Architecting and Evaluating Discrete Integration Services in the Advancements of Digital Technologies of an Enterprise

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Presenter: Smita Seth

Overview
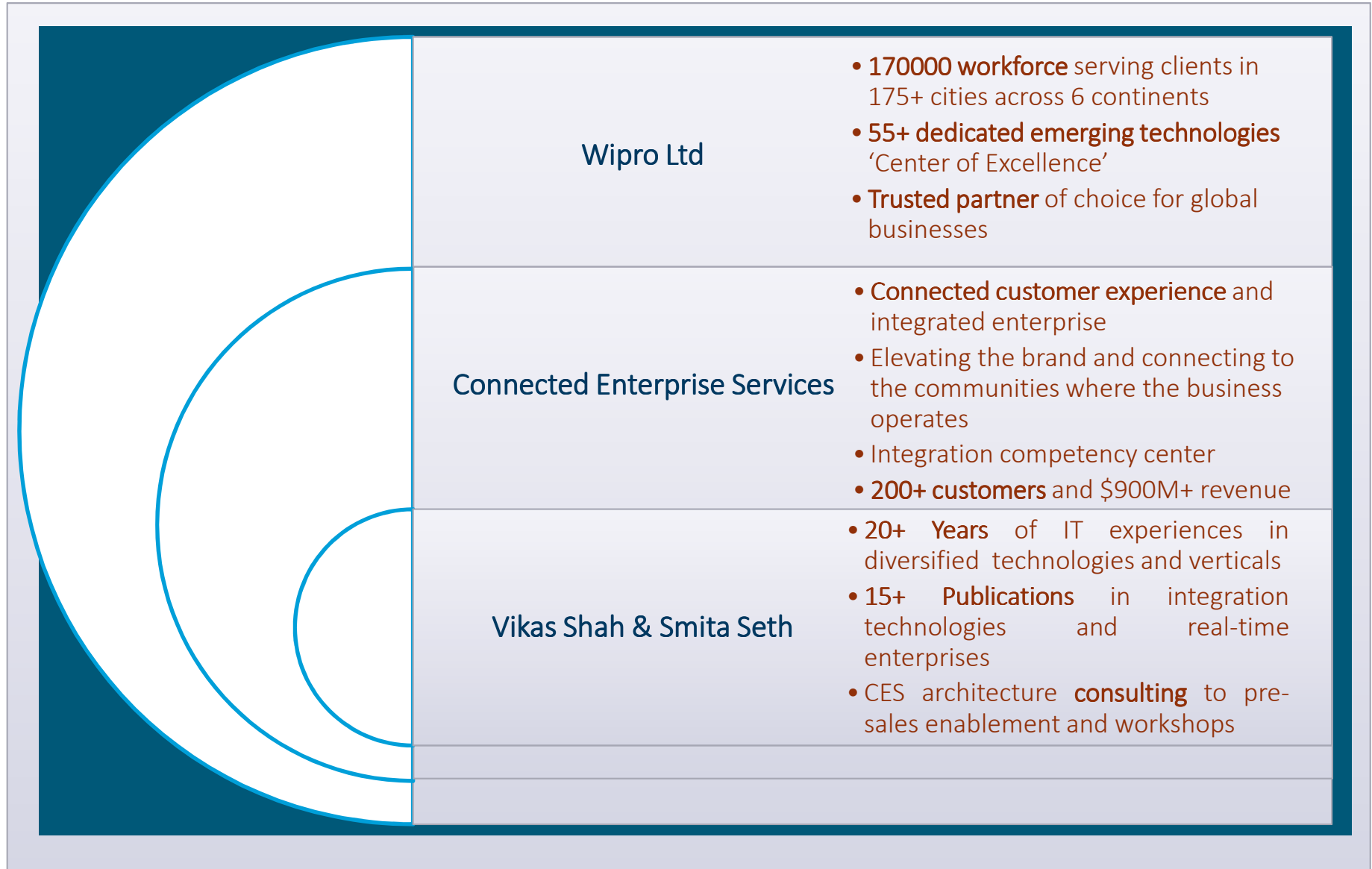
Correlation of Digital Technologies and Integration

Wipro Ltd. ➔ Connected Enterprise Services

Wipro Ltd	• **170000 workforce** serving clients in 175+ cities across 6 continents • **55+ dedicated emerging technologies** 'Center of Excellence' • **Trusted partner** of choice for global businesses
Connected Enterprise Services	• **Connected customer experience** and integrated enterprise • Elevating the brand and connecting to the communities where the business operates • Integration competency center • **200+ customers** and $900M+ revenue
Vikas Shah & Smita Seth	• **20+ Years** of IT experiences in diversified technologies and verticals • **15+ Publications** in integration technologies and real-time enterprises • CES architecture **consulting** to pre-sales enablement and workshops

Digital Technologies

Consumer Channels	Web	Mobile Apps	IoT	Social

Enterprise Integration

PaaS Integration Platform	On Premise Integration Platform	API Management Platform	Real Time Event Processing

Applications

On Premise Applications	SaaS Applications	Partner/Supplier Applications	3rd Party Services

Engineering Tools

Enterprise DevOps	Agile Framework	Governance Tools

Advancements and Transformations

Backend Centric Business Processes

Data Driven Integration

Longer Release Cycle

On-Premise and Controlled Technology landscape

Digital Wave

Consumer Centric Business Processes

Real Time Integration

Quicker Release Cycle

Cloud Adoption and extended landscape across Partners, digital Channels, smart Devices

Integration Architecture in Digital Technologies

Digital Integration Strategy

Digital Integration Technology Adoption Decision Tree

Guidelines & best practices to implement digital technologies enabled Platform leveraging – Real-Time Integration & Event Processing, APIs, Microservices

Middleware Technologies Adoptions

Integration Platform Standardization

Digital Integration Adoption Lifecycle

Integration Architecture Readiness

Reference Architecture – PaaS Architecture, SaaS Integration, API Management, Microservices Architecture

Digital Processes: Non-functional requirements

Digital Data Model

Services & APIs Identifications

Agility & Automation

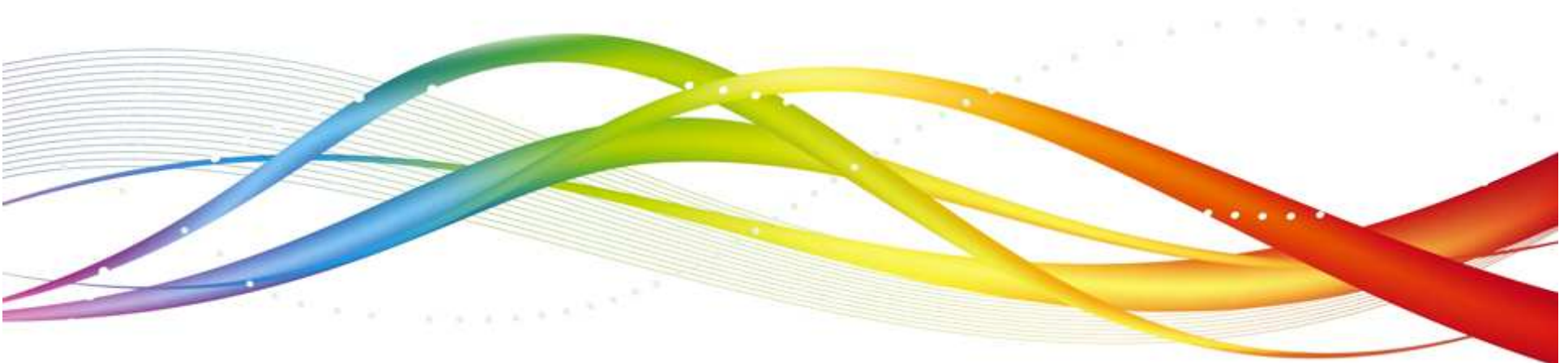## Digitalize Enterprise Integration Solution

