

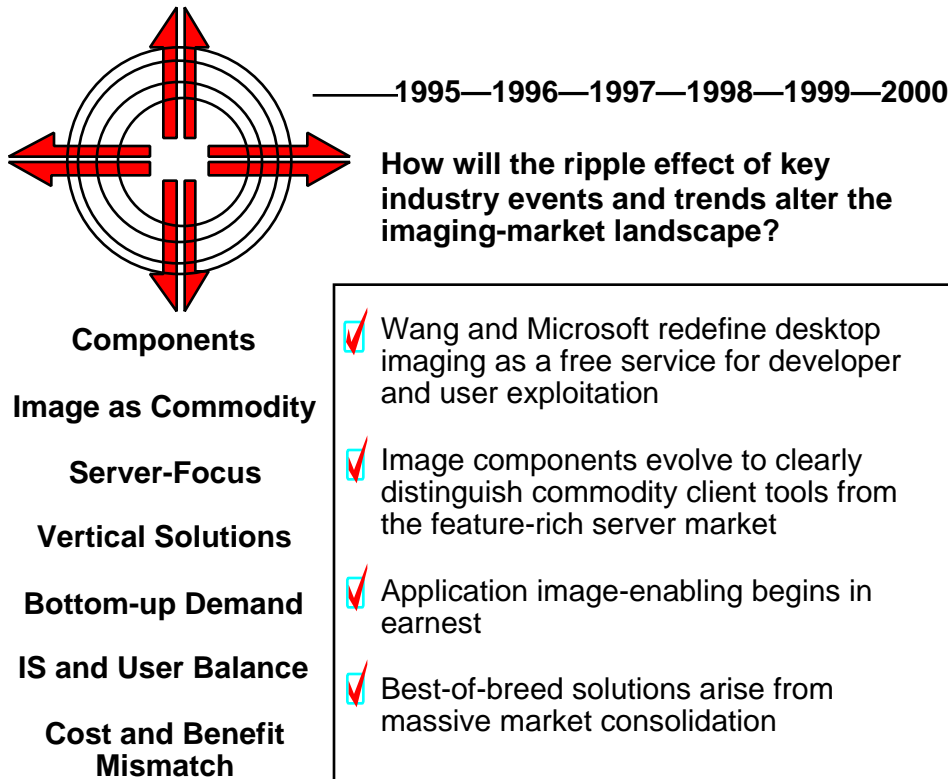
1. **As document imaging moves to broad acceptance and component-based solutions replace monolithic systems, which new strategic trends will emerge?**
2. **How are the best uses of document-imaging technology changing the operations of traditional paper-based applications?**
3. **How will technology architectures be affected as document imaging becomes more of a component and a commodity?**
4. **Which document imaging vendors will survive market consolidation, and what is the basis of a successful strategy?**
5. **How does an organization balance bottom-up imaging user initiatives with IS infrastructure, maintenance, support and technology-acquisition responsibilities?**

Document imaging is one of several core topics of research integrated primarily in the IDOM and OIS services. In the IDOM service, the research focus is on production configurations, whereas the OIS service focuses on “ad hoc” configurations. While both have many similarities, each exhibits distinctive differences in scope, robustness, and user and vendor strategies.

Imaging is shedding its reputation as an overhyped and high-cost technology, and is quietly becoming a dominant force inside many organizations. In many cases, implementations are driven from the bottom up as users attempt to do away with paper and re-engineer fundamental business processes. Basic imaging technologies have reached commodity status, and this opens the door for a wide range of image-enabling strategies.



As document imaging moves to broad acceptance and component-based solutions replace monolithic systems, which new strategic trends will emerge?



