

# Client/Server BENEFITS, PROBLEMS, BEST PRACTICES

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**THE GOAL:** NOT JUST BETTER TECHNOLOGY BUT BETTER BUSINESS PROCESSES THAT MAKE A COMPANY MORE COMPETITIVE.

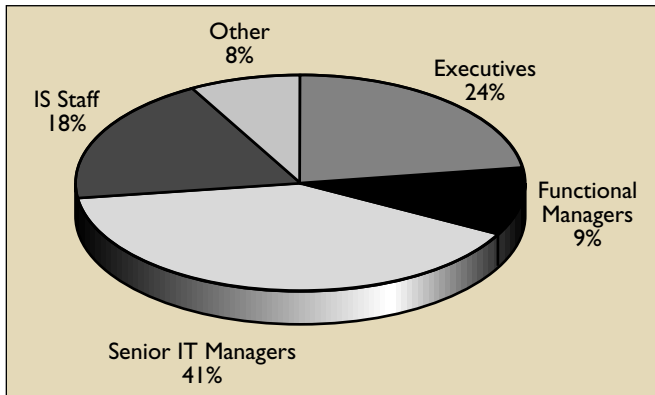
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Client/server systems link clients and servers via a network to support distributed computation, analysis, and presentation, providing a common method for distributing computer power within companies. Although companies are embracing client/server technology when moving from legacy systems [4], a 1996 survey of IS managers by *InformationWeek* found that only 40% of them consider client/server systems “a worthwhile investment” [1]. In fact, only about 16% of all client/server applications were (and are) viewed as successful by the companies implementing them [5].

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**Figure 1.** Distribution of survey respondents by title

Why this sense of futility? What problems do companies encounter when implementing client/server technology? Are these problems solvable? Do they negate the benefits—rendering the architecture economically infeasible. Here, using data collected from our own nationwide study of 350 client/server applications, we answer these questions and provide further insight into implementing client/server technology.

The majority of respondents (41%) to our survey were senior IT executives (including CIOs); 24% senior corporate executives (including CEOs); and the balance (35%) primarily IS and functional managers (see Figure 1). Almost 75% of them were from companies that had implemented more than just a client/server network (see Figure 2). About 77% of the respondents classified their companies as either the dominant market leader or a major competitor, with the remaining 23% classified as minor competitors. Companies that have not yet discarded their old computing architecture should not be surprised at their larger competitors' more modern applications portfolio. Just over 60% of the respondents' businesses were in the service (25%), industrial (18%), and financial (18%) sectors (see Figure 3).

Although some

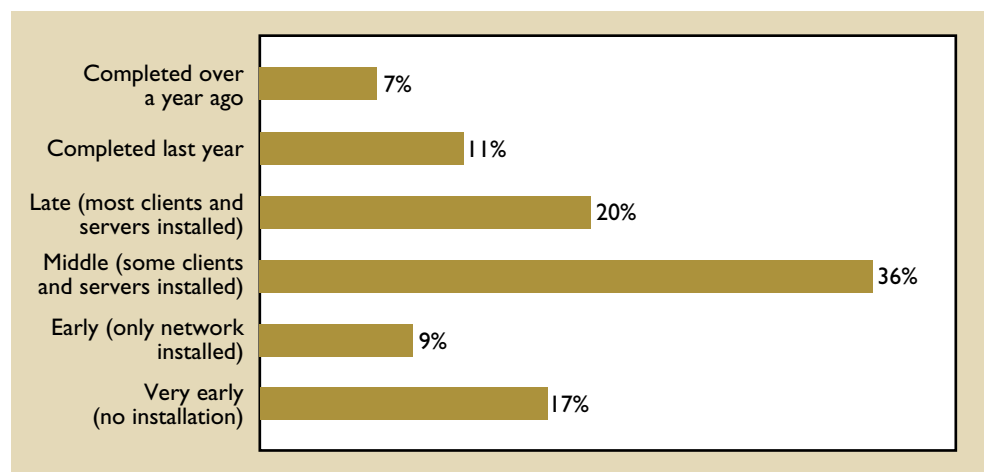
MIS-centric management pundits have suggested the impetus for client/server technology is from IT management, we found that executive management initiates 50% of all implementations, while senior IT executives initiate 33% of them, with lower-level managers composing the balance. Thus, senior, non-IT executives are an important force behind the application of client/server technology.

