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Semantic Web Government Wide: Enterprises, Projects and Initiatives

Fusing Visions to Achieve Organizational Transformation, Advanced Knowledge Management (KM) with Advanced Service Oriented Architecture (SOA)

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Briefing Objectives

- Present a framework vision for discussion … orchestrated implementation of advanced knowledge management, web services, and Semantic technology
- Relate vision to national security programs
- Suggest a concurrent crawl, walk, run implementation strategy

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Architectural Principles

- **Mission focus** means that the mission life of information drives the technical enablers, and is based on the recognition that all knowledge starts and ends in the human mind
- **Net-centric effects** means exponentially speeded communication of decisions, news, ideas, skills and attributes through technology-enabled capability generation, information sharing and problem solving networks
- **Simplicity** means that one chooses whenever possible the simplest solution to implement.
- **Modularity** means that those who provide technical solutions avoid trying to build software that does everything, opting instead for components that do “one thing well so that they can be re-used in unanticipated ways.”
- **Loose coupling** means that components know “as little as possible about one another, allowing components to be interchanged and upgraded as needed.”
- **Emergent behavior** points to the way that “surprising possibilities” open up “when simple, modular, loosely coupled components are connected and re-used in new ways."

Advanced Knowledge Management

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2nd Generation KM … Knowledge Making

- Creating new knowledge
- Generate the right solutions, knowledge, skills and abilities
- Human Focus
  - People (Human Capital)
  - Relationships (Social Capital)
  - Processes (Knowledge and Business)
  - Cognitive modes (especially experiential and reflective cognition)
- Advanced Service-Oriented Architecture to liberate people for optimal collaborative behavior and experiential and reflective cognition

Demand-side KM … the Agent

1st Generation KM … Knowledge Sharing

- Sharing what is known
- Get the right information to the right person at the right time
- IT Focus

Supply-side KM … the Artifact

Partners in Transforming Agencies into Adaptive Learning Organizations

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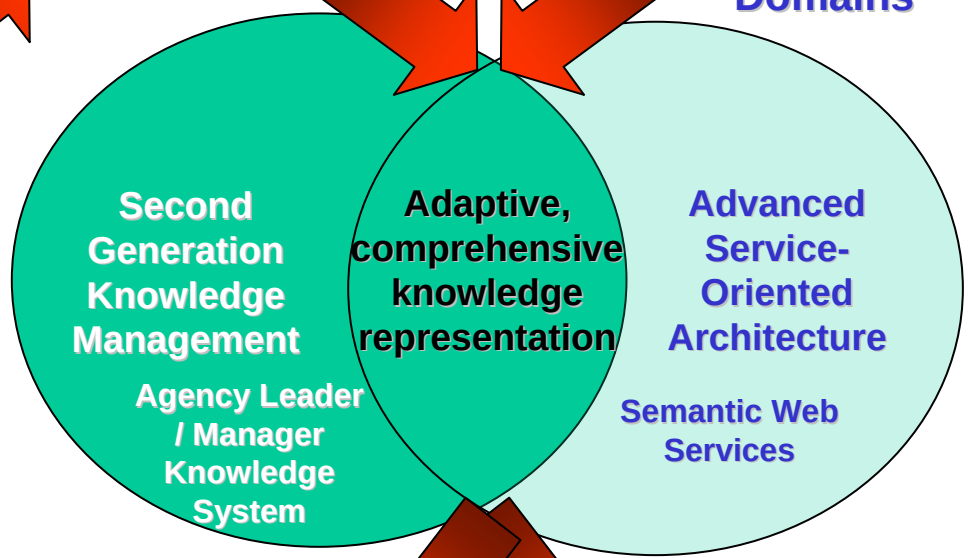
Operational Situations

Nested Knowledge Domains

Complex, rapidly changing operational environment "creating both more hazards and opportunities for everyone"

Quotation from John P. Kotter, *Leading Change* (Boston, Massachusetts, 2003), p. 18



Mobilizing human and social capital to enable Semantic Technology, which in turn liberates and empowers human creativity in the organization of the future

Enhanced knowledge making, integration and use

Smart data and smart web services

Avoid Hazards

Transformed Knowledge Process

Transformed Business Process

Seize Opportunities

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What is an Agency Leader / Manager Knowledge System?

An Agency Leader / Manager Knowledge System (ALMKS) – Is a networked system of Structured Professional Forums (SPFs) providing agile dominant *Learning*, *Teaching, Decision-making, Leadership* and *Management* capabilities to <u>produce high- performing and adaptive Leader / Management Teams</u> (LMTs) within an adaptive Teaching Organization

$$\text{Competitive Effectiveness} = f(P + O + A) \times (LM \times LE)^{T \times E1 \times E2}$$

