Digital & Modern Enterprise Architecture

An enabler for innovation and transformation

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November 2019

Agenda

- Company Introduction
- EA Practice @Vale
- Innovation Network
- Data-driven Dynamic EA

Vale: Main Line of Businesses and Indicators

Mining

Logistics

Energy

Steelmaking

World largest producer of Iron Ore
350 Million
Metric Tons / Year

World largest producer of Nickel
340,000
Metric Tons / Year

Logistics
500+ haul trucks
200+ underground equipment
15,000 km of railroads
20 ports
400+ vessels

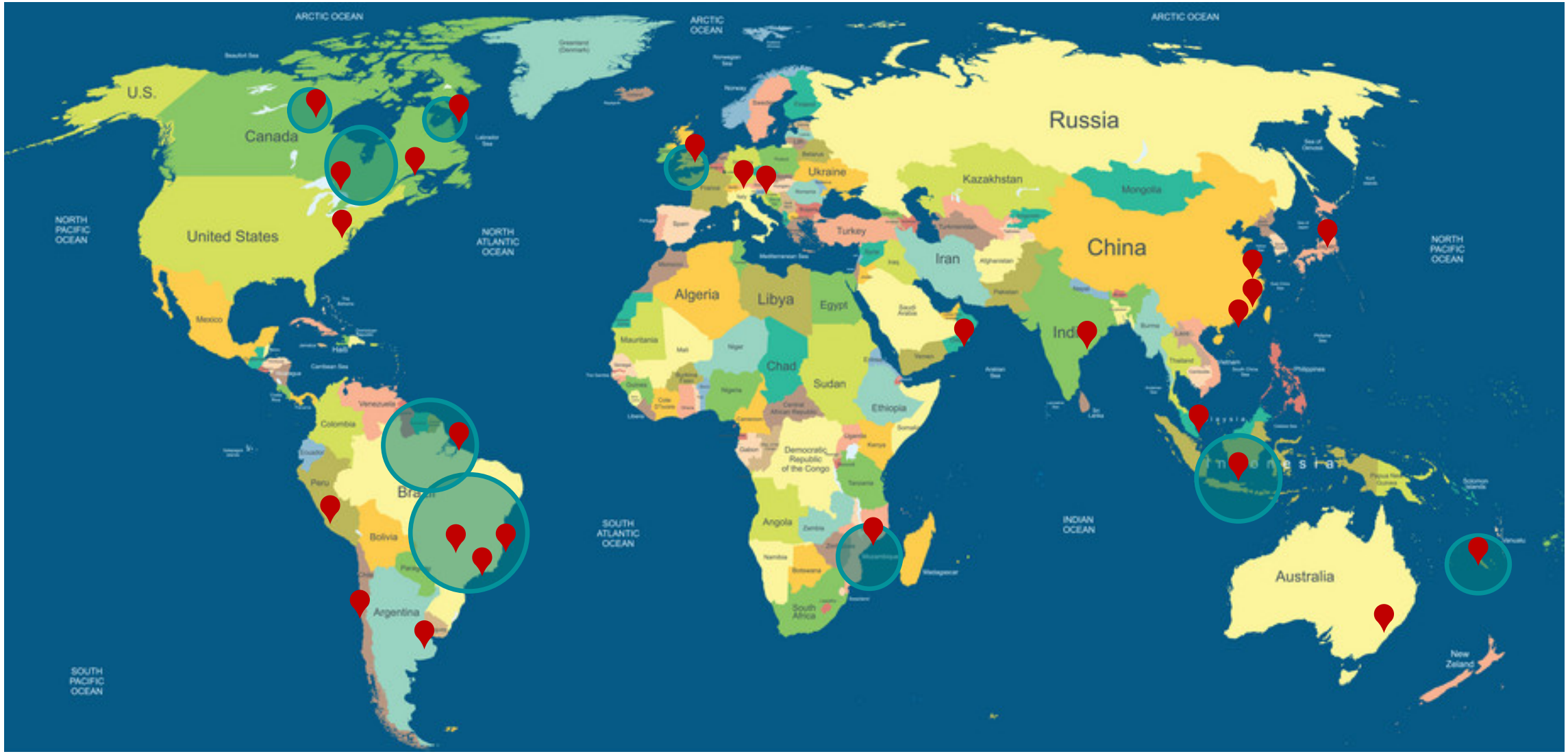
Operations & Offices in **40+** countries

