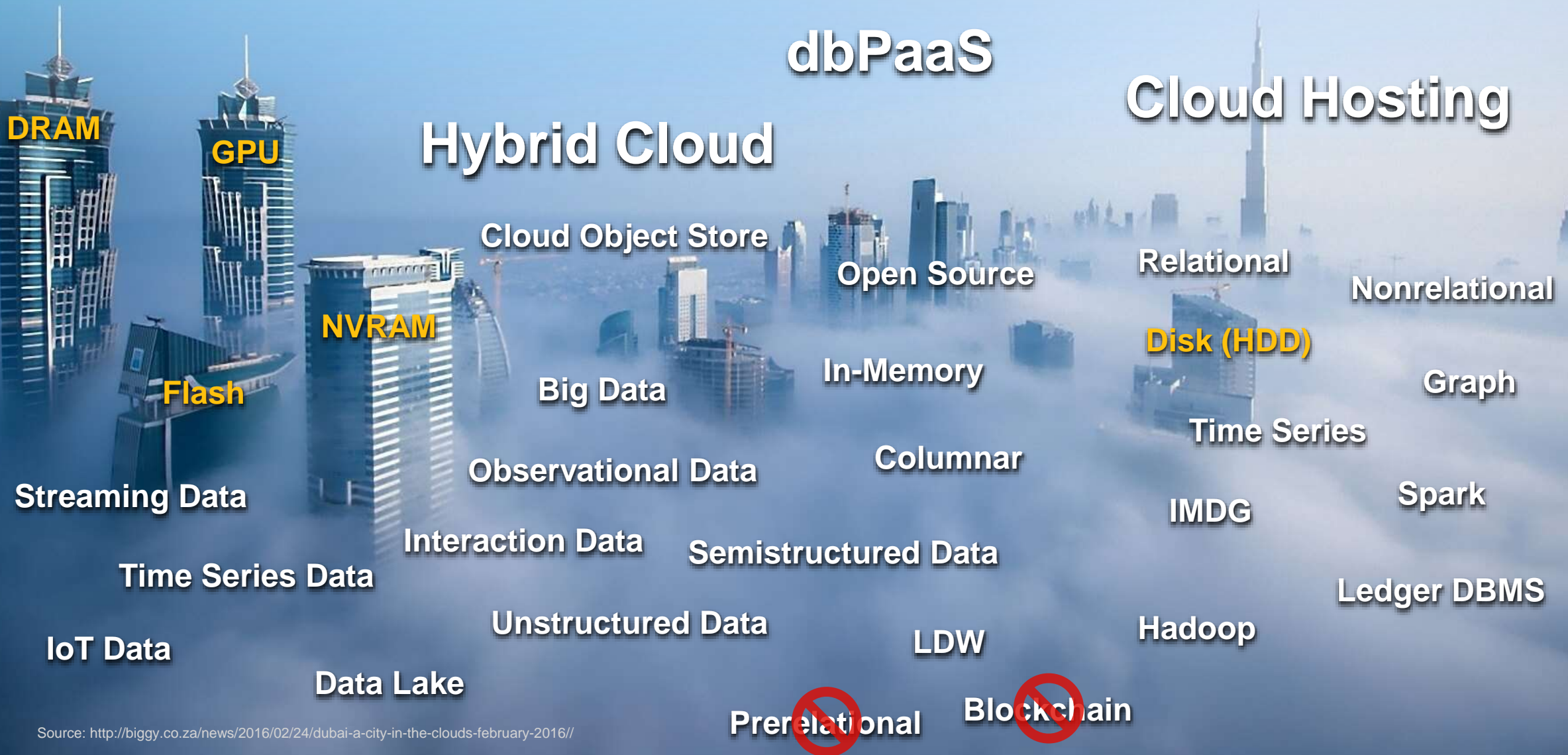


The Future of Data Infrastructure in Digital Enterprise

Donald Feinberg

Digital Business Demands a Fully Configurable Data Environment



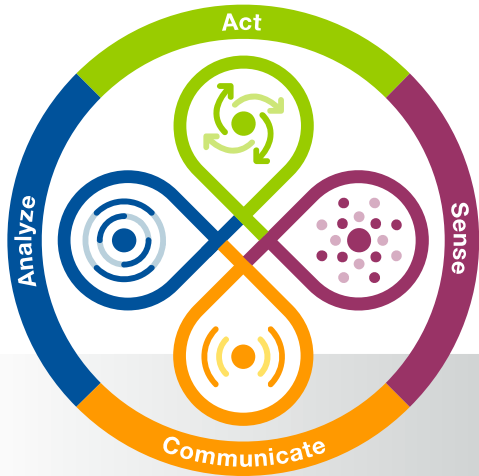
Key Issues

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IoT and Digital Business Use Cases Drive Data Architecture



The Internet of Things creates a digital version of physical world devices.

Digital business creates new business designs through merging the physical with the digital.



We need to process data at speed and scale and we have the tools to do it.

Speed



Scale



Speed
and
Scale



2019 Trends in DBMS

- Cloud
- Augmented DBMS
- Open Source (Relational and Nonrelational)
- Multimodel/Nonrelational Support
- Cloud Providers — Best Fit Services
- Internet of Things/Stream Processing
- Operational/Analytical Convergence (HTAP)
- SMP vs. Scale-out plus NVRAM
- Security and Compliance
- Broader Business Analytics Support (in DBMS)
- Serverless and Containerization
- Logical Data Warehouse

The two big ticket items for 2019:

Cloud:

- ❑ Pervasive dbPaaS, cloud hosting and private cloud.

Augmented DBMS:

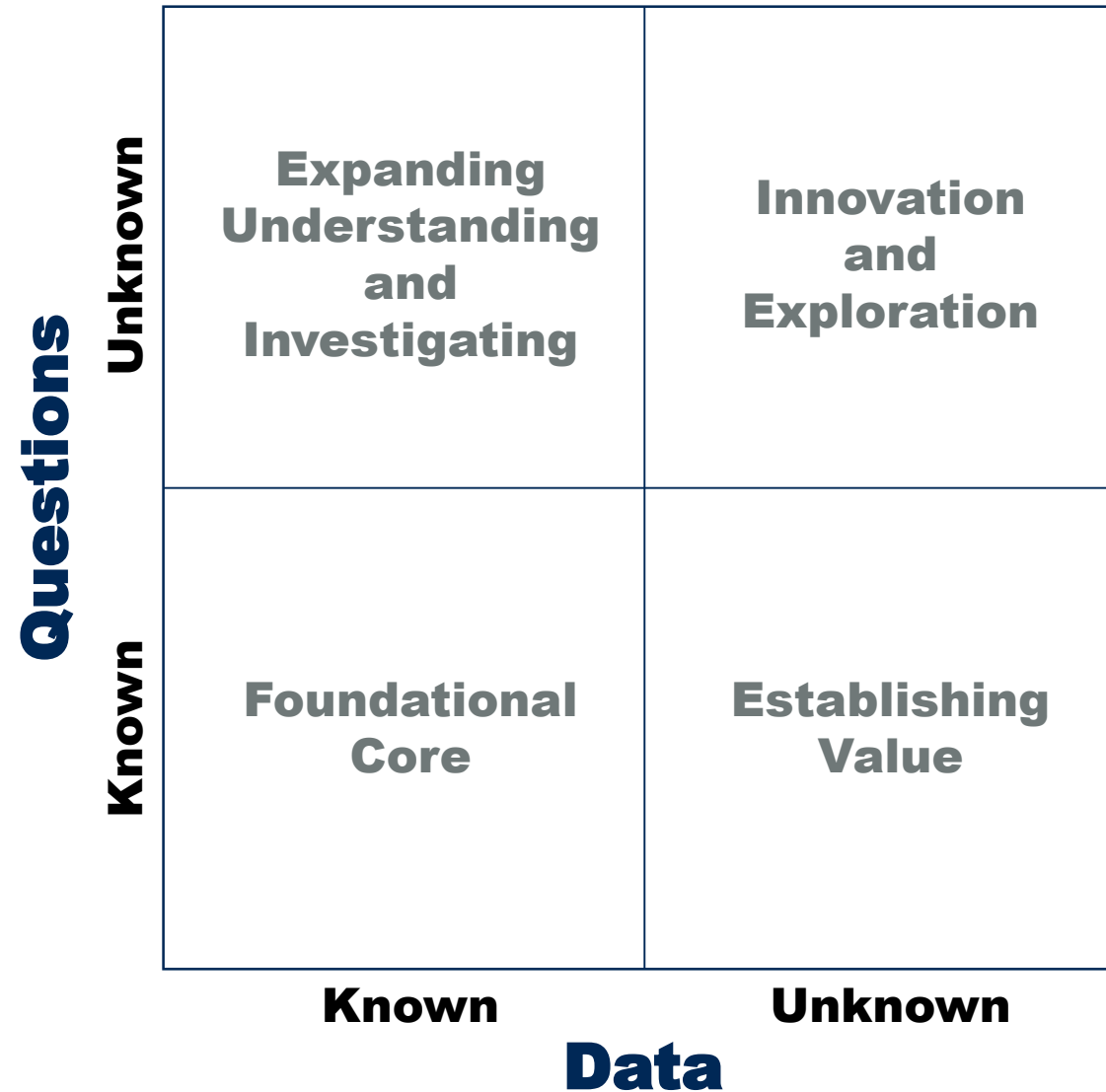
- ❑ Use of ML and AI in the DBMS allowing the DBMS to become self-maintaining.

