1. **What benefits and risks should AD organizations weigh when considering the transition to object technology?**

2. **Which vendors and technologies will provide the most effective solutions for object and component development?**

3. **How will the transition to object technology impact AD organizations?**

Object technology offers new paradigms for development with benefits and risks for AD organizations retooling for next-generation solutions. Many AD organizations have experimented with objects, and a few have successfully developed production applications. This presentation takes "a manager's view" of object technology and considers the risks, benefits, success stories and stumbling blocks. It will assess the likelihood of success and make recommendations for those AD organizations facing the prospect of exploiting object technology for business purposes.

**What benefits and risks should AD organizations weigh when considering the transition to object technology?**
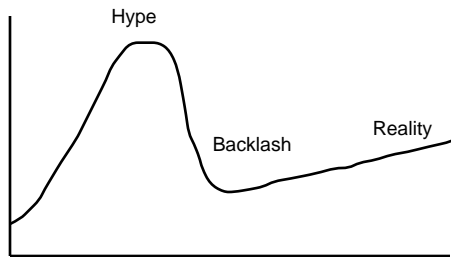
What are the Pitfalls?

What is the Promise?

- Productivity

- Reuse

- Managing Complexity

- Flexibility

- Adaptability

- Improved Quality

- Unrealistic Expectations

- Over- or Under-committing

- Organizational Immaturity

- Technological Immaturity

- Inappropriate Technology

- Inadequate Infrastructure

- Crossing the Chasm

- Enterprise Objects
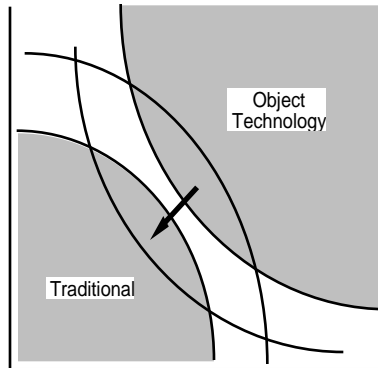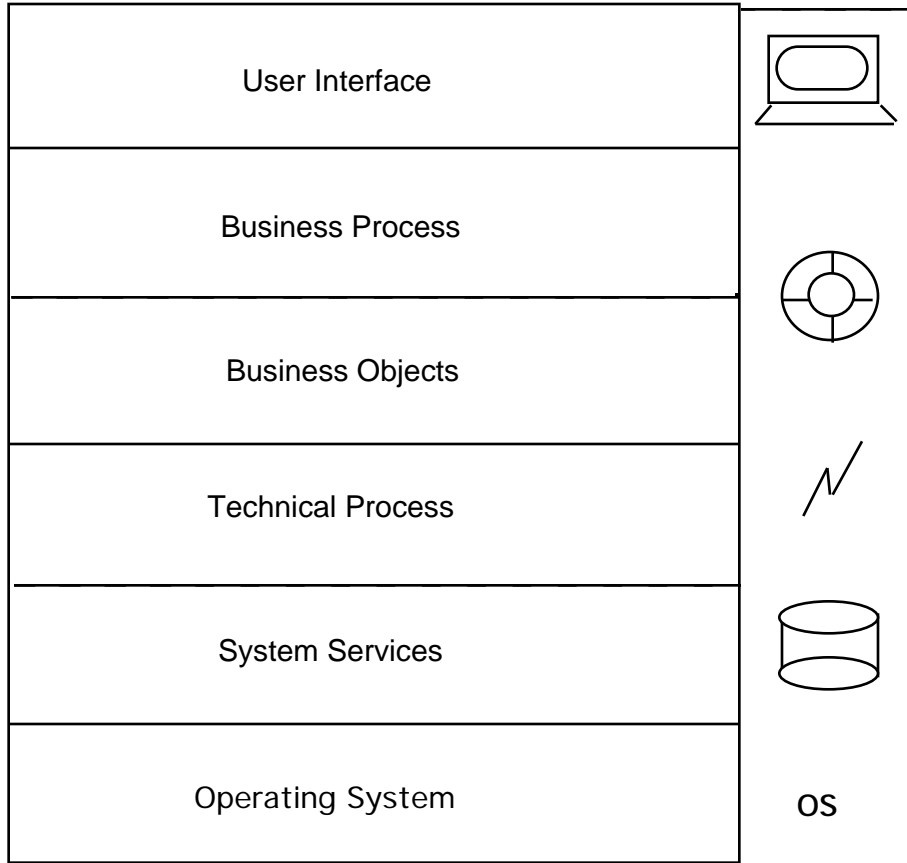

Source: Gartner Group

Object technology (OT) applied to complex enterprise systems represents both a promise and a threat to AD organizations. Most have heard the promise of OT, but they have also heard these promises before for other technologies. The threat looms more prominently, as these AD organizations face immature OT tools and methodologies, a long and costly technology and organizational learning curve, unstable OT tools vendors and inadequate infrastructure technology.

While programming tools are maturing and available in a wide variety of technology options, the general lack of technology support for object cataloguing and management ties successful reuse to the skills and practice of knowledgeable staff. Methodology and process management are also immature and evolving disciplines. Consequently, we must caution AD organizations that despite the real benefits of developing with object technology, there are far too many pitfalls to ignore.

By 2000, at least five in 10 new applications will use OT for user interfaces and complex client and server functionality (0.7 probability).