120,000
Employees and Contractors

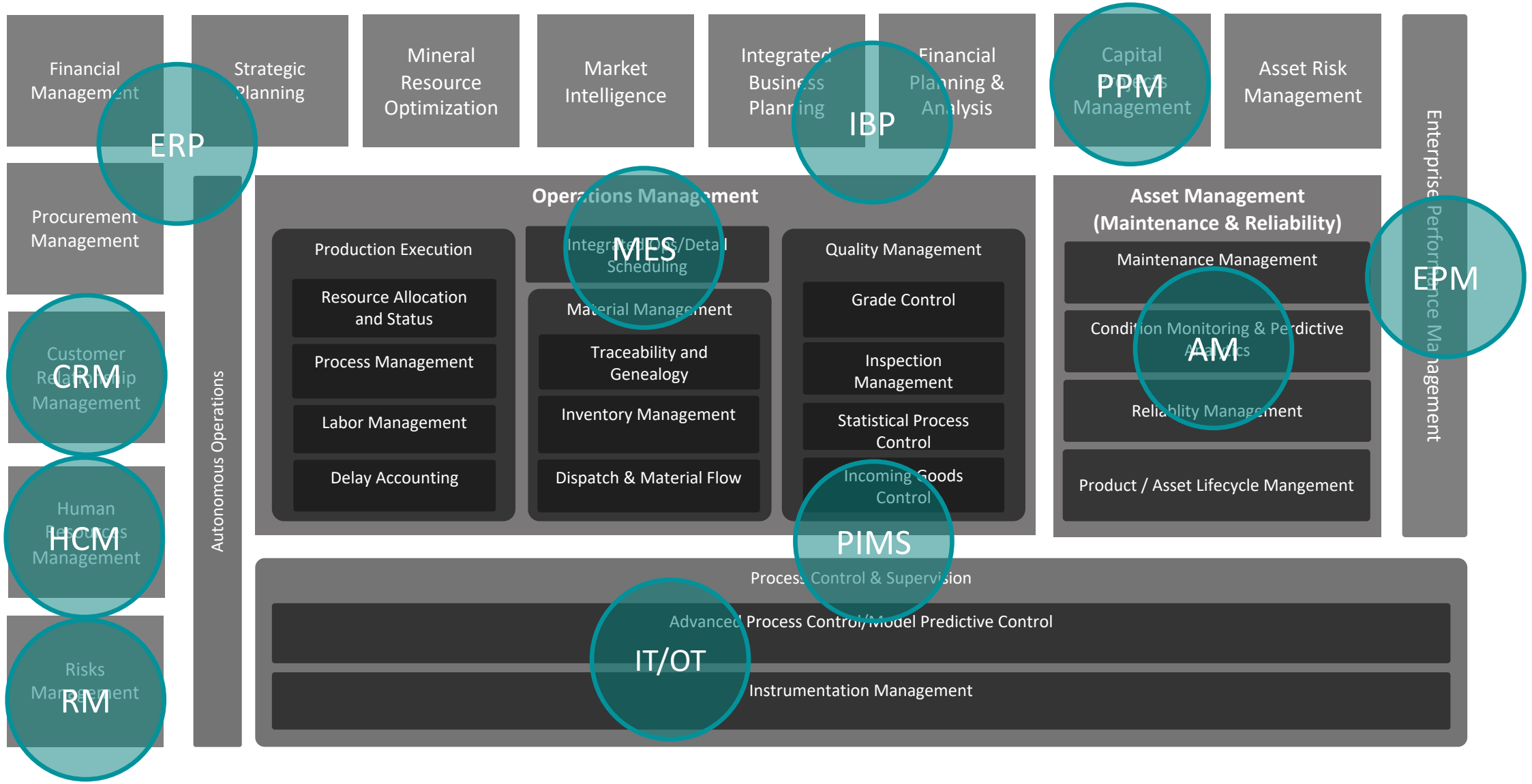
50,000+
IT Users

Sustainability
Waterless Mining
Energy Generation
Efficient Transportation
Environment regeneration

Vale: Worldwide footprint [Mining Operations, Processing Plants, Ports and Offices]



Main Business Capabilities and Solutions



Main Technical Capabilities and Platforms

Cloud Strategy Modern Applications
SAAS, PAAS, IAAS
Azure, AWS, Google

Industry 4.0
IIoT Sensors, Wifi Instruments, Robotics, Drones

Modern Applications
Micro-Service, APIs, Containers, Event Driven Architecture

Advances Analytics and AI
Machines Learning, RDL, Algorithms

Data Management
Databases, Data Lake, Info Hubs, Discovery, Self-Serve Platform

SAP Platform
SAP ECC, S4Hana, SCP, Concur, Success Factor

Citizen Development
Low and No-Code tools, Self-serve BI

Cyber-Security
IDP, Firewalls, DMZ, GDPR

Network
SDN, Global Regional Hubs, CDN

DevOps
DevSecOps
CI/CD, Security

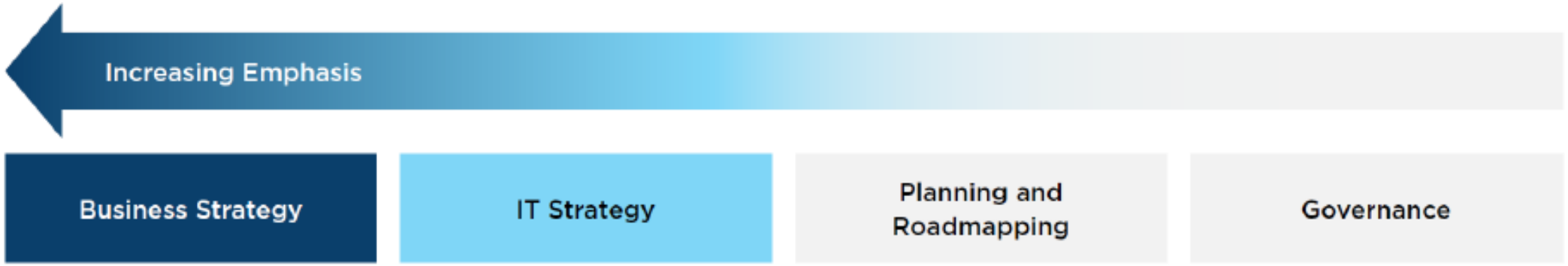
End User and UX
Mobile Devices, VDI, Wearables, AR/VR

Collaboration
Portals, Messaging VC, Emails, SMS

EA Practice @Vale

EA: Shift from Governance to Strategic Focus

[Source: Gartner/CEB]