Service Oriented Modeling

Transform legacy enterprise functions such as CRM, ERP to Services

Degrade or Upgrade Integration Services based on Digital Technologies Paradigms

Primary Concerns

Integration in Advancements of Digital Technologies

Challenges

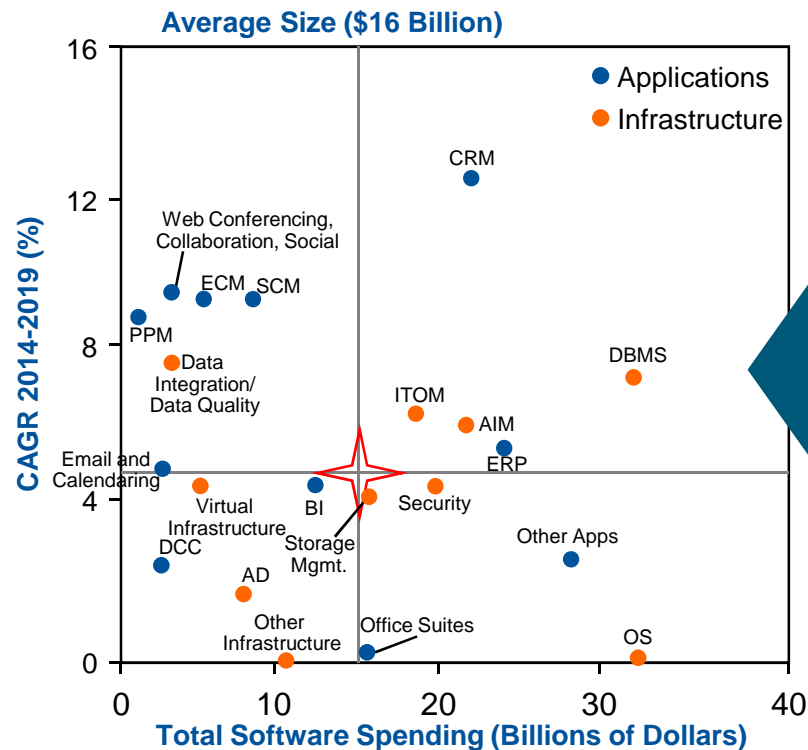| Digital Technologies Adoption	○ Silo departments, processes & applications creating islands of information ○ Inflexible legacy systems
Digital Data Flow	○ Information inconsistency across channels ○ Real-time tracking and monitoring of data in rationalization of business operations
Digital Channels & Communication	○ Poor transaction visibility across enterprise ○ Inconsistent cross channel experience ○ Changing customer behavior and channel usage patterns
Technical Architecture	○ Ready-to-use functional services to deliver diversifications in scenarios (or situations) ○ Require availability of predictable & consistent solution ○ Expected optimization & automation capabilities in association with digital technologies
Increased Consumer Expectations	○ Anytime-anywhere access from any device ○ Usage profiling and its best utilization ○ Personalized experience

Key Influencing Factors

Average Size ($16 Billion)

CAGR 2014-2019 (%)

● Applications
● Infrastructure

CRM

Web Conferencing, Collaboration, Social

ECM SCM

PPM

Data Integration/ Data Quality

DBMS

ITOM

AIM

Email and Calendaring

ERP

Virtual Infrastructure

BI

Security

DCC

Storage Mgmt.

Other Apps

AD

Other Infrastructure

Office Suites

OS

Total Software Spending (Billions of Dollars)

AD = application development; DCC = digital content creation; ECM = enterprise content management; ITOM = IT operations management; PPM = project and portfolio management; SCM = supply chain management

Factors

- Digital channels and integration platforms are the game changers
- Alternative go-to-market and licensing strategies are emerging
- Buying centers are shifting toward lines of business (LOBs)
- The vendor landscape is being reshaped
- Functionally rich platforms contest with "fit for purpose."
- Balance between stand-alone solutions and suites

Illustration: Dynamic Integration in Digital Edge
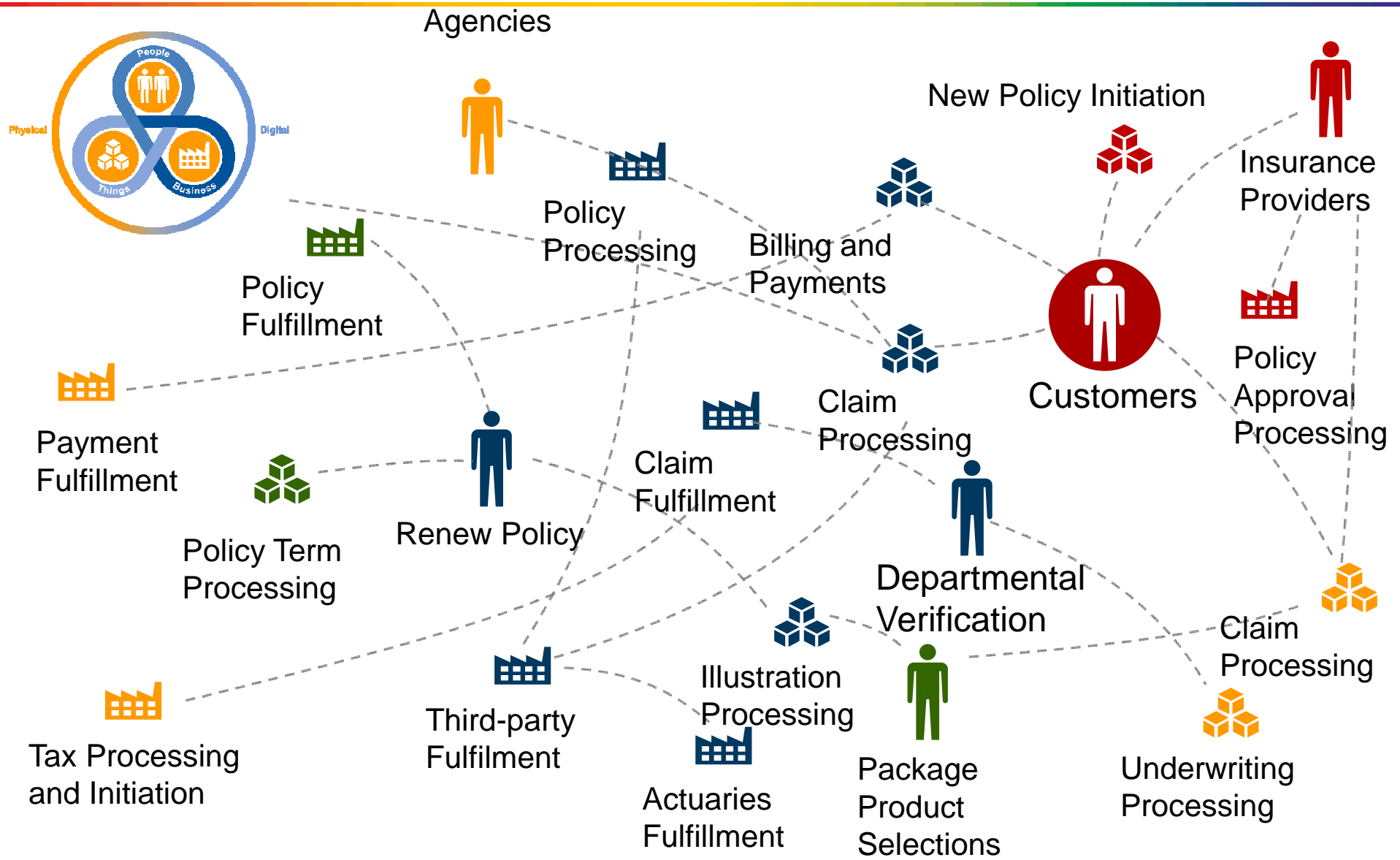
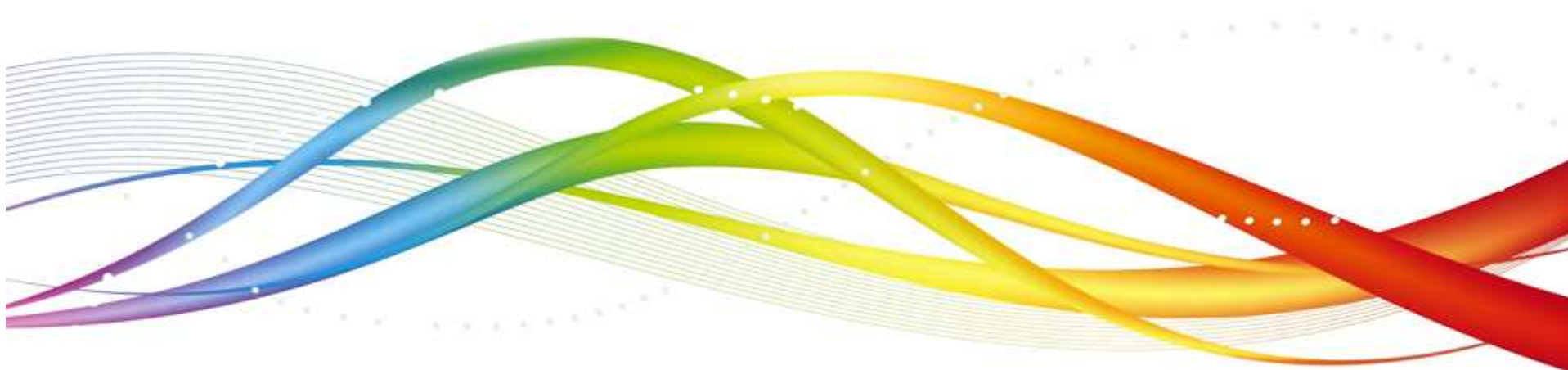# Integration: Risks and Mitigations

