

Product Information Management for
Automotive Aftermarket
Solution Definition

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WebSphere software



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Hemanth Manda
WPC Services

Geoff Bernard
WPC Technical Sales

Kimberly Simms
WPC Services Solution Management

Ahmer Siddiqu
WPC Services

Kevin Zachary
WPC Services

Divakaran Permalla
WPC Services

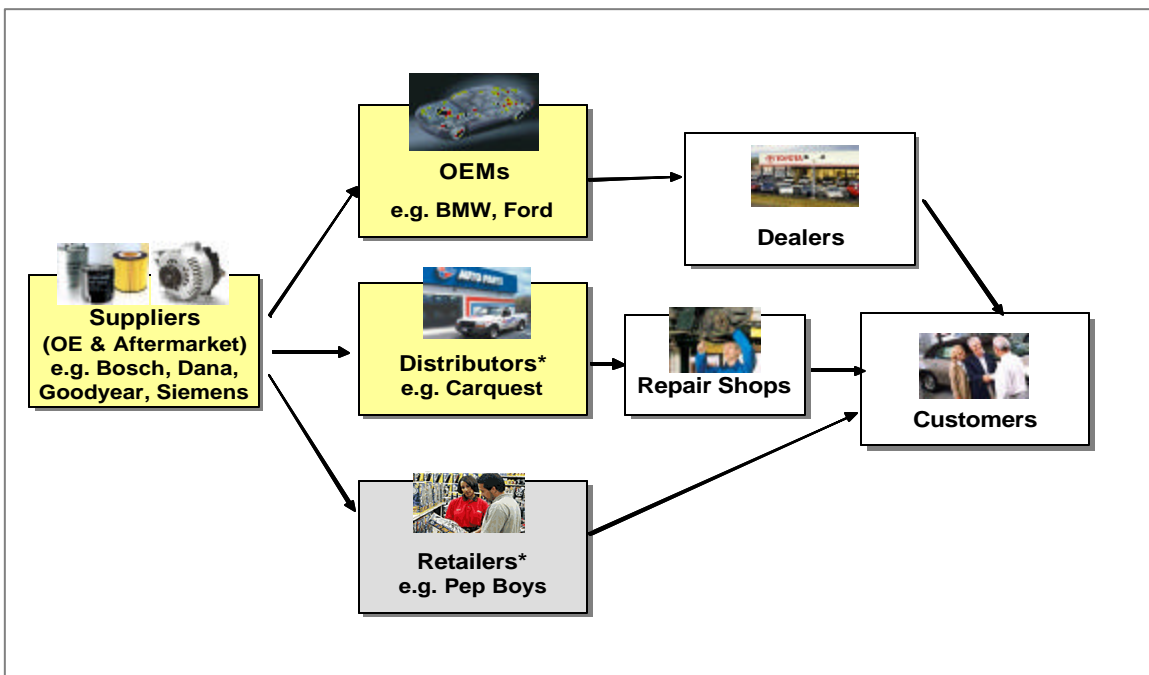
Prem D'Cruz
WPC Product Marketing

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1 Solution Overview

The Product Information Management (PIM) for Automotive Aftermarket is an IBM solution that uses WebSphere Product Center (WPC, currently at version 5.3.1) specifically to cater to the requirements of the automotive industry. The solution leverages the automotive aftermarket accelerator to simplify WPC implementations amongst automotive companies. The following paper captures some of the unique challenges faced by the auto industry while managing master data, as well as provides an overview of IBM's After Market Accelerator.



The above figure illustrates the different players within the automotive industry. The experiences documented in this paper reflect feedback received from our ongoing service implementations at various automotive companies.

2 Business Problem

Today's automotive companies face constant change – churning market demand, fleeting consumer preferences and continual technological advances. To add to

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these problems, managing a cacophony of IT systems has become a real challenge within this industry. Mergers and acquisitions, independent deployment of applications within different business units along with customization of software and data to suit individual business group's requirements has all bred heterogeneity in IT systems. Quite often, automotive aftermarket companies have multiple versions of product information captured amongst a number of their legacy and transactional systems. This affects day-to-day business processes and has a direct bearing on the bottom line of the industry.

If companies are to rapidly reconfigure their business processes across disparate IT systems, there is an obvious need to synchronize their master data to get a consistent view of parts, applications, and vendors. Furthermore, this lack of transparency significantly delays the introduction of new products (also known as New Number Announcements) impacting the time to market of a new product. The results are lost sales, lost productivity and overall process inefficiencies.

