



SAP RESEARCH

SYSTEMATIC THOUGHT LEADERSHIP FOR INNOVATIVE BUSINESS

Composite Dev. Research at SAP

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THE BEST-RUN BUSINESSES RUN SAP

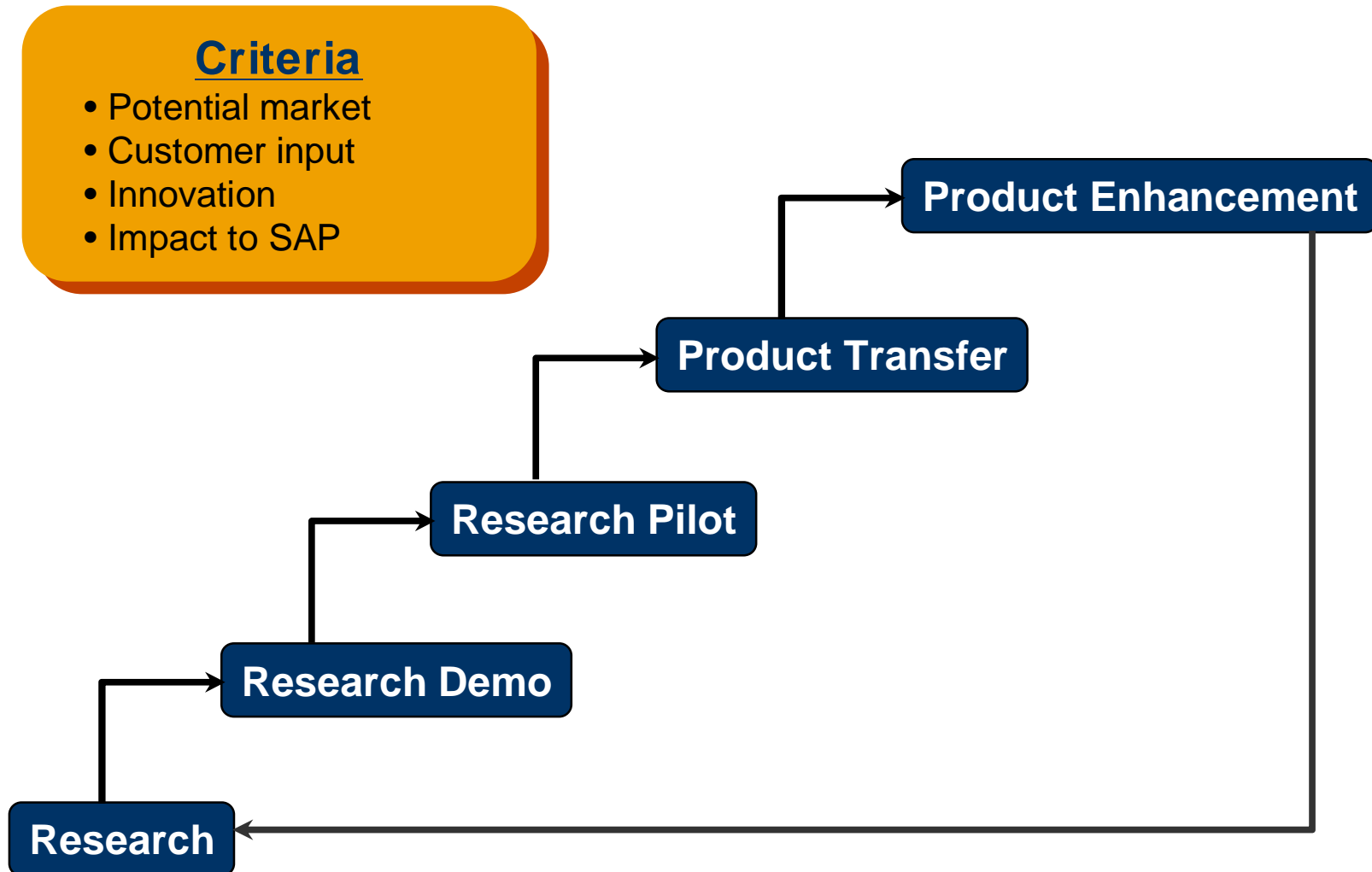




- **In current research projects, we cooperate with >200 partners**
 - ◆ 50 Universities
 - ◆ 30 research organizations
 - ◆ 80 technology partners
 - ◆ 30 industrial users
 - ◆ 10 public sector users

