Thinking of Cloud? Options for Automotive Companies

Executive Summary

It's no surprise that analysts see cloud computing as a game-changing phenomenon for most industries and information technology companies. Lower cost combined with scalability and flexibility makes cloud computing more attractive than the on-premise, infrastructure-intensive computing model in these times of budgetary challenges.

This white paper examines the applicability of cloud computing to various business processes within the automotive landscape and provides solutions and recommendations related to activities with which automotive companies should move forward in the near future.

The global recession hit the automotive industry especially hard. As it retools, the industry is becoming increasingly dynamic and is driven by the following key trends:

- **Globalization and global processes:** Automotive companies are increasingly moving toward a "one company, one process" mindset for most supply chain processes, from allocation planning, to order, to delivery. Many auto companies are in favor of implementing the "build anywhere, sell anywhere" approach to meet customer needs across the globe.
- **Rising use of vehicle electronics systems:** Vehicle electronics systems such as Ford Sync, GM's On-Star or BMW's Assist will soon become a standard feature in all vehicles in developed markets. The increasing development of vehicle electronic systems is expected to result in an accelerated use of information technology tools that enable interaction between in-vehicle electronics systems and vendor-supplier consumer-centric technology solutions.
- **Social media impact:** Social networking sites such as Facebook are impacting consumer behavior to an extent that was never seen before. Social media is increasingly emerging as a rich source of data that companies will need to harness to gain competitive advantage.
- **Alternative energy sources:** The move toward electric cars is gaining momentum and is expected to be a key competitive advantage in the future. Most companies are expected to invest a significant amount of money to develop systems and processes that make it easier to build electric vehicles.

This paper looks at the aforementioned trends, the key business processes affected by these trends, and provides recommendations related to the relevance of cloud computing to those business processes, using a straightforward framework to evaluate the applicability of the cloud model.

Cognizant

The Next Decade: A Road Less Traveled

As automotive companies finalize their visions for 2020, they have a long list of lessons learned from the near death experience that some major suppliers faced during the recent global economic downturn.

The recession shook the structural foundation of the automotive supply chain, reflecting its overcapacity in production, underutilization in operations and overreliance on demand push in marketing, sales and after-sales (see Figure 1, below).

As a result, survivors are striving for just the right capacity, with 100% utilization rates and a shift towards on-demand production. In addition, the industry is focusing on more efficient expenditure in marketing, sales and after-sales services targeted at achieving the highest ROI possible for every dollar spent.

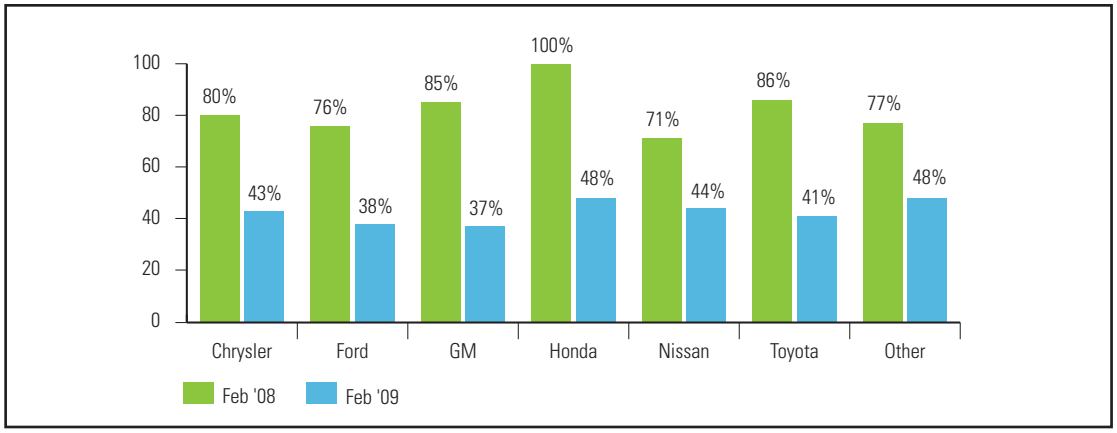
These structural changes are giving rise to four key trends: increased globalization, the expanding role of vehicle electronics systems, a retooling of social media strategies, and a renewed focus on alternate energy sources.

