Oracle's Approach to Information Infrastructure and the Gartner Information Capabilities Framework

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The Gartner ICF describes a modern information infrastructure for organizations and IT leaders that need to create a business edge through information. Oracle offers complete information infrastructure technology capability, a product-centered approach, interoperability and open-standards support.

Key Findings

- Oracle has a complete product portfolio enabling the different information capabilities.
- Oracle’s product-based approach favors interoperability via open standards. For example, the Oracle relational database management system (RDBMS) is commonly used by clients, even when other capabilities (such as data integration) are provided by different vendors.

Recommendations

- Use the Information Capabilities Framework (ICF) to plan your information infrastructure modernization.
- Start with evaluating to which extent Oracle fits with your implementation of the ICF principles, before you choose the open or integrated options. In modernizing your information infrastructure, it is unlikely you can start with a clean slate, as you will probably work with your current vendors.
- Recognize that solution and data architects play a central role in defining the overall capabilities and the best approaches to support various use cases. Oracle offers a product-centric approach to information capabilities that favors an open set of technologies over an integrated scenario, creating less dependency between products.
What You Need to Know

Oracle offers a broad set of information management technology capabilities that enable virtually all of the relevant capabilities defined in Gartner’s ICF. Oracle’s main support for its customers’ information infrastructure needs is from an open scenario approach delivered through a very complete set of products. This favors interoperability of products through support of open standards.

Analysis

*This research document is part of a larger set, introduced in "Large Software Vendors and Their Roles in Information Infrastructure" Read this research first.*
A modern IM approach will become increasingly independent from specific application design. The Gartner ICF detailed in "The Information Capabilities Framework: An Aligned Vision for Information Infrastructure" and "Information Management in the 21st Century Is About All Kinds of Semantics" is a conceptual framework that provides an overview of all of the "common capabilities" that a well-defined information infrastructure should offer and which should work throughout different semantic styles of IM.

These common capabilities are independent of any specific technology, or any specific use case. Typically, use cases need multiple capabilities interacting with each other (and with some specialized capabilities). Technologies may offer multiple capabilities, and common capabilities may be found in multiple technologies.

Vision

Oracle clearly understands that organizations need to expand their information capabilities while at the same time leveraging their existing investments. Oracle treats its product portfolio as a full information capabilities stack of products designed to work together. Figure 1 shows the information management conceptual view that forms Oracle’s opinion of the information capabilities. Central to this view is the separation of information delivery from information provisioning.

Oracle recognizes that information provisioning needs to address the "best fit for purpose" storage of information for diverse data types. Information delivery recognizes that information can be accessed and serviced in multiple ways to support diverse use cases, including business processes, operational applications and analytical needs.

The information management view allows clients to understand what parts of the information infrastructure need to be added to fulfill their requirements. Oracle has also provided a detailed product table that will help to identify which products to consider for specific capabilities (see Appendix section).
Figure 1. Oracle's Information Management Conceptual View

JDBC = Java Database Connectivity; ODBC = Open Database Connectivity; WS* = Web Services

Information Management Conceptual View, as of April 2014

Source: Oracle
Information Capabilities

The ICF uses six verbs to describe a wide variety of information capabilities: describe, organize, integrate, share, govern and implement (see "Introduction to Gartner's Information Capabilities Framework").

Here, we describe how Oracle addresses these capabilities (see Note 1 for the different perspectives).

Describe

This includes a combination of software platforms or product offerings and hardware inclusive "appliances" as an additional form factor for delivery. Oracle follows an approach where design time and runtime considerations should both be supported equally, and provides capabilities in a variety of tools. Design time and runtime discussions use significantly different vocabulary than the ICF overall, but follow similar principles.

In general, Oracle's approach to describe capabilities is to use the same separation of logical descriptive functions from the physical platform deployment that is advised under the ICF. There are a few notable exceptions, which represent some dissonance with the ICF. For example, Oracle’s representation of functional capabilities regarding data quality and auditing of data, as well as specification of assets, may sit more appropriately as part of the govern or share capabilities in the ICF.

Relative to highly structured data, the describe capabilities are present, but their representation is not distinguished in a similar way to the ICF. Interestingly, Oracle’s view of "faceted" information assets is closely similar to the same difficulty encountered in the ICF regarding the search capability (which is shown as spanning describe, organize and implement capabilities).

Organize

Oracle's product family for data persistence is rich and has significant overlap — the Oracle DBMS can contain text, dimensional, spatial, resource description framework (RDF) graph, topological and network-type models. Some of these are also supported in varying degrees by other portfolio data stores such as Essbase (for online analytical processing), Endeca (for multistructured, "faceted" data), OracleNoSQL DBMS (for key/value data), and Hadoop (for unstructured data in Hadoop Distributed File System [HDFS] offered with partner Cloudera on Oracle's Big Data Appliance).