Layered Architecture

User Interface	
Business Process	
Business Objects	
Technical Process	
System Services	
Operating System	OS

Source: Gartner Group

Key Issue: What benefits and risks should AD organizations weigh when considering the transition to object technology?
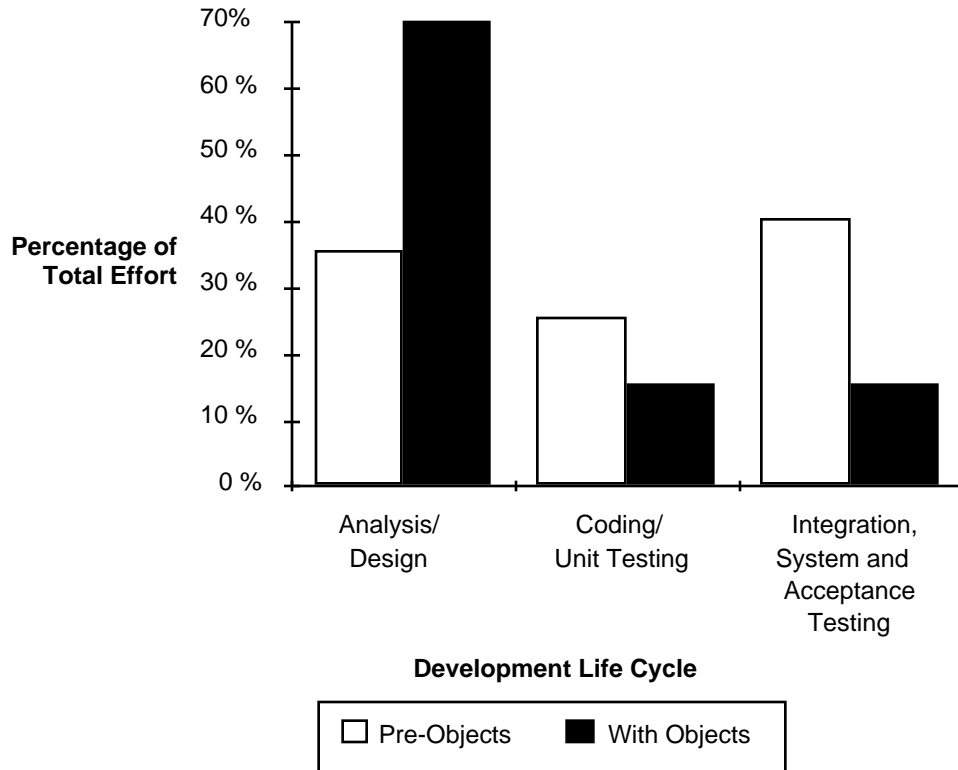
A leading vendor of order entry and subscription billing software is betting on object technology. This vendor will rearchitect its character-based package of more than 100 programs to support multiple graphical user interfaces, Unix transaction processing and relational databases. Flexible report writing options are equally important to its customers for billing and market analysis. Two key business goals drive the choice of object technology: 1) improve customer satisfaction through customizable user interfaces and 2) flexible, scalable architecture for adaptability to new market requirements. A layered software architecture similar to the one depicted above has been chosen to permit the developer to deploy the user interface, business objects and the transaction and data storage (relational) independently of one another in a variety of configurations. The language environment will be hybrid using C++ and C. The existing software product, written in C, will be mined for components that can be reused.

The immaturity of today's object technology, tools and methods requires mature process management, training and mentoring.

Effort Shifts to Analysis and Design

```
Percentage of
Total Effort
```

70%
60 %
50 %
40 %
30 %
20 %
10 %
0 %

Analysis/
Design

Coding/
Unit Testing

Integration,
System and
Acceptance
Testing

Development Life Cycle

☐ Pre-Objects   ■ With Objects

Source: Gartner Group

Key Issue: What benefits and risks should AD organizations weigh when considering the transition to object technology?
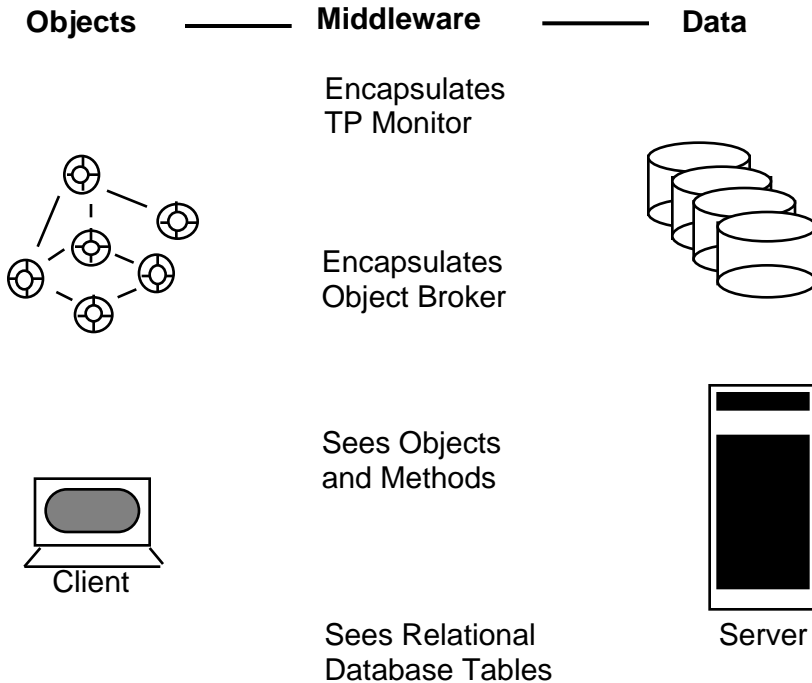
Benefits: OO development has been substantially adopted within Data Sciences, with 200 staff members having received some level of OO training. Productivity and flexibility goals have been generally achieved with a significant redistribution of effort in the life cycle. The object library contains around 300 components constructed from an estimated 3,000 classes. The effectiveness of reuse is demonstrated by the substantial reduction in coding effort. Converting traditionally skilled staff to effective OO designers is taking six to 12 months, and newly trained staff need close mentoring for around three months.