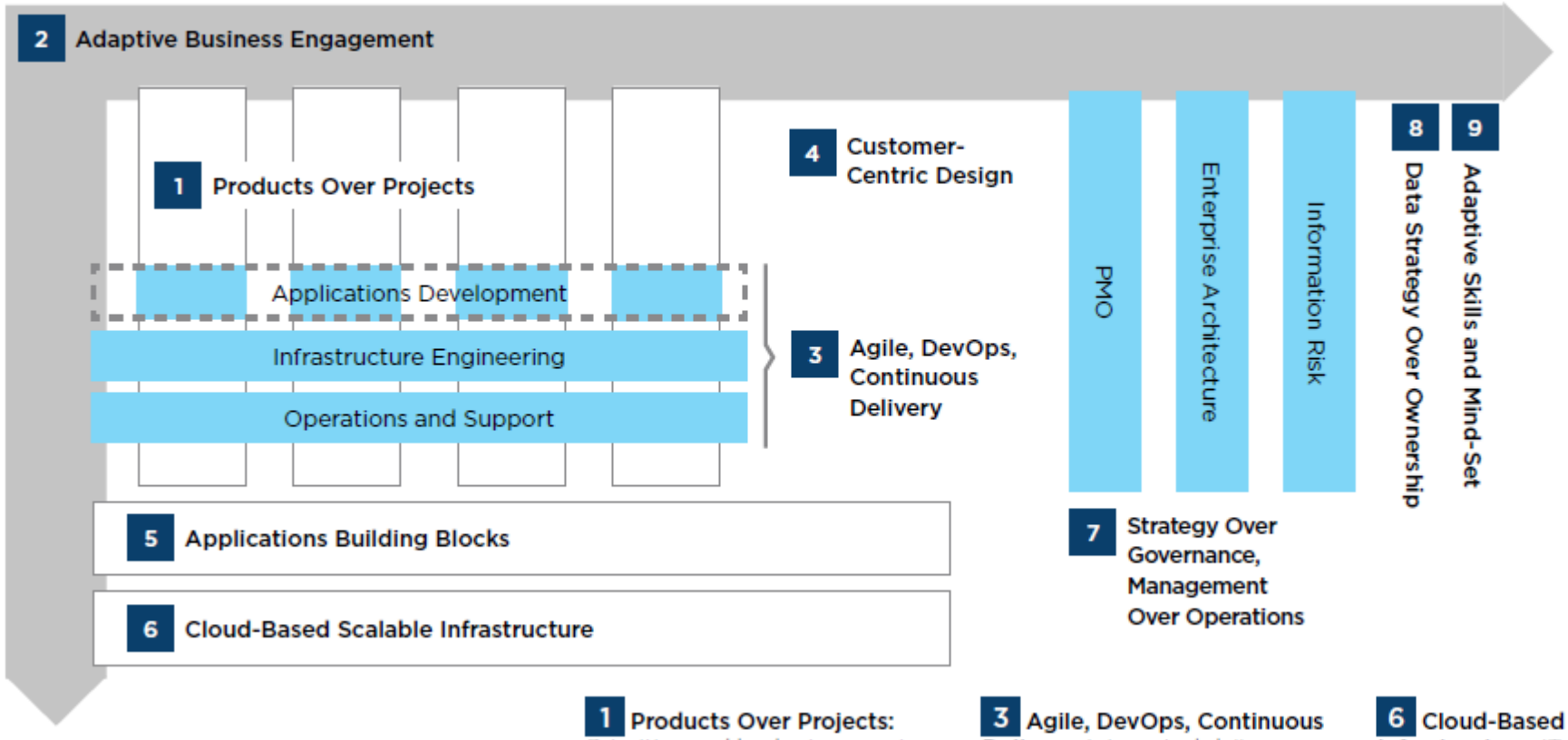
Emerging Focus

1. Manage Business Architecture
2. Demonstrate Digital Opportunities to Business Leaders
3. Facilitate Digital Strategy Decisions
4. Bring the Customer-Experience Lens to IT
5. Provide Digital Business Model Consulting
6. Support Business Transformation
7. Design IT Strategic Plan
8. Assess Vendors
9. Introduce New Technologies
10. Manage Information Architecture
11. Accelerate Agile Adoption
12. Design IT Workforce Plan
13. Conduct IT Talent Assessments

Traditional Focus

14. Assess Current-State IT Environment
15. Develop Future-State IT Architecture
16. Set Technology Standards
17. Develop and Maintain Roadmaps
18. Support IT Portfolio Modernization
19. Promote Standards Adherence
20. Support Project Delivery
21. Review Solution Designs
22. Provide Solution Designs (Solutions Architecture)
23. Manage Reference Architecture
24. Manage Integration (SOA, API, etc.)

IT Operating Model: Key Features
[Source: Gartner/CEB]



1 Products Over Projects: Priorities and budgets are set for business capabilities and products, not projects.

2 Adaptive Business Engagement: Business engagement approach flexes based on business context.

3 Agile, DevOps, Continuous Delivery: Integrated delivery, engineering, and support boost responsiveness and output.

4 Customer-Centric Design: Customer-journey mapping is used to guide design.

5 Applications Building Blocks: APIs, platforms, data, and reusable services reduce effort and accelerate delivery.

6 Cloud-Based Scalable Infrastructure: IT automation and cloud platforms cuts time to scale.

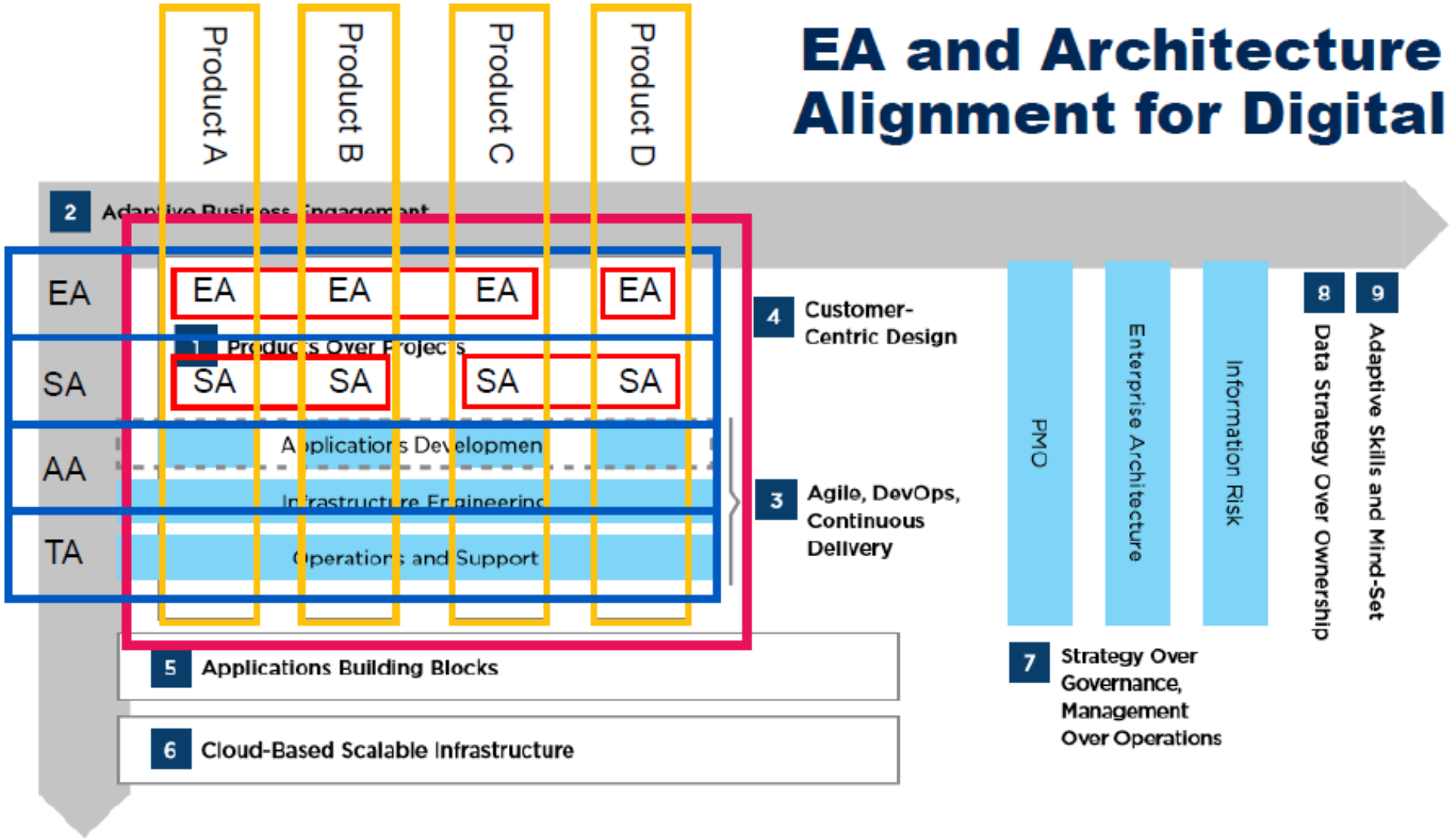
7 Strategy Over Governance, Management Over Operations: Central groups refocus on facilitating strategy, innovation, change, and enterprise data.