To further complicate this picture, parts in an automotive industry are typically linked to one or more vehicle configurations (also referred to as applications). With new vehicle models released every year, the complexity of these relationships has been exploding over the past few years. Therefore, managing product information within this industry is not a simple task and entails persisting multiple part-to-part relationships, part to application relationships, and enabling industry-specific functionality for supercessions, core parts, kits, interchanges, and base parts.

Before delving into the structure and benefits of the proposed WPC auto solution, the following describes a few IBM company specific sample scenarios:

- a. Large Automotive Aftermarket Parts Supplier: One of the major suppliers for automotive aftermarket parts in North America is essentially a conglomeration of multiple independent divisions. The parts information at this supplier is segregated amongst multiple systems and is therefore difficult to manage. More importantly there is no streamlined process for managing new number announcements (NNA) within this company. The NNA process requires a vast array of information from multiple business divisions that needs to be processed and assigned so that new products can be intelligently utilized by subsequent systems. These multiple steps coupled with manual checks and balances translate into long delays affecting the timely release of new parts. It is estimated that a typical NNA at this supplier can take anywhere between 2 to 5 months. Like any other industry, the demand and profit margin for new parts is much higher than the existing ones and any delay in their time to market considerably affects the bottom line. Also being early to market provides this supplier with significant competitive advantages and is the primary driver for its interest in IBM's automotive aftermarket solution. IBM's common build accelerator

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supporting IBM's automotive aftermarket solution comes pre-packaged with some generic workflows that can be used to automate the NNA process thereby significantly improving the time to market.

- b. Large Automotive Aftermarket Parts Distributor: A privately held aftermarket parts distributor that supplies parts to more than 3000 US stores (half of these stores are company owned). For the past 25 years this distributor has been relying on a legacy inventory/order management system to persist its product information. This application has been very robust and reliable, but has imposed an extremely rigid data model. The advent of new technologies and industry standards within the automotive industry mandated a number of data-model and workflow changes. To cope with this influx, this distributor began multiple versions of the master data. Over the past few years, the complexity of these systems has grown exponentially and become a major bottleneck for the smooth functioning of business. Furthermore, the existence of multiple silos meant that no single person or persons are in charge of the business process resulting in lack of overall data ownership. Removing this chaos and complexity has been the primary criteria and was an important driver for selecting IBM's solution. This distributor's objective is to leverage WPC to provide a framework for the following:

- ✓ Define, create and maintain accurate product data across the enterprise
- ✓ Reduce overhead and inefficient processes for managing product data
- ✓ Develop a single product database repository to maintain/manage product data
- ✓ Develop a vendor integration framework and vendor on-boarding strategy.

3 Value Proposition

The following are some of the major benefits of implementing an IBM automotive WPC solution:

- a. Increased Revenue
 - ✓ Clean and Consistent information across the enterprise: Reliable and comprehensive part data helps reduce dissatisfied companies and thereby improves the overall sales. Redundant and conflicting information disseminated through flyers, shelf labels, Web sites and so on has an adverse impact on the business and is a major concern in the auto industry.
 - ✓ Improved information at point of sale: Timely availability of product information within automotive stores and distribution centers impacts

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the product sales by enabling the dealers and DC managers in making appropriate decisions. With the availability of interchange and application configurations, the solution can facilitate much more meaningful information in a timely manner. A centralized repository feeding product information ensures that comprehensive and current data is available at the POS outlets (stores) improving the customer service.

- ✓ Faster New Product Introductions: A faster and more efficient NNA process results in increased revenues for the company. New products are in high demand in the automotive industry and typically carry hefty margins.
- ✓ Improved ability to manage price promotions: WPC's embedded workflow engine facilitates timely and reliable updates to pricing information thereby helping product managers in managing price promotions.

b. Reduced Cost

- ✓ Elimination of manual processes: IBM's WPC provides a robust platform for data validation, content approval and data maintenance thereby replacing some of the manual processes currently in vogue.
- ✓ Consolidated IT systems: Managing a single version of truth results in reduced maintenance expenditure (less infrastructure and reduced man power).
- ✓ Data synchronization with internal and external systems: The embedded integration framework of IBM's automotive aftermarket solution supports all of the industry standards (imports / exports). This reduces the overall cost of ownership for the company.

c. Enhanced security and access control: Enforcing strict security guidelines for data dispersed among multiple systems is a difficult task. However, with a single application managing all part data, one can impose the relevant security and access control permissions at different levels (WPC supports granular security access both at the item level and at the attribute level)

d. Improved productivity of business users: The WPC solution is meant to replace multiple legacy systems thereby reducing the inherent redundancy built into enterprise systems. Furthermore, the system facilitates a streamlined workflow capability improving the overall productivity of business users.