There Are Six Primary Use Cases of Data Driving DBMS Architecture

- Traditional Transactions
- Traditional Data Warehouse
- Logical Data Warehouse
- Operational/Analytical Convergence (HTAP)
- Stream/Event Processing (IoT)
- Data Science Exploration/Deep Learning

Over the next five years **analytic** and **operational** data functions will be less dependent upon the infrastructure and a **single** DBMS market will emerge.

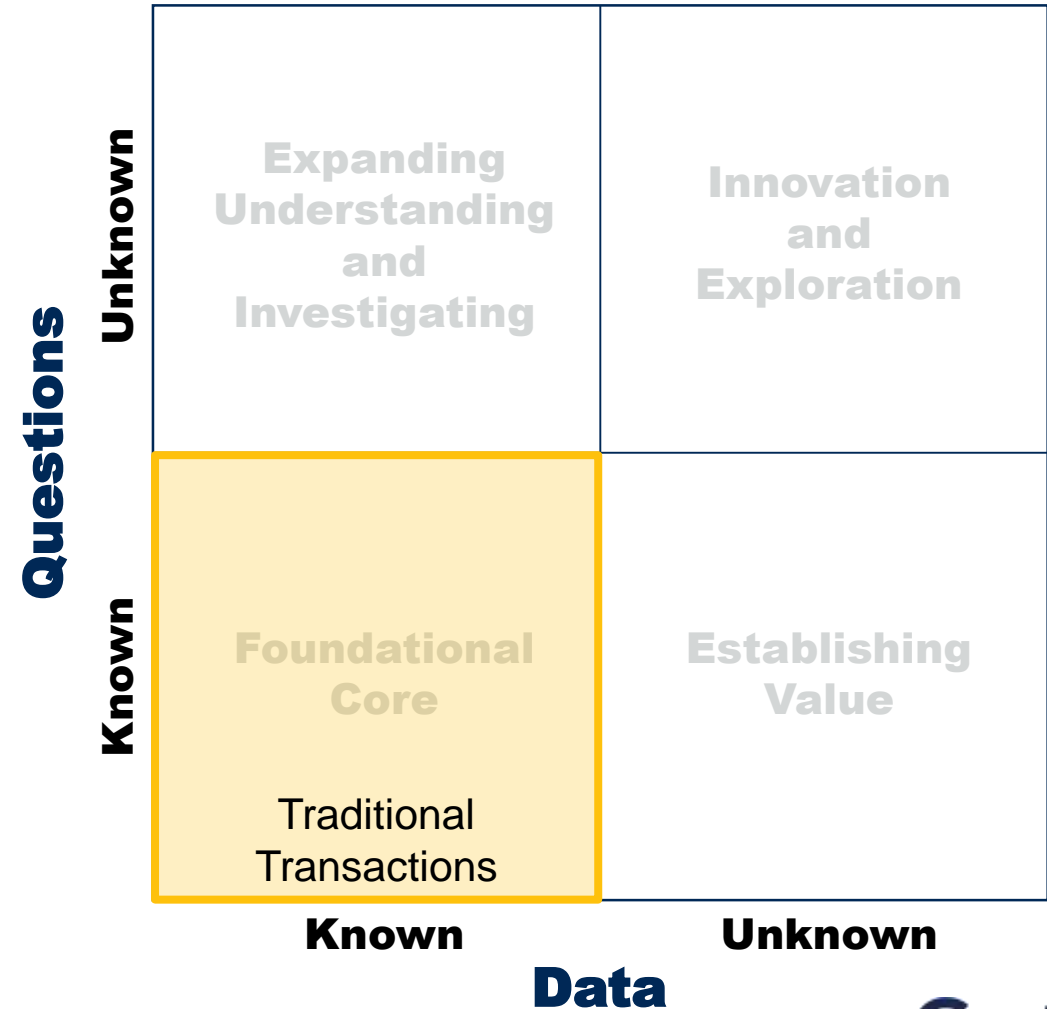
The Data and Analytics Infrastructure Model



Adapt Your Data Management Strategy to Your Organization's Strategy

Diversity of your **data management technology landscape** needs to adapt to your **strategy**.
Standards alone will not assure agility and flexibility.

