



An Arena Solutions whitepaper

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## **The Arena PLM Return on Investment: Benefits of Collaborative Product Development**

whitepaper

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

### Abstract

Quantifying the return on investment (ROI) from a collaborative application like Arena PLM is a complex undertaking, as differences in organizational structure, workflow and product design impact the specific results each enterprise will see. Evaluating the potential Arena PLM ROI for an organization is a process of understanding where Arena PLM provides key benefits that create both short-term ROI and long-term strategic advantages.

The application architecture and data model that underlie Arena PLM enable four key feature sets that create value for users:

- Centralized and sophisticated data management
- Controlled data access
- Extensive data visibility and analysis
- Data persistence

Each feature delivers specific benefits that translate to four areas in which Arena PLM delivers tangible ROI results.

- Improved enterprise efficiency
- Reduced product cost of goods sold (COGS)
- Increased revenues
- Strategic benefits

The basic equation for Arena PLM ROI incorporates these elements as returns, and the Arena PLM subscription cost as the investment cost.

$$\text{Arena PLM ROI} = \frac{(\text{efficiencies gains} + \text{COGS reductions} + \text{revenue increases}) - (\text{arena solutions subscriptions cost})}{(\text{arena solutions subscription cost})}$$

The four categories of return impact the cash flows associated with product development. When viewing a standard cash flow curve alongside a cash flow curve showing Arena PLM usage, the following key changes are visible:

- Changed lifecycle phase durations: shorter expenditure and extended profit-generation periods
- Shifted change points: an earlier and swifter transition to profit
- Changed curve dimensions: reduced expenditures and greater profits

A view of marginal return over time shows the benefit of employing a subscription-based solution like Arena PLM: With no large upfront outlay, Arena PLM is a low-risk investment that offers positive marginal return from the start. An illustrative example, InterGalactic Enterprises, shows how ROI benefits accrue over the course of the development lifecycle.

An appendix after the body of the paper defines ROI, discusses marginality and discounting in the context of the Arena PLM ROI and compares the marginal return from a "traditional" investment with that from the Arena PLM subscription model. An appendix after the body of the paper defines ROI, discusses marginality and discounting in the context of the Arena PLM ROI and compares the marginal return from a "traditional" investment with that from the Arena PLM subscription model.

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

<b>Introduction</b>	<b>5</b>
<b>How Arena PLM Creates Value</b>	<b>5</b>
<b>Arena PLM application architecture</b>	<b>6</b>
<b>Quantifying the Arena PLM Return</b>	<b>8</b>
<b>Improved enterprise efficiency</b>	<b>8</b>
<b>Reduction in COGS</b>	<b>10</b>
<b>Revenue increases</b>	<b>11</b>
<b>Strategic benefits</b>	<b>11</b>
<b>An ROI Equation</b>	<b>12</b>
<b>Cash Flows and the Product Lifecycle</b>	<b>13</b>
<b>Fig. 1: Standard Cash Flow Curve</b>	<b>13</b>
<b>Cash flow with Arena PLM</b>	<b>14</b>
<b>Fig. 2: Cash flow curve comparison with Arena PLM</b>	<b>14</b>
<b>Marginal Return</b>	<b>16</b>
<b>Fig. 3: Arena PLM Marginal Return over Time</b>	<b>16</b>
<b>Benefits from bom.com over a product's lifetime</b>	<b>17</b>
<b>Illustration: InterGalactic Enterprises</b>	<b>17</b>
<b>Conclusion</b>	<b>20</b>
<b>Appendix - ROI Defined</b>	<b>21</b>
<b>Discounting</b>	<b>21</b>
<b>Marginality</b>	<b>21</b>
<b>ROI and cash flow</b>	<b>21</b>
<b>Fig. 4: Standard cash flow diagram</b>	<b>22</b>
<b>Fig. 5: Cash flow diagram with bom.com</b>	<b>22</b>

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

### Introduction

Arena PLM is designed to increase enterprise competitiveness by providing a robust framework for organizing product data, generating product metrics and managing product development. Organizations considering an investment in the Arena PLM solution should understand exactly what a likely return on investment (ROI) in this technology would be. Because Arena PLM can be used by organizations of any size in a variety of industries, a quantitative analysis of ROI depends largely on the specific circumstances of each organization. This paper will provide a framework for estimating ROI based on specific benefits of the Arena PLM application, with a case study that provides a generic ROI estimate.

