Improving Insurer Performance with Big Data
Architect’s Guide and Reference Architecture Introduction

ORACLE ENTERPRISE ARCHITECTURE WHITE PAPER | FEBRUARY 2016
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Executive Summary

As insurance companies improve business efficiency and performance, the ability to access, analyze, and manage vast amounts of data while rapidly evolving the Information Architecture has proven critical. Insurers will continue to focus on revenue growth while maintaining adequate margins through operational efficiency, better risk management, and improved customer intimacy while developing new revenue streams when entering new markets and service areas.

Many larger property, casualty, and life insurance companies are gravitating towards an expansion of portfolios to lessen risk and establish consistent fee-based revenue. Differentiated services, cross-sell and up-sell initiatives, and expansion into emerging markets around the world are on the rise. Analytics and information management play a central role in ensuring that these strategies are properly executed.

As insurance companies embark on a journey to gain a better understanding of customers and their household preferences and provide more differentiated services, the amount of data grows, data collection occurs more frequently, and data variety becomes more complex. Today, these data sources can include:

» Traditional enterprise data from operational systems related to customer touch points such as:
  » Claims processing
  » Sales transactions and customer relationship management
  » Financial / portfolio management

» Insurance and related business forecasts from various sources such as:
  » Traditional and social news media
  » Industry data
  » Financial trading data
  » Regulatory data
  » Analyst reports (internal and competing insurers and investment companies)

» Other sources of data such as:
  » Sensor data (Telematics in transportation vehicles, sensors deployed in buildings, etc.)
  » Advertising response data
  » Social media sentiment data

As the rate that this data is generated increases, business analysts who crave such data consume it. Information discovery tools enable them to rapidly combine various data sets leading to better insight. They often want more data to be ingested at higher rates and stored longer, and want to analyze the
growing data volumes faster. “Big Data” solutions help insurance institutions respond to these requirements.

This paper provides an overview for the adoption of Big Data and analytic capabilities as part of a “next-generation” architecture that can meet the needs of the dynamic insurance industry.

This white paper also presents a reference architecture introduction. The approach and guidance offered is the byproduct of hundreds of customer projects and highlights the decisions that customers face in the course of architecture planning and implementation. The paper reflects the experience of Oracle’s enterprise architects who work within many industries and who have developed a standardized methodology based on enterprise architecture best practices. Oracle’s enterprise architecture approach and framework are articulated in the Oracle Architecture Development Process (OADP) and the Oracle Enterprise Architecture Framework (OEAF).
Key Business Challenges

Insurers typically have data warehouses employing advanced analytics and business intelligence tools for reporting on and analyzing customers and policies to better anticipate customer needs, understand risk, and optimize operations. Traditional enterprise architectures have served insurance companies well for years. The architectures have enabled these institutions to manage operational risk and set policy pricing. In addition, these systems have enabled the institutions to meet regulatory requirements.

By deploying Big Data Management Systems that include data reservoirs (featuring Hadoop and/or NoSQL databases), greater benefits in these areas can be achieved as the business gains better predictive capabilities and becomes more agile. The addition of Big Data systems enables organizations to gain much higher levels of insight into data faster and enables more effective decision making.

Insurers are rethinking how they model their enterprises. Statistical modeling has long been a requirement to understand risk and pricing strategies and for determining the likelihood of fraud. The models are often deployed on centrally managed platforms in IT that are aligned to individual lines of business. However, there can be a chasm between the modeling and IT worlds.

Modeling platforms often contain copies of enterprise data. While an insurer may have put in place sophisticated data governance policies around data in the enterprise warehouse, data used for models often falls outside the purview of these governance systems. The problem is exacerbated by the new sources of data that modelers want access to. The oft-repeated phrase that “the analytics problem is a data problem” underscores the need to closely link analytics and data management.

Of course, data movement introduces data latency delaying access to critical updates in information. Line of business needs sometimes lead to massive data duplication in analysts’ systems. Big Data platforms can provide centralized highly scalable and cost effective statistical modeling platforms and eliminate the need to move or duplicate data.

