Retrospect of Taiwan’s Software Industry - from Academic perspective

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Outline

- Status of IT industry
- Challenges for Taiwan Software Industry
- Solutions -- Policies/Technologies/Education
- Conclusion
Status of IT industry

- Global IT Expenditure Prediction
- The Taiwanese IT Software Market (2003 – 2007)
- Current Status of e-Taiwan
- Hardware Industry
- Software Industry
- Who took the beef
Global IT Expenditure Prediction

Hardware Expenditures

Software Expenditures

Sources: Gartner group, August 2001.

- Hardware expenditure growth highest in the Asia-Pacific region and Japan; the compound growth rate spanning the period 1999 – 2004 will be 10.3%
- The compound growth rate for software expenditure exceeds 15% in all regions. This shows that software spending will be an important IT expenditure item in the future.
- Software expenditure in all regions will display a U-shaped recovery in 2002

Sources:
The Taiwanese IT Software Market (2003-2007)

Taiwanese IT Software Market, 2003 - 2007 (NT$Million)

<table>
<thead>
<tr>
<th>Year</th>
<th>Network Services</th>
<th>Project Services</th>
<th>Software Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>42,026</td>
<td>42,909</td>
<td>65,125</td>
</tr>
<tr>
<td>2004</td>
<td>46,859</td>
<td>44,582</td>
<td>66,232</td>
</tr>
<tr>
<td>2005(F)</td>
<td>52,763</td>
<td>46,678</td>
<td>67,491</td>
</tr>
<tr>
<td>2006(F)</td>
<td>59,833</td>
<td>49,152</td>
<td>68,909</td>
</tr>
<tr>
<td>2007(F)</td>
<td>68,569</td>
<td>51,904</td>
<td>70,287</td>
</tr>
</tbody>
</table>

Source: MIC/III, March 2005
Current Status of e-Taiwan

- IT-readiness
  - Ranked No. 14 WW (WEF 2005)
  - Internet subscribers: 41%
  - PC at home: 73%
  - Internet access at home: 61%

- IT industry
  - Total production value: 70B US$ in 2004

Source: III CEO J. S. Ke SEKE 2005 Keynote
Hardware Industry

- A major procurement center for global ICT companies (OEM/ODM)
- 10+ products ranked No.1 in WW ICT market share
- World’s 4th largest ICT hardware producer (domestic production)
- Most manufacturing capacity has been moved to China (80% of China’s production value)
- Lack of owned brands

Source: III CEO J. S. Ke SEKE 2005 Keynote
Software Industry

- Domestic Market: 5B US$
- Software Import: 2B US$
- Software Export: 0.65B US$
- Embedded Software: N/A (in-house oriented)
- CMMI
  - 2 Level 3
  - 19 level 2
  - 10+ by year end

