Industry Trends and Software Assurance

COMPSAC 2005
Edinburgh
26th July, 2005

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Agenda

- Changes in the world and in the world of technology
- IT Trends
- Responses and focus areas for IBM
- The need for Innovation
- Closing challenges
Changes in the world and in the world of technology
Historic Junctures

<table>
<thead>
<tr>
<th>Installation</th>
<th>Deployment</th>
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Source: Robert Petroz, Technological Revolution with Economic Engine Falling

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Pace of Innovation Accelerating

Newer technologies taking hold at double or triple previous rates

% Penetration

Years

0 25 50 75 100 125 150

0 25 50 75 100

PC

Internet

VCR

Television

Radio

Electricity

Telephone

Automobile

Cellular
IT Trends
Evolving Market Trends Affecting Middleware

Solution buying and selling growing in importance

“More than 60% of middleware purchases are made in solution oriented combinations”

Fusion of business and IT - CIOs are taking on wider business leadership

“Business/IT Alignment” was the #1 issue in 2003 for CIOs in every geography (METADATA Group)

New business designs are emerging to increase productivity and responsiveness

Sources: IDC/Gartner, Stonebridge, Buyer Behavior, SWG MI
Horizontal Integration is the New IT Challenge

Bridging the gap between business transformation and IT

Customer Connections | Internal Systems | Supplier Networks
A Revolution in Enterprise Software

The requirements of on demand, the componentization of businesses, and emerging software technologies will fundamentally change the way enterprise software will be developed, deployed and delivered

- Industry ecosystems are being transformed by and created from networks of companies that provide business process components
- Traditional IT development is struggling to support and take advantage of these new emerging ecosystems
- Componentization of software is accelerating, driven by Service Oriented Architectures (SOAs)
- Software as a Service is an emerging alternative to buying or developing solution components
- Industries are accelerating the creation of vertical standards, facilitating the assembly of solutions from service components
- These trends will cause fundamental changes in the way enterprise software will be developed, deployed and delivered
Today: Polarization in Enterprise Application Development

Traditionally, choices were limited to developing custom software or using monolithic applications developed by ISVs.

- Tailored to enterprise
  - Higher costs
  - Higher risks
  - Longer time to deploy

- Turnkey solutions
  - Harder to adapt to business
  - Harder to differentiate
  - Narrower scope
Today’s Enterprise Software is Too Rigid to Support On Demand Businesses…

- Companies are under pressure to deal with the inflexibility of monolithic applications in connecting with new partners and customers.
- Business processes are disaggregating to take advantage of specialization and cost savings through outsourcing.
- On demand businesses need IT implementations that facilitate business process transformation.
More Flexibility is Needed to Support On Demand Businesses

Pressure to quickly align IT functions to business objectives and process changes will motivate companies to embrace more flexible approaches to enterprise software development and deployment.
Software Lifecycle Implications

This new flexible solution assembly approach will challenge current technologies and methodologies for discovering, reusing, developing, testing, deploying and managing applications.
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- The software industry will **shift to development of components**, changing the way we think about applications.
- The discovery, understanding and reuse of components will **leverage the increasing amount of standard-based business semantics** and metadata.
Software Lifecycle Implications

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Discover

- The software industry will shift to development of components, changing the way we think about applications
- The discovery, understanding and reuse of components will leverage the increasing amount of standard-based business semantics and metadata

Develop

- Customization and integration of components will become key aspects of software development
- New tools and techniques will help enterprises transform legacy apps into reusable components
- Composition of dynamic, distributed, externally provided components will challenge software and application testing

Deploy
Recovering Logical Models from Legacy Apps

Tools to extract logical data and process models, as well as business rules, from legacy code will facilitate the componentization of monolithic applications and the reuse of extracted components.

Legacy Programs

```
10 TJ-1318-DATABASE-KEY-20.
10 TJ-1318-DATABASE-KEY-20.
10 TJ-1318-DATABASE-KEY-20.
  15 FILLER                PIC X(7).
  15 TJ-8343-FP-ACCT-TYPE  PIC X(1).
  15 TJ-8348-FP-REC-TYPE   PIC 9(2).
  ...                      TJ-VARIABLE-KEY.
```

Data Models

e.g.: class diagrams

Process Models

e.g.: sequence charts, activity diagrams, ...

Business Rules

e.g.: “An order for more than $50 qualifies for free shipping”
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Deploy

- The need for assembling large number of service components and for integrating them with legacy systems will require a more flexible approach to software delivery and management, ranging from fully installed, to hybrid, to fully hosted models.
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### Discover
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- **Customization and integration of components** will become key aspects of software development.
- New tools and techniques will help enterprises **transform legacy apps** into reusable components.
- Composition of dynamic, distributed, externally provided components will challenge **software and application testing**.