Interestingly, management's primary motives for moving toward client/server technology are not just technical, such as to avoid dated or proprietary architectures, as is often touted by the leading vendors. As identified by our survey, the top five reasons—increased productivity, better management and control of information, improved

**Table 1.** Motives for implementing client/server technology

Items	Average Ratings*
Increase productivity	4.12
Manage and control information better	3.96
Improve customer service	3.92
Enhance organizational flexibility	3.48
Empower users	3.45
Reduce cycle time	3.28
Decrease costs	3.22
Increase profit and revenue	3.10
Reengineer business processes	3.03
Exploit leading-edge technologies	2.91
Respond to competitive pressures	2.90
Escape from old proprietary platforms	2.71
Create new products and services	2.62
Create new sales opportunities	2.59
Avoid mainframe facilities	2.36
Create external linkages with suppliers and customers	2.24

\*Based on a five-point rating scale: 1 = not at all, 5 = to a great extent



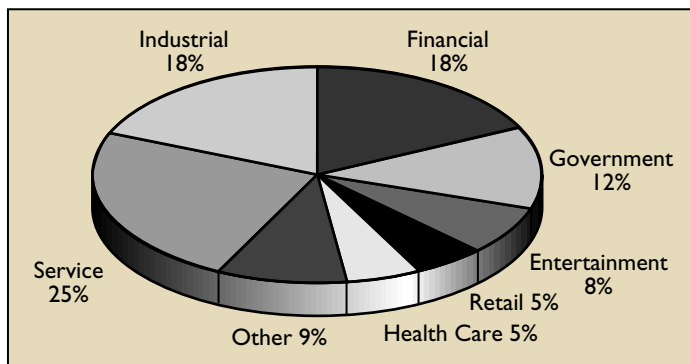
**Figure 2.** Implementation stages of respondents' systems

customer service, enhanced organizational flexibility, and user empowerment—relate to business operations (see Table 1). Thus, by using client/server technology, companies seek to organize themselves for greater operating effectiveness. The primary hooks for management are potential improvements in business operations (such as increased productivity) promoted through process improvements (such as

tackling more advanced applications spanning their entire operations to link various functions and levels. We also found that 48% of the applications were distributed-function, 19% distributed-database, and 14% remote-data-management, with the others split into remote-presentation and distributed-presentation.<sup>1</sup> Thus, in terms of these application complexity measures (such as application scope), it appears that companies are implementing more ambitious, and more risky, applications.

Over 50% of the respondents claimed their organizational cultures are decentralized and flat. However, a majority also reported the management styles at their companies are top down, rather than bottom up. This paradoxical result may indicate that, while client/server technology permits companies to become more decentralized in their operations or help maintain decentralized operations, management uses the technology to retain control and centralize decision making.

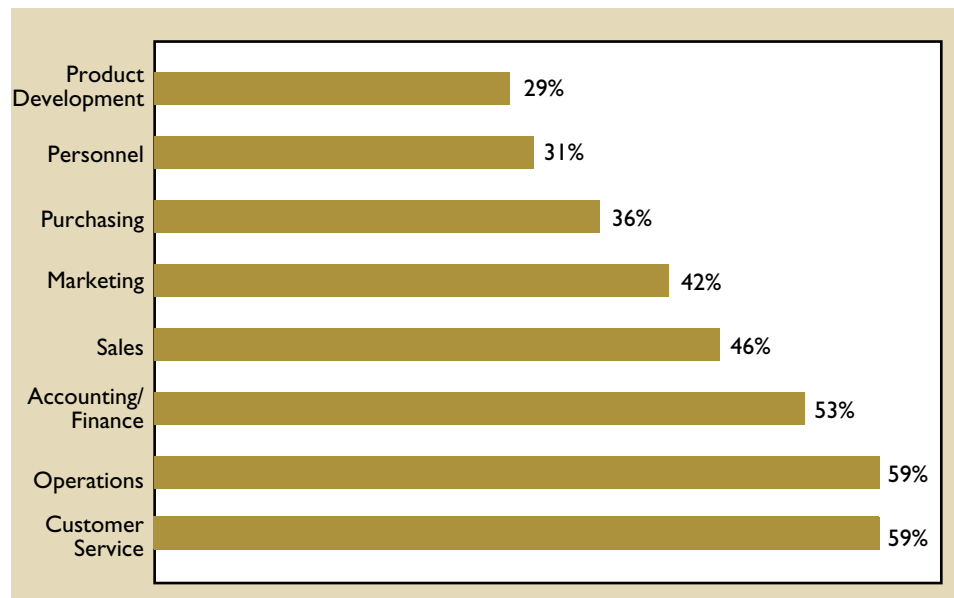
Thus, it appears that as companies pursue client/server technology for broad business benefits to make themselves more competitive, their client/server systems evolve away from workgroup applications to large-scale, mission-critical applications that may deliver business benefits congruent with their primary business motives.