- **Innovations emerge from ecosystems, not from single players**

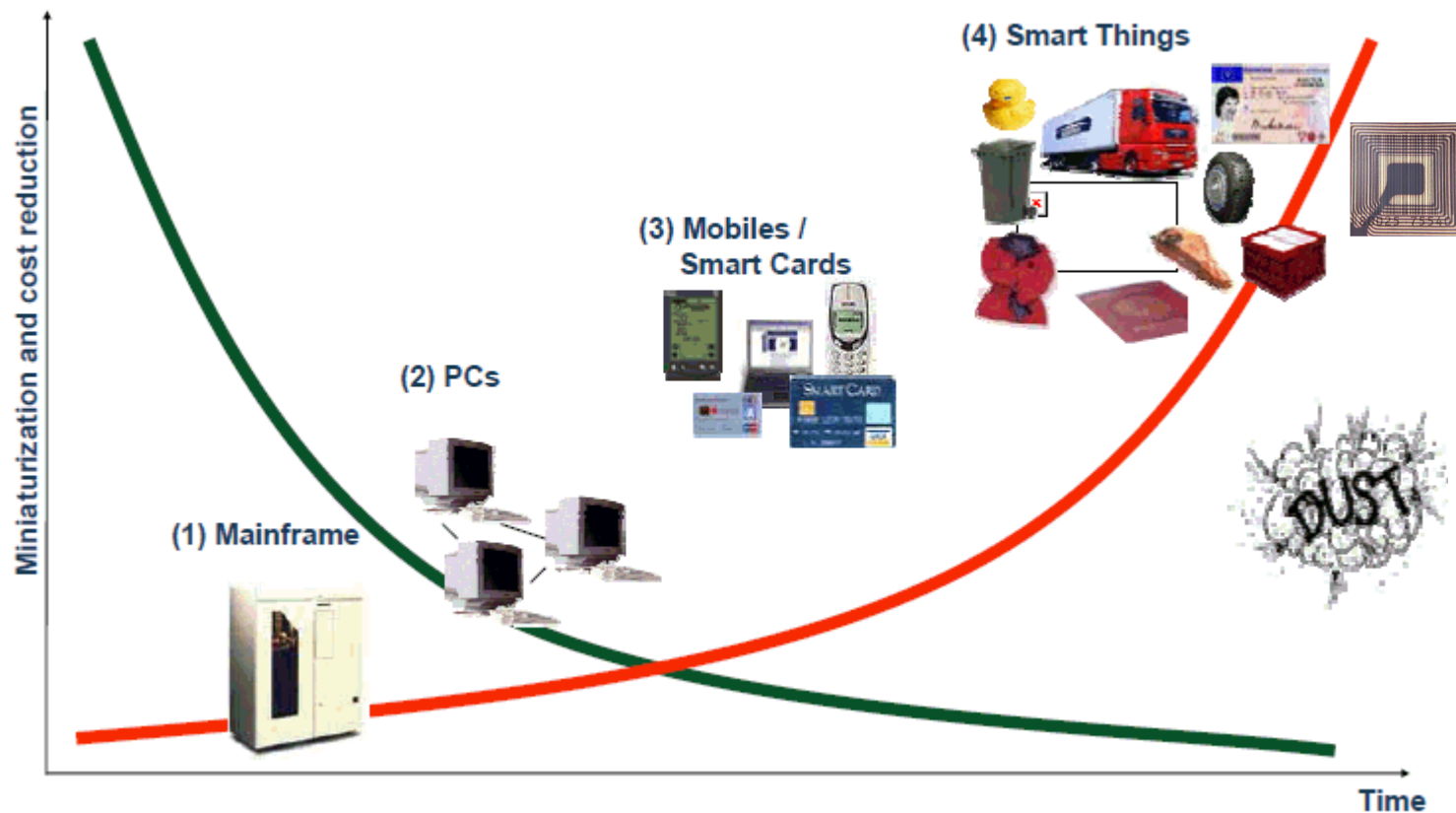
- **We want to better leverage North American Universities.. Such as Stanford, ...**