8 Data Strategy Over Ownership: Coherent strategy and guidelines around data allow for rapid exploitation by distributed teams.

9 Adaptive Skills and Mind-Set: Staff become technically versatile, collaborative, and open to innovation.

From Projects to Products & Products Lines

[Source: Gartner/CEB]



Vale Innovation Network

Lean + **Agile**

Remove waste

Balance production capacity

Promote relentless improvements

Empowering teams

Focus in continuous value delivery

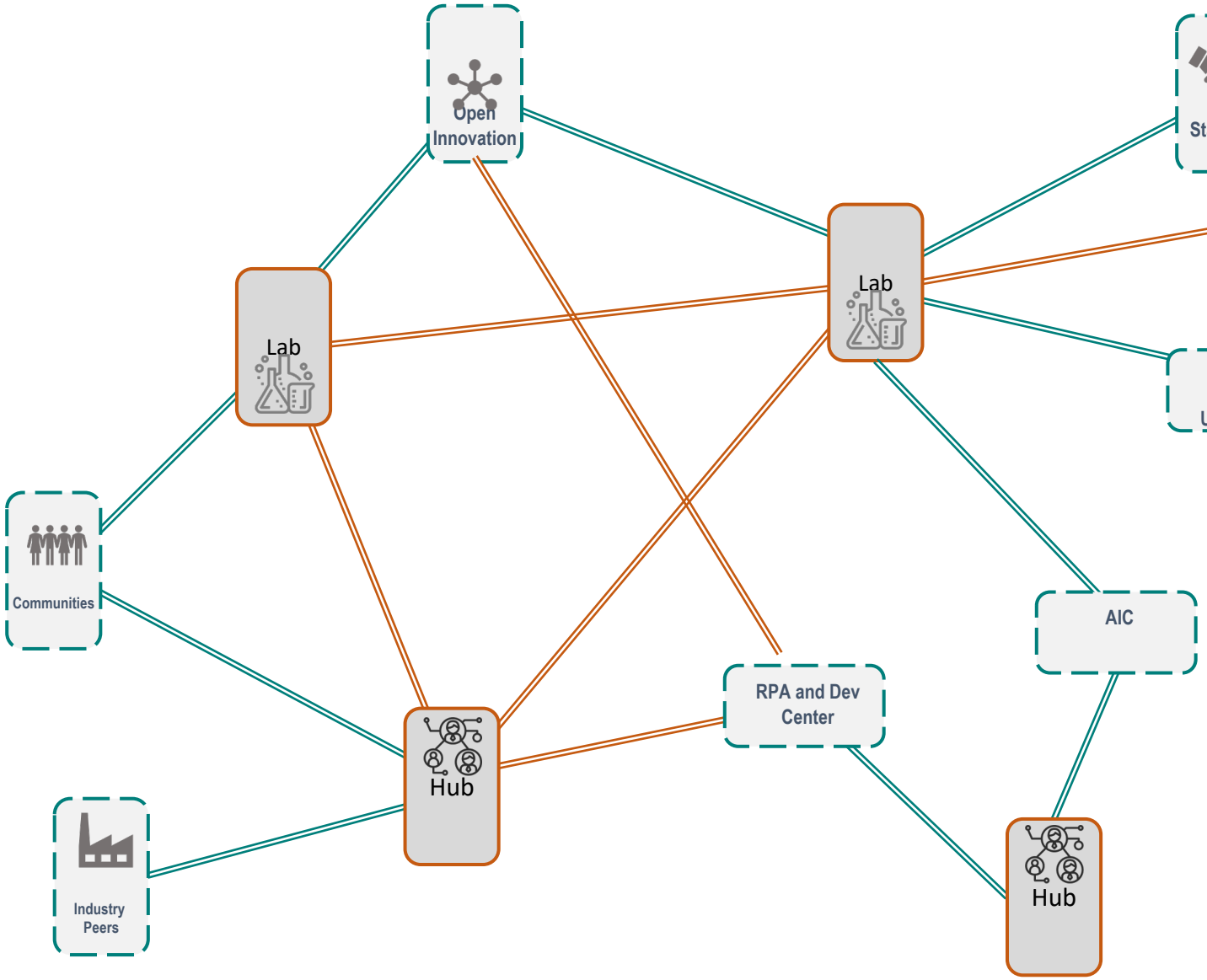
Learn while doing

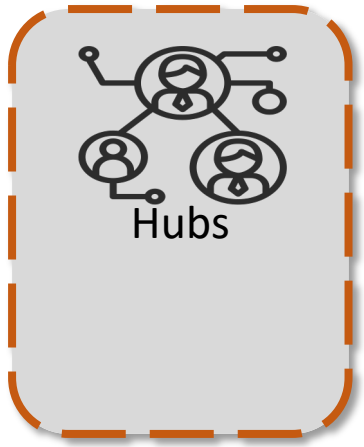