Risks: OO analysis and design skills are critical because this becomes 70 percent of the life cycle. In Data Sciences' case, half of the traditional developers learned object orientation readily, a quarter eventually and a quarter failed to grasp the concepts (but didn't always realize it). Enthusiasm isn't enough. The last category can prove dangerous if not identified early.

Through 2000, the majority of new applications using OT will target relational databases via middleware interfaces (0.7 probability).

Crossing the Chasm to Relational

Objects —— **Middleware** —— **Data**

Encapsulates
TP Monitor

Encapsulates
Object Broker

Sees Objects
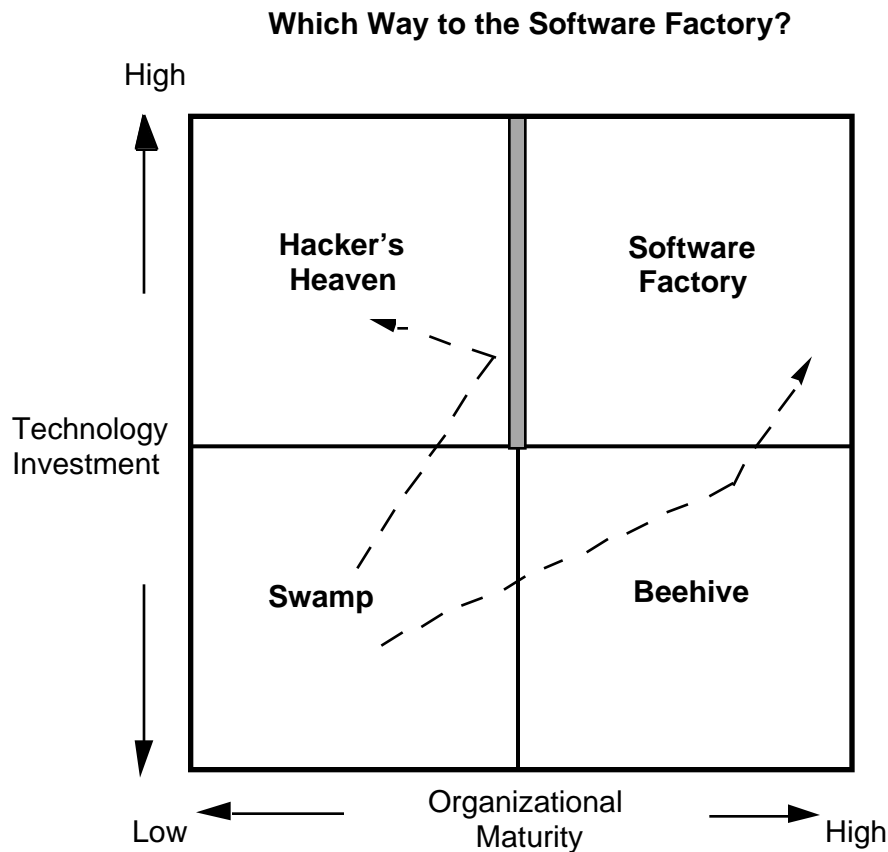and Methods

Client

Sees Relational
Database Tables

Server

Source: Gartner Group

Key Issue: What benefits and risks should AD organizations weigh when considering the transition to object technology?

A medium-sized customer services company could not get new promotions to market fast enough. Clients were looking to its competitors, and the company began to lose money. A new CIO was recruited who was familiar with newer technologies such as RDBMS and OO development. The CIO identified that the company could not wait to train its IS staff of COBOL programmers so he contracted with a systems integrator. The products chosen were: NEXTSTEP on Intel PCs for the client and Unix servers running Sybase. NeXT's PDO and DBKit were used to encapsulate existing Unix-based code that accessed data from the mainframe and provided the underlying infrastructure that enabled the success of the project. The company has experienced a 25 percent increase in business, has returned to profitability and has significantly increased client satisfaction. The enabling infrastructure based on NeXT PDO provided for the sharing of information and protection from change necessary for continued development and profitability.

Which vendors and technologies will provide the most effective solutions for object and component development?

Which Way to the Software Factory?