Real World Awareness, Miniaturization, and the Internet of Things

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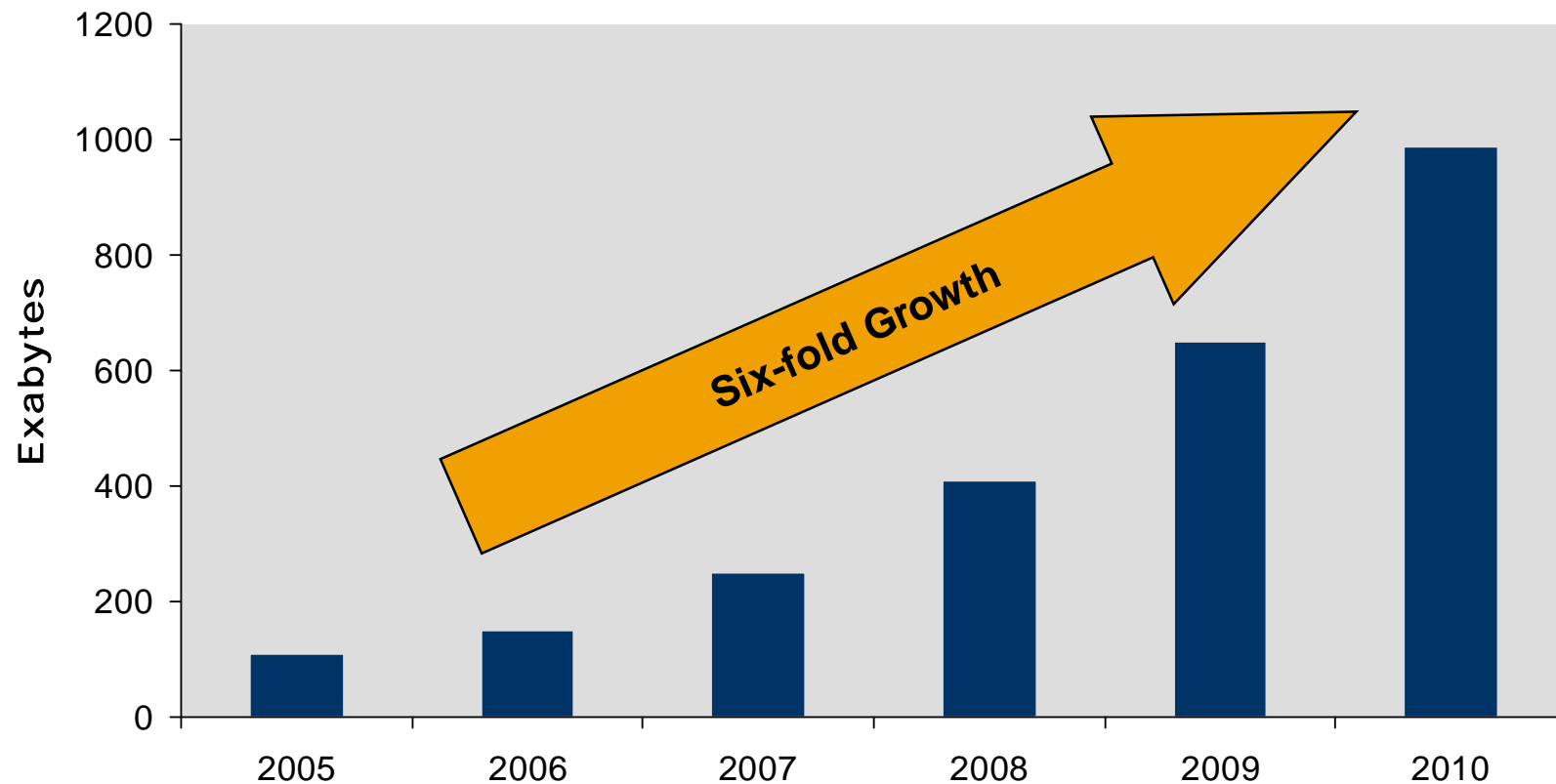
Recent advances in miniaturization, sensor & communication technology, and new materials drive for a new computing paradigm and an explosion of information



The Information Explosion

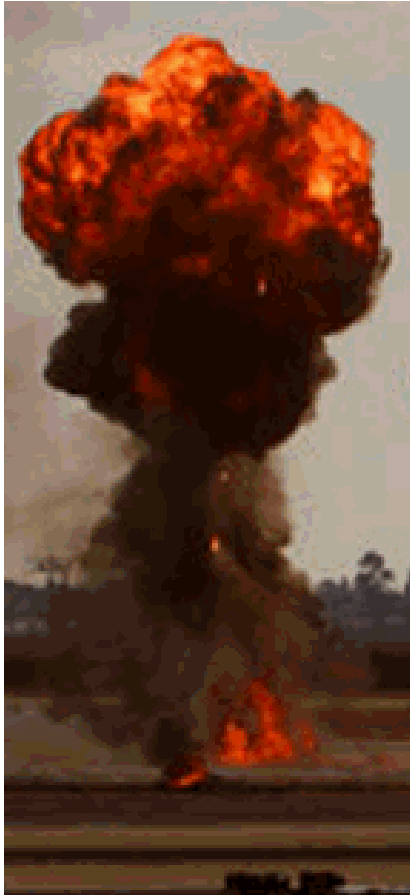
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Exabytes Created, Captured, Copied in a Year



Source: IDC, "The Expanding Digital Universe, March 2007"

- **Chevron – 2 Terabytes per day**
- **London Traffic Surveillance – 64 Trillion Bits/day**



- ~ 65% Consumer Generated
- ~ 85% Incurring Enterprise Responsibility
- ~ 90% Unstructured Data