**Figure 3.** Distribution of survey respondents by industry

enhanced organizational flexibility) rather than technical enhancements per se.

As the initial driving force, executive management can generate broad organizational support—important because client/server applications span several areas and multiple organizational levels. The scope of many client/server applications is large. In our sample, 62% of the client/server projects provided service to all levels of the company, including executives, middle managers, staff, and line supervisors, with the remaining 38% involving fewer levels. We found that 60% of the applications spanned three or more functional areas, with the most prevalent being customer service, operations, and accounting/finance (see Figure 4). Moreover, 75% of the respondents described their applications as mission critical, indicating that most companies are beyond experimenting with small workgroup applications and are



**Figure 4.** Functional areas of client/server applications

<sup>1</sup>We used Gartner Group's original 1994 five-tier model to delineate the potential range of client/server applications.

## Potential Problems and Obstacles

Many companies are overwhelmed by the technical issues accompanying client/server implementation. Practitioners cite network management, limited software interoperability, and lack of vendor support. In our analysis of potential obstacles, we also considered organizational problems (such as organizational change brought on by the new system), because computer technology is planned, deployed, and used by people. We observed three problem categories—computer architecture, management and organization, and conversion and maintenance (see Table 2). In our sample, the top five reported problems, in descending order of severity, were inadequate internal skill set; unanticipated extra costs; the need to support multiple vendor products; continual troubleshooting requirements; and performance degradation as the number of components increases.

We found that problems manifest at different implementation stages: very early implementation (application identified and specified); early implementation (installation of communications network only); middle implementation (installation of some clients and servers); late implementation (installation of most clients and servers); implementation completed in the last year; and implementation completed more than a year ago. Moreover, there are differences among problems within each implementation stage. Management and organization problems (such as counterproductive corporate policies and politics) appear during early implementation and subside after implementation is complete. Computer architecture problems appear across all implementation stages (even after installation of all components), and no single stage has less severe problems than another. Conversion and maintenance problems begin during early implementation and subside after completion of the project. Computer architecture problems are the main obstacles during middle implementation and after implementation completion, with no apparent differences among problems within the other stages.

Some problems, especially technical ones, a company may encounter during client/server implementation, linger well after installation of all components. The top five problems we found indicate many companies underestimate the effort and cost of education, training, product support, scala-

**Table 2.** Problems associated with implementing client/server technology

Factors	Average Ratings*
<b>Computer Architecture</b>	
Inadequate internal skill set	2.70
Unanticipated extra costs	2.53
Supporting multiple vendor products	2.42
Continual troubleshooting activities	2.39
Performance degradation as the number of components increased	2.37
Interoperability of components	2.34
Quality and reliability of middleware	2.23
Quality and reliability of network	2.04
<b>Management and Organization</b>	
Corporate policies and politics	2.35
Inadequate user involvement	2.19
Senior management's inability to create an integrated technology strategy	2.17
Organizational change brought about by the new system	2.13
Inadequate management support	2.09
Management partnership between IS and functional managers	2.03
Other business activities	1.99
IS group's inability to be user oriented	1.95
<b>Conversion and Maintenance</b>	
Inadequate disaster recovery	2.19
Inadequate security	2.13
Conversion of mainframe applications	2.04
Knowledge of corporate data availability	1.93

\*Based on a five-point rating scale: 1 = not at all a problem, 5 = caused severe problems

bility, and troubleshooting activities. According to Gartner Group, a computer consulting company based in Stamford, Conn., during the first five years, user and IS labor, that is, time spent developing, operating, supporting, and learning the application, constitutes nearly 75% of all costs, while hardware, software, upgrades, and communications account for the rest [3]. These results are understandable, because client/server applications use multiple vendor technologies, some that are foreign to most IS professionals; require users to learn new procedures; and are more difficult to support and manage than traditional time-sharing applications. Moreover, due to the additional network traffic caused by database updating, security checking, and physical layout of the underlying network, many companies may not start with networks that can grow to accommodate their client/server aspirations.

