WHITE PAPER

Open Source PLM - An Innovation in PLM

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Abstract

Free and open source software has a major impact on the computer industry since the late 1990s and has changed the way software is perceived, developed and deployed in many areas. There are numerous open source and free software products available for many kinds of businesses. Especially markets in operating systems, development tools, web servers and databases have significant open source and free software products available. This paper explains open source Product Lifecycle Management (PLM) software and its impact on plm implementations. Further it discusses advantages & challenges faced in the pre-implementation & post implementation phases. Currently only one company is providing open source PLM; that is Aras Innovator for the industry. A brief discussion about Aras Innovator PLM and its architecture are included in this paper.

Open Source Software

Open source software (OSS) is a software application, tool, utility, component or framework for which the source code and certain other rights normally reserved for copyright holders are provided under a software license agreement. This permits users to use, change, and improve the software, and to redistribute it in modified or unmodified forms. It is very often developed in a public, collaborative manner. Open source software is the most prominent example of open source development and often compared to user-generated content. Red Hat Linux and Apache are popular Open Source Software offerings today.

Open source vs. closed source

Business Comparison

A brief business perspective comparison between Open source versus commercially sold software tools is depicted below

Open Source	Closed Source (Proprietary Softare)
1 Revenue comes from services like implementation, support & maintenance given for the product. Maintenance can be in the form of patches, adapters or extensions for any functionality on demand by a user or sometimes through re-distribution of the software.	1 Revenue is generated through traditional methods, such as the sale of individual copies called licensing and through technical support.
2 User support for the product is absent. Where needed, support is provided at a cost by the product owner or any 3rd party vendor.	2 The software vendor will provide user support and product upgrades to all the customers covered under a maintenance contract.
3 The core business aspects of the software like architecture, protocols used in the software are usually exposed and made available to the users.	3 No source code of the software is given to the customers.
4 Open-source software vendors generally allow, and even depend on, third-parties to modify and improve their software.	4 Software development is carried by the product owner only.
5 Open-source enables companies to tap the broadest possible community of developers. Thus the strengths & weakness of the software are exposed openly to the user.	5 Closed-source software imposes restrictions on who can inspect the code and make modifications.
6 There is no limit for innovation to the OSS user community.	6 Innovation is limited to the product developers group.

Functionality Comparison

Aras in incrementally adding PLM features; its user community plays a vital role in extending the product capabilities. It is expected that in the coming years Aras will emerge as a full-fledged PLM solution, superior to any traditional PLM package on the market today. The table below highlights some of the differences that exist today between Aras and the traditional PLM packages.

Feature	Aras	Traditional PLM tools
Quality planning & manageent	Quality and planning management is part of Aras PLM	This is not considered as part of PLM, but the product owners provide this feature in a separate product
CAD	No tight integraion with any CAD, because of this Aras have to rely on third-party tools	Team center has UG-NX and Windchill has Pro-E as default CAD tool
Variants management	Aras variants management engine is still under development	Almost all the commercial products available in the market provides a rich set of variant capabilities
Data Schema	Aras comes with a default schema, which users have to enhance for commercial use	Almost all the commercially available PLM products come with a rich schema that matches most of the customization scenarios in the industry
Manufacturing module	No manufacturing module exists in Aras today	All the PLM products implement a manufacturing module
Visualization	No default visualization tool available in Aras	Viewers are available in the commercial products
Product customization	This product can be equally customized like the commercially available products; Aras is developed using .Net technologies, the product has the capability to use any of the latest technologies like SOA for integration and flexible customization	The product can be controlled with a rich set of customization. But customization can't change the core application layer
Integration capabilities	Aras exposes various web services through which integrations can be done	Some PLM tools expose services through a SOA tool kit for external integrations but they are not fully matured
Data migration	No default utilities for legacy data migration or data migration for third party tools	Default utilities as well as third party tools are available for data migration activities

Business Model For Open Source Software

The main revenue for any open source software company comes from selling services like application training, support and royalty. The use of dual-licensing[1] provides an offer of the software under an open source license but also under separate proprietary license terms. Customers can initially be attracted to a no-cost and open source edition, then subsequently be part of an up-sell to a commercial enterprise edition.