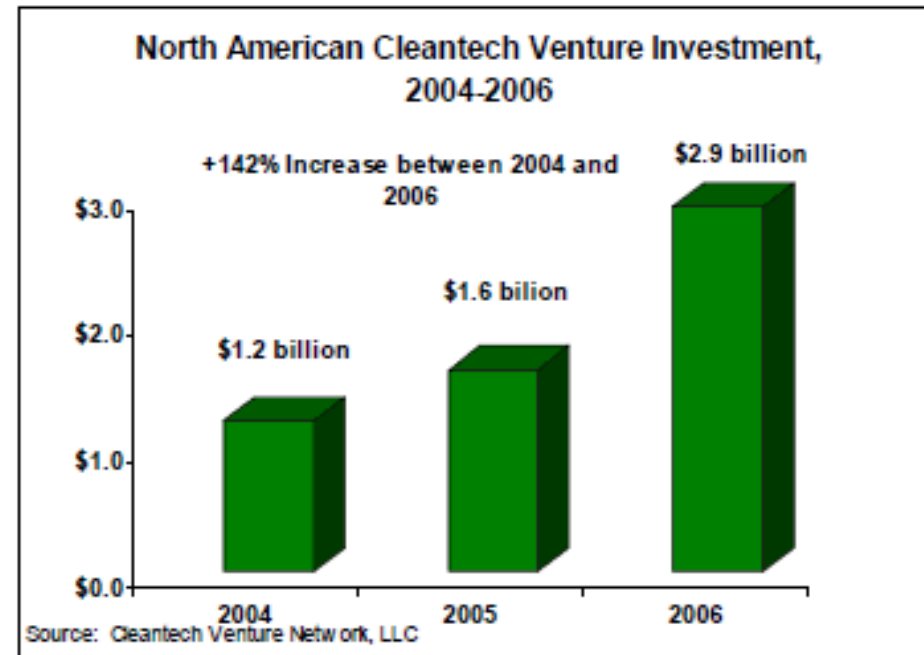


Key Questions

- How do we make sense of this data?
- Is there unlocked business value in this data?

Green Technology Momentum

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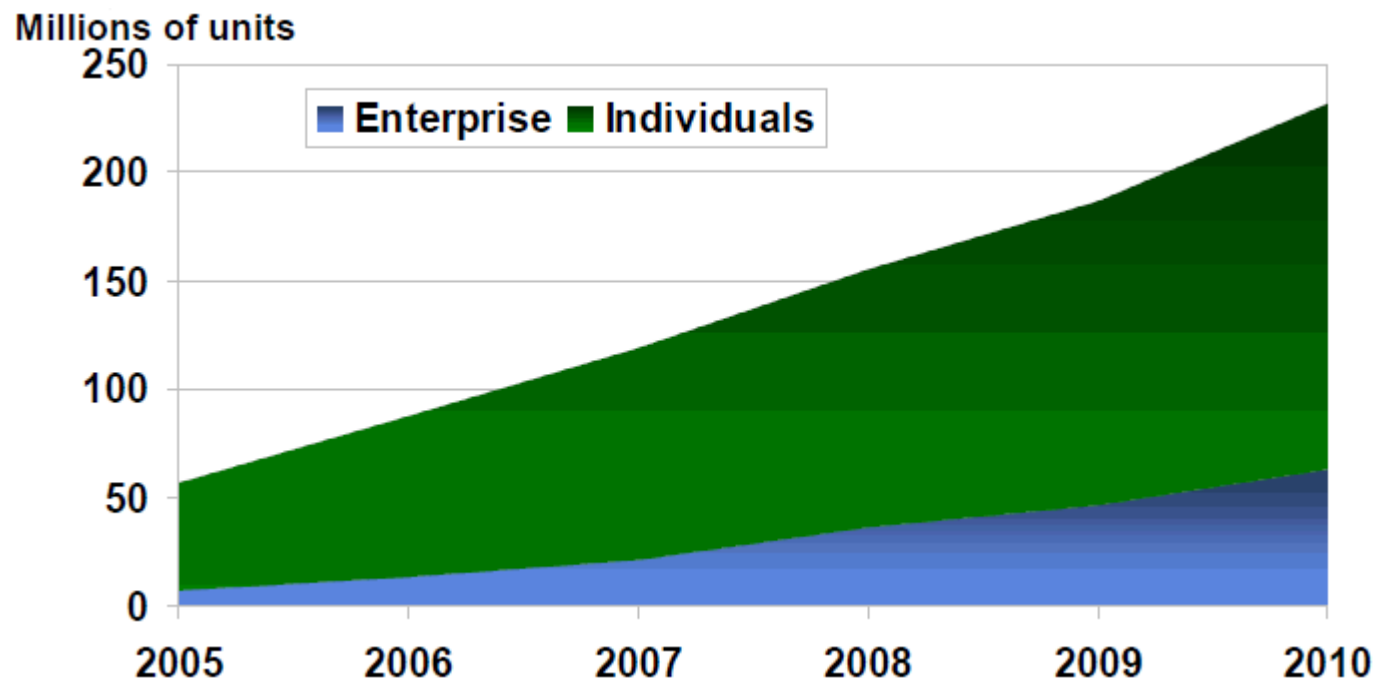


▶ Key Questions

- Where can customers and SAP provide value?
- What are the new business models?
- What new processes and technologies will be required?