Source: III CEO J. S. Ke SEKE 2005 Keynote
Who took the beef

### Competitive Environment 2003: Top 10 IT Service Providers in Asia/Pacific and Major ASEAN Countries

<table>
<thead>
<tr>
<th>Japan</th>
<th>Asia/Pacific</th>
<th>Taiwan</th>
<th>Malaysia</th>
<th>Thailand</th>
<th>Indonesia</th>
<th>Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fujitsu</td>
<td>IBM</td>
<td>IBM</td>
<td>IBM</td>
<td>IBM</td>
<td>IBM</td>
<td>IBM</td>
</tr>
<tr>
<td>IBM</td>
<td>HP</td>
<td>HP</td>
<td>HP</td>
<td>HP</td>
<td>HP</td>
<td>NCS</td>
</tr>
<tr>
<td>Hitachi</td>
<td>EDS</td>
<td>Systex</td>
<td>Accenture</td>
<td>BearingPoint</td>
<td>Sigma Cipta Craka</td>
<td>HP</td>
</tr>
<tr>
<td>NTT Data</td>
<td>Samsung</td>
<td>III</td>
<td>HeiTech Padu</td>
<td>CDG Group</td>
<td>Accenture</td>
<td>Accenture</td>
</tr>
<tr>
<td>NEC</td>
<td>CSC</td>
<td>Mitac</td>
<td>CSA Holdings</td>
<td>EDS</td>
<td>Hewlett-Packard</td>
<td>Accenture</td>
</tr>
<tr>
<td>Toshiba</td>
<td>LG CNS</td>
<td>Acer</td>
<td>EDS</td>
<td>Accenture</td>
<td>Astra Graphia</td>
<td>Silverlake</td>
</tr>
<tr>
<td>CSK</td>
<td>Fujitsu</td>
<td>EDS</td>
<td>Sapura Telecommunications</td>
<td>Loxley</td>
<td>Sigma Cipta Craka</td>
<td>SVOA</td>
</tr>
<tr>
<td>Nihon</td>
<td>Accenture</td>
<td>Stark Technologies</td>
<td>Mesiniaga</td>
<td>Siemens Networks</td>
<td>Siemens Networks</td>
<td>EDS</td>
</tr>
<tr>
<td>Unisys</td>
<td>SK C&amp;C</td>
<td>Oracle</td>
<td>Silverlake</td>
<td>Oracle</td>
<td>Schlumberger –Sema</td>
<td>CSA Holdings</td>
</tr>
<tr>
<td>Nomura Research</td>
<td>Oracle</td>
<td>Accenture</td>
<td>Fujitsu</td>
<td>SAP</td>
<td>SAP</td>
<td>NCR</td>
</tr>
</tbody>
</table>

*Source: Gartner Dataquest, Sept 2004*
Challenges for Taiwan Software Industry

- Characteristics Comparison of Hardware and Software
- Multi-convergence Era is coming
- Characteristics of Taiwan’s Software Industry
- New challenge for software vendors
- Problems we face
Characteristics Comparison

**IT Hardware Industry**

**Nature of Competition**
- Cost, Production Orientation

**Elements of Production**
- Concentrated Investment
- High Manufacturing Costs

**Industry Structure**
- Vertical Division of Labor
- OEM or Independent Brands

**Product Orientation**
- Adherence to Industry Standards
- Adherence to Primary Markets
- Easily Changeable Products

**Market Sales**
- Non Zero Sum Games
- Value Orientation
- High Gateway Costs

**IT Software Industry**

**Nature of Competition**
- R& D, Consumer Orientation
- Knowledge Intensive
- High R& D Cost

**Elements of Production**
- Vertical Integration
- Emphasis on Independent Brands

**Industry Structure**
- Product Innovation
- Specific Profit Base Market
- Products not Easily Changeable

**Product Orientation**
- Zero Sum Games
- Consumer Orientation
- High Advertising Cost

Source: MIC/III
Multi-convergence Era is coming

Sources: MIC, III
Characteristics of Taiwan’s Software Industry

- **General**
  - Company sizes are very small
  - Less specialization
  - Low international competitiveness
    - Language
    - Culture
    - Sales channel

- **Major Losers**
  - Domestic market focus
  - Custom-made AP and SI

- **Major Winners**
  - Global market reach
  - Niche tools and domain-specific solutions with service
  - Big pocket and best people

Source: III CEO J. S. Ke SEKE 2005 Keynote
New challenges for software vendors

- From windows platform to internet platform
  - Innovative technologies terminates the age of internet surfing
- From product oriented to service oriented
  - The new era of service orientation
  - Web services will set to revolt traditional business model
- Strategic alliances grow along with the increase of service integration development
- Creativity and sensitivity are the keys to software development
- The international markets get important, software vendors need to improve their capability of international marketing
Problems we face (1/2)

