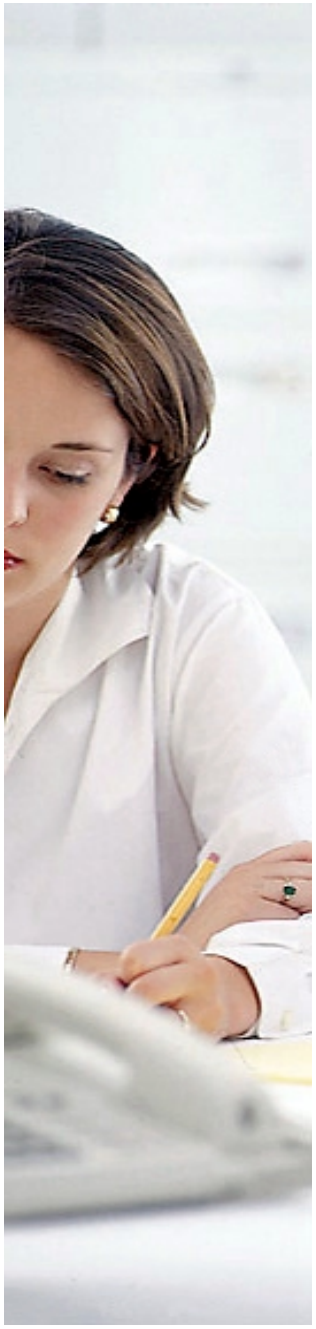
Appendix C. Gap Analysis
Table of Contents

Appendix C. Gap Analysis
Table of Contents (continued)



1. IT Governance

IT Governance Gap Analysis
IT Governance Framework

- **IT Governance is essentially the authority and process for making decisions regarding information technology. To assess IT Governance, Gartner uses the following framework:**

	1. IT Services	2. Use Policies	3. Architecture	4. Standards	5. Security and Privacy Policies	6. Project Approvals
A. Scope **What?**	What IT Services are provided by: ITD Schools Vendors	Identify and provide the University's IT use policies (i.e., use of email, PCs, telephone, etc.).	*Not Applicable*	Identify and provide the University's IT standards.	Identify and provide the University's IT security and privacy policies.	Which IT projects must be approved before they may be undertaken?
B. Structure **Who?**	Who has the authority to determine which services are provided by each group: ITD Schools Vendors	Who has the authority to establish (and enforce) IT use policies?	Who has the authority to establish (and enforce) the University's IT Architecture?	Who has the authority to establish (and enforce) IT standards?	Who has the authority to establish (and enforce) IT security and privacy policies?	Who has the authority to approve proposed IT projects?
C. Process **How?**	What is the process for determining which services are provided by each group: ITD Schools Vendors	What is the process for establishing IT use policies?	What is the process for developing and establishing the University's IT Architecture?	What is the process for establishing IT standards?	What is the process for establishing IT security and privacy policies?	What is the process and criteria for reviewing and approving proposed IT projects?

IT Governance Gap Analysis
Current Issues

- **IT Project Decision-making, Planning and Prioritization**
  - Users often have little input into IT Projects
  - Decentralized decision-making limits the University's ability to leverage projects on an enterprise-wide basis
  - Decisions about IT Projects may not consider the needs of non-Malibu-based Schools and programs
- **IT Budgeting**
  - Perception that Schools are not treated equally in the IT funding process
  - No way to accurately determine how much is spent on IT each year
  - Projects are not always funded for the life of the project; only first-year funding considered
  - Individual Schools undertake University-wide projects, but funding is not shared across the enterprise
- **IT Standards**
  - While there are some standards (e.g., Dell PCs, MS Office), they are not enforced across the University

IT Governance Gap Analysis
Current Issues

- **IT Policies (including Use, Security and Privacy Policies)**
  - Use Policies
    - Use Policies should cover use of the following:
      - PCs and Peripherals
      - Software
      - e-mail
      - Internet
      - Telephone/Cell Phones
      - Pagers
      - PDA devices
      - Electronic Document Management
    - Pepperdine's Use Policy addresses e-mail specifically, but does not define what is contained within "University computing and network resources"
  - Security Policies
    - Pepperdine's Security Policy adequately describes the current security environment. If security efforts are increased, the policy would need updating. While there is a Disaster Recovery Report, the University currently has no Disaster Recovery policy or approved plan.
  - Privacy Policies
    - Pepperdine's current Privacy Policy is adequate

IT Governance Gap Analysis
Current Issues

- **Governance of IT Architecture**
  - ITD is responsible for establishing the University's IT architecture through it's role in developing and maintaining the infrastructure. Since architecture is maintained through enforcing hardware and software standards, ITD's ability to maintain a planned architecture is only as good as its ability to enforce hardware/software standards.

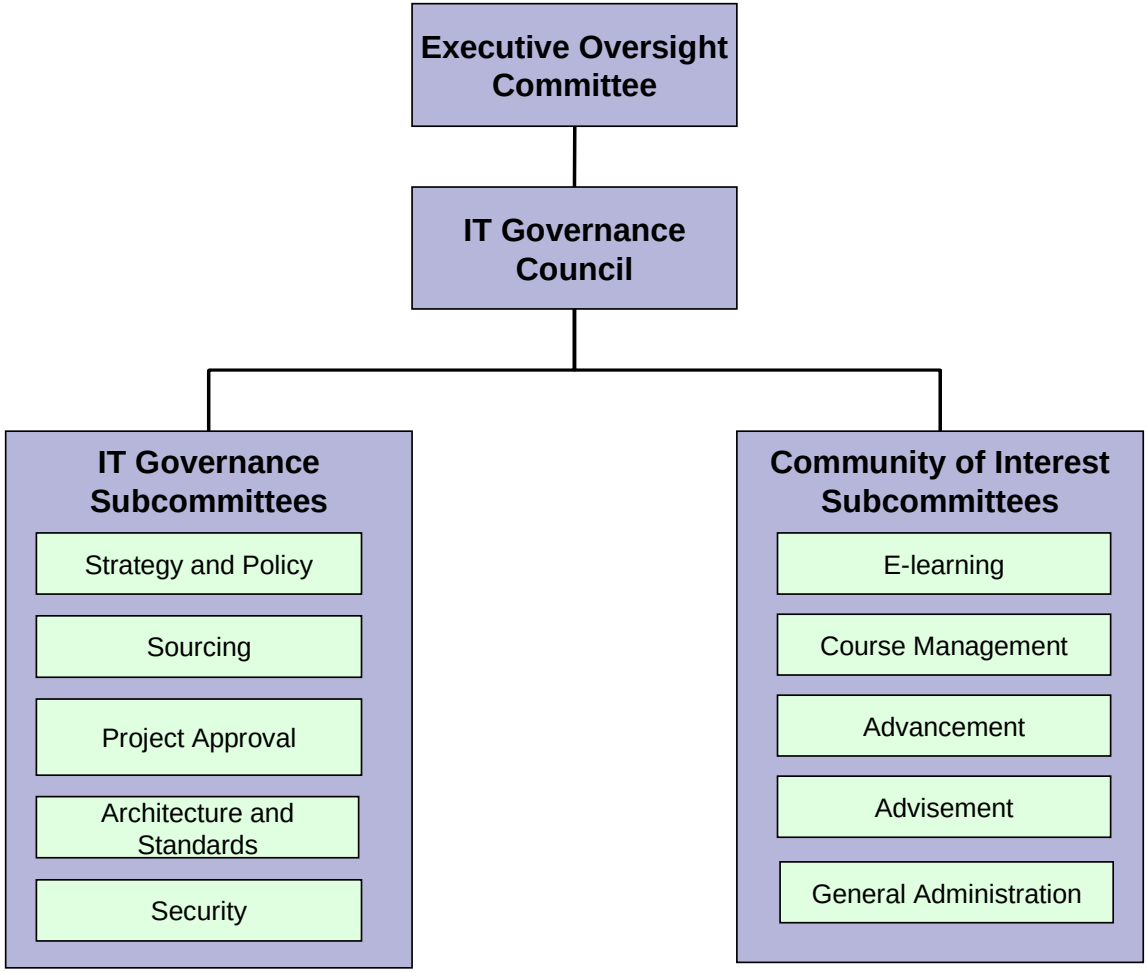
- **Summary:**
  - Pepperdine needs a more formal IT governance mechanism to address the issues identified here.

IT Governance Gap Analysis
Industry Trends

- **There are two primary approaches to Governance:**
  - Strong CIO Model
    - CIO has ultimate authority over IT decisions, and makes decisions based on input from the Schools, Divisions and Executives:
  - IT Governance Council Model
    - Governance Council is made up of representatives of ITD, Schools, Divisions, and makes decisions based on consensus. CIO is a key member of the Council.
- **The main functions in both models are the same -- the key difference is in WHO is responsible for these functions:**
  - Determining how IT services are provided (centralized or decentralized IT staff)
  - Developing IT Use Policies, Security Policies and Privacy Policies which are to be followed by Users
  - Developing/enforcing standards for hardware/software which are to be followed by Users
  - Managing the process for reviewing/approving use of non-standard hardware/software
  - Working with the IT Department to develop and enforce an enterprise-wide IT architecture through the enforcement of IT standards
  - Reviewing/approving/prioritizing IT projects University-wide
  - Reviewing/approving IT budgets for Schools, Divisions

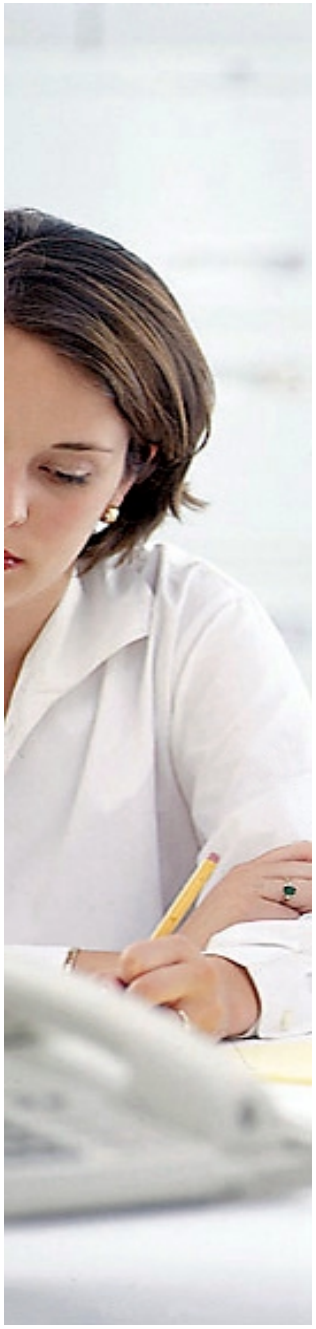
IT Governance Gap Analysis
Industry Trends

- **A typical IT Governance Council Model is depicted below:**



IT Governance Gap Analysis
Industry Trends

- **Strong CIO Model**
  - Advantages:
    - Decisions are made quickly -- no consensus required
    - CIO's office acts as a central point of knowledge, requiring an understanding of the major projects/needs/requirements across the enterprise
  - Disadvantages:
    - Decisions may seem arbitrary, politically-motivated, or the result of strong lobbying
    - Difficult for CIO to keep a grasp on all the major projects/needs/requirements in a very large organization without sufficient staff to assist
- **Governance Council Model**
  - Advantages:
    - Decisions about projects, standards, policies, etc. are based on a consensus of the key business and technology units in the organization, providing strong buy-in to the end result across the enterprise
    - Allows the CIO to act as an advisor and advocate of all Departments rather than a "Gatekeeper" for IT
    - Requires a series of Subcommittees and Communities of Interest to complete governance tasks
  - Disadvantages:
    - Decisions may take longer, as developing consensus across diverse units requires time
    - Some Governance Councils are not able to make consensus-based decisions; if consensus cannot be reached, some groups resort to voting
    - Requires a series of Subcommittees and Communities of Interest to complete governance tasks



2. IT Organization

IT Organization Gap Analysis
Current Issues

- **1-TRAC**
  - While service has improved, 1-TRAC does not meet many users' needs
    - 1-TRAC staff often cannot resolve the caller's problem on the first call
    - It is not clear how calls are prioritized and users are not given a projected resolution time
    - Users are not always contacted when the problem is resolved; some requests are never completed
- **IT Staffing and Support**
  - Users perceive that there are not enough IT staff to meet user demands
  - Technical Liaison program works well for Seaver College, but this program has not been expanded to other Schools
  - Some Schools/Divisions rely entirely on ITD for support, while others have their own IT staff members who provide on-site support
    - It is not clear what level of support should be provided centrally vs. by decentralized staff, and who should pay for those services
  - The IT Division has recently reorganized
    - Because many users bypass 1-TRAC and request assistance from individual ITD staff members, users have experienced difficulty locating staff members

IT Organization Gap Analysis
Current Issues

- **Student IT Support**
  - There is no clear, university-wide policy on IT support for students
    - Programs with laptop requirements also provide IT support for students
    - Other programs do not provide IT support for students;
    - The wireless network makes some level of IT support for students necessary; this support is accomplished in an ad hoc way, sometimes by faculty members
- **Chargeback**
  - The current chargeback mechanism is not related to technology use
    - Current mechanism is made up of charges for network ports and photocopying
    - The amount paid by users does not completely cover ITD's support costs
    - In addition to the chargeback amount, some Schools/Divisions fund their own projects and IT staff members

IT Organization Gap Analysis
Industry Trends -- Help Desk Support

- **Help Desk Support**
  - Typically, well-established help desks have the following characteristics
    - Use a modern Help Desk automated system (e.g., Remedy, Heat, Magic, Track-It, etc.)
    - Use extensive metrics to track not only basic measures (number of calls, abandonment rate, etc.), but also customer satisfaction levels, and mean time to repair
    - Use knowledge bases to assist Call Takers with Level 1 Support
    - Provide communication to customers about:
      - Estimated completion time
      - Technician assigned and contact information
      - Revised estimated completion times and status
      - Confirmation of completion
    - Communication often provided on-line, with no staffing support required

IT Organization Gap Analysis
Industry Trends -- Centralized vs. Decentralized Staff

- **IT Staffing and Support -- Centralized vs. Decentralized Staff**
  - Pepperdine's combination centralized/decentralized approach to IT service provision is the most popular structural model used in large organizations, but it has both advantages and disadvantages.
  - Centralized IT service provision
    - Advantages
      - Economies of scale
      - Coherent technical standards across the organization as a whole
      - Architectural uniformity
      - Appropriate levels of security and integrity
    - Disadvantages
      - Danger of "ivory tower isolation"
      - High communication costs
      - User frustration

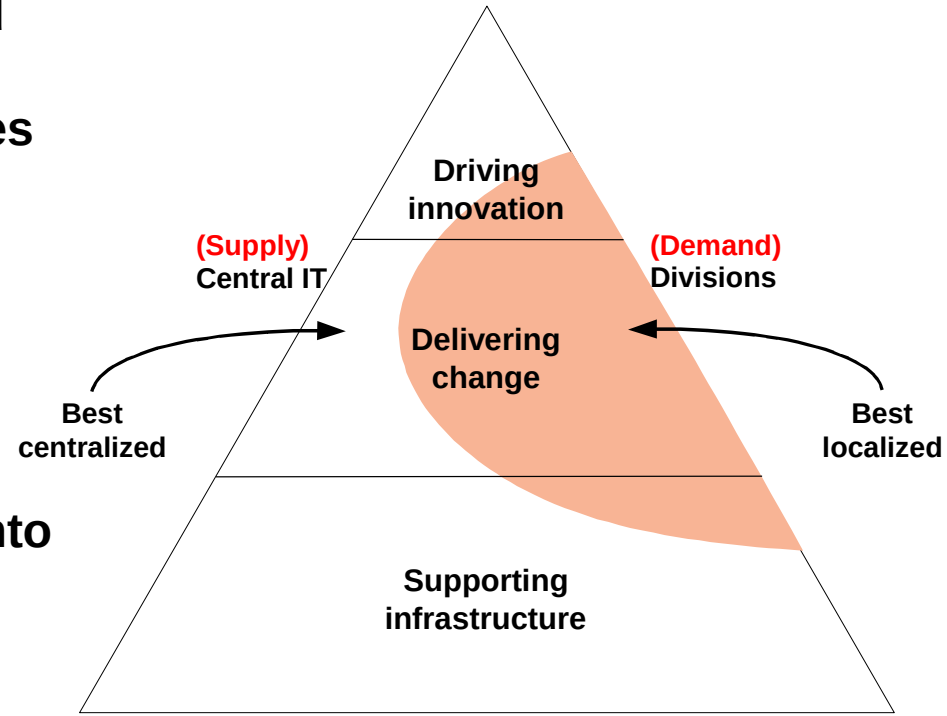
IT Organization Gap Analysis
Industry Trends -- Centralized vs. Decentralized Staff

- Decentralized IT service provision
  - Advantages
    - Improves responsiveness and organization awareness of IT
    - Improves alignment of IT with business objectives
    - Makes technology priority setting easier at the School/Division level
  - Disadvantages
    - Allows individual Departments to adapt their own technical standards without consideration of enterprise-wide standards or issues, resulting in architectural diffusion
    - Duplication of effort

IT Organization Gap Analysis
Industry Trends -- Centralized vs. Decentralized Staff

- **To determine which IT activities should be centralized and which should be decentralized, we first group IT activities into three main IT processes**
  - Driving innovation
  - Delivering change
  - Supporting infrastructure

- **These activities can then be grouped into two categories**
  - Supply-side -- corresponds to the central IT service provider; “how to do it” of IT
  - Demand-side -- corresponds to IT customers; “what to do with it” of IT



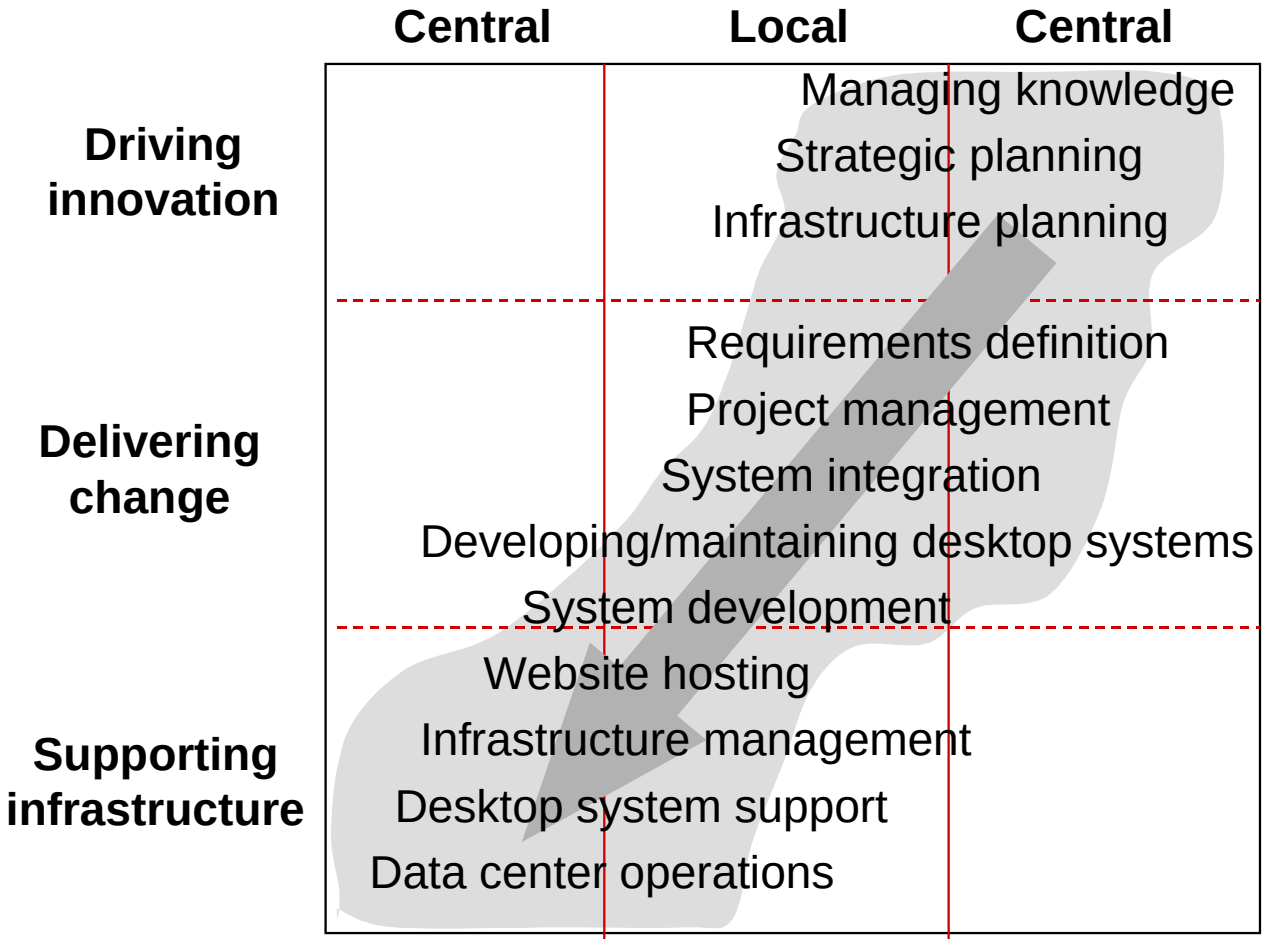
The three main IT processes:
- Driving innovation
- Delivering change
- Supporting infrastructure

IT Organization Gap Analysis
Industry Trends -- Centralized vs. Decentralized Staff

- **Supporting infrastructure is a supply-side activity**
  - Supply-side activity that includes website hosting, infrastructure management, desktop system support and data center operations
  - Infrastructure support is best done centrally with input from the business units to ensure that those services are meeting the needs of the business
- **Delivering change is partially a demand-side activity and partially a supply-side**
  - Includes requirements definition, project management, system integration, developing/maintaining desktop systems and system development
  - When these activities are done on an enterprise basis, e.g., enterprise application development, they should be done by central IT
  - When these activities are done on a divisional basis, e.g., the business units should do the single-division application development
- **Driving innovation should be primarily supply-side, but has a demand-side component**
  - Includes activities such as managing enterprise knowledge, strategic planning, and infrastructure planning
  - While these are enterprise issues and these activities should be conducted by central IT, the business units must be involved in order to ensure that these efforts truly reflect the needs of the business units and the enterprise as a whole

IT Organization Gap Analysis
Industry Trends -- Centralized vs. Decentralized Staff

- **The following figure shows a typical distribution of IT activities, illustrating how these principles apply in practice**



IT Organization Gap Analysis
Industry Trends -- IT Staffing Levels

- **IT Staffing and Support -- Staffing Levels**
  - 1999 Campus Computing Survey yields the following results[1]:
    - Ratio of Help Desk Personnel to Student Headcount Enrollment (Private Universities): 1 : 162

	Universities		4-Year Colleges		2-Year Colleges	
All Institutions	**Public**	**Private**	**Public**	**Private**	**Public**	**Private**
279	**190**	**162**	**353**	**201**	**715**	**171**