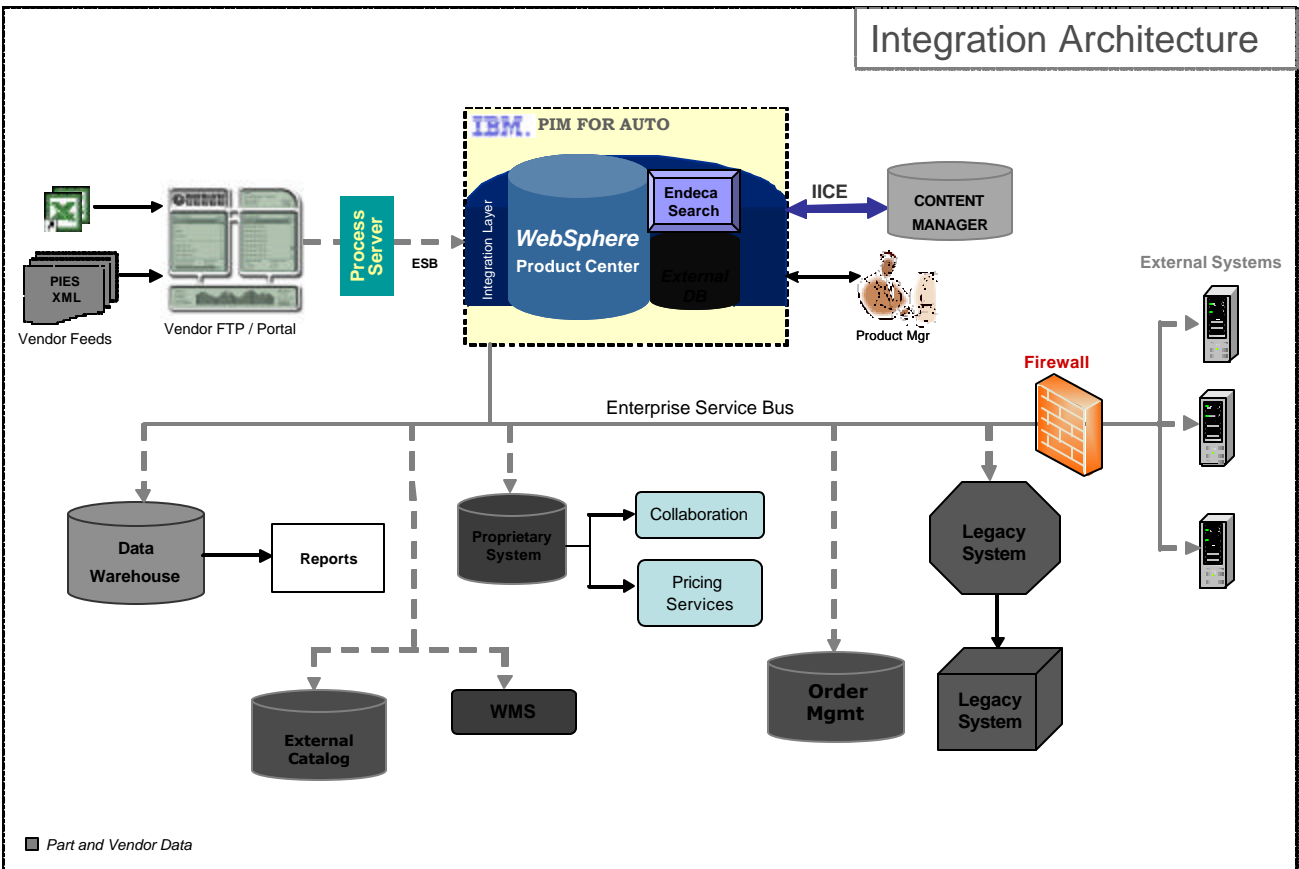
e. Enhanced user interface and search experience: The WPC solution coupled with Endeca (a third party search engine) helps to facilitate a powerful navigation and search experience while enhancing the solution with a user-friendly interface.

4 High Level Systems Architecture

The following diagram illustrates the typical architecture of a WPC automotive solution. The specific details such as integration framework (for example, ESB, and ETL), sources and destinations and data types differ. However, the central theme remains the same with WPC feeding master data to multiple transactional systems.

As illustrated below, the solution is comprised of WPC with an Endeca search engine and an external database. While WPC is the core component of this solution, Endeca is used to enhance its search and presentation capabilities. The external database is used to persist and manage data entities that are specific to the automotive industry (for example, application configurations, part to part relationships, part to application relationships, and interchange data).