High

Technology
Investment

Hacker's Heaven	Software Factory
Swamp	Beehive

Low

Organizational
Maturity

High

Source: Gartner Group

Type A: The Risk of Creating a High-Tech Playground

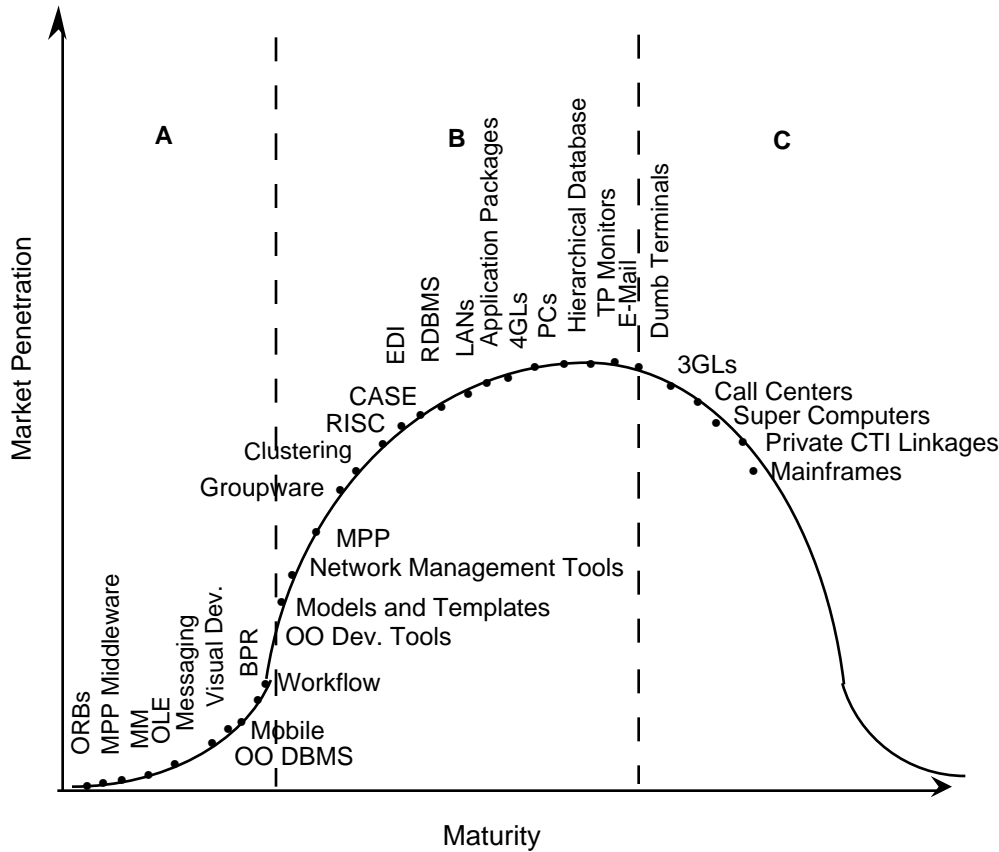Type B and Type C: "Making Honey Without Getting Stung"

Know the Organization

• Assess Level of Maturity

• Identify Skills and Technology Resources

• Target Business Benefits Appropriately

• Know the Tradeoffs (Quality, Flexibility and Time-to-Market)

Organizations should select new technologies according to degree of maturity.

Technology Life Cycle Curve

A   B   C

Market Penetration

ORBs
MPP Middleware
MM
OLE
Messaging
Visual Dev.
BPR

EDI
RDBMS
LANs
Application Packages
4GLs
PCs
Hierarchical Database
TP Monitors
E-Mail
Dumb Terminals

CASE
RISC
Clustering
Groupware

MPP
Network Management Tools
Models and Templates
OO Dev. Tools
Workflow
Mobile
OO DBMS

3GLs
Call Centers
Super Computers
Private CTI Linkages
Mainframes

Maturity

Source: Gartner Group

Key Issue: Which vendors and technologies will provide the most effective solutions for object and component development?

The curve above reflects usage, not the amount being sold. Technology's positioning on the curve does not reflect its length on market. Technologies on the left of the bell curve should be reviewed, piloted and partially implemented by Type A companies today. Technologies at the apex of the bell curve will have reached a level of reduced complexity that enables widespread Type B usage. Type B users should review technologies ascending the bell curve, waiting for Type A success stories before implementation. Type C users should be considering technologies that have peaked in their development and have started to descend in price.

Technology implementation inconsistent with organizational maturity level will result in staff frustration, lower productivity and shelfware.

Reader Notes

Object Technology Strategies

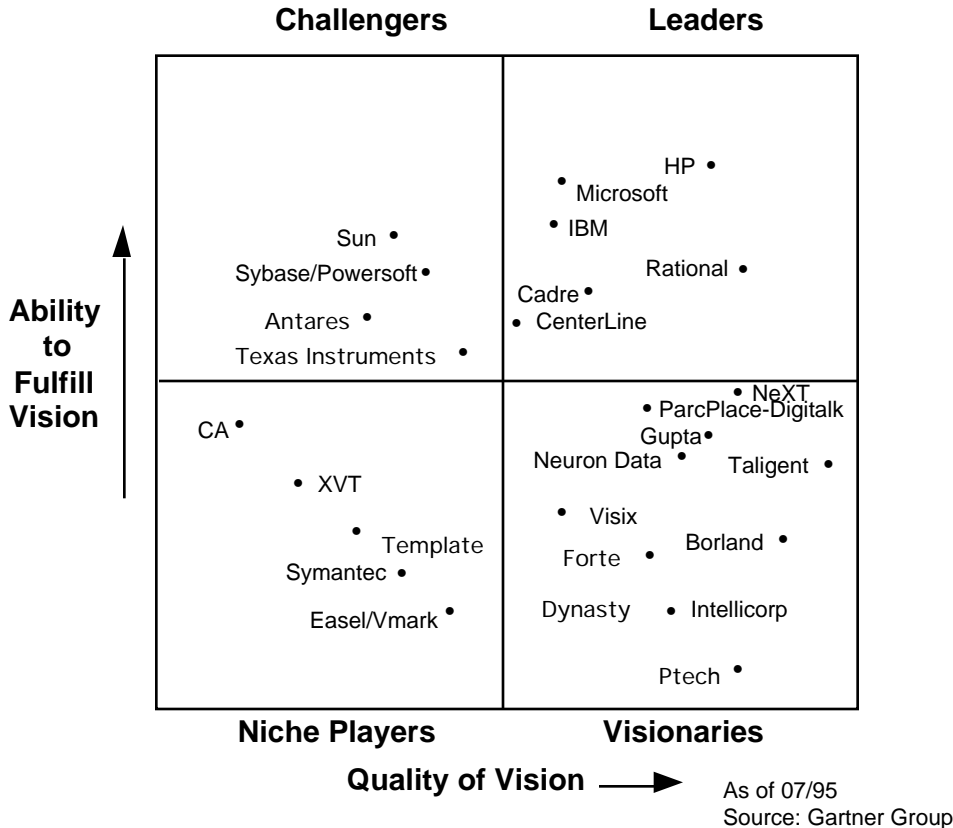|	**Type A** Pioneers *High risk*	**Type B** Moderates *Low risk*	**Type C** Followers *Risk averse*
Approach	Aggressive	Balanced	Cautious
Vision	Competitive edge	Productivity	Cost efficiency
Sophistication	High	Medium / High	Low / Medium
Funds	Flexible	Variable	Constrained
OO Status	Medium-sized production	Pilots and small production	None or Exploration
Programming Tools	C++, NextStep, Smalltalk VPE	Smalltalk VPE, OO4GL	Existing 4GL
CASE	Multiple methods and tools	OMT, OOIE	-
DBMS Access	VPE tools, class libraries	VPE tools, components	-
Components	OLE, DSOM	VBX	-
Middleware	Multiple Inc. CORBA	ODBC, TP monitor	TP monitor
Object Admin.	Operational	Establishing OA	-
Key 1996 Technologies	Taligent, Cairo	OA tools, OCX	OO programming