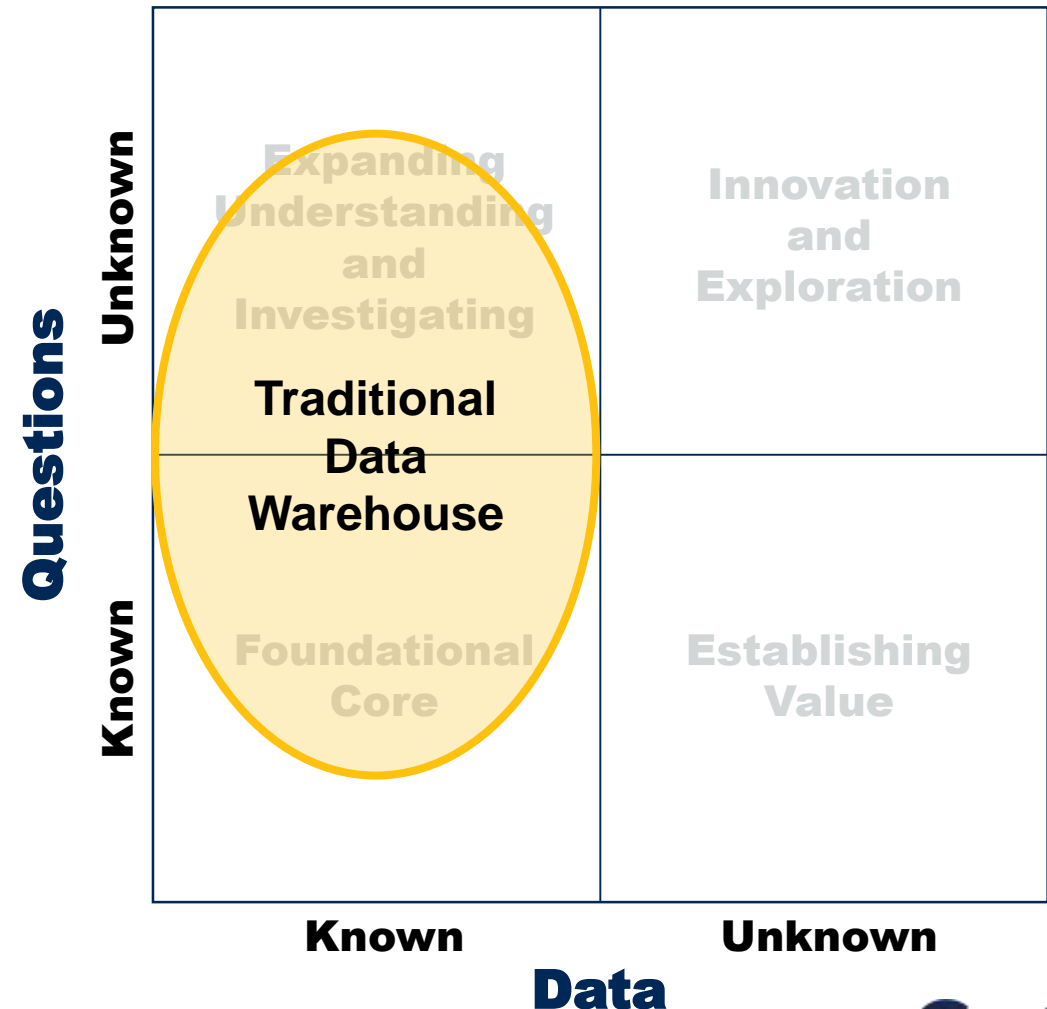
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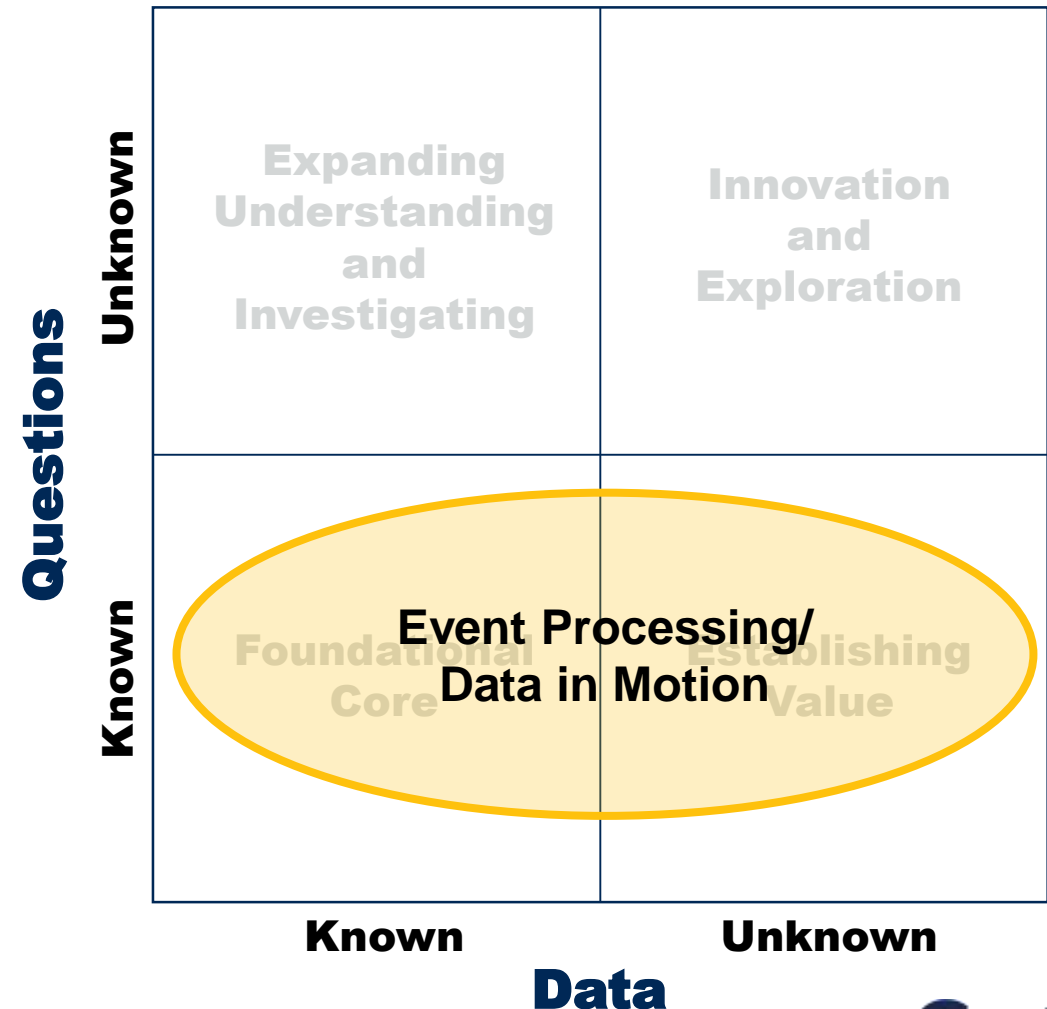
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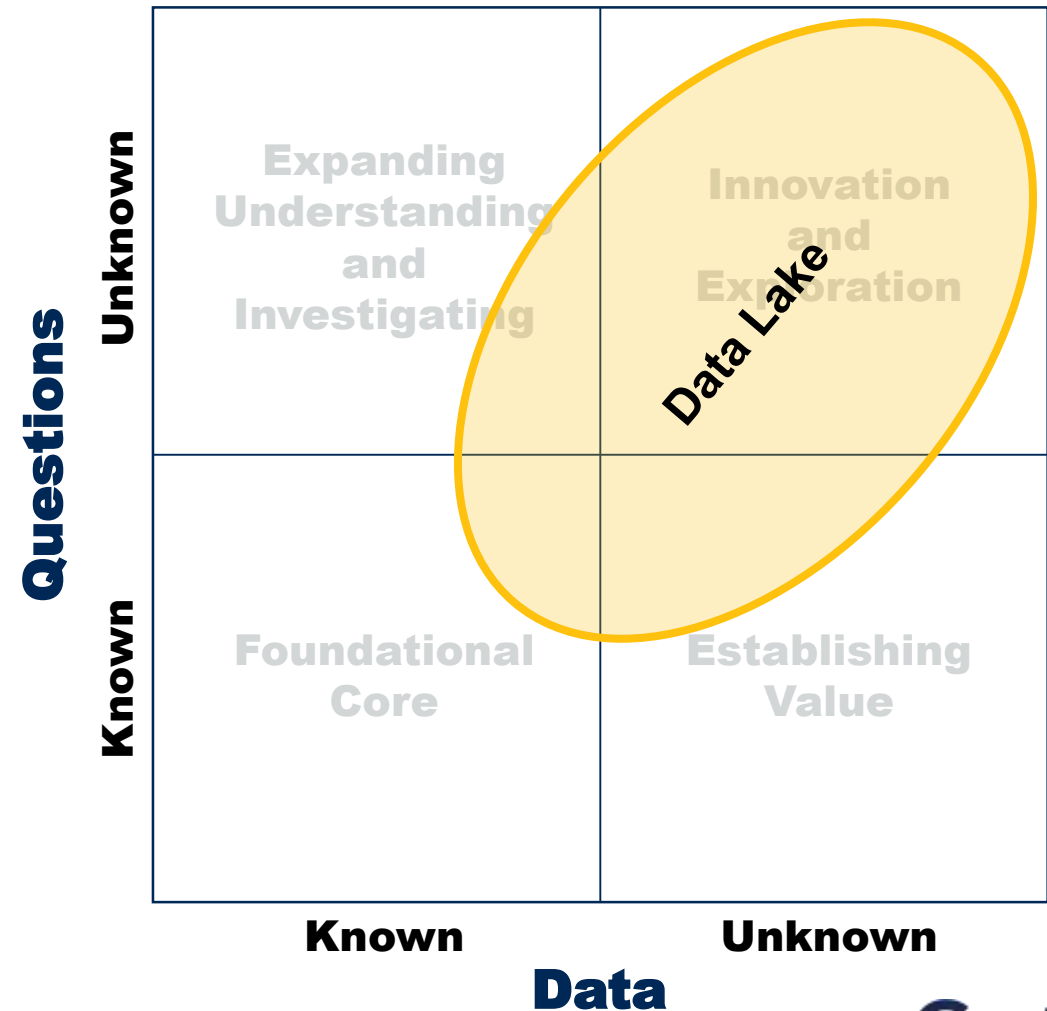
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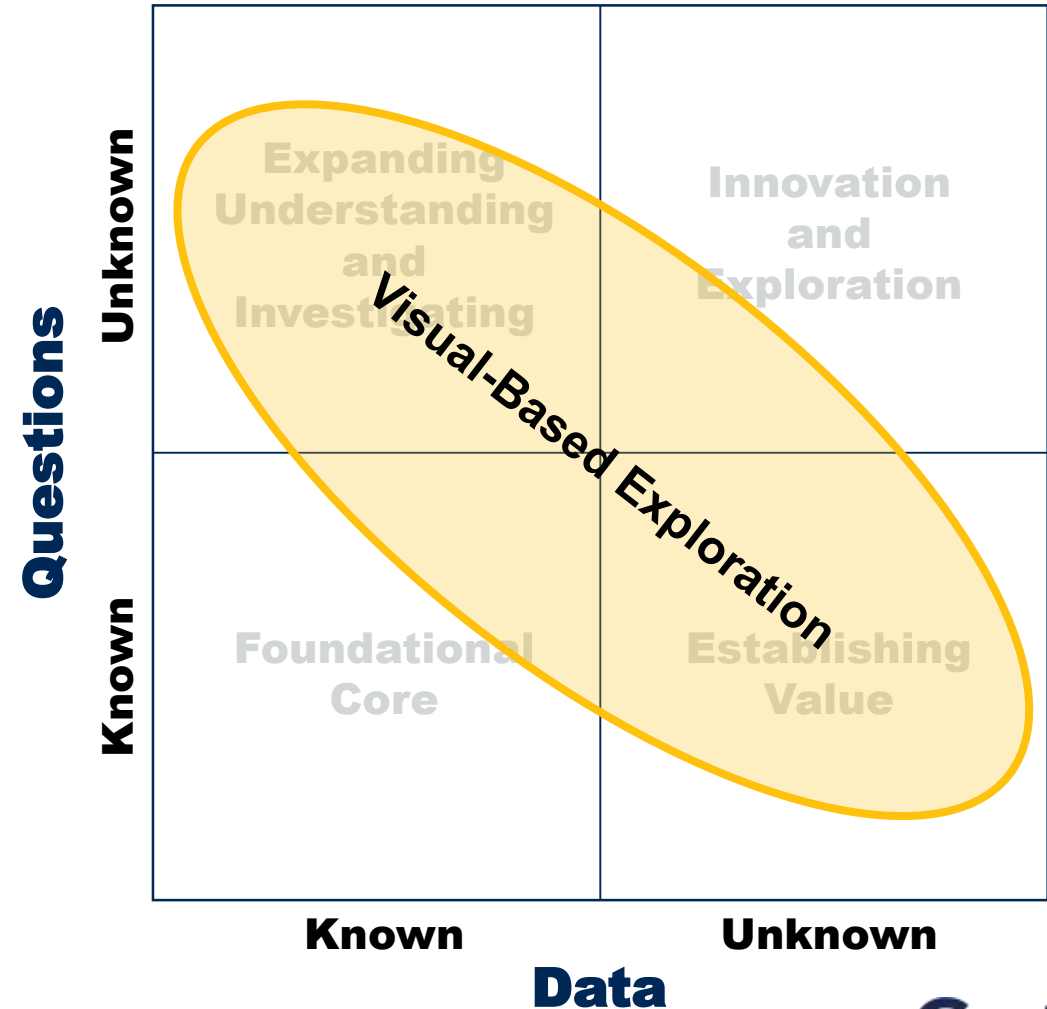
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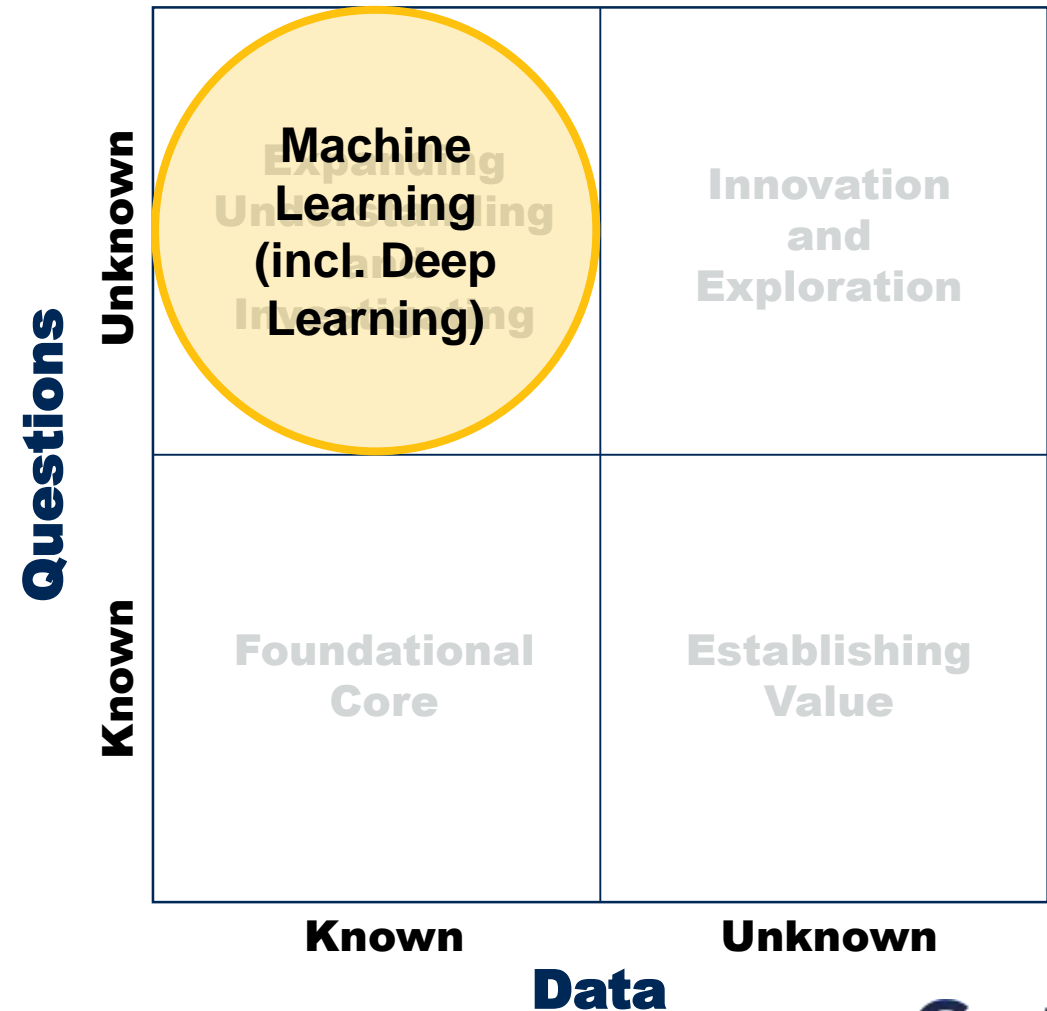
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Data and Analytics Infrastructure Model