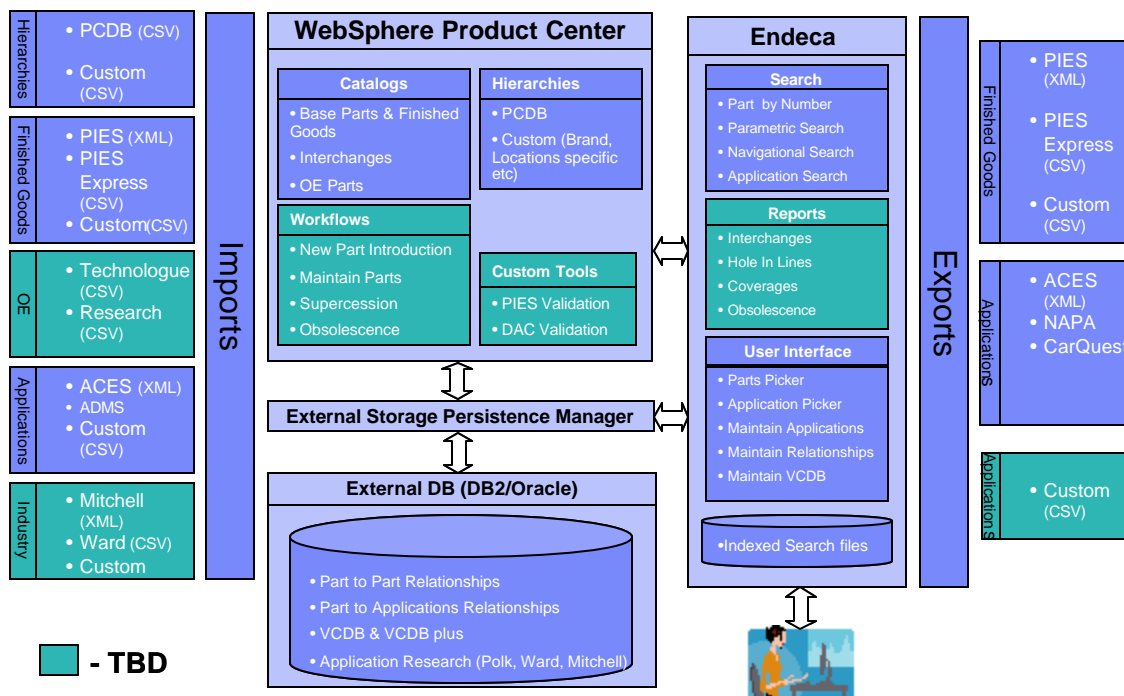
Further, a content management solution such as DB2 content manager can be used to persist unstructured content. End users can directly interact with this unstructured content through WPC through Information Integrator Content Edition - IICE (The IICE adapter enables WPC to add, search, view and update unstructured content stored in an external system).



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The typical downstream systems that rely on WPC for master data include transactional systems (such as OMS, and IMS), Data Marts, Data Warehouses, Proprietary systems, pricing services, legacy applications and external catalogs. In addition, WPC is the primary source of parts data for external organizations including partners (vendors and/or retailers), and standard compliance committees (for example, data audit certification).

AAA Common Build Architecture - Logical



The above diagram illustrates the internal architecture of the IBM aftermarket automotive solution. Here you can see the dividing of responsibilities among WPC, Endeca and an external database. For example WPC serves as the master repository for all product information and any associated validations / workflows. On the other hand, the external database is used to persist vehicle configurations information, part to application relationships, part-to-part relationships, and interchanges. Endeca enables the search functionality for both the part and

application data. Endeca also supports the user interface for managing applications, part to application relationships and interchanges.

5 Solution components

5.1 Data Model

The automotive aftermarket WPC solution is capable of managing all the master data including parts, vendors, and locations. WPC's data model capabilities are flexible enough to support future updates and more importantly can be instantiated as a superset of all the entity models within the enterprise. For example, the part data model of the solution encompasses attributes from all of its downstream applications. The template as such contains the minimum set of attributes that can be extended during company specific implementations.

Furthermore, AAA common build provides a basic framework for creating, managing and deleting vehicle configurations. An application or a vehicle configuration is a distinct combination of year, make, model and other relevant attributes that uniquely identifies a vehicle. Parts that are linked to one or more vehicle configurations are referred to as application parts, while those that are not are called non-application parts. The following is a high level overview of the generic data model components modeled within WPC (for auto aftermarket):

Data Model Components		
S. NO	Solution Component	Description
1	Parts Entity	The parts entity contains all the required part attributes of downstream systems (for example, Order Management System, Supplier Collaboration, Inventory Management System, ERP and other transactional systems).
2	Vendor Entity	The vendor entity supports those companies who use WPC to persist and manage vendor attributes currently required by their enterprise systems. Typically, WPC is not positioned as the "vendor master" therefore only a subset of vendor attribute data is required (10-20 defining attributes).