  - Pepperdine's metrics
    - Student Headcount Enrollment: 8000
    - Number of Help Desk Personnel: 22 (1-TRAC Staff)
  - Pepperdine's Ratios
    - Help Desk Personnel to Student Headcount Enrollment: 1:364
      - » This ratio is far higher than other Private Universities

1. Source: Kenneth C. Green, Campus Computing 1999: The Tenth Survey of Computing and Information Technology in Higher Education (The Campus Computing Project: Encino, CA 1999)

IT Organization Gap Analysis
Industry Trends -- Student IT Support

- **Student IT Support**
  - Most institutions provide IT support to all students through either a Consolidated Help Desk (such as 1-TRAC) or through an Academic Computing Help Desk solely for student support.
  - Larger institutions provide IT support to students for extended hours, some provide 24/7 support
    - Smaller institutions provide support Mon-Fri 8:00 -5:00, then on-call emergency service after that for specific issues
  - Many institutions charge students a Technology Fee, although it rarely goes for IT staffing
    - Fee is typically used to fund infrastructure
  - Most institutions provide the same level of support for commuting students and residential students (except there are no house calls)

IT Organization Gap Analysis
Industry Trends -- Sourcing

- **Most organizations use selective outsourcing**
  - Data Center
  - Help Desk
  - Network
  - Desktop, client/server
  - Applications
- **Other key services are kept in-house**
  - IT Management
  - IT Planning
- **Within Higher Education, the trend is toward selective outsourcing rather than full outsourcing**
  - Pepperdine currently follows this model, outsourcing selected services
    - Hardware maintenance
    - Application development and maintenance
  - Should consider sourcing options related to ERP
    - Will discuss during Workshop 2

IT Organization Gap Analysis
Industry Trends -- Chargeback

- **Chargeback**
  - What is Chargeback?
    - An accounting methodology that posts costs that were once considered part of a strict overhead area to the areas that consume the products and services provided internally
  - Why have Chargeback?
    - Two main reasons
      - The IS organization does not bill for IT services, but top executives, sensing that IT spending is careening out of control, insist that the IS organization recover all costs from the business.
      - The IS organization already bills for IT services, but business managers demand a fairer and more succinct billing system.
    - Other reasons
      - Increased accountability for IT expenditures
      - Shift IT justification to clients
      - Clearly define the line-of-business operating expenses
      - Make IT a discrete business unit
      - You're told, "Just Do It!" (management edict)

IT Organization Gap Analysis
Industry Trends -- Chargeback

- **An effective chargeback system will:**
  - Apportion costs to areas that use services the most
  - Help managers make more cost-effective decisions
  - Establish accountability for cost overruns with the areas that caused them,
  - Force more customer service focus, if customer satisfaction is measured and used as a performance criterion
  - Develop an entrepreneurial spirit to "sell" your products and services
  - Assist in budgeting by tracking activity volumes and anticipated demand increases that can help financially justify additional resources
  - Employ free enterprise checks and balances to control costs as in a free market economy. Your cost for services should be competitive with that of an outside vendor

IT Organization Gap Analysis
Industry Trends -- Chargeback

- **The Dynamic World of Chargeback**
  - Given the pace of change in IT and the pendulum swings of organizational dynamics, no chargeback system should last indefinitely.
  - Most IS directors re-examine their chargeback system after two or three years.
  - Moreover, a chargeback system typically needs 12 months to 18 months for rollout, meaning that a system designed today must anticipate the drivers of the chargeback system tomorrow.
  - Finally, most enterprises require several chargeback schemes, even though internal customers see only one bill.
- **Chargeback methodologies must be:**
  - **Understandable** -- The Business Unit must understand how the charges are generated and how their behavior affects total cost
  - **Predictable** -- Business Units need to budget so monthly costs must be predictable based on behavior/usage patterns
  - **Equitable** -- Business Units must not believe they are subsidizing other units
  - **Minimally Burdensome Administratively** -- The cost to administer the chargeback mechanism must be something the IT Division can bear

IT Organization Gap Analysis
Industry Trends -- Chargeback

- **Infrastructure Chargeback Methodology Trends — by Service Area — 2004**

Mainframe Data Center Operations
Measured Usage (85%)
Activity-Based Costing (ABC) — (15%)

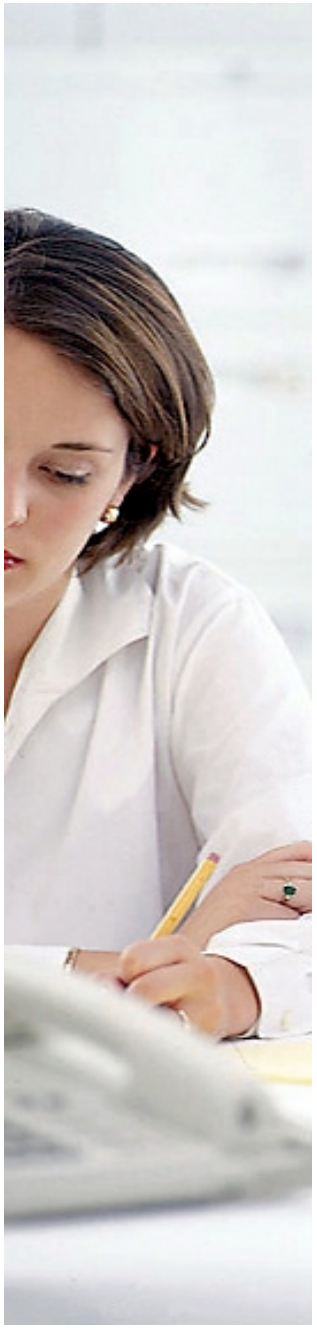
Centralized Applications Server
Measured Usage (40%)
Direct Cost (30%)
Tiered Flat Rate (30%)

Distributed Computing
Direct Cost (42%)
Subscription Fee (33%)
Tiered Flat Rate (25%)

Help Desk
Subscription Fee (45%)
Measured Usage (30%)
Tiered Flat Rate (25%)

Wide-Area Data Network
Subscription Fee (50%)
Tiered Flat Rate (35%)
Measured Usage (15%)

IT Management Overhead
Allocation (85%)
Subscription Fee (15%)



3. Applications

Applications Gap Analysis
Current Issues

- **ERP**
  - The Current SCT product suite, including the Financial Records System (FRS), the Student Information (SIS) and other administrative systems does not meet user needs
    - FRS is a transaction system for accounting rather than an information management system. Limited information is available on-line; queries are difficult.
    - SIS is not flexible enough (e.g., does not accommodate weekend classes), is difficult to query, cannot accommodate needed volume (e.g., 800 students registering at the same time)
  - System Integration
    - FRS, SIS and the Human Resources System (HRS) are not integrated.
    - No central repository of data, multiple data entry into each system, difficult to reconcile data across systems
    - Staff use separate MS Office products to reconcile data and keep data accurate
  - Data Warehouse
    - This currently works well, although it contains only financial accounting data
    - HRS and SIS data should be included to store all critical data in one place
  - Academic Advising Tool
    - Current system does not have an adequate academic advising tool which will allow faculty and students to view course requirements, conduct degree audits, etc.

Applications Gap Analysis
Current Issues

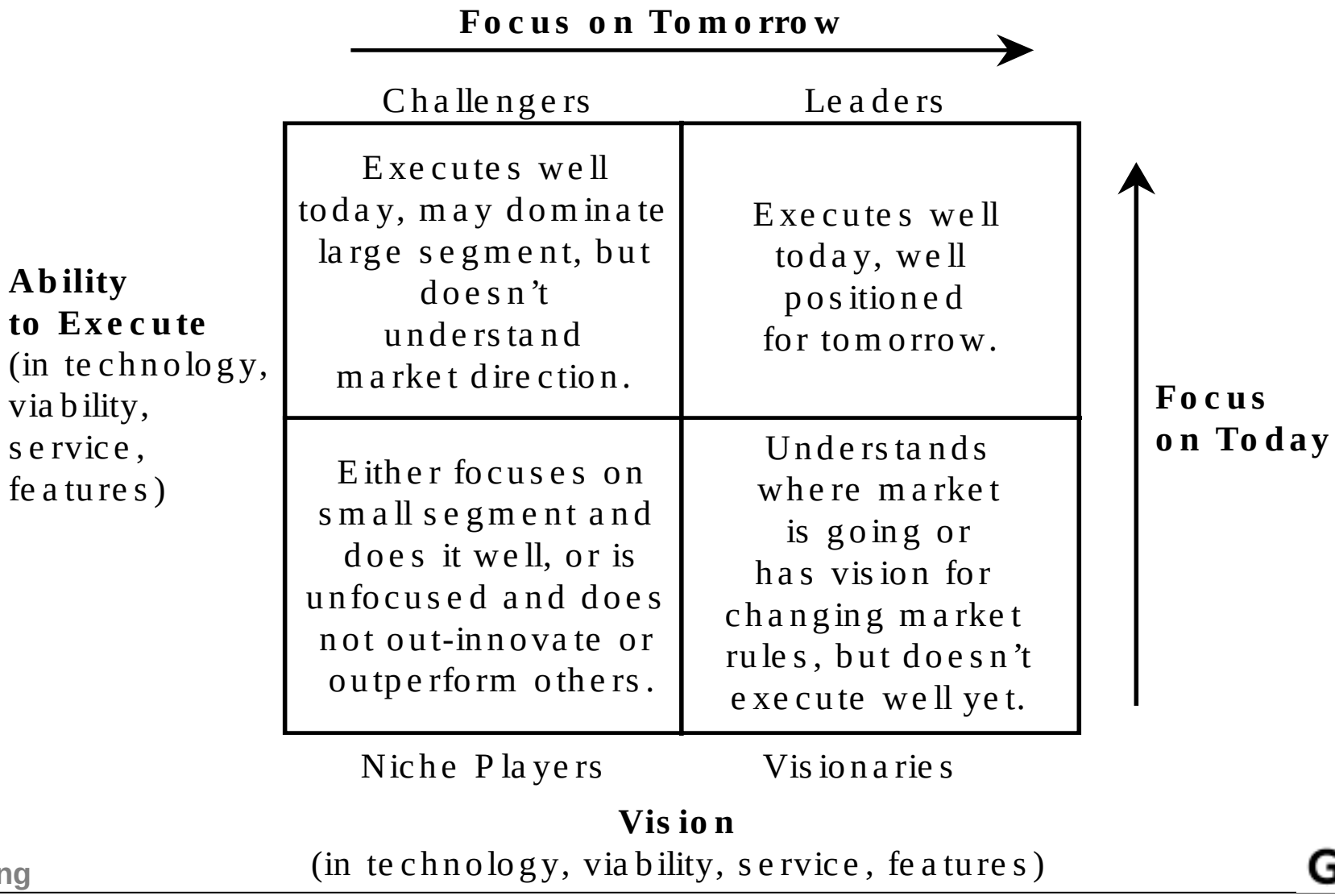
- **Portals**
  - Pepperdine has two portals:
    - PepXpress and Graziadio Net
    - While there are benefits to this approach, particularly in better service to Graziadio Net users, there are additional costs associated with supporting two portals
    - There is consensus across the schools that a single portal that meets all users needs, and achieves a consistent look and feel, is needed
  - PepXpress does not meet the needs of all users
    - It is considered non-intuitive and difficult to navigate
    - It did not meet the needs of Graziadio students, which prompted the development of Graziadio Net
- **Course Management Systems**
  - Pepperdine has two major course management systems:
    - Blackboard (most widely used) and WebCT
    - There are additional costs to the University to purchase and maintain multiple course management systems
- **e-Learning Platforms**
  - Pepperdine will soon have 6 e-learning platforms
    - While this allows for customized e-learning applications to be used by each school/program, there are additional costs for purchasing and maintaining each platform

Applications Gap Analysis
Current Issues

- **Access to Applications**
  - Students currently have cost-effective access only to MS Office applications
    - Students have expressed a need to have greater access to other standard applications, such as SPSS for statistics, accounting applications, etc.

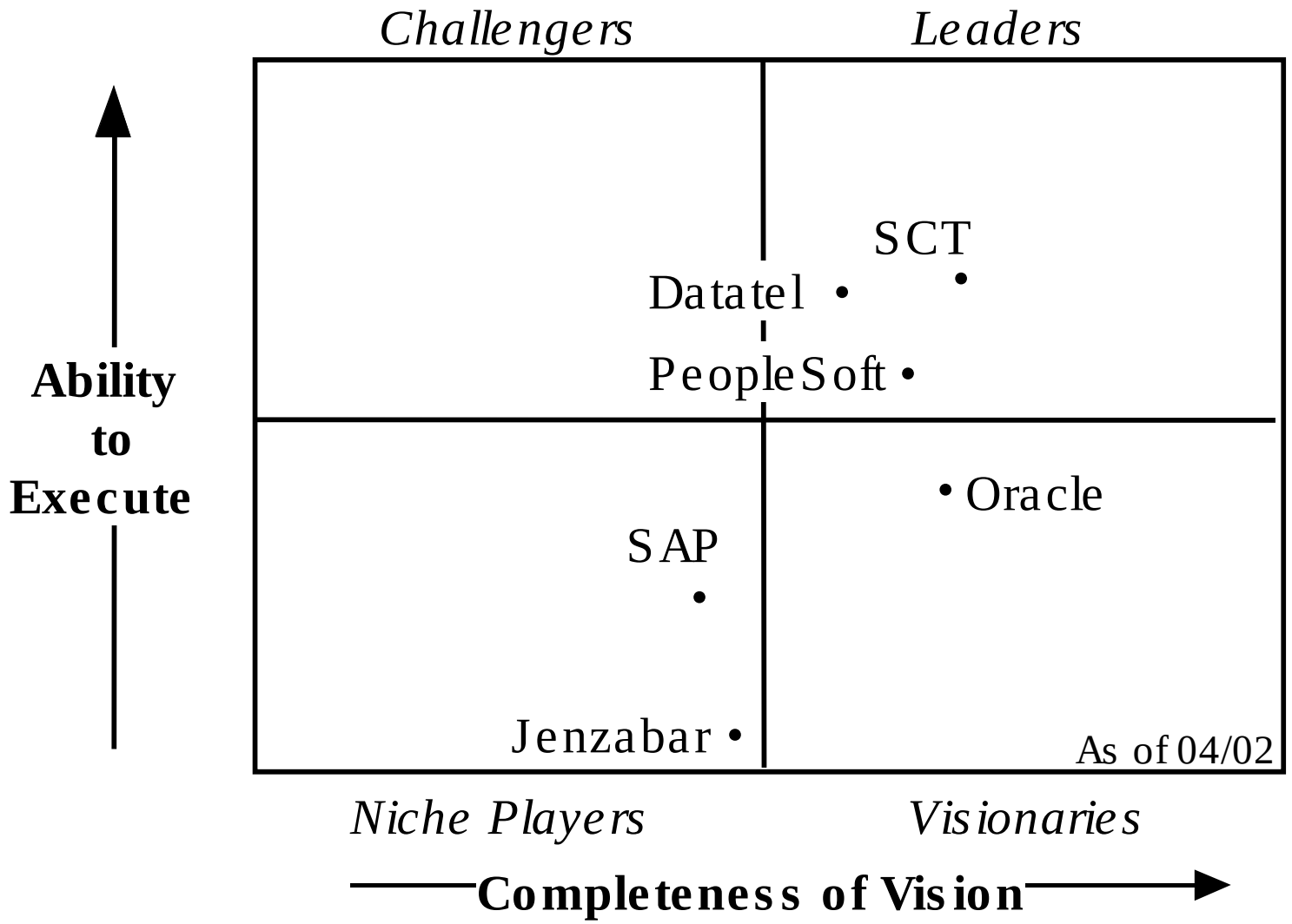
Applications Gap Analysis
Industry Trends -- ERP

The Gartner Magic Quadrant



Applications Gap Analysis
Industry Trends -- ERP

Magic Quadrant for Higher-Education ERP Vendors

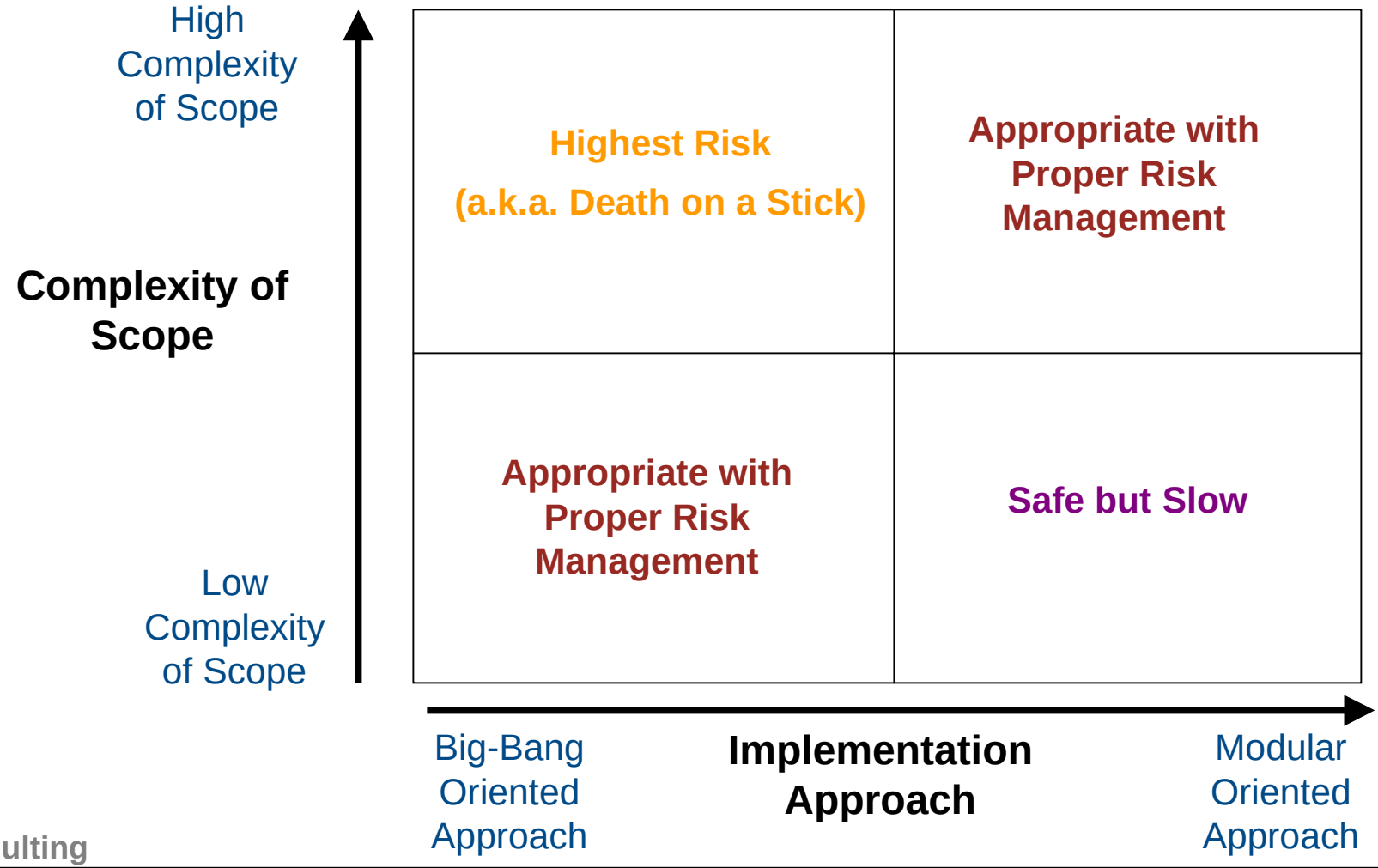


Applications Gap Analysis
Industry Trends -- ERP Critical Success Factors

- **Manage Expectations**
  - Users often expect the new system to answer all that is wrong with the enterprise
  - Sales cycle fuels inflated expectations by demonstrating capabilities that may not be feasible in the organization's environment
  - Create a detailed Statement of Expectations related to business process change, application functionality and specific business benefits (business case)
    - Make this visible to the Implementation Team to help them stay focused and to other stakeholders to communicate expected business benefits
- **Know Your Scope**
  - Scope dimensions include: applications, processes, geographies, locations, users, significant organizational and infrastructure changes
  - Larger project more risk more challenging to manage more likely to fail
  - Plan project to achieve benefits within 18 months
    - Achieve the ideal future state via a few transition states
    - An incremental coordinated program approach will allow value to be derived while enabling the organization to respond to changes in the business environment

Applications Gap Analysis
Industry Trends -- ERP Critical Success Factors

- **Pick the Right Implementation Approach**



Source: Gartner

Applications Gap Analysis
Industry Trends -- ERP Critical Success Factors

- **Focus on the Users**
  - The people dimension has the greatest impact on project success
  - Pay significant attention to the following:
    - **Communication** — about the project to the enterprise, on a regular basis, throughout the project
    - **Consistency** — of messages originating from the project team, creating a consistent view of the project within the enterprise
    - **Inclusion** — of users not directly involved in the project in such activities as validation of design and conference room pilots
    - **Education** — helping users understand why the project is important and what the organizational benefits will be; providing them with the knowledge required to assist in achieving the benefits
    - **Training** — preparing users for the changes to their daily activities
- **Have Committed Sponsors**
  - Business executive involvement reinforces the importance of the project to line managers and users tasked with project execution and deployment
  - Ensure business executive sponsorship, ownership and commitment throughout the life of the project
    - Steering committee meetings, quality reviews, issue escalation, conflict resolution

Applications Gap Analysis
Industry Trends -- ERP Critical Success Factors

- **Avoid Modifications to the Package**
  - Two key dimensions
    - Ability of the application to meet business needs
    - Willingness of the business to adapt to the capabilities of the application
  - Most ERP projects have a guiding principle to “use the package as delivered”
    - In practice, users often find reasons to customize the package
    - This puts projects at greater risk of failure, increases timeframes and increases costs
  - Some organizations choose to reengineering business processes first, then customize the product to fit the processes
    - This add complexity, raises costs, delays future system enhancements, limits system knowledge to a few technical staff, and increases overall risk
    - Best approach is to acquire a COTS package, and redesign business processes around the capabilities of the new system (System-Centric BPR)
  - Examine other Higher Education ERP implementations to determine customizations required, and plan for these
  - Conduct a gap analysis to identify any other required customizations, and analyze the specific business value vs. increased costs/risks

Applications Gap Analysis
Industry Trends -- ERP Vendor Selection Methodology

The Three Phases of Vendor Selection:

1 Internal Needs Assessment

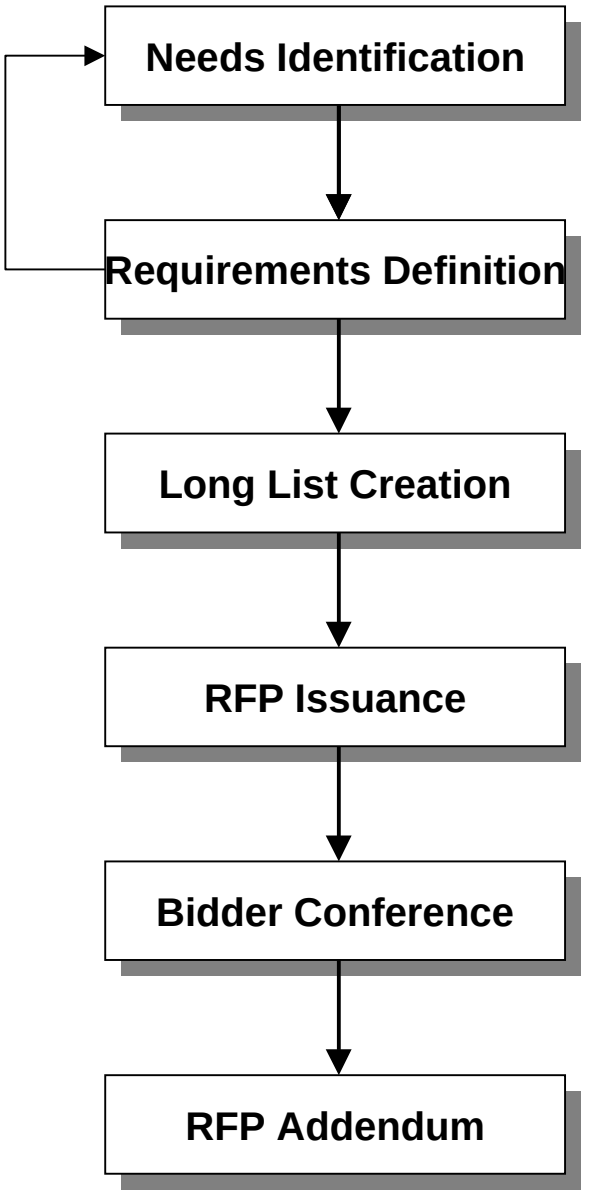
2 Vendor Analysis

3 Negotiation and Selection

Applications Gap Analysis
Industry Trends -- ERP Vendor Selection Methodology

Phase One:
Internal Needs Assessment

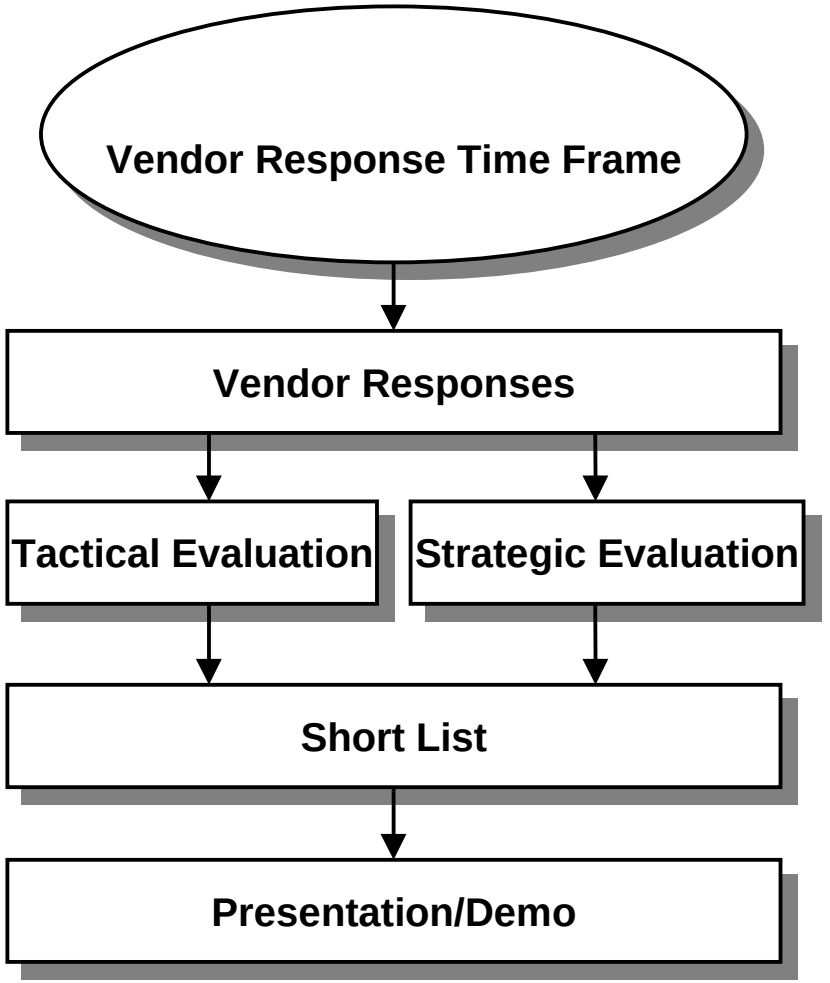
- Spend significant time in Requirements Definition
- Identify mandatory requirements and strong preferences
- Follow critical success factors and ensure significant user involvement



Applications Gap Analysis
Industry Trends -- ERP Vendor Selection Methodology

Phase Two:
Vendor Analysis

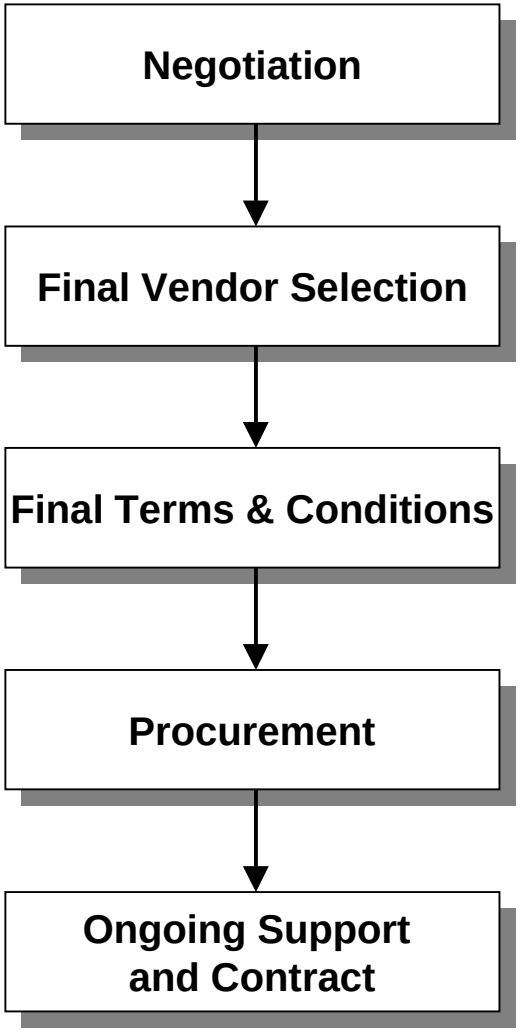
- Internal needs and requirements of the organization are mapped to the capabilities of vendors in the marketplace
- Vendors that best meet functional, technical and business needs are asked to move into Phase Three — Negotiation and Final Selection



Applications Gap Analysis
Industry Trends -- ERP Vendor Selection Methodology

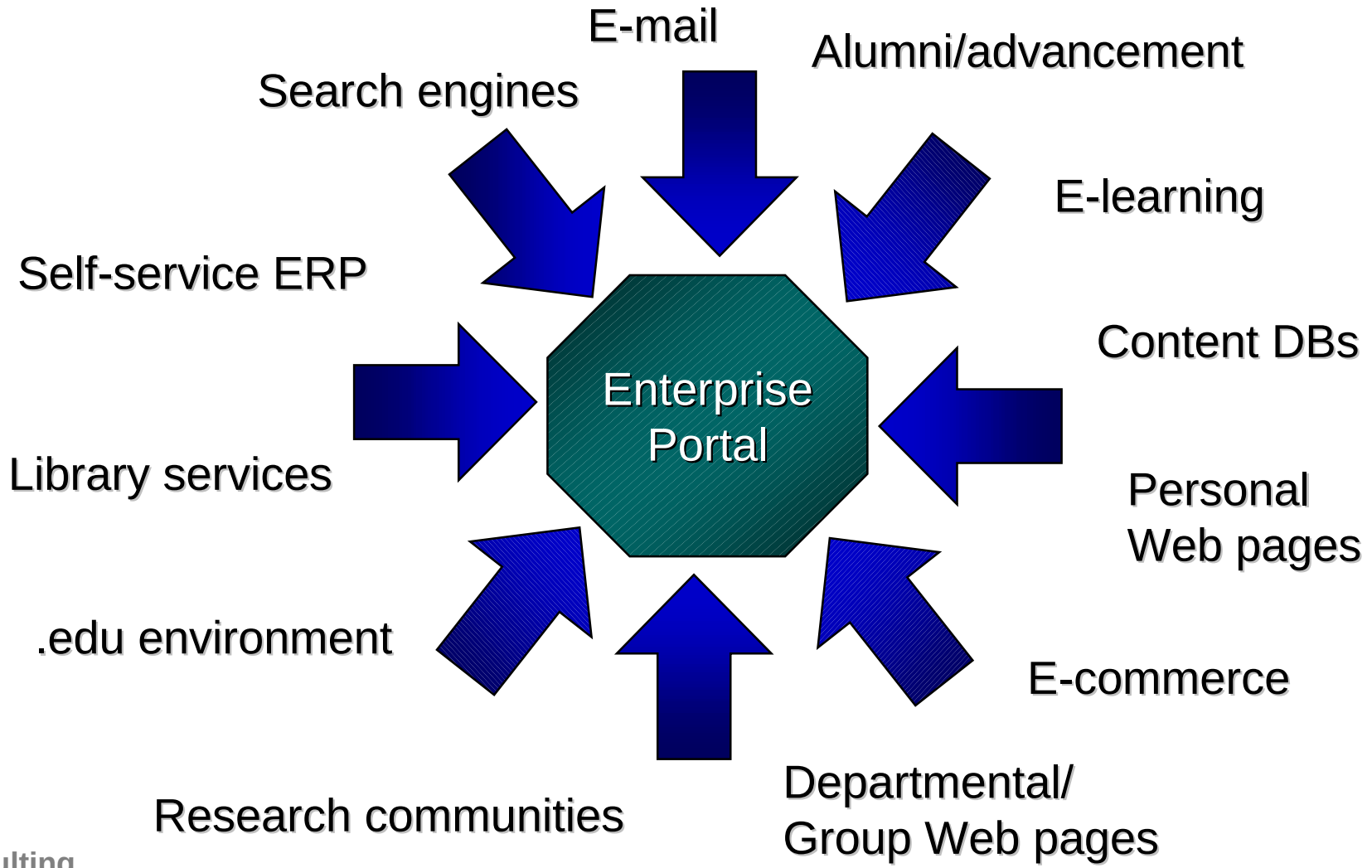
Phase Three:
Negotiation and Final Selection

- Prepare negotiating strategy
- Develop critical terms and conditions for the contract
- Negotiate with the vendor(s) of choice



Applications Gap Analysis
Industry Trends -- Portals

- **Why Portalize? Application and Intranet Proliferation**



Applications Gap Analysis
Industry Trends -- Portals

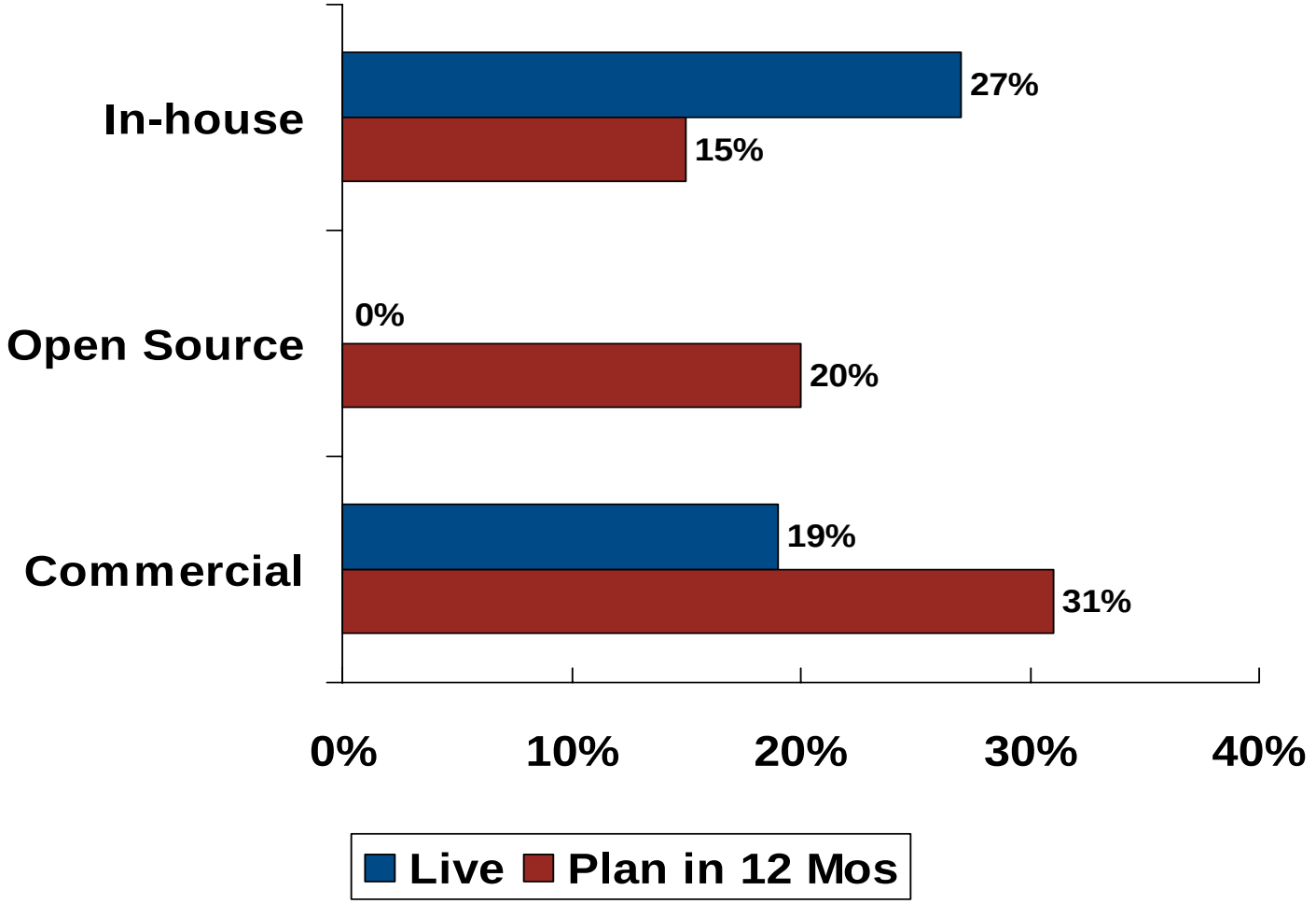
- **"Best Practice" is a single enterprise-wide portal**
  - In actual practice, institutions often have multiple portals
  - Multiple portals provide school/program-specific functionality, but also result in additional support and integration costs
  - Multiple portals become problematic when the same user group must use both portals
    - Can lead to confusion, loss of "brand" message, more time/effort by user, lost users
- **Organizations should use a comprehensive set of criteria for selecting a portal product that meets user needs**
  - Features and functions
    - Basic Generation-One functionality
    - Good list of robust Generation-Two features
    - Indications that Generation Three is not far away
  - Architecture
    - Ability to leverage load balancing, security, integration, task management and prioritization features on application servers

Applications Gap Analysis
Industry Trends -- Portals

- Out-of-the-Box Functionality
  - Match enterprise requirements as closely as possible to the pre-built integration component list provided by the vendor to avoid custom integration components
- Partnerships
  - Portal vendors should be well-connected, with solid relationships with other providers
- Vendor Stability
  - Examine vendor finances, cash on hand, and timeframes for operating in a negative cash flow environment
- Adherence to Standards
  - Look for a match between the vendors and the enterprise's key IT standards (e.g., XML, Java, etc.)
- Security
  - Look for built-in features that allow use of strong authentication and integrated access control
- Vertical Industry Support
  - Look for provision of integration components to relevant industry applications (e.g., Academic Advising Tool)
- Solid Customer References
  - Go beyond the list of smooth deployments and demand a complete list of customers who have had their portals for at least a year

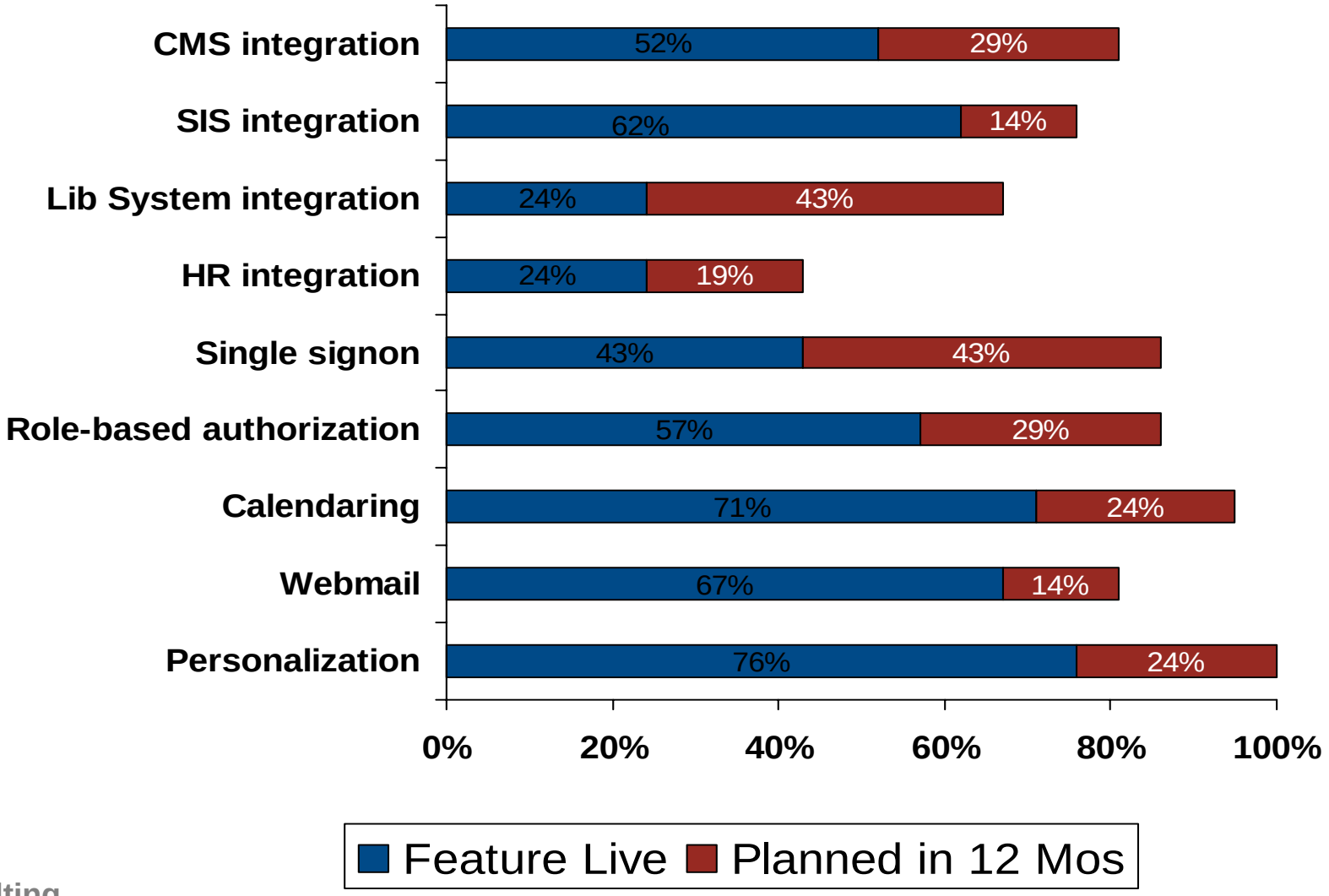
Applications Gap Analysis
Industry Trends -- Portals

- **Which best describes your current usage of enterprise portals? (multiple responses allowed)**



Applications Gap Analysis
Industry Trends -- Portals

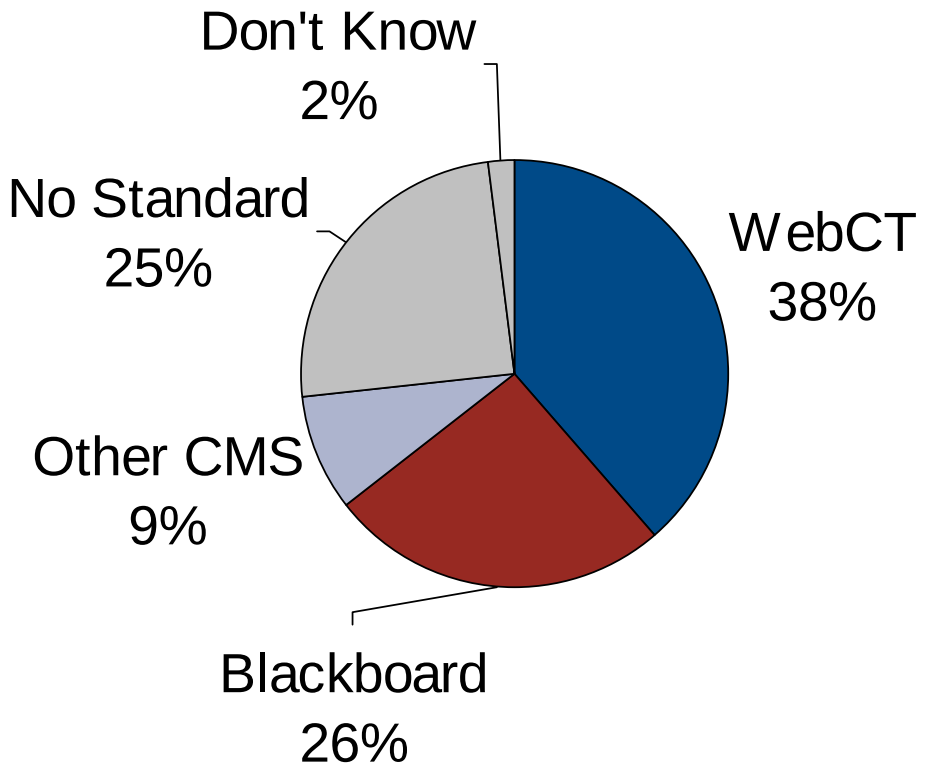
- **Features of current commercial enterprise portal (n=21)**



Applications Gap Analysis
Industry Trends -- Course Management Systems

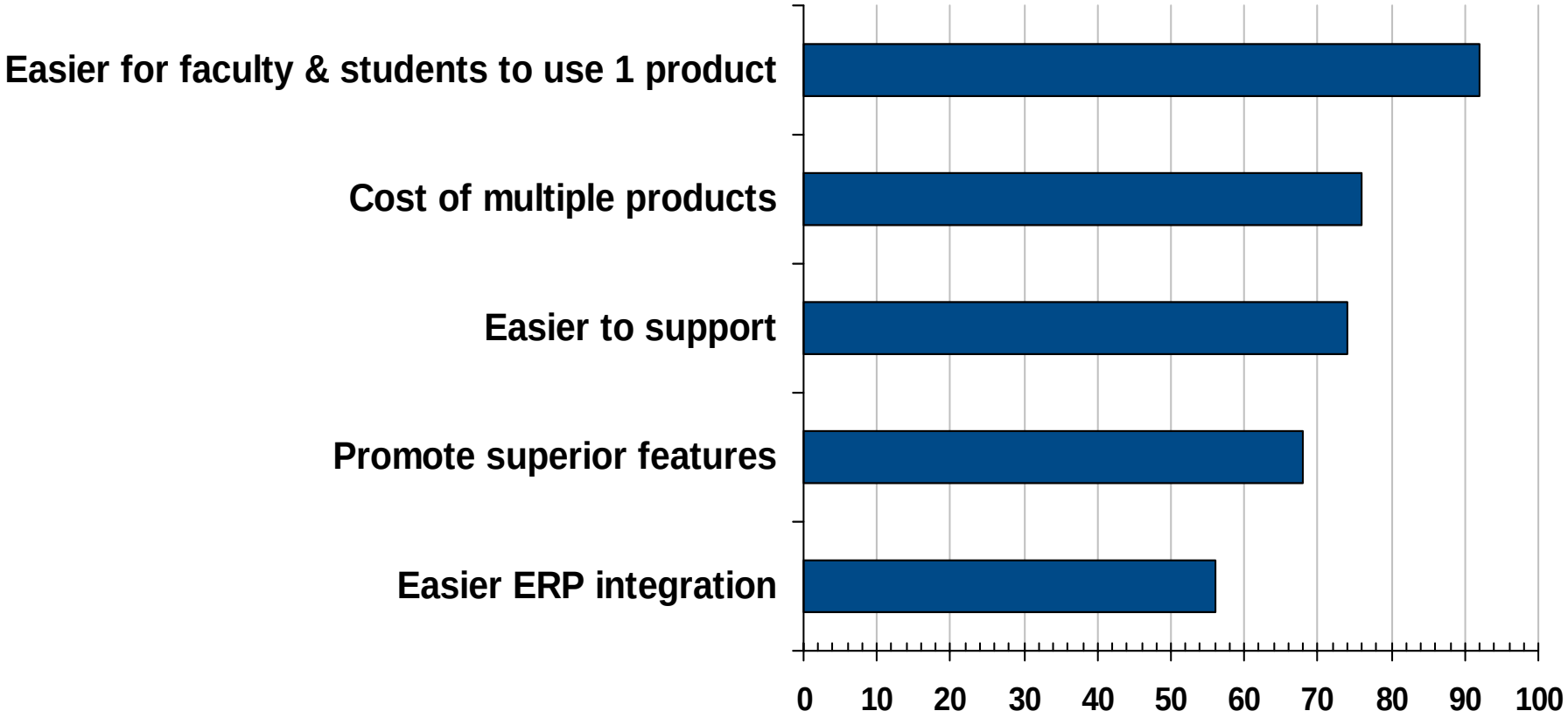
- **By 2005, 90 percent of institutions that have not adopted and planned for a CMS as a campus standard will be unable to meet increasing faculty and student demand (0.8 probability).**
- **By year-end 2003, 80 percent of higher-education central IS departments will support only a single CMS product (0.7 probability).**

Has your campus named a single,official CMS standard?