Source: Gartner Group

Key Issue: Which vendors and technologies will provide the most effective solutions for object and component development?

Classes are a more valuable reuse mechanism than components. A component can only be used "as is." If it does not perform the required task, it can only be modified by changing its source code. Inheritance allows a class to be reused as the basis for a new class without changing (or even owning) its source code. Object-oriented inheritance changes the "build vs. buy" equation, because it becomes possible to buy objects that are close (but not exact) matches to requirements, and to customize them without damaging the originals or invalidating their testing. Components and classes offer different reuse opportunities and benefits. Components are typically technical. Classes may define technical or business objects. Classes generally are used by professional designers and programmers using CASE tools and implementation languages, such as C++ and Smalltalk. Components may be used by a wider range of developers or even power users. System construction may be carried out by traditional programming or visual component assembly tools.

OO vendors are evolving their products to support component development.

Selected Object Technology Vendors

Challengers   **Leaders**

```
                            •    HP •
                              • Microsoft
                            • IBM
                 Sun •                  Rational •
     Sybase/Powersoft•      Cadre •
                           • CenterLine
       Antares •
    Texas Instruments •
                                      • NeXT
  CA •              • ParcPlace-Digitalk
                        Gupta•
         • XVT     Neuron Data •   Taligent •
              •         • Visix
            Template  Forte •  Borland •
     Symantec •
      Easel/Vmark •   Dynasty  • Intellicorp
                          Ptech •
```

Ability to Fulfill Vision

Niche Players   **Visionaries**

Quality of Vision ⟶

As of 07/95
Source: Gartner Group

Key Issue: Which vendors and technologies will provide the most effective solutions for object and component development?

Components are integral to Microsoft's vision of both desktop applications and development tools such as Visual Basic. Core Microsoft technologies (OLE, VBX and OCX) exploit component objects. At the other end of the spectrum, we have vendors such as Taligent, whose vision is to achieve productivity through a sophisticated class library. When this is delivered in 1995, it is likely to be complex, with twice as many classes as today's Smalltalk systems, but it will also be powerful, focused on the needs of enterprise developers creating "well-architected" applications. Even before the arrival of Taligent's libraries, there are dozens of companies (e.g., Rogue Wave) selling C++ classes. Some vendors have a foot in both camps. Sybase PowerBuilder and Gupta SQLWindows feature support for VBX components and third-party class libraries. Products such as IBM's Visual Age and Digitalk's Parts Workbench support both OO development using Smalltalk and visual programming by component assembly. Components may be created either by writing Smalltalk or by "wrapping" legacy 3GLs application code.

How will the transition to object technology impact AD organizations?

Challenges Facing IS Managers

- **Vision:** Forming realistic expectations and cultivating them through pilots and education

- **Application Portfolio:** Committing resources to object technology appropriately

- **Corporate Culture:** Evolving a more mature organization through organizational change, new roles

- **Process vs. Results:** Recognizing and compensating for immature technology through methods, training and mentoring

- **Tools Selection:** Avoiding inappropriate technology choices or disengaging from them

- **Standards:** Architecting infrastructure and supplementary policy, process and procedures

- **Looking Back:** Integrating with legacy and relational technology investments

- **Looking Ahead:** Planning well for a new legacy of enterprise objects

Source: Gartner Group

Differences in competitive and cost-control strategies among business organizations and other institutions will drive the posture of their AD organizations toward object technology and the potential benefits and risks it presents. However, by the year 2000, the transition to object technology will impact nearly all AD organizations either directly or indirectly, the two critical variables being how soon and to what advantage or disadvantage. As we have already seen, there is no single formula for success, although its elements are well-known. These include: aligning technology strategy with business strategy, understanding corporate culture and its degree of organizational maturity, formalizing the process for tools selection and development, and setting internal standards and policies toward the application legacy and its evolution.

Competitive differences will determine how AD organizations decide about enterprise objects.

Scenarios for Enterprise Systems

We believe the following scenarios will prevail during the next two to three years:

- **Type A:** "Acquisitive" or "aggressive" companies, especially those motivated by a "burning deck" competitive situation, will attempt in-house development of enterprise systems using OT (0.8 probability).

- **Type B:** "Bottom-line" or "balanced" organizations will be reluctant to exploit OT for in-house enterprise systems development due to the lack of mature tools and methods (0.7 probability).