Based on Emerging Army Model … Battle Command Knowledge System

P: Policies, Rules, Practices
O: Organization
A: Assets

LM: Leader/Managers
LE: Leader/Employee
T: Training
E1: Education
E2: Experience

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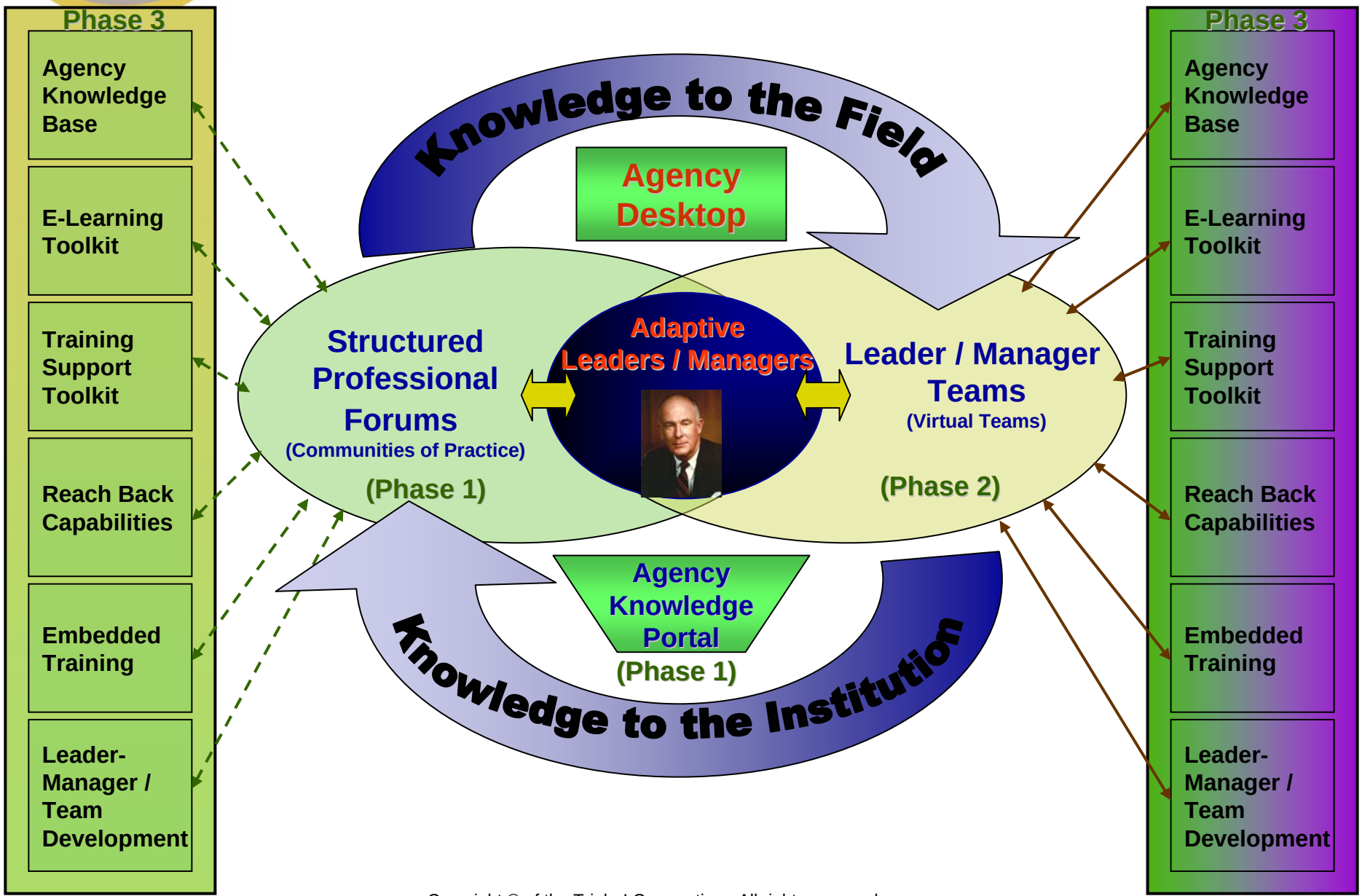
Overall Purpose of an Agency Leader / Manager Knowledge System Knowledge System?

Generate and apply solutions and capabilities (knowledge, skills and attributes) faster and more effectively than the operational environment can generate dilemmas, challenges and opportunities

Anticipate and Avoid Hazards!

Anticipate and Seize Opportunities!

Agency Leader / Manager Knowledge System



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The Knowledge Process … Agency Leader / Manager Knowledge System

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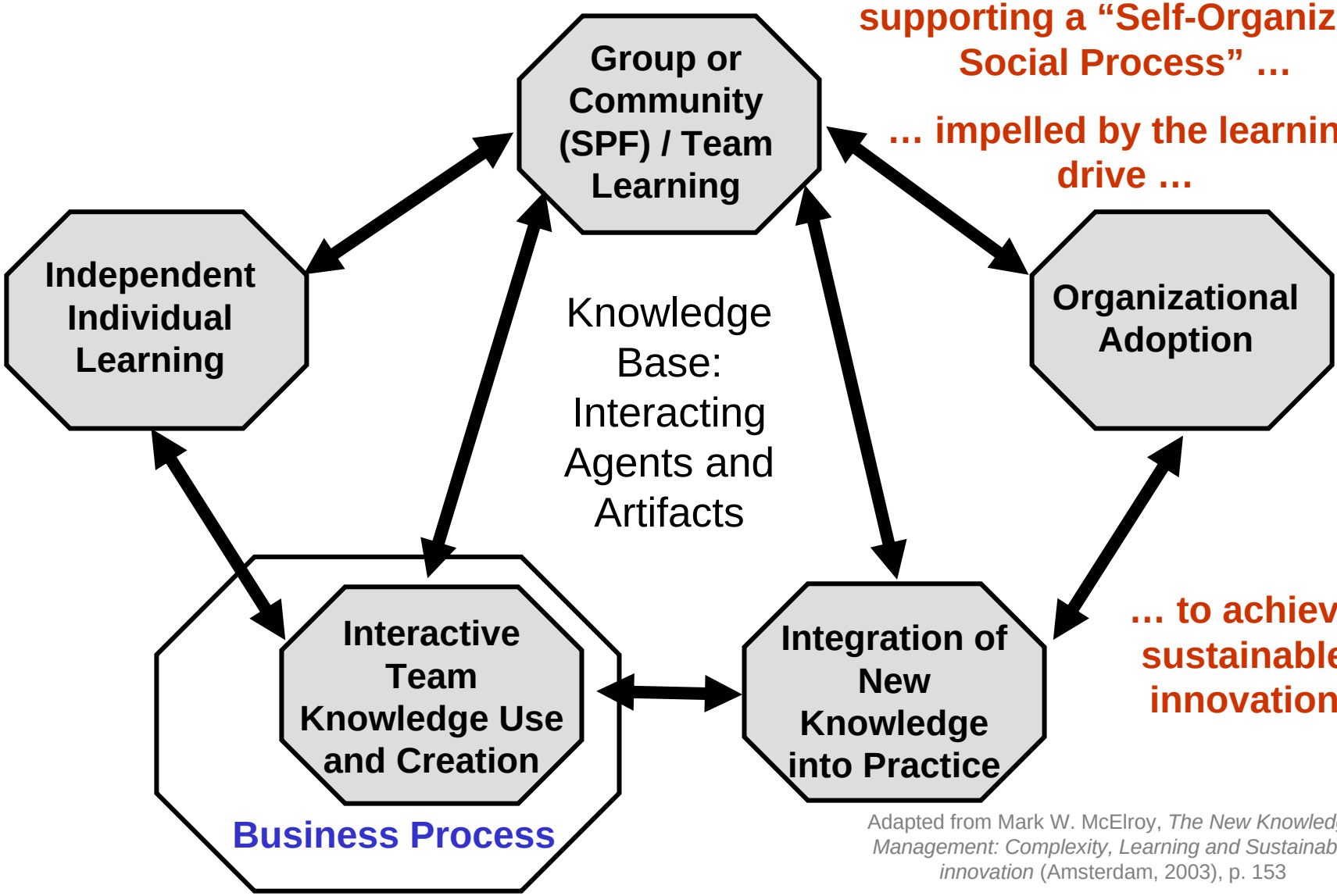
Cultivating, enhancing and supporting a "Self-Organizing Social Process" …