Globalization of Business Processes

OEMs are overwhelmingly moving toward a global platform to remain competitive across markets. Many recent reports indicate a shift in production bases to move closer to demand centers. Specifically, the clear shift is toward the high-volume demand centers located in emerging markets.

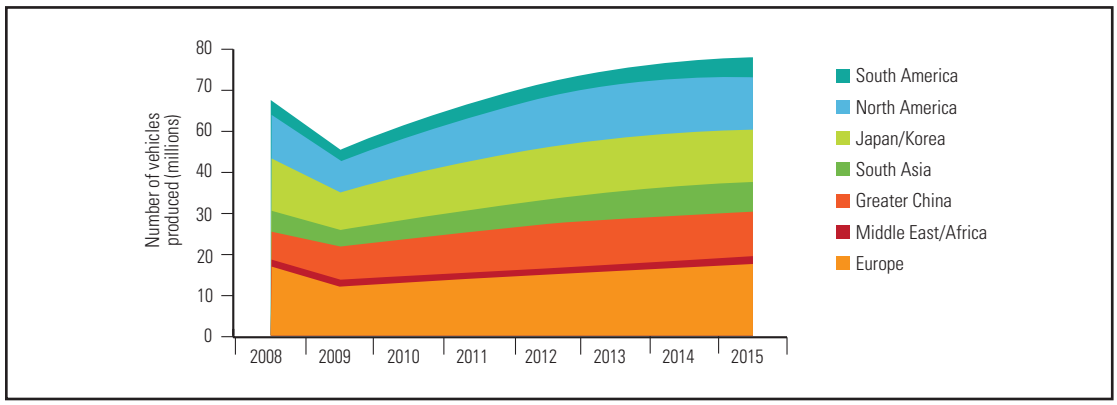
A shift in high-volume demand centers can be clearly seen in Figure 2, below. (China, South America and South Asia will represent more than 50% of growth in global light vehicle production.)

NAFTA Light Vehicle Assembly Capacity Utilization (Feb. 2008 vs. Feb. 2009)



Sources: Ward's Auto, Data Reference Center
Figure 1

Emerging Markets Enter the Fast Lane



Source: CSM Worldwide
Figure 2

At the same time, the demand centers in developed markets are becoming more selective and are pushing for safer and greener vehicles.

Automotive OEMs are trying to solve this dilemma of changing demand centers by focusing more on consolidation of individual brands and business units across the world. As this trend continues, the automotive industry is likely to consolidate more and more business processes in the coming years.

A majority of the OEMs are expected to engage in global business processes with regional focuses to meet the needs of a diverse consumer base across emerging and developed markets. This seems to be a natural progression given the fact that the automotive industry itself has experienced remarkably high levels of consolidation. Even before the start of the economic recession in 2008, 77% of global automotive production was concentrated among 10 companies (see Figure 3, below).

Production Share of Top 10 Automakers

Rank	OEM Group	HQ Location	2008 Global Production	Global Market Share	Cumulative Market Share
1	Toyota	Japan	9,237,780	13.3%	13.3%
2	GM	United States	8,282,803	11.9%	25.2%
3	Volkswagen	European Union	6,437,414	9.3%	34.4%
4	Nissan-Renault	Japan/European Union	5,812,416	8.4%	42.8%
5	Ford	United States	5,407,000	7.8%	50.6%
6	Fiat-Chrysler	European Union	4,417,393	6.4%	56.9%
7	Hyundai-Kia	Korea	4,126,411	5.9%	62.9%
8	Honda	Japan	3,912,700	5.6%	68.5%
9	PSA	European Union	3.325,407	4.8%	73.3%
10	Suzuki	Japan	2,623,567	3.8%	77%

Figure 3

The above scenario is unlikely to change as the global economy stabilizes. In addition, as companies consolidate individual brands and rid themselves of assets with high cost impact with a low profit share, they will look for ways to reduce product and process configurations and complexities.

If recent automotive industry events are any indication, it is clear that automotive companies are taking consolidation to an extent that was never thought possible before. They are also investing money in process platforms that provide an ability to follow the philosophy of "build anywhere and sell anywhere."

Increasing Importance of Vehicle Electronics Systems for Developed Markets

An article by the IEEE indicates that "it takes dozens of microprocessors running 100 million lines of code to get a premium car out of the driveway, and this software is only going to get more complex."