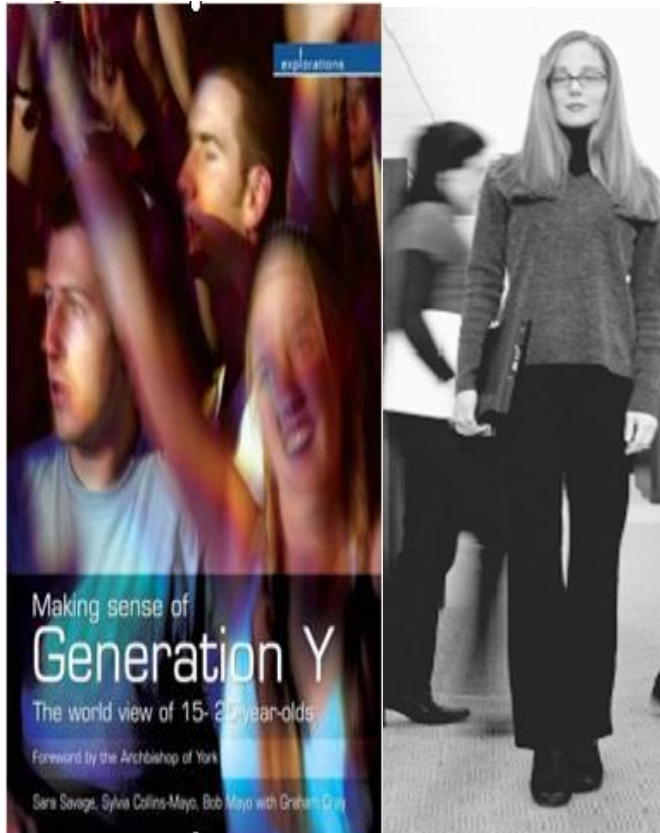
Corporate purchasing driving use of individual-owned mobile devices for Mobile Enterprise Applications

Worldwide Converged Mobile Device Market: Who Buys the Phone



Key Questions

- What mobile platforms and technologies are required to support mobile Enterprise apps?



- **Comfortable with the “Web 2.0” world**
 - ◆ For communication, collaboration, information gathering...
- **Blurred line between work and “lifestyle”**
- **Low tolerance for lagging business IT**

▶ Key Questions

- **What are their expectations of the SAP's of the world?**
- **How will they define business processes?**



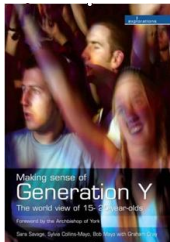
Information Explosion



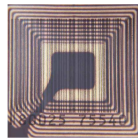
Green Tech



Rise of the MIBU



The New Generation of Worker



**Real World Awareness/
Internet of Things**

The SAP Research Vision and Research Areas

“Towards Business in Networked Economies”

- Rapidly changing business designs and business models
- Next generation of Web-related services and technologies
- Architectures of participation and collective intelligence
- IT-structures removing technology barriers to evolutionary business process transformation

Global Research Areas		
Business Aspects	Technology/Platforms	Applications
<ul style="list-style-type: none"> • Service Ecosystems • Industrialization of Software Development 	<ul style="list-style-type: none"> • Service Delivery Platform • Internet of Things & Real-World Awareness • End-to-End Simplicity • Advanced Web Technologies • Seamless Cross-Organizational Interoperability • Open Source & Security • Active Databases • Mobility Platform • Virtualization/ Parallelism • Composite Development • Semantics and Ontologies 	<ul style="list-style-type: none"> • Future Manufacturing • Web 2.0 Applications • Service Industry • Public Sector • Energy Distribution, Mgmt. and Conservation • Composite Applications • Product Lifecycle Management • Service Applications
Global Research Ecosystem		
Universities, Strategic Industrial Partners, Lighthouse Customers, Consortia		

Vision:

“Towards Business in Networked Economies”

- Rapidly changing business designs and business models
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- Architectures of participation and collective intelligence
- IT-structures removing technology barriers to evolutionary business process transformation