Types of Risks

- Digital **technology change** and upgrades required due to changing dynamics of marketplace
- Advancements in **connectivity and convergence** due to potentials of newly introduced threats in communication channels
- Upcoming **regulatory and legality** of digital technologies in assertion of globalization
- Desired and recognized **time-to-market** versus the anticipated accuracies in products or services
- Consumer satisfaction due to preference in **operational agility** of delivering the digital business functionalities
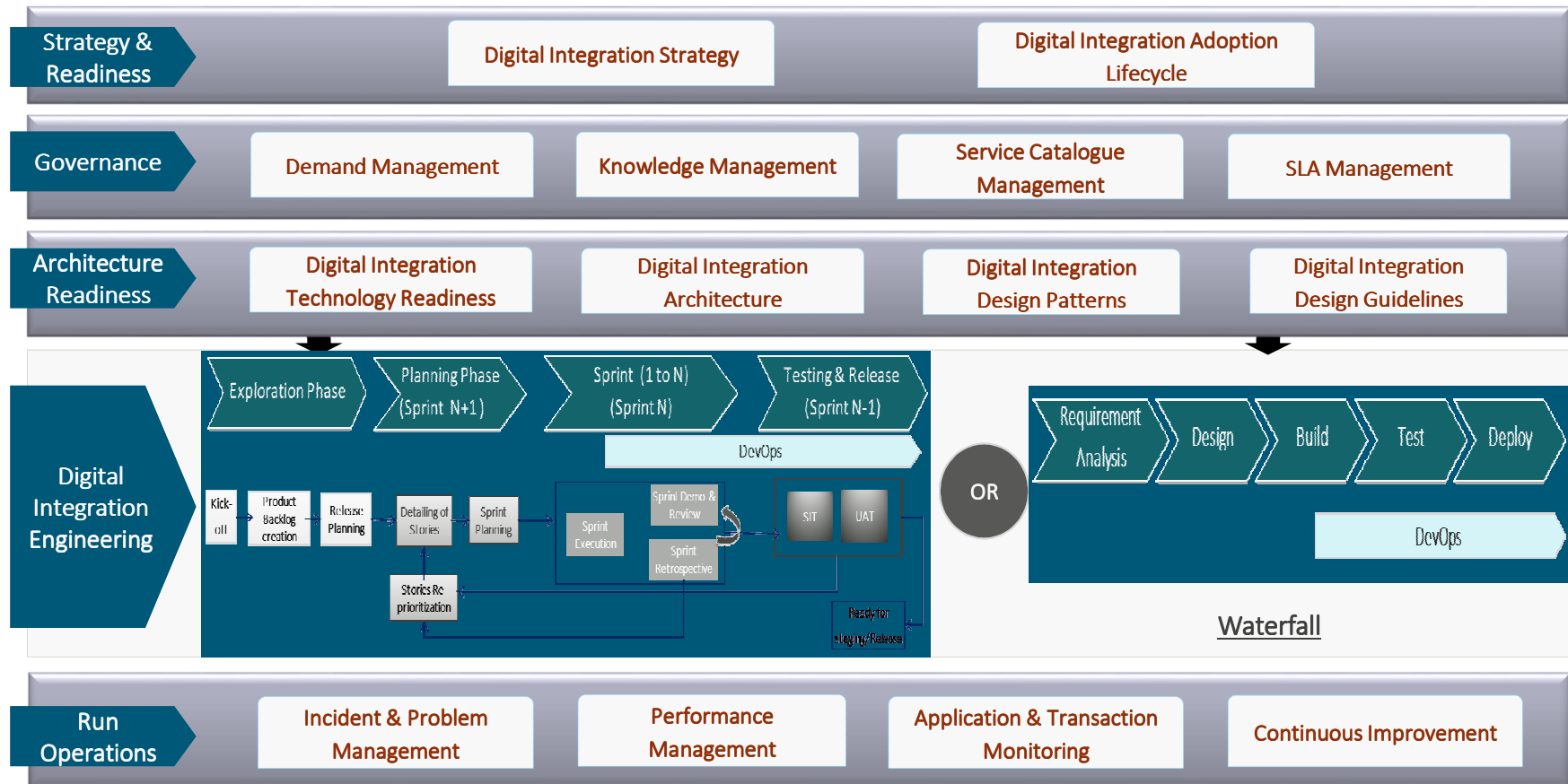
Key Migration Strategies

- Precision in business integration to digital technologies
- Early resolution of deficiencies in business operations due to connectivity paradigms
- Analyze, evaluate, and predict pervasive scenarios
- Accuracy in estimating uncertainties and errors
- Streamlining detection and realization of emerging market trends
- Continuously evolve enterprise to rationalize decision making process