Premium car manufacturers such as Daimler have repeatedly claimed that their vehicles contain anywhere between 10 million to 100 million lines of code and this trend will only increase in the future.

This trend has huge implications for automotive business process, from product codification to product servicing. As per some estimates, 50% of car warranty costs are now related to electronics and their embedded software, costing automakers in the U.S. around $350 and European automakers $250 per vehicle in 2005.

However, a closer look at this trend in the automotive industry also reveals a fundamental shift in the way in which software code that runs the vehicle is used. As automotive OEMs concentrate on writing the most efficient software code that runs the vehicle without any glitches, many supplier companies are riding a wave of providing in-vehicle customer services that are tightly integrated with the in-vehicle systems running the vehicle.

GM's association with On-Star is a perfect example of this. Another example is BMW 2009 model year vehicles, which are armed with a BMW Assist System that performs "risk of severe injury" calculation based on information gathered from the car's air-bag controller and its other ECUs. This system has the logic to inform accident response teams not only where the accident took place, but also the likelihood of passengers being severely injured.

Most OEMs and dealers realize they need to have two-way communication with consumers if they want to succeed with social media strategies.

If the present is any indicator of the future, the integration between in-vehicle customer services systems and in-vehicle electronics systems is likely to continue.

It may not be too long until your vehicle "drives" itself to a dealer's garage for servicing and returns home while you are sleeping or shopping at the mall.

Harnessing Social Media

To date, automotive companies have not been particularly successful in their use of social media. (Ford's effective use of social media in recent times is one exception.) However, automotive companies and dealers are rethinking ways to more effectively harness social media.

For example, a leading Korean automotive manufacturer is now looking at ways to summarize customer complaints that get reported in social media and use that information to identify vehicle servicing issues. In addition, this information can be used to pre-identify warranty claims. Most OEMs and dealers realize they need to have two-way communication with consumers if they want to succeed with social media strategies. Setting up a Facebook page and/or a Twitter account has proved to be an insufficient response to customer requests for information regarding their vehicles.

Keeping past failures in mind, automotive companies are turning their social media strategy to focus more on effective use of blogging, social networking engagements and Web 2.0 visual media techniques. This in turn is also increasing their demands on the technology infrastructure required to harness and analyze the data generated from social media interactions with all consumers.

Focus on Alternative Energy Use

The effect of the "Great Recession" is likely to be felt for years. As the impact of government bailouts, the Cash for Clunkers program and near bankruptcies fades away, the debate about energy efficient vehicles and using alternative energy vehicles is only going to intensify. Even though a fully solar-powered vehicle capable of traveling 100 miles an hour for five days on a single charge seems to be a distant possibility, automotive OEMs are looking for ways to perfect their hybrid solutions. OEMs are striving to build a perfect hybrid vehicle with minimal environmental and cost impact. However, given the history, this is not going to be a magic invention that will change the course of the world. Instead, automotive OEMs will work to perfect hybrid vehicles over time using available technology. Therefore, the role of efficient software that monitors vehicle energy usage and other relevant parameters is only going to increase in the near term.

Given the above trends, the automotive industry needs to examine new business models that leverage technology to attain new levels of operational efficiency and business performance. As with every technological evolution, the early adopters will gain unfair competitive advantage. One such game-changing technology is cloud computing.

Introduction to Cloud Computing

Cloud computing appeals to companies across industry (and the world) for a variety of reasons. Chief among them: its on-demand, pay-per-use model offers significant cost and scalability advantages over on-premises computing approaches. Over time, different definitions of cloud computing have emerged. In this paper, we fall back to the most basic definition of cloud computing.

Cloud computing is Internet-based ("cloud") development and use of computer technology ("computing"). The cloud is a metaphor for the Internet, based on how it is depicted in computer network diagrams, and is an abstraction for the complex infrastructure it conceals. It is a style of computing in which IT-related capabilities are provided "as a service," allowing users to access technology-enabled services from the Internet ("in the cloud") without knowledge of, expertise with, or control over the technology infrastructure that supports them.