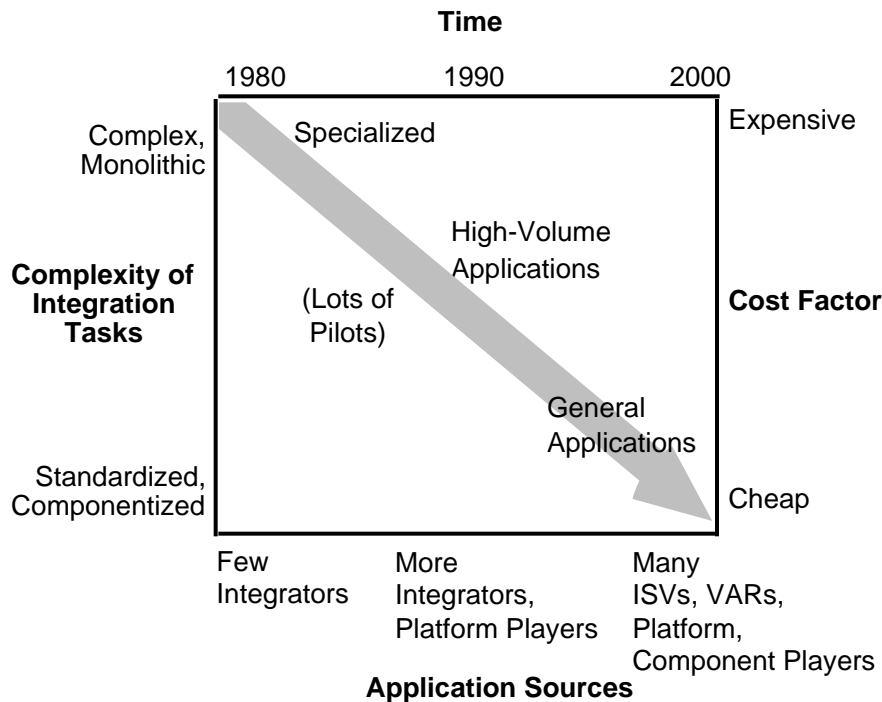
Source: Gartner Group

Due to the Microsoft and Wang laboratories deal, document imaging will transcend from esoteric data type to widespread application building block. Long delivered as part of a narrowly-focused closed system, document-imaging technology will now be available “out of the box,” as part of future releases of Microsoft’s Windows 95 and NT in 1H96 (0.7 probability). As we have long projected, core technologies are becoming components. Viewing has become a desktop commodity. Vendors must now increase the fight to capture the value-added, core-competency arena of server-software supremacy, vertical-market penetration, and best-of-breed product-suite control. Users will have an image “free-for-all” as more image componentry arrives from related areas such as fax software, World Wide Web-based documents and images, document management tools and workflow-enabled processes, and as application vendors, VARs and ISVs add image-enabled processing to their standard “plain-text” offerings.



By 2000, imaging will achieve near-universal penetration as a common office and production environment data type (0.9 probability).

Reader Notes



Source: Gartner Group

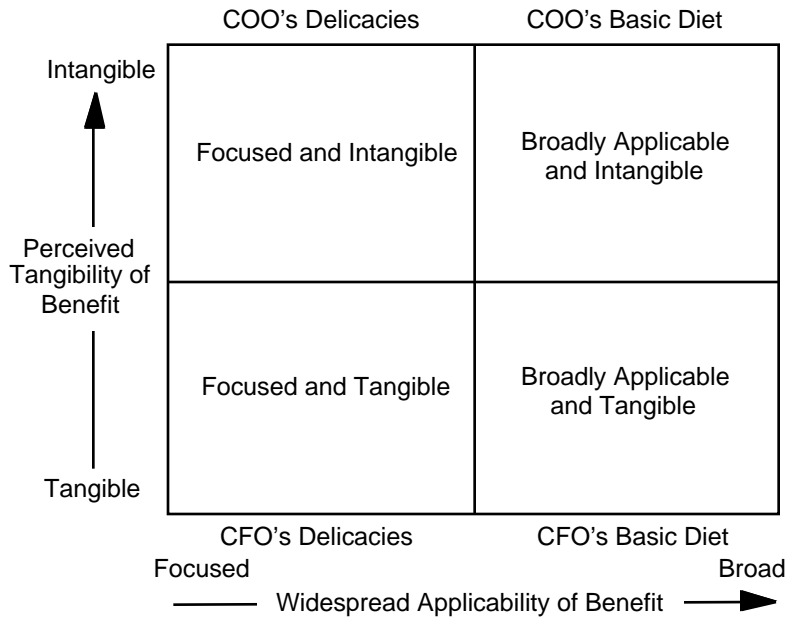
Key Issue: As document imaging moves to broad acceptance and component-based solutions replace monolithic systems, which new strategic trends will emerge?

The historical high cost of technologies required to cope with the large size of image objects demanded that implementations of image systems deliver high paybacks in mission-critical applications. These solutions were expensive, and required huge amounts of programming resources to implement. As costs continue to free fall, key standards solidify and vendors shift to server-based solutions running with inexpensive-to-free viewers, image is becoming just another data type to be employed in an unlimited range of applications. When these low-cost image tools and components arrive in the hands of the development community, general retooling of applications and new, creative replacements for traditional paper-based processes will escalate the acceptance of and reliance upon imaging. Users experimenting with the desktop arsenal, which will include workflow, imaging and elements of document management, will open a Pandora's box of personal application development and process-driven work-management demands.



Traditional tangible benefits, directly and easily expressible in monetary amounts, currently account for less than 50 percent of the actual benefits delivered by a typical image and workflow solution (0.8 probability).

The CEO's Shopping Cart of Benefits



Source: Gartner Group

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Broadly focused and intangible benefits are here to stay for imaging and workflow. Consider that few client organizations are required to justify telephones. If they were, then presenting a CEO with a huge list of the tangible benefits of replacing written correspondence (reduced paper costs, decreased manual letter-writing labor and saved postage) would seem ludicrous when compared to the "true" benefits of increased customer service, task enablement and organizational coordination. The world of intangible benefits is complex, and while it can be argued that they can eventually be represented in monetary form, most enterprises do not have the time, effort, or analytical tools to do so. Just as telephones, fax machines and business computing are taken as "givens," so too should document imaging and workflow. Type A enterprises are establishing document imaging and workflow solutions on an enterprisewide basis, with little or no regard to traditional cost-benefit analysis. Imaging tools will be treated as stock-in-trade commodities by Type B enterprises in 1996 and by Type C enterprises in 1997 (0.8 probability).