The definition of ROI that will be used in this paper is detailed in the appendix, "ROI Defined." Broadly speaking, ROI compares the cost of an investment to the value it delivers. Because Arena PLM requires no software, hardware or IT personnel, the cost of a Arena PLM subscription represents the total cost of investment. Quantifying the value delivered by Arena PLM is a challenge, as differences in organizational structure, workflow and product design impact the specific results each enterprise will see. To show how Arena PLM delivers ROI, then, this paper begins with an explanation of the tool's features and benefits, continues with a discussion of the tool's positive impact on cash flow and concludes with an illustrative example of Arena PLM in use.

A customizable quantitative ROI model, while beyond the scope of this paper, will be available from Arena PLM in the near future.

### How Arena PLM Creates Value

Arena PLM is a web-native environment for product development that establishes a shared bill-of-materials (BOM) as the central framework around which all design and communication occur. Product data is centralized in a single online location so that the entire network of people involved in moving a product from concept to reality are collaborating in real-time. Because Arena PLM is designed for product development, it includes sophisticated tools for cost analysis, collaboration with an outsourced supply chain, and version control.

The foundation of the Arena PLM value proposition is the concept that companies can increase competitiveness through better management of their product data during development. All manufacturing organizations use some tools to manage product data: scattered spreadsheets or clumsy PDM modules grafted onto CAD tools to handle data during development, and MRP/ERP systems to manage data during production. Arena PLM provides a far more sophisticated and powerful means to manage data during product development, and then enables easy transition to manufacturing by preparing data for handoff to MRP/ERP.

This analysis will begin with a discussion of the Arena PLM application architecture and data model, and then continue with an exploration of specific quantifiable and strategic benefits that accrue.

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

### Arena PLM application architecture

The Arena PLM architecture and underlying data model are fundamental to the application's ability to create value for its users.

- Arena PLM is a **web-native application**. Arena PLM is designed to run across the Internet and be accessed using a web browser. Anyone with a web connection and a browser can quickly, easily and inexpensively gain secure access to the application, regardless of location.
- Arena PLM **centralizes data around a BOM framework**. The application accommodates product designs of any complexity and yet remains a well-ordered system that presents product data in a well-understood format. The single online location means that everyone in the design chain accesses the same set of information.
- Arena PLM is **built on a relational database**. A relational database is the most efficient and consistent means to capture large amounts of information, and yet provides the flexibility to transform data into meaningful information. Arena PLM captures connections that reflect the real-life relationships among all the data that defines a product and enables data to be aggregated and instantly analyzed for a variety of uses.

The Arena PLM database has been designed around fundamental concepts that ensure its robustness and usability:

- **Data integrity:** Data is captured with completeness but not duplicated between multiple entries in the database.
- **Data accessibility:** Data is aggregated from diverse sources into an integrated whole, and presented in useful formats to the complete organization.
- **Intelligent complexity:** The database is designed for product development data, enabling complicated relationships while enforcing fundamental rules that ensure the logic and completeness of the data.

These principles are the foundation for the Arena PLM data model, and result in four key features of the application.

- **Centralized and sophisticated data management.** By organizing product data into the bill-of-materials (BOM) format, and then creating a collaborative environment that ensures that all users work on the same set of product data, Arena PLM ensures that there is "one version of the truth" that is available to all users. Because product data is intelligently structured in a universally understood format, data is inherently well organized and coherent, facilitating the decision-making process and reducing errors due to miscommunication. In addition to providing a robust platform for organizing product data, the Arena PLM application includes key functionality for version control, document management, cost analysis and collaboration.
- **Controlled data access.** As a web-native tool, Arena PLM provides flexible access with user roles that ensure precise control over data visibility and change privileges. While all users collaborate in a shared environment, access control enforces workflow and ensures that only authorized users make changes to given types of data. External sharing functionality includes different levels of access for component suppliers, contract manufacturers and other design partners.

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

- **Extensive data visibility and analysis.** Product cost information is available to Arena PLM users early in the development cycle on a component-by-component as well as assembly-level basis. The ease of investigating cost structures enables designers and project managers to design costs out of a product very early in the design process, anticipate bottlenecks, and move products into production with a minimum of last-minute cost surprises.
- **Data persistence.** Because component data is stored in a relational database, product data is instantly available and easily found for reuse on multiple projects, making a company's Arena PLM component database an increasingly valuable resource over time. The ability to involve suppliers in the creation of this database is an efficient way to ensure the accuracy and completeness of this data.

The features of Arena PLM named above result in tangible ROI benefits in the following areas.

- Improved enterprise efficiency
- Reduced product cost of goods sold (COGS)
- Increased revenues
- Strategic benefits

## Quantifying the Arena PLM Return

The Arena PLM fundamentals outlined in the previous section lead to benefits that produce tangible return on investment.

