



An Oracle White Paper on Enterprise Architecture  
July 2012

# Leveraging Governance to Sustain Enterprise Architecture Efforts

- Executive Overview ..... 3
- Introduction ..... 4
  - Enterprise Architecture and the Second Law of Thermodynamics ..... 4
- Advances in IT Capabilities ..... 5
  - Service-Oriented Architecture..... 5
  - Mobile Computing and Bring Your Own Device (BYOD)..... 6
  - Cloud Computing..... 7
  - Big Data ..... 9
  - Consumerization of IT (CoIT)..... 10
- Characteristics of Quality EA Governance ..... 11
  - The Importance of EA Governance..... 11
  - Organization-specific Governance ..... 11
  - Just Enough, Just in Time ..... 12
  - Socialization and Communication ..... 12
  - Process Integration..... 12
- Instilling a Governance-driven Technology Adoption Process ..... 13
  - Early Identification ..... 13
  - Portfolio Management ..... 13
  - Comprehensive, Innovation Friendly Adoption Process ..... 13
- Conclusion ..... 14
- Enterprise Architecture and Oracle ..... 14

## Executive Overview

Anecdotally, most Enterprise Architecture (EA) professionals probably rose through IT ranks in their careers. And most IT professionals like to experiment and work with computer-based technology. They like to solve problems and make things better. Whether its building the Linux kernel or writing Java code, there is a thrill with making something work. Setting up rules, procedures, and processes to regulate such activities can be counter intuitive for some individuals. They might feel constrained and even have their very agility jeopardized when delivering a solution.

It has been said, “Neither the importance nor the tedium of EA governance can be overstated.” Arguably, the topic of EA governance isn’t an exciting topic. However, with the onslaught of new technology innovation presented to organizations, it is essential to address EA governance in an incremental and adaptive way. Otherwise, organizations’ problems with their technology portfolios will only grow exponentially. It is as if problems were simply moved from a black-and-white television to a color, high-definition television.

This paper will discuss a number of technologies and technology-related phenomena being introduced to corporations. For each, sample issues and questions will be addressed. The paper concludes with a discussion of the attributes of a quality EA program and how to instill a holistic, governance-driven technology/capability adoption process.

## Introduction

Corporations are being bombarded with a number of new technologies promising seemingly magical fixes to traditional computing and managerial problems. Technologies such as SOA, cloud computing, and mobility typically require alignment with corporate objectives to realize new enterprise capabilities. However, they are also subject to architectural abuse - especially as they become easier to use (e.g., start an Amazon AWS instance in minutes).

With each new technological innovation, it is critical to reevaluate relevant EA governance to ensure the necessary processes, controls, and standards are in place. Otherwise, the architectural fragmentation that exists with legacy technology will manifest itself by an order of magnitude with newer generations of technology. And corporate objectives will be missed and enterprise capabilities and objectives unrealized.

## Enterprise Architecture and the Second Law of Thermodynamics

The second law of thermodynamics indicates any closed, biological system will suffer from entropy - or degradation - unless new energy is introduced. All biological life forms are subject to this principle. Place a banana on top of a refrigerator and a few weeks later it will blacken all on its own. Animal life - especially human life - is no different; deprived of food and water and eventually animal life perishes.

Analogously, the idea of the second law carries over to Enterprise Architecture. Over the past five or six decades organizations have embarked on introducing new and exciting IT components with the intention of automating business processes, gaining new efficiencies, lowering operating costs, and simply beating competition. These motivators are coupled with innovations in IT as well as multitudes of independent projects incentivized to behave with a silo mentality.

Without proper coordination of these activities, architectural entropy occurs. Considering the funding model of many enterprises - typically to individual lines-of-business and/or projects - leaders will optimize to reach their own objectives. Said differently, misaligned incentives contribute to the chaos. Enterprises that run in this mode for years or even decades may suddenly catch their breath and look around only to see a cacophony of processes and technologies architected in a haphazard way. Projects take longer and longer to execute. In turn, innovation is stifled and in some cases regulatory mandates cannot be met due to the entropy. Eventually, an enterprise becomes ossified under the weight of its own IT.

This reality makes necessary a disciplined approach to technology acquisition that is driven by strategic concerns and managed with governance. The following will explore some of the newer IT capabilities and technologies presented to corporations and recommend governance considerations.