… impelled by the learning drive …



… to achieve sustainable innovation

Adapted from Mark W. McElroy, *The New Knowledge Management: Complexity, Learning and Sustainable innovation* (Amsterdam, 2003), p. 153

Personal KM for Self-Directed, Individual Self-Development: Action Elements for Independent Individual Learning

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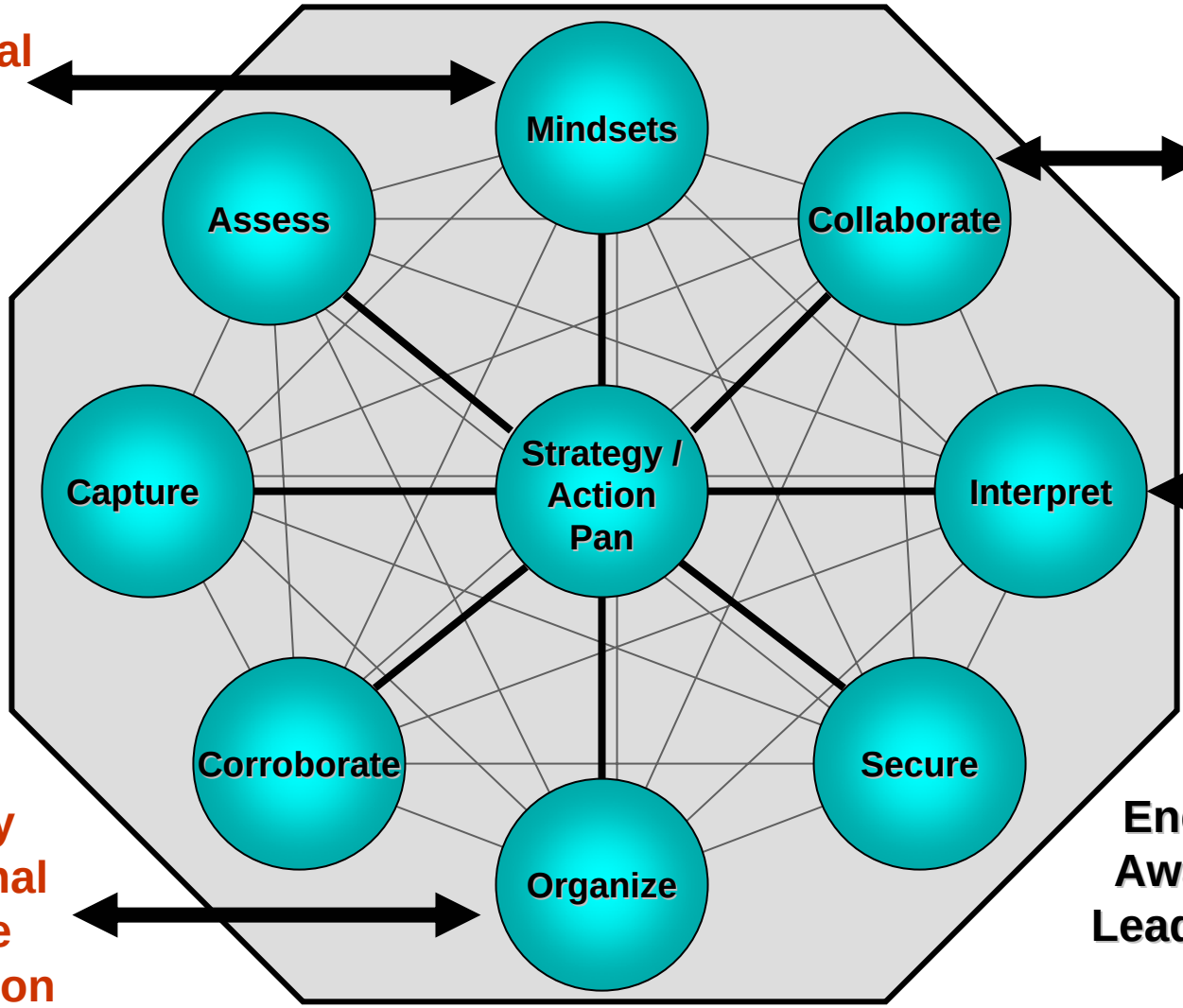
Organizational Culture

Double Knit Structured Professional Forums and Virtual Teams



Reflect on Implicit Patterns, Define Taxonomy

Apply Community Organizational Knowledge Representation

End State: Self-Aware, Adaptive Leader / Managers

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Adapted from Todd R. Groff and Thomas P. Jones, *Introduction to Knowledge Management* (Amsterdam, 2003), especially pp. 11-67

Knowledge Representation for an Agency Leader / Manager Knowledge System

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- **The design and implementation of languages and systems that represent knowledge about the world.**
- **A knowledge representation therefore is a stand-in for real objects in the world, and the events and relationships that real things participate in.**
- **Ontology forms the centerpiece of ALMKS knowledge representation strategy.**
- **Ontology, which builds out from rigorously executed taxonomy, defines the common words and contexts (the meaning) used to describe and represent an area of knowledge.**
- **When written in machine-readable form, ontology governs the context and metadata required for effective knowledge discovery, production and application in decision-making and leadership.**
- **It forms a necessary precondition for the seamless interoperability and connectivity required in the net-centric approach**
- **Effective knowledge representation arms leader / managers with intelligent, interoperable information, web services (software applications that can be discovered, described, and accessed based on XML and standard Web protocols over intranets, extranets, and the Internet), and the online access points to the right expertise for any mission or challenge.**

Adapted from Michael Daconta, Leo Obrst, and Kevin Smith

What are Structured Professional Forums (SPFs)?