### Improved enterprise efficiency

Arena PLM improves enterprise efficiency through features that reduce the potential for error, improve communication and increase individual team members' productivity during both development and production. The results include savings due to reductions in time and headcount, scrap, and outsourced services costs. The specific mechanisms that drive these improvements are:

- **Faster design communication with fewer errors.** The Arena PLM communication features improve overall staff efficiency. Certain repetitive tasks, such as copying data between data sources, checking for inconsistencies, and searching for missing information, are reduced or eliminated completely due to the centralization of data. Project managers spend less time chasing down information, engineers can quickly locate parts for re-use, and purchasing managers can track the completeness of the sourcing process.
- **Improved quote management.** The process of sending out component specifications for quotation, collecting price quotes, tracking supplier information, and creating a coherent pricing structure can consume full-time resources for weeks at a time. Arena PLM automates many of these processes and greatly reduces the time and effort required to source a product. Component specifications can be shared securely with suppliers from within the application, eliminating the steps of printing, faxing, transferring files and emailing documentation. Because suppliers see the same up-to-date information as the design team, there is no risk of having outdated specifications quoted. As supplier quotes are entered into the system, purchasing managers can track the sourcing process with up-to-the-minute accuracy. Supplier quotes and contact information are preserved for subsequent projects, so that

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

re-used parts include full sourcing and costing information and the process of re-quoting and re-purchasing parts is simplified.

- **Less scrap.** Significant time and money are wasted when parts are ordered based on out-of-date or missing information. By ensuring that component data is always up-to-date, Arena PLM greatly reduces the potential for premature or erroneous purchases during prototyping and ramp.
- **Easier transitions to manufacturing.** At the end of the design process, the project manager is responsible for delivering a complete bill of materials (BOM) to the manufacturing group. If product data spreadsheets are scattered throughout the design team, this process is chaotic, labor-intensive and time-consuming. Using Arena PLM, where the product data is already organized into the BOM format and ready for easy export, the process takes minutes. In addition, the manufacturing team can preview the BOM before design is complete in order to identify potential problems before hand-off.
- **More sophisticated supply and design chains.** Because Arena PLM is web-based, real-world distance between design and supply chain members is irrelevant. Arena PLM enables collaboration with global partners—whether design team members, suppliers, or contract manufacturers—as information sharing is instant and product data is centralized. Strong access control and data security ensure that the right level of information is shared with each category of user that needs visibility.
- **Data reuse.** A core benefit of the relational database structure underlying Arena PLM is that each item—component, assembly, document or process, and all related data—can be reused. This means that part specifications, documentation, suppliers and costs are instantly available, which can translate into faster project start-up, time savings and volume purchase discounts.

In summary, the features above produce the following key benefits that contribute to the Arena PLM ROI.

- **Time/headcount savings:** Existing users focus on their core responsibilities and often perform these functions more efficiently.
- **Scrap savings:** The erroneous purchase of parts based on missing or outdated information is greatly reduced, sometimes eliminated entirely.
- **Outsourced services savings:** The ability to collaborate efficiently with globally dispersed design and supply chain partners enables organizations to take advantage of the lowest-priced providers without regard to their geographic location.

## Reduction in COGS

The cost of goods sold (COGS) for an organization's products is primarily determined during the design phase, when materials and sourcing decisions are made. Arena PLM provides tools for strategic decision-making that allow users to reduce COGS in three key ways.

- **Production COGS reduction via cost visibility.** Studies have shown that 70% of a product's costs are locked down during the design phase.<sup>1</sup> Arena PLM provides early visibility into product costs and extensive cost analysis tools throughout development, giving companies the information they need to make cost-effective design decisions. During the concept phase, users can capture estimated costs for new items or access complete cost and sourcing information for reused parts. Throughout design,

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

Arena PLM lets users view automatic cost roll-ups for both prototype and production parts and makes it easy to identify high-cost items. With these cost visibility tools organizations can avoid expensive redesigns and delayed production schedules while achieving their target margins.

- **COGS reduction through strategic sourcing.** Early cost visibility combined with sophisticated supply-chain management tools means that Arena PLM users can optimize their designs to take advantage of low-cost suppliers. Users can track historical purchase data as well as current quotes and thus focus their sourcing efforts on suppliers who are likely to offer the best prices.
- **COGS reduced via part re-use.** The re-use of part data can produce price breaks in two key ways: volume purchases and re-quoting. Because Arena PLM makes it easy to reuse parts in subsequent production runs and to use the same parts across different products, an organization can purchase parts in volume and lower the per-part cost. In addition, when parts are re-used, a lower cost replacement or a lower quote can often be found. Both of these outcomes directly lower COGS.