Today’s modern insurance companies are also interested in analyzing data external to their organization. Such data can include sensor data, demographic information, weather data, and other sources. As insurers look forward, they continue to focus on improving risk management and policy pricing, fraud detection, claims processing, and marketing. They are more aware of possible reputational risk associated with negative sentiment expressed on social media. And, they are exploring new lines of business while keeping their eyes open for possible non-traditional competitors that now have access to important new sources of data.
Where to Find Business Cases that Justify Projects

Many existing business capabilities can be enhanced when more and varied data becomes part of the Information Architecture. IT organizations at insurance companies typically work with their lines of business to build solutions in the following areas when defining Big Data projects:

1) **Risk Management and Pricing**: Insurers are building data reservoirs to store data extracts from all operational and non-traditional data sources. Business users and analysts explore the data in the data reservoir and develop analytic business models in a self-service environment in near real-time (and eliminate the need to move huge data sets onto workstations for analysis). Customer risk can be quickly evaluated to better determine the true cost of doing business with that customer and maintain business margins.

New sources of data such as from sensors can provide information about customer driving patterns (e.g. unusual acceleration, braking, speed of vehicle) to better understand insurability and proper policy pricing. Sensors deployed in buildings can provide insight into how properties are being utilized. Other external semi-structured data sources such as weather information and location information can augment existing data sources to better determine risk.

2) **Fraud Detection and Claims Processing**: Fraud detection and prevention is facilitated by analyzing transactional data and interdicting an incoming real-time stream of transactions against a well known set of patterns. Big Data technologies enable correlation of data from multiple sources or incidents to determine fraud. The individual incidents by themselves may not signal a fraudulent event. An example of suspicious activity might occur when a customer consistently sends an email or calls a telephone number within a few minutes of making a large claim. Adding new data points such as geo-location data can enhance fraud prevention. Modern self-adaptive machine learning algorithms can learn and track behaviors of customers and devices enabling identification of fraud early.

Most insurers also want to reduce the cost of claims processing while assuring that valid claims are quickly paid to the most valuable and loyal customers. Automating the fraud detection process and quickly separating those that are very unlikely to commit fraud (and automatically paying the claim) can build brand loyalty while reducing costs in handling a majority of claims.

3) **New Services and Lines of Business**: Insurers offer a variety of policies that often also serve as investment vehicles. So understanding the health of portfolios held internally and providing financial advice is an important aspect of modern insurers. As many large insurers also seek to acquire smaller insurers to establish a broader presence, understanding implications the holdings in portfolios held by those organizations to be acquired is fundamental to making wise decisions.

As insurers begin to leverage sensor data and other data sources, new business opportunities can open up. For example, putting sensors into buildings and analyzing the data might lead to opportunities to offer building security systems and networks. That said, as automakers have access to the same driving pattern data that insurers seek, they may become a new competitor and impact the viability of continuing to offer policies in this area. So understanding who has an analytics advantage can be critical to deciding what services to offer.

4) **Managing the Reputation of the Business**: Better understanding of the customer, the services they consume, and the customers’ opinion of how products are sold and claims are handled becomes more transparent as they share their opinions on social media. Individuals and organizations with a large number of followers can greatly impact the
reputation of the insurer. Insurers that can react to negative commentary and delight their customers can turn a bad situation into a good one.

5) **Marketing and Customer 360:** Understanding the life cycle of a customer enables more services to be sold to the customer over time. The value of the customer continues to grow as more and more services are sold to them. Social media can be a good source of data to get a head start on life events including graduation, first job, engagement, weddings, college costs and retirement. This insight can enable more products to be sold by getting the right product in front of the consumer at the right time.

6) **IT operational efficiency:** Not unique to insurance companies and rarely driven from the lines of business (but a possible reason for embarking on extended architectures that include Hadoop) is the need to move data staging and transformation to a schema-less platform for more efficient processing and leveraging of IT resources. IT operational efficiency is often difficult to prove but is sometimes an initial justification that IT organizations gravitate toward when deploying these types of solutions.