Cloud Computing Architecture

The majority of the cloud computing infrastructure currently consists of reliable services delivered through data centers that are built on servers with different levels of virtualization technologies. The services are accessible anywhere in the world, with "the cloud" appearing as a single

point of access for all computing needs. Commercial offerings need to meet the customer's quality of service requirements, which are typically managed via service level agreements.

As customers generally do not own the infrastructure (they merely access or rent) they can forego capital expenditures and consume resources as a service, paying instead for what they use. Many cloud computing offerings have adopted the utility computing model, which is analogous to how traditional utilities like electricity are consumed, while others are billed on a subscription basis. By sharing "perishable and intangible" computing power among multiple tenants, utilization rates can be improved, as servers are not left idle, which can reduce costs significantly while increasing the speed of application development. A side effect of this approach is that "computer capacity rises dramatically" as customers do not have to engineer for peak loads.

One big advantage of cloud computing is that it makes computing technology platform-agonistic, which has great implications for the way in which business services are delivered to customers.

The following figure illuminates how a cloud computing infrastructure allows different platforms to connect to business services (see Figure 4).

Cloud Computing Architecture

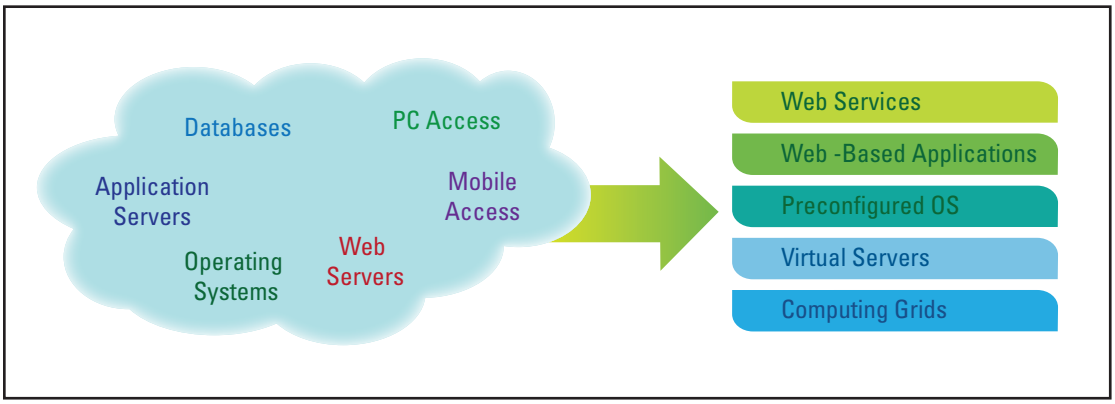


Figure 4

Typically, a cloud computing architecture depends on the type of cloud implemented. These include public, private or hybrid clouds, which can be provisioned to deliver software-as-a-service (SaaS), platform as a service (PaaS), infrastructure as a service (IaaS), or any combination of the three services (see Figure 5, below).

Cloud Computing: Architectural Layers

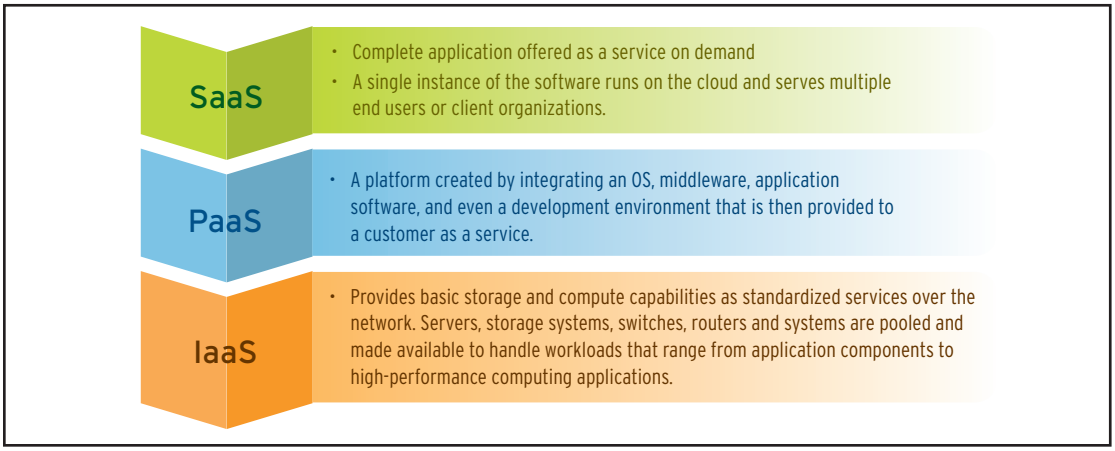


Figure 5

Applying Cloud to Business Process

Typically, companies use three basic principles to determine the suitability of their business processes for cloud computing:

- Ability to standardize
- Need for customization
- Information criticality

The following graphs explain the relationship between the three parameters and the applicability of the business process to use a cloud computing-based infrastructure (see Figure 6).

Cloud Computing: Applicability Parameters

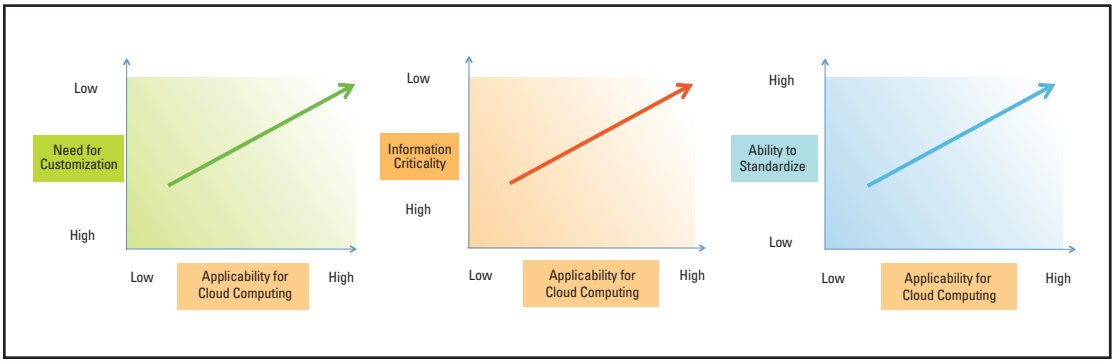


Figure 6

- As the ability to standardize a business process increases, the applicability of cloud computing increases.
  - A highly standardized business process will provide maximum opportunities for moving the solution to the cloud, reducing infrastructure requirements at the company's site and providing simpler applications and middleware for its users.
- As the need for customization of a business process increases, the applicability of cloud computing decreases.
  - Business processes that vary widely according to specific company needs may prove detrimental to a cloud-based offering as the benefits of centralized applications will not be effective in such a scenario.
- As the criticality of information increases, the applicability of cloud computing decreases.
  - Business units are typically unwilling to share the critical information that forms the "secret sauce" of a business strategy that an organization follows. Even in the presence of a "private cloud," companies will be less willing to migrate business processes to a cloud-based solution.

Automotive Companies and the Cloud

As with many other technological trends, automotive companies have been cautious and slow in adopting cloud computing.

To date, very few applications of cloud computing have been accepted by automotive companies and other stakeholders. This makes sense considering the billions of dollars that automotive OEMs have invested in building the systems addressing regional business needs across the world. The cost of migrating complete processes to a cloud-based infrastructure may or may not outweigh the benefits received in the longer term.

Automotive OEMs are justifiably skeptical of making use of cloud computing for every business process they have. However, given the emerging trends covered above, automotive companies should consider using cloud-based solutions for business processes impacted by accelerating change.

The following is a list of business processes that will most likely be affected by ongoing changes in the automotive industry (see Figure 7).

As the Automotive Industry Turns

Trend	Procurement	Product Development	Manufacturing	Marketing, Sales and After-Sales
Globalization of Business Process Supplier Collaboration Management	1. Supplier Collaboration Management 2. Purchase Management 3. Inbound Logistics Management 4. Supplier Integration and Performance Management		1. Production Planning 2. Quality Analysis	1. Order Management 2. Outbound Logistics Management 3. Dealer Management 4. Warranty Management 5. Customer Relationship Management
Rising Use of Vehicle Electronics Systems **Focus on Alternative Energy Usage**		1. Design Document Management 2. Product Development 3. Workflow Management 4. In-Vehicle System Design 5. Corporate Fuel Efficiency Management		
Social Media Impact				1. Warranty Analysis 2. Customer Relationship Management

Figure 7

Now, let's apply the principles of the applicability of cloud computing to identify the business processes that can be migrated to a cloud-based solution in the near term by automotive companies (see Figure 8).