Augmented Data Management: Exploiting AI to Make the Software Run Better

Self-Driving Data Management:

- **DQ:** Extend profiling, cleansing, linking, identifying and semantically reconciling master data in different data sources.
- **MDM:** ML-driven configuration and optimization of record-matching and merging algorithms.
- **DI:** Simplify the integration development process by recommending or even automating repetitive integration flows.
- **DBMS:** Automated management of storage, indexes and partitions, database tuning, patching, upgrading, security patching, and configuration



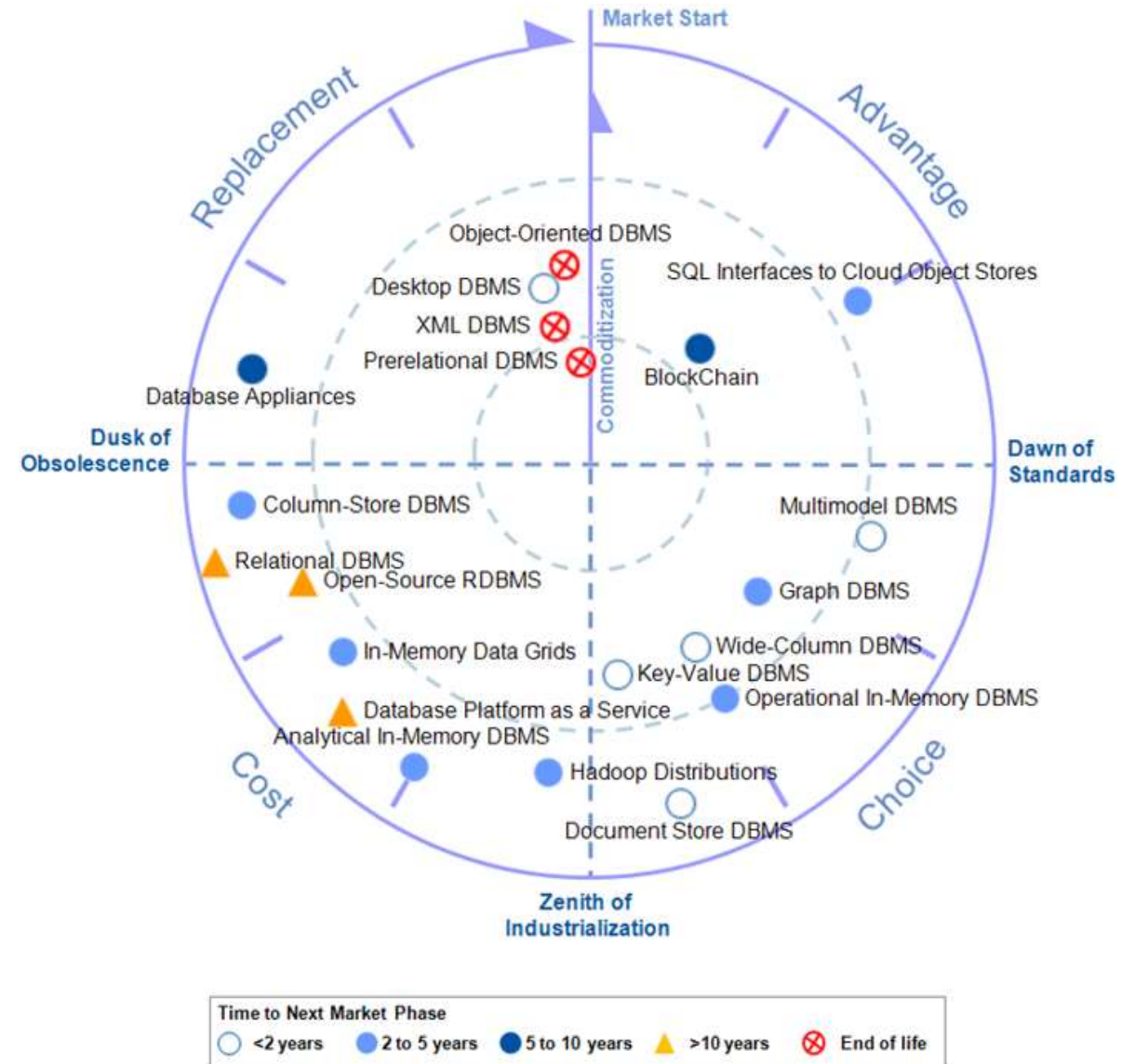
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Modernization and Legacy DBMS Product

- Do you know what time it is?
Time to migrate.
- Nonrelational DBMS finds its uses.
- Product replacement is long overdue.
- Prerelational must go now.
- RDBMS is here for the long haul,
increasingly multimodel.

Nonrelational DBMS does **not** replace relational DBMS, rather **augments** it and may be a good choice for new applications.



DBMS Strategic Planning Assumptions

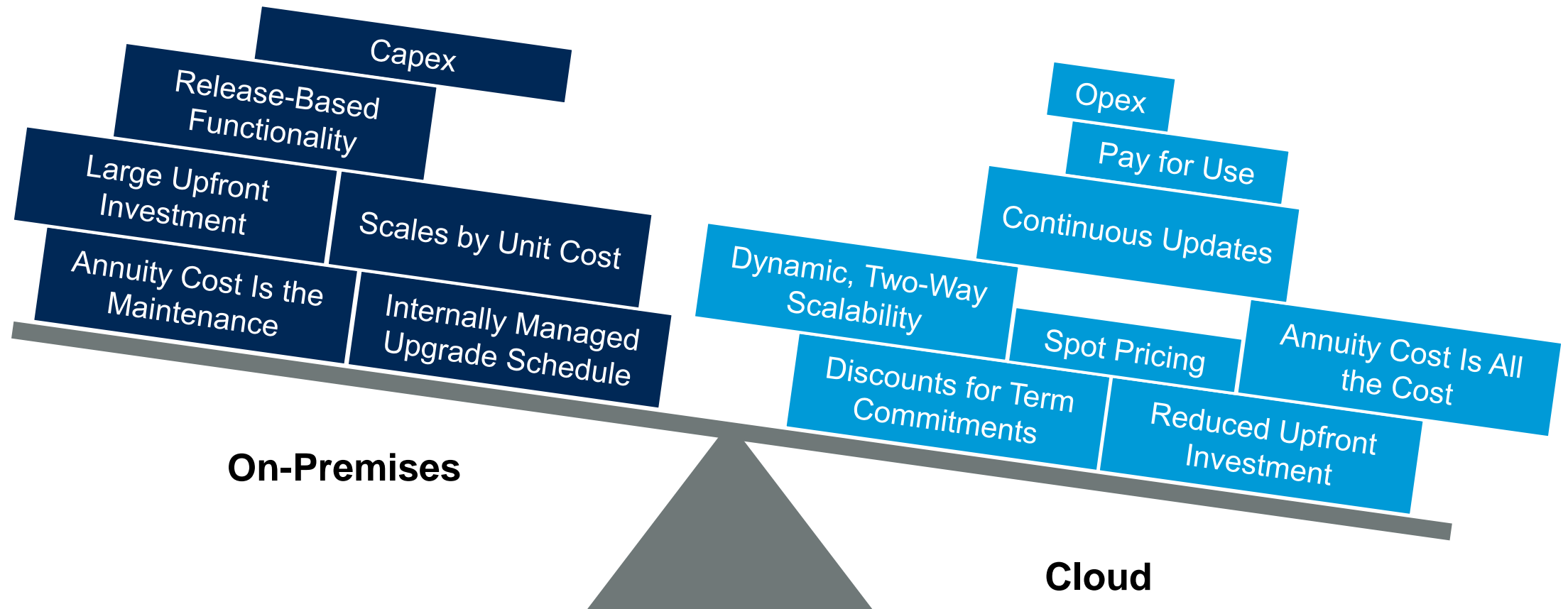
By 2023, 75% of all databases will be on a cloud platform, reducing the DBMS vendor landscape and increasing complexity for data governance and integration.