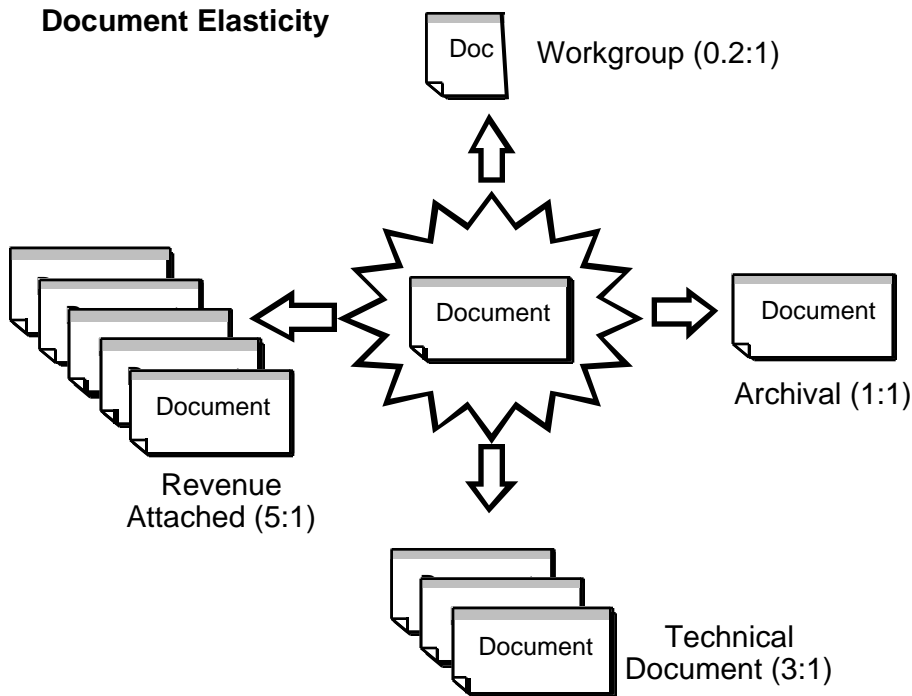
How are the best uses of document-imaging technology changing the operations of traditional paper-based applications?

Reader Notes

Strategic Planning Assumption

For each 1 percent increase in an organization's population of digital documents, there will be a greater than 1 percent increase in demand for document imaging to ensure the integration of paper-based information delivery systems with digital information repositories (0.8 probability).

Document Elasticity



Source: Gartner Group

In the information age, users must face and transcend the massive installed base of paper and paper-based delivery systems. Imaging is a bridge from the post-industrial stand-alone PC generation to the all-digital, all-networked computing information age.

For every digital transaction and/or digitally created document, ancillary paper documents need to be captured through imaging (see below). Applications that are being image-enabled must be examined for links to paper repositories that will be required for processing. The repositories must be imaged along with the core application.

Document Type	Ancillary Paper:Image
Revenue Attached	5:1
Technical Document	3:1
Workgroup	0.2:1
Archival	1:1



Multiple avenues exist for image-enabling applications.

Reader Notes

Image System Component	Production Imaging	Workgroup Imaging	Electronic File Cabinet	Desktop Application Image-Enabling	C/S Application Toolkits
Image Capture	High speed, high volume (1,000s to 10,000s/hr)	Moderate to low speed and volume (100s/hr)	Moderate to high speed and volume (100s to 1,000s/hr)	Low to moderate speed and volume (100s/hr)	High to moderate speed and volume (1,000s - 10,000s/hr)
Image Display	Fast retrieval and display	Moderate to fast retrieval and display	Moderate to low speed retrieval and display, often bundled with full-text retrieval engine	Moderate to high speed retrieval and display	High- to moderate-speed retrieval and display
Image Recognition	Rapid, multipass character recognition and handwriting recognition	Moderate- to low-speed single-pass character recognition	Optional, low- to moderate-speed single-pass character recognition	Optional, low- to moderate-speed single-pass OCR	High to moderate single- and multipass OCR and handwriting recognition
Workflow	Complex conditional and parallel processing, rules-based routing and graphical application building	Simple to moderately complex, often mail-enabled routing and notification	Not included	Some mail-enabling, but not significant, workflow	Full range of workflow functionality available
Storage Subsystem	Large volume, complex network optical and mixed storage media specialists with prefetching, caching and prestaging functions	Moderate to low volume optical storage support, moderate mixed storage media functionality	Moderate- to high-volume, limited mixed storage media functionality	Some optional moderate- to high-volume optical storage support	Full range of optical and mixed storage media functionality available
Price per user (20-user system)	Hardware + Software + Services = \$25,000-\$35,000	Hardware + Software + Services = \$3,000-\$5,000	Hardware + Software + Services = \$2,000-\$10,000	Hardware + Software + Services = \$250-\$500	Hardware + Software + Services = \$1,000-\$10,000+

Source: Gartner Group

Key Issue: How are the best uses of document-imaging technology changing the operations of traditional paper-based applications?

"I have called this principle, by which each slight variation, if useful, is preserved, by the term Natural Selection." Charles Robert Darwin, *On the Origin of Species*, 1859

The evolution of imaging technology and its deployment has led to a blossoming of a variety of "imaging" options, ranging from high-speed, high-volume production systems replete with complex workflow, optical and mixed storage media and sophisticated character and handwriting-recognition algorithms to office desktop-application image enabling. The prevalence of imaging products indicates a maturing market that has rapidly differentiated to meet a wide array of customer requirements. Application strategies incorporating imaging have a wide variety of choices: incorporation of imaging side-by-side or integrated with traditional manual processes (i.e., check processing via production imaging), wholesale replacement of traditionally non-automated processes (workgroup imaging), complete retooling from the ground up (client/server application toolkits) and others.



By 1997, more than 65 percent of imaging investments will target existing business applications where document processing logic is already well-understood and networked computing is entrenched (0.7 probability).