On the next page, we show a table that summarizes several typical business challenges in insurers and illustrates the opportunity for new or enhanced business capability when adding new analytic capabilities.
<table>
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<tr>
<th>FUNCTIONAL AREA</th>
<th>BUSINESS CHALLENGE</th>
<th>OPPORTUNITY</th>
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| Risk Management & Pricing        | Reduce exposure to expensive claims  
                               | More accurately price offerings based on customer’s risk profile and cost of doing business  
                               | Competitively price offerings to gain most valuable customers                                                                                                                                               | Improve scoring of customers and potential clients utilizing non-traditional sources of data  
                               | Utilize open technologies such as Hadoop/Spark for massively parallel compute  
                               | Re-platform SAS Institute and / or R users and perform in data store advanced analytics for near real-time analysis  
                               | Leverage data from sensors for more complete customer profile                                                                                                                                                    |
| Fraud Detection & Claims Processing | Detect fraudulent claims with greater accuracy to reduce costs  
                               | Pay out valid claims to most valuable customers faster                                                                                                                                                         | Correlate seemingly unrelated incidents to identify fraud  
                               | Utilize machine learning to keep up with ever changing fraudulent activity  
                               | Reduce cost of claims processing                                                                                                                                                                                |
| New Services / Lines of Business | Broaden product footprint  
                               | Increase revenues globally  
                               | Enhance profit margins  
                               | Anticipate / respond to non-traditional competitors                                                                                                                                                         | Launch new services and expand into global markets with new targeted services (e.g. financial investments)  
                               | Leverage sensor data to offer non-traditional products (e.g. security systems)  
                               | Reduce risk and costs to boost profitability                                                                                                                                                                   |
| Reputational Risk                | Protect the brand                                                                                                                                                                                                       | Monitor the web to understand customer sentiment towards the insurer’s products, process, employees, board members etc.                                                                                     |
| Marketing and Customer 360      | Grow the business by selling more services and products to customers.                                                                                                                                                  | Better understand customer behavior and needs  
                               | Identify customers with long term profitability potential  
                               | Proactively make context relevant offers and suggest investment strategies                                                                          |
Establishing an Architectural Pattern

The following figure illustrates key components in a typical Information Architecture. Data is acquired and organized as appropriate and then analyzed to make meaningful business decisions. A variety of underlying platforms provide critical roles. Management, security and governance are critical throughout and are always top of mind in insurers. These components are further described in the “Information Architecture and Big Data” whitepaper posted at http://www.oracle.com/goto/ea.

Figure 1: Key Information Architecture Components

How do we determine which of these components should be part of the architecture to meet the needs of a specific organization or company? If we create an information architecture diagram, and trace the data flow from the sources to the application (end-user), we can build a logical configuration of the components to support the functions.

The first step in defining a future state architecture is documenting the current state, its capabilities and any functional gaps. Typically a current state data warehouse environment might look something like Figure 2.

Figure 2: Typical Current State Data Warehouse
The first gap that typically has to be closed is a need to provide a more agile reporting and analysis environment where new data and ad-hoc reports are needed on an ongoing basis. Information and data discovery engines can provide this type of capability. When information discovery is incorporated into the architecture it would look something like the illustration in Figure 3.

![Figure 3: Typical Introduction of Information Discovery](image)

Now that we’re better able to analyze the data we have, the next step would be to explore bringing in new data and new data types. These data sets might be internal, 3rd party, structured, unstructured or of unknown structure. When storing data of unknown structure, the most efficient way to store data sets is often in a Hadoop-based data reservoir. Initially, such projects are often considered experimental in organizations and therefore they might be independent efforts separated from the traditional environments, as illustrated in Figure 4.

![Figure 4: Typical Early Hadoop Environment separate from the Data Warehouse](image)

The profile of the data such as how it is acquired, how it should be formatted, the frequency of updates and quality of the data will help us put the right technology in place best suited for the particular situation. We need to
understand whether real-time or batch processing is appropriate. We should understand the periodicity of processing required based on data availability. Below is a partial list of the characteristics that should be considered:

» Processing Method – prediction, analytics, query, ad-hoc reports
» Format and Frequency – external data feeds, real-time, continuous or periodic on-demand
» Data Type – web/social media, machine generated, human generated, biometric, legacy or internal, transactional
» Consumer Application – Web Browser, Intermediate processes, Enterprise Application

When business value is found in analyzing data in a Hadoop-based data reservoir, lines of business generally begin to see a need to link data there to historical data stored in their data warehouse. For example, a relationship manager might want to compare historical transactions for a commercial customer stored in the data warehouse to public data available about the industry the customer belongs to in the data reservoir. Various linkages are often established as pictured in Figure 5.