Global Research Areas

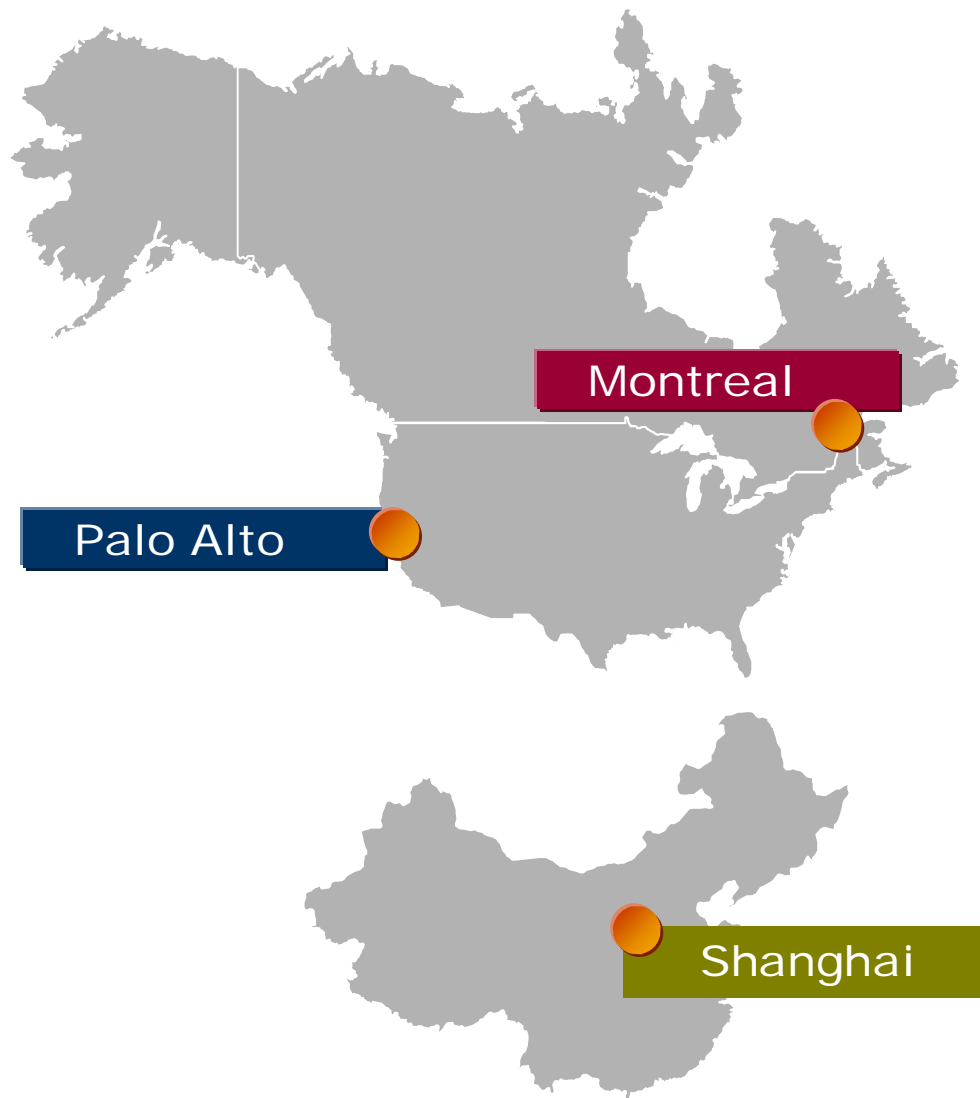
<u>Business Aspects</u>	<u>Technology/Platforms</u>	<u>Applications</u>
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Global Research Ecosystem

Universities, Strategic Industrial Partners, Lighthouse Customers, Consortia

SAP Research North Americas Research Fields

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Mobility Platform

Internet of Things and Real World Awareness

Advanced Web Technologies and Web 2.0 Applications

Model driven Composite Dev.