<table>
<thead>
<tr>
<th>status</th>
<th>circumstance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
<td>How can we cope with requirements change? How can we build systems that are more resilient or adaptive under change? How can we predict the effects of such changes?</td>
</tr>
<tr>
<td>Non-functional Properties</td>
<td>How can we model nonfunctional properties of systems and reason about them, particularly in the early stages of system development? How can these models be integrated with other models used in system development?</td>
</tr>
<tr>
<td>Service-view</td>
<td>How can we shift from a traditional product-oriented view of software system development towards a service view? What effects do new modes of software service delivery have on software development?</td>
</tr>
<tr>
<td>Perspectives</td>
<td>How can we devise and support new structuring schemes and methods for separating concerns?</td>
</tr>
<tr>
<td>Non-classical life cycles</td>
<td>How can we adapt conventional software engineering methods and techniques to work in evolutionary, rapid, extreme and other non-classical styles of software development?</td>
</tr>
</tbody>
</table>
## Problems we face (2/2)

<table>
<thead>
<tr>
<th>status</th>
<th>circumstance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Architecture</strong></td>
<td>How can we represent, reason about and manage the evolution of software architectures? How can we relate software architecture to other parts of the software development process?</td>
</tr>
<tr>
<td><strong>Configurability</strong></td>
<td>How can we allow users, in the broadest sense, to use components in order to configure, customize and evolve systems?</td>
</tr>
<tr>
<td><strong>Compositionality</strong></td>
<td>When we compose components what effect does this have on the properties of those components? Can we reason about, and engineer for, the emergent properties of systems composed from components whose behaviors we understand?</td>
</tr>
<tr>
<td><strong>Domain specificity</strong></td>
<td>How can we exploit the properties of particular domains (telecommunications, transport) to make any of these challenges easier to address?</td>
</tr>
</tbody>
</table>
Solutions

- Policies
- Technologies
- Software Engineering education
Policies (1/2)

- Promotion from Industrial Development Bureau (IDB), MOEA
  - 1992 to 2002 – 2 5-year software development plan
  - 2002 -- Network & Multimedia project
  - 2003 – Open source project (IDB, MOEA)
  - 2003 -- CMMI project (2010 --- 100 CMMI level 3, 5 level 5)
  - BEST project
Policies (2/2)

- Setting up International Research Centers in Taiwan --- Allied with major well-known international companies, such as Microsoft, IBM, ... etc
- Encouraging Collaboration between industry and academy
- Promoting creativity and brands -- Taiwan has become well-developed country, creative services/products E-Taiwan, M-Taiwan projects, DOD?
Technologies

- Standard-based (open standard)
- Pattern-based
- Modeling -- OO/Aspect/Service Oriented
Our solution

- Modeling Transfer and Verification
Proposes an XML-based meta-model (XUMM) to unify and integrate these well-accepted standards in order to improve development and maintenance of the software systems.

An XML-based unified model is proposed to unify and integrate models that are composed with various standards.

Provide comprehensive process frameworks or environment (PRAISE) that can be tailored by individual existing tools.
Unifying and Integrating Standards
1. Update a Class-Add attribute
2. System add a record to maintenance history

3. Click and Trace the ripple effect
4. Show the related submodel
Architecture of PRAISE
The benefit of integration model

- **Software Reuse**
  - In practice, in XUM, the unification links connecting components of models in phases can be used to enable systematic software reuse for development at the earlier stages in the software life cycle.

- **The modeling of patterns**
  - Formal modeling of patterns is another important issue for the future. In particular, when a formal pattern is applied together with other standards, the software properties increasing rate will be obvious.

- **Properties verification of the models themselves**
  - Not only the inter-model properties are important, but also the transparency of various models is indispensable.
Software Engineering Education

- Complete Software engineering courses/training are needed for designers
- Basic Software engineering education to users (who pay for it)
- Software (with quality) value should be taught and recognized.
- The importance of Collaboration
Conclusion

- Technologies Improvements (Component based, Service Oriented…)
- Quality Improvement (CMMI, Software Engineering)
- Populating Software Engineering education (to solution providers/Users)
- Vertical/Horizontal Collaboration
- More Government sponsored creative project, such as M-Taiwan, Taiwan DOD projects released to domestic solution provider)
- Confidence!!! (with high quality peoples and hardware industry advantages)