By 2020, 30% of data lakes will be built on standard relational technology at equal or lower cost than Hadoop.

Through 2020, relational technology will continue to be used for at least 70% of new applications and projects.

By 2022, more than 70% of new in-house applications will be developed on an OSDBMS, and 50% of existing commercial RDBMS instances will have been converted or will be in process of converting.

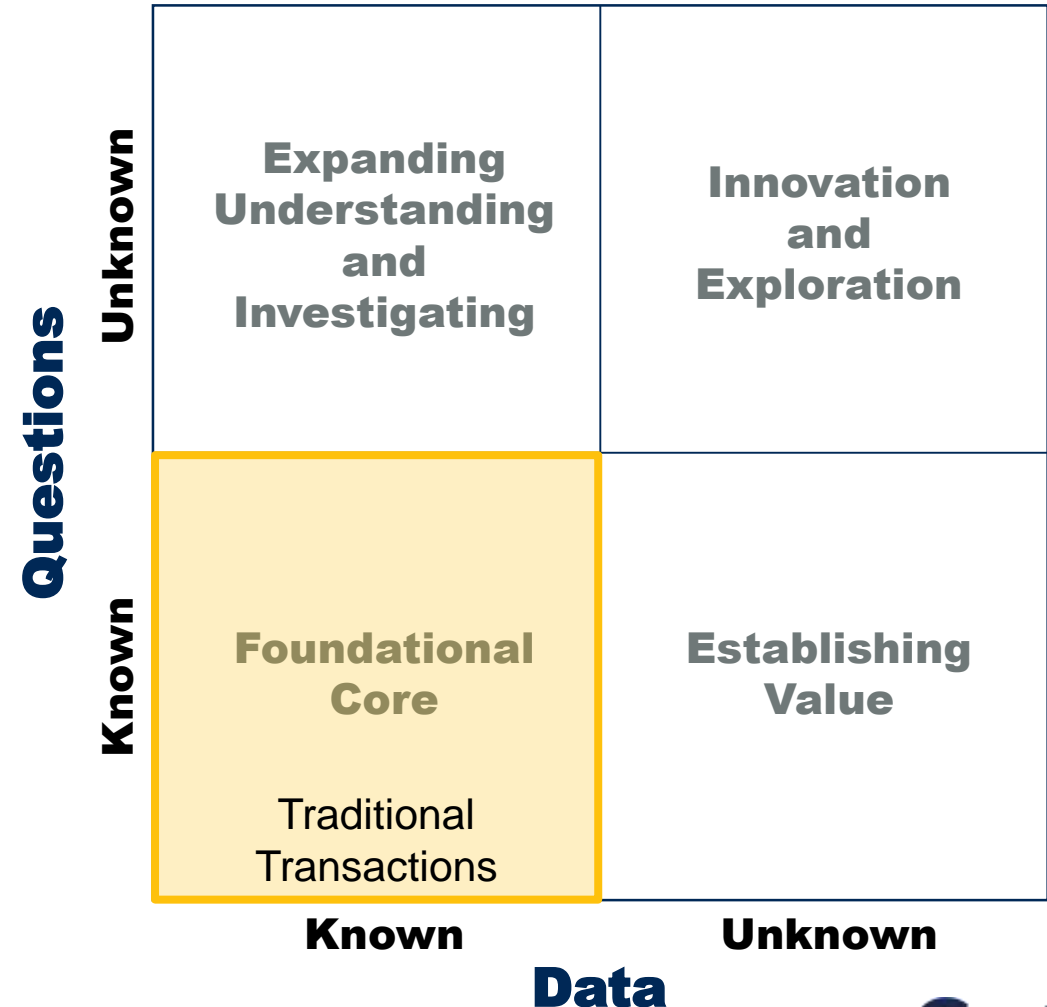
Cloud vs. On-Premises: Why Is Cloud Attractive?



“There Can Be Only One” DBMS Market

- **DMSA and OPDBMS** were split due to performance requirements.
- Modern DBMSs can do **both OPDBMS and DMSA**.
- DMSA and OPDBMS are **just use cases**.
- One DBMS market — **six use cases**.