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3	Support for multiple hierarchies	Automotive solutions may require support for multiple hierarchies for a given part. For example, product managers can drill down to specific parts using their internal hierarchy as well as using the AAIA standard hierarchy (PcDB hierarchy).
4	Parts to Hierarchy Category relationships	<p>Many-to-many relationships between parts and their categories are a requirement for modeling. For example, product managers can opt to associate one part to many PcDB categories. While associating a new part to the AAIA standard hierarchy, the product manager can choose one or more leaf level categories (for example, head cover light might be associated to multiple positions)</p> <p>Classifying product data into a hierarchy can capture this type of relationship modeling.</p>
5	Location Specific Attributes	Location specific data may also be required, such as DC / Warehouse / Customer. An example of location specific data is pricing: The product manager can enter pricing either at a global level (valid for all warehouses) or for some specific locations.
6	Vendor Pricing	The solution can be used to persist static vendor pricing attributes on individual parts such as Jobber Price, Core Price, and List Price.
7	Application Configurations	<p>Users need the ability to create, manage and delete application configurations. A product manager should be able to either create new application configurations or modify existing ones. Also, the tool allows direct partner imports channeled through any integration framework (for example, ESB)</p> <p>In the WPC Automotive solution, support for configuring applications can be accomplished through a custom tool in WPC, working off of an external database for application storage.</p>
8	Supercessions	<p>The need to capture supercession information through vendor updates and manual edits is required. There are 2 use-cases for this process (i) Vendor wants to supersede part A with part B and publishes this information to WPC. Alternatively, a product manager can change this within the solution manually.</p> <p>(ii) The product manager decides to supersede part A belonging to vendor 1 with that of part B belonging to vendor 2. He should be able to make this change by</p>

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		<p>logging into the solution.</p> <p>Supercession can be modeled through relationship attributes on the parts in WPC.</p>
9	Kits	<p>Kits are a relationship developed across different parts.</p> <p>This type of relationship can be modeled through relationship attributes in WPC.</p>
11	Core Parts	<p>The solution supports the requirements around core parts and their relevant attributes.</p>
12	Interchanges	<p>The application supports interchange part data and facilitates a user-friendly interface for browsing and managing interchange information. Further the solution supports bulk imports of interchange data files from vendors. Vendor uploads interchange file data either in standard xml format (AAIA) or in custom Excel sheet format to a portal.</p>
13	Base Part and Part to Part Relationships	<p>WPC for automotive aftermarket provides a user-friendly interface to manage base parts and to cross reference part relationships (for example, base parts to OEM parts). The solution also supports attribute and relationship inheritance so that end users can override the attribute values as well as the relationships inherited from its base parts.</p>
Searching		
14	Part Search	<p>WPC should allow end users to search for part and vendor records using specific attributes.</p>
15	Parametric Search – Year, Make, Model	<p>Parametric search is the ability to search for application parts based on the year, make and model of the vehicle. Consider the following use-case as an example: Product manager enters year, make and model information and clicks the search button. The solution would return all the applications that are associated with the specified vehicle configuration. Note: The solution allows searches based on partial search criteria (for example, only year, a combination of year and make).</p>
Validations		
16	Integrity Check	<p>The application checks for basic data integrity based on the attribute definitions.</p>

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		Note: WPC solution ensures data integrity of the attributes based on their specification definitions. No further configuration is required other than the modeling effort involved.
17	Referential Integrity	WPC solution validates and enforces referential integrity for part and vendor attributes. For example, a new number announcement fails unless the vendor associated with that part has been created and active within the solution.
18	Valid Values	The solution supports valid values for specific attributes. Any value that is not part of this list isn't accepted and the request is not processed. Note: WPC solution currently has two flavors of valid values, while the first is defined and managed at the specification level, the second allows one to use lookup tables to maintain these valid values
19	Automated Validations	Ability to define automated validations to capture invalid or inconsistent data, These rules are identified during the design phase and implemented either within a workflow or as part of the part specification.
20	Validations based on existing attributes	Ability to validate changes based on existing values within WPC.
Security and Role Based Access		
21	Authentication	The authentication framework for Automotive WPC solution is managed in both WPC and Endeca. Some configuration work might be required to seamlessly integrate the two applications from a security point of view. The exact nature of this integration is spelled out as part of the AAA release.
22	Authorization	Authorization of roles is managed independently by WPC and Endeca and might require additional maintenance effort.