### Deploy
- The need for assembling large number of service components and for integrating them with legacy systems will require a more **flexible approach to software delivery** and management, ranging from fully installed, to hybrid, to fully hosted models.
- Software implementations of business processes will evolve from mostly static, hard-coded logic and rules to automatic, dynamic **orchestration of process components driven by business policies** and metrics.
Responses and focus areas for IBM
Responses and Focus Areas for IBM

- **Development focus:**
  - Consumability
  - Componentisation
  - Community
Consumability

- Customers demand high quality solutions
- The market demands low cycle times
- Software systems are becoming more and more complex.
- Costs are rising, and we are spending increasingly more ensuring quality
- We are focusing on new design approaches to facilitate consumability
What do our Clients Say about Quality?

Quotes from Corp WW MI Report on Software Measure Attribute

“Quality of products has, by far, the greatest influence on Overall Sat…”

“Quality of products is key competitive strength…”

“Ease of use and ease of integration are competitive weaknesses... efforts to improve would be beneficial.”

“Majority of IBM Software customers who are NOT completely satisfied recommend Improvements related to product – 34% cite quality.”

69% of those not satisfied with quality cited integration, compatibility and usability

“Across all divisions, usability of s/w products is the top area for Improvement related to quality.”

Per May IDC: For SMBs, product reliability & high quality are the TOP 2 factors in making IT purchase decisions for technology and provider.

S/W Product QUALITY is the Greatest Satisfier & the Greatest Dissatisfier
Software Quality at Top Speed

As a rule, the projects that achieve the lowest defect rates also achieve the shortest schedule.

Complexity is increasing

Call Depth Frequency for simple J2EE application

- Frequency counts for each call depth.
- The graph shows the frequency of call depths from 1 to 41.
Cost of Defects & Problem Reports

- **Intrinsic Defect Rate = 4.2 / Coder Hour - Watts Humphrey**
  - 20 per Day / 100 per Week / 400 per Month / 5000 Per Year
- **5000 Defect Project**
- **Consider the value of discovering 100 defects early**

<table>
<thead>
<tr>
<th>Cost Per Defect</th>
<th>Coding</th>
<th>Unit Test</th>
<th>FV</th>
<th>ST</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>$25</td>
<td>$100</td>
<td>$250</td>
<td>$1000</td>
<td>$16K</td>
</tr>
<tr>
<td>35%</td>
<td>1x</td>
<td>4x</td>
<td>10x</td>
<td>40x</td>
<td>64x</td>
</tr>
<tr>
<td>30%</td>
<td>250</td>
<td>1000</td>
<td>1500</td>
<td>1750</td>
<td>500</td>
</tr>
<tr>
<td>20%</td>
<td>5%</td>
<td>20%</td>
<td>30%</td>
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<td>10%</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>35%</td>
<td>10%</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$6.25K</td>
<td>$100K</td>
<td>$375K</td>
<td>$1.75M</td>
<td>$8M</td>
</tr>
<tr>
<td>Removal of 100 Defects Costs</td>
<td>$2.5K</td>
<td>$10K</td>
<td>$25K</td>
<td>$100K</td>
<td>$1.6M</td>
</tr>
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</table>
New Design Approaches to Improve Consumability

- **Outside-in design**
  - Scenario-based approach is used to better capture requirements, and to recognise the end-to-end role of middleware software.
    - Focus on Roles and Tasks
  - Scenarios and resulting designs – as UML models - are then validated with customers.
Enterprise Services Bus: Basic Scenario – What the client is asking for?

New Application

Service Interface

Mediation

Customer Info System on WAS

Customer Info System on Siebel
Enterprise Services Bus: Basic Scenario – What needs to be done?

1) Generic Service is specified
   Solution Architect

2) An interface to existing application is created
   Adapter Developer

3) ESB Network is designed
   Integration Developer

4) Mediation is developed
   Integration Developer/Implementer

5) Pieces are connected together
   Deployer & IT Administrator

6) A call to the Service interface is coded
   Implementer

New Application

Mediation

Service Interface

Customer Info System on WAS

Customer Info System on Siebel
Componentisation

- **Horizontal integration is also important to IBM as a development organisation.**

- **Compelling reasons:**
  - The opportunity to identify and create common components.
    - reduce cost, increase quality
  - The opportunity to increase reuse and reduce the amount of programming.
    - reduce defects, pmrs
  - The opportunity to leverage advances in open source.
    - reduct cost, focus on value add
Componentisation: Shared Capabilities of IBM Product Portfolio

Product Offerings →

Product Specific Investment

Shared Components →

Shared Capabilities →

Initial Base Product →

Re-factor to SWG Product Offerings

Componentisation
Community

- To break down our own internal barriers, we have adopted an internal open source model to share software.