- They are groups or networks of people … who share a concern, a set of problems, or a passion about a topic, … and who generate and share understanding, solutions and capabilities (knowledge, skills and attributes) in this area … by interacting on an ongoing basis
- These interactions are structured into the organization's operations to support and transform the way it does business
- The groups are communities, the areas in which they interact are their domains, and the understanding, solutions and capabilities they generate constitute the practice
- They are also known as structured communities of practice (CoPs)

Elements: Structured Professional Forum (Structured Community of Practice)

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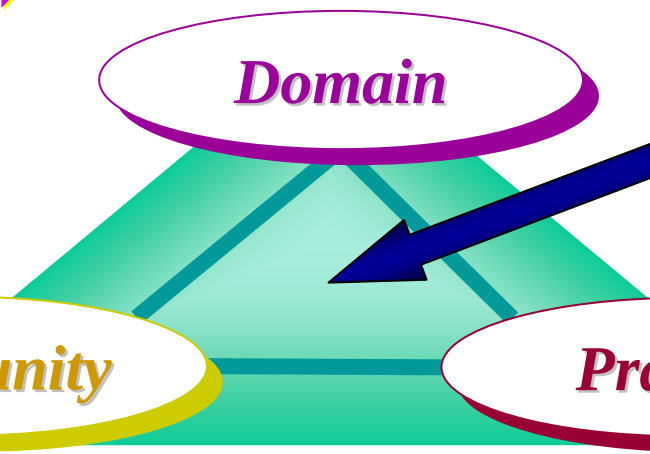
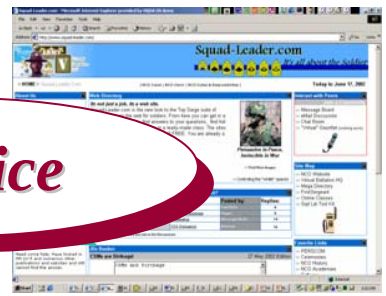
Groups of people (communities) who share a concern, a set of problems, or a passion about a topic (domain), and who deepen their knowledge and expertise in this area (practice) by interacting on an ongoing basis

For Example, West Point

Conventions governing internal processes and structuring the SPF into the business of the organization, especially action learning, training and operations ... and ontology definition





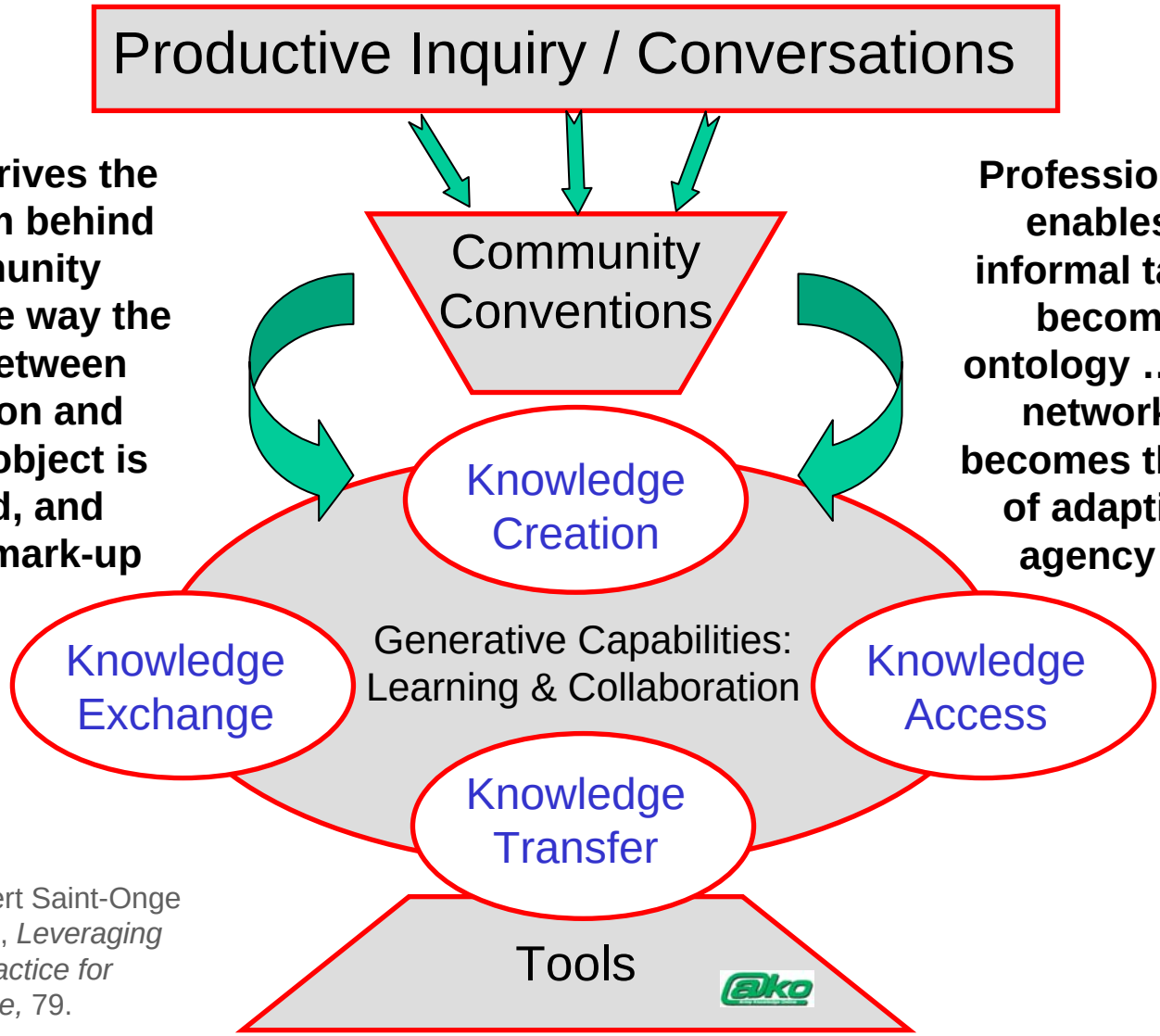
Agency Contracted KM Expert, Resources

Adapted from Etienne Wenger

What Drives Structured Professional Forums (SPFs)?