## Advances in IT Capabilities

### Service-Oriented Architecture

Most enterprises have implemented some form of Service-Oriented Architecture (SOA) to aide in the development, installation, and operation of their application software. According to Wikipedia, SOA is “...a set of principles and methodologies for designing and developing software [as] interoperable services.” Contemporary SOA practices have their roots in modular programming as introduced by Donald Parnas’ in his 1972 seminal paper<sup>1</sup>. Parnas asserts in the abstract that modularization can be used to increase understanding of a [software-intensive] system, reduce development [and maintenance] required, and increase flexibility.

The motivations cited by Parnas in 1972 still hold true today. Computing power has improved by orders-of-magnitude. Yet some organizations still struggle with some of the challenges Parnas was trying to avoid. Despite our best efforts, throwing technology at software maintenance challenges does not solve the problem.

A sound approach to SOA Governance is essential for organizations to obtain the return on investment they seek with SOA. The first key consideration is to develop a sound SOA architecture blueprint and roadmap. It is essential to include the development of an expandable Governance program to ensure the adoption of SOA techniques within the organization to fully realize the value of SOA. In some regards, SOA is more of an approach and mindset rather than a collection of technologies.

SOA Governance contains a number of elements. Organizations will need to define the criteria for a service. Additional work will be required to classify services between simple data input/output services or other types of protocol handling or business logic services.

Enterprises will also need to define where in their software development lifecycle (SDLC) opportunities for service development and reuse will be investigated. Additional approval gates in the process will be necessary to enforce any SOA-related standards. Finally, internal communication will be necessary to instill the SOA mindset throughout the organization.

By way of example, a defense and scientific firm was puzzled by the lack of (perceived) ROI with their SOA investments. While the architecture design and technology selection (i.e., SOA Suite) was sound, the necessary people and process considerations were not addressed. This firm risked a large investment in a product suite without the necessary governance mechanisms intact. A targeted effort was recommended to explicitly define an SOA Governance program. By doing so, this organizations is poised to reduce risk and improve the value of their SOA-related investments by addressing governance first.

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<sup>1</sup> Parnas, D.L. *On the criteria to be used in decomposing systems into modules*. Communications. ACM 15, 12 (December 1972), 1053-1058. DOI=10.1145/361598.361623 <http://doi.acm.org/10.1145/361598.361623>

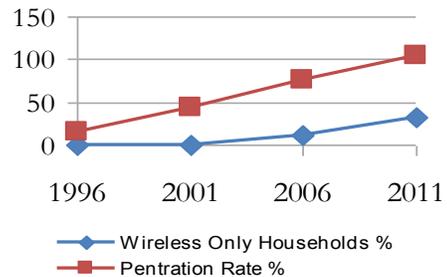
## Mobile Computing and Bring Your Own Device (BYOD)

To say the adoption of mobile phones in the US is high would be an understatement. A recent study by the CTIA<sup>2</sup> indicates there are over 322 million subscribers in the US with a penetration rate exceeding 104%. Nearly 30% of households are now wireless only with no landlines. And as those with teenagers will affirm over two trillion text messages were sent in 2011. Even in rural towns nearly all middle school students have a mobile phone and nearly half of those are smartphones (e.g., Android, iPhone)<sup>3</sup>.

The advent of smartphones and tablet computers (e.g., iPad) has created a phenomenon known as Bring Your Own Device (BYOD). Consumerization of IT has created the situation where employees are bringing their own, and in many cases better, devices to the office. And if the employee has sufficient stature in the organization, they are requesting (or insisting) to be able to use their device at the office. They can easily rig up their iPad at home to Gmail, why can't they access their corporate email just as easily? Younger generation employees recently entering the workforce armed with their Macs and other "alternative" technologies are disappointed when unable to use these devices. Savvy CIOs see this as a way to increase productivity and get out of the business of maintaining some of the desktop "build" or "image." But those who do not approach this carefully will fall prey to the same challenges that have plagued desktop IT for decades. Careful governance will be key to making BYOD succeed.

One of the key considerations for BYOD will be around data ownership. After all, that shiny new, employee-owned iPad has a load of corporate data on it now. What happens when the employee leaves tomorrow? Will a fresh copy of the latest product marketing plan show up on Wikileaks and/or a public Dropbox folder? Effective rights management will be necessary on content to ensure it "self-destructs" once the employee is de-provisioned from the organization. Device ownership is another consideration. Who will fund these devices and then which devices will be funded and/or permitted on the network will need to be determined. A solid, mobile device management (MDM) strategy will be essential for organizations to leverage BYOD to their advantage.