Discrete Integration Services
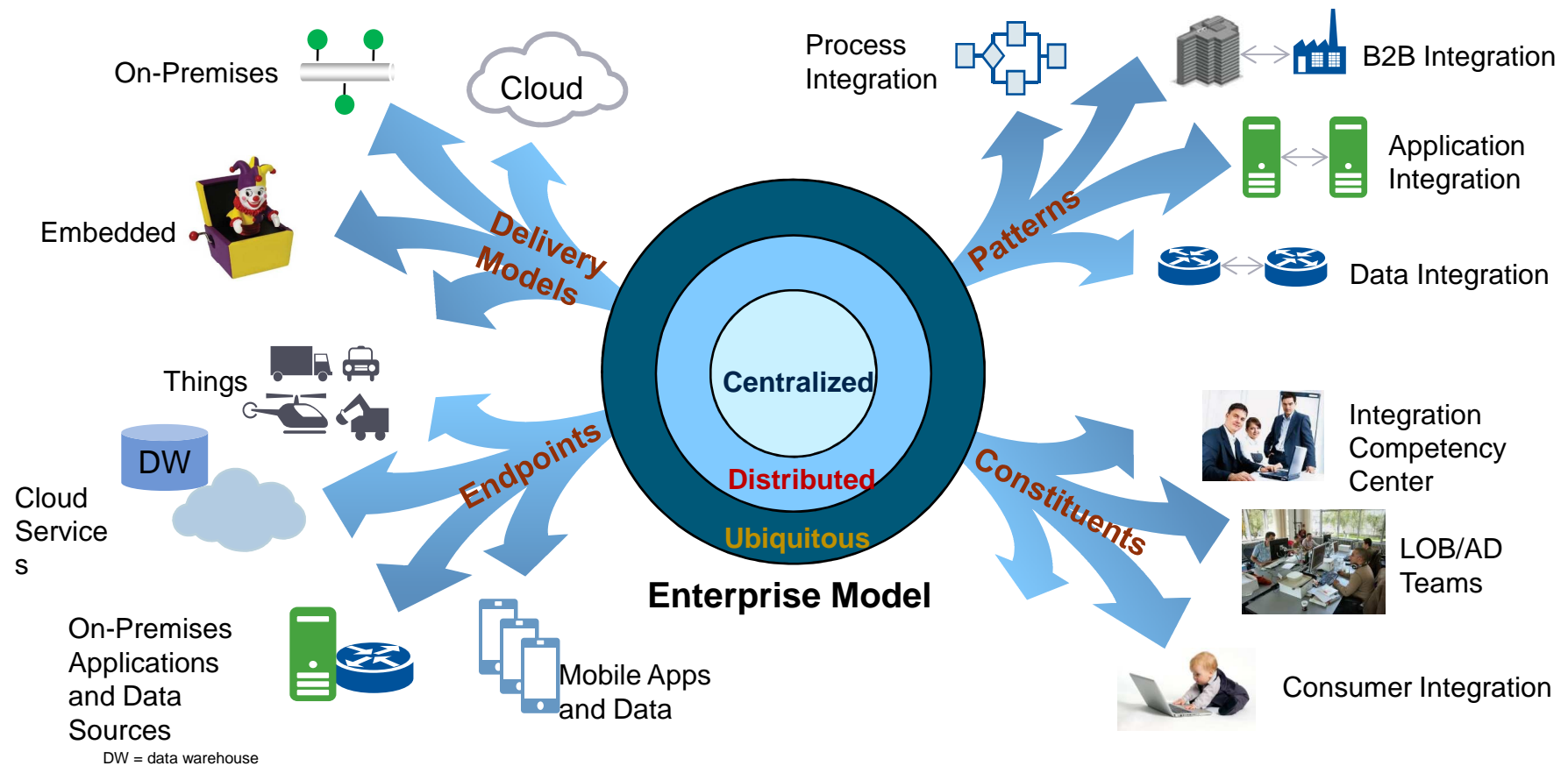
Purposes and Instituting

Solution

Strategy & Readiness
- Digital Integration Strategy
- Digital Integration Adoption Lifecycle

Governance
- Demand Management
- Knowledge Management
- Service Catalogue Management
- SLA Management

Architecture Readiness
- Digital Integration Technology Readiness
- Digital Integration Architecture
- Digital Integration Design Patterns
- Digital Integration Design Guidelines

Digital Integration Engineering

Exploration Phase → Planning Phase (Sprint N+1) → Sprint (1 to N) (Sprint N) → Testing & Release (Sprint N-1)

DevOps

Kick-off → Product Backlog creation → Release Planning → Detailing of Stories → Sprint Planning → Sprint Execution → Sprint Demo & Review / Sprint Retrospective → SIT / UAT → Ready for staging/Release

Stories Re prioritization

OR

Requirement Analysis → Design → Build → Test → Deploy

DevOps

Waterfall

Run Operations
- Incident & Problem Management
- Performance Management
- Application & Transaction Monitoring
- Continuous Improvement

Modeling Discrete Integration Services (DIS)

On-Premises

Cloud

Process Integration

B2B Integration

Embedded

Application Integration

Delivery Models

Patterns

Data Integration

Things

Centralized

DW

Distributed

Endpoints

Constituents

Integration Competency Center

Cloud Services

Ubiquitous

LOB/AD Teams

On-Premises Applications and Data Sources

Mobile Apps and Data

Enterprise Model

Consumer Integration

DW = data warehouse

Factors to Consider

- **Subordinate DIS with information** that can be utilized in the context of concrete digital business operation and corresponding activities

- **Deterministic specification of relationship** between actual activities and enterprise entities during modeling of DIS

- **Precisely define events** that can be emulated, monitored, and optimized through DIS

- **Impact of people, processes, and product** (or service) offerings as metadata associated with the DIS

- **Specify and govern SLAs** in the correlation of DIS and digital business operations

- **Regularly place and evaluate delivery paradigms** for DIS in association with digital technologies to address uncertainties of business operations due to advancements
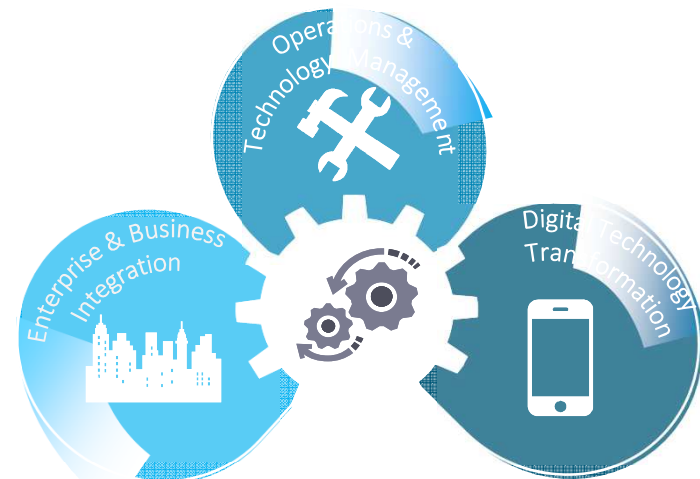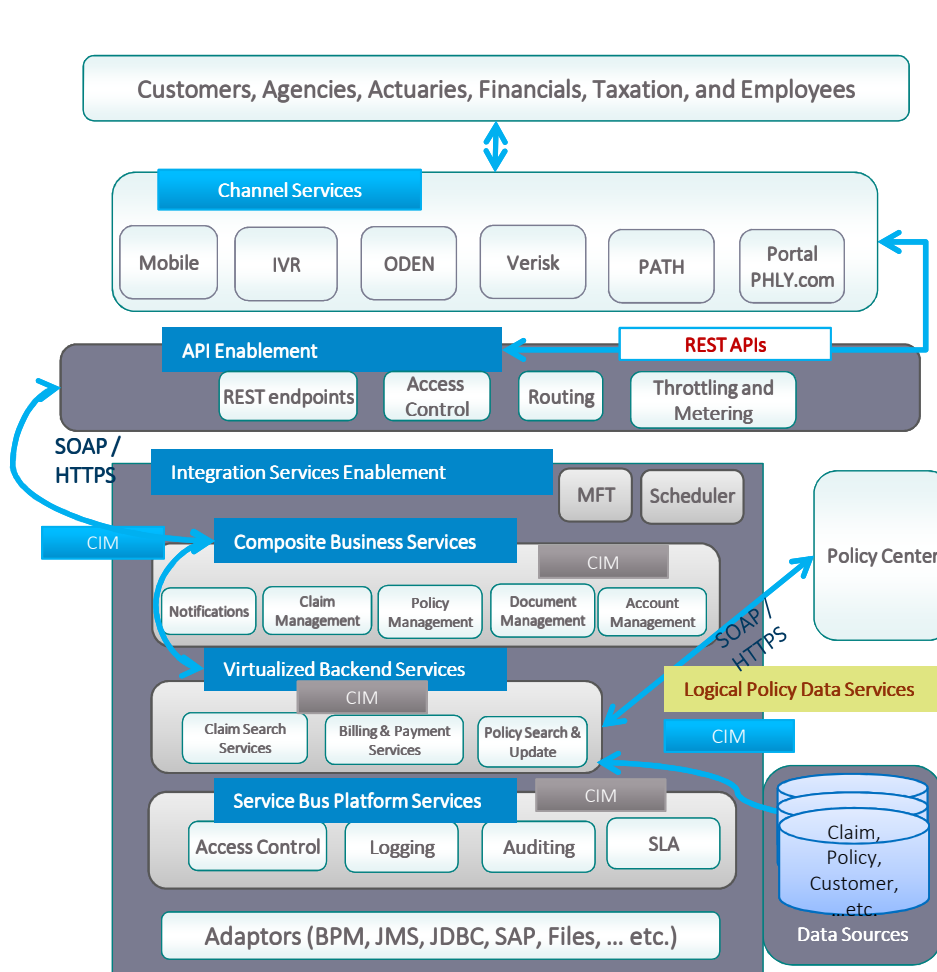
Advantages