Oracle does not describe how to combine the use of its other stores comprising MySQL, TimesTen, Coherence, or Oracle NoSQL DBMS. Choice should be left to the implementer, with Oracle’s Information Management Reference Architecture as a guide. The exception to this is the data management appliance scenario, as Exadata, Exalytics and the Big Data Appliance each run specific data stores with no overlap among them, which provides a clearer choice.

Syntax, semantics and terminology are managed in what Oracle refers to as "localized scope," adding that there is no single product able to manage everything. The Oracle DBMS supports federation across Oracle and non-Oracle stores, using them via gateways and connectors.
alternative is to use Oracle Business Intelligence Enterprise Edition (OBIEE) and its Common Enterprise Information Model, although again, which product to use and when is not always clear.

Movement and integration of information among these stores is described in the following Integrate section. Sources of information in the Oracle portfolio include the Fusion Middleware offerings such as WebLogic Server (which also runs on a dedicated platform, ExaLogic), Oracle Event Processing and the SOA Suite, which can deliver Business Process Execution Language (BPEL) Web services-based information so often used in emerging big data and NoSQL use cases. Mediation as required — across protocols and message types — can be handled by the Oracle Service Bus.

Oracle's Hadoop connection technology (some of which is usable only with its own Big Data Appliance) and its support via Fusion Middleware provide ways to connect to other data sources. Oracle Database can also act at the core via its Web server provider interfaces to deliver data in XML and other formats to external stores. External processes can use SQL, XQuery or Oracle's PL/SQL to request information from the Oracle DBMS, and similar capabilities exist for its other data stores.

Oracle's organize capabilities are very rich and can overlap. It offers many options and requires architects, designers and programmers to decide which stores to use for which use cases. Managing inputs and outputs from multiple stores and the semantics associated with the use cases is left to the client to manage, but allows for the addition of non-Oracle stores as part of the implementation.

Integrate

Oracle's ability to ingest data from a range of source types and perform integration across sources is supported by three main products in the portfolio — Oracle Data Integrator (primary for bulk-batch data acquisition), GoldenGate (for granular change capture), and Oracle Data Services Integrator (for creating federated views across heterogenous data sources). Oracle's various Gateway products provide native interfaces with many non-Oracle sources in a way that can be plugged into virtually any of Oracle's technologies.

In addition, Oracle's application integration middleware capabilities enable ingestion of message streams and real-time data feeds. The Oracle Enterprise Data Quality and Master Data Management products support the relationship identification and aggregation operations required for combining structured data sources of various types. The breadth of capabilities to support the various integrate capabilities is comprehensive and Oracle has no significant functional gaps.

The lack of a single metadata repository, or even seamless sharing and synchronization of metadata across the tools, is an inhibitor for customers looking at seamlessly interoperating Oracle products. This can also affect integration capabilities exporting and ingesting metadata from outside the Oracle ecosystem required by customers. The main emphasis in this part of the portfolio is on structured data and Oracle's products for ingestion and integration of content, such as Endeca and WebCenter Content, have little to no connection to the other integrate capabilities.

Like many vendors, Oracle has fragmented metadata architecture, with metadata repositories tied to each integration product and no single place where metadata is stored. Oracle supports the
sharing of commonly used metadata through all layers of its stack and through import/export capabilities, which can enable metadata to be shared horizontally across products. However, the significant differences in metamodels between the various products sometimes means a less than seamless and complete level of interoperability for customers.

Share
Capabilities for accessing, transforming, and publishing data are also supported by the same set of products described for integrate. Here, Endeca, Oracle Data Service Integrator (ODSI), the Gateways, and Oracle Business Intelligence (BI) support the ability to access data in a wide range of formats from virtually any location. Transformation capabilities are largely centered in Oracle Data Integrator (ODI) and Oracle Enterprise Data Quality (OEDQ), although many other products have (often more limited) transformation functionality.

Oracle supports exposing of data through direct loading to repositories and through SOA interfaces (for example, atop the master data management [MDM] solutions). The core of Oracle’s capabilities for provisioning data are ODI and GoldenGate — both of which are commonly used in heterogeneous environments and alongside alternative styles of integration tools from other vendors.

Similarly to integrate, the range of share capabilities is impressive, but support for the integrated scenario is fairly limited since not all the products are integrated. For example, there is no single place that rules data transformation can be defined and then consumed by all the products. In addition, exposing metadata to consumption points is made more difficult by the lack of a shared and consistent metadata model across the product set.

Metadata can be readily exposed from certain individual products, but the lack of completeness and consistency can affect interoperability of products for the integrated and open scenarios. Clients seeking share capabilities that can be easily and deeply integrated into a diverse information infrastructure, will need to compensate for the lack of interoperability and consistency of metadata management capabilities.