US Wireless Adoption Rates



<sup>2</sup> CTIA - The Wireless Association. Wireless Quick Facts. Available from <http://www.ctia.org/advocacy/research/index.cfm/aid/10323>

<sup>3</sup> Based on a private conversation with the author's daughter.

## Cloud Computing

Corporations are formulating strategies around cloud computing in the hopes of saving money while some are shuddering in fear of losing their data and/or IT control over solutions. Numerous vendors are stepping up to be the key suppliers for cloud-based solutions.

According to the National Institute of Standards and Technology (NIST), cloud computing is defined as, "...a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."<sup>4</sup>

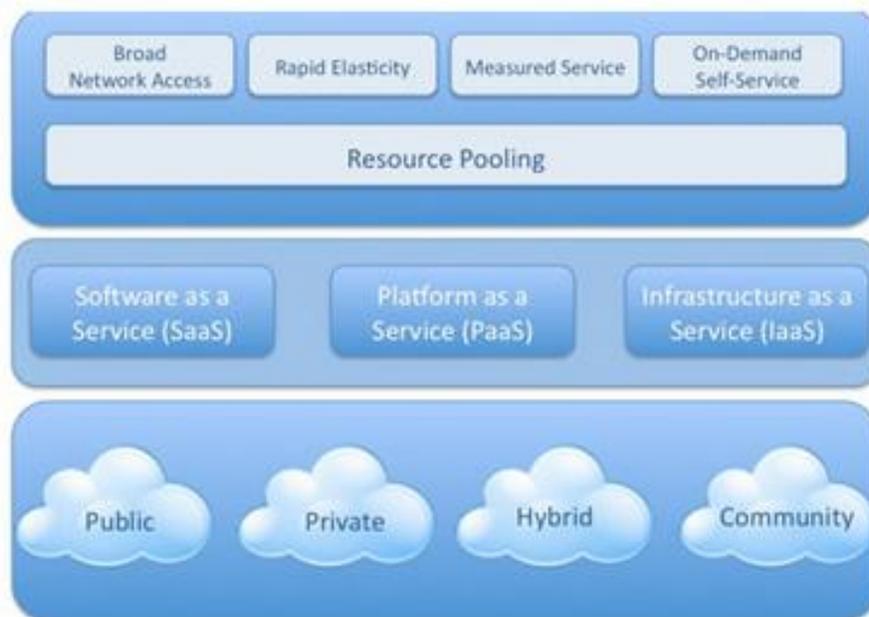


Figure 1: NIST Cloud Computing Model

The maximum benefits of cloud computing can be gained with diligence in the coordination and consistency across the enterprise. To be successful, governance plays a major role and the following six factors stand out:

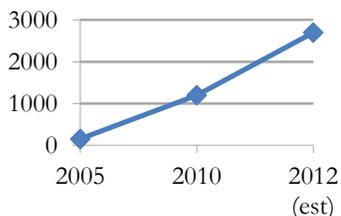
- **Standardization.** Have overall cloud strategies been articulated through the organization? Technology selection processes, discussed below, should have the necessary standards in place to include cloud computing as a standard choice. Some Oracle clients have gone as far to say “Why not cloud?” or “Cloud first” when referring to hosting options. Whatever the direction is for a corporation, it should be explicit and well communicated throughout the enterprise.

<sup>4</sup> Mell, Peter; Grance, Timothy. *The NIST Definition of Cloud Computing*. National Institute of Standards and Technology. Available at <http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf>

- **Data Ownership.** What is the exit strategy with a particular cloud vendor? Do the terms and conditions alter expectations regarding the ultimate owner of the data. Recent news of policies regarding Google Drive along with practices of sites like Facebook bring this concern forward.
- **Data Location.** Does the cloud provider “pin” data within a particular country? And does that matter for certain types of applications (e.g., US Medicare/Medicaid-related)?
- **Availability.** The issue of availability, along with other non-functional requirements, comes into play. Have precise availability requirements been defined for the solution and do the cloud provider(s) support the necessary level of service?
- **Service Request Handling.** The handling of requests will also be important. The promised level of agility can be squelched if the supporting administrative processes are cumbersome.
- **Procurement Authority.** Procurement authority will need to be clearly defined. Does the organization allow business leaders or (rogue?) IT staff to subscribe to cloud services with a corporate credit card? Are there mechanisms in place to detect and, optimally, prevent unwanted procurement of services? There are just some of the governance considerations needed for cloud computing.