5.2 Business Process

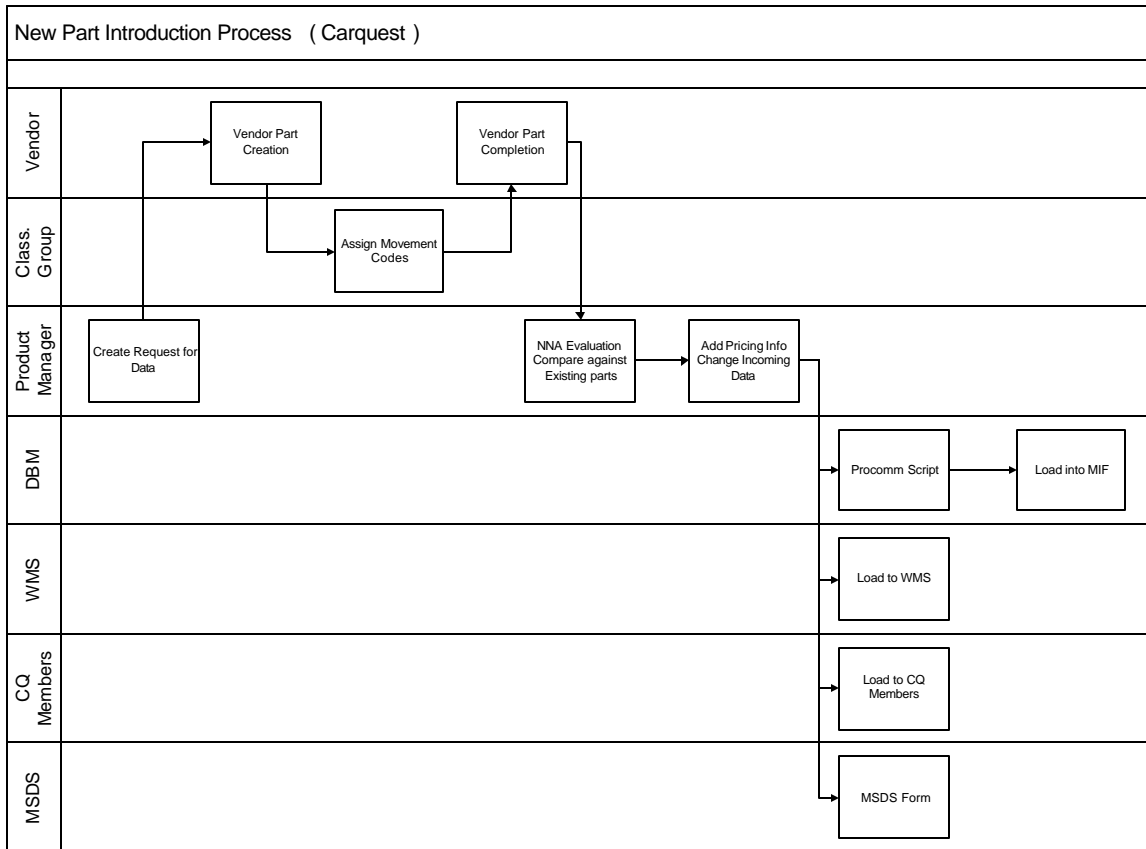
The following business processes are often relevant for the WPC solution within the automotive market. While most of these processes can be easily simplified using WPC, some require extensive manual intervention and are not good candidates for automation (for example, New Vendor Introduction).

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Business Processes		
S.NO	Process Name	Description
1	New Number Announcement	<p>New number announcement (also referred to as NNA) is one of the key business processes within the automotive industry and involves the introduction of new products. The workflow users include data feeds from vendors, product managers, and other internal groups (such as classification and group).</p> <p>The exact steps and the users of this workflow vary from company to company, but the final objective is invariably to introduce a new product that it has all the requisite data and the necessary approvals. Some of the key steps in an NNA process include attribute validations, price approvals, and inter-department communication.</p> <p>The NNA process itself requires a vast array of information from multiple business divisions that needs to be processed and assigned so that the new products can be intelligently utilized by subsequent systems. An example of a typical NNA process is delineated using a flow chart. This process is typically implemented in WPC through a workflow or custom tool.</p>
2	Price / Part Updates	<p>This workflow is primarily used for data maintenance and is critical for any automotive aftermarket WPC implementation. The roles for this workflow include product managers, data feeds from vendors, and IT personnel responsible for data maintenance.</p> <p>The process steps include modification, validation and approval of part data received from multiple vendors. Some companies mandate that the product managers should be able to view the differences between the existing values and their proposed changes, before the changes could be approved.</p>
3	Part Obsolescence	<p>Part obsolescence is a process wherein a part is marked as obsolete, based on vendor's feedback. The part data is, however, persisted in the system for a pre-determined period (for example, 2 yrs) of time and is ultimately deleted, if no updates are received for the part (within that pre-determined period).</p>