- **The structured professional forums are driven by constructive conversations … usually begun by productive inquiries (comprised of questions or observations) from practitioners … requiring or offering support in making a decision or performing tasks, or striving to expand or share their expertise**
- **These forums support lifelong learning, leader and leader team development, advancement of the practice, decision-making, and performance**
- **They acquire much of their power from the fact that learning and teaching is embedded in doing**
- **While a single structured professional forum adds value, a network of such forums gives an organization a decisive competitive advantage through modular, adaptive adjustments to foreseen and unanticipated change**

Knowledge Architecture: Structured Professional Forum (Structured Community of Practice)

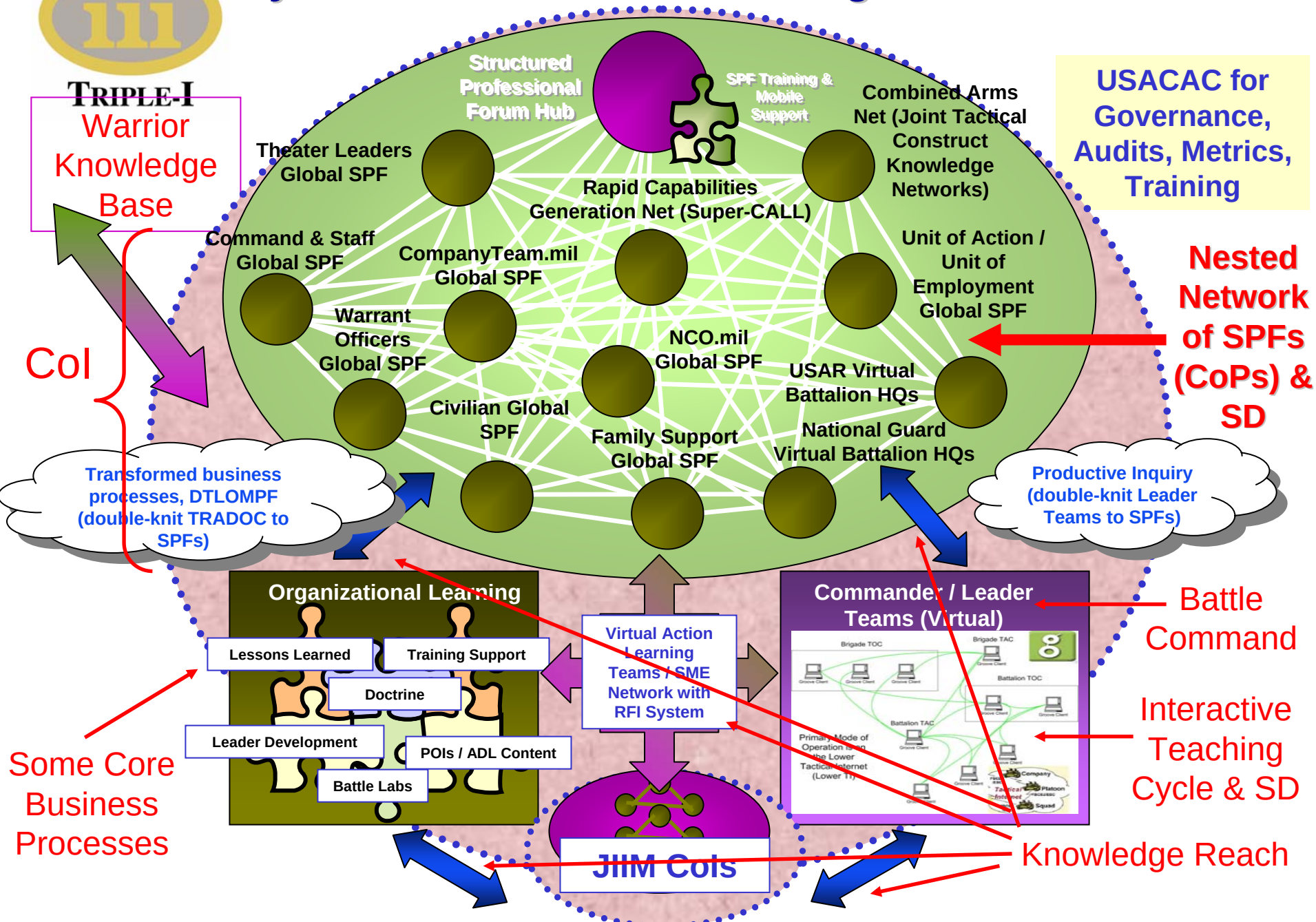


Taxonomy drives the way the team behind the community organizes, the way the interplay between conversation and knowledge object is structured, and metadata / mark-up