![Figure 5: Integration of Hadoop Infrastructure and Data Warehouse](image)

We also added something new to Figure 5, a real-time analytics and recommendation engine and event processing. In many situations, the latency inherent in the data movement pictured above means that the recommendation from analysis would come too late to take action in near real-time. A way around this is to perform periodic advanced analytics in the data reservoir and/or data warehouse and provide updates to a real-time recommendation engine that becomes more fine-tuned through self-learning over time. Event processing engines are used to signal intelligent sensors such that immediate action can be taken at the source.

For use cases such as fraud detection, risk management, marketing, and pricing, having canonical data models that document the required data elements significantly reduces the amount of time required to deliver these solutions on Big Data technologies. Some of these data elements may be in a relational database, others in a Hadoop file system, while still others in a NoSQL database. However the ability to be able to identify precisely which elements are required for processing can lead to a huge time-to-market and competitive advantage.
Giving business analysts and analytics data modeler’s access to all the data can enable rapid monetization of the data reservoir. As long as the access is controlled, the data can be used for a variety of regulatory purposes and non-regulatory purposes and ad hoc exploratory purposes.

Emerging applications are being built upon Big Data technologies for the purpose of providing better customer insight, improved marketing, risk management, fraud detection, and other uses. The applications alleviate the burden of building the solutions from scratch. This approach offers a significant time-to-market advantage – the vendor supplies the application and specifications of the data requirements, the bank points the vendor to the bank’s data sources or their data reservoir.
IT Operational ETL Efficiency

In Figure 5, you might have noticed a line pointing from the transactional sources to the Hadoop cluster. This is to illustrate a popular ETL alternative, leveraging Hadoop as a data transformation engine.

Let’s now consider the type of data typically stored in today’s data warehouse. Such warehouses are typically based on traditional relational databases using a “schema on write” data model. The data sources can vary, but the structure of the data is determined before the data in imported into the data warehouse. In the example below there are two data sources. These two data sources go through an ETL process to prepare the data to be loaded into the warehouse.

Extending the architecture can enable a more agile workflow by incorporating data sets for which there is not rigid structure. This data model is best defined as “schema on read”. That is, we store the data without the traditional ETL processing, as we don’t know exactly how we want to access the data. In the example below we are using multiple data sources with varying structures.

These two environments should not be separate and unique. Building an integrated Information Architecture that can handle data sets of known structure as well as unknown structure enables us to augment the capabilities of existing warehouses as well as leverage data center best practices that are already in place.
Oracle Products in the Information Architecture

In Figure 8, we illustrate how key Oracle products could fit in the generic architecture diagram previously shown.

While Oracle can provide a more complete integrated solution, many organizations mix and match products from a variety of vendors. Therefore, such architecture diagrams often show such a mixture of products from Oracle and other vendors.

Along with the relevant technology components, Oracle is also a supplier of a canonical physical data model, the Financial Services Data Foundation or FSDF. It is a platform using in managing the data lifecycle and enables modelers to create models and operationalize them rapidly. The Analytical Applications Infrastructure or AAI is the basis for a series of applications built using FSDF as well as AAI for risk, capital adequacy, regulatory reporting, finance, treasury, profitability, marketing, and financial crime and compliance. Figure 9 illustrates FSDF and AAI.
FSDF can host upon an Oracle Database, a Hadoop file system, or a combination of both. AAI is capable of ingesting any data model – including FSDF – and it can be implemented on an Oracle Database or Hadoop. It allows data movement and transformation, defining of data quality checks and their execution, deterministic rule execution, building and operationalization of models written in “R”, Mahout and/or Custom C++/Java and Apache Spark. Figure 10 illustrates this platform and shows the analytical workflow orchestration for the Oracle Financial Services Analytics Applications (OFSAA). Figure 11 illustrates the analytics applications functional areas.
The various software capabilities required in a typical architecture might include these Oracle components:

- Oracle Relational Database Management System (RDBMS): Oracle Database 12c Enterprise Edition is designed for performance and availability, security and compliance, data warehousing and analytics, and manageability. Key data warehousing options often include In-Memory, OLAP, the Advanced Analytics Option, and Partitioning.
- Oracle Business Intelligence Enterprise Edition (OBIEE): A business intelligence platform that delivers a full range of capabilities - including interactive dashboards, ad hoc queries, notifications and alerts, enterprise and financial reporting, scorecard and strategy management, business process invocation, search and collaboration, mobile, integrated systems management and more.
- Financial Services Applications and Analytics (OFSA built upon FSDF & AAI)
- Oracle Event Processing / Stream Explorer: Real-time event-driven engine for applying rules based on streaming data.
- Hadoop Distributed File System (HDFS): A scalable, distributed file system that is the data storage layer of Hadoop. Ideal for storing large volumes of unstructured data. Key options available from Oracle include the Big Data Connectors and the Spatial and Graph Option.
- Flume: A framework for populating Hadoop with data via agents on web servers, application servers, and mobile devices.
- Oracle Data Loader for Hadoop: A connectivity toolset for moving data between the Oracle RDBMS and the Hadoop environment.
- ODI: Oracle Data Integrator is a comprehensive data integration platform that covers all data integration requirements: from high-volume, high-performance batch loads, to event-driven, trickle-feed integration processes, to SOA-enabled data services.
- Oracle Enterprise Metadata Management: Data governance and metadata management tool providing lineage and impact analysis, and model versioning for business and technical metadata from databases, Hadoop, business intelligence tools, and ETL tools.
- Endeca: An information discovery tool and engine.
- Oracle Big Data Discovery: A Hadoop-based information discovery tool.
- Oracle Big Data SQL: An optimal solution for querying an Oracle Database on Exadata and combining the results with data that also answers the query and resides on Oracle’s Big Data Appliance.

Figure 11: Sample Analytical Applications functional coverage
» ORE: Oracle R Enterprise enables analysts and statisticians to run existing R applications and use the R client directly against data stored in Oracle Database (Oracle Advanced Analytics Option) and Hadoop environments (referred to as ORAAH).

» Oracle Enterprise Manager: An integrated enterprise platform management single tool used to manage both the Oracle structured and unstructured data environments and Oracle BI tools.

» Oracle Essbase: An OLAP (Online Analytical Processing) Server that provides an environment for deploying pre-packaged applications or developing custom analytic and enterprise performance management applications.

The software products listed above can be deployed in an integrated environment leveraging these engineered systems:

» Big Data Appliance (BDA): Eliminates the time needed to install and configure the complex infrastructure associated with build-out of a Hadoop environment by integrating the optimal server, storage and networking infrastructure in a rack.

» Exadata: Streamlines implementation and management while improving performance and time to value for Oracle relational database workloads by integrating the optimal server, storage and networking infrastructure.

» Exalytics: Provides an in-memory server platform for Oracle Business Intelligence Foundation Suite, Oracle Big Data Discovery, Endeca Information Discovery, and Oracle Essbase.

Oracle also offers many of these components deployed as Platform as a Service. For example, Oracle Cloud Services that might be considered include the Big Data Cloud Service (for deploying Hadoop), Exadata Cloud Service (for high performance relational database / data warehouse deployment), Big Data SQL Cloud Service, Business Intelligence Cloud Service, Big Data Preparation Cloud Service (for data clean-up), Internet of Things Cloud Service, and other offerings.
Additional Data Management System Considerations

In defining the Information Architecture, it is important to align the data processing problem with the most appropriate technology.

When considering the choices you have in database management systems to include in an Information Architecture, you might consider if the form of the incoming data or ACID properties or fast data availability is most important. Other considerations should include manageability, interoperability, scalability, and availability. Of course, you should also consider the skills present in your organization.

Some of the various data management technologies in a typical architecture include:

Relational Databases

Typically already in use at most companies, RDBMS’ are ideal for managing structured data in predefined schema. Historically they excel when production queries are predictable. Support of dimensional models makes them ideal for many business intelligence and analytics workloads. They frequently house cleansed data of known quality processed through ETL workloads. Relational databases also excel at transactional (OLTP) workloads where read / write latency, fast response time, and support of ACID properties are important to the business.