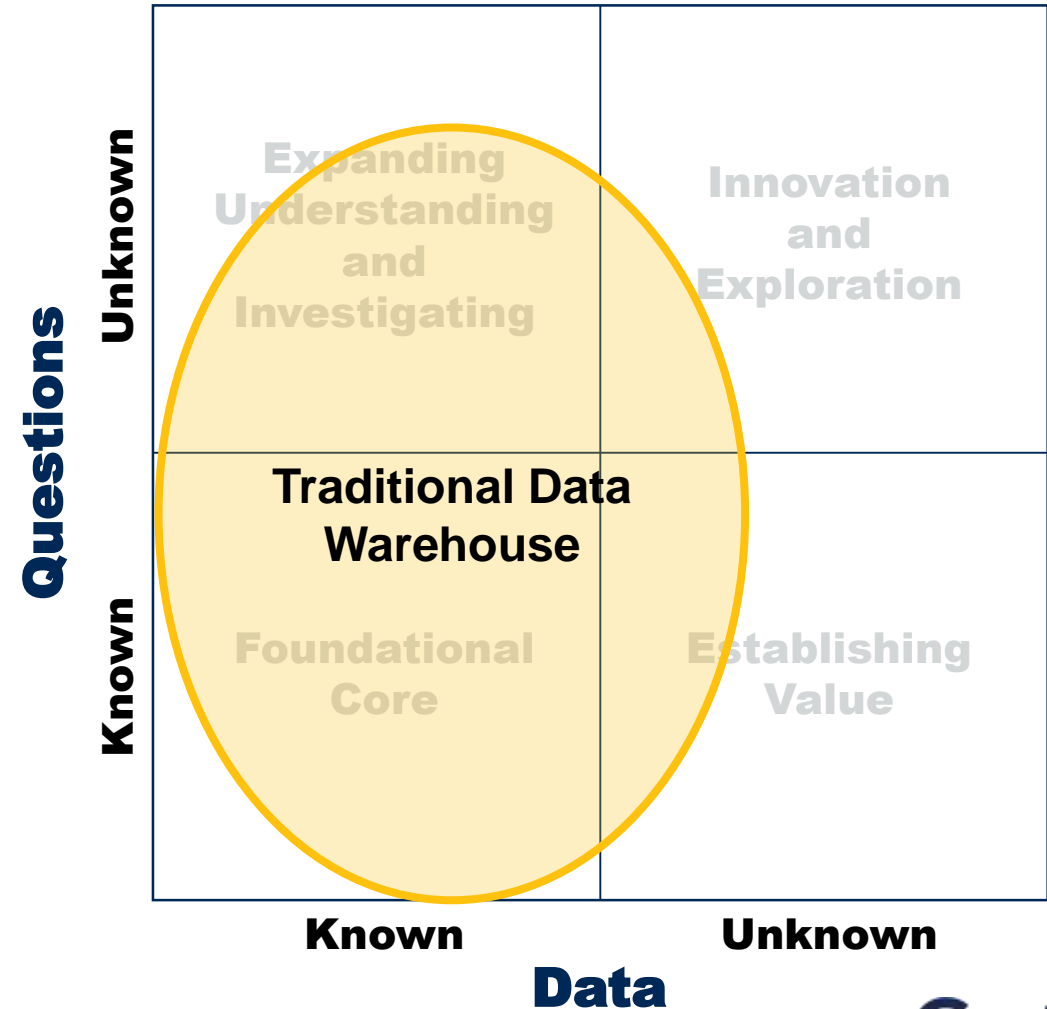
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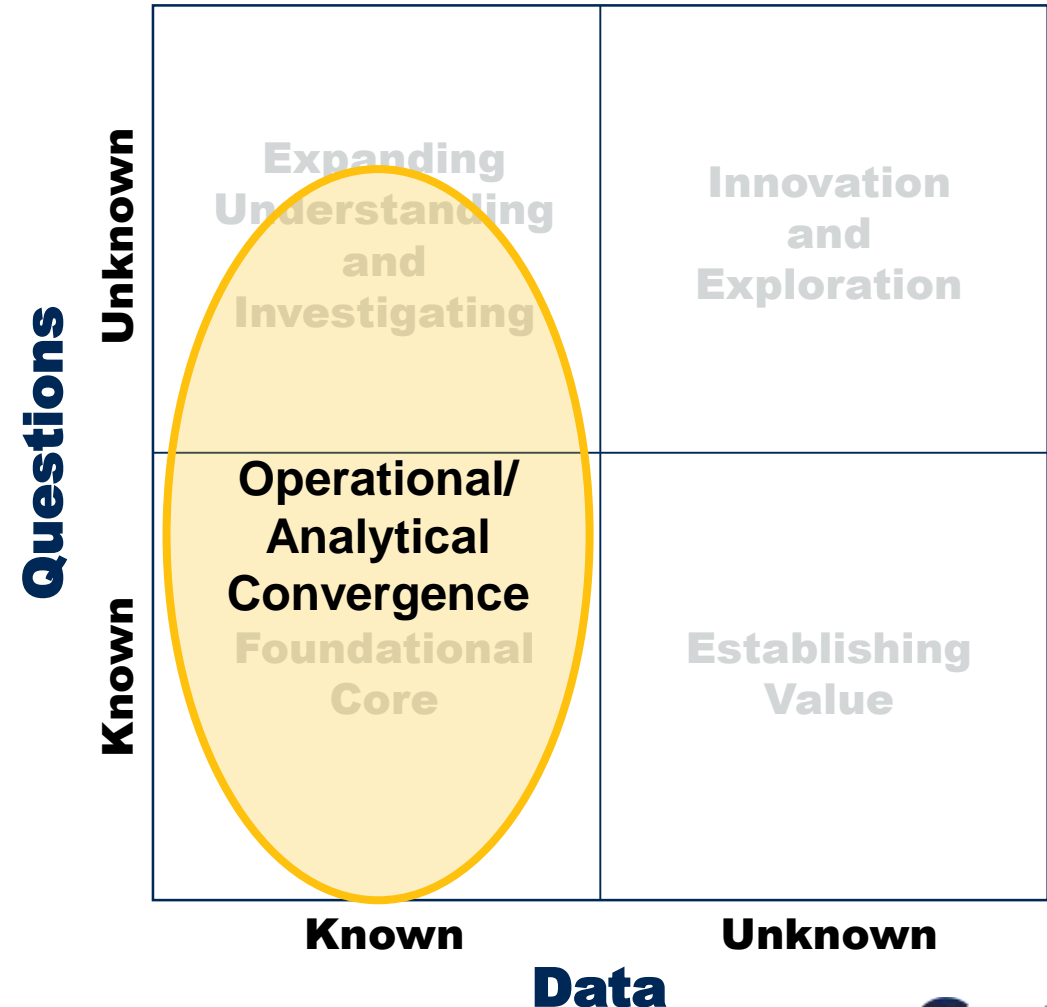
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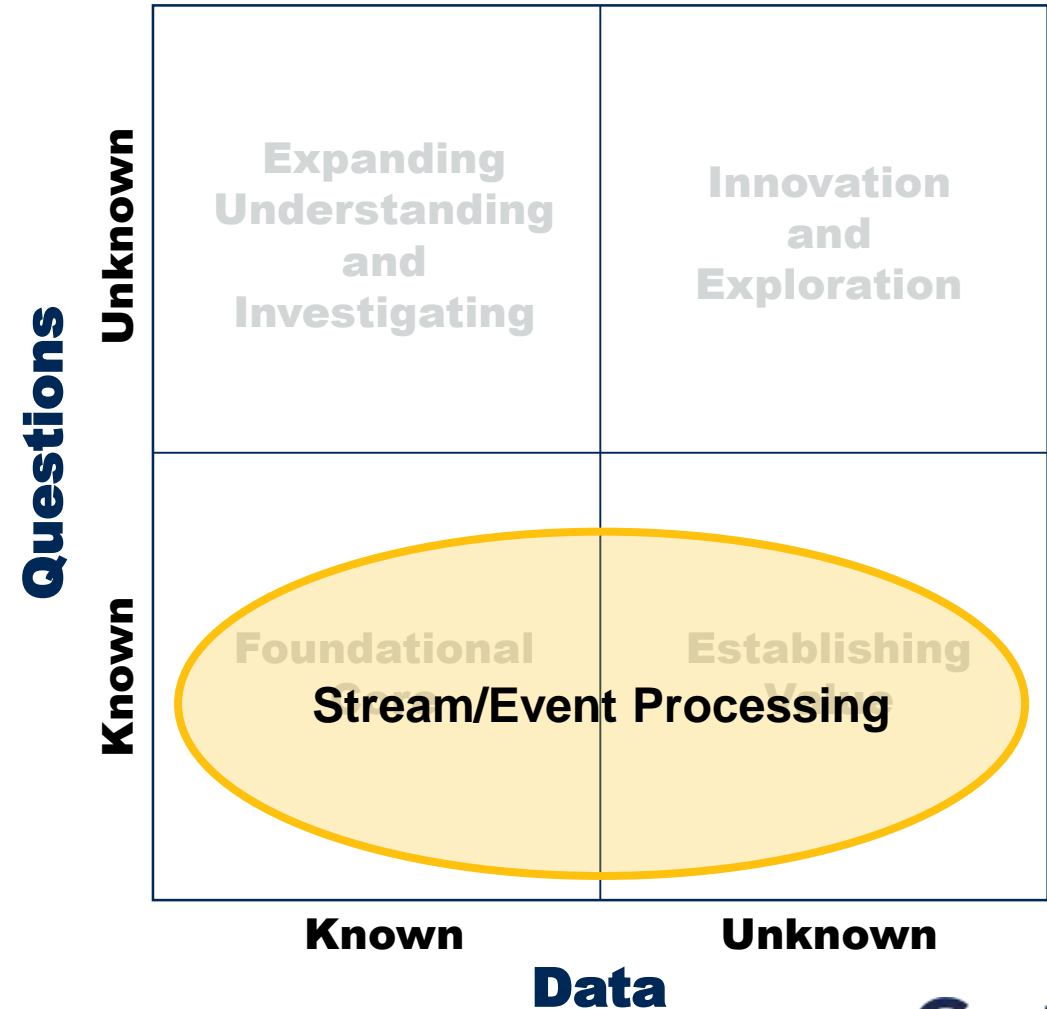
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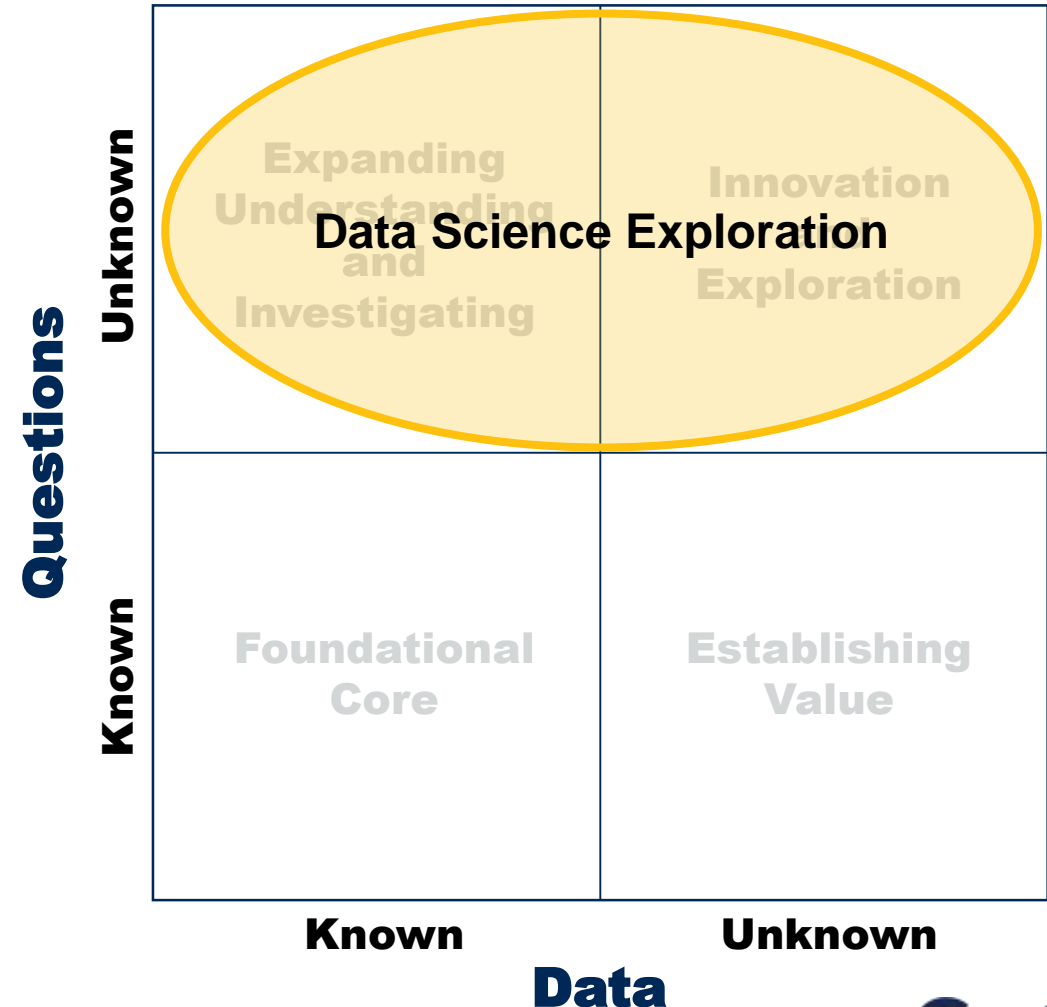
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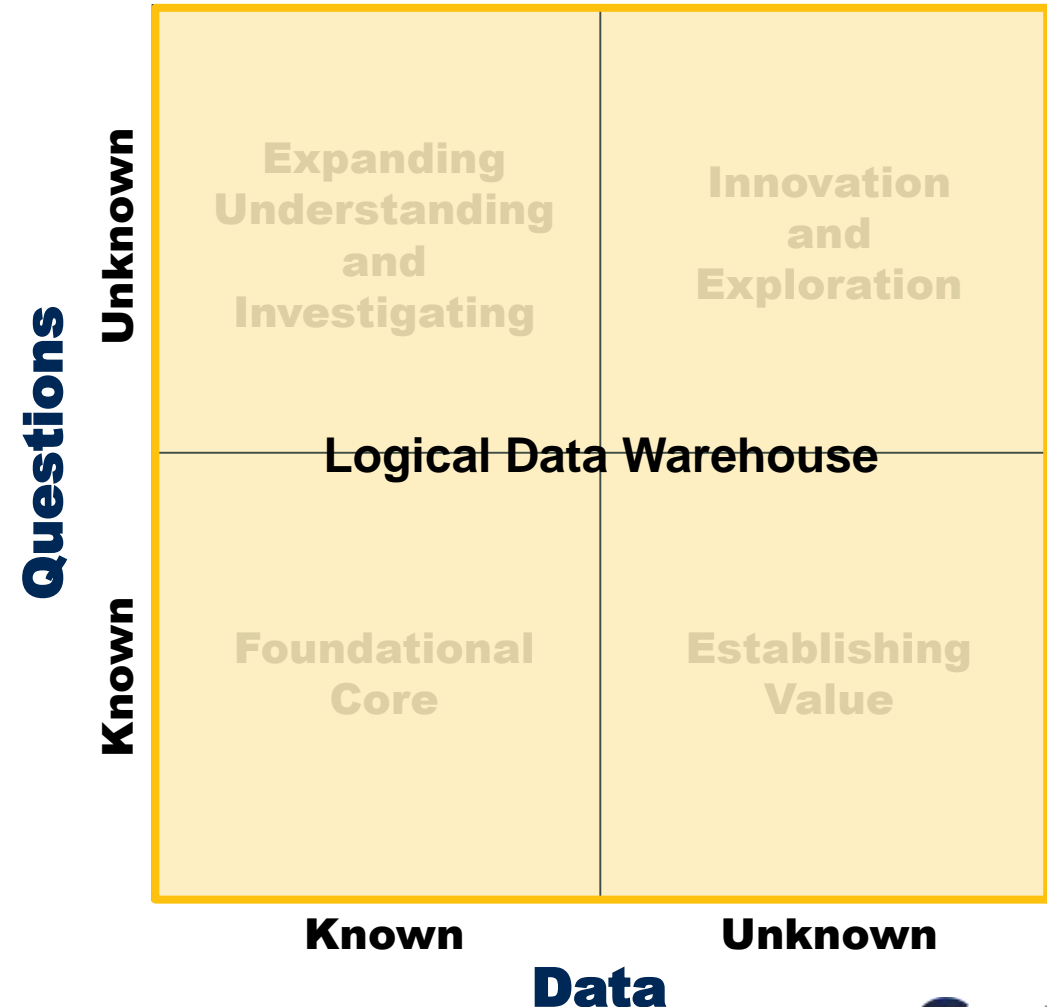
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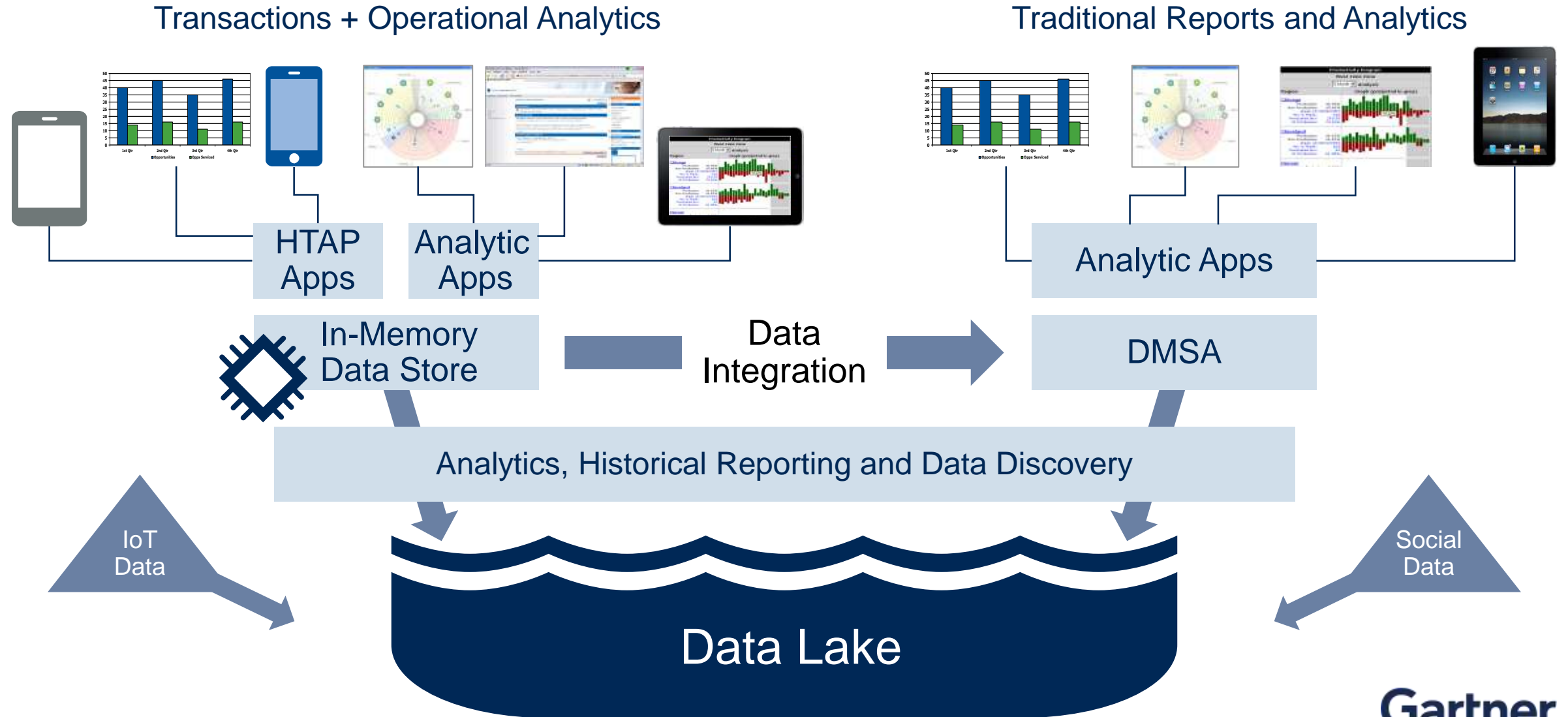
Operational DBMS vendors are incorporating learned analytics workload lessons