## Big Data

Big Data has captured everyone’s imagination and is characterized across three dimensions: volume, velocity, variety. For traditional data intensive business processes, this is nothing new, but the emergence of mobility, social media, and personalization has placed new value on data that surrounds us and never been exploited.



Worldwide Data Production (in exabytes)

The number of data sources has grown, such as industrial machines, consumer devices, web logs, government data, to name a few. And for the most part, companies are not yet taking advantage.

In 2005 it is estimated 150 exabytes (1 billion gigabytes) of data were produced worldwide. In 2010, the number has increased to 1.2 zettabytes (1000 exabytes) with International Data Corporation estimating the 2012 figure to be 2.7 zettabytes. Much of this information is not just large but also unstructured and semi-structured.

As corporations move to the cloud, additional governance mechanisms will be needed for Big Data as well as derivative extracts and summary versions (e.g., data marts). Missing disks/thumb drives, laptops/iPads left behind on airplanes, and obscure social network privacy settings are all potential breaches waiting to happen.

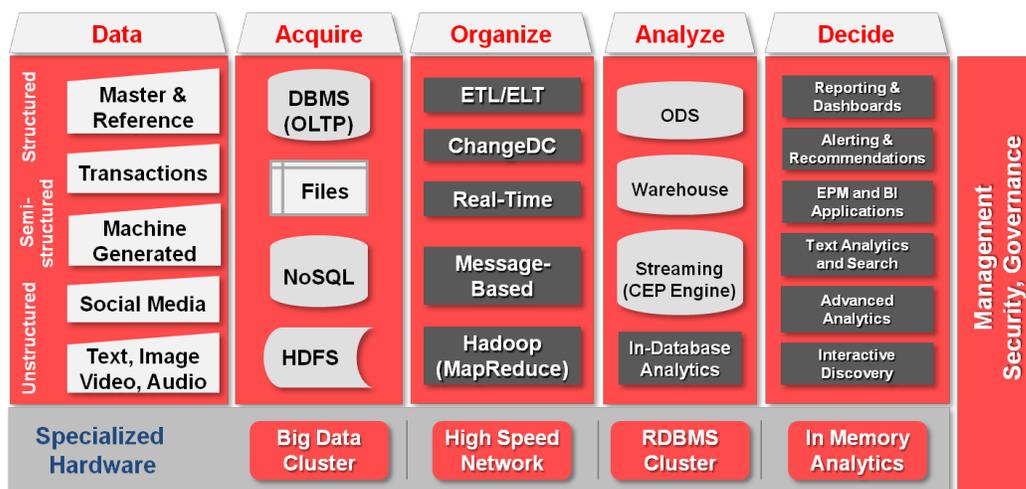


Figure 2: Oracle Big Data Information Architecture Capabilities

Big Data governance is an extension of data governance. A solid architecture plan coupled with master data management will aid in putting Big Data in the right architectural perspective. With a correct architecture, Big Data is just another source of data to include in organizations overall data management plans leading up to business intelligence capabilities. Metadata management of this information, like other “traditional” data, will be essential. However, the rigidity will need to be relaxed as new “columns” of data may be inferred from trend analysis. Privacy and access management will need to be addressed to protect this valuable asset. Finally, traditional data stewardship and ownership mechanisms will need to be applied to maximize the value of the data.

## Consumerization of IT (CoIT)

What is the role of the IT department in the future? The perception of IT in an organization can be viewed in a number of ways. The first was the cost center or necessary expense. Only those functions that were required to be automated were subjected to the IT department. As time has progressed and the maturity of IT departments has improved, IT can be viewed as a strategic partner providing innovation solutions to the business. Could there be a day where “there is no IT”? In this reality, the IT capabilities are woven into the very fabric of business units. The idea of “digital” is no more differentiating than the yellow legal pad. While organizations may be far from this reality, those charged with IT-related services should consider this now to maintain relevancy within their respective enterprises.



This increasingly artificial border between IT and “the Business” is beginning to fade. When computer-based technology was introduced, only a select priesthood of white-shirted individuals knew how to interact with the technology. With the increasing use of computing in everyday life and the mantra of “there’s an app for that”, increasing numbers of individuals are developing expertise with computers. The digital immigrants - those who grew up in an analog world and were thrust into the information age - are now joined by the digital natives who are being raised on the Internet, computers, and smartphones. Younger generations of knowledge workers are more likely to craft their own solutions - at least be less afraid to do so.