Applications Gap Analysis
Industry Trends -- Course Management Systems

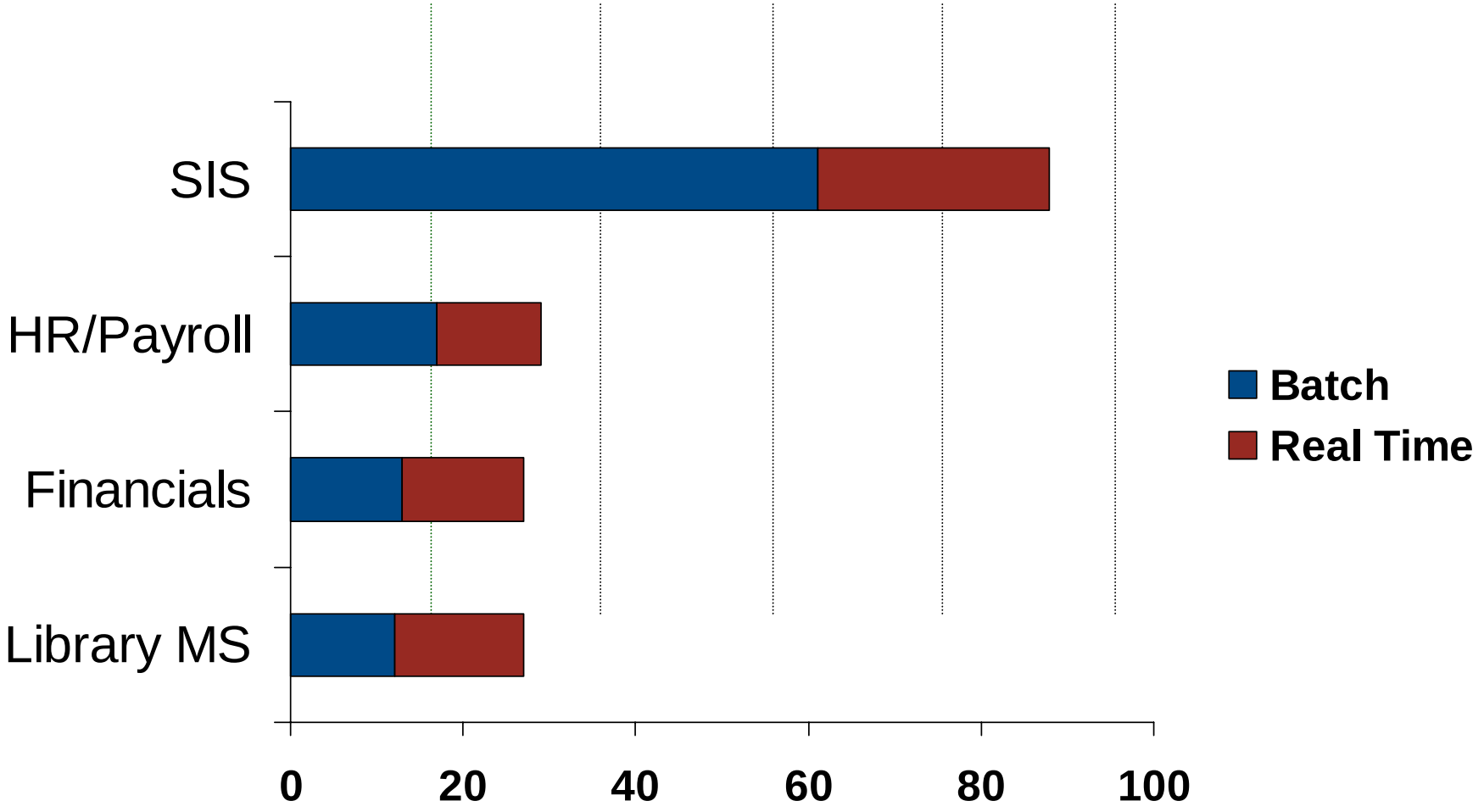
- **Reasons for adopting single official CMS: all adoptees**



Percentage of respondents rating motivation as very important or extremely important

Applications Gap Analysis
Industry Trends -- Course Management Systems

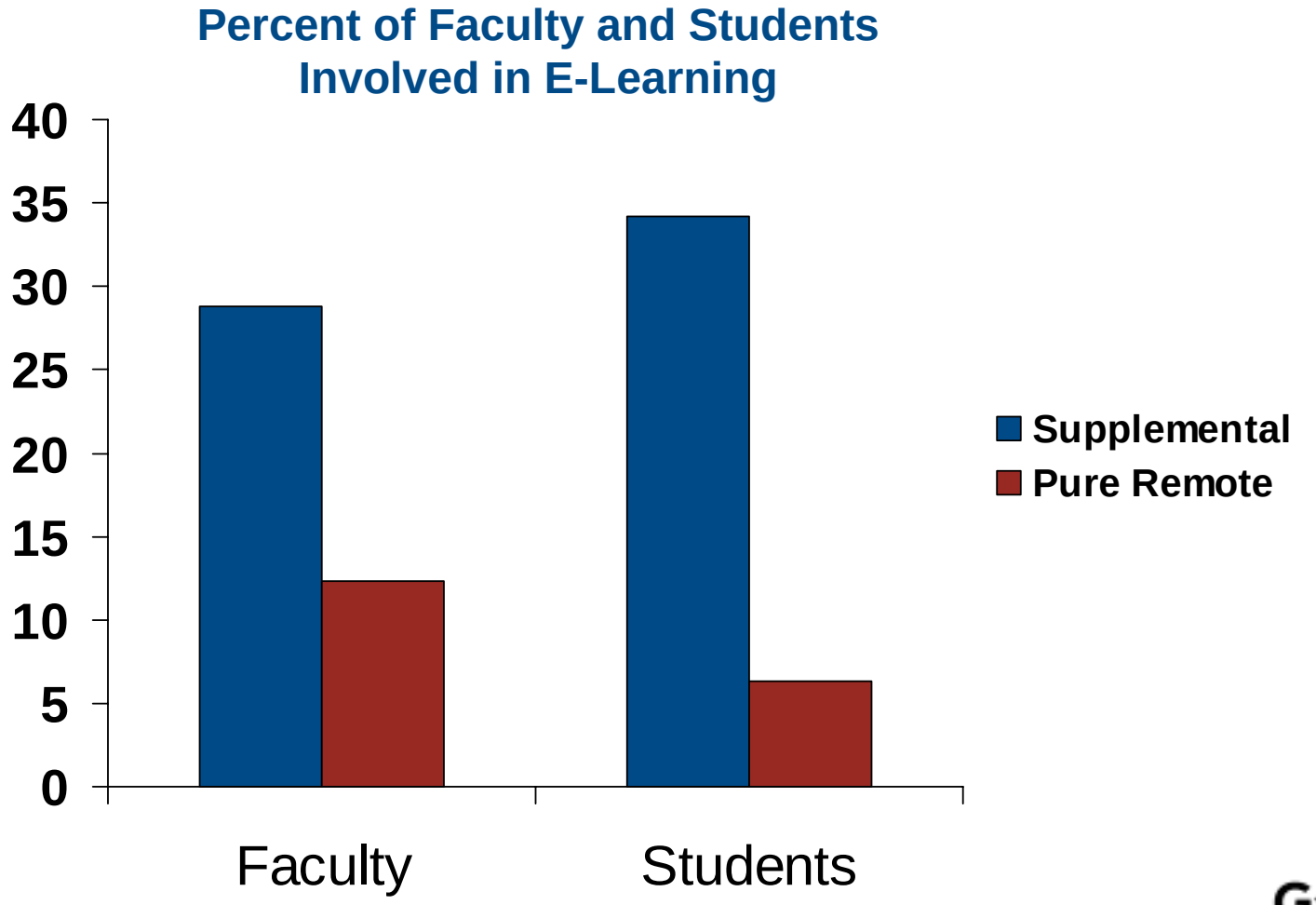
- **Integration: Emphasizing Student Services**



Batch and Real-Time Integration of CMS With Major Systems

Applications Gap Analysis
Industry Trends -- e-Learning Platforms

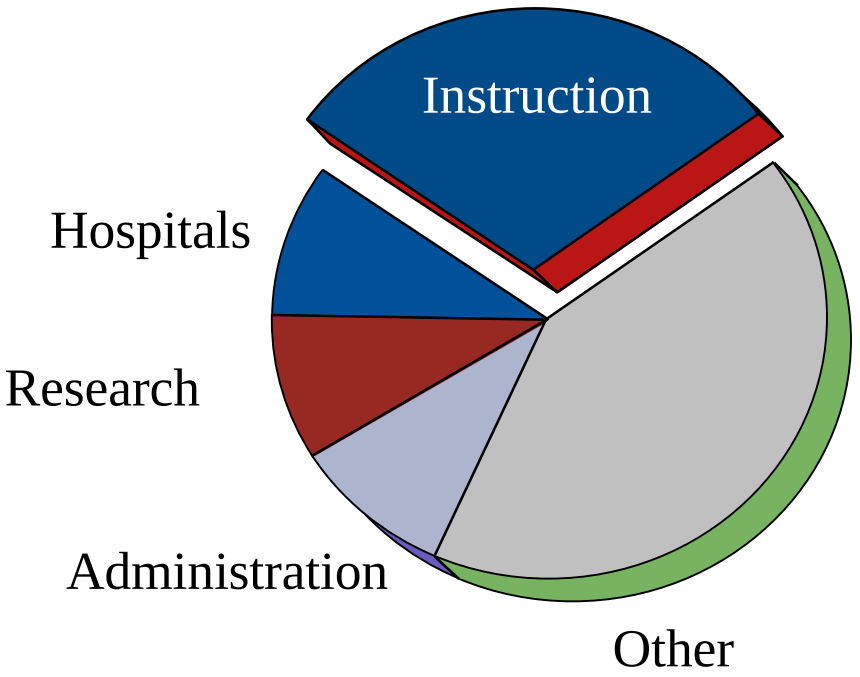
- **By 2005, more than 70 percent of student headcount will be enrolled in courses using e-learning as a supplement to traditional instruction (0.8 probability).**

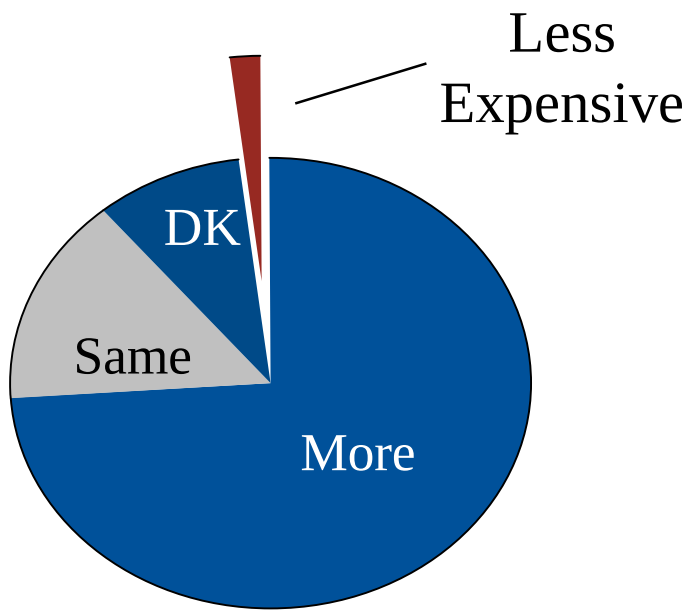


Applications Gap Analysis
Industry Trends -- e-Learning Platforms

- **The development and delivery of distance learning (DL) e-content will be more expensive on a per-student basis than traditional content development and delivery through 2006 (0.8 probability).**

Instruction is the largest single expense in higher education ...





. . . and only 2 percent of institutions find DL cheaper than traditional instruction.

Applications Gap Analysis
Industry Trends -- e-Learning Platforms

- **How Do You Prioritize New E-Learning Technology Projects?**

Value
- Contribution to academic goals
- Service contribution

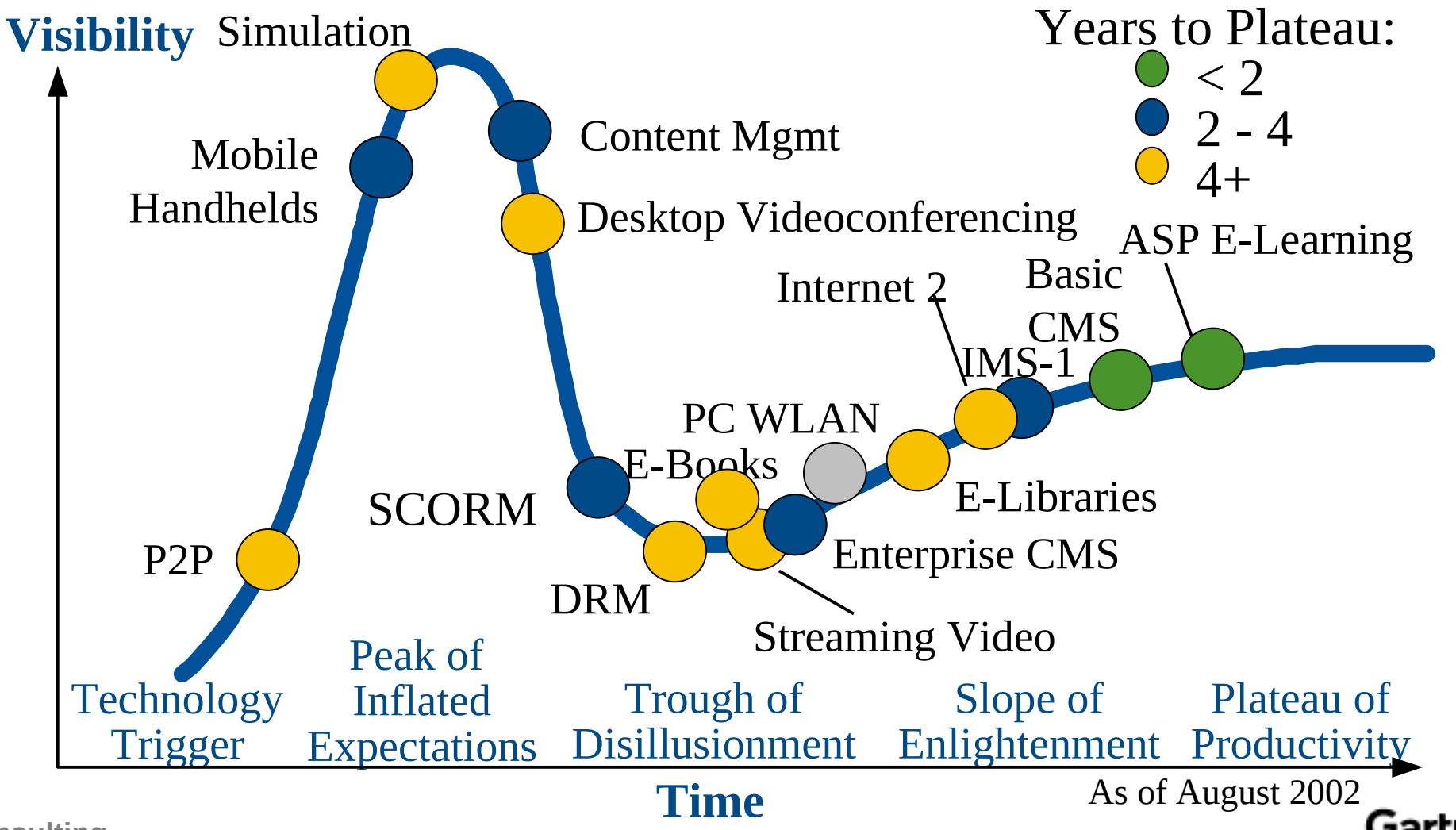
Cost
- Total cost of ownership (development, deployment and maintenance)
- Cost/risk of doing nothing
- Integration with other systems

Risk Factors
- Wrong assumptions
- Lack of management support
- Lack of financial resources
- Benefit not achieved
- Faculty/student rejection
- Lack of technical support
- Vendor viability

Technology Status
- Current maturity
- Time to full maturity
- Interaction with other technologies

Applications Gap Analysis
Industry Trends -- e-Learning Platforms

E-Learning Hype Cycle

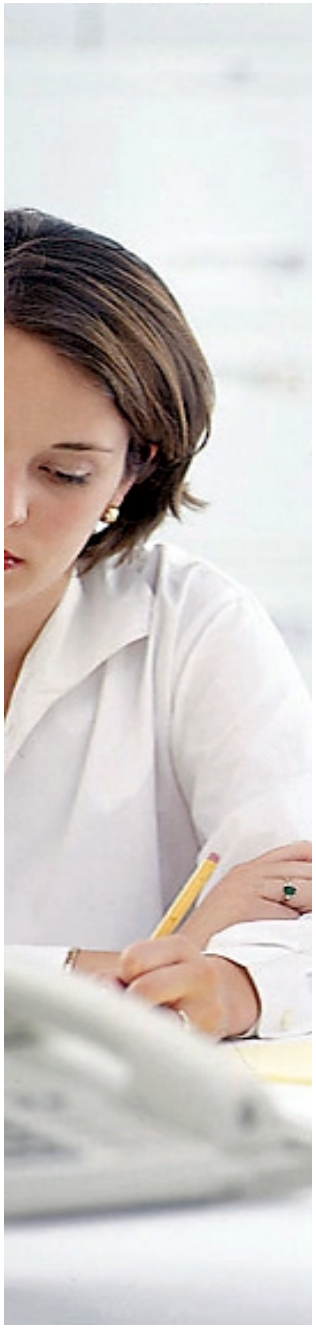


consulting

Gartner

Applications Gap Analysis
Industry Trends -- Access to Applications

- **Many software vendors provide site licenses similar to Microsoft's campus licensing program**
  - Statistics (SPSS)
  - Accounting
  - Other



4. Infrastructure

Infrastructure Gap Analysis
Current Issues

- **Network Bandwidth**
  - Network response speed is an issue with every School and Department
    - Malibu campus: Network speed declines as student access increases
    - Educational Centers: Connected by two T1 lines to Malibu campus; student use peaks during evenings and weekends, slowing network
    - Programs: Some programs would like to use streaming technology for providing course content, but network will not allow it
    - Library: Would like to provide large amounts of data over network, but cannot be done effectively with current bandwidth
- **Technology Refresh**
  - Currently the University does not have a technology refresh plan
    - Some Schools refresh PCs every 3-5 years, other Schools have no refresh plan
    - Result is inconsistent use of hardware and operating systems, which leads to compatibility and service challenges
- **Wireless Network Access**
  - The current network is working quite well across the Schools and admin departments. However, bandwidth continues to be an issue.