- Technology heterogeneity

- Resilience

- Scaling

- Ease of deployment

- Enterprise alignment

- Composability

- Optimizing for replaceability

DIS Landscape of an Enterprise during the Uncertainties of Advancements in Digital Technologies

➢ Improved Time-to-Market with streamlining consumers, vendors/ suppliers, and enterprise communication

➢ Multi-channel delivery capabilities of enterprise's offerings with minimal changes

➢ Scalable and performance sensitive approach to integrate digital technologies with business operations

➢ Automated processes and workflows in alignment with associated activities

➢ Contrast and compare utilities before delivery including pricing model

➢ Monitoring, alerting, and dynamic changes based on runtime behavior and conditions

Illustration: Insurance Policy and Claims

Customers, Agencies, Actuaries, Financials, Taxation, and Employees

Channel Services

| Mobile | IVR | ODEN | Verisk | PATH | Portal PHLY.com |

API Enablement

REST APIs

| REST endpoints | Access Control | Routing | Throttling and Metering |

SOAP / HTTPS

CIM

Integration Services Enablement

| MFT | Scheduler |

Composite Business Services

CIM

| Notifications | Claim Management | Policy Management | Document Management | Account Management |

Virtualized Backend Services

CIM

| Claim Search Services | Billing & Payment Services | Policy Search & Update |

Service Bus Platform Services

CIM

| Access Control | Logging | Auditing | SLA |

Adaptors (BPM, JMS, JDBC, SAP, Files, … etc.)

Policy Center

SOAP / HTTPS

Logical Policy Data Services

CIM

Claim, Policy, Customer, …etc.

Data Sources

| Enterprise Entities, Digital Technologies, & Business Operations | Modeling of DIS and SLA Specification | Implementation & Delivery of DIS | Monitoring & Continuous Integration |

Operations & Technology Management

Enterprise & Business Integration

Digital Technology Transformation

Analyst Speak

Long-term growth will be driven primarily by modernization, functional expansion, and digital transformation
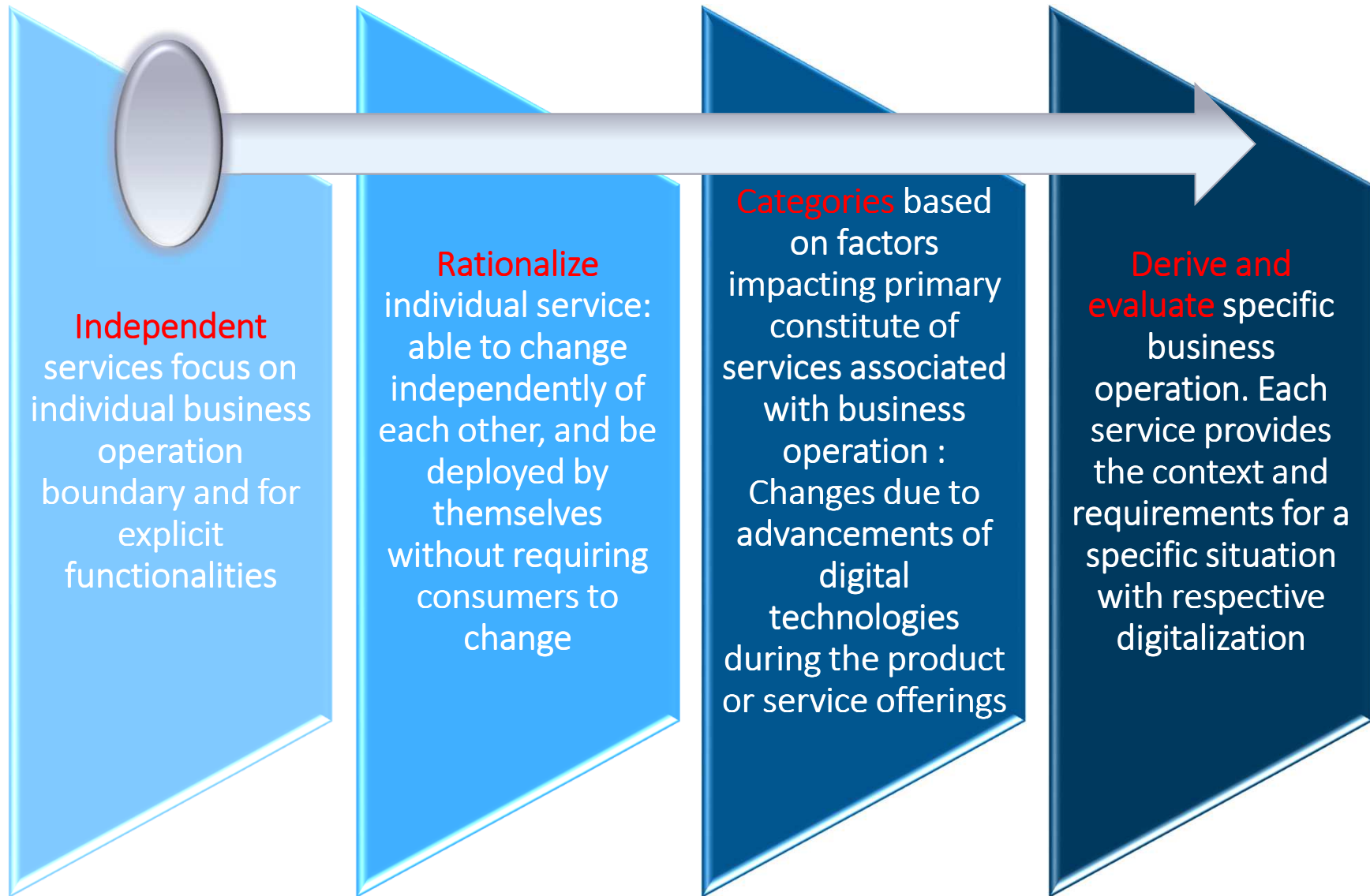
Gartner   **FORRESTER**   **IDC** Analyze the Future   **HfS** BLUEPRINT REPORTS
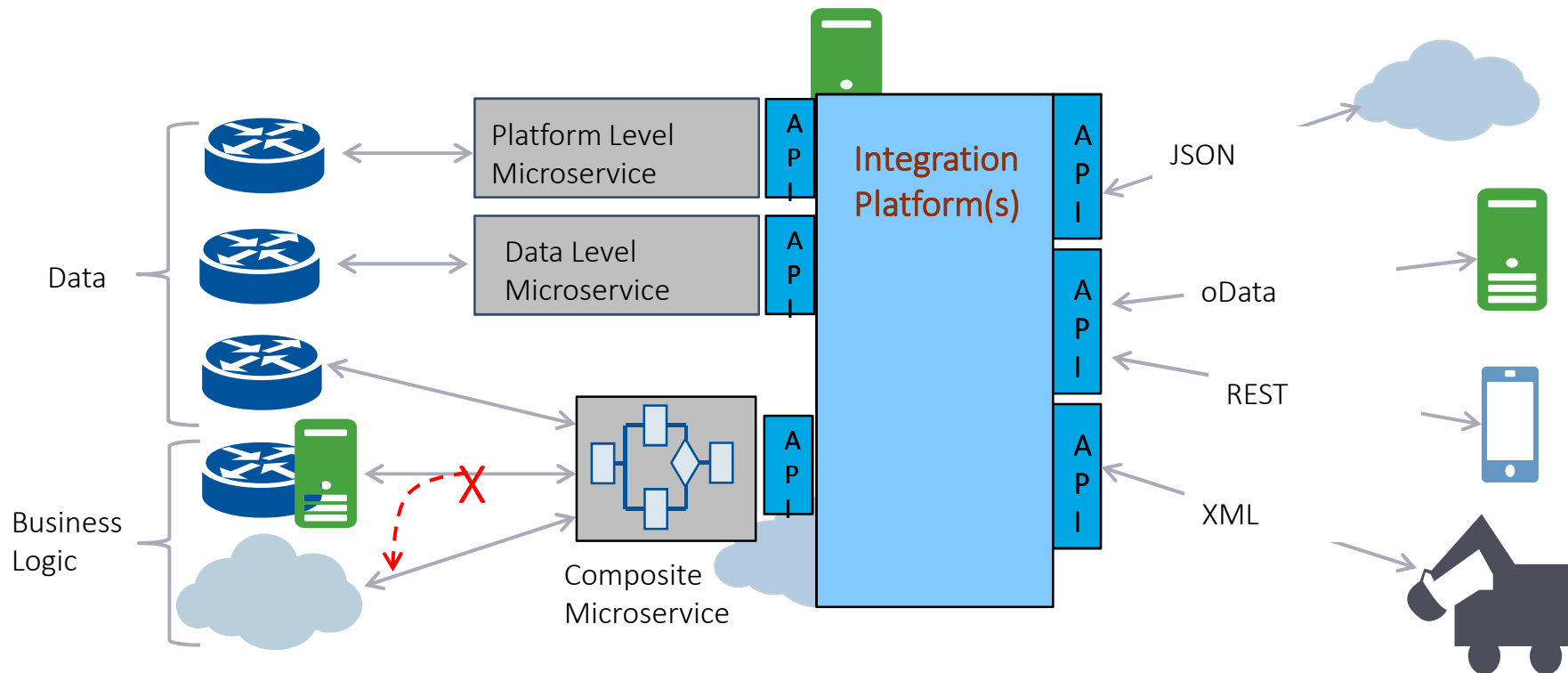
Microservices