Financial Services Example

Characterization of Work by Management	Work Function	Labor Expenditure Allocation
High Value Added, Need More of This	Customer Relations	} 25%
	Loan Risk Analysis, Review	
Moderate Value Added, But Would Like to Minimize	Management Reporting Supervision, Process Monitoring	} 45%
	Document Compliance	
	Follow Up/ Error Correction	
Low Value Added, Would Like to Avoid Altogether	File Management	} 30%
	Mail Processing, Doc/Batch Prep And Movement	
	Keypunching, Initial Error Correcting	

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Reallocate Labor Ratios Using Workflow/ Document Management

Source: Gartner Group

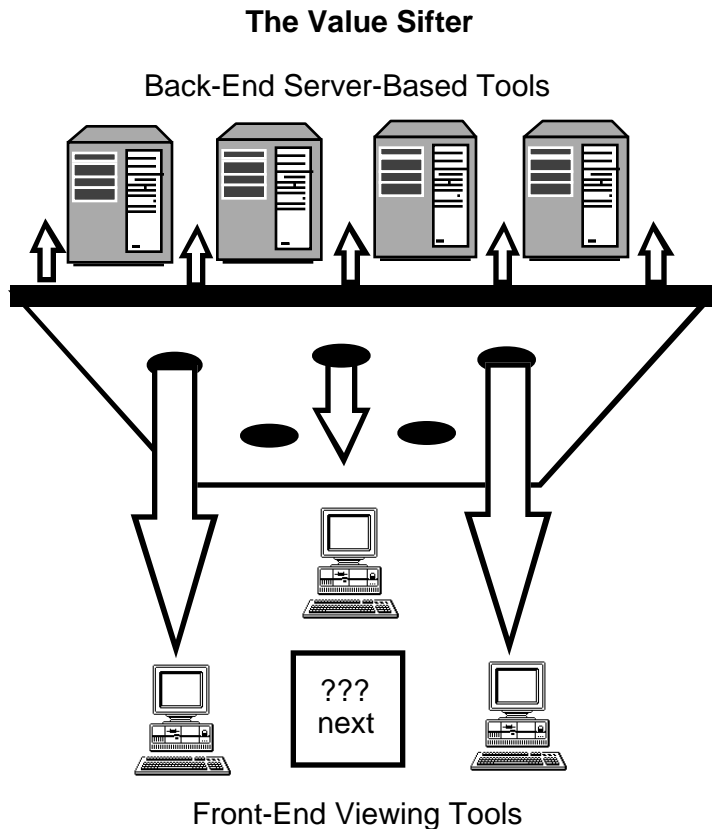
Key Issue: How are the best uses of document-imaging technology changing the operations of traditional paper-based applications?

Although document-imaging technology opens up new application space, with workflow potentially threading together dozens of applications, most users will stick to imaging in application arenas they know well. Even for those responding “both,” we believe their first implementations will be heavily tied to existing business applications. Once these systems take root, many new applications, perhaps unthinkable at the present time, will emerge. The term “new” is a relative term and generally represents application space relatively untouched by traditional business computing so far. A good example of a “new” system could be the professional underwriting system.



How will technology architectures be affected as document imaging becomes more of a component and a commodity?

Reader Notes



Source: Gartner Group

Document imaging is being filtered through a value sifter. High-priced equipment (scanners, optical and other large-capacity storage systems) and specialized, image and workflow servers are top candidates for deployment as enterprise services — they are retained by the image value sifter and prized by vendors. Other componentry, typified by the image viewer, passes through the sifter, lands in the general populace of desktop tools, and takes on a public-domain cachet. The sifter is running constantly, and each year the holes get slightly larger and let more pieces of the once-almighty image world slip into widespread diffusion. Architectures are being scrambled: image architectures as vendors decide how much of the technology to hold on to; and client-technology architectures as these components fall from the sky and land in the laps of image-hungry users.



Document-imaging system costs (hardware, software and services) will decline 15 percent to 20 percent per year through 2000 (0.8 probability).

Reader Notes

COMPONENT

Facsimile	CCITT GIII (stand-alone)		(Networkable) CCITT GIII BIS, T.434, JBIG			
Scanners	Low-end, non-production		Networkable, production grade			
Printers	Low-end, non-production		Networkable, production grade			
Recognition	OCR (limited)		ICR	Handprint	Handwriting, Geometry	
Workstation	DOS, Mac, Sun		W3.0, MAC 7.0, Sun,	OS/2	Win4.0	NT, OSF, OS/2/Pink
Compression	CCITT GIII	CCITT GIV	JPEG JBIG		MPEG	
Optical Store	WORM 12-inch		WORM/ 5.25-inch		Rewritable	
LAN	Ethernet	Token Ring	CDDI		FDDI	
WAN	Dedicated T1		Bandwidth on Demand			
Document	Unaware Objects		DDE/OLE	ODA/SGML	ODMA/DMA Multimedia	
Database	Flat Files, SQL Directories		SQL BLOBs		OO/SQL	
Workflow	Retrieval-oriented	Structured Workflow	GUI Workflow		WfMC/Black Forest/Object	

Cost per User, 20-User System HW/SW (U.S.\$)	<u>1985</u> \$100,000	<u>1990</u> \$25,000	<u>1993</u> \$12,000	<u>1994</u> \$10,000	<u>1995</u> \$9,000	<u>1996</u> \$8,500
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Source: Gartner Group

Key Issue: How will technology architectures be affected as document imaging becomes more of a component and a commodity?

The most dramatic advancements in document-imaging technologies during the next three years will include complete “commoditization” of the image at the PC workstation via the Microsoft/Wang deal, database embracement of BLOBs, bandwidth-on-demand WAN services, and sophisticated, integrated ICR capabilities.