Another possibility to generate revenue from open source software is by selling the source code to those customers who pay, whilst providing executable binaries for free. Additionally, the vendor can provide free source code with some financial terms and conditions on the derivatives of the source code. Some companies provide the latest versions available only to paying customers. Companies provide proprietary extensions, modules, plug-in or add-ons to an open source package. Independent developers often accept donations. SourceForge.net, for example, accepts user donations to hosted projects. Users of software may come together and pool money into a bounty for the implementation of a desired feature or functionality. Other financial situations include partnerships with other companies. Sometimes a commercial version may be sold to finance the continued development of the free version. The vendor can also sell subscriptions for online user accounts; for using the application through the web.

Examples: Much of the Internet runs on open source software tools and utilities such as Linux, Apache, MySQL and PHP, known as the LAMP stack for web servers. Using open source appeals to software developers for three main reasons:

1. low or no cost,
2. access to source code they can tailor themselves,
3. a shared community that ensures a generally robust code base, with quick fixes for any new issues that surface.

Open Source PLM Software

Product lifecycle management, or PLM, is often sold to companies as a "backbone" technology that can be used in all parts of the organization. Yet the license fees associated with most of the PLM software is a major investment for PLM implementations. It is always a struggle to anticipate the number of licenses needed, and to fit the license costs into a budget. That is why most PLM systems end up being used only by engineers rather than by a wide variety of engineering, manufacturing, business personnel and other stake holders. And this is the reason for a need of open-source software license model in PLM implementations. The chart below depicts the cost of license as part of the overall cost of PLM software ownership.

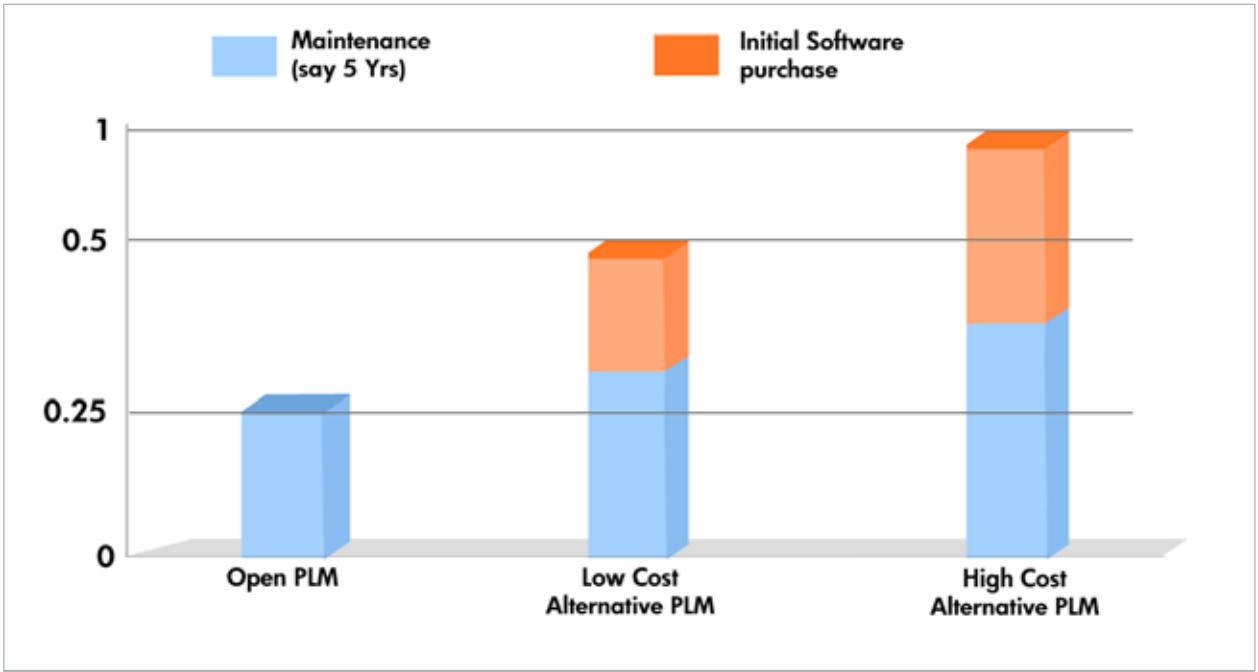

Figure 1 Total cost of ownership for PLM software (comparative)