In summary, the benefits above improve ROI through:

- **% change in COGS:** The overall reduction in COGS due to early cost visibility, strategic sourcing, and part reuse.

### Revenue increases

In addition to allowing substantial cost savings, the features that increase efficiency and reduce COGS also provide indirect benefits that drive revenue increases.

- **Increased market share.** An organization that provides a solid product in a new niche is likely to secure greater market share than subsequent entrants. The efficiency gains from Arena PLM enable organizations to release products to market faster, without compromising design quality.
- **More time in market.** A second benefit of getting products to market quickly is that products spend longer time in the market, earning revenue over a longer product lifetime.
- **More products on the market.** Due to development efficiencies such as part re-use and shortened design cycles, organizations can develop more products over time. This is a difficult benefit to quantify, however, and is therefore omitted from the revenue estimates listed below.

In summary, the benefits above improve ROI through:

- **% change in revenue:** Increased revenue through greater market share and more time in market.

### Strategic benefits

In addition to the efficiency gains, COGS savings and revenue increases that lend themselves to quantification, Arena PLM provides several key strategic benefits that accrue over the long term and are not as easily measured. While these advantages can indirectly drive revenue growth, market expansion and overall competitiveness, they provide intangible benefits that result in more dramatic and far-reaching results.

- **Greater product complexity:** With powerful tools to organize, analyze and deploy product data, organizations can better handle complicated product structures. Organizational resources that were

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

previously devoted to managing the administrative overhead of product development can be focused on design and production. Organizations can produce more innovative products, sell at higher margins, and penetrate larger, more competitive markets.

- Sophisticated design and supply chains: Organizations can collaborate quickly and effectively with design and supply chain partners, regardless of size or location. An organization can take advantage of outsourced expertise without the expense of relocation or the limitations of conventional communication methods. Low-cost manufacturers can be integrated into the design process, reducing errors and costs.
- **Transfer of intellectual property:** With product data stored in electronic format and organized for easy access, the process of packaging and transferring product intellectual property is greatly facilitated. When an organization decides to terminate a product line, product data can be easily packaged and sold to competitors, providing an end-of-life revenue source.

These strategic benefits prove immensely valuable in the long term as they enable the type of growth and transformation that organizations cannot otherwise attain.

### An ROI Equation

Estimating ROI depends on factors that vary from one organization to another and on numbers that are more difficult to extract than simple R&D expenditures or sales. However, the discussion above has produced variables that can be synthesized into an ROI estimation based on tangible benefits from Arena PLM.

Using the definition of ROI used in this paper, ROI is the relationship between the cost of an investment and the value it delivers.

$$\text{ROI} = \frac{\text{return} - \text{investment cost}}{\text{investment cost}}$$

The investment cost is the Arena PLM subscription fee: \$1000 per user, per year. No upfront hardware, software or set-up costs are entailed. The return consists of the key variables discussed earlier:

- Savings due to efficiency gains
- Savings due to COGS reductions
- Revenue increases

These variables can be integrated into the following equation:

$$\text{Arena PLM ROI} = \frac{(\text{efficiencies gains} + \text{COGS reductions} + \text{revenue increases}) - (\text{arena solutions subscriptions cost})}{(\text{arena solutions subscription cost})}$$

As shown above, the basic equation for the Arena PLM ROI incorporates efficiency gains, COGS reductions, and revenue increases that are driven by the Arena PLM architecture, data model and specialized features for improved product development.

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

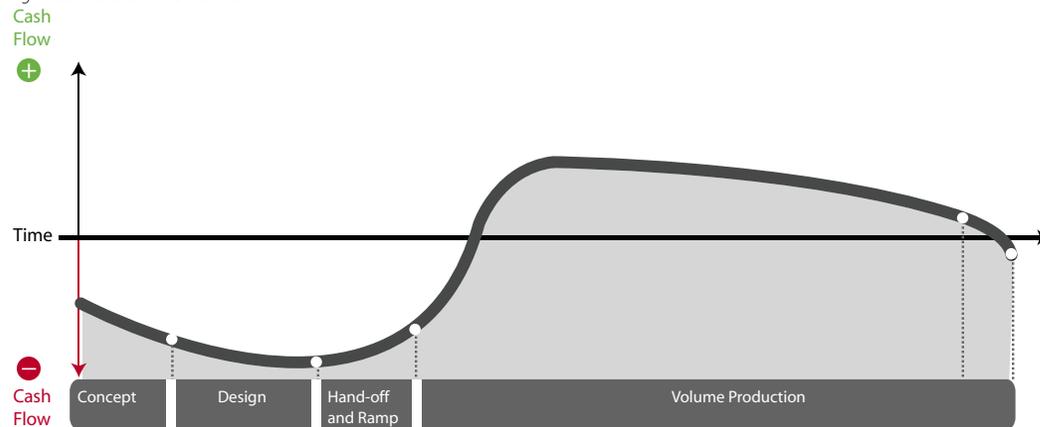
### Cash Flows and the Product Lifecycle