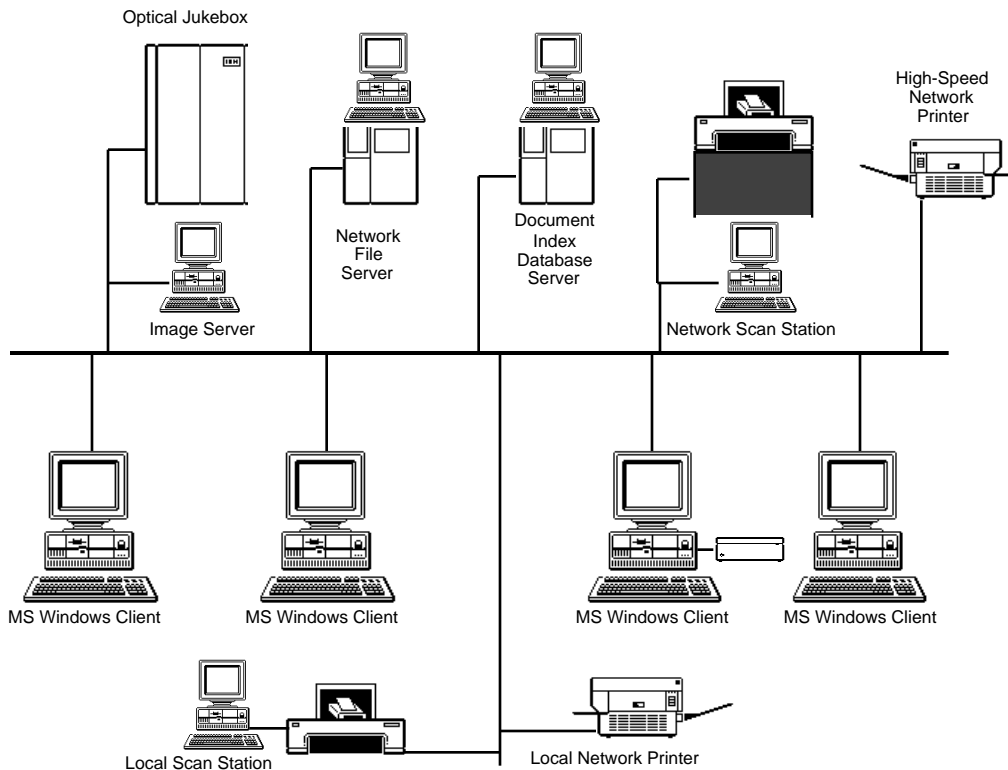
Pricing declines continue on the track we predicted close to three years ago. Rich production solutions today are less than \$10,000 per seat for hardware and software, (services such as application development and system integration are extra). Less production-oriented solutions can be as low as \$7,500 to \$9,000 per user.

The collection of imaging advancements will result in a dramatically lower price structure, and a more-pervasive role for imaging in the corporate infrastructure. Standards in key areas for imaging continue to mature; however, it is critical that the IS organization plans for change in storage media types and desktop devices. Consistent or at least interchangeable file formats and compression techniques are critical design points.



As image on the desktop becomes a nonrevenue product, vendors will rush to establish dominant server-based products (OCR, ICR and workflow), which will account for 60 percent to 75 percent of their software revenue by 1997 (0.8 probability).

Reader Notes



Source: Gartner Group

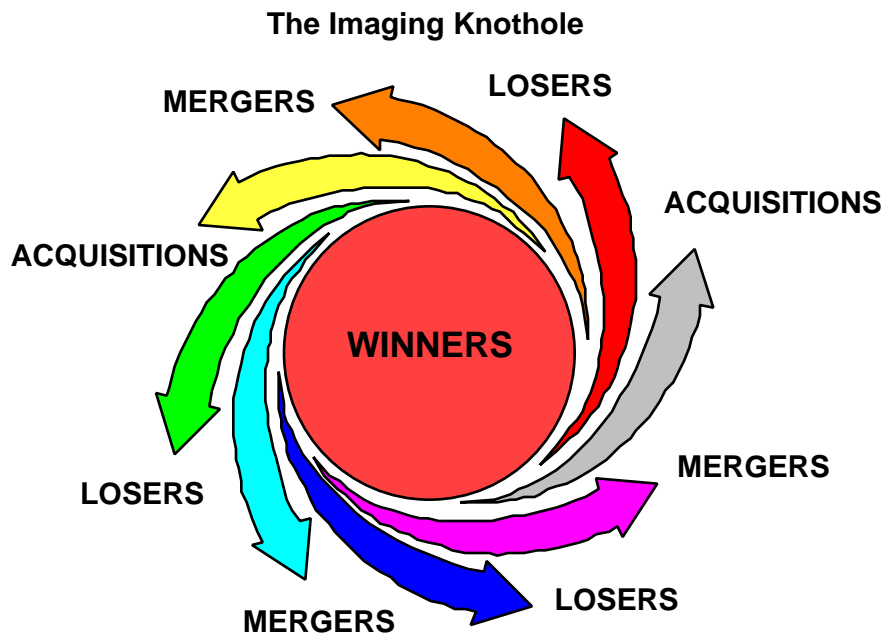
Key Issue: How will technology architectures be affected as document imaging becomes more of a component and a commodity?