1 See http://en.wikipedia.org/wiki/Dual-licensing

Going Open Source for PLM

The main objective of open source Product Lifecycle Management is to provide a license-free PLM tool, thus reducing the total PLM implementation cost. This avoids the complex and confusing licensing options of traditional PLM packages, at the same time eliminating their monopoly position. Aras combines a service-oriented architecture with a model-based run-time engine; that is Aras is flexible software based on reusable components. It lets users model business logic and processes graphically. The business logic is separate from the underlying core software that does the processing for the system. The way Aras built its software makes it relatively easy to update and change business processes.

Aras software is used by a wide variety of large and small enterprises. Some companies use the software as a primary PLM system, while others use only certain features and functions. For example, a major automotive parts supplier has implemented the quality planning functions of Aras Innovator, tying the program with in its primary Team center PLM system from UGS.

Aras Innovator PLM Introduction

The Innovator solution for PLM from Aras provides a broad suite of advanced functionality for Program Management, Product Engineering and Quality Planning. Innovator is based on the most advanced service-oriented architecture (SOA) on the Microsoft platform which has the flexibility to support any company's specific business processes. The business benefits of Aras are revolutionary. The proven Aras Innovator solution for PLM is delivered in an enterprise open-source format removing the up-front capital expense for licenses, to eliminate risk.

- Eliminates expensive license fees (no user, module, or server license costs)
- Removes the need for up-front capital budget
- Gets rid of complicated license schemes and hidden costs

With Aras the production-ready enterprise PLM is available at no charge with complete access for unlimited users. This innovative structure means that the companies can have a comprehensive enterprise PLM solution with the significant business advantages of the open model. Aras is ideal for small to mid-sized companies across industries and scalable for global enterprise deployments.

Aras Benefits for Stake Holders

- Engineers and designers - coordinate and manage product information more effectively.
- Product managers - collaborate with the extended enterprise across the product lifecycle.
- Operations and quality - single version of the truth for supply chain control.
- Executives - visibility into costs, schedules, and progress for new product success.
- Unlimited licenses – This is one of the major benefits of Aras Innovator. There is no limit to the number of licenses that a company can use.

Aras Architecture

Aras Innovator is built on an advanced Model-Based Service Oriented Architecture (SOA). Applications can be quickly tailored and extended to meet specific business requirements. Business logic, rules, workflows and data structures can be created and modified using browser-based graphical administration tools without programming. The solution is scalable and very flexible and can be adapted to the organizations rather than the other way around. A brief architecture of Aras Innovator PLM followed by a detailed architecture is shown in the diagrams below.