- The growth in standards is a key enabler for Integration (SOA).

- External open source is also changing the way that IBM delivers software and services.
Internal open source model

- Accelerates reuse through increased awareness, and access.
- Enhances quality through greater transparency and broader visibility
- Enthusiasm is high – but there are challenges:
  - Provenance
  - Quality
  - Motivation
Growth in Standards
Standards Recommendations by W3C
Implications of Standards

- Heavy focus on compliance and compliance testing increases cost, and may actually detract from quality.

- But – standards are essential, and it is by no means the case that sufficient infrastructure is yet in place – e.g.,
  - the up-stream part of the supply chain (materials, typically coming in from overseas).

- Metadata is a key area of innovation opportunity.
Historical Trends in Use of Metadata

- **Hierarchical Data Model**: Rigid Metadata, Single Application
- **Relational Data Model**: Rigid Metadata, Integration Within Enterprise
- **Extensible Data Model (XML)**: Flexible Metadata, Integration Within Industry
- **Domain Specific Ontologies**: Flexible Metadata, Cross Industry Integration

Semantic annotations of data: what this data means

Syntactic annotation of data: what this data represents
Open Source is bringing many changes

- Software is no longer sourced from a single organisation (also a consequence of componentisation) and is not tightly integrated.
  - Can we develop models of assurance that allow use without duplicating costs?
  - How do we deal with provenance?
Summary, and implications for Assurance

- Product/feature cycle times are reducing significantly
- Cycle time reduction puts increasing pressure on testing.
- Growth in standards drives focus on compliance; may add confusion in marketplace; increases testing and quality requirements
- Products are becoming more complex, and costs associated with software are shifting
- Complexity drives costs in testing; and costs to delivering product service
- Componentisation creates new challenges for all parts of the development cycle.
- Increased use of open source software adds complexity to testing, to performance, to serviceability of software.
- Integration software is very dynamic, and is typically designed for late-binding and just-in-time decisions.
- Technological Innovation outpaces social consequences, which in turn must drive further technological development
The Need for Innovation
Historic Junctures

- **1771**: Industrial Revolution
  - **Installation**: Panic 1797
  - **Deployment**: Manufacturing develops
    - Repeal of tariff laws opens trade

- **1829**: Steam & Railways
  - **Installation**: Panic 1847
  - **Deployment**: Economies of scale
    - Joint stock companies

- **1875**: Steel, Electricity & Heavy Engineering
  - **Installation**: Depression 1893
  - **Deployment**: Transcontinental rail
    - Banking reform

- **1903**: Oil, Automobiles & Mass Production
  - **Installation**: Crash 1929
  - **Deployment**: Interstate / International highways
    - IMF, World Bank

- **1971**: Information & Telecommunications
  - **Installation**: Dot.com Collapse
  - **Deployment**: Current period of adjustment

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Where do we go from here?

- How do we deliver value on top of the current technology infrastructure?
  - Services
  - End-to-end solutions, Integration

- What is the next generation of technology infrastructure?

- We need innovation in both dimensions – exploiting the here and now, and laying down the next infrastructure for IT
Innovation That Matters Is A Differentiator

- Invention alone is not enough
- True innovation requires ideas and inventions in first-of-a-kind combinations
- Innovation is creation of new value
  - Transforming knowledge and technologies to drive productivity and economic growth

- Uncover new opportunities and insights that will shape business and society

Consistent Themes Emerged From The GIO

- The need for standard ways of exchanging information between members of each ecosystem (and across ecosystems)

- The need for more open collaboration between ecosystem members (including competitors)

- The primacy of the individual as a focal point for innovation
The GIO and Assurance

- A key theme in this year’s discussion has been around security and privacy.
  - New technologies are needed
  - New processes are needed
  - New sensitivities need to be addressed

- The GIO reminds us that it’s not just about technology and making money.
  - Societal issues will drive new challenges.
  - And we must cope with the rapid pace of technology.
Closing Challenges
Some Closing Challenges

- Improvements in test & quality may require innovation in process rather than technology.
  - We have known about the benefit of early defect removal for ages – but we don’t learn. Why?

- Security and Privacy are profound issues. The broad population may not realise what it surrenders when it uses certain technologies. Much more work is needed in this area.

- Metadata is an exploding area. It has significant implications for integration. The infrastructure around metadata is not yet well established.
Thank You