Shortening the feedback loops

Visual management

Break down Silos

Vale Innovation Network > Hubs and Nodes





Innovation Hubs

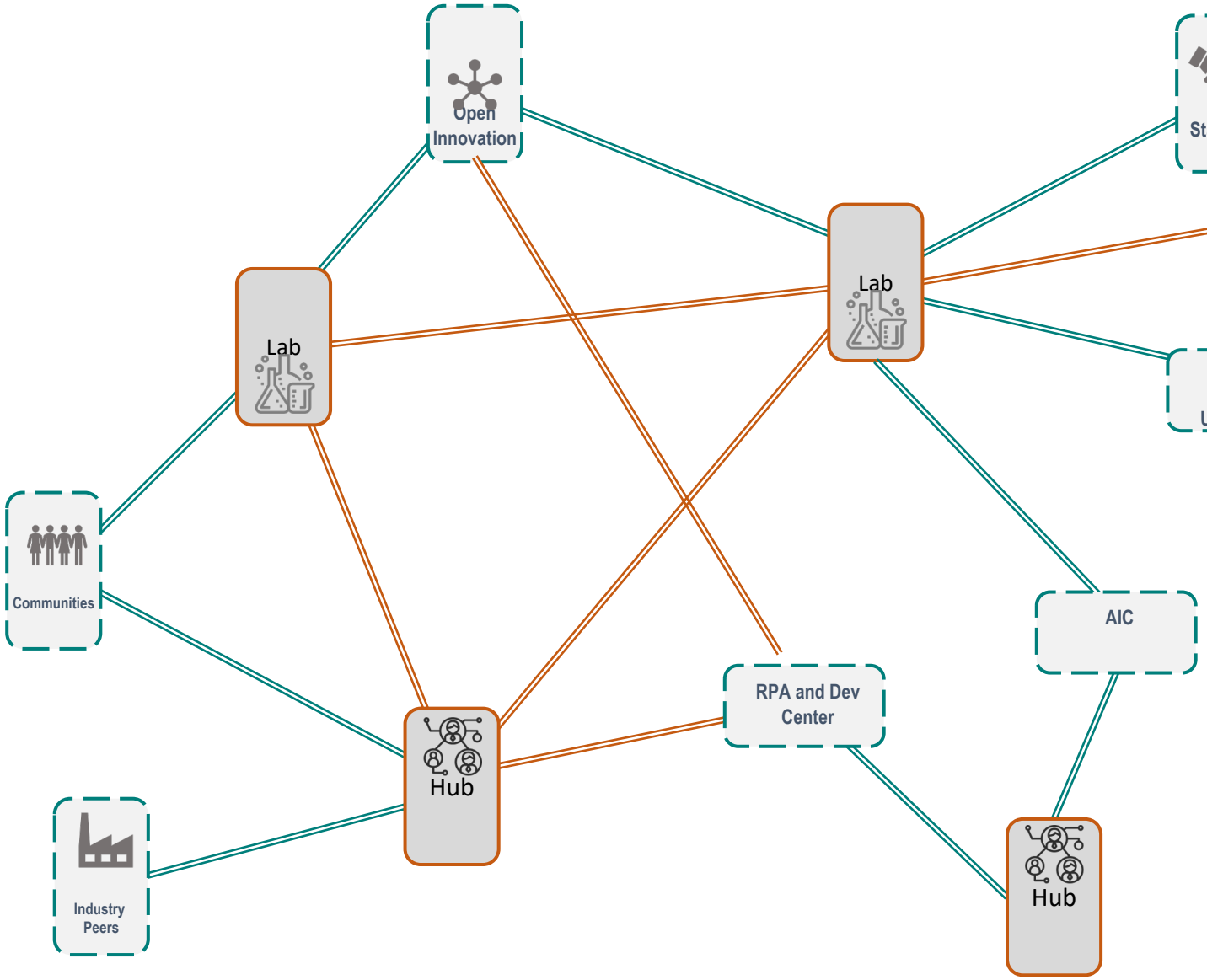
Business connection

Problem definition

Design thinking

Collaboration

Vale Innovation Network > Digital Labs

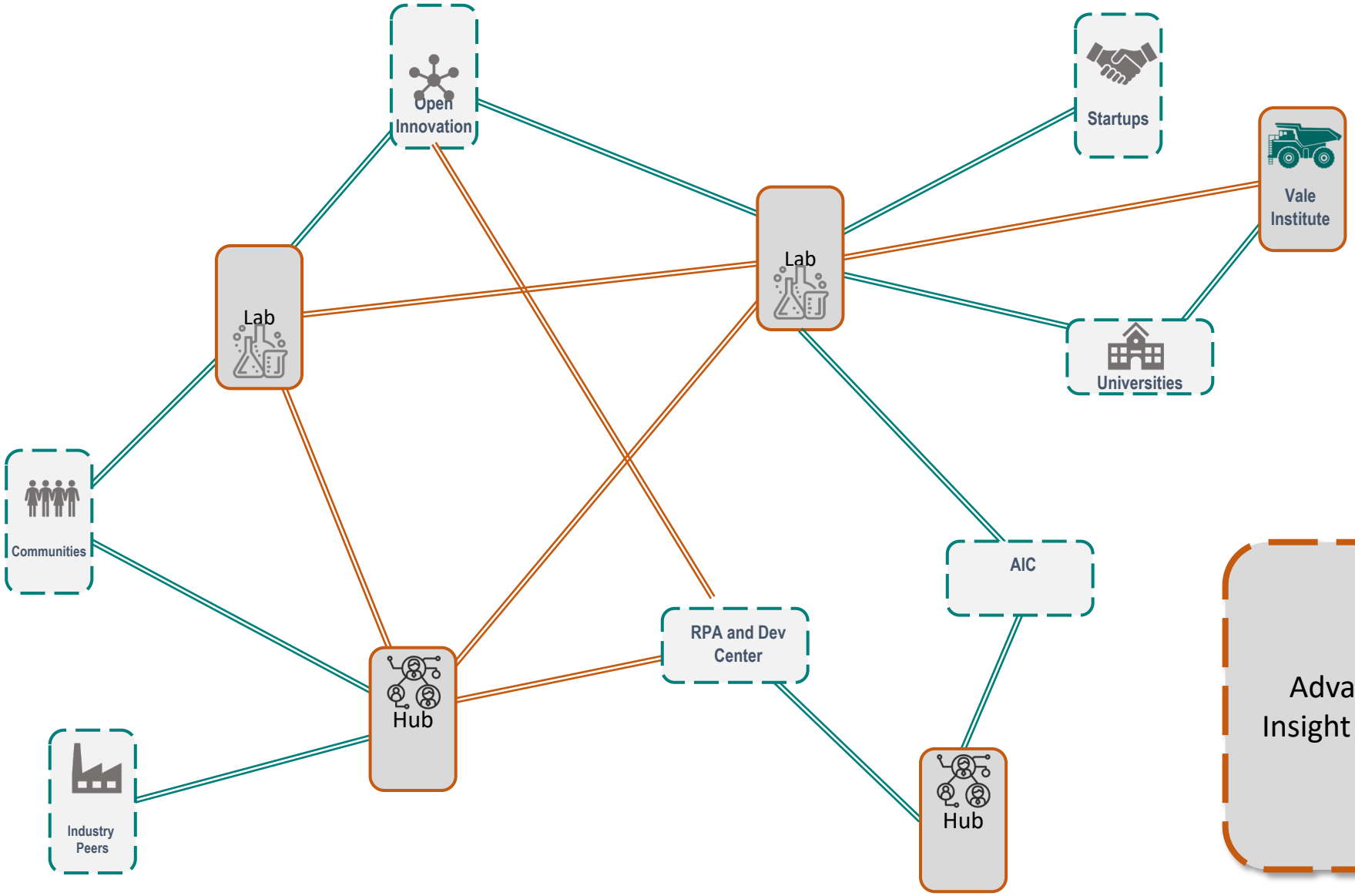


Digital Labs

Digital Labs

Experimentation
Greenhouse process
Prototyping
Envisioning
Open innovation

Vale Innovation Network > Advanced Insights Center

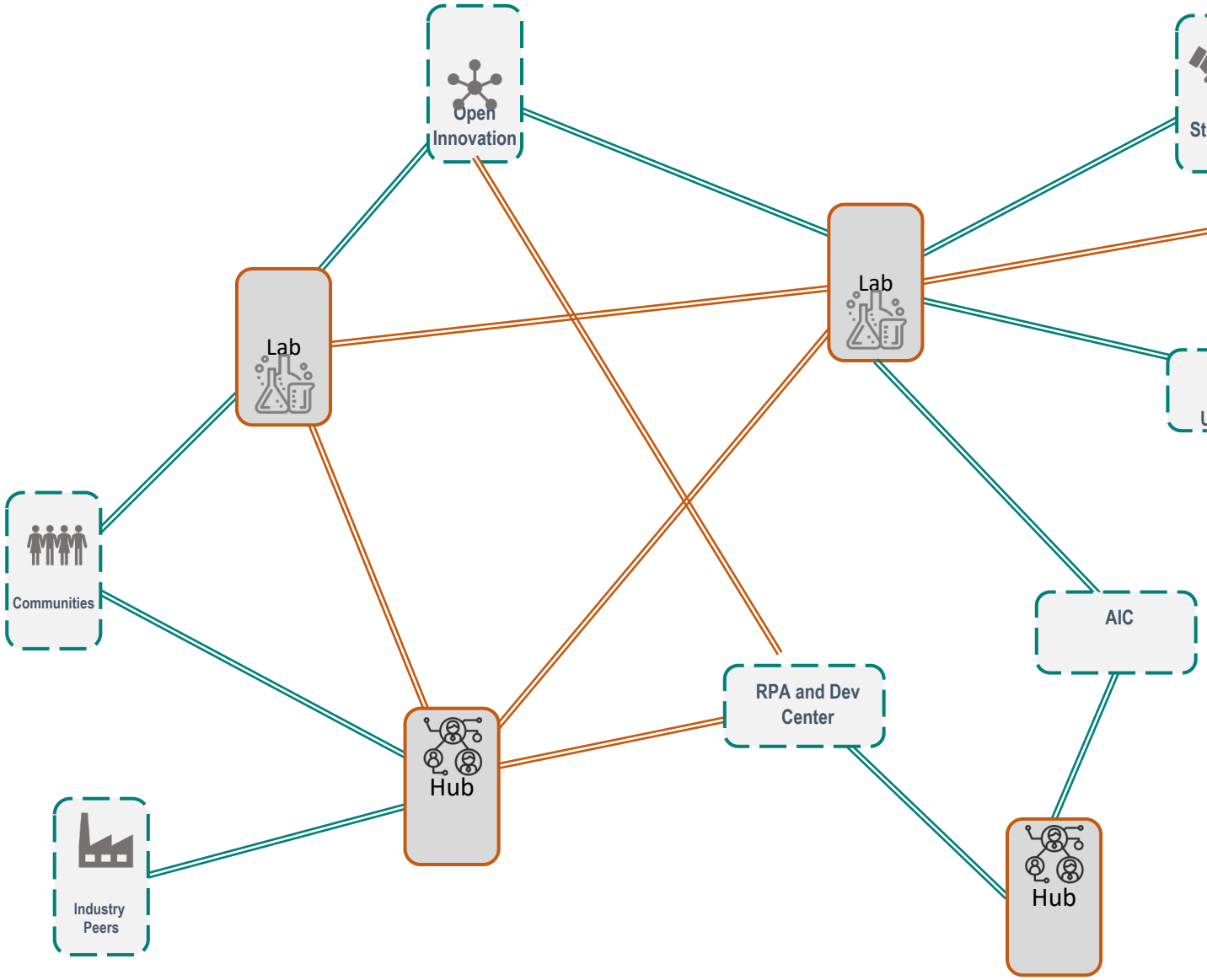


Advanced Insight Center

AIC

Data Science
Algorithms
Machine Learning