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		The users of this workflow are vendor data feeds and product managers while the process steps include “mark data obsolete” and “purge Data”.
4	New Vendor Introduction	<p>This is the typical process by which new vendors are entered into the enterprise MDM system. The process involves a lot of manual processing followed by some automated workflow steps to validate, authorize and persist the new vendor information. However, product managers are the only users of this process.</p> <p>This workflow spans across multiple business organizations and is relatively simple, when compared to the other workflows.</p>



5.3 Integrations

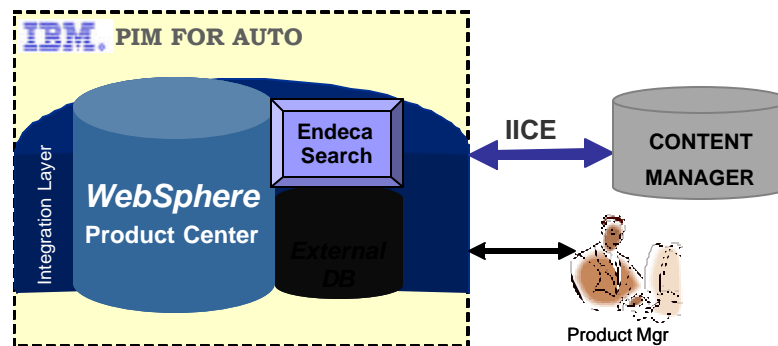
The integrations implemented for a typical automotive WPC solution varies a great deal and is specific to the company. The following chart provides a high level summary of the typical integration components deployed in conjunction with the WPC automotive solution.

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Integrations		
S. NO	Type	Description
1	Upstream Integration	In most cases, the upstream data source is usually a vendor portal or a FTP site These front-end utilities (for example, portals, and ftp sites) accept data either in CSV/excel format or industry standard xml format. The files undergo some basic validation and cleansing, before they are uploaded into WPC. Based on the company, either the files are converted into a standard format and loaded into WPC or WPC is configured to support multiple file formats. Either way, the end objective is to persist all master data within WPC irrespective of the protocol and the format in which the data is created. Please note, vendor on-boarding is one of the major contributors to the success of a WPC project and support for multiple formats is essential, in order to help vendors to simplify the data sharing. The frequency of data updates to WPC is daily, if not weekly.
2	Downstream Integration	As for the downstream systems, WPC is the data source for any enterprise application that needs product information (some companies also use WPC as their vendor master in which case WPC acts as the source for vendor data). Some of the typical downstream systems that fall into this category are legacy ERP applications, order management systems, inventory management systems, data warehouses, collaboration utilities and external catalogues. Also, a subset of the product data is shared with business partners (for example, retailers and distributors for aftermarket part suppliers, and OEM's for OEM part suppliers). To support these exports, WPC needs to be configured to spit out pre-determined file formats, which are translated and pushed out to respective partners. The exact integration channel to accomplish this varies by company.
3	Integration to support Unstructured Content	Finally, WPC supports real time integration with content management solutions such as DB2 Content Manager for unstructured data (see below diagram for details). There is an IICE (Information Integrator Content Edition) product that enables WPC to connect

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		<p>Edition) accelerator that enables WPC to manage, search and view unstructured data through its own interfaces. WPC requires some configuration to accommodate company specific requirements and is supported by IBM's SAL (Scenario Analysis Lab team). Some companies have content management systems while others use file systems to manage their unstructured content. This integration is required only if a content management system like DB2 CM is used. For other scenarios, companies manage their unstructured content using WPC. In either case, unstructured content is typically treated as an attribute of a product or category and linked, using a URL.</p>
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6 Implementation Approach and Methodology

The implementation and deployment of WPC for automotive aftermarket is often complex and time consuming. As a result, companies usually adopt a phased approach to implementation a PIM solution. Not only does a phased approach reduce risk, but it also facilitates quick wins, promotes gradual assimilation and avoids over-engineering. Many factors need to be considered when phasing the solution. Some factors are item categories, vendors, integration components, product functionality, locales, and end users. Typically, a combination of these factors influences the actual decision on how to phase a project.

Option 1: Phasing by Item Categories

Depending on the size of the company, data should be considered as an aspect to phasing. In the automotive industry, data is organized and maintained by category. In most solution rollouts, existing legacy systems are not typically decommissioned

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immediately upon the deployment of a WPC solution. Legacy systems, currently managing product information, are usually phased out over time to minimize risk to the organization. Therefore, the option to phase by a category of data is a very realistic approach that reduces a great deal of risk. This approach allows functionality to be tested out on a small set of data, while minimizing the potential impact to an organization.