Return on investment can be considered as a series of cash flow that result from a given investment. A cash flow diagram over the product lifecycle is therefore a useful visual representation of ROI. In general, there are five stages in the product lifecycle:

- Concept
- Design
- Hand-off and ramp
- Volume production
- End of life (EOL)

The diagram below represents a typical cash flow for a product from project initiation to obsolescence.

Fig. 1: Standard Cash Flow Curve



Certain points on the graph indicate key events during the product lifetime.

- **Maximum development expenditure:** Cash flows are negative during development, as skilled labor resources are focused on design and prototypes are being built. Production purchasing begins during the later phases of development, the time when the design task is tapering off. The slope of the cash flow curve begins to shift during ramp, when the first wave of products is sold.
- **Transition to positive cash flow:** At some point during or after the hand-off and ramp phase, cash flow crosses into positive territory. The cash inflows from product sales exceed the expenditures for parts and production labor.
- **Revenue peak:** The greatest positive cash flow is achieved during volume production, generally driven by such things as optimal manufacturing capacity, peak market share and/or the ability to charge a premium price. When any of those circumstances change, cash flows begin to decrease, though the flow itself remains positive.
- **End of life:** As the end of the product lifecycle arrives, cash flow declines more steeply as the product is discounted or less actively promoted.

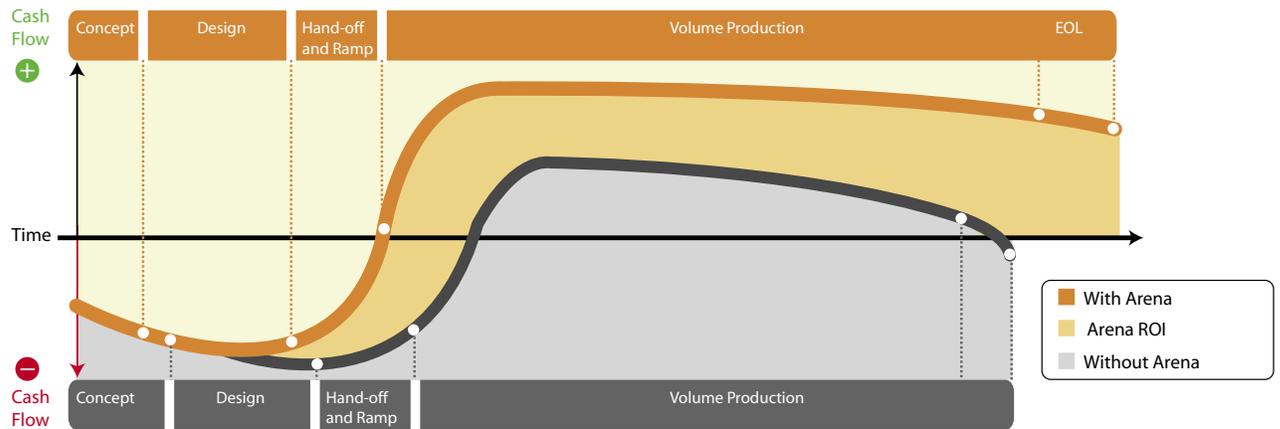
## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

While each organization will spend different amounts of time in each stage—and hit key milestones at different points—the core process is generally the same.

### Cash flow with Arena PLM

The cash flow diagram for product development using Arena PLM has significant differences from the standard cash flow model described above. The diagram below compares the standard curve to a second curve that tracks cash flow over the lifecycle of a product developed with Arena PLM.

Fig. 2: Cash Flow Curve Comparison with Arena PLM



Key differences include the changed lifecycle phase durations, the shifting of change points, and the overall dimension of the cash flow curve.

### Changed lifecycle durations

With Arena PLM, the duration of the stages in the product lifecycle is changed.

