings and conclusions, including guidance on how to proceed and the potential time, cost, quality and innovation benefits of an RPD implementation. An optional strategic-level financial business case is available to determine the potential ROI.

3. Strategic roadmap

The output of the capability and needs assessment is used to create a strategic roadmap to ensure a clear business transformation. The roadmap states the main business process to be improved through RPD, and recommends an improvement path as a prioritised sequence of steps according to a company's specific requirements.

Using a proven improvement path, the strategic roadmap helps companies to quickly and easily take advantage of advanced RPD capabilities for quantifiable business benefits, with minimised cost and risk.

4. Technology roadmap and implementation plan

This phase builds on the strategic roadmap to take the implementation from a process to a project level. The technology roadmap outlines the scope of the implementation and aligns the required technology with a company's specific needs.

The objective of the technology roadmap and implementation plan is to develop a detailed solution design and delivery plan. Using RPD tools and methodologies, information representing all aspects of a business is converted into a customised transformation roadmap designed to optimise ease of implementation and ROI.

At this stage, all constructs are prototyped in an initial proof of concept phase to enable RPD methodologies to be reviewed for technical feasibility.

5. Training and implementation

The final phase of deployment expands the project into full production. The aim is to achieve the successful large-scale implementation of an RPD infrastructure that works in practice – the 'industrialisation' of the RPD approach.

Milestone assessments and feedback are used to monitor implementation progress, and enable adjustments to the installed system for an optimised RPD deployment.

A supportive culture is critical to an RPD implementation's success. Therefore, training is a major focus during this phase, to increase the skills of critical decision-makers, support team members and key subject matter experts.



Implementation summary

This five-phased engagement model supports a converging degree of detail and accuracy for an RPD solution implementation that is unique to the client in question. No two organisations are identical. Accordingly, no two implementations are the same. The flexible IBM RPD implementation methodology can be uniquely applied to virtually every client for a customised solution to optimise the return on their PLM investment.

Conclusion

Product development capabilities have evolved over the past 30 years to support a shift towards a product synthesis approach. This approach, known as relational product development (RPD), aims to capture and leverage a company's product and product behaviour data to fuel innovation.

Investing in RPD technologies alone is not sufficient to realise the full value of relational design. Fundamental business process, system and cultural changes may also be required to support the enhanced PLM technology level.

IBM has developed an RPD methodology that provides a holistic approach to improve an organisation's product development strategies and optimise its PLM investment.

The unique IBM PLM RPD methodology goes beyond the enabling technologies to provide a holistic RPD solution to help create a business culture to support innovation, provide the tools and infrastructure needed to enable innovation, and establish the correct processes required for business success. As such, RPD represents a business transformation opportunity to help an organisation reach heightened levels of business performance.

IBM Eurocoordination

Product Lifecycle Management
Tour Descartes
La Defense 5
2, avenue Gambetta
92066 Paris La Defense Cedex
France

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- 1 The IBM Global CEO study 2004 surveyed a representative sample of 465 CEOs from companies in every major industry, across geographical locations and annual revenues.
- 2 The IBM Global CEO study 2006 analysed the responses from face-to-face, one-hour interviews with 765 such CEOs across more than 20 industries. 29 percent worked for companies with less than \$500 million in annual revenues, 17 percent worked for companies with annual revenues between \$500 million and \$1 billion, 36 percent had revenues between \$1 billion and \$10 billion and 18 percent worked for companies with annual revenues in excess of \$10 billion.
- 3 The IBM PLM Capability Benchmark conducted over 50 intensive onsite client assessments worldwide, over a period of three years. Using executive interviews and the 'Virtual Product Innovation (VPI) Assessment' workshop in which client participants were asked to rank their company in over 220 competencies on a 1-5 scale, the study measured a client's PLM capability against 10 PLM best practices.

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