Document-imaging commoditization is pushing vendors to abandon profit plans based on client tools that are beginning to flood the market. As vendors such as Novell, Adobe, Lotus and most notably Microsoft continue to subsidize the image-viewing market, traditional image vendors are running to server-based products. These two complementary actions increase the overall demand for computing and its related resources. The ante will be raised in all infrastructure areas: WAN speed limits must be increased to accommodate image traffic; server MIPS must rise in aggregate to process compute-intensive applications such as OCR and ICR; and desktop horsepower, memory and local storage will be allocated more to image-related data. The merging of imaging with the client/server world will escalate as vendors of imaging products realize that server-based competition raises the minimal level of competence required to deliver products, while at the same time, making competitive product's architectures more alike than different (e.g., mass competition in the NT/SQL Server, Solaris/Sybase world). To "own" a competitive lead, imaging vendors will shorten their adoption times for new database and operating-system advances and be more aggressive with beta testing new solutions and solution mixes.



Which document-imaging vendors will survive market consolidation, and what is the basis of a successful strategy?

Reader Notes



Strategic Planning Assumption: In 1995 and 1996, the document-imaging market will undergo a consolidation in which large and/or rapidly growing vendors will gain market share, and slow-growing vendors will either be acquired or fail (0.8 probability).

Source: Gartner Group

Like spectators peering through a knothole in a wooden fence, yearning to participate in the game on the other side, imaging-market players in 1995 are striving for the opportunity to be recognized as long-term, strategic solution providers. Their goal is to accumulate enough critical mass (as measured by revenues, installed base and distribution strength) to survive the current market consolidation. The image-market consolidation is being driven by basic forces of supply and demand. The oversupply of vendors in the moderate-volume segment of the transaction processing market is causing intense pressure on vendors to lower sales costs, differentiate products and generate economies of scale.



Through 1996, as imaging vendors traverse the four states of market consolidation, numerous well-known vendors will be acquired or will go out of business (0.9 probability).

Image Market Consolidation Final States

Future State	Type of Buy	Description
Sovereign	Strategic	Independent vendor that drives a diverse channel
Semiautonomous	Strategic	Vendor with a symbiotic relationship to a dominant segment of the channel or a vertical application
Acquisition/merger candidate	Strategic/Tactical	Either strong technology or channel, but cannot do it alone
Niche/failure	Tactical	Niche business removes it from mainstream

Source: Gartner Group

Key Issue: Which document imaging vendors will survive market consolidation, and what is the basis of a successful strategy?

The four categories listed above indicate the course a vendor will take during the next 18 months as well as the state we expect the vendor to be in at year-end 1996. We may place a vendor in one category today and forecast that it will stay in that category throughout its trip through the knothole, or we may place a vendor in a category today and explain why we think it will move into another category by year-end 1996. When categorizing a vendor, we will examine its overall strategy, financial performance, product development plans, distribution channel, product delivery capability, competitive advantages and disadvantages, strategic partnerships and a bottom-line forecast of the vendor's prospects.



The merger and acquisition activity will be most intense in the production imaging and workflow market through 1996 (0.8 probability).

Reader Notes

Final Vendor State Scenario (numbers represent likelihood of particular final state)

		Semi- Sovereign	autonomous	Merger/ Acquisition	Niche/ Failure
AT&T GIS	0	.7	0	.3	
Computron	0	.9	.1	0	
Digital Equipment	0	0	.6	.4	
Diamond Head	0	.6	.4	0	
DST	.1	.9	0	0	
Feith Systems	.1	.8	.1	0	
FileNet	.8	.2	0	0	
IA Corp.	.1	.8	.1	0	
IBM	.7	.3	0	0	
Keyfile	0	.3	.6	.1	
LaserData	0	0	.4	.6	
Optika	0	.6	.4	0	
Recognition/Plexus	0	.3	.7	0	
Sietec	.1	.9	0	0	
Sigma Imaging	0	.5	.4	.1	
Tower Tech (U.S.)	.1	.9	0	0	
Unisys	.4	.4	.2	0	
ViewStar	.1	.6	.3	0	
Wang	.8	.2	0	0	
Watermark	.1	.4	.5	0	

As of 4/95

Source: Gartner Group

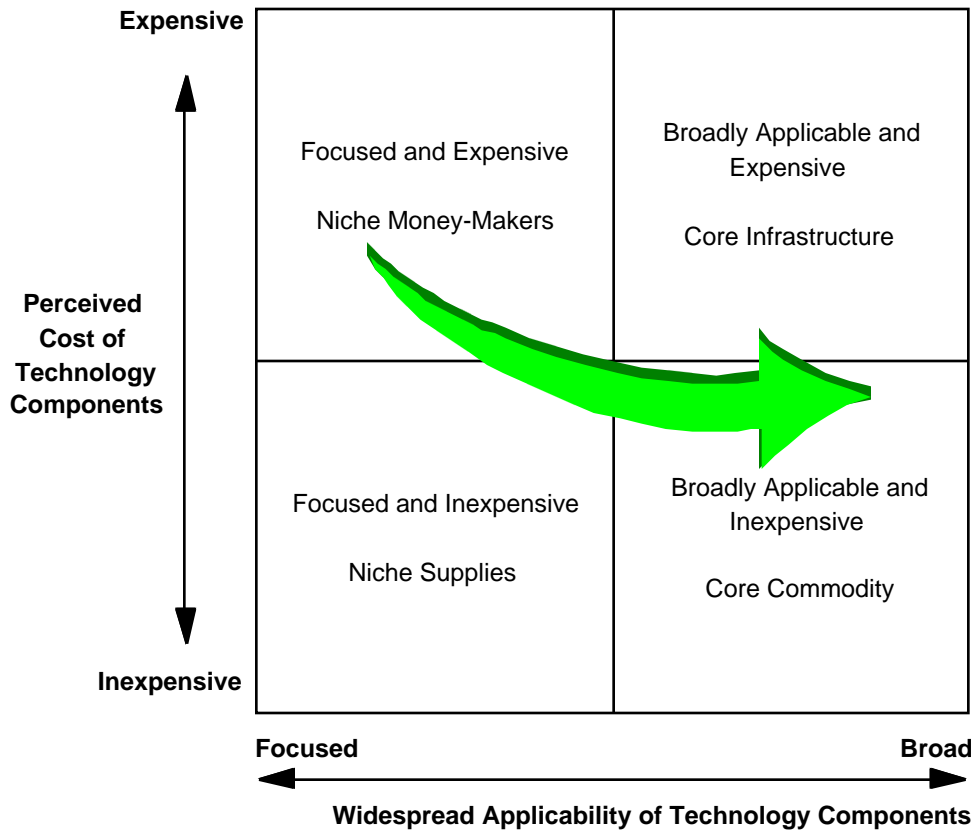
Key Issue: Which document-imaging vendors will survive market consolidation, and what is the basis of a successful strategy?