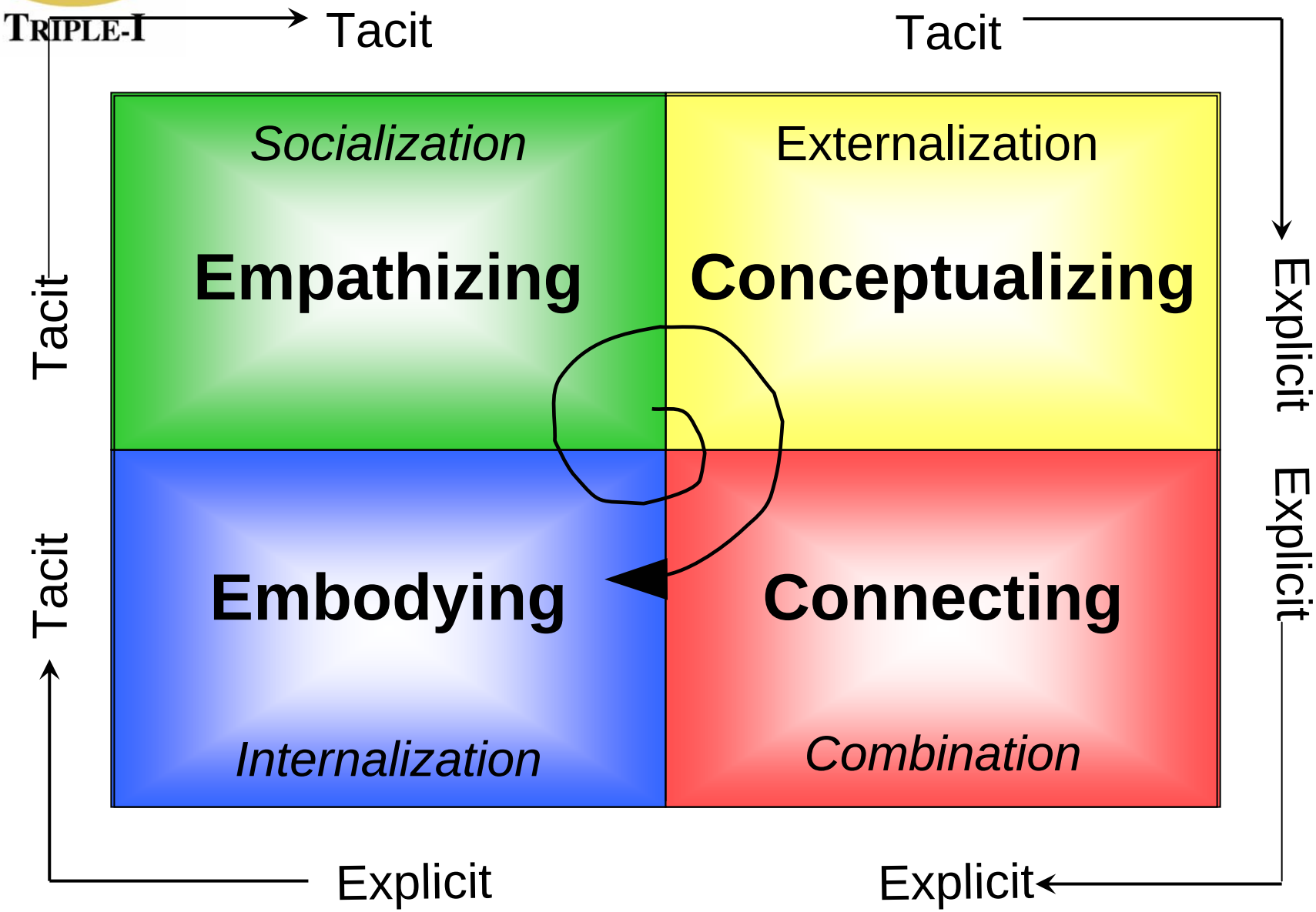
Professional support enables natural, informal taxonomy to become formal ontology … the nested network of SPFs becomes the incubator of adaptive nested agency ontology

Adapted from Hubert Saint-Onge and Debra Wallace, *Leveraging Communities of Practice for Strategic Advantage*, 79.