Advance Analytics

Vale Innovation Network > Dev Centers and RPA

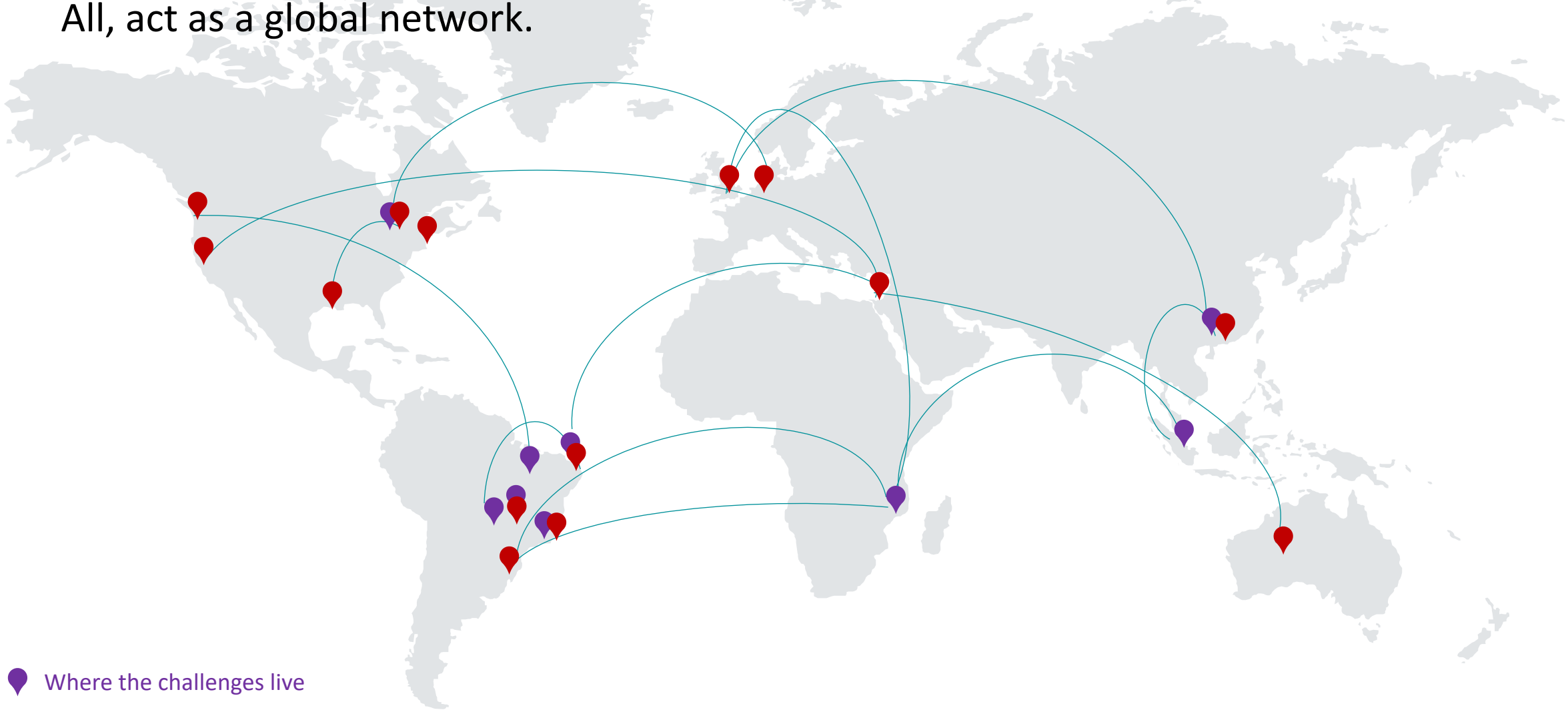


RPA
Dev Center

RPA & Dev Center

Process Automation
Mobile Dev Apps
Agile and Devops

Innovation Hubs are regional, close to the problems.
Digital Labs are distributed by affinity with hot technology regions or central cities.
All, act as a global network.

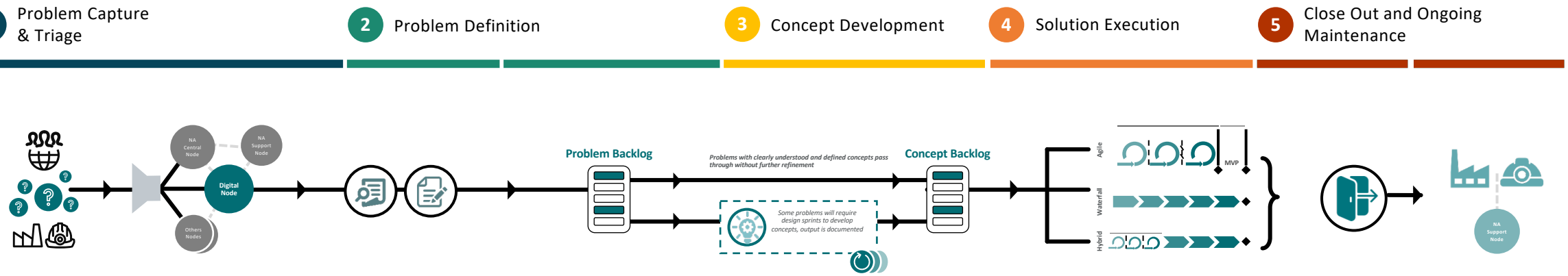


Where the challenges live

Where the experts & startups live

Innovation Network: Overall Operating Model and End-to-End lifecycle