- **Concept:** The process of moving conceptual ideas to active design is faster due to collaboration tools that facilitate communication and organize data into a usable format. The task of bringing new team members up to speed is made easier because product data is centralized and easy to review.
- **Design:** The stage of active design is shortened due to efficiency increases that result from improved communication, part reuse, efficient quoting and the cost visibility necessary to avoid redesign late in the process.
- **Hand-off and ramp:** The hand-off to manufacturing is streamlined because complete product data is readily available in the BOM format. The manufacturing team has already been able to preview the product data to avert production problems. The ramp process is faster and smoother as a result.
- **Volume production:** The profitable lifetime of the product begins earlier due to shortened development and hand-off/ramp periods. The lifetime is also extended because the product is more complex, and therefore maintains its market advantage for a longer period.

**The Arena PLM Return on Investment: Benefits of Collaborative Product Development**

### Shifted change points

With Arena PLM, the key change points during the product lifetime occur at different times.

- **Maximum development expenditure:** Due to Arena PLM process efficiencies and reduction in COGS, the point of greatest expenditure—the end of the design process and the beginning of ramp—occurs earlier and then transitions to positive cash flow at a faster rate. With efficiencies in the design, prototyping and sourcing processes, the hand-off to manufacturing occurs sooner.
- **Transition to positive cash flow:** A smoother, faster ramp process and savings from efficiency and COGS reductions enable positive cash flow to increase at a faster rate.
- **Revenue peak:** The product arrives sooner in the marketplace with the potential to achieve greater market share. The sales drop-off is shallower, possibly due to the product complexity and quality enabled by sophisticated development techniques and strategic sourcing. Early market arrival and greater market share often lead to longer time in market.

### Changed dimensions of the cash flow curve

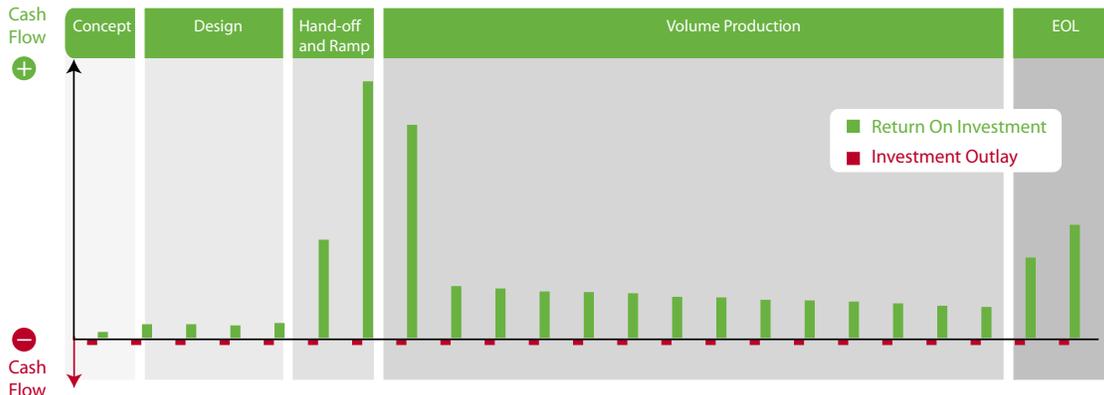
The cash flow curve for a product developed with Arena PLM traces a different set of cash flow values across the product lifetime.

- **Decreased expenditures during development:** Design team resources are more efficiently deployed, data is reused, scrap is reduced and COGS are controlled.
- **Increased revenues during production:** The cash flow at this point is higher than for the standard model. While its COGS are lower, the product can be sold at a higher price point due to its complexity and innovative design. The product retains greater value over its lifetime.
- **Increased revenues during end of life:** The product sells profitably for a longer period and less discounting is required. If the organization wishes to sell product intellectual property for additional revenue, Arena PLM provides a clean package that is easy to transfer.

### Marginal return

The area between the two curves represents the Arena PLM return on investment across a product’s lifetime. This quantity can be graphed to produce a diagram of the marginal return over time. In the graph below, the black bars below the horizontal axis represent the investment cost: the Arena PLM subscription cost.

Fig. 3: Arena PLM Marginal Return over Time



## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

The return on investment for a single product can therefore be considered in terms of the marginal returns over time, divided by the Arena PLM subscription price that is allocable to that product. For organizations that produce multiple product lines, the marginal return for all products should be considered.

$$\text{Arena PLM ROI} = \frac{\text{(marginal returns over time)}}{\text{(Arena PLM subscription price)}}$$

### Benefits from Arena PLM over a product's lifetime

An important consideration for this discussion is that while many of the features of Arena PLM are most heavily used during development, the benefits of using Arena PLM are realized throughout the entire life of the product. In fact, for most companies, the returns realized after the product has been released to production will far exceed the savings achieved during development. The efficiency benefits detailed earlier provide significant advantages during the design and hand-off and ramp periods, while substantial gains are realized longer term from selling higher volumes of product, at higher margins, for longer periods of time. In addition, the cash flow diagram represents sales in a single market. But because Arena PLM enables easy integration of globally dispersed design and supply chain partners, additional cash flows can be realized from entering new markets previously inaccessible with conventional development tools.