These databases can usually scale vertically via large SMP servers. These databases can also scale horizontally with clustering software.

Example RDBMS Product: Oracle Relational Database

MOLAP Databases

Typically used for highly structured data, MOLAP databases are ideal when you know what queries will be asked (e.g. facts and dimensions are predefined and non-changing) and performance is critical. These databases excel at certain business intelligence and analytics workloads.

Example MOLAP Product: Oracle Essbase, Oracle Database OLAP Option

NoSQL Databases

NoSQL databases are without schema and are designed for very fast writes. Often, they are used to support high ingestion workloads. Horizontal scale is most often provided via sharding. Java and Java scripting (JSON) are commonly used for access in many of the commercial varieties.

NoSQL databases are sometimes described as coming in different varieties:

Key Value Pairs: These databases hold keys and a value or set of values. They are often used for very lightweight transactions (where ACID properties may not be required), and where the number of values tied to a key change over time.

Column-based: These databases are collections of one or more key value pairs, sometimes described as two dimensional arrays, and are used to represent records. Queries return entire records.

Document-based: Similar to column-based NoSQL databases, these databases also support deep nesting and enable complex structures to be built such that documents can be stored within documents.
Graph-based: Instead of structures like the previous types, these databases use tree-like structures with nodes and edges connecting via relations.

Example NoSQL Database Product: Oracle NoSQL Database

Distributed File System

Not a database per se as the name would indicate, highly distributed file systems have the advantage of extreme scalability as nodes are added and frequently serve as a data landing zones or data reservoirs for all sorts of data. Read performance is typically limited by the individual node of the “system” when accessing data confined to that node, however scalability to a huge number of nodes is possible driving massive parallelism. Write performance scales well as data objects can be striped across nodes.

The most popular distributed file system used today is Hadoop. Given its role as a data reservoir, it is increasingly a location for performing predictive analytics. SQL access is available via a variety of interfaces though various levels of standards support are offered.

Example Distributed File System Product: Cloudera Hadoop Distribution (featuring the Cloudera Hadoop Distributed File System and other features)

Big Table Inspired Databases

There is an emerging class column-oriented data stores inspired by Google’s BigTable paper. These feature tunable parameters around consistency, availability and partitioning that can be adjusted to prefer either consistency or availability (given these are rather operationally intensive.

A typical use case might be where consistency and write performance are needed with huge horizontal scaling. HBase (deployed on a Hadoop Distributed File System) in particular has been deployed to 1,000 node configurations in production.

Example Big Table inspired Product: Cloudera Hadoop Distribution (Cloudera HBase)
Extending the Architecture to the Internet of Things

Thus far, we’ve focused on the analytics and reporting and related data management pieces of the Information Architecture. Where sensors are providing key input, the architecture for data capture, security, and linkage to the rest of the Information Architecture can require additional consideration. Insurance companies put themselves in a favored position when they can gather more data about the habits of those they insure (e.g. driving habits, safety practices, building maintenance practices, etc.).

The following illustrates what is often described as an Internet of Things footprint for connected customers in insurance companies:

Figure 12: Connected Insurers

Items to the far right of Figure 12 have largely been previously discussed in this paper. Many of the other items pictured are what Oracle typically describes as Fusion Middleware components. For example, much of the sensor programming today takes place using Java. Security is extremely important since most would not want unidentified third parties intercepting the data provided by the sensors. Applications closer to the sensors themselves are often written using Event Processing engines to take immediate action based on pre-defined rules. There are also various message routing, provisioning, and management aspects of such a solution.

Figure 13 illustrates a typical capability map of this architecture for connected insurers:
Mobile devices and sensors are increasingly providing critical usage patterns and customer preferences, and increasingly being integrated into insurance institutions. They are also used to enhance partner offerings by monitoring customer needs and preferences enabling improved customer experiences. The ability to respond to customer events in real-time and ability provide advice beyond traditional networks can help ensure higher revenues in the long term.

Today's smartphones, with various software applications, act as sensors. They tell us where they are and how they are being used. There is a wealth of data that can be gathered from cellphones, including location data. The data will continue to grow and enable insurers to better assess and manage the products and services that are being offered.