The End-to-End (E2E) lifecycle has five stages which provide guidance on how to capture problems through to solution delivery and integration.



Problem Capture	Triage & Prioritize Problems	Form Team	Research	Prioritize Problems	Re-evaluate Team	Concept Development	Prioritize Concepts	Re-evaluate Team	Deliver Solutions	Validate and Integrate Solutions	Close the Problem

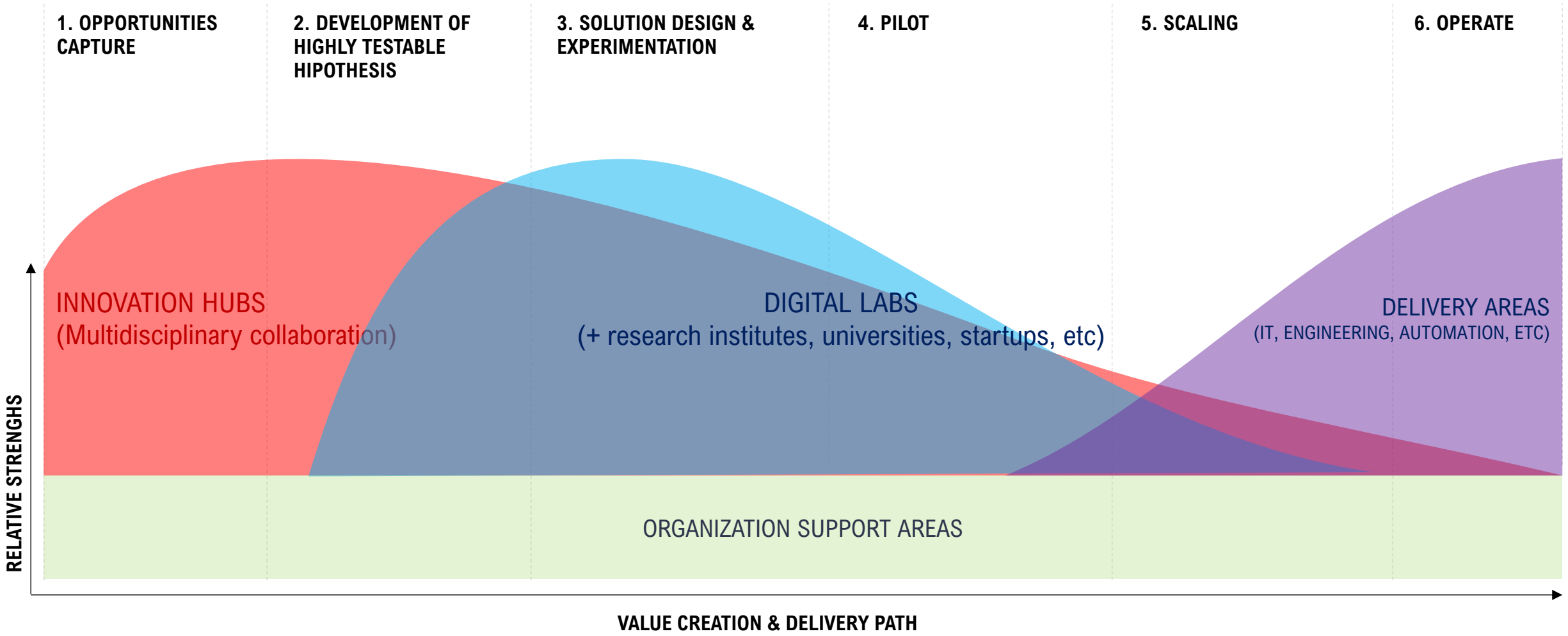
- Identify problems at a high level
- Specify which Node should be solving the problem and which problems should be prioritized for further research
- Identify the Problem Sponsor, Problem Owner and team for prioritized problems