Infrastructure Gap Analysis
Current Issues

- **Cabling**
  - Cabling across the Malibu campus is inconsistent
    - Fiber optic is available to most campus facilities
    - In-building cabling ranges from Cat 5 in newer buildings to Cat 3 or non-rated in older buildings
- **Security**
  - Physical Security: Not an issue for Pepperdine
    - Computer labs are staffed and adequately secured when closed
  - Network/Systems/Data Security: Critical issue for Pepperdine
    - Firewall approaches are not completely effective; Seaver college has experienced breeches by hackers and denial of service attacks
- **Classroom Technology**
  - The type and quality of classroom technology varies by facility
    - Most classrooms have LCD projectors, but there are compatibility issues with faculty laptops
    - Wireless network is beneficial, but faculty would like the option to turn it off to prevent access to the Internet during class

Infrastructure Gap Analysis
Current Issues

- **Student Access to PCs**
  - Not all Pepperdine students have PCs
    - Estimates of student PC ownership range from 20% - 65% across the University
    - Some programs have a laptop requirement (e.g., Undergraduate Business Program, Masters in Education Program), but there is no University-wide PC requirement
    - Students have a variety of needs from computer labs to network access points and printing capability
- **E-mail Management**
  - Unified messaging
    - Voicemail messages are automatically routed to recipient's e-mail inbox, quickly filling the e-mail inbox with these large message
    - Current mailbox size limit is set at 50mb
    - Users would like the ability to select/deselect this feature
  - E-mail attachment size limit
    - Current attachment size limit is set at 1.3mb, which is not adequate for programs that heavily use distance learning
  - Student use of e-mail
    - While all Pepperdine students are issued a Pepperdine e-mail account, many also have a personal e-mail account that they prefer to use
    - Some Schools/Programs will use students' personal e-mail, others will only use the Pepperdine e-mail account

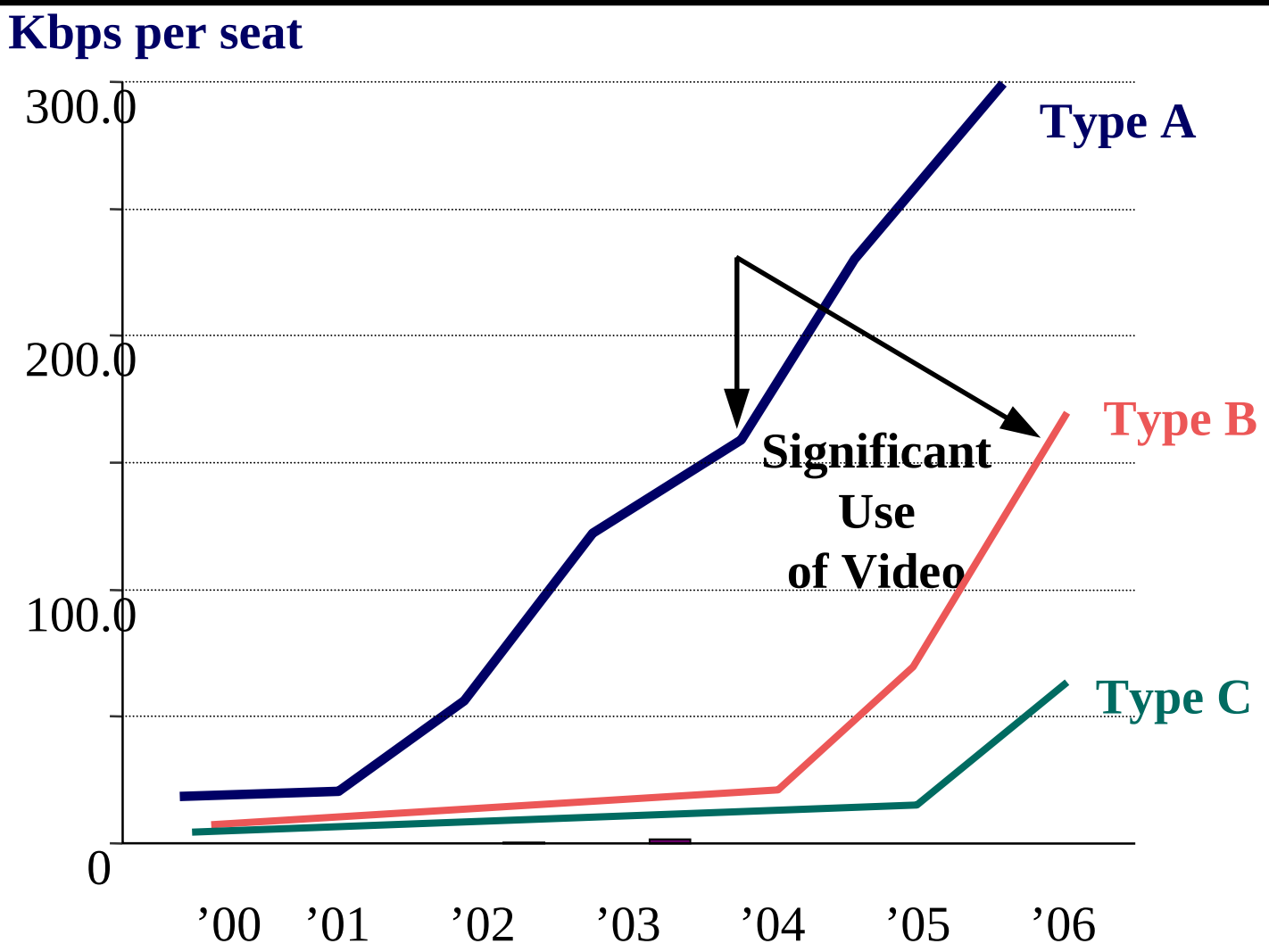
Network Bandwidth -- Industry Trends

- By 2005, on average and not including managed services, prices for given bandwidths for international WANs and corporate IP services will decrease by 15% per year (0.7 probability)
- By 2006, overall WAN budgets will at least double (0.7 probability)
- By 2010, optical connections with Ethernet services will be available in 90% of the office complexes in the industrialized world (0.8 probability)
- By 2004, 90% of of new desktop PCs will be shipped with video codecs offering near-VHS quality at 256 Kbps (0.8 probability)

Network Bandwidth -- Industry Trends
Trends in the Enterprise Network

- Due to current budget constraints, a key focus is to extend product life cycles
- ROI and value needs to be demonstrated for new purchases
- Convergence of Voice, Data, Video and Storage is a driver in new technologies
- It's all about Internet Protocol (IP)
- Voice over IP (VoIP) is rapidly becoming a viable technology for some implementations.
- The number of vendors in the enterprise is being reduced

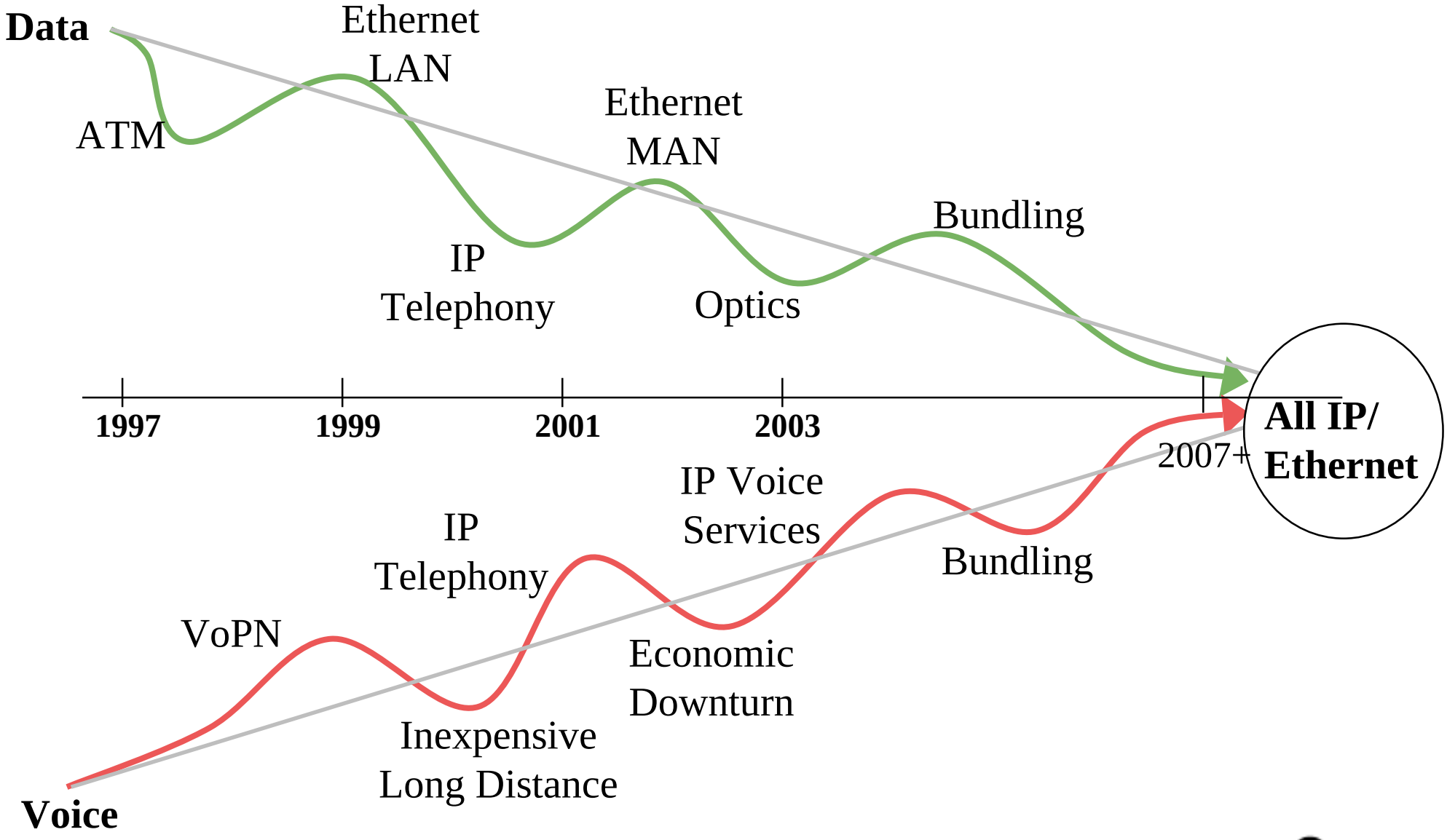
Network Bandwidth -- Industry Trends
Gartner Model of Bandwidth Growth



The Economy slows down but the Applications keep coming

Corporate Data Applications 30% CAGR
WebApplications 50% CAGR

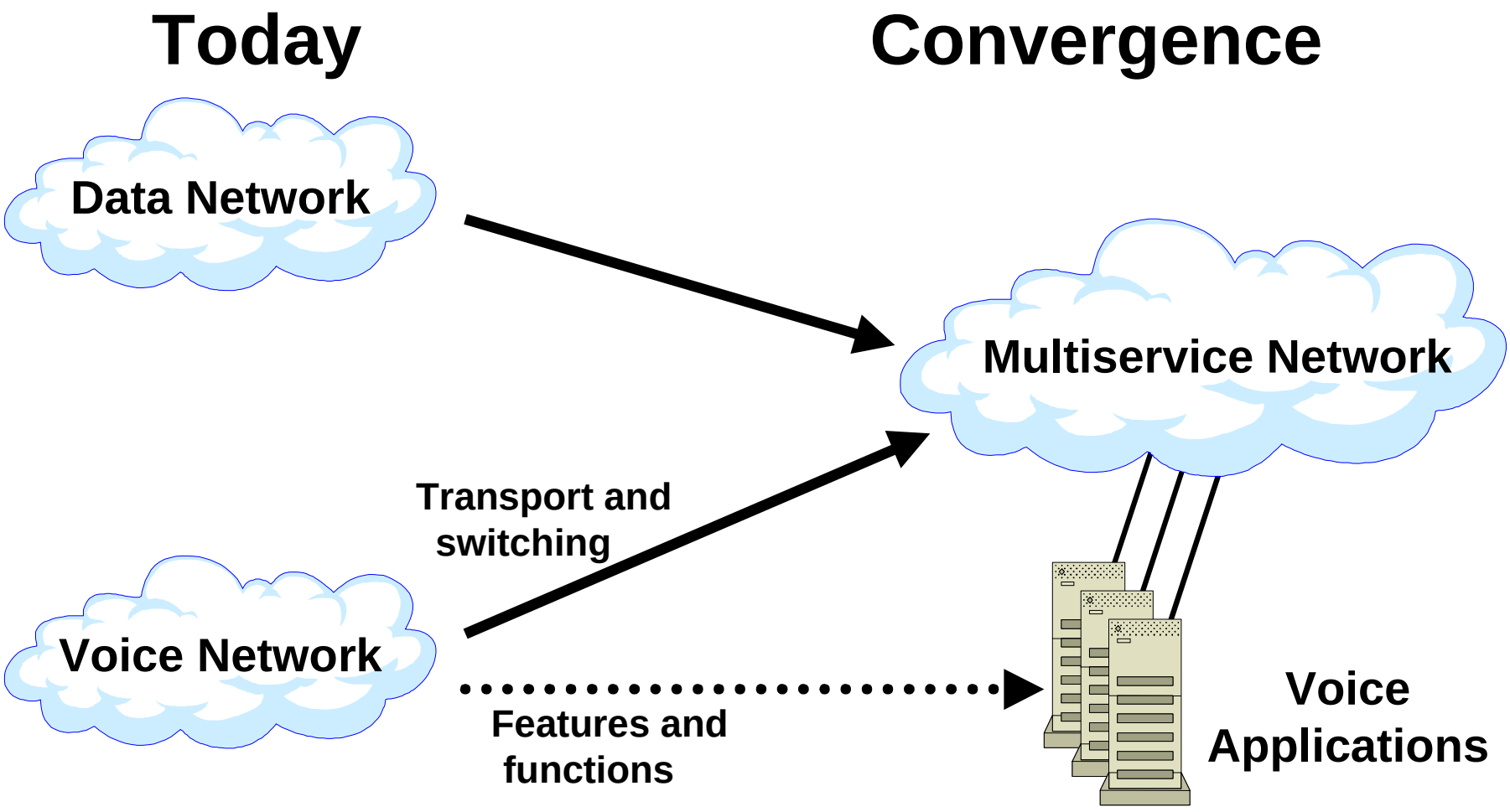
Network Bandwidth -- Industry Trends
Convergence: The Battle of Technology and Money



consulting

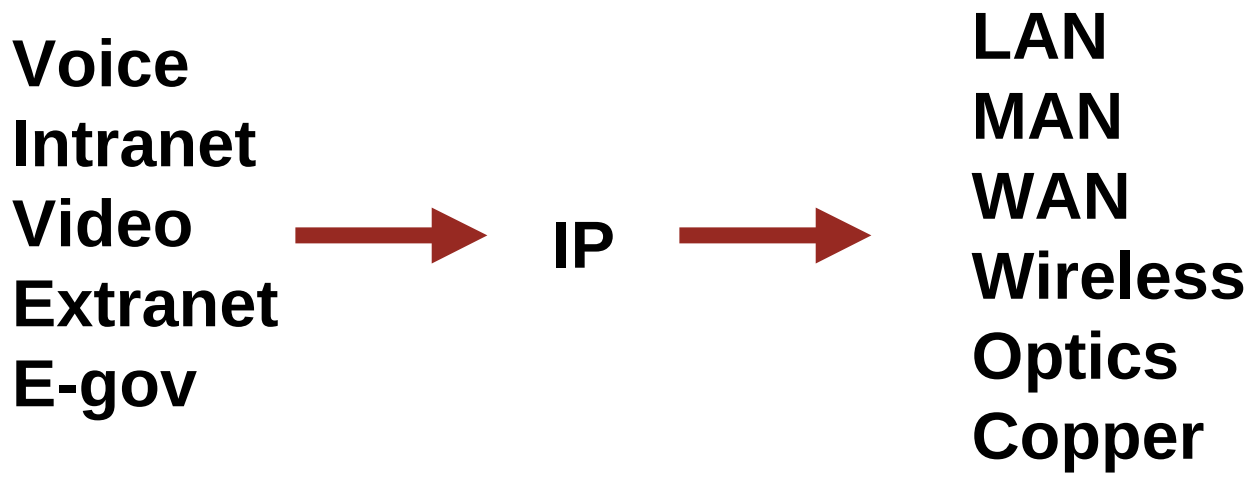
Gartner

Network Bandwidth -- Industry Trends
Convergence = One Network, not One Vendor



Network Bandwidth -- Industry Trends
What is the future Communications?

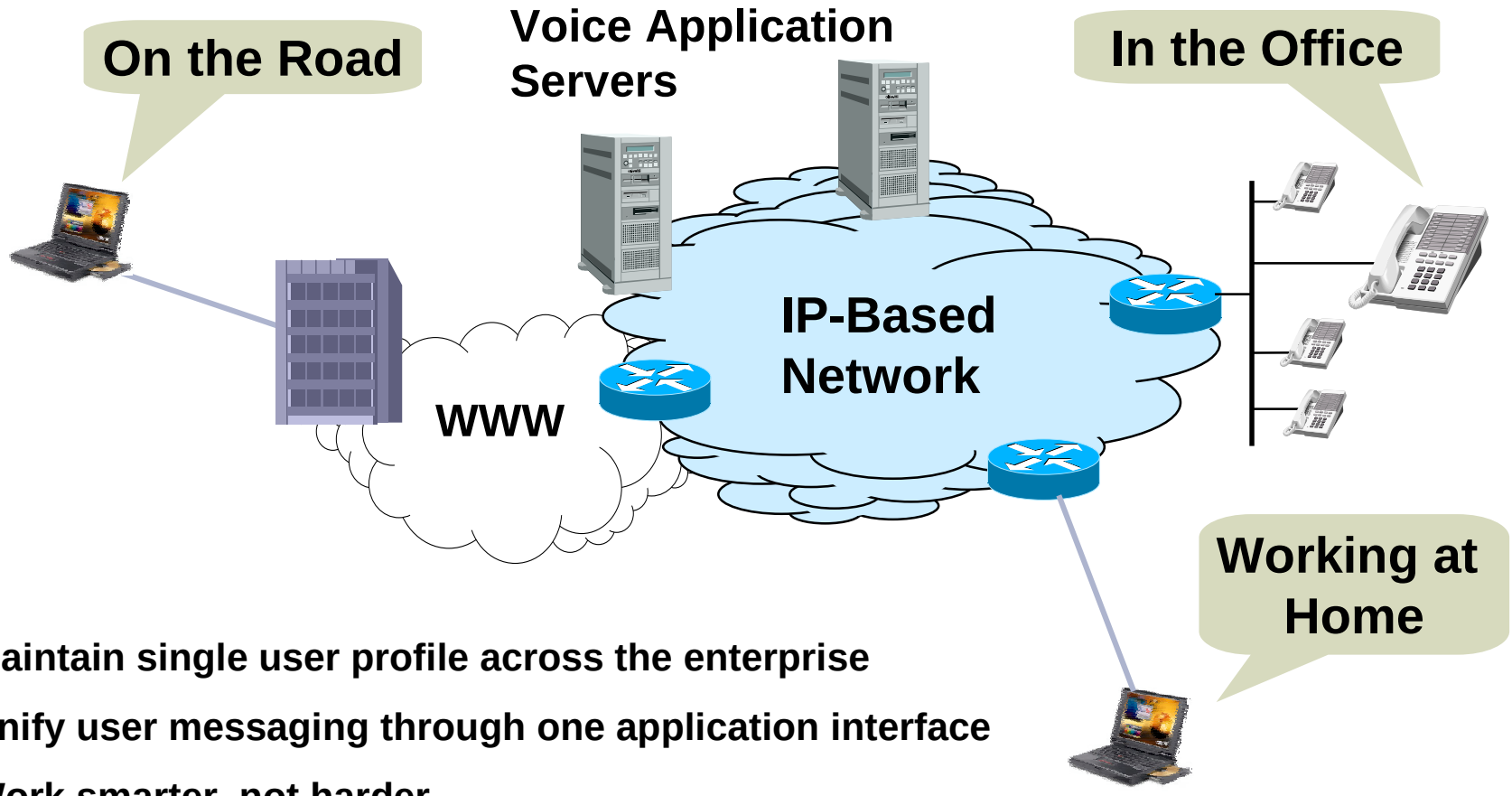
Anything over IP and IP over anything!



Real-time
Store and forward

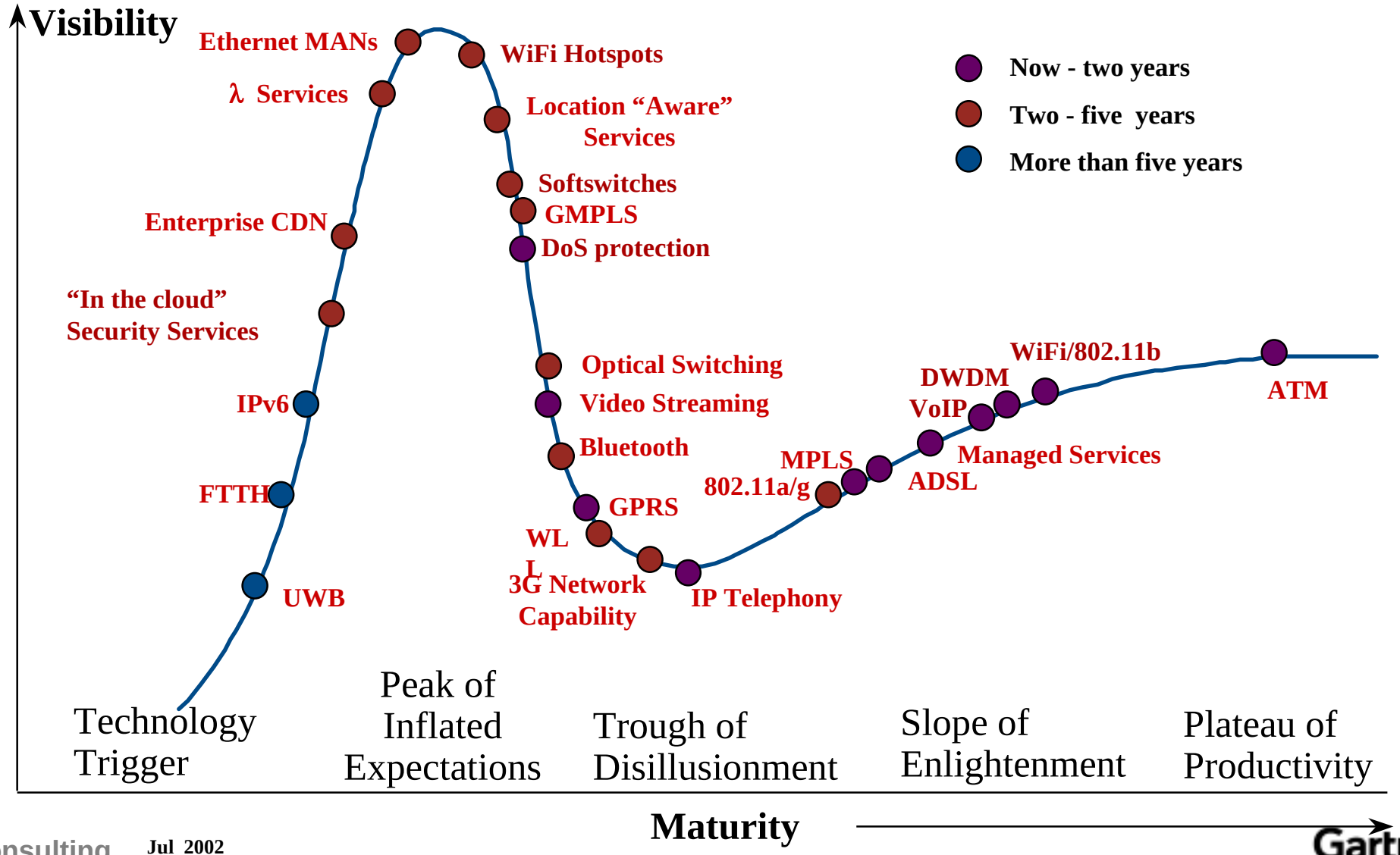
Organizations that achieve end-to-end convergence will achieve the lowest TCO.