Army's Nested SPF Network: High-Level View

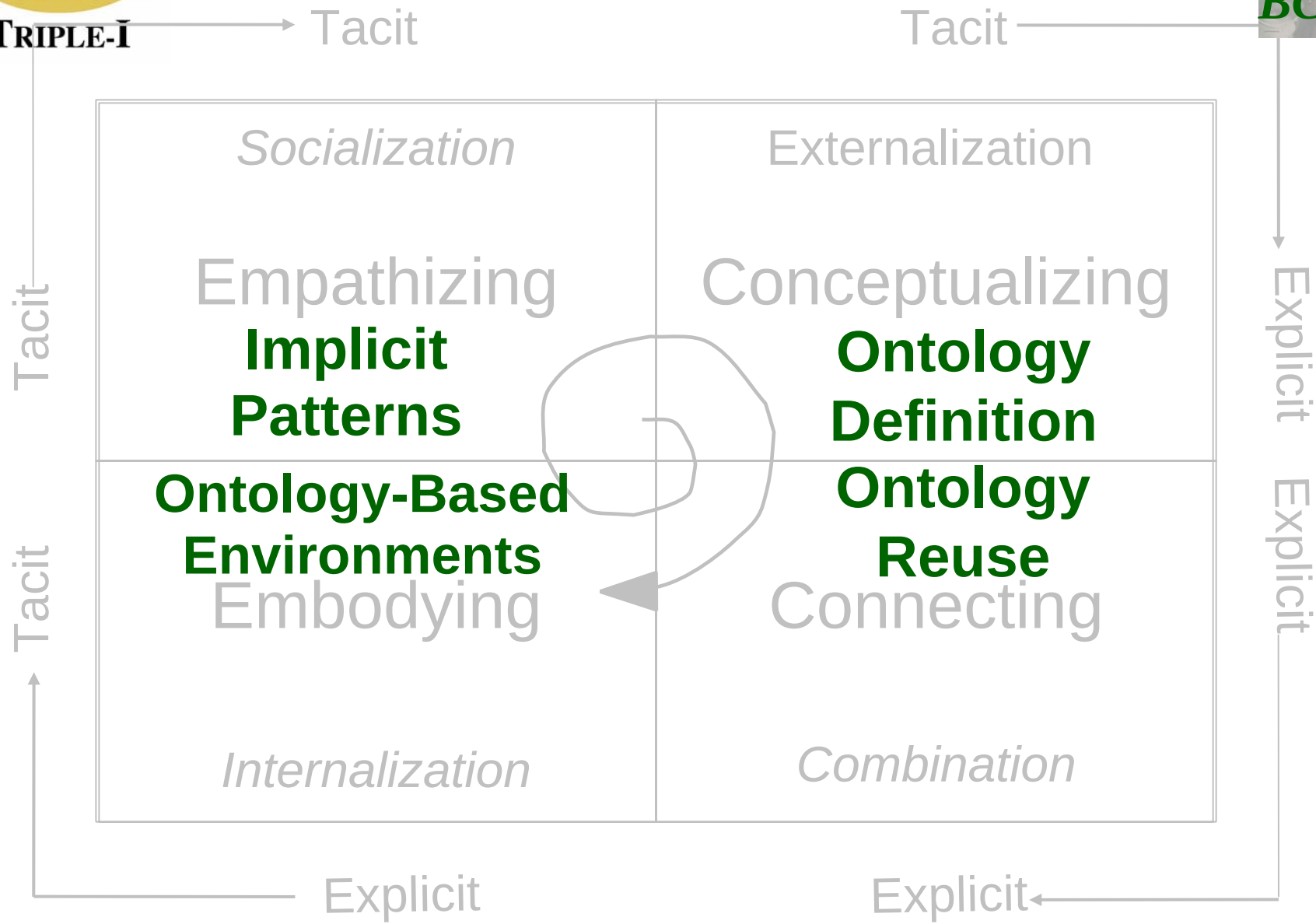


Knowledge Creation & Exchange (The SECI Process)



Adapted from Ikujiro Nonaka

Ontology Generation, Integration and Use Spiral



Adapted from Ikujiro Nonaka

Ontology, Services, and Content in the Learning Organization

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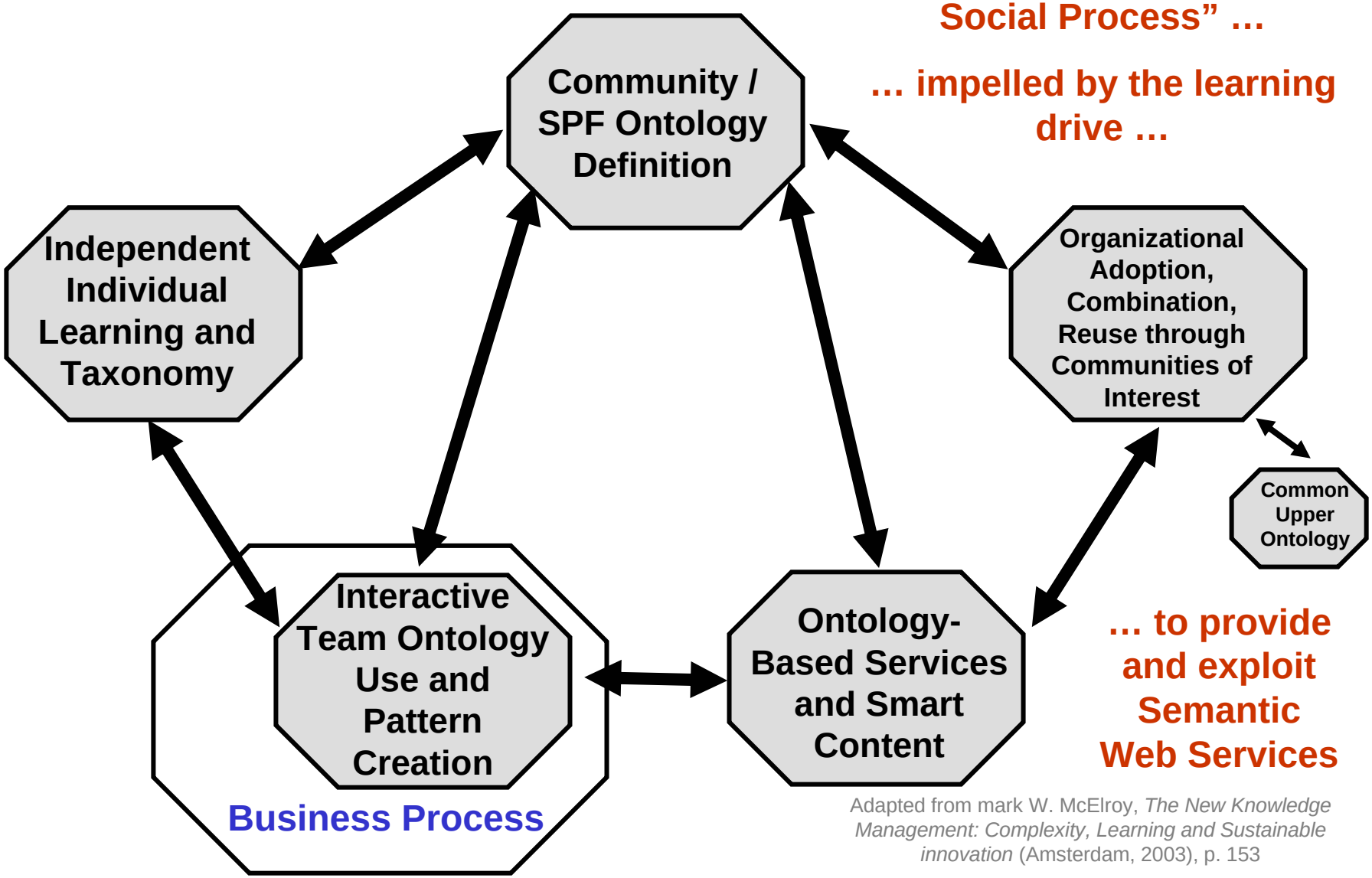
Leveraging a "Self-Organizing Social Process" …

… impelled by the learning drive …



… to provide and exploit Semantic Web Services

Adapted from mark W. McElroy, *The New Knowledge Management: Complexity, Learning and Sustainable innovation* (Amsterdam, 2003), p. 153