- **Type C:** "Cost-constrained" or "cautious" organizations will be unable to marshal the mind share, the required resources or the organizational discipline (0.6 probability).
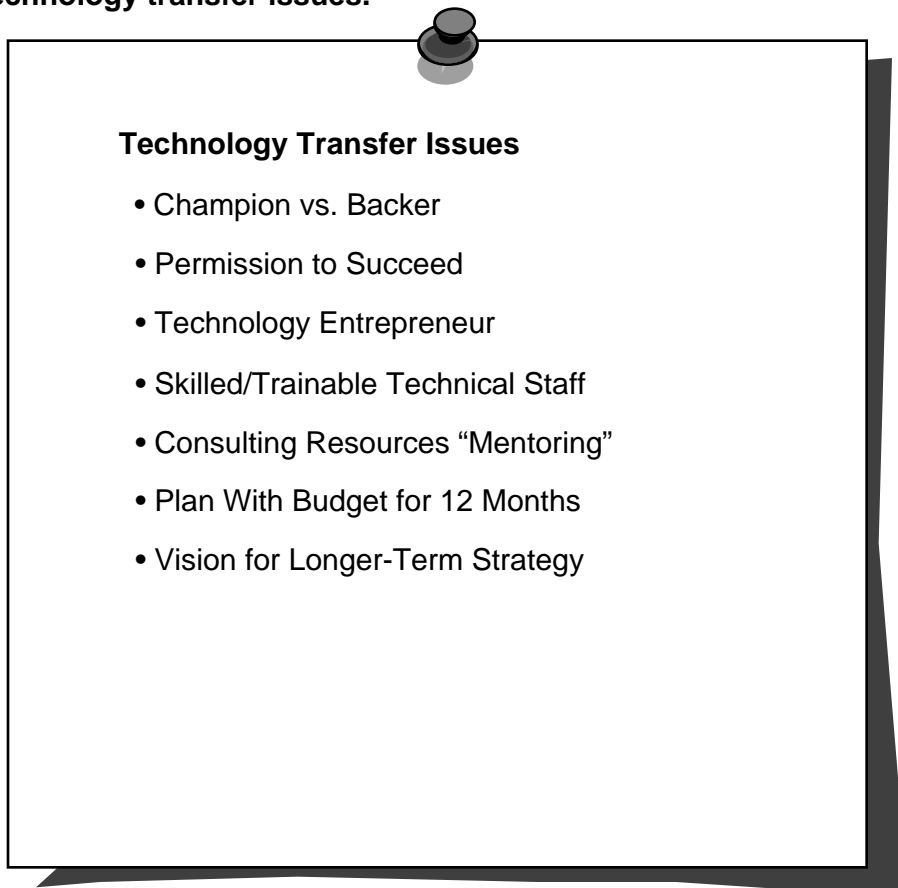
Bottom Line Issue: Make vs. Buy

Source: Gartner Group

Key Issue: How will the transition to object technology impact AD organizations?

Both Type A and Type B organizations should consider partnering with a systems integrator for risk avoidance, technology transfer and more adaptive OT enterprise systems. The Type A company will have to move quickly, as time-to-market will be a governing concern, and an up-to-speed system integrator can deliver what it will need. Type A companies will let the chips fall where they may and worry about cleaning up afterward. The Type B company will need to participate in and even control the process. It will also need to train and mentor its own personnel resources and prepare them to manage the system and to maintain it when the need arises. Type B companies are more concerned with an orderly process than Type A companies. Type C companies, if convinced of the cost neutrality of an OT solution, may outsource not only development but also ongoing maintenance and production, again given cost neutrality and the available budget. Convincing avowed technology skeptics is a common Type C problem.

AD organizations bringing in OO tools and methods can increase their likelihood of success by addressing key technology transfer issues.

Reader Notes

Technology Transfer Issues

- Champion vs. Backer

- Permission to Succeed

- Technology Entrepreneur

- Skilled/Trainable Technical Staff

- Consulting Resources "Mentoring"

- Plan With Budget for 12 Months

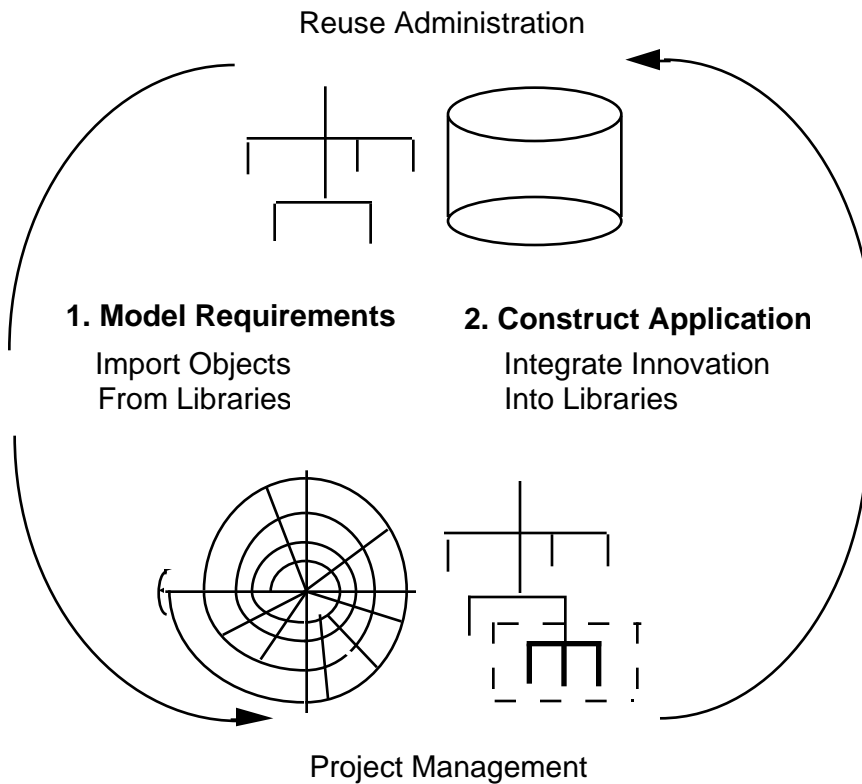- Vision for Longer-Term Strategy

Source: Gartner Group

Key Issue: How will the transition to object technology impact AD organizations?