Risk Mitigation: Open Source

Continuous Information Sensemaking

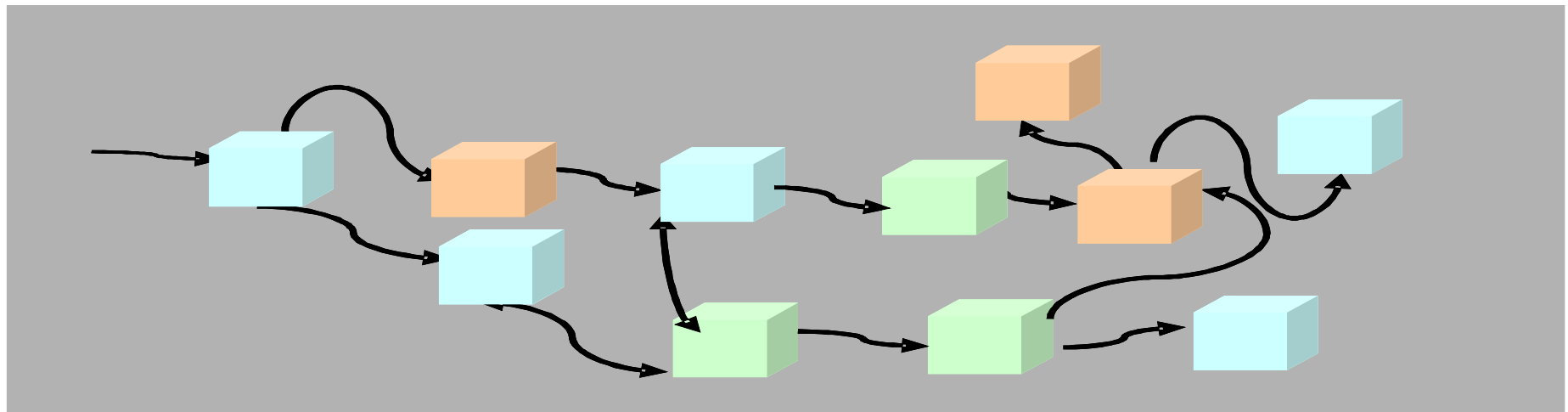
Virtualization/Parallelism

Composite Dev. - Motivation

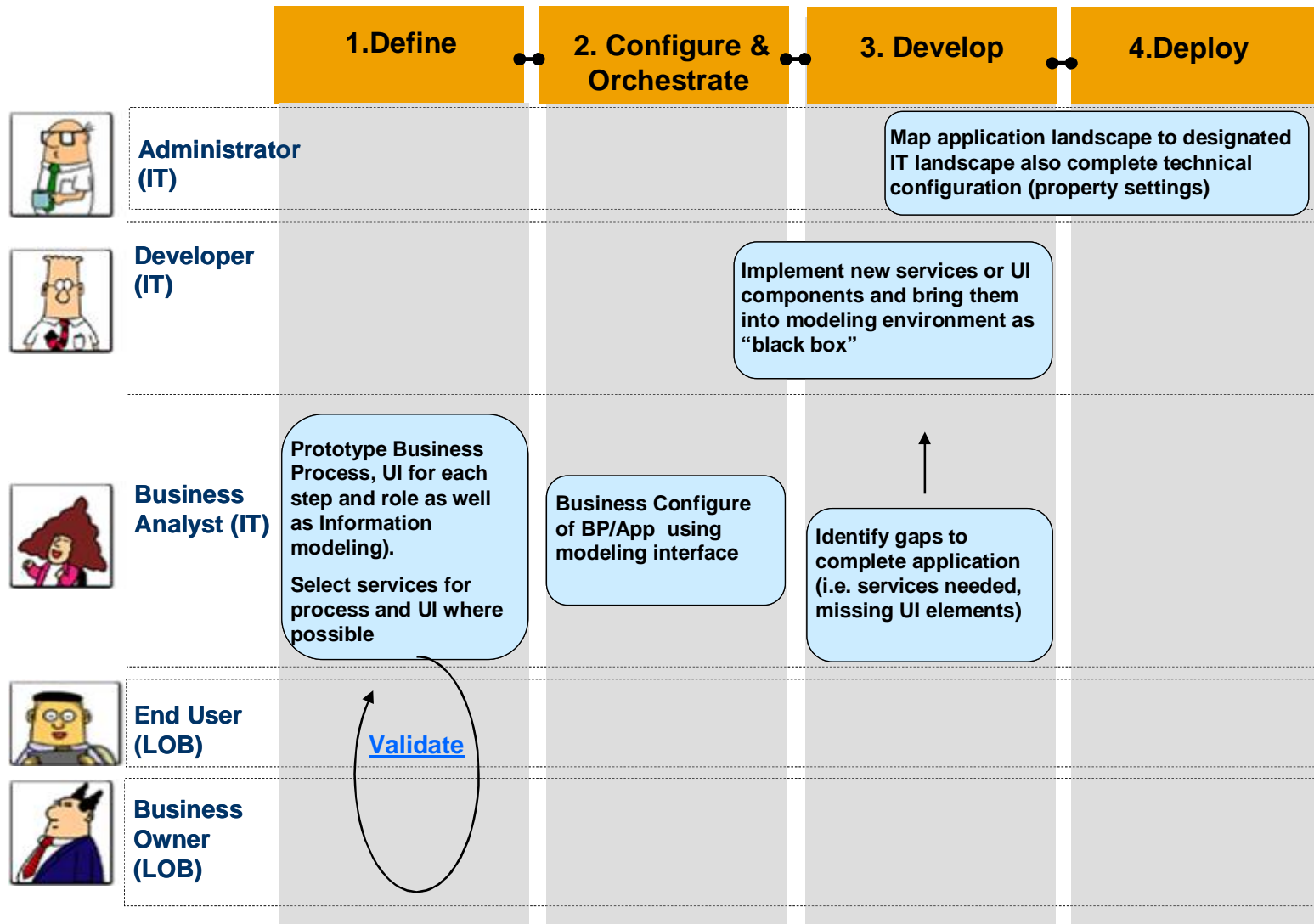
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The globalization trend and dynamics of today's business operations impose many new requirements on software application development.