## Benefits

We found that client/server applications lead to numerous, diverse benefits. In order of prominence,

they are: improved integration of business information; improved system accessibility; reduced costs; increased organizational productivity; improved customer service; improved decision making; better business control and management; employee empowerment; reduced decision-making time; improved competitive position; and improved customer linkages. The least conspicuous benefits are improved system reliability; reengineered business processes; improved financial position; and improved linkages with suppliers.

System reliability and reengineered business processes are near the bottom of the benefit list. The complexity of client/server applications make system reliability difficult to achieve. But reengineered business processes beget many of the higher-ranked benefits, including increased productivity, reduced costs, and improved customer service. By enabling revenue

improved financial position, and improved decision making. In pursuit of improved business performance, companies that redesign decision-making processes and reengineer business processes interrupt the status quo and should not be surprised by the related problems—especially when the reengineering effort disrupts existing lines of authority and communication.

### **Preventing and Overcoming Problems**

Despite the numerous business benefits, a number of obstacles make the transition to client/server technology anything but an easy ride. Smart-thinking companies refine their implementation approach, taking special care to prevent problems and/or overcome them as they arise.

We view client/server implementation as a triad

## **MANAGEMENT'S PRIMARY HOOKS ARE IMPROVED BUSINESS OPERATIONS PROMOTED THROUGH PROCESS IMPROVEMENTS, RATHER THAN TECHNICAL ENHANCEMENTS PER SE.**

generation through improved customer service and reducing a company's operating costs, client/server applications can offset escalating hardware, software, and support costs. According to Gartner Group's analysis, client/server computing over a five-year period winds up costing 70% more than mainframe/terminal computing [2]. Yet preoccupation with client/server costs can prevent companies from pursuing the technology and realizing the benefits, although these are considerable.

Achieving reengineered business processes coincides with numerous problems: organizational change brought about by the new system; inadequate security capabilities; inadequate disaster recovery capabilities; conversion of mainframe applications; lack of knowledge of corporate data availability; quality and reliability of middleware; difficulties in management partnership between IS and functional managers; and competing business activities. Moreover, reengineered business processes are positively related to almost all benefits, including reduced costs,

of management, implementation execution, and user and IS staff factors. Each of these elements incorporates numerous items that mitigate or relate to client/server-related problems. Management includes the actions and responsibilities associated with accepting, planning, and supporting the technology. Implementation execution covers numerous steps and activities for conducting a client/server implementation, including deployment of formal standards, policies, and procedures; vendor selection; and timely execution of the implementation schedule. User and IS staff factors incorporate the client/server application's ability to improve users' personal stakes; extent of user participation; and level of cooperation between user and IS staff in a client/server environment. Our results demonstrate that companies have to address each part of the triad to navigate around the problems in order to be successful. For each part, the most salient findings are summarized as a set of best practices.

**Management's role.** We found that CEOs and CIOs can mitigate several management and organizational problems—inadequate management support, disjointed technology strategy, poor partnership between IS and functional managers, counterproductive corporate policies and politics, and inadequate user involvement—by making implementation a high priority, establishing a clear business direction, using competitive and technology assessments to create an IT strategy, aligning the IT strategy with the company's business direction, and making the appropriate technologies, including client/server, an integral part of the IT strategy. In this way, senior management sets a clear path, helps the company avoid confusion over appropriate computing approaches, and makes it easier for IS professionals to solicit the active support of user communities.

IS management can alleviate many of the same

at least not being perceived as) user oriented. The process of developing a user-oriented IS organization belongs primarily to IS professionals; their actions make the difference. Senior management, including the CIO, and functional management appear to have little effect on developing user-oriented IS organizations.