- Finding a project champion in upper management is more advantageous than having a neutral backer that approves the project budget.

- One key benefit a champion can provide, aside from visibility, is permission to succeed (not to be confused with permission to fail).

- A successful OO start up will have an entrepreneur as the project leader, a skilled and trainable technical staff and available consulting resources to provide "mentoring" to newly trained OO developers.

- The project leader must also combine a vision for longer-term strategy with the practicality of managing a 12-month project budget.

Successful reuse will be dependent on well-managed teams, formal policy and specialized roles, rather than purchased technology solutions.

Integrating and Managing Enhancements

Reuse Administration

1. Model Requirements   **2. Construct Application**

Import Objects   Integrate Innovation
From Libraries   Into Libraries

Project Management

Source: Gartner Group

Key Issue: How will the transition to object technology impact AD organizations?

Organizational changes and new roles and responsibilities: The object or reuse administrator, whose responsibilities include establishing and enforcing procedures for correct object naming and versioning, will play a key role in organizations implementing object orientation and will be critical in keeping objects under control. Successful object administration will be built on successful data administration and thus will be rare.

Incentives to motivate IS staff: Successful cultural change at AD organizations will require a personnel strategy to motivate AD management and staff toward change that aligns with the goals of object orientation: quality and productivity via reuse. Elements of an effective personnel strategy will include performance appraisal mechanisms that evaluate reuse and reusability of object classes, rewards for risk-taking behavior and compensation adjusted to the new skill requirements of object orientation.

Systems integrators can be effective in assisting AD organizations to assimilate and implement object technology.

1994 Worldwide Revenues ($ in Millions)
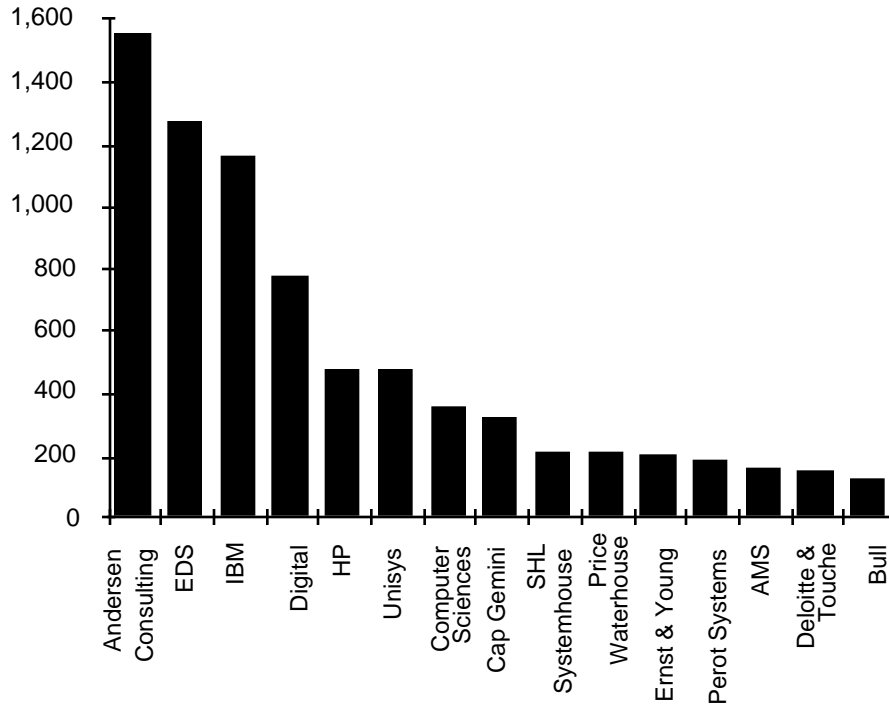
Source: Gartner Group

Key Issue: How will the transition to object technology impact AD organizations?

The leading systems integration (SI) and consulting firms, such as AMS, Andersen Consulting, CSC and EDS, have been active in OT engagements for years. Andersen Consulting built the first major OT enterprise system in 1991 at Brooklyn Union Gas and has recently launched an OT development center code-named "Eagle." Both EDS and IBM have established multiple OT development centers, each with a focus on particular industries. Ernst & Young has implemented a similar strategy. Systemhouse and Cap Gemini Sogeti, which have had success in OT engagements, have also started down this path. Within the next year, we expect most of the leading systems integrators will have established multiple OT development centers, each with an industry focus. Though many leading SI vendors have built these practices, we believe the selection of an SI partner also involves consideration of the industry expertise and proven project successes in delivering these solutions.

Through 2000, AD organizations will avoid project disasters by choosing services providers for their proven successes and project management skills (0.8 probability).

How Should AD Organizations Evaluate System Integrators?

Criteria	1994 AD Org. Ranking	Gartner Group Ranking*
Successful Past Relationship	1	1
Similarity of Culture (e.g., Team Players)	2	5
Solid Performance on Similar Assignments	3	2
IT Architecture/Infrastructure Expertise	4	7
Technical Credibility	5	8
Price	6	9
Application Expertise	7	7
Industry Expertise	8	4
Project Management Expertise and Methods	9	3
Financial Stability	10	10
Multivendor Experience	11	11
Product Independence	12	12
"Business Architect" Expertise	—	6

* Circled numbers show differences in rank of three or more. Source: Gartner Group

Key Issue: How will the transition to object technology impact AD organizations?