Classifications and Positioning

What is Microservices? Formulation of DIS

Independent services focus on individual business operation boundary and for explicit functionalities

Rationalize individual service: able to change independently of each other, and be deployed by themselves without requiring consumers to change

Categories based on factors impacting primary constitute of services associated with business operation : Changes due to advancements of digital technologies during the product or service offerings

Derive and evaluate specific business operation. Each service provides the context and requirements for a specific situation with respective digitalization

Key Enablers of Microservices' Implementation

Data

Business Logic

Platform Level Microservice

Data Level Microservice

Composite Microservice

Integration Platform(s)

API

JSON

oData

REST

XML

Microservices at Scale

- **Derive scalability SLAs** within the modeling paradigms of Microservices: Response time, Latency, Availability, and Durability of associated data

- **Standardizing integrity** of Composite Micoservices and right level of isolation to reduce erroneous execution: Define alternate paths and error conditions

- **Consistent behavioral modeling** when defining Microservice's operations in presence of diversified scenarios pertaining to digitalization

- **Streamline degrade and upgrade of Microservices' functionalities** based on demand of digital technologies in collaboration with allied business operation

- **Utilize dynamic service registries** to describe, discover, publish, subscribe, version, and monitor Microservices

- **Imply performance optimization** techniques in consideration of physical resources utilized during execution of Microservice's operations

Method to Evaluate and Maturity Model

Degree of Coverage and Enterprise Capability Index
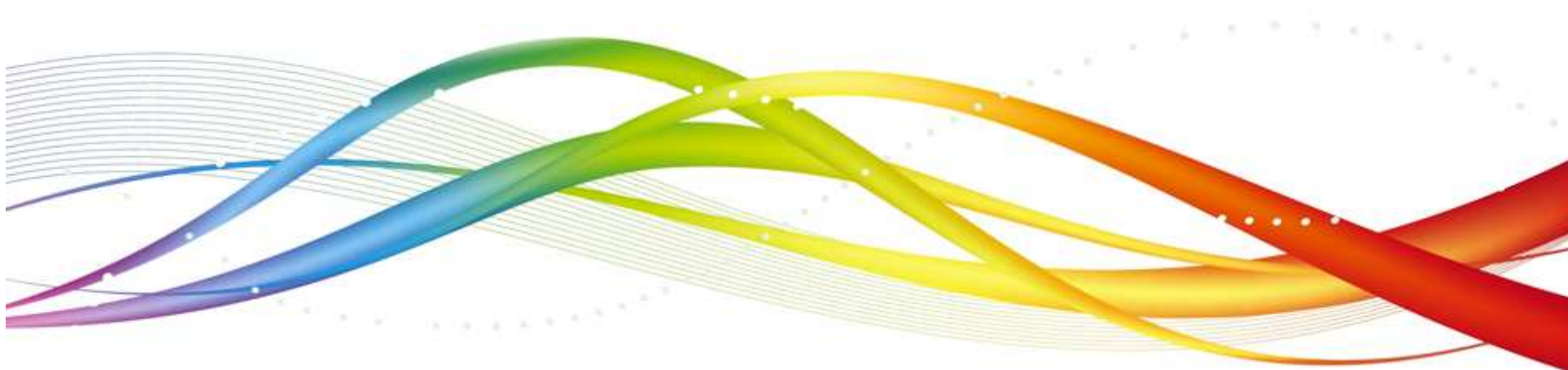
Categories of Assessment

Organizational
- Enterprise Adaptability & Acceptability
- Consistency
- Evolution
- Management
- SOA Adaptability & Adoption
- Time-to-Market
- Standardization & Compliance
- Continuity

Functional
- Roles & Responsibilities (Security & Entitlement)
- PMO/SDLC Metrics & Measurements
- SLA Factorization (Scalability, Reliability, & Performance)
- Interoperability, Compatibility, & Portability
- Complexity v/s Coherency
- Extendibility & Maintainability
- Provisioning
- Capability (CM & Updates)