Network Bandwidth -- Industry Trends
Improving Staff Mobility



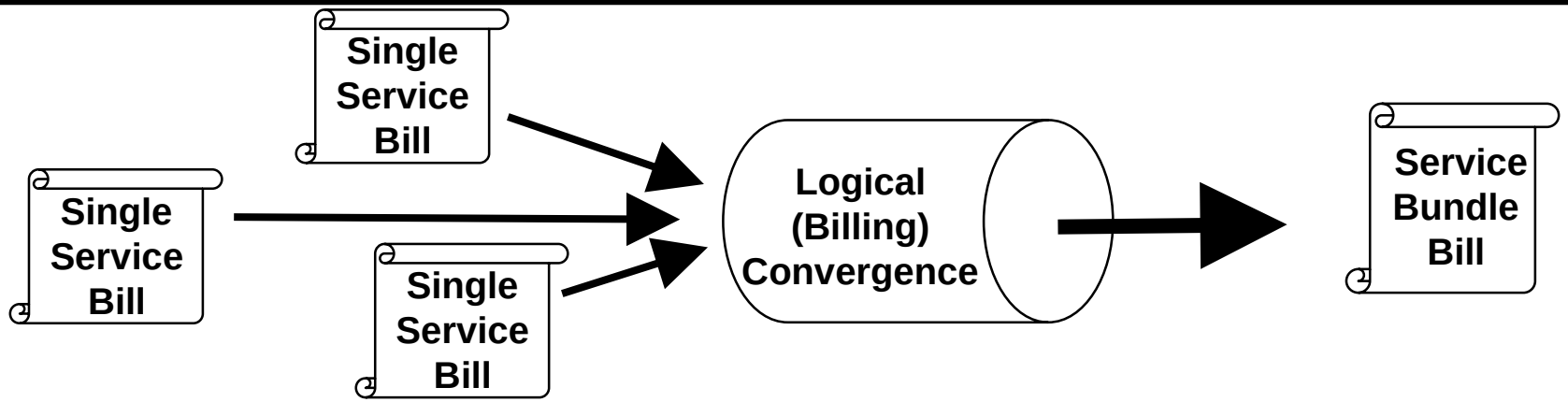
- Maintain single user profile across the enterprise
- Unify user messaging through one application interface
- Work smarter, not harder

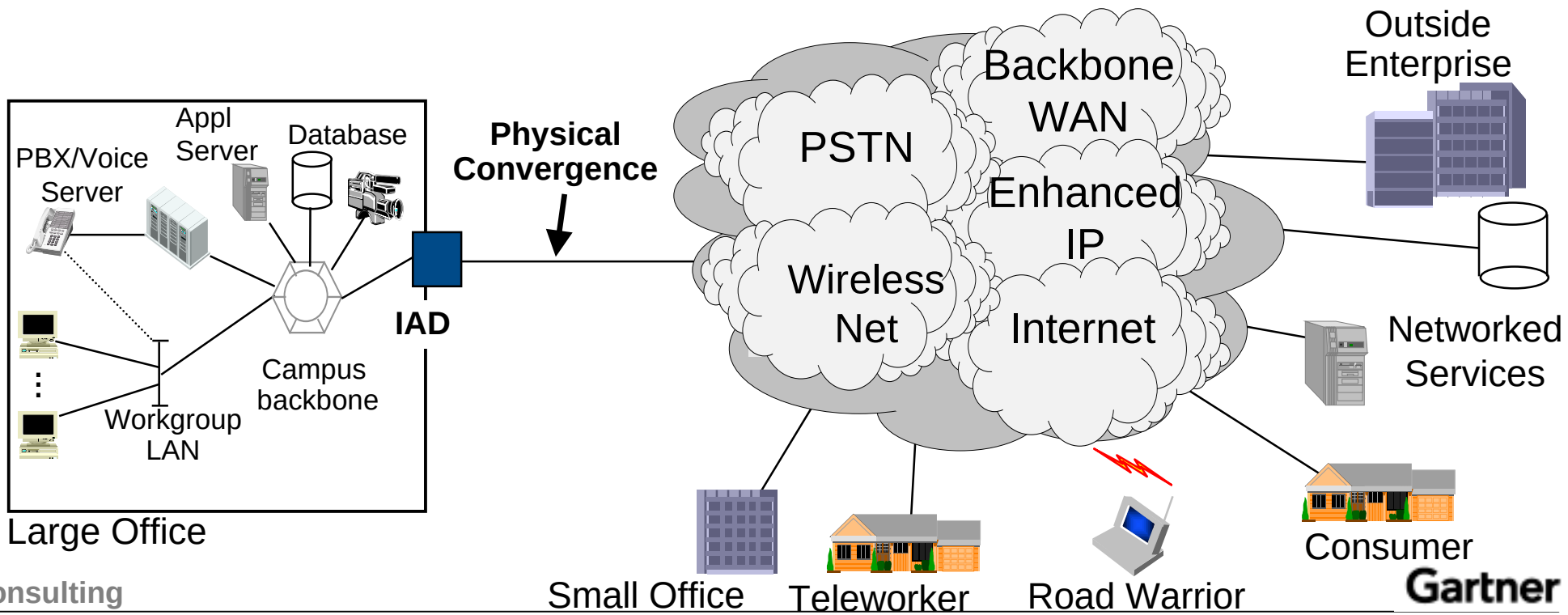
Network Bandwidth -- Industry Trends
The Convergence Hype Cycle



consulting Jul 2002 Gartner

Network Bandwidth -- Industry Trends
Converged Network Services -- Logical and Physical



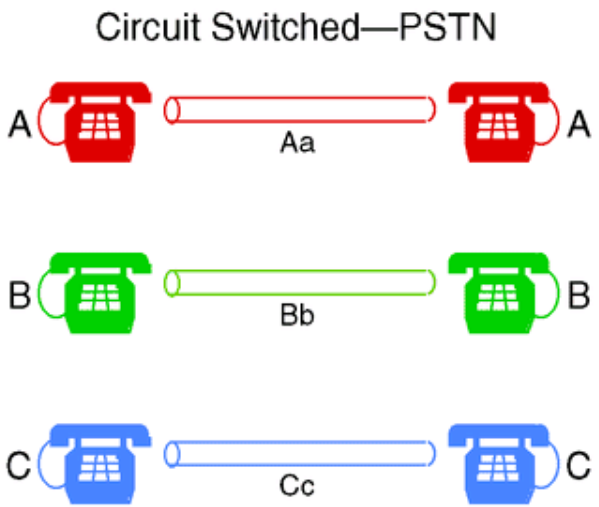


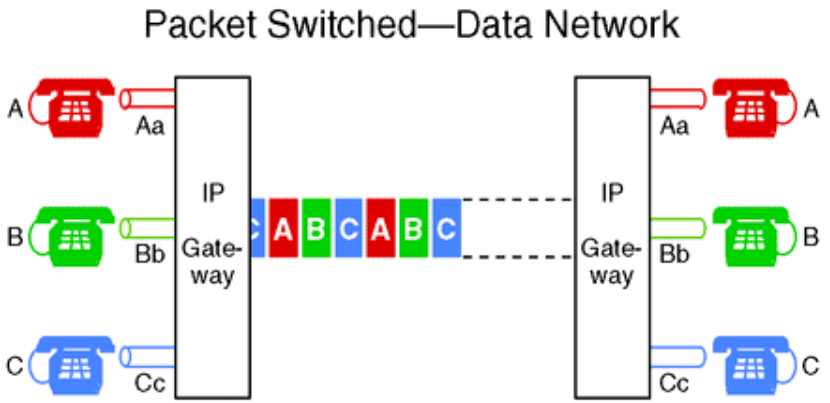
Network Bandwidth -- Industry Trends
What Is VoIP?

VoIP = Voice over the Internet Protocol

It is not:Voice over the Internet

- **Instead of using traditional circuit switch systems for voice communications, VoIP uses a packet protocol originally designed for data communications.**
- **VoIP can be used within the LAN, WAN, MAN, and/or the PBX**





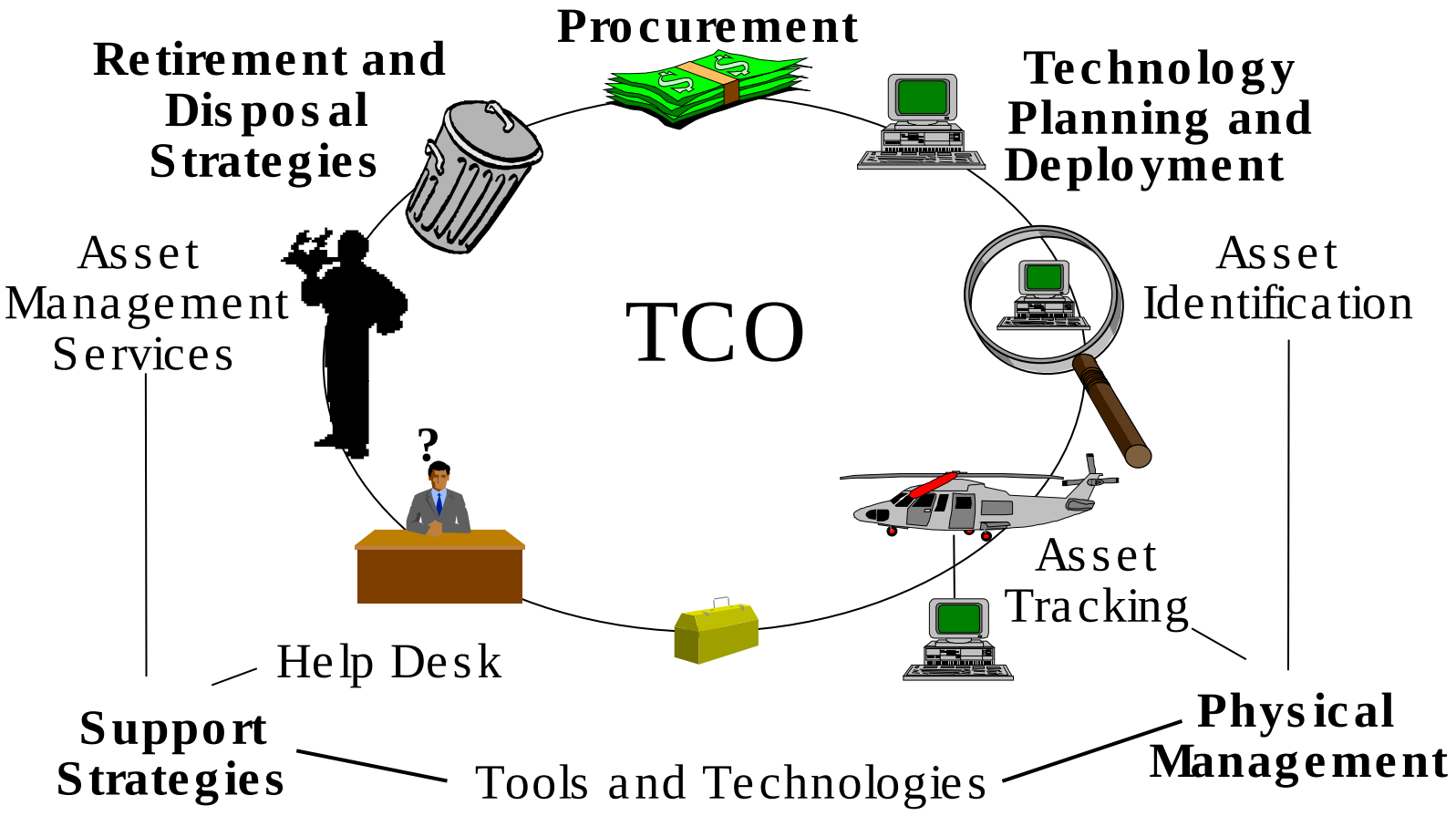
Network Bandwidth -- Industry Trends
Conclusions

- **Plan for a bandwidth explosion**
- **Maximize the use of existing infrastructure, don't buy anything unless you have to**
- **Manage and eliminate bottlenecks - add ISP drop off points at the Educational Centers**
- **Converge, converge, converge. Convergence as an opportunity to maximize efficiency, cost effectiveness and scalability to meet growing demands**
- **Proactively plan for network needs, it will always save money and result in a better network than reactive decisions.**

Technology Refresh -- Industry Trends

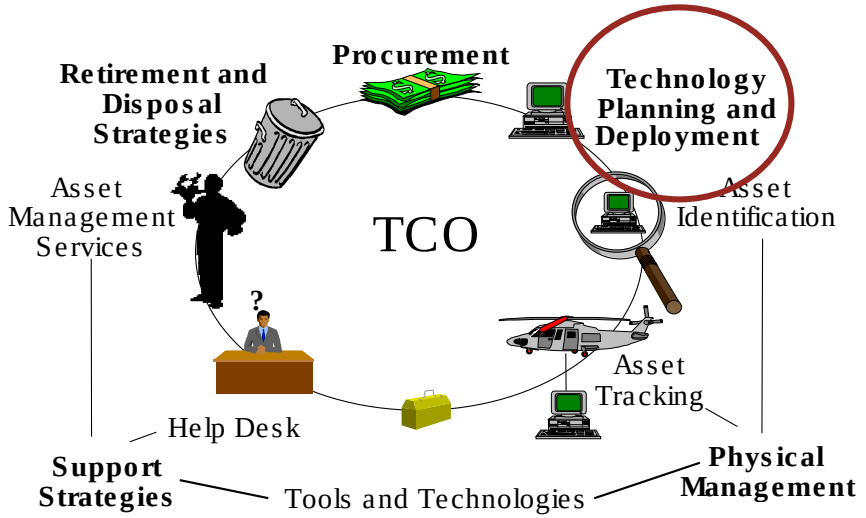
- **Colleges and universities that want to control costs develop a managed life cycle plan for their desktop environments.**
  - The plan should encompass best practices in procurement, technology planning and deployment, physical management, support, and technology retirement.
  - With an effective life cycle plan, institutions will be able to reduce complexity, better exploit technological advances, decrease life cycle costs and better evaluate outsourcing opportunities.
  - The higher-education institution must think globally and holistically but act locally, in a consistent fashion, to control the total cost of ownership (TCO) and maximize return on investment in PC hardware.

Elements of the Managed Life Cycle



Technology Refresh -- Industry Trends

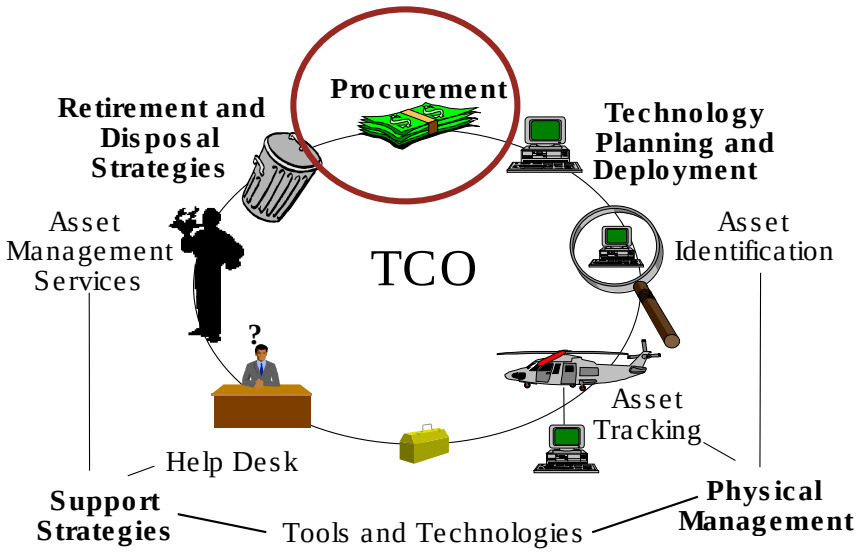
- **Technology Planning and Deployment**
  - Life cycle management planning should be a multidisciplinary, multifunctional team effort facilitated by IS organizations.
    - Teams should include key individuals from business units and academic departments and span institutional constituencies (i.e., IS professionals; influencers in the academic and administrative end-user community; vendor representatives and finance departments).
    - The function of these teams should be to establish an institution-wide mission for personal computing, analyze and segment the end-user environment according to current and evolving requirements, and determine system software and application architecture standards and rollout schedules.
    - These efforts will define organizational hardware requirements and highlight deficiencies in the hardware installed base that could jeopardize the attainment of business objectives.



Technology Refresh -- Industry Trends

Procurement Strategies

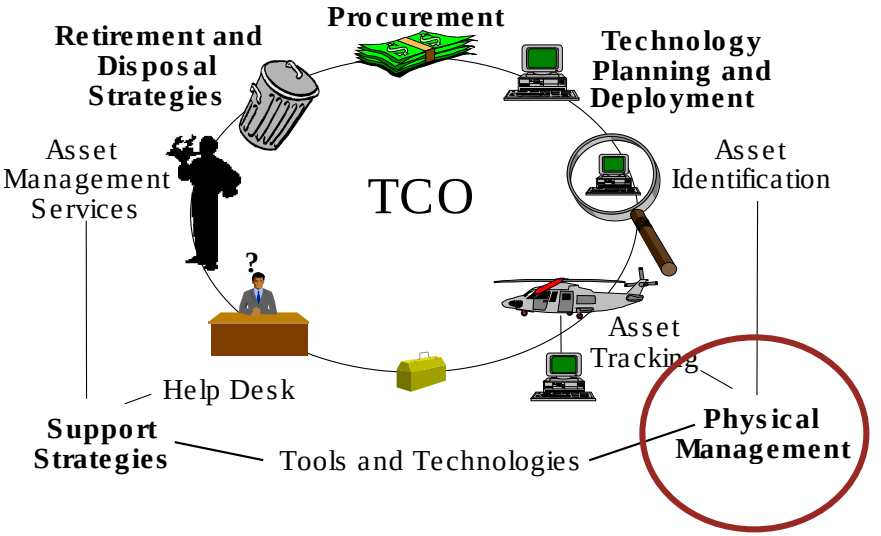
- Develop institution-wide procurement standards for hardware and communicate the underlying rationale to the academic and administrative departments and the end users (e.g., standards will result in better overall support, manageability, lower costs, a greater potential to invest in and exploit new technology, and happier end users).
- Centralized procurement can result in significant negotiating leverage and savings.
  - Hardware and vendor selection decisions made at the departmental or business-unit level often result in unnecessary heterogeneity and complexity.
  - However, special needs and requirements of some academic departments may result in exceptions. These exceptions to procurement standards would still be best supported by a central office.
  - The political reality on many campuses will make the idea of all PC procurement through a central office impossible



Technology Refresh -- Industry Trends

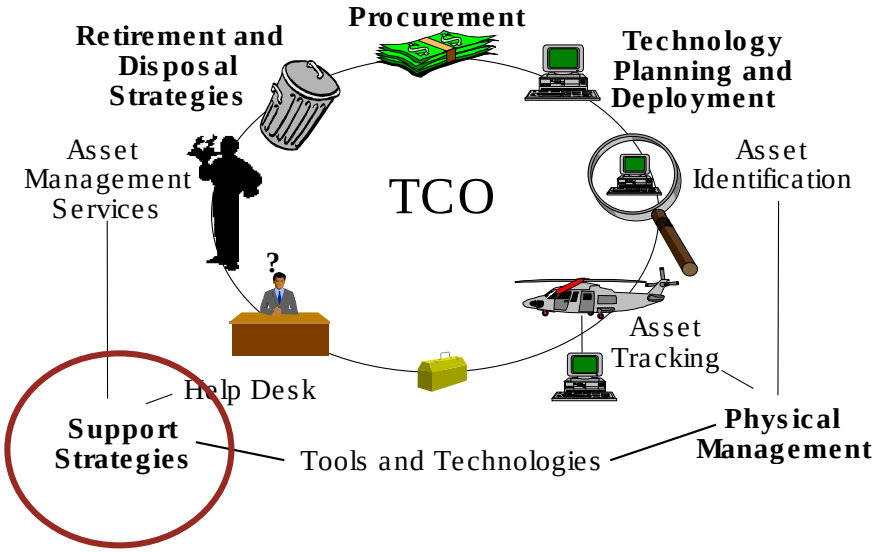
Physical Management

- The inability to analyze the physical makeup of the installed base or to map the flow of hardware through the organization will result in significantly higher life cycle costs.
  - Risks include a reduced ability to identify aging equipment, track system warranty status and compliance, ensure adherence to lease terms, and reduce labor costs.
- Physical management strategies should encompass specifications for the purchase of new hardware, hardware auditing, inventory, asset tagging of all equipment, asset tracking, evaluating network-based asset management tools, and upgrading and redeploying hardware.



Technology Refresh -- Industry Trends

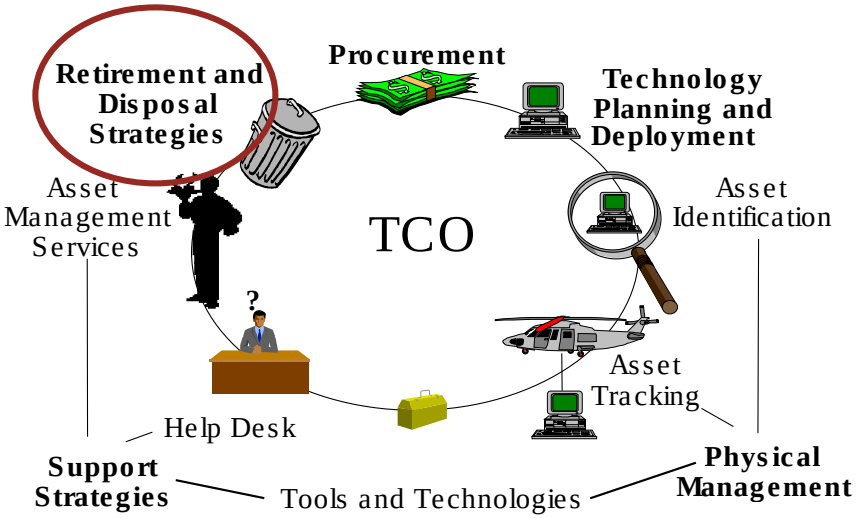
- **Support Strategies**
  - Technical support and help desk functions are critical to an effective life cycle management strategy, and vice versa.
  - They are a window to the installed base
    - Technicians and help desk personnel should have access to an integrated network-based help desk/asset database system to readily determine physical location, analyze hardware/software configurations, and expedite problem identification, tracking and resolution.
    - These functions are critical data gathering and filtering points vital to the development and ongoing success of life cycle management.