Govern
Oracle provides governance capabilities in a number of its products, which, depending on customer requirements, are appropriately configured and integrated. Central to its information provisioning across consuming applications is its metadata capabilities, which enable solutions such as Oracle MDM to deliver consistent multiple-domain master data across operational and analytical applications.

In non-MDM situations, where for example, data quality policy rules must be standardized, measured, monitored and reported, other technologies within its technology (Enterprise Data Quality and Enterprise Manager) provision appropriate govern capabilities very well. Management of the life cycle and audit governance capabilities are also well-served through Data Relationship Governance and Audit Vault technologies with good visualization technology.
Despite this, the range of possibilities that Oracle offers through its solutions and products is a challenge that its clients struggle with. For example, Oracle Governance, Risk and Compliance (GRC) Manager serves risk modeling, compliance management and provides excellent controls management, as well as access and segregation of duties management. However, Oracle GRC Manager was not provided in Oracle’s response to this survey as a governance capabilities component, which, through Fusion middleware, could bring together powerful governance capabilities.

Oracle’s architecture offers a high degree of interoperability that sits well with customer requirements in the open scenario. Common Standard interfaces and protocols within its architecture (such as SQL and Multidimensional Expressions [MDX] over Java Database Connectivity [JDBC]/Open Database Connectivity [ODBC], and REST), as well as common adapters and APIs allowing integration of data and metadata with non-Oracle applications that support a complex heterogeneous environment.

Some of the challenges in the integrated scenario may be alleviated in the open scenario where a customer selects a best-of-breed technology to serve, monitor and control governance capabilities across a heterogeneous landscape and requires effective metadata exchange with other best-of-breed technologies. Oracle differentiates between governance and governance capabilities in its white papers on data governance, and this very clear and sound advice should be noted by organizations.

Implement

Gartner’s ICF indicates that implement capabilities are specifically focused on the required components and practices for deploying information management approaches and their testing in production scenarios. Oracle’s representation of these capabilities and the language used tends to mix the functionality of describe and organize with implement when compared to the ICF. This emerges primarily due to the overall requirements in deploying a new system or information asset and includes development tools that are used to design and then deploy assets using the same workbench and resulting metadata.

The language used by Oracle implies a development sequence that culminates in deployment and offers multiple implementation choices (for example, JDeveloper, SQLDeveloper, and SQL Developer Data Modeler, among others). This tight relationship between describe, organize and implement and its focus on application development, implies a different language from the ICF.

Oracle’s production and implementation tools focus on deployment — which is the ultimate and ultimately the best goal of information design. This is further demonstrated by Oracle Enterprise Manager that offers a comprehensive management experience solution for key software and hardware components, such as Oracle DBMS or Oracle Engineered Systems. In contrast, the ICF focuses on information as an independent architecture that can be used for multiple end uses.

This difference in representation and language does not mean a negative outcome, but it should be noted that Oracle’s language and representation of implement is actually far more pragmatic than the ICF — with a specific end goal in sight that is always targeted and pursued.
Oracle's approach does include the capability and representation of a free-standing "middle tier" than can use multiple implementation approaches. With the implement functionality firmly ensconced in pragmatism, Oracle also represents the capability that regardless of how describe and organize are accomplished, implementation will take place with a specific case in mind for end use. This differs in several significant ways from the ICF.

Analysis

There are multiple approaches to information infrastructure. Oracle's approach to the information capability framework is "product centered" (for further definition, see Appendix section) and can be articulated around two main aspects:

- **Completeness.** The overall Oracle product portfolio offers a very complete set of capabilities allowing supporting a wide variety of use cases.

- **Openness.** The consistency across the product offering is established through consistent support of standards that allow interoperating products and composure of the information infrastructure supporting the various use cases.

Oracle has a very pragmatic implementation-focused view of information capabilities. The products can be combined to deliver a large number of use cases, as demonstrated in the various customer reference examples.

Open and integrated scenarios are treated very similarly. Oracle’s approach, based on standards for interoperability and integration, allows support without strong differentiation between them. This product approach also provides the flexibility to blend Oracle products in organizations' information infrastructure where Oracle is not the sole vendor. Oracle products can participate in a best-of-breed approach when selecting and combining products from multiple vendors is required.

Oracle has specific approaches that can be identified in the different pillars. Oracle’s representation of the required information management capabilities appears complete, with significant blending of describe, share and govern, whereas the ICF distinguishes them more clearly.

Oracle is well-positioned in terms of breadth of capability for integrate, but the lack of metadata management capability affects the interoperability capabilities across both integrated and open scenarios.