Automotive Business Processes and Applicability to Cloud Computing

Process	Ability to Standardize	Need for Regional Customization	Information Criticality	Overall Score
Supplier Collaboration Management	High	Low	Low	9
Purchase Management	High	Low	Medium	8
Inbound Logistics Management	High	Low	Low	9
Supplier Integration and Performance Management	High	Low	Low	9
Design Document Management	Medium	Low	High	6
Product Development Workflow Management	Medium	Low	High	6
In-Vehicle System Design	High	Low	High	7
Corporate Fuel Efficiency Management	High	Low	Medium	8
Production Planning	Medium	Medium	High	5
Quality Analysis	High	Low	High	7
Order Management	High	Low	Low	9
Outbound Logistics Management	High	Low	Low	9
Dealer Inventory Management	High	Low	Low	9
Warranty Management and Warranty Analysis	High	Low	Medium	8
Customer Relationship Management	High	Low	Low	9

Scoring Method Used:
Ability to Standardize: Low=1 , Medium=2 and High=3
Need for Customization: Low=3 , Medium=2 and High=1
Information Criticality: Low=3 , Medium=2 and High=1

Figure 8

Conclusion

As cloud computing becomes more accepted among automotive companies, they should consider the following business processes as they plan their next-generation solutions:

1. Supplier Collaboration Management
2. Inbound Logistics Management
3. Outbound Logistics Management
4. Supplier Integration and Performance Management
5. Order Management
6. Dealer Inventory Management
7. Customer Relationship Management
8. Purchase Management
9. Corporate Fuel Efficiency Management
10. Warranty Management and Warranty Analytics

In addition, automakers can choose the type of cloud they want – public, private or hybrid – for these applications after a detailed due diligence exercise.

Based on the specific need, automakers should consider working with proven partners that have vast experience developing solutions for different layers of the cloud architecture (i.e., SaaS, PaaS or IaaS). In many cases, automakers will prefer a public cloud for areas such as outbound logistic management and inbound logistic management capabilities since they have the potential to offer extended usage inside and outside the company (i.e., logistic providers).

About the Author

Gajanan Pujari is a Consultant with Cognizant Business Consulting within the Manufacturing and Logistics Practice. At Cognizant, Gajanan has worked on business process modeling and analytics advisory assignments for leading automotive companies globally. Gajanan has over eight years of experience in the technology and automotive domain. He holds an MBA (Finance and Operations Management) from the Indian School of Business Hyderabad, and a Bachelor's Degree in Production Engineering. Gajanan can be reached at Gajanan.Pujari@Cognizant.com.

About Cognizant

Cognizant (NASDAQ: CTSH) is a leading provider of information technology, consulting, and business process outsourcing services. Cognizant's single-minded passion is to dedicate our global technology and innovation know-how, our industry expertise and worldwide resources to working together with clients to make their businesses stronger. With over 50 global delivery centers and more than 100,000 employees as of as of December 1, 2010, we combine a unique global delivery model infused with a distinct culture of customer satisfaction. A member of the NASDAQ-100 Index and S&P 500 Index, Cognizant is a Forbes Global 2000 company and a member of the Fortune 1000 and is ranked among the top information technology companies in BusinessWeek's Hot Growth and Top 50 Performers listings.

Visit us online at www.cognizant.com for more information.

Cognizant

World Headquarters
500 Frank W. Burr Blvd.
Teaneck, NJ 07666 USA
Phone: +1 201 801 0233
Fax: +1 201 801 0243
Toll Free: +1 888 937 3277
Email: inquiry@cognizant.com

European Headquarters
Haymarket House
28-29 Haymarket
London SW1Y 4SP UK
Phone: +44 (0) 20 7321 4888
Fax: +44 (0) 20 7321 4890
Email: infouk@cognizant.com

India Operations Headquarters
#5/535, Old Mahabalipuram Road
Okkiyam Pettai, Thoraipakkam
Chennai, 600 096 India
Phone: +91 (0) 44 4209 6000
Fax: +91 (0) 44 4209 6060
Email: inquiryindia@cognizant.com