- Gather insights to understand end-user goals and measure the viability of solving problems
- Prioritize which problems to enter concept development
- Form teams for concept development of prioritized problems

- Create and prioritize concepts
- Identify the desirability of concepts through rapid prototyping
- Identify the feasibility of concepts through proof of concepts (POCs)
- Prioritize concepts for solution delivery

- Choose the best methodology for solution delivery
- Form teams for solution delivery
- Follow a guiding framework for each solution delivery methodology

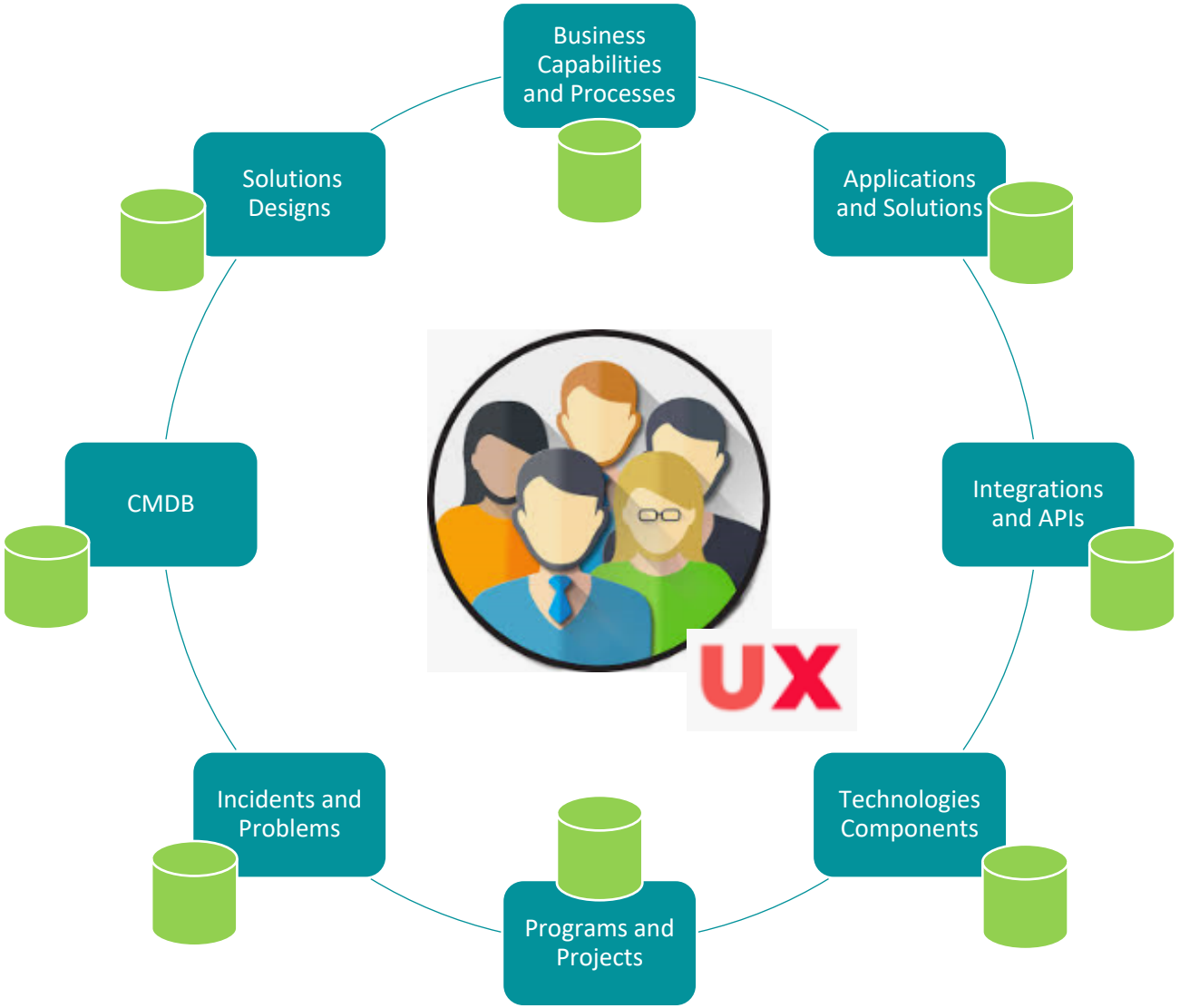
- Transfer solution ownership to a support team
- Monitor the continued business value of each solution


1. OPPORTUNITIES CAPTURE
2. DEVELOPMENT OF HIGHLY TESTABLE HIPOTHESIS
3. SOLUTION DESIGN & EXPERIMENTATION
4. PILOT
5. SCALING
6. OPERATE
INNOVATION HUBS
(Multidisciplinary collaboration)
DIGITAL LABS
(+ research institutes, universities, startups, etc)
DELIVERY AREAS
(IT, ENGINEERING, AUTOMATION, ETC)
ORGANIZATION SUPPORT AREAS
RELATIVE STRENGHS
VALUE CREATION & DELIVERY PATH

Digital Architecture

From Documents to Data-Driven

Digital Architecture: From Static Documents to Data-Driven Repositories



- Democratization of data/information
- Visibility and Insights
- Simple governance
- Data quality
- Systems of Record
- Single source of truth
- User friendly and UX
- Many-2-Many Relationships
- APIs with external systems
- Configurable reports and dashboards
- Extended features and functions
- Dynamic data-driven blueprints
- Use for decision making,
- Collaborative real-time design


VALE