The organize pillar is probably where Oracle provides the strongest guidance, particularly when it comes to the engineered systems. Oracle’s organize capabilities are very rich and can overlap. It requires architects, designers and programmers to decide which stores to use for which use cases. Managing inputs and outputs from multiple stores, along with the semantics associated with the use cases, is left to the client to manage, but allows for the addition of non-Oracle stores as part of the implementation.

Many of the integration points in organize are enabled by integration through the Oracle DBMS. This comes as no surprise as Oracle is the uncontested revenue leader in the DBMS market and this is the entry point for Oracle in many organizations. However, to get to an ICF approach, organizations
will need to put in place much stronger architecture and implementation practices addressing
diverse use cases, as the vendor has not built strong integration capability into its products. Oracle
does deliver guidance via its sales consulting organization to help clients develop an information
architecture strategy. In particular, much of the metadata management and governance aspects will
need to be taken care of by the users.

There are a few important and major use cases gaining traction that require an ICF-style approach.
These are the logical data warehouse, hybrid analytics and enterprise metadata management that
Oracle manages through a use-case and product-enabled approach. Oracle has provided press
releases and white papers on these use cases (see Note 2).

Oracle's approach to the logical data warehouse consists of combining Oracle Engineered systems
— specifically, Oracle Big Data Appliance, Oracle Exadata Database Machine and Oracle Exalytics
in-Memory Machine. These combinations of products allow support to the variety of data and
address provisioning needs through the combined use of Hadoop, NoSQL and relational DBMSs.
While data can be accessed or federated across these various repositories, the integration of the
various components to support the final use case needs to be specifically built by the customer
using the range of technology components available.

Support of the hybrid scenario that permits the combining of structured data and content is mainly
based on the Oracle Endeca product that also allows the visualization of the combined dataset. This
architecture style is referred to as search and discovery in "How to Expand Your Information
Infrastructure for Analytics With Content." However, other options for combining structured data
and content could be implemented using Oracle's products. It is left to customers to pick the right
combination for their specific use cases.

Enterprise metadata management use cases leverage Oracle Spatial and Graph capabilities. The
RDF graph repository allows describing and maintaining relationships, taxonomies and ontologies
across heterogeneous data assets. The Oracle BI product can be used to analyze, visualize and
report RDF graph data and integration with R enables statistical modeling.

These metadata management use cases (while still nascent) will become more and more important
as the need to relate and discover relationships across very diverse information becomes more
widely needed. However, it should also be noted that these tools do not fulfill all of the capabilities
required for governance, metadata management by themselves, or address the needs of business
stewards in assisting them in defining and managing policies. Table 1 shows Oracle's range of
information infrastructure capabilities.

Appendix
<table>
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<tr>
<th>Product</th>
<th>Version</th>
<th>Describe</th>
<th>Organize</th>
<th>Integrate</th>
<th>Share</th>
<th>Govern</th>
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Source: Gartner (June 2014)
Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Large Software Vendors and Their Roles in Information Infrastructure"

"The Information Capabilities Framework: An Aligned Vision for Information Infrastructure"

"Information Management in the 21st Century Is About All Kinds of Semantics"

"Understanding the Logical Data Warehouse: The Emerging Practice"

"New Information Use Cases Combine Analytics, Content Management and a Modern Approach to Information Infrastructure"

"You Can't Get to EIM From MDM Without EMM"

Evidence

Evidence comprises data from recent Gartner primary research studies from various IM technology markets.

Note 1 Different Perspectives

See "Large Software Vendors and Their Roles in Information Infrastructure" for more discussion on the four different perspectives on information capabilities, but in short:

- **People-centered** approaches permit a self-service, decentralized and ad hoc authority, as well as implementation, and emphasize human interfacing for governance models. The benefits include a focus on usability and a high level of interoperability. Risks include reactive governance and a lack of efficiency.

- **Process-centered** approaches utilize centralized authority — not in a vertical hierarchical sense, but centered on business processes. Information capabilities aim to support business operations. Benefits include business process innovation, such as dynamic case management, and clear and direct use cases. There are risks, too — information can still end up as a byproduct of process.

- **Product-centered** approaches utilize decentralized authority because each application or product assumes its own authority. As a result, implementation is organized within the product, but forces ad hoc integration efforts. Enforcement is services-focused, insular to the product and executed by hidden services within each product. Benefits include preintegration and a best-practice approach. Risks revolve around the limited reusability of capabilities across products.

- **Corporate-centered** approaches utilize highly centralized authority and drive that authority into implementation. Although ad hoc implementation is permitted regarding application development and processing flows, ad hoc governance is rejected. Benefits include neutrality and efficiency. Risks involved are an IT-heavy approach and limitations of local opportunity.
Note 2 References

- La Caixa Bank
- Endeca customer Barclays
- EU Publications Office