- One DBMS market — six use cases.

Data and Analytics Infrastructure Model



Traditional (With DMSA) → Future Data Architecture



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Magic Quadrants for Database Management Systems

Operational DBMS



Source: "Magic Quadrant for Operational Database Management Systems," 22 October 2018 (G00346575)

Data Management Solutions for Analytics



Source: "Magic Quadrant for Data Management Solutions for Analytics," 21 January 2019 (G00353775)

DBMS Internal Use of Machine Learning and Artificial Intelligence

The Augmented DBMS — Self-Maintaining:

- All major vendors (and many others) are adding ML and AI for maintenance and tuning.
- Most dbPaaS is already autonomous.
- DBA skills will be utilized for more business value:
 - Data service administrators — knowledgeable about statistics gathered, system reliabilities, data reliabilities, physical and logical data models.
 - Application performance tuning.

DBMS **automation** for maintenance has been around for years. With the use of ML and AI it is becoming **autonomous**.

Within the next two years, **all DBMS products** will include some ML and AI.

Database PaaS Offerings in the Cloud (Examples)

Analytics and Warehousing:

- Alibaba Cloud's AnalyticDB, ApsaraDB HybridDB and MaxCompute
- Amazon's Redshift, Athena and EMR
- Cloudera (Altus Cloud)
- Google's BigQuery and BigTable
- Hortonworks (Data Cloud for AWS)
- IBM's Db2 Warehouse on Cloud
- MemSQL Cloud
- Microsoft (Azure SQL Data Warehouse)
- Oracle (Autonomous Data Warehouse Cloud)
- Qubole's Data Service

- SAP
(Cloud Platform)
- Snowflake
- Teradata
(IntelliCloud)