The idea of do-it-yourself (DIY) solutions has been underway for some time. The use of desktop databases, spreadsheets, and “mini-apps” have proliferated organizations for decades. With the advent of software-as-a-service (SaaS) and open source software (OSS), those outside IT are afforded their own building blocks for solutions. Enterprise architects - along with other roles charged with governance - have a new challenge before them.

A strategy of trust and facilitation - IT and EA as enablers - can provide the correct blend of governance, agility, and room to innovate. This notion accepts the reality that IT is not the only source of computing solutions. The technology is simply getting that good. And IT departments’ backlog is not getting any better. Enterprise architects now have the opportunity to craft platforms and standards that facilitate the idea of “end-user computing” that lives and works within the confines of the overall EA plan.

A retail industry firm experienced this type of facilitative governance. While revitalizing their EA Governance program, the firm was actively working on a mobile strategy that addressed this concern straight away. They developed a tiered approach to support whereas the ownership of the device determined level of support and the permission levels for access data. Taking this approach provided an avenue for those who already owned compatible but not fully supported devices. It allowed these individuals to benefit from their devices for work purposes and liberated IT staff from unnecessary standards policing.

## Characteristics of Quality EA Governance

This paper has explored a number of technological and technology-related phenomena being introduced into business today. The following sections will explore the characteristics of an effective EA governance program to meet new and dynamic IT/Business models.

### The Importance of EA Governance

Why can one drive a Formula 1 race car at extreme speeds? Because these cars have superior control systems (e.g., braking and steering) along with very fast engines. Without these systems in place, the vehicle would still go fast...so fast it would rip apart and cause certain tragedy.

Some may assert there is a tension between agility and EA governance. Organizations are trying to adapt to new business models and the innovative folks feel constrained by IT and the lawyers who are trying to stay out of court. The right amount of governance - the braking and steering subsystem of an organization - can facilitate an organization's agility. Done correct, a few "rules" will streamline choices and designs resulting in reduced total cost of ownership (TCO) for solutions. This is not to advocate for a draconian approach where the smallest decision requires sign-offs by the CxO. Rather, organizations establish a reasonable set of rules and stick within the bounds. Further, staff should be empowered to follow an objective set of guidelines.

### Organization-specific Governance

Variability in governance approaches should take into account the variability of objectives, environmental factors, and financial health between organizations. But most of all, cultural variability will play a key factor. Here are some examples

- Organizations with strong command-and-control (C2) attitudes will easily absorb strong EA governance (e.g., military or defense contractors).
- Smaller, more creative organizations in dynamic, emerging markets will need skillfully crafted governance with just enough rigidity to remain responsive to business developments.
- Organizations in a recovery/survival may benefit from temporary "lifting" of EA governance controls until stability is realized. Even in the extreme cases, the absence of all governance will only contribute to some of the problems at the root of the crisis. So caution is called for in this extreme case.

A financial services firm experienced shifts in its executive leadership - including IT - which owned the EA organization. In this journey, the EA program had gone from a strict C2 approach with governance to reducing all EA governance to a set of "nice" guidelines to follow if possible. Oracle was able to work with this client to revitalize the EA program to include stronger governance consistent with the theme of "just enough, just in time." This way, the organization could still innovate and transform while the necessary controls were in place to reduce unnecessary complexity.

## Just Enough, Just in Time

The idea of “just enough, just in time” applies very well for EA governance, especially with the phenomena described earlier. Less mature EA programs as well as those who are in a state of flux will benefit from a minimalist approach to EA governance. EA frameworks and development methodologies should be adopted in an incremental fashion. Doing so will ensure changes to processes and structures are absorbed within the organization. For more mature organizations, this approach also aids in realizing maximum value of invested time and resources as to prevent “shelf-ware.”

## Socialization and Communication

Effective EA governance is socialized and communicated well through an organization. The idea of self-service EA governance is another factor to make it easy for staff to “comply” with the architecture. Said differently, the baseline components for solutions are easily accessible for those who are charged with solution development.