### Illustration: InterGalactic Enterprises

To illustrate the Arena PLM ROI in action, consider a fictitious company called InterGalactic Enterprises (IGE). IGE has a typical product lifecycle of 24 months. The company has annual sales of \$20M, and a core team of 8 engineers, 5 executives and a support staff of 25. IGE plans to use 38 seats of Arena PLM for the complete product life cycle.

#### Design

In the design phase Arena PLM is the shared environment in which the entire design team works. Early cost visibility enables strategic decisions to focus design efforts on critical parts and reduce costs. Engineers can concentrate on design tasks and thus improve the overall design of the product. This lays the groundwork for a longer, more profitable production run. IGE typically has a 6-month design cycle, but by using Arena PLM is able to shorten this to 5 months.<sup>2</sup> This results in a time/headcount savings of \$100,000.

Furthermore, due to early visibility into the cost structure of the product and the reuse of existing components, IGE decreases the COGS by 5%.<sup>3</sup>

#### Hand-off & Ramp

Hand-off to manufacturing begins earlier in development due to the shortened design phase. Complete product data is readily available in the BOM format from the start and streamlines the hand-off process. Also, internal and external production staff and manufacturing partners have been able to preview the product data to identify potential problems. Scrap is greatly reduced and other costly errors avoided as the result of centralized product data and facilitated supplier communication.

The ramp process is accelerated due to the smoother, more coordinated hand-off to the manufacturing team. Volume production is achieved more quickly, as the manufacturing group has had a chance to anticipate and resolve

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

problems beforehand. Most significantly, market share increases due to the earlier product launch, which drives increased revenue.

Previously at IGE, transitioning a design into production was a two-month-long process that involved gathering, correlating and correcting several scattered documents. With Arena PLM, this process is shortened to one month, because product data is complete, centralized and well organized from the start. The time/headcount savings here amount to \$60,000 for IGE.

In addition to this savings, IGE does not waste capital buying useless components. This results in an additional \$10,000 in scrap savings.

### Volume Production

During volume production, Arena PLM continues to deliver benefits. The faster time to market ensures higher market share and a longer time in market. The product's reduced COGS enhance its profit margin.

With Arena PLM, IGE is able to bring its product to market 2 months sooner, and can ramp to full production volumes at a faster rate. The lower COGS enables greater pricing flexibility. Market share increases from 22% to 26%, increasing monthly sales by approximately 20%.

This sales increase combined with the cost reduction nets the company \$700,000 in additional profit.

### End of life

Arena PLM provides several key benefits towards the end of a product's life. IGE is able to maintain low COGS—and therefore forestall unprofitable selling—by reusing components in newer products. IGE also faces less pressure to discontinue the product; shorter development cycles enable the company to deliver new products sooner and ensure that it keeps profitable products in the marketplace. Both these benefits slow the decline in cash flow and provide more options for when and how the product is terminated. With Arena PLM, IGE can easily package and sell its intellectual property to an overseas manufacturer. The prospective buyer can be invited into the product workspace to preview the technology, and once the purchase is finalized, IGE can easily export product data for transfer to the buyer.

The benefits during end of life total \$50,000 in additional returns.

### Summary

While IGE is a fictitious company, and the amounts used above are estimates based on predictions, the numbers provide an indication of where and to what extent ROI benefits accrue.

<b>Design</b>	Time/headcount savings	\$100,000
<b>Hand-off &amp; ramp</b>	Time/headcount savings	\$60,000
	Scrap savings	\$10,000
<b>Volume production</b>	Increased profits	\$700,000
<b>End of life</b>	Additional revenue	\$50,000
<hr/>		
<b>Aggregate ROI</b>		\$920,000
<b>Investment cost</b>	38 seats x \$1000 x 2 years	(\$76,000)

$$\text{Arena PLM ROI} = \frac{(\$920,000) - \$76,000}{\$76,000} = 1111\% \text{ ROI}$$

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

### Conclusion

The Arena PLM application increases enterprise competitiveness through sophisticated tools for managing data as well as the workflow and analytics around it. The tool produces tangible returns on investment throughout the product development cycle in four major categories:

- **Improved enterprise efficiency** through improved communication, facilitated quote management, decreased scrap, easier hand-off to manufacturing, more sophisticated design and supply chains, and data reuse.
- **Reduced product cost of goods sold (COGS)** through improved cost visibility, strategic sourcing and part reuse.
- **Increased revenues from increased market share**, more time in market and more products on the market.
- **Strategic benefits** such as greater product complexity, sophisticated design and supply chains, and the ability to transfer of intellectual property.