Vendors of document imaging are struggling to understand the impact of the commoditization and componentization of key tools. Most will depart the client-viewing and desktop-functionality market in reaction to the Microsoft-Wang offering. Many have already recognized their core industry competencies and are focused on building strategic server-based product suites. *Best-of-breed server products exist in several categories (e.g., OCR and ICR) and as more of these prime examples of product components are developed, surviving vendors will rush to build strategic relationships, obtain favorable pricing or acquire these solutions outright as part of an umbrella strategy to have a stable of the best components for customer solutions through 1997 (0.7 probability).* IS organizations will follow suit and implement core infrastructure services as well. Market conditions will favor those vendors who remain flexible and offer the best solution available, regardless of origin. Vertical-market solution vendors will stand to take application suites to new levels of functionality by following the best-of-breed approach and plying it against the demands of a focused market (0.8 probability through 1997). Embedded, self-created componentry will be a competitive disadvantage by 1999 (0.7 probability).



Vendors surviving market consolidation will shed the low-value image commodities and focus on server-based dominance and growth as revenue sources through 1998 (0.7 probability).

The “My, How Times Have Changed” Imaging Picture



Source: Gartner Group

Key Issue: Which document-imaging vendors will survive market consolidation, and what is the basis of a successful strategy?

Document-image componentry is rampant. Once viewed and treated as an isolated technology investment (**niche moneymakers**), imaging is now recognized to consist of **core commodity** software and hardware (e.g., viewing and scanning software) along with **core infrastructure** components (e.g., LANs and WANs). Imaging componentry is usable in more areas than what has historically held true. Fax technology has been blended with document viewing and OCR; Web-based networking makes heavy use of viewing systems; and E-mail is learning how to use image data as yet another type of mail format. Hardware has also become more broadly applicable. For example, optical storage is being used for additional data storage for large LANs. Additionally, CD-ROM and CD-R technology are used for imaging and traditional applications alike. As users find that fax OCR, page scanners, viewers and other traditionally focused tools of imaging (**niche supplies**) are available from the local computer store, expect the demand for and support of imaging to increase.



How does an organization balance bottom-up imaging user initiatives with IS infrastructure, maintenance, support and technology-acquisition responsibilities?



	Bottom-Up	Top-Down
<i>Application Type</i>	Imaging componentry	Solutions focus
<i>Image Processing Volume</i>	Low-Medium	High
<i>Functionality</i>	Targeted	Broad suite
<i>Price Points</i>	Desktop pricing	High-end
<i>Distribution Channel</i>	Indirect/retail	Direct sales
<i>Organizational Use</i>	Personal productivity	Competitive advantage

Strategic Planning Assumption

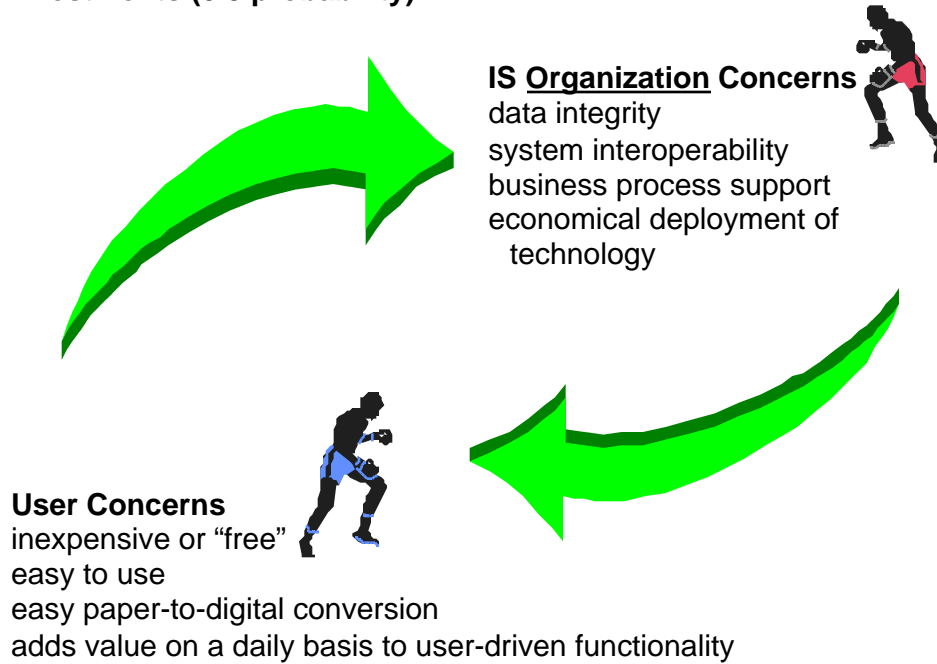
Through 1997, the IS organization will focus its document imaging efforts on providing core infrastructure technology, managing user-led desktop image-enabling and retooling 75 percent of the existing application base for image access (0.7 probability).