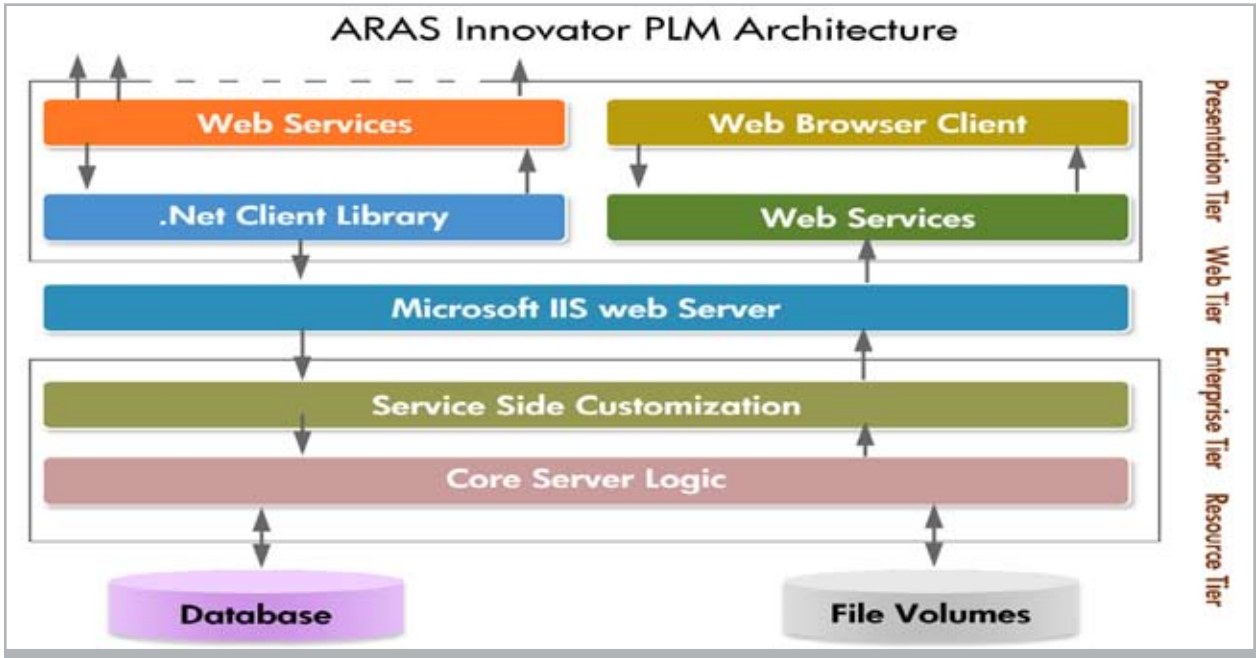

Figure 2 Aras Innovator PLM Architecture (Source: Aras Website)

Aras Benefits to service providers

Aras Innovator delivers an integrated and comprehensive set of applications covering the product lifecycle from concept to development and introduction and through production to end of life. Aras builds on a strong PLM back-bone which provides state of the art workflow, version control, security and change management. There is a really comprehensive set of tools for PLM.

In lieu of a traditional software license model, Aras Innovator is available immediately for free as a commercial open source offering. This gives companies the licensing flexibility and input into code. In addition, the platform works with Microsoft technology allowing companies to leverage Microsoft technology already in place in their organizations.
Aras has CAD integration functionality for a wide range of Mechanical Computer-Aided Design (MCAD) and Enterprise Digital Asset Management (EDAM) systems. CAD integration connectors deliver proven multi-CAD solution functionality. Aras has developed integration with major CAD systems like UG-NX, Solid Edge, Pro-E, Co Create, CATIA, Solid Works, Inventor and AutoCAD[2]. Apart from CAD integration capabilities, the .Net based Architecture of Aras provides the flexibility of connecting with other applications like ERP and CRM systems through a Service Oriented Architecture (SOA). The business advantage of SOA is that it allows an organization to effectively leverage existing assets rather than forcing them to create another redundant silo for each business need which in turn streamlines, automates, and enables better tracking and visibility of business processes in the organization.

Implementation Challenges:

- One of the biggest challenges is the implementation of open PLM (such as Aras) due to technical incompetency caused by complexity of the application and inadequate documentation of the product;
- Unavailability of Aras resources is a challenge for implemen tation and maintenance of the solution implementation;
- Limited availability of CAD and ERP connectors for open PLM software might be another big challenge although some third party vendors have already developed some connectors for CAD applications;
- Operational Challenges: In order to maximize product and business innovation with Aras, the scope of any Aras PLM implementation must also include important cross-life cycle business processes like managing the overall product portfolio, programs and platforms, modeling and simulating the system across the product development lifecycle, and capturing and managing marketplace requirements and operational constraints.

Business Challenges

Throughout the global manufacturing industry, companies employ a wide array of information technology solutions designed to increase productivity, reduce costs and promote innovation in product design. Manufacturers select from a myriad of software applications – in addition to developing software of their own – as they continually seek a new competitive edge that ultimately translates into increased revenue and higher profits. It is no longer sufficient for organizations using Aras PLM to simply solve an isolated problem or set of problems that exist along a product's value chain. They also must ensure that Aras PLM communicates seamlessly with multiple applications – developed by a variety of independent organizations – in order to plug into an existing PLM system and operate efficiently across an integrated multi-company process.

Conclusion

In this paper, conclusions are drawn based on the open source software advantages and challenges. There is a strong case for companies to conduct a PLM pilot around open source software like Aras Innovator because it is likely to meet or exceed technical requirements. This will also provide a baseline against which to judge the incremental value of other solutions and ultimately it may strengthen an organization's commercial position in relation to the PLM software market place.

2 See http://www.aras.com/solutions/CAD-integration.aspx for an overview

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