One of them is how to composite or extend an application by ***leveraging existing software components*** and ***enabling the quick development of new/missing functions***.



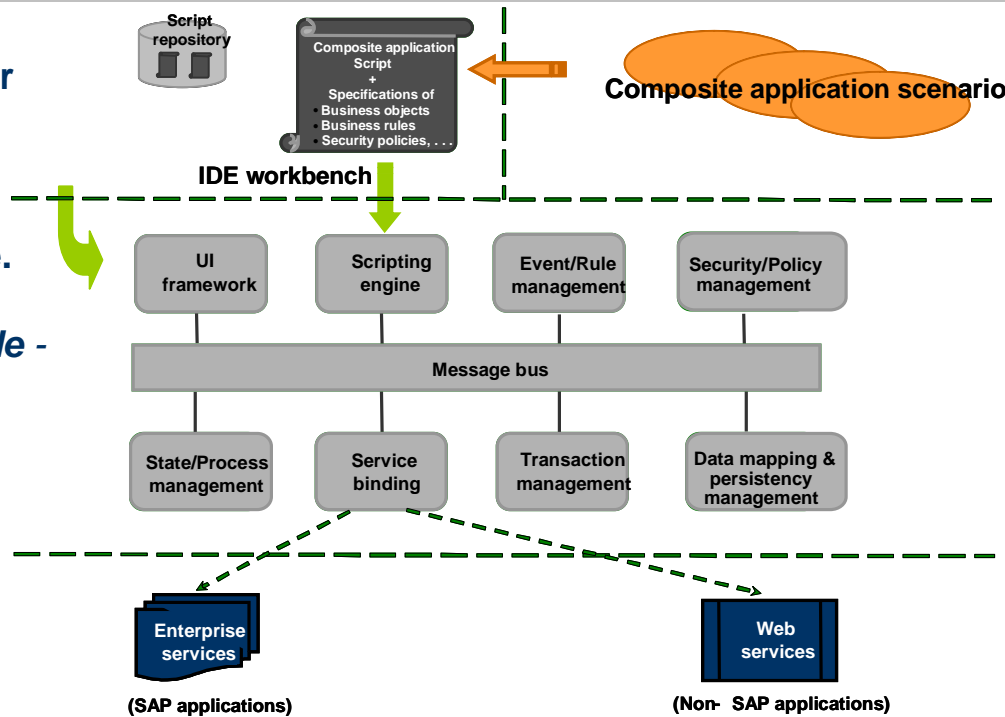
Typical Composite Dev. cycle



Composite Dev. - Vision

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- More *concise* - fewer lines of code.
- More *expressive* - each line does more.
- More *understandable* - closer to business domain.
- More *productive* - less programming effort required



One-stop shop for composite applications

A Development Platform

That provides all the needed design and implementation facilities under one coherently **integrated** environment.

And an Execution Platform

That enables the efficient execution and effective monitoring and management of the composite applications.

Target user = developer with SSP

Quick application implementation and extension

One coherent integrated model

On-demand and on the fly enhancement

Design-time + run-time

Incremental development: start with the domain that you prefer

DSL + Scripting = Unification

- **Declarative + Imperative = Goodness**
- **Declarative only goes so far – we need a programming language**
- **DSL + Ruby = Ruby DSL**

Clean separation of UI, business logic and data models.

Three Kinds of Composition

- **Process flow-based composition**
- **Event-driven composition**
- **Data integration/aggregation**

What programming model is needed? Coarse grained or fine grained?

What is the right level of abstraction? What should be the associated models? For UI, Security, Event Management?

From high level modeling to workflow execution and monitoring?

Model-Based Development Environment: Integrated Development & Execution Environment; Composite Application Development; Flexible and Expressive Scripting Language to support Modeling all Functional and Operational Aspects; Separation of UI, Business Logic, and Data Management; Modeling Real Time Input; Automatic Code Generation;

Agile Execution Platform: Data Mapping and Mediation; Persistent Data Management; Complex Business object support; Business Process Automation; Business Process Monitoring; Business Process Enforcement; Event Management & Correlations; Security Policy Enforcement

Service Binding

New Service Creation