Option 2: Phasing by Vendors

This option is more pertinent to retailers within the automotive industry. Vendor onboarding is a time consuming process and is often a major bottleneck to the successful deployment of WPC. So as opposed to targeting all vendors, a company may want to onboard a select few vendors during phase 1 and follow-up with the rest of the vendors in subsequent phases. This approach allows the PIM process to be tested on a select set of suppliers. This experience can be leveraged while on-boarding the remaining vendors.

Option 3: Phasing by Integration Components

Integration is often a huge component of any WPC implementation and should be planned thoroughly. The significance and relevance of WPC is realized only after it starts feeding all legacy and transactional systems. Since only then would it become the single source of truth for item information. However integration is a challenging job that requires broad participation of subject matter experts and extended test cycles. A good approach is to integrate key downstream systems during phase 1 and extend the framework to others in the subsequent phases. This approach not only facilitates quick wins but ensures a smooth rollout of WPC.

Option 4: Phasing by Functionality

Phasing through gradual introduction of new features such as workflow processes, custom tools, reports, data validations, and data model expansion should be considered. This approach works well when functionality can easily be separated between "nice to have" features and "mission critical" features. Higher priority items should always be addressed first, when taking this approach.

Option 5: Phasing by Locales

Some companies within the automotive industry require support for more than one locale. Though deploying all locales at once can be easily achieved within WPC, a more conservative approach is to phase out deployment to individual locales, especially given the fact that different locales usually translate to a different set of end-users, time zones, and vendors.

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Option 6: Phasing by end-Users

Rolling out the solution to the entire business community in a single deployment is a recipe for disaster, especially within the automotive aftermarket industry. Not only are the users ill prepared to cope with the sudden change, but such a drastic change also has an impact on the performance of the solution. A phased approach is advisable, if the company has significant number of users and roles that require access to WPC.

7 Definitions / Acronyms

Acronym	Definition
AAA	Automotive Aftermarket Accelerator
IBM	International Business Machines
AAIA	Automotive Aftermarket Industry Association
ACES	AAIA Catalog Enhanced Standard
PIES	Product Information Exchange Standard
VCDB	Vehicle Configuration Database
PCDB	Parts Categorization Database
VIN	Vehicle Identification Number
NNA	New Number Announcement
IPO	Internet Parts Ordering
DAC	Data Audit Certification
WPC	WebSphere Product Center
DAM	Digital Asset Manager,
NVI	New Vendor Introduction
PIM	Product Information Management
WMS	Warehouse Management System
IMS	Inventory Management System
OMS	Order Management System
IICE	Information Integrator Content Edition
ERP	Enterprise Resource Planning
MDM	Master Data Management
Technologue	An organization that publishes the most current OE part numbers for new and old model vehicles. Data sent is useful to track parts and their applications.
Coverage	All parts that are currently being supplied for a certain vehicle and/or category
Supercession	A term used when one part supersedes another part or parts. From a business perspective, it defines which parts have been replaced, or which new part replaces an old one.
Interchange Part	Interchange parts are the competitor parts for a specific part. This provides the mechanism to interchange parts across different manufacturers
POLK	A privately held global firm based in Michigan. They collect and interpret global automobile aftermarket data and provide extensive automotive business expertise to help assist companies with their most important market issues. Polk provides vehicle production and vehicle registration data. For example, total number of vehicles produced and transported to a county in a state and/or total number of vehicle registered in a county of a state.
OEM	Original Equipment Manufacturer

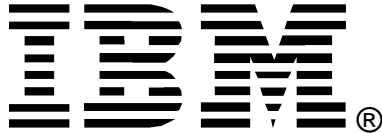
7.1 Automotive Aftermarket Sales Data

Size of the U.S. Motor Vehicle Aftermarket (Billions of Consumer Dollars)

Year	Automotive	Medium and Heavy Duty	Total Aftermarket	% Change
1997	\$138.8	\$53.4	\$192.2	--
1998	\$142.0	\$55.3	\$197.3	2.7%
1999	\$149.0	\$58.6	\$207.6	5.2%
2000	\$157.5	\$61.5	\$219.0	5.5%
2001	\$166.7	\$60.9	\$227.6	3.9%
2002	\$174.3	\$61.5	\$235.8	3.6%
2003	\$181.6	\$62.1	\$243.7	3.4%
2004	\$188.4	\$66.5	\$254.9	4.6%
2005	\$197.0	\$70.6	\$267.6	5.0%
2006*	\$204.4	\$73.9	\$278.3	4.0%

Notes: * Forecast
Historical data have been revised.
Figures do not include warranty work.

Source: AAIA



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