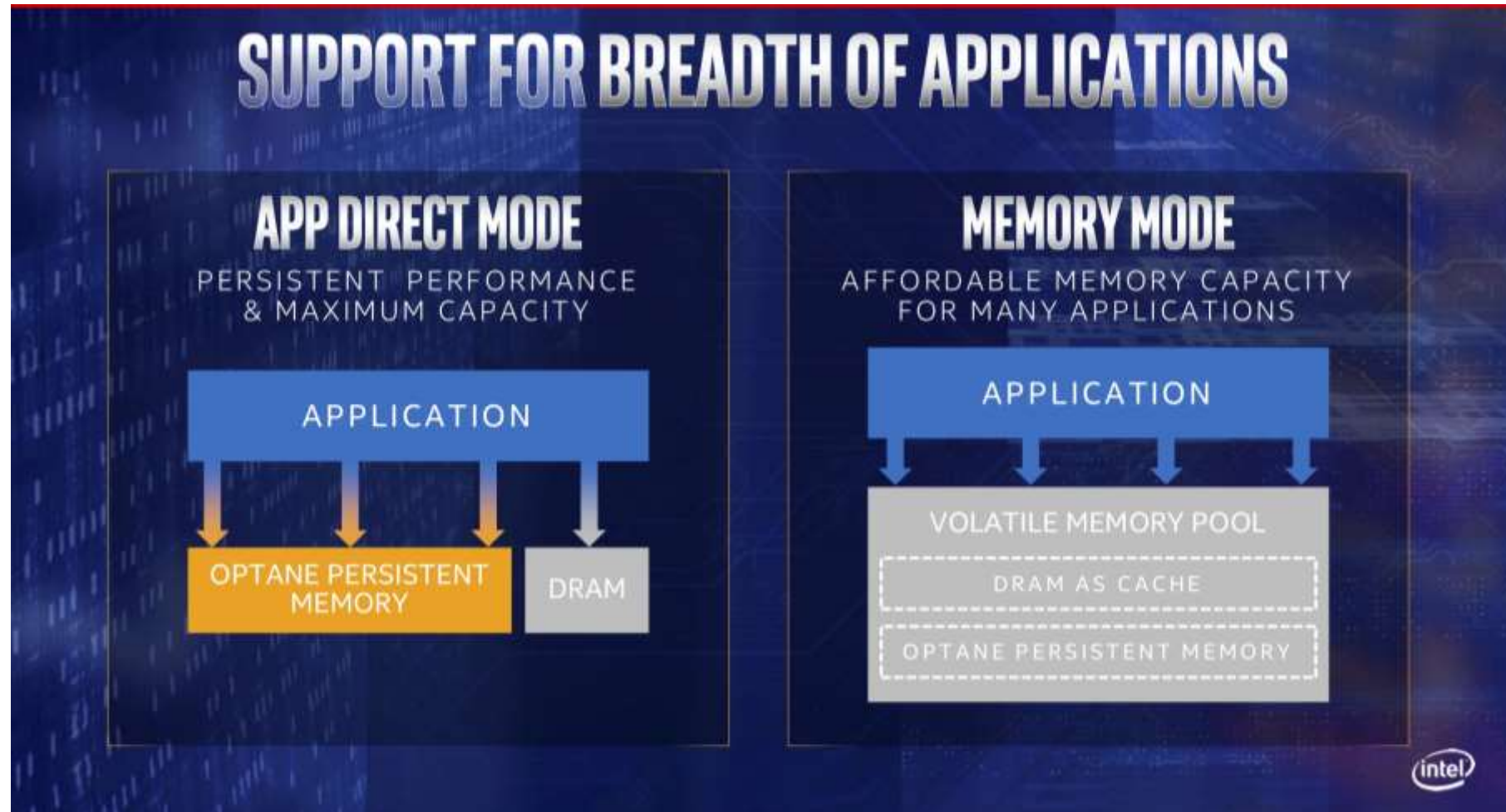
Private Cloud:

- Alibaba Cloud (Apsara Stack)
- AWS (Outposts)
- Microsoft (Azure Stack)
- Oracle (Cloud at Customer)

Operational:

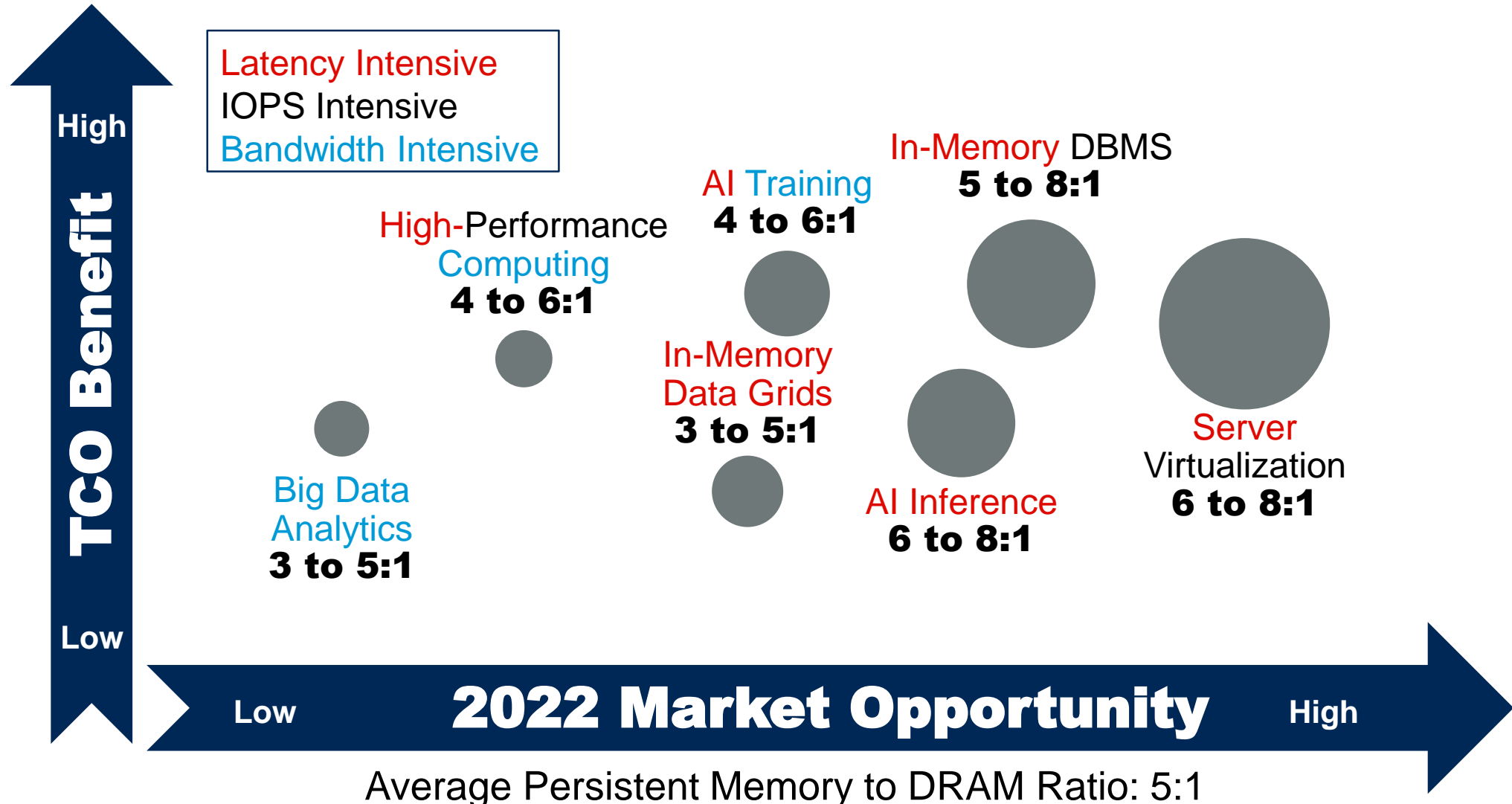
- Alibaba Cloud's ApsaraDB for RDS, ApsaraDB for Redis and ApsaraDB for MongoDB
- Amazon's Aurora, DynamoDB and Relational Database Service (RDS)
- Cockroach Labs (CockroachDB)
- Google's Cloud SQL, Cloud Datastore and Cloud Spanner
- IBM's Cloudant and Db2 on Cloud
- Microsoft's Azure SQL Database and Azure Cosmos DB
- mLab (Database-as-a-Service for MongoDB)
- Oracle (Autonomous Transaction Processing)
- Redis Labs (Redis Enterprise Cloud)
- SAP (SAP Cloud Platform) and (SAP HANA service)
- Heroku (PostgreSQL)

Big Architecture Change Coming Intel Optane DC Persistent Memory



Source: Intel Corporation

Generalized Persistent Memory Workload Ratios to DRAM



Recommendations

- ✓ *Build* an overall data-management strategy for transforming the data infrastructure of the organization.
- ✓ *Begin* a DBMS cost-optimization plan to free resources for a transition of the data-management infrastructure to support digital business transformation.
- ✓ *Implement* cloud-based DBMS approaches for new applications where:
 - Agility is required.
 - Data sizes are manageable.
 - Local regulations allow.
- ✓ *Evaluate* the nonfinancial benefits of dbPaaS and cloud implementations, such as greater flexibility, elasticity, global accessibility and built-in redundancy.
- ✓ *Do not assume* that nonrelational DBMSs (including Hadoop) must be used for unstructured data and data lakes.
- ✓ *Plan and begin* implementation of pilot projects using architectures such as cloud, in-memory computing and nonrelational technology.

Recommended Gartner Research

- ▶ [State of the Open-Source DBMS Market, 2018](#)
Merv Adrian and Donald Feinberg (G00301457)
- ▶ [State of the Operational DBMS Market, 2018](#)
Nick Heudecker, Donald Feinberg and Merv Adrian (G00360276)
- ▶ [Use the Data and Analytics Infrastructure Model to Classify Digital Business Capabilities](#)
Adam Ronthal, Donald Feinberg and Andrew White (G00370421)
- ▶ [Toolkit: RFP Template for Operational DBMS](#)
Donald Feinberg and Adam Ronthal (G00364256)
- ▶ [It Is Time to Replace Aging Prerelational Database Management Systems](#)
Donald Feinberg (G00364199)

For information, please contact your Gartner representative.