The Most Common Mistake: When AD organizations are selecting project partners, the most common mistake is to overrate the importance of the organization's experience using a particular technology. The chart above compares criteria considered important by large client organizations with Gartner Group's opinion based on a study of hundreds of engagements. We consider "price," "IT architecture," and "technical credibility" to be sixth, seventh and eighth in importance, considerably below where AD organizations typically rate its importance. "Similarity of culture" is considerably lower in importance.
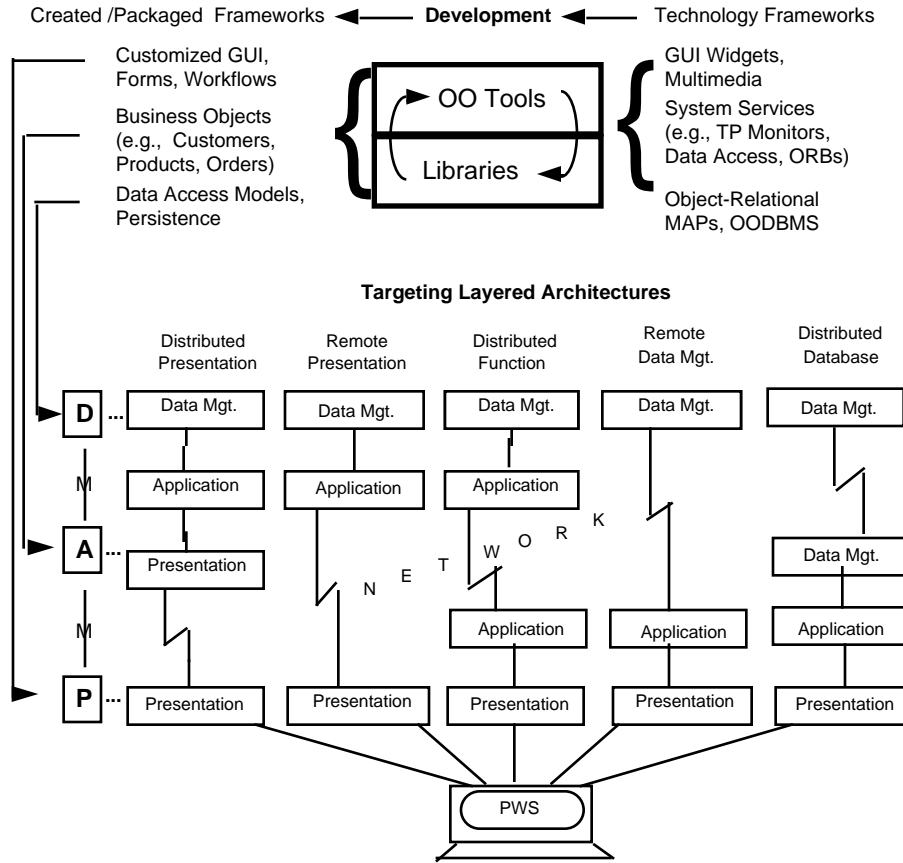
Key Criteria: Most importantly, we consider "project management expertise" and "industry experience" to be more important than they are commonly considered. We rate them third and fourth, just after "successful past relationship" and "solid performance on similar assignments."

AD organizations can exploit OT for hybrid client/server structures in layered architectures.

Object Technology: Three-Layer Architecture

Created /Packaged Frameworks ◄——— **Development** ◄——— Technology Frameworks

Customized GUI,
Forms, Workflows

Business Objects
(e.g., Customers,
Products, Orders)

Data Access Models,
Persistence

{ OO Tools

Libraries }

GUI Widgets,
Multimedia

System Services
(e.g., TP Monitors,
Data Access, ORBs)

Object-Relational
MAPs, OODBMS

Targeting Layered Architectures

	Distributed Presentation	Remote Presentation	Distributed Function	Remote Data Mgt.	Distributed Database
D ...	Data Mgt.	Data Mgt.	Data Mgt.	Data Mgt.	Data Mgt.
M	Application	Application	Application		
A ...	Presentation				Data Mgt.
M			Application	Application	Application
P ...	Presentation	Presentation	Presentation	Presentation	Presentation

NETWORK

PWS

Source: Gartner Group

Key Issue: How will the transition to object technology impact AD organizations?

Enterprise object systems to date have many common characteristics:

• Emphasis on the business problem, often via BPR
• Architecture-driven technology solutions
• "Three-layer" architecture for flexible deployment
• Tools choice usually client-driven; use of class libraries
• Use of off-the-shelf components, often mixing technologies
• Proprietary methodologies, hybrids of leading standards
• OT for GUI and business objects
• Unix TP monitors (Tuxedo and Encina)
• Messaging middleware to drive transactions
• Relational or hierarchical DBMS technology; not much OODBMS

- By 2000, at least five in 10 new applications will use OT for user interfaces and complex client and server functionality (0.7 probability).

- Technology implementation inconsistent with organizational maturity level will result in staff frustration, lower productivity and shelfware.

- Through 2000, the majority of new applications using OT will target relational databases via middleware interfaces (0.7 probability).

- Successful reuse will be dependent on well-managed teams, formal policy and specialized roles, rather than purchased technology solutions.

- Through 2000, AD organizations will avoid project disasters by choosing services providers for their proven successes and project management skills (0.8 probability).