Technology Refresh -- Industry Trends

Retirement and Disposal Strategies

- Higher-education institutions should adopt a life cycle approach to planning equipment acquisitions
- A retirement and disposal strategy should be an explicit part of life cycle management, and should specify retirement and refresh rates according to:
  - User segmentation (i.e., Type A, Type B or Type C),
  - Platform (i.e., mobile desktop or server)
  - Application requirements (i.e., specialized or rapidly evolving software technologies vs. stable, core office productivity suites)
- Outsource disposal
  - Other disposal options (i.e., broker, donation, recycling, volume sale or employee purchase) often yield minimal financial return and introduce additional liability (e.g., implied warranty for employee purchase) that the institution will need to manage



Technology Refresh -- Industry Trends

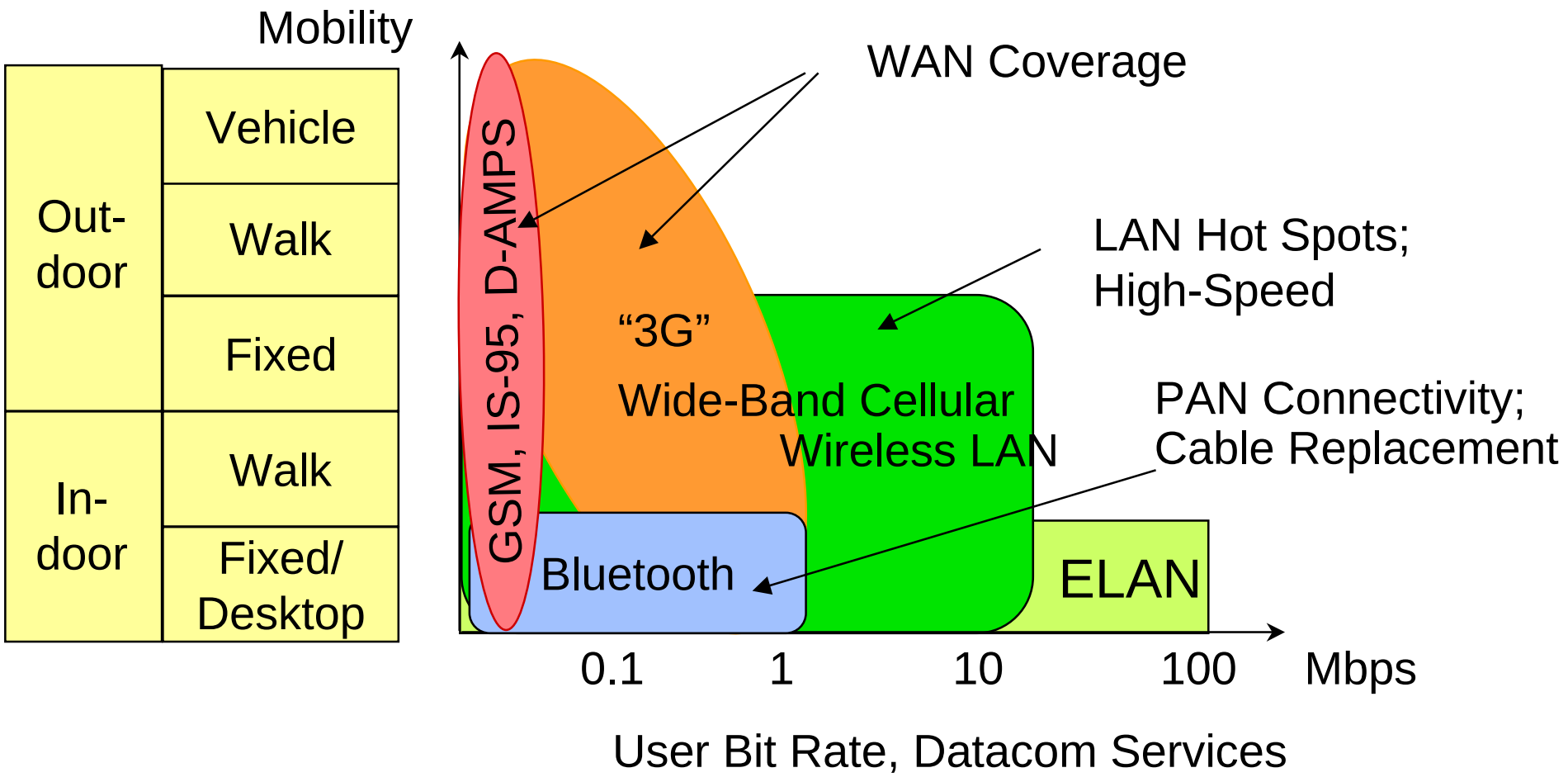
- **User Types**
  - Type A Users
    - Technology-driven and are often willing to risk using immature, cutting-edge technologies to gain a competitive edge
    - They have high technical requirements
  - Type B Users
    - Moderate technology adopters who use new technologies once they have been proven, have entered the mainstream and have standardized
    - They have medium technical requirements
  - Type C Users
    - Technology laggers who use technology once proven stable and have business requirements to do so
    - They replace technology after obsolescence, and they have low technical requirements

Wireless Network Access -- Industry Trends
Drivers and Trends

- Inexpensive 802.11b (Wi-Fi) wireless technology is here and can fulfill many enterprise needs.
- 802.11a (Wi-Fi5) will become mainstream in 2003, but it will not replace 802.11b wireless LANs (WLANs).
- 802.11i security enhancements will be available by 2003, resolving current security issues.
- Deployment of single vendors can overcome security issues.
- Cisco is the leading WLAN vendor, but it remains weak on client device deployment.
- Deploy WLANs, with the expectation of 802.11a.
- The highest return on investment (ROI) applications will be in homes, remote offices and locations where cable placement is difficult.
- Bluetooth will force a move to 5GHz/802.11a/Wi-Fi5.
- Shared WLANs have the potential to cut acquisition costs to near zero for property owners.

Wireless Network Access -- Industry Trends

Complementing Wireless Datacom Solutions



Wireless Network Access -- Industry Trends
Wireless Technologies

PAN "Personal-Area Network"	LAN "Local-Area Network"	WAN "Wide-Area Network"
Bluetooth	**802.11b** **802.11a** **HyperLAN2**	**GSM** **GPRS** **CDMA** **2.5G to 3G**
Low Data Rates	Higher Data Rates	Lower Data Rates
Short Distances	Medium Distances	Longer Distances
Notebook/PC to Devices/Printer/ Keyboard/Phone	Computer to Computer and to Internet	PDA Devices and Handhelds to Internet
Less Than 1 Mbps	**2 Mbps to 54 Mbps+**	**10 Kbps to 384 Kbps**

Wireless Network Access -- Industry Trends
Wireless LAN Standards Evolution

	802.11b	802.11a	802.11g
Frequency Band	2.4 GHz	5 GHz	2.4 GHz
Coverage	Worldwide	US/AP	US
Data Rate	1 Mbps to 11 Mbps (now)	20 Mbps to 54 Mbps (very soon)	20 Mbps to 54 Mbps (1-2 years)

The Laws of Radio Dynamics:

Higher data rates = shorter transmission range
Higher power output = increased range, but lower battery life
Higher frequency radios = higher data rates, shorter ranges

Wireless Network Access -- Industry Trends
WLANs: Evolving Standards

Know the standards
to know the plan ….

802.11h/Euro reqs.

802.11a/Wi-Fi5

802.11b/Wi-Fi

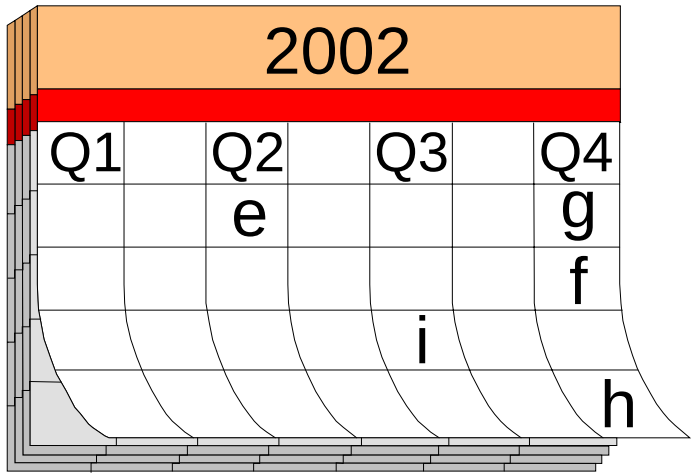
802.11g

802.11e/QOS

802.11f/Roaming

802.11i/Security

Expected Approval



Legend

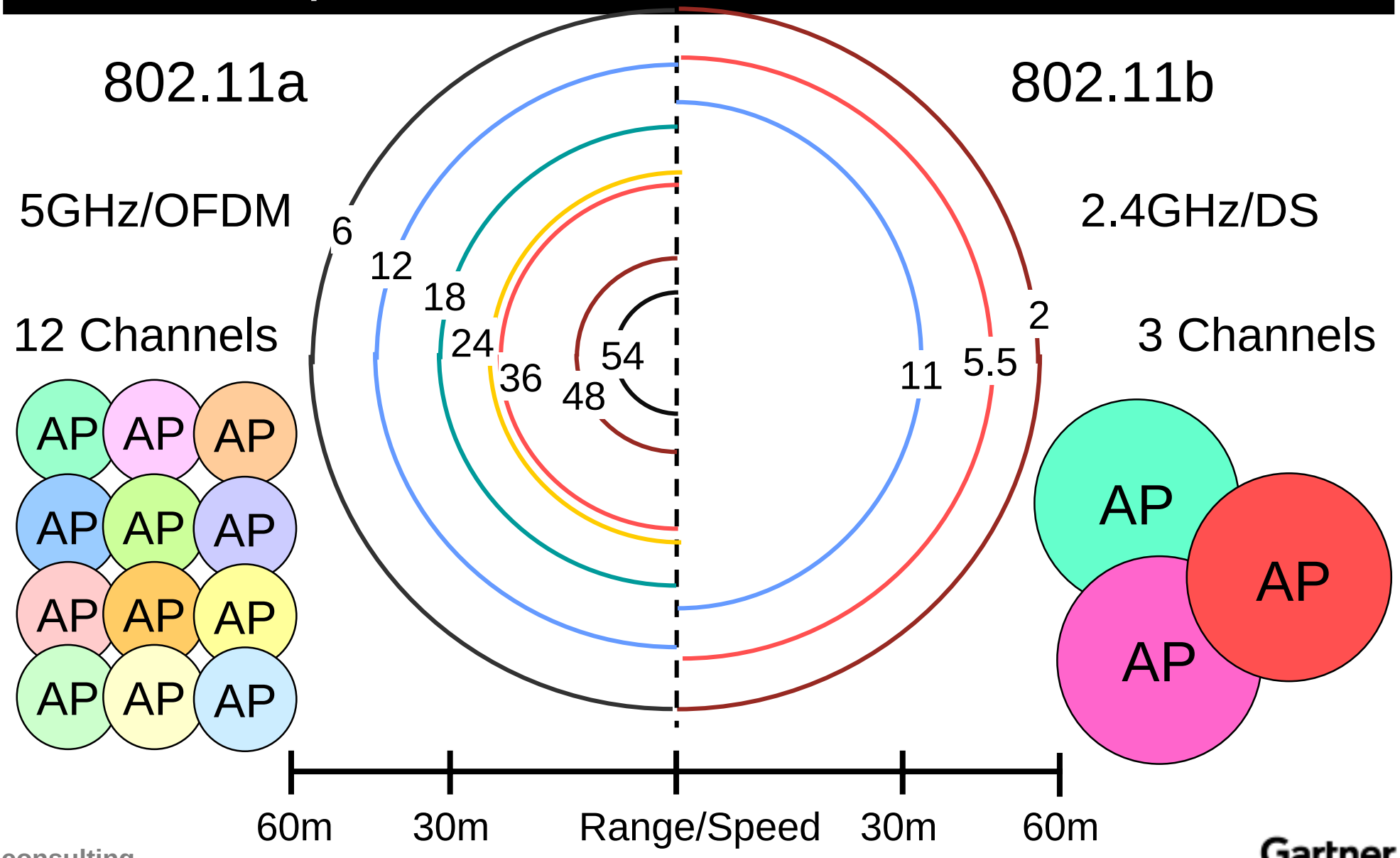
Phy. Layer

MAC Layer

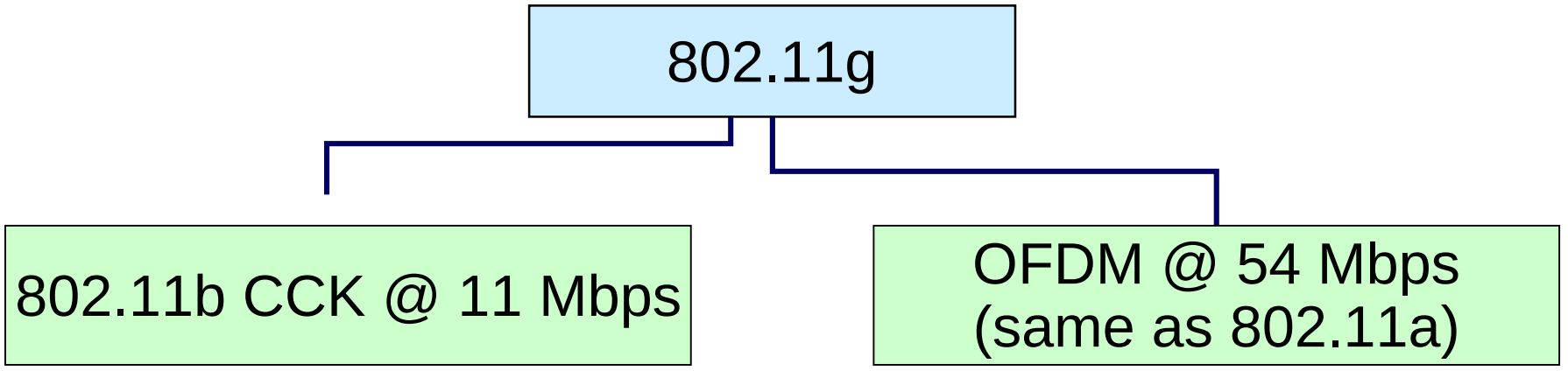
Other

Wireless Network Access -- Industry Trends

802.11 a/b Comparison



Wireless Network Access -- Industry Trends
802.11g — Muddle in the Middle?

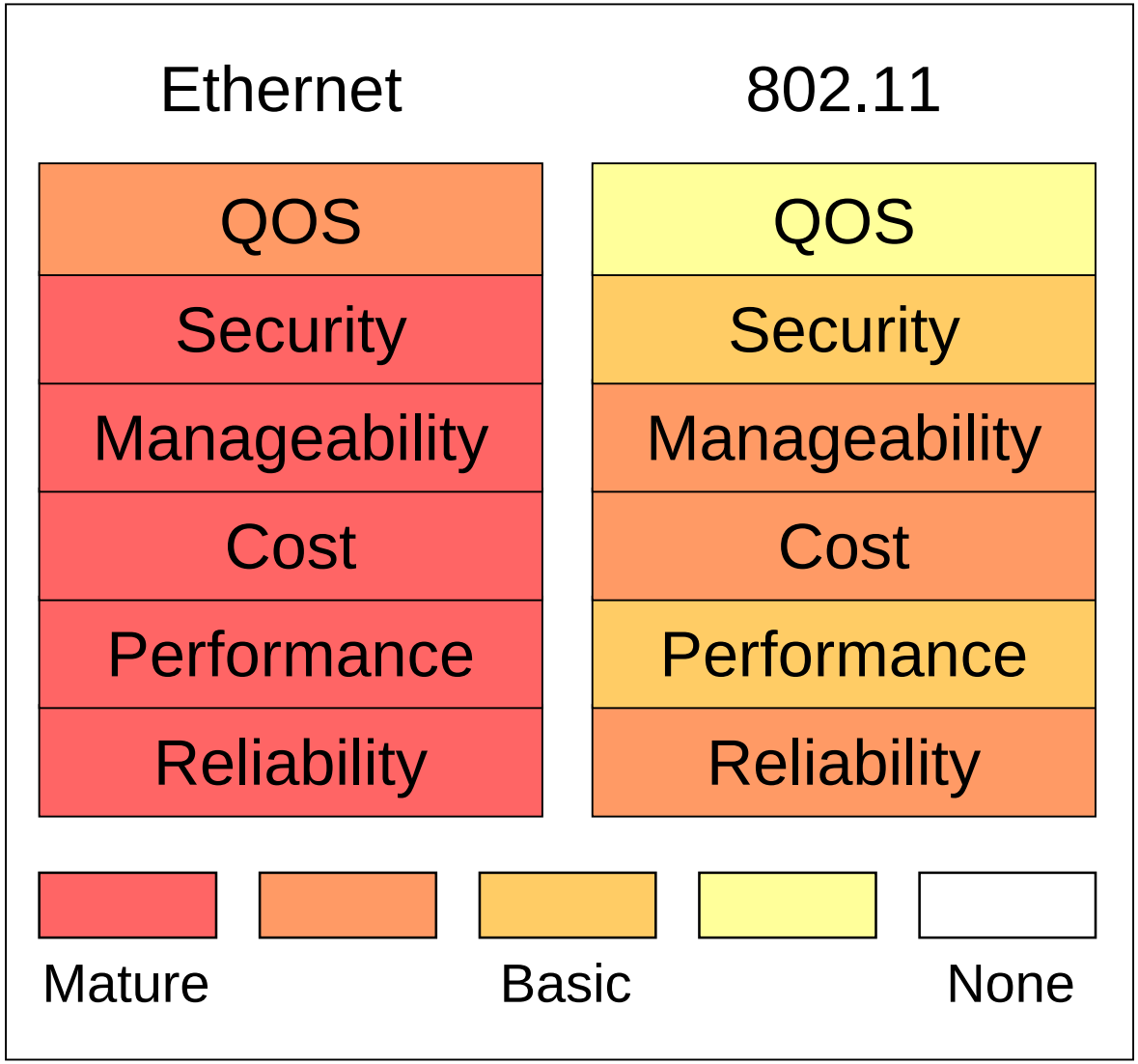


- "Coordinated" with 802.11b

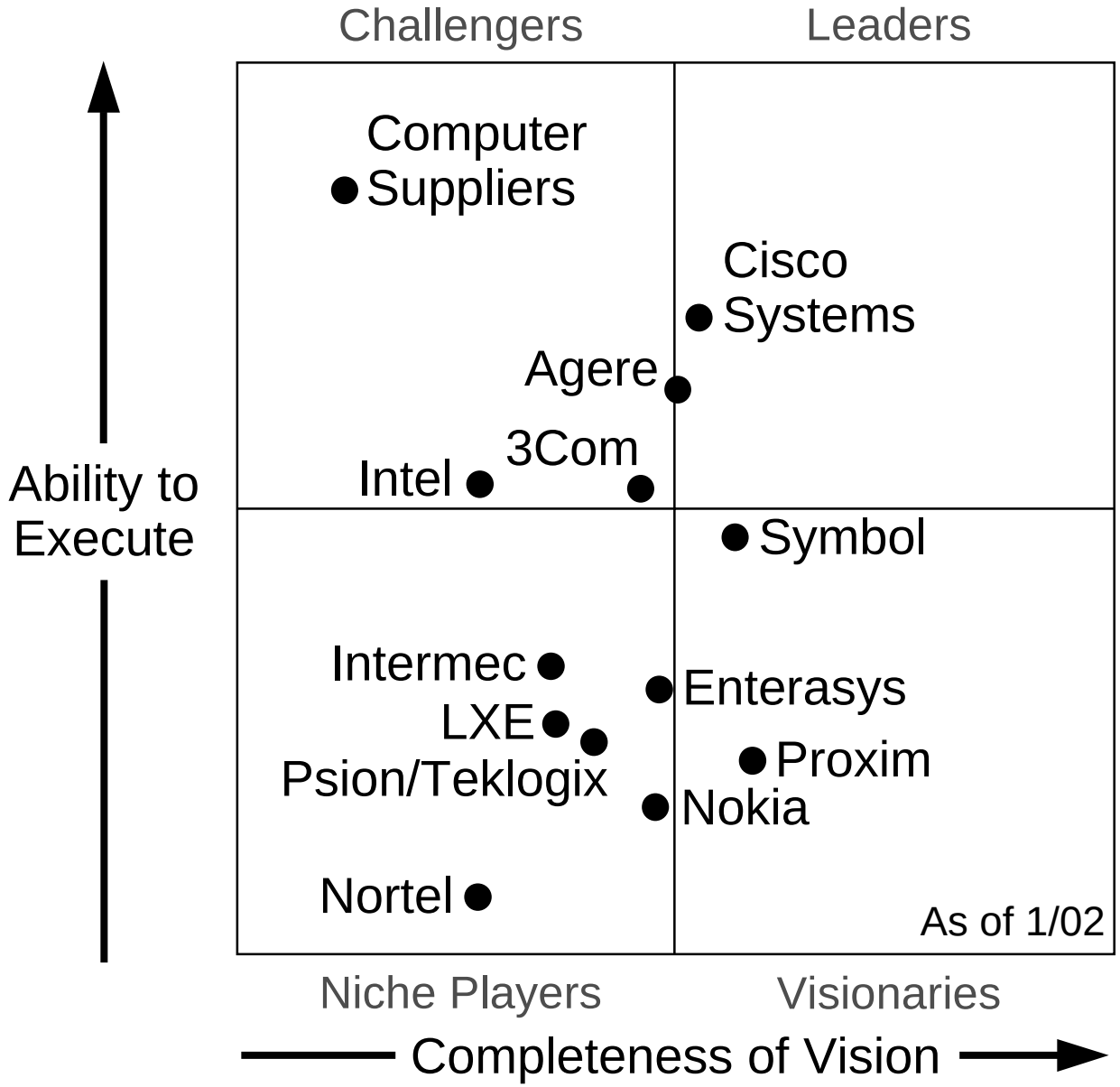
Summary

- Still Bluetooth issues
- Don't pay premium
- Need speed? Move to 802.11a
- Wait for 802.11a/b/g solutions at YE02
- Ignore Texas Instruments PBCC at 22 Mbps/33 Mbps

Wireless Network Access -- Industry Trends
Will WLANs Match Ethernet?