Source: Gartner Group

Approximately 45 percent of Gartner Group OIS clients believe that imaging will be purely a bottom-up phenomenon. An overwhelming majority of these persons cited costs as the primary reason. Typically, these respondents plan to implement a bottom-up pilot in one department to gain experience and demonstrate the benefits of imaging. The pilot will then be repeated in other areas of the enterprise. A little more than 30 percent of the respondents plan to undertake a hybrid approach. For most of these respondents, imaging will develop according to the existing framework within a particular department. Many clients that choose the hybrid approach believe that a LAN-based approach is not robust enough and that a purely mainframe strategy is too expensive. The IS organization must prepare for this wave of bottom-up effort and support the processes while providing leadership through image-enabling its own application base and legacy systems.



Through 1999, bottom-up imaging adoption will challenge the IS organization to develop a corporate imaging strategy focused on mediating potential interoperability conflicts, technology sharing and cost-effective image technology investments (0.8 probability).



Source: Gartner Group

Key Issue: How does an organization balance bottom-up imaging user initiatives with IS infrastructure, maintenance, support and technology-acquisition responsibilities?

Almost 15 percent of the respondents believe that they will deploy a top-down strategy for imaging. These persons emphasized the importance of protecting and leveraging investments in people skills, the existing architecture and the application set. We believe the term "bottom up" refers to lower-cost LAN implementations, although this market/topology will be redefined as LANs merge with powerful operating system (e.g., HP-UX with NetWare). The bottom-up channel is becoming rich in products, but delivery capabilities are still "hit or miss."



The IS organization can establish itself as a leader in solving business problems by adopting new roles, skills and methodologies in a team-based approach to imaging-system implementations (0.8 probability).

<p>Imaging System Project Manager:</p> <p>Role:</p> <ul style="list-style-type: none">- Work as part of a team with end users, building an understanding of the business and user needs.- Work with end-users to prototype and develop imaging applications.- On an ongoing basis, work with end-users to evolve imaging solutions to ensure that they meet changing user needs and technical requirements. <p>Skills:</p> <ul style="list-style-type: none">- End-user and business experience.- Experience in complex project management.- Solid grounding in imaging system technology fundamentals.
<p>Imaging System Administrator:</p> <p>Role:</p> <ul style="list-style-type: none">- Day-to-day responsibility for system performance and availability.- Coordinate image and index loading and updating, system maintenance and user training.- Manage optical storage services and implement record retention policy. <p>Skills:</p> <ul style="list-style-type: none">- Strong application development and management experience — SQL, C programming and file systems.- Strong understanding of business and end-user requirements.- Trained in the operation and maintenance of imaging hardware peripherals and specialized software modules (e.g., jukebox management software).
<p>Imaging System Data Manager</p> <p>Role:</p> <ul style="list-style-type: none">- Work with end-users to develop, maintain and update image index information.- Assist imaging system administrator with data loading. <p>Skills:</p> <ul style="list-style-type: none">- Expertise in information retrieval and document profiling.- Training in imaging system operation and management.

Source: Gartner Group

Key Issue: How does an organization balance bottom-up imaging user initiatives with IS infrastructure, maintenance, support and technology-acquisition responsibilities?

Image, the big-data type, has big support needs in the form of complicated capture, recognition and optical storage subsystems, and indexing requirements. IS organizations need to develop image-specific skill sets that can be shared across applications and platforms. As the IS organization reshapes itself in the 1990s, a team of image specialists will be required.



The Imaging-Eruption Scenario (0.8 probability)

The shock waves from the Microsoft/Wang deal will lead to a proliferation of both highly planned and absolutely capricious use of imaging on the desktop, but will result in near-universal penetration of imaging as a common data type by 2000 (0.8 probability).

While the impact of pervasive imaging on network infrastructures, storage architectures and desktop computing power will be massive, the value-add to applications will justify the required infrastructure investments (0.8 probability).

Image-market consolidation will stabilize the market by yielding fewer, larger and better-differentiated vendors with clear visions and stronger long-term prospects (0.8 probability).

Organizations faced with enormous demand for imaging services and support will exploit economies of scale and implement enterprise architectures for providing low cost (0.8 probability).

The Imaging-Calm Scenario (0.2 Probability)

The Microsoft/Wang deal will dissolve, severely restricting the proliferation of imaging on the desktop (0.2 probability).

Imaging as an application-enhancing technology is transcended by digital transaction and commerce technologies, such as EDI, or by other paper-to-digital technologies, such as Adobe Capture (0.2 probability).

Market consolidation will be so tumultuous as it careens toward an equilibrium of supply and demand, and a balance between desktop-imaging demand and server-side functionality, that users will delay enterprise deployment until year-end 1998 (0.2 probability).

Enterprise deployment of document imaging is further stunted as the IS organization is overwhelmed by a seemingly endless and inexorable demand for imaging services and support, while end-users become frustrated with the halting pace and challenge of widespread image deployment (0.2 probability).