Figure 14 illustrates some of the Oracle products aligned to the previously shown capability map:
Figure 14: Oracle Products aligned to Capability Map
Keys to Success

One of the most significant keys to success in a large project undertaking is to gain alignment between the business needs and goals and with the IT architecture design and deployment plans. Key business sponsors must be engaged and active in all phases.

Methodologies based on phased approaches are almost always the most successful. To start, you’ll need to understand the current state and its gaps so that you can better understand how to build towards the future state. You will need to modify the architecture as business needs change. Therefore, a common method to help assure success is to deploy quickly in well scoped increments in order to claim success along the way and adjust the plan as needed. A complete Information Architecture is never built overnight, but is developed over years from continued refinement.

Figure 15 illustrates such an approach, beginning with defining an initial vision, then understanding critical success factors and key measures tied to use cases, defining business information maps based on output required, linking the requirements to a Technical Information Architecture, defining a Roadmap (including phases, costs, and potential benefits), and then implementing. Of course, an implementation leads to a new vision and requirements and the process continues to repeat. Pictured in the Figure are some of the artifacts Oracle often helps deliver during Enterprise Architecture engagements and Information Architecture Workshops.

Usability needs will drive many of your decisions. Business analysts will likely have a variety of business requirements and possess a variety of analysis and technical skills. They could require solutions ranging from simple reporting to ad-hoc query capability to predictive analytics. You’ll need to match the right tools and capabilities to the right users. One size does not usually fit all. While new features in the data management platforms can provide more flexibility as to where you host the data for such solutions, the data types, volumes and usage will usually determine the most optimal technology to deploy. A common best practice is to eliminate as much movement of data as possible to reduce latency.
Data security and governance are also a key consideration. Insurance companies gather sensitive data that in the wrong hands could lead to liability claims and worse. So securing access to the data, regardless of data management platforms, tools, and data transmission methods used, is critical. Data governance needs regarding the meaning of data as well as its accuracy and quality will often require close coordination with and among multiple lines of business.

Finally, as fast time to implementation important to the success of any business driven initiative, you will want to leverage reference architectures, data models and appliance-like configurations where possible. These can speed up the design and deployment and reduce the risk of incomplete solutions and severe integration challenges. Leveraging engineered systems and appliances where possible can simplify the architecture, reduce time to value and improve architecture reliability.
Final Considerations

This paper is intended to provide an introduction to applying Information Architecture techniques for insurers. These techniques guide the extension of current architecture patterns to meet new and varied data sources that are becoming part of the information landscape. Oracle has very specific views regarding this type of information architecture and can provide even more of the individual components than were described in this paper.

The following diagram provides a conceptual future state that can encompass all types of data from various facets of the enterprise:

Figure 16: Typical Conceptual Future State Diagram


The following is a figure from one of the just referenced documents to give an idea as to the level of detail that might be considered around information delivery and provisioning.
Often, the architecture discussion also leads to consideration on where to host and analyze the data (e.g. in the cloud versus on-premises). Aside from security considerations, most insurance companies come to the conclusion that another motivating factor to storing the data on-premises is the volume of data being produced and a desire to minimize network data traffic. In other words, most organizations are coming to the conclusion that it makes sense to analyze the data where it lands. And once it lands, reporting and predictive analytics often take place in the data management system holding the data.

As mentioned previously, relevant Oracle Cloud Services that might be considered include the Big Data Cloud Service, Exadata Cloud Service, Big Data SQL Cloud Service, Business Intelligence Cloud Service, Big Data Preparation Cloud Service, and Internet of Things Cloud Service. Other Cloud Service offerings might also be appropriate depending on the deployment strategy and business needs.

An additional consideration not addressed in this paper is the availability of skills needed by the business analysts and the IT organization. A future state architecture evaluation should include an understanding as to the degree of difficulty that a future state might create and the ability of the organization to overcome it.

The highly competitive nature of companies involved in providing insurance will assure that those that take advantage of these new data sources to augment what they know about their business will continue to be leaders. They will continue to invent new and better business products, processes and efficiencies and they will do so by evolving their Information Architecture in an impactful manner. Some will likely leverage their advanced footprints to offer data subscriber networks, thereby going into competition with data aggregators and further monetizing their IT investments.
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