Wireless Network Access -- Industry Trends
Wireless LAN Vendor Ratings

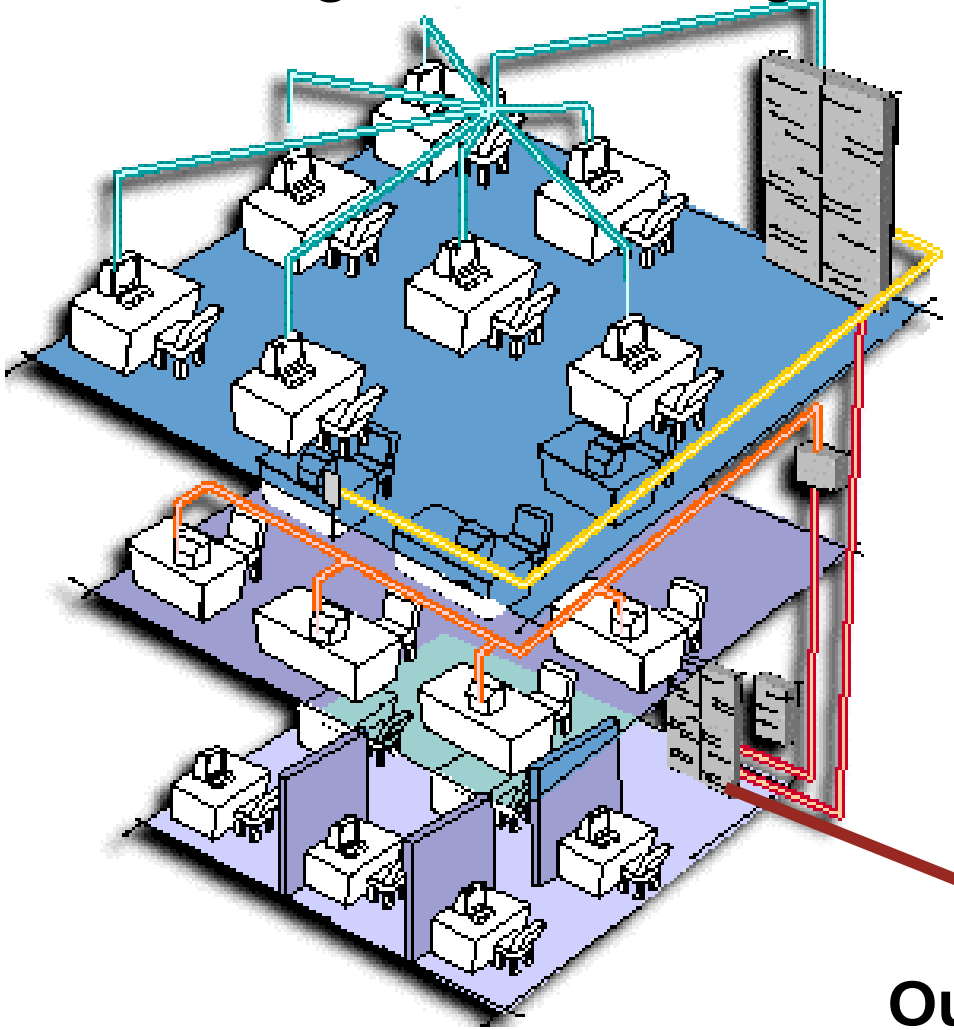


(From "Wireless LAN Vendor Evaluation and Magic Quadrant," 24 January 2002)

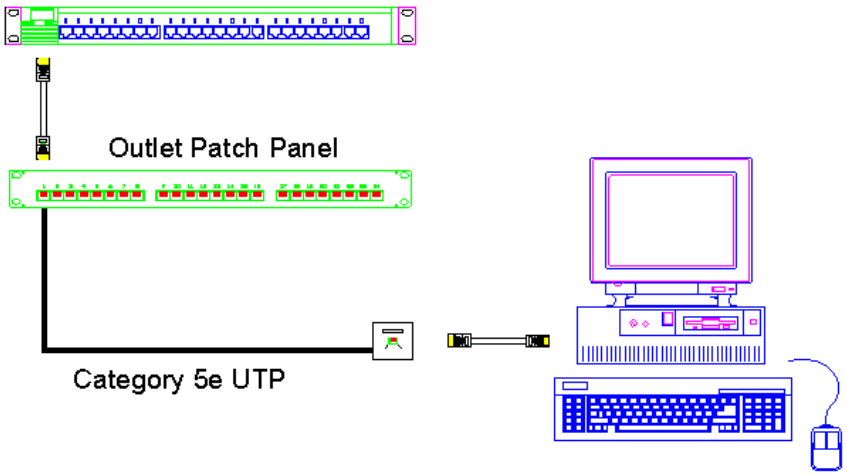
Wireless Network Access -- Industry Trends
Conclusions

- **Stay the course and make wireless universally available on campuses**
- **Assume a 4 year lifecycle**
- **Plan for next generation 802.11g**

In Building General Design

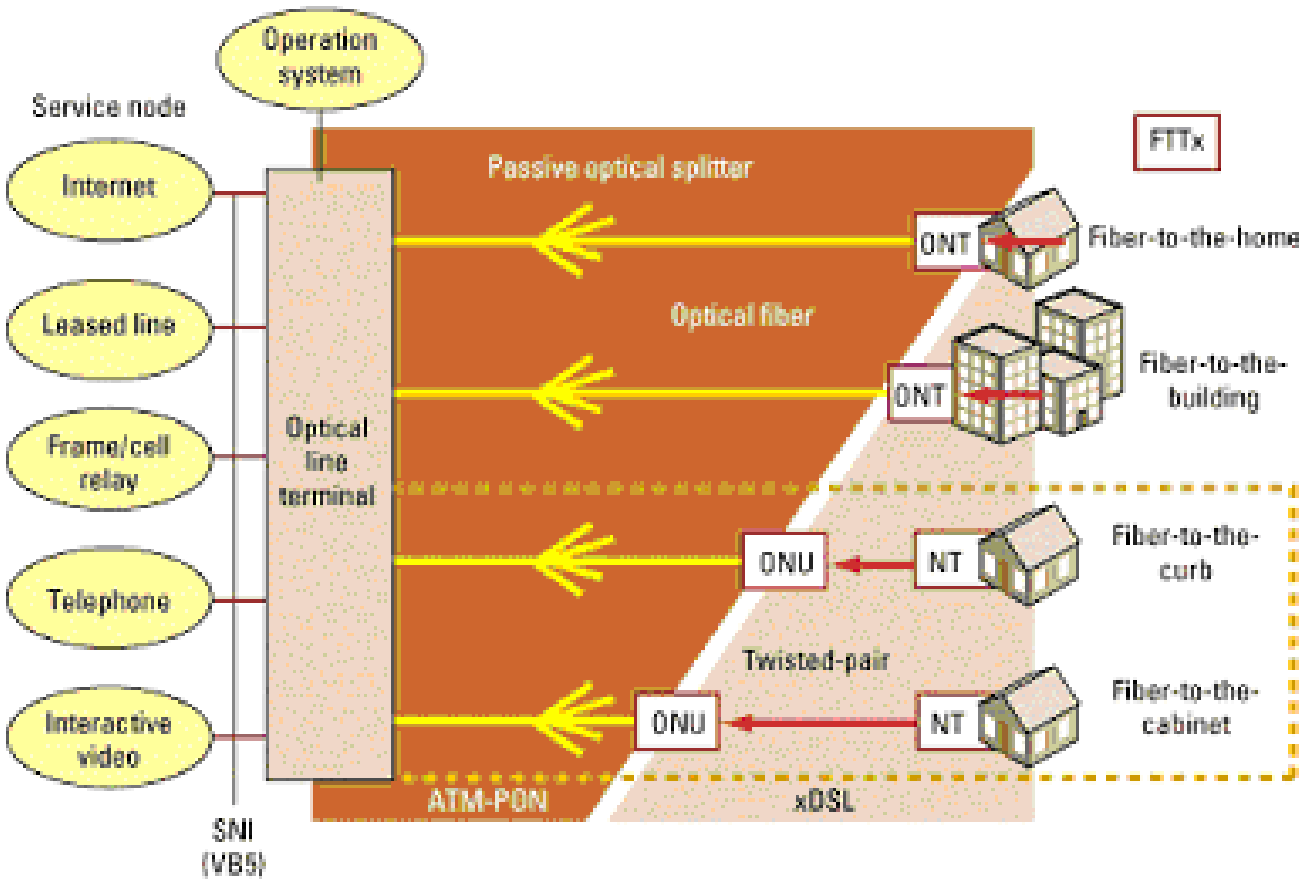


Ethernet Over Structured Cabling



Outside Plant - Fiber

Cabling -- Industry Trends
FSAN Model for PON

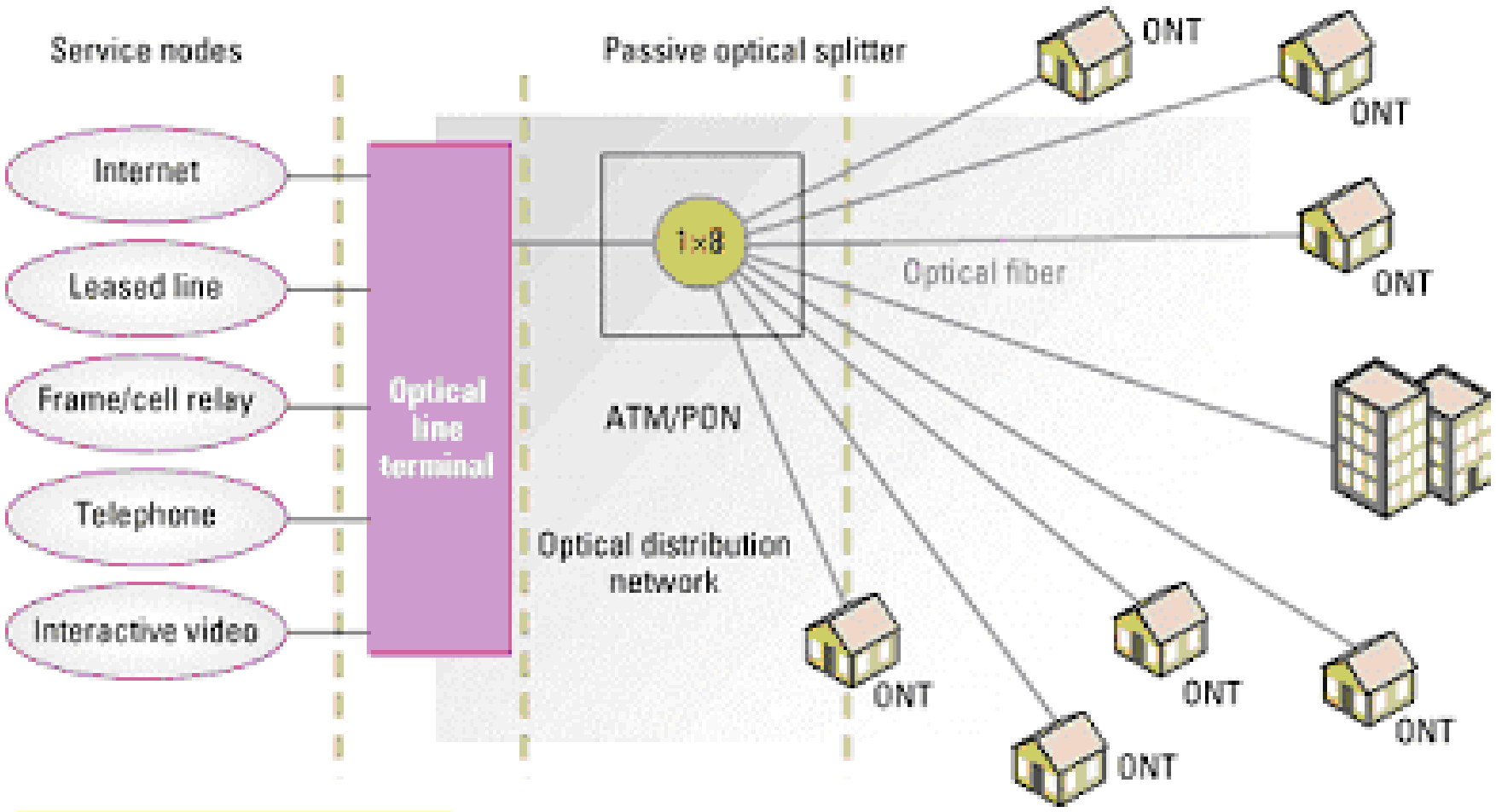


FSAN - Full Service Access Network
NT - Network terminal
ONT - Optical-network terminal
ONU - Optical-network unit
PON - Passive optical network

Source: FSAN

The Full Service Access Network standards initiative defines a set of passive-optical-network architecture standards using ATM as the transport technology.

Cabling -- Industry Trends
Passive Optical Network Access System



Cabling -- Industry Trends
Free Space Optics

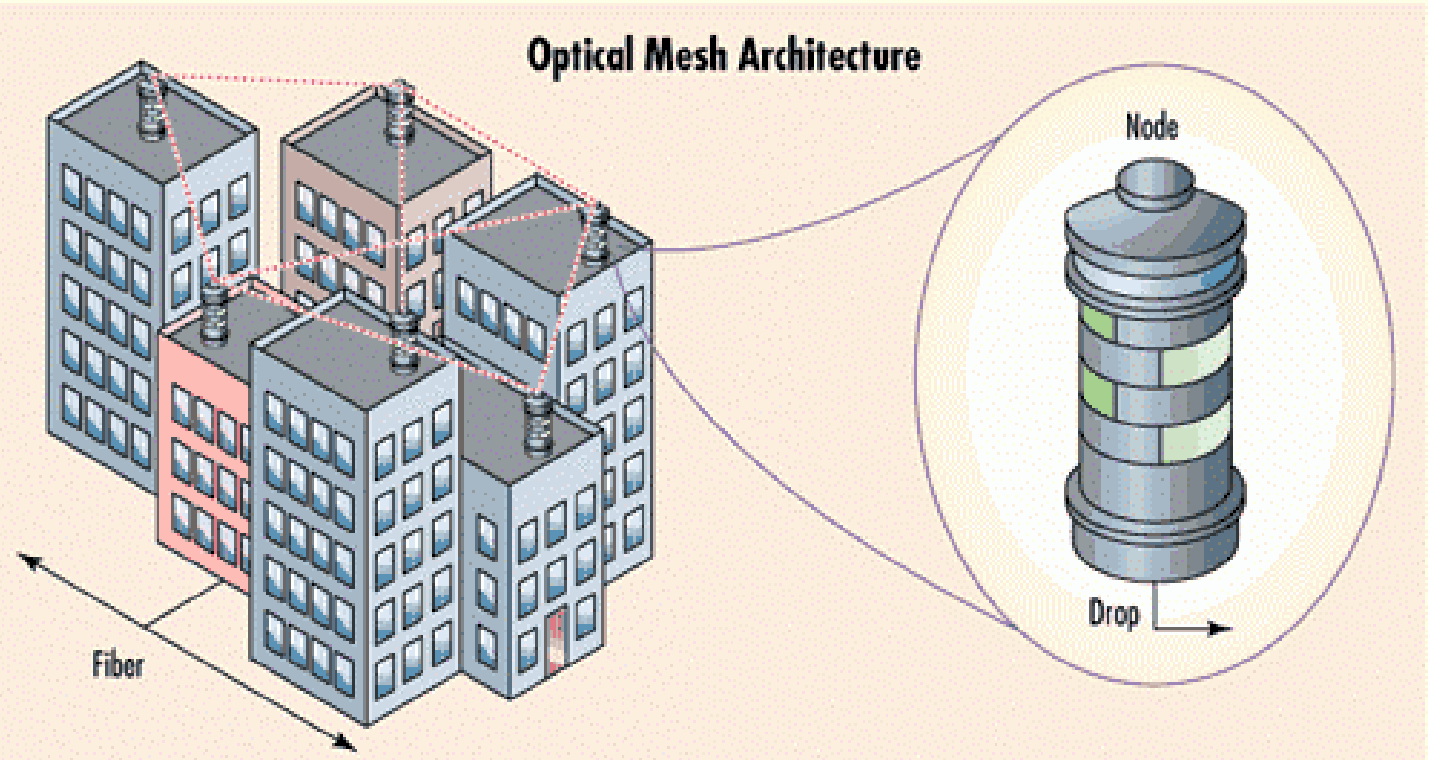


Figure 2. A wireless optical mesh network extends fiber-like access from "on-net" buildings to "near-net" buildings without fiber connections via wireless optical links. Each access point (or node) is connected with multiple pathways to improve reliability.

Advantages

- **Quick time of deployment**
- **Cost-efficient network investment**
- **No license acquisitions**
- **Investment protection for leased buildings**
- **Excellent for temporary installations**

Security -- Industry Trends

Strategic Planning Assumption: By 2005, 80 percent of institutions that have not strengthened security and established institutional policies on network behavior will face at least one major incident leading to lawsuit or negative publicity (0.8 probability).

Institutions must embrace security best practices that cover all devices that connect to the campus network or utilize institutional licensed software.

Business Continuity Planning

Strengthened policies to balance freedom and system integrity

Improved security for remote users

Improved user authentication

Improved responsiveness to incidents

Security -- Industry Trends

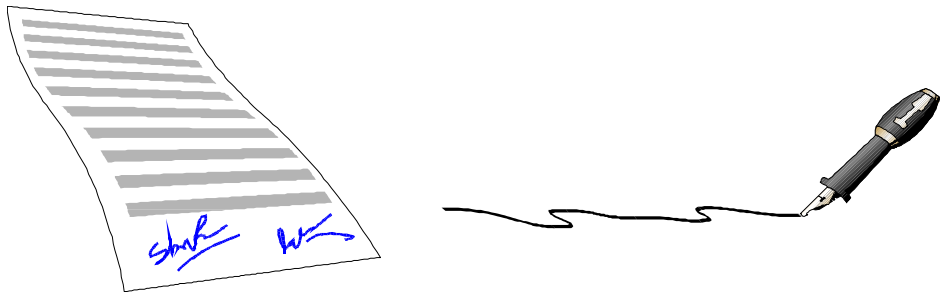
- **Business Continuity Planning**
  - Most higher education institutions have disaster recovery plans
    - Many are regularly updated and some are even tested
  - Plans must include procedures and tested resources that will allow the institution to continue business if a major outage occurs
    - Could include a disaster recovery site where the institution can access similar hardware and institutional data to get the IT operation up and running
- **Improved responsiveness to security incidents**
  - Create strong links with the global community of security experts, and use these relationships to help quickly identify risks and deploy effective responses
    - These include various computer emergency response teams around the world (www.cert.org and www.first.org) and major managed security service providers
  - Redesign decision-making processes to increase the speed with which the institution detects and responds to threats
    - Focus first on high-leverage functions (deploying patches to large numbers of desktops, servers and network infrastructure components)
    - Create an effective security incident response team responsible for maintaining awareness of global security risk issues and responding within minutes to vulnerabilities
    - Fine-tune escalation processes to enable quick crisis decision-making

Security -- Industry Trends

- **Improved user authentication**
  - Single sign-on (SSO) can simplify security management while improving user convenience and encouraging better password control
    - Because SSO creates greater exposure, strong authentication measures are required, such as password-generating tokens, smart cards or biometrics
- **Improved security for remote users**
  - Web-enabled institutional systems and off-site user broadband access have left institutional data exposed to interception over untrusted networks
  - Virtual private networks (VPNs) adds an important layer of protection by encryption the data flow
    - VPNs must be used in an environment of strong authentication tools, firewalling and define transaction zones
  - Standardized and consistently updated antiviral systems are critical to the institutions ability to respond to viral threats
    - Encourage all users of campus to use updated antiviral software through policy and low-cost or no-cost access to software for faculty, staff or student-owned PCs.

Security -- Industry Trends

- **Strengthened policies to balance freedom and system integrity**
  - The Nimda and Code Red viruses demonstrated that “the chain of security is only as strong as its weakest link”
    - Some institutions were hit hard when necessary patches were not applied quickly enough and individual machines became launching pads for attacking other machines inside and outside the institution
  - Users will have to give up some individual freedoms (e.g., to set up their machines any way they want) to be connected as “good citizens” within the institutional network
    - Institutions must formally articulate, enforce and regularly review policies for ethical and secure use of the network
    - Incorporate network behavior into the campus code of conduct as part of a new “social contract”



Classroom Technology -- Industry Trends

- **No strong trend toward smart classrooms**
  - Most institutions have a “mixed bag” of technology across campus
- **Typical technology-enabled classrooms**
  - Level 1:
    - Videotape/DVD player, TV set, screen, slide projector and overhead projector (no computers)
  - Level 2:
    - Level 1 plus projection capability through podium computer or laptop, LCD projector and large screen
  - Level 3:
    - Level 2 plus computer resources at students' seats in the form of a computer or port for a laptop that was brought to class
    - May support the ability to display student computers on a large screen and send a selected image to all student computers
  - Level 4:
    - Similar to mini-TV studios, supporting origination as well as display of two-way video conferencing, TV cameras (usually more than one), microphones, plus the elements described in the prior levels
- **The basic classroom of today is typically Level 2**
- **Pepperdine’s classrooms have network access, but some lack Level 2 features.**

Classroom Technology -- Industry Trends

- **Smart Classroom Issues**
  - Cost:
    - Technology in Level 2 classrooms can cost $10,000 - $20,000
    - Level 4 classroom can cost $250,000 - $600,000 (and up)
  - Training
    - Training faculty is key to successful use of classroom technology
    - In-class minutes are so limited, that faculty can't afford to lose any to faulty technology; this limits adoption by faculty
  - Staffing
    - The more complex the technology, the higher staffing level required to maintain it and support its use
  - Obsolescence
    - As technology changes classroom technology needs to be updated, adding to the long term cost

Student Access to PCs -- Industry Trends

- **No apparent trend toward institution-wide PC requirements**
  - Of institutions that have a PC requirement, typically it is limited to certain programs (e.g., business programs)
  - Some institutions have increased tuition or the student technology fee to provide laptops to incoming students
    - Others cannot increase tuition/fees without significantly impacting students
- **Most institutions still need Computer Labs, even with a PC requirement**
  - Faculty need PCs to be configured in a certain way, or loaded with software, to support teaching and testing
  - If PCs are mandatory, supplied and maintained by the institution and configured the same way, the institution may be able to eliminate Computer Labs
    - This requires a significant investment in staffing to be sure individual PCs are working properly for each class session
  - If PCs are not provided by the institution and the configuration is not consistent, Computer labs are still needed
- **Institutions with high PC ownership still cannot eliminate computer labs**
  - Students may have desktops instead of laptops, laptops may break, students do not always bring them to class, students want a place to “hang out” between classes, need access to print resources

E-mail Management -- Industry Trends

Through 2004, enterprise mailbox volume will increase by 40% per year (0.8 probability).

E-mail Attachment Size

- Storage capacity and bandwidth must be managed
  - When an e-mail database grows too large, it becomes sluggish, vulnerable to corruption and requires a significant amount of time to restore if corrupted
    - MS Exchange version 5.5 databases experience these problems in the 60GB to 80GB range
- Organizations typically limit mail box size and message retention time to manage the e-mail data base
  - Most enterprises have set user mailbox size between 40MB and 100MB
    - Most US organizations are standardizing at 50MB, with exceptions for users requiring additional space for business reasons
  - Message retention is usually set between 30 and 90 days
- Most institutions also limit attachment size
  - Large e-mail attachments impact both bandwidth and the e-mail database
  - Standard attachment size limit tends to be from 2.5mb to 5mb
  - Exceptions may be made for business reasons

E-mail Management -- Industry Trends

- Archiving messages with attachments will help reduce data stores
  - All attachments can be archived or they can be archived based on date, size or file extension
    - » Veritas' NetBackupStorage Migrator for Exchange is an example of a product that archives attachments
  - Disadvantage: Archived attachments will only be available when user is connected to the network, and retrieval time may be longer than for attachments in the mailbox

- **Unified messaging**
  - Unified messaging users can be configured to use separate (dual)-message stores or a single-message store

- **Student use of e-mail**
  - Most institutions provide an e-mail account to students and use only that account to communicate with students
  - Some e-mail applications (e.g., Groupwise) will allow the student to forward mail to another personal account (e.g., hotmail, yahoo, etc.)
    - Institutions that allow forwarding instruct students to do so “at their own risk” and that students are still responsible for receiving/reading e-mail messages sent to their university account