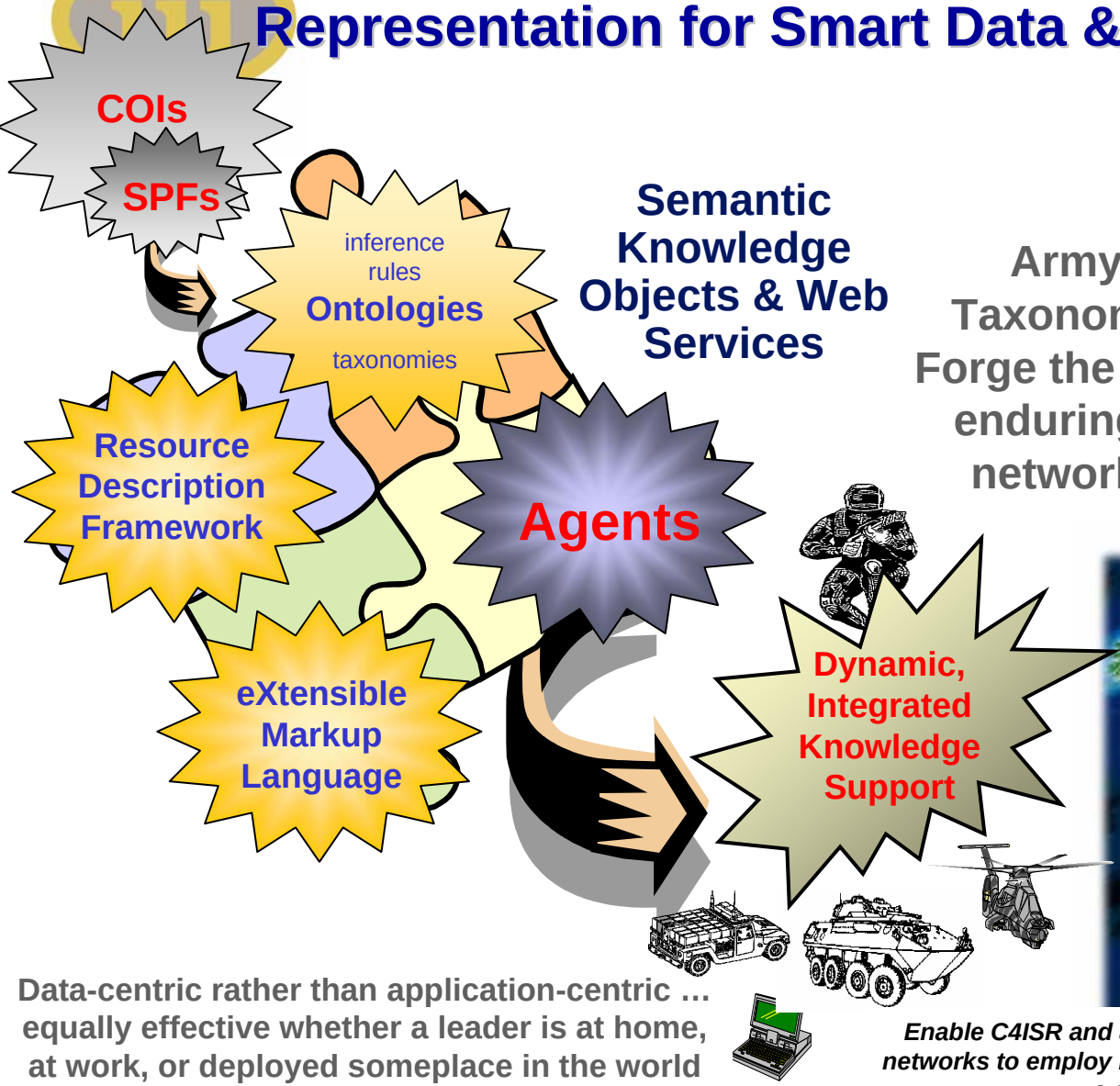
Concurrent Crawl, Walk, Run in an XML Universe

- Implement a systematic process for introducing major change
- Crawl … transition to XML, rich metadata, and open content architecture as rapidly as possible to underpin every aspect of individual and group KM (focus integrated desktop and collaborative environment)
- Walk … Implement web services, with combined grass-roots and nested portal-based approach (focus integration of web top with key enterprise applications)
- Run … Implement Semantic Web pilots within framework of larger knowledge and service-oriented architecture, and within a transformational vision (focus applications for intuition-based decision-making and deliberate practice, or other agency centers of gravity requirements)

Doable Now?

- Crawl … Army Battle Command Knowledge System is now implementing an interlocked strategy for nested network of communities of practice, XML implementation and a Warrior Knowledge Base grounded in an Open Content Architecture
- Walk … The XVIII Airborne Corps / Multinational Corps Iraq is now implementing a Tactical Service Oriented Architecture (FusionNet) that integrates advanced knowledge management, rapid application integration, a nested network of portals and the Army Battle Command System
- Run … The Intelligence Community, the Environmental Protection Agency, Navy Task Force Web, the National Aeronautics and Space Administration, the Department of Homeland Security, the Tennessee Valley Authority, the Office of Child Support Enforcement, the National Institute of Standards and Technology … all have Semantic Web projects in progress

Next Step in the Army, BCKS Knowledge Representation for Smart Data & Web Services



Semantic Knowledge Objects & Web Services

Army Enterprise Knowledge Taxonomy / Ontology … Vision … Forge the "intelligent," interoperable, enduring information required for network-centric land operations

Enable C4ISR and art-of-war / battle-command networks to employ intelligent software agents on a global scale

Data-centric rather than application-centric … equally effective whether a leader is at home, at work, or deployed someplace in the world … current technology is already sufficient to go a long way towards achieving the Semantic Web vision

End State – High-Performance Commander Leader Teams with Actionable Intelligence and just the right KSA for the GWOT

Net-Centric Enterprise Services Must Move Rapidly from Today's Web to the Semantic Web …

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Today's Web … changed the way we communicate and do business … but information is hard to find, stove-piped, perishable and hard to transform into actionable knowledge or to adapt rapidly in synthetic environments for building robust intuition and gut instinct

… and so must the Department of Defense, the Department of Homeland Security, the Intelligence Community

Leveraging, advancing transformation of the World Wide Web from "a human-readable information system into a machine-readable knowledge-sharing system"

[Michael Daconta]

Semantic Web … intelligent, interoperable, enduring information … that enables enterprise information integration, improved information discovery, net-centric warfare … and much more advanced knowledge management systems with much greater transformational promise

In conclusion

- On target -- “The thrust of SWANS is that the Semantic Web is here, advanced to be sure but not bleeding edge any more, and that there is a good business case and a technology case for putting it in to pilots and programs of record where advanced KM is required.” Mark Greaves
- Likely true -- The Semantic, Service-Oriented Web will be a product as well as an enabler of Advanced Knowledge Management
- Our solution and its effects will be socio-technical
- The means and the ends will be transformative