Leverage Rating based Evaluation Graph
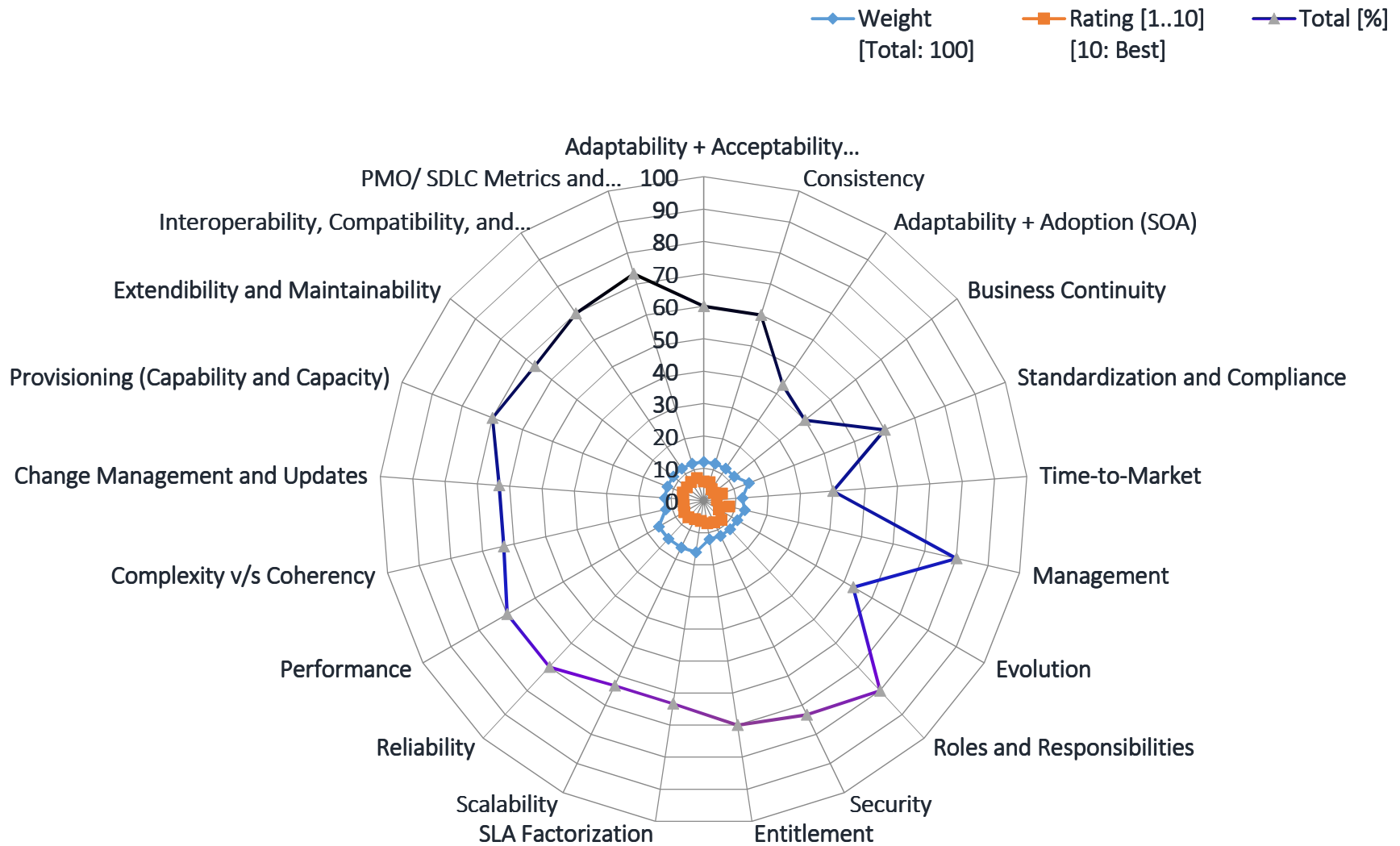
Defining Quantitative Assessment Method

Degree of Coverage

- **#BA** is number of Business Process (BP) activities in BPs of APIs
- **#DIS** is number of discrete integration services utilized to accomplish the BAs
- **#BP** is the number of BPs associated with APIs in an enterprise

$$\text{DEGREE}_{\text{Coverage}} = \frac{\sum_{k=1}^{\#BP} [(\sum_{j=1}^{\#BA_k} [\#DIS_j]) / \# BA_k]}{\# BP}$$

Enterprise Capability Index (ECI)

- **B_USL and B_LSL** are the overall upper and lower number of alterations in requirements specification based on the histogram of the BP activities associated with APIs
- **(B_USL – B_LSL)** provides finite number indicating allowable BP variations in APIs
- **"T"** is the target state mean of the number of changes
- The overall **mean of the number of changes** is **μ**
- Actual variability of the overall enterprise, expressed as a **standard deviation σ**

$$\text{ECI} = \frac{\text{B\_USL} - \text{B\_LSL}}{6\sigma \sqrt{1 + ((\mu - T) / \sigma)^2}}$$

Deriving DIS Maturity Model

Dimension		Level	0	1	2	3	4	5	6
		Type	No Integration Services		Adhoc	Opportunistic	Systematic	Managed	Optimized
		Maturity / Maturity Indicator	Integration strategy underway		Awareness of integration services No streamlining	Identified integration approach Opportunistically applied	Enterprise-wide integration approach	Enterprise-wide integration Governance and Metrics	Incremental improvements and proactive services (internal and external)
Business & Integration Strategy	High-level constructs that allow the integration initiative to proceed. Business motivation, expected benefits, guiding principles, expected costs, and funding model.		Isolated Business Line-driven		Business Process Integration	Componentized Business	Componentized Business Provides and Consumes Services	Processes Provided and Consumed via Composite Business Services	Mix-and-match Business Capabilities via Context-Aware Services
Architecture	Definitions of the overall architecture and guidelines for various practitioners to ensure adherence to the architecture. Service components are designed using formal integration service methods, principles, patterns, frameworks, or techniques.		Monolithic Architecture		Layered Architecture	Component Architecture	Emerging services	Grid-enabled services	Dynamically Reconfigurable Architecture
Infrastructure	Service infrastructure and tools that provide the technical foundation for the integration initiative. The IT infrastructure supports the non-functional and operational requirements and SLAs needed to operate an integration environment.		Line of Business Platform-Specific		Platform-Specific infrastructure	Common Reusable Infrastructure	Project-Based Integration Service Environment	Common Integration Service Environment	Integration Service Environment Sense and Respond. CEP (Complex Event Processing)
Information & Analytics	The information architecture supports a master data model that implements a common business data vocabulary.		Application-Specific Data Solution		LOB or Enterprise-Specific	Canonical Models	Information as a Service	Business Data Dictionary and Repository	Virtualized Information Services and Semantic Data Vocabularies
Projects, Portfolios & Services	Formal use of an architectural design, construction, and deployment methodology for the implementation of services for the consumers.		Structured Analysis and Design (Modules) based on individual project		Object-Oriented Modelling (Objects) depending on project business requirement	Component-Based Development (Components). Structured around projects	Service Modelling derived from business requirements across enterprise	Applications Composed of Composite Services (Virtualized).	Dynamic Application Assembly, Context-Aware Invocation based on consumer
Operations, Administrations, & Management	Post deployment aspects of solutions based on integration services including versioning of services and upgrades.		QoS, security, administrative policies captured in specific module. No shared ability to adapt changing demand		Identifying service management methodology and declarative policy definition. Basic shared QoS and administration	Operation model for services covering deployment, maintenance, and management. Capacity planning	SLA and QoS incorporated in contracts. Policy association based on types of services	Service level performance monitoring and sophisticated exception handling. Single unified grid for all LOBs	QoS and service delivery through automated policies, resource allocation, and operations environment
Organization	Development of corporate competency around integration including the organizational structure and skills development.		Thought of Integration Services and silo perspective		Development team based on department or logical group. Architecture collectives	Cross-organization Integration EA group formation and training. Service roles & responsibilities	Active sponsorship of Integration Service and EA group. Enterprise-wide PM and BA alignments	Integration COE and reward programs. On-boarding with composite applications	Mature integration COE and organization structure. Continuous improvements
Governance	Formal use of service and integration services governance across the organization to develop, deploy, and manage business and IT services (integration solutions). Service registry policies.		Ad-hoc LOB strategy and governance		Integration Service Transformation Initiation	Common Integration Service governance Processes and life cycle	Emerging Integration Service governance and principles (registry)	Integration Service and IT governance alignment	Governance implemented using automated policies