## Process Integration

Finally, a quality EA governance program is integrated and out-in-front of solutions development work. EA governance should play a key role in procurement and project funding decisions as well as project execution design work. This applies whether projects are implemented internally to an organization, outsourced to a service provider, and/or hosted by a cloud vendor. The earlier EA governance and EA alignment/integration can be verified, the easier projects will execute and comply with the architecture. It is similar to the cost of repairing software defects within a project; the cost of making changes increases exponentially within the project. The same holds true for architectural change.

## Instilling a Governance-driven Technology Adoption Process

To meet the challenges and opportunities discussed earlier, technology/capability adoption requires a flexible, agile approach. The increasing demands of contemporary business as well as the increased IT skills of staff are shifting the role of IT.

### Early Identification

Part of this process is at the earliest point of identification. A repeatable and simple way of proposing new IT capabilities should be available to all staff. Not all new IT ideas need to come from the IT organization. Subsequently, a well defined process for vetting and experimenting with these new ideas assists in disciplined adoption. Those charged with governing technology adoption decisions can leverage the innovation and experimentation regardless of organizational location and transform it to competitive advantage.

### Portfolio Management

A robust portfolio management methodology should be employed early to ascertain functional duplication with the proposed new capability. Architects should review existing components to determine if a particular IT capability is already provided by one or more components. Additionally, the reality of duplication should be addressed. Business realities may require some duplication within the portfolio. Explicitly documenting these deviations will help future stewards of the portfolio to best optimize it for evolving business needs.

### Comprehensive, Innovation Friendly Adoption Process

Effective adoption processes will address not just the technology but people and process as well. Organizational readiness will be key for staff to ensure the solution building blocks are in place - especially for end-user computing solutions.

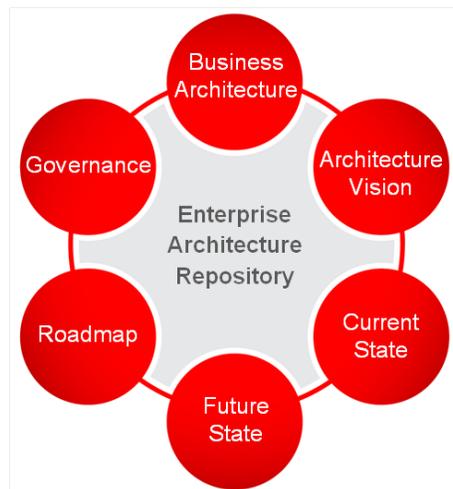
A well-defined verification process with classification of capabilities (e.g., proof-of-concept, testing) should be employed to reduce ambiguity in capability selection for solutions. Well defined approval gates and roadmaps will ensure that only vetted capabilities are introduced into solutions. As a new technology or capability is introduced and nears production use, the level of scrutiny increases. Certain safeguards will be necessary even during exploration as simple components such as cloud-based file storage (e.g., Dropbox, SugarSync) can leak intellectual property and violate other compliance rules.

## Conclusion

This paper has discussed a number of technological and technology-related phenomena affecting modern businesses. Various issues and questions were raised for consideration in crafting an effective EA governance program. It is important to continually evaluate and ensure just enough governance mechanisms are in place for an organization with new technology direction. Organizations should resist the temptation to be carried away with the new technology and forget about the governance. Balancing agility and governance will aid EA programs in delivering value and facilitating goal attainment for enterprises.

## Enterprise Architecture and Oracle

Oracle has created a streamlined and repeatable process to facilitate the development of your big data architecture vision.



The Oracle Architecture Development Process divides the development of architecture into the phases listed above. Oracle Enterprise Architects and Information Architects use this methodology to propose solutions and to implement solutions. This process leverages many planning assets and reference architectures to ensure every implementation follows Oracle's best experiences and practices.

For additional white papers on the [Oracle Architecture Development Process \(OADP\)](#), the associated [Oracle Enterprise Architecture Framework \(OEAF\)](#), read about Oracle's experiences in enterprise architecture projects, and to participate in a community of enterprise architects, visit the [www.oracle.com/goto/EA](http://www.oracle.com/goto/EA)

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Architecture Efforts

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Author: Eric A. Stephens

With a pithy quote from Ram Chakravarti and  
reviews by Michael Glas

Oracle Corporation  
World Headquarters  
500 Oracle Parkway  
Redwood Shores, CA 94065  
U.S.A.

Worldwide Inquiries:

Phone: +1.650.506.7000

Fax: +1.650.506.7200

oracle.com



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