Viewing the impact of these benefits on a cash flow curve is instructive, as such a diagram clearly indicates:

- **Changed lifecycle durations** with the revenue-earning phase extended and costly developmental phases shortened.
- **Shifted change points** because positive cash flow occurs earlier in the product development cycle and peak revenue occurs more quickly.
- **Changed dimensions of the cash flow** graph to indicate reduced expenditures and greater profits across the product lifetime.

The illustrative example of InterGalactic Enterprises provides a simple model of how critical ROI benefits accrue during the product lifecycle. The specific returns achieved from using Arena PLM vary significantly from company to company, and are best estimated by those companies themselves.

When doing so, companies should be certain to remember the many qualitative benefits that impact ROI but do not lend themselves to calculation. The Arena PLM strategic benefits mentioned earlier, which are not readily quantified as immediate gains, provide the foundation for long-term growth and change. Other intangible ROI factors include better brand value through higher quality products, resulting in the ability to command a price premium and build goodwill; employee retention through the ability to encourage innovative work and respect core competencies; and improved investor relations through the ability to provide meaningful information on project progress and results. The Arena PLM solution for product development provides a combination of tangible, immediate ROI and intangible benefits that result in increased competitiveness, viability, and long-term growth.

## The Arena PLM Return on Investment: Benefits of Collaborative Product Development

### Appendix - ROI Defined

When determining how to allocate limited capital resources, return on investment (ROI) is a useful metric for highlighting the best potential uses of capital. ROI relates initial outlays to the financial returns an investment is expected to provide, thus enabling an assessment of whether an investment is justified.

When calculating ROI, two key concepts help establish the relationship between investment and return: discounting and marginality

#### Discounting

Discounting is the practice of devaluing future cash flow to account for the time value of money. For example, a \$100 outlay a year from now costs less than a \$100 outlay today. Conversely, however, \$100 earned a year from now is worth less than \$100 earned today. Discounting is generally a significant factor for long-term projects with substantial upfront costs, such as buildings and civic projects. In contrast, Arena PLM is subscription-based at \$1000 per user per year with no upfront installation costs and no specialized software or hardware to buy. Therefore, discounting is not a factor in considering the Arena PLM investment.

#### Marginality

Marginality is the notion of calculating the incremental cost and impact of an investment, holding other variables constant. That is, the cash flows considered should be the difference between cash flows with the investment versus cash flows without the investment over the life of the investment; no external changes to business conditions enter into the equation, only changes due to the adoption of the investment itself. Sunk costs should not be considered, and business factors external to the investment (such as interest rates, market growth, and pricing pressures) should be held constant.

#### ROI and cash flow

Because both of the factors in ROI are related to cash flow, ROI is often represented graphically as a cash flow diagram. In the simple example below, the investment cost is represented as an initial cash outlay in red, and the incremental returns are represented as positive cash flows, shown in green.

#### Fig. 4: Standard marginal returns over time

Note that the amount of the outlay dwarfs the initial incremental returns. At some point the incremental returns will add up to the initial investment, indicating that the investment has "paid for itself" and has justified itself financially. The larger the initial investment and the smaller the incremental returns, the longer it takes to reach this breakeven point.

In contrast, the cash flow diagram using Arena PLM does not feature the large initial outlay, but instead a small, steady outlay in the form of the annual subscription fee.

#### Fig. 5: Marginal return over time with Arena PLM

With this model, the breakeven point occurs much sooner. Even from the start, the incremental returns are much greater relative to the investment cost. The organization's financial exposure is greatly reduced.

In sum, ROI is considered as the return on the investment less the cost of the investment, divided by the cost of the investment. The resulting percentage indicates the return per dollar spent.

In the case of Arena PLM, the variables are easy to assign. The investment cost is the annual Arena PLM subscription fee. There are no additional hardware costs to consider, and no large up-front payment.

Finally, the Arena PLM subscription model further simplifies the ROI discussion because of the low-risk exit it provides: if the desired ROI does not materialize, there is no up-front expenditure at risk.

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