Trends and Observations

Optimizing Availability of Discrete Integration Services
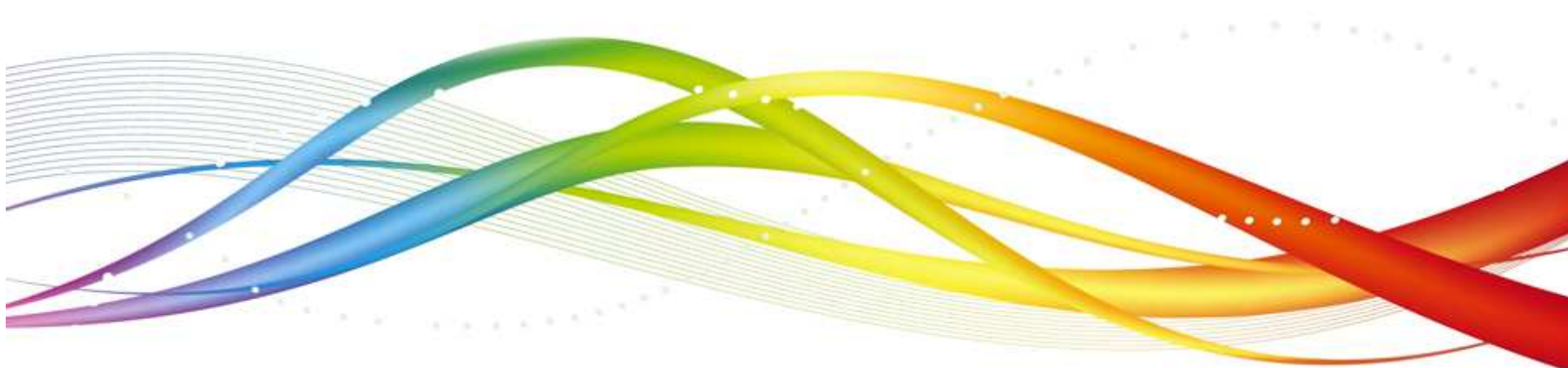
Trends

Technology Trends

- Integration features embedded in:
  - Packaged application/ SaaS
  - BI/analytics
  - BPM tools
  - Mobile AD platforms/mobile back end as a service (mBaaS)
  - API management
- API proliferation
- Application/data integration convergence
- Prepackaged integration
- Internet of Everything - Over 30 billion objects will be connected by 2020

Vendors' Landscape

- Classic "heavy duty" ESB/data Integration market slowdown
- Skyrocketing growth for "lightweight" integration platforms:
  - Open-source integration platforms
  - iPaaS (cloud-based delivery)
  - Integration SaaS (iSaaS) (citizen integrators)
- Traditional vendors repositioning
- Overcrowded market (leading to M&As)
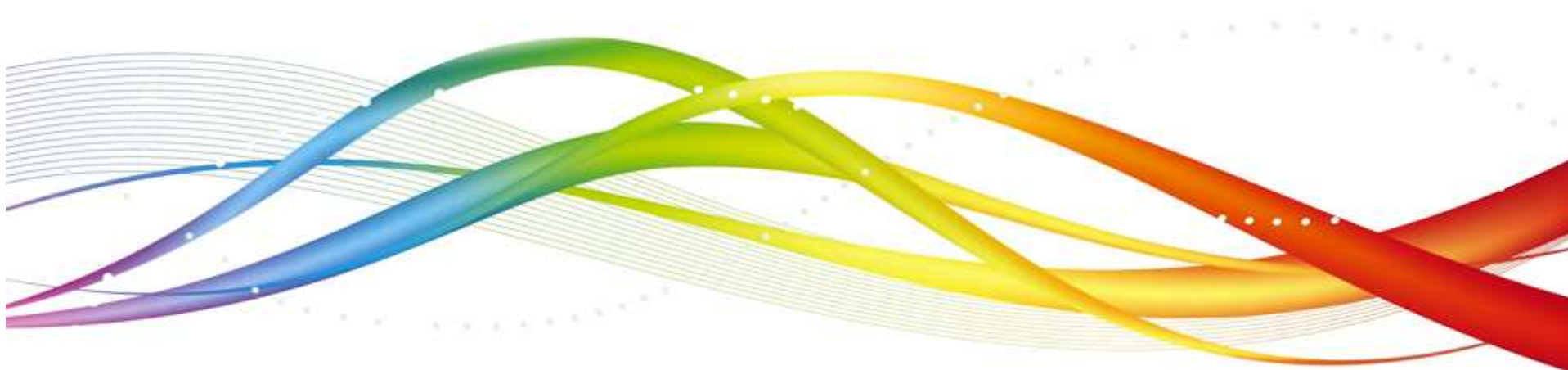- Focus on digital business operations

Key Observations

- Increased utilization of digital technologies due to new breed of competition in emerging industry segments

- Diversification in available integration solutions to address different kinds of integration problems raises need to evaluate them

- Hybrid integration platform concept is gaining momentum to accelerate operating of businesses in presence of digital technologies' advancements

- Increased offerings to pursue integration specific to LOBs, departments, customers, and service or product line

- Enablement of systematic and adaptive approaches for integration of digital technologies

Conclusions and Key References

Current R & D and Industrialization

Conclusions

✓ DIS manages and provisions upcoming digital technologies such as Internet-of-Things (IoT), Big Data, social media platform, online services, and mobile applications

✓ DISs are the means to accommodate uncertainties of business operations such that an enterprise can gain acceptable level of agility and completeness during the upgrades

✓ Capturing the way that internal and external participants of an enterprise communicates with respective to the identified when modeling DIS increases the visibility and transparency across multiple channels

✓ Microservices architecture assists enterprises by investigating the effects of digital technologies' interventions to efficiently operate businesses

✓ Diversification in business scenarios and SLAs can be associated within DIS in order for enterprises to establish processes across organization and corresponding operative digital technologies

✓ Different types of DISs determines the effect of advancements in digital technologies depending on the corresponding business processes, enterprise entities, and consumer applications

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WIPRO
Applying Thought
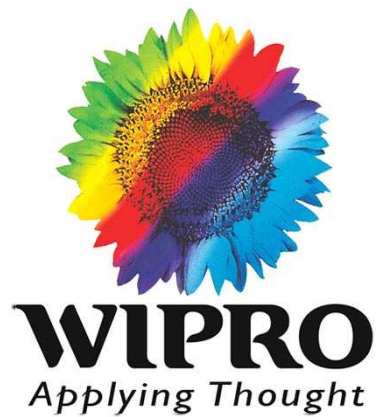
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