Concerning organizational arrangements for a client/server implementation, we found the steering committee and project team can mitigate several organizational problems, such as inadequate management support and user involvement, a disjointed technology strategy, and counterproductive corporate policies and politics. The project team can also foster a partnership between IS and functional management. Moreover, a project team with technically skilled members and a well-conceived migration plan for network, systems, management, and organi-

## WHEN USERS FEEL THREATENED AND BEGIN USING OLD OR ALTERNATIVE SYSTEMS, COMPANIES HAVE A TOUGH GO OF IT.

problems, as well as the IS group's inability to be user-oriented, by integrating business function requirements into IT strategy, taking the lead in planning their companies' computing infrastructures (such as workstations, software, and networks), helping line management conceptualize IS applications, and aligning these applications with the company's business direction. Functional management has a nearly equal effect on the problems in different ways, such as helping develop IT strategy and specifying client/server requirements. IS management can demonstrate its support for a client/server application and formation of a cohesive IT strategy at a functional level.

Thus, companies may need to refine their IT planning processes, moving IS professionals closer to the front lines to help functional managers identify the most appropriate client/server applications, integrate the applications with IT strategy, and determine the associated requirements for these applications. Moreover, by taking these steps, IS management alleviates the problem of not being (or

zational changes reduces the possibility of such important technical problems as the need for continuous troubleshooting, quality and reliability of the network, unanticipated extra costs, and inadequate internal skill set. Considering that client/server applications can simultaneously cover several organizational levels and functions, a project team is a necessity. Such teams with technically skilled people, especially in project management and systems integration, and a good migration plan can avoid obstacles, including counterproductive corporate policies and politics, that could derail a project. The migration plan should explicate the requisite resources—people, time, and money—and include slack in anticipation of the unforeseen.

To justify IT investment, many companies employ a single straightforward, conventional approach, including internal rate of return, net present value, and/or payback period, as prescribed by internal policies or guidelines. Sheer whim drives the adoption process in less well managed companies. Our results reveal that when management bases

justification for a client/server project on both a cost-benefit analysis and the application's strategic fit with the business, it lessens problems of inadequate management support, disjointed IT strategy, and poor partnership between IS and functional management. By mandating the project be justified on economic and strategic grounds, management validates the project, enhances the chance of a good fit between business and IT strategies, and fosters an environment that in turn fosters partnerships between IS and functional managers.

However, to mitigate numerous management and organization problems, companies should:

- Ensure that senior managers establish the business direction, align the IT strategy with it, and make client/server applications an integral part of the IT strategy.
- Encourage IS managers to be more business oriented and less systems oriented, help business functions conceptualize client/server applications, and integrate those applications with the IT strategy.
- Make IS management responsible for planning the company's computing infrastructure based on an understanding of business function requirements and company strategy.
- Give functional managers a role in developing IT strategy and specifying client/server requirements.
- Form a project team with technically skilled people and have them create a detailed migration plan for all of the network, systems, management, and organizational changes required by the application.
- Provide the resources needed for hardware, software, and network requirements, as well as for education, training, product support, and systems operation activities, and budget them accordingly. (Of total systems costs, those for client hardware and software are 9%; for servers, printers, and communications, 9%; and for relational database and systems management, 2% [3]. These costs can be shared by the affected functional areas.)
- Evaluate client/server projects for their strategic fit with the business as well as for their expected benefits and costs.

## How to Implement

Because most companies lack the technical expertise to accomplish client/server technology alone, vendor selection and support are important aspects of the implementation process. We found that evaluating

vendors against predefined criteria and testing their products and services for their ability to function as advertised can reduce problems of inadequate management support and a disjointed IT strategy. A formal evaluation methodology with predefined criteria ensures that the selected vendor's software satisfies user requirements and the company's IT plans. By selecting vendors with plug-compatible products, user companies reduce their computer architecture problems.

Companies careful in selecting software and hardware have less severe compatibility problems that can undermine a client/server project, avoid excessive costs associated with overcoming these problems, and prevent stressing the technical reach of their employees. The last is one of the most severe problems we've seen companies face during client/server implementations. By selecting vendors that provide good technical support, offer general consulting services, and consider the client/server application to be critical, user companies alleviate these problems, as well as the problems of unreliable middleware, continuous troubleshooting requirements, and an inadequate internal skill set. Companies should also choose vendors they can rely on for consulting and technical support, especially if they don't have the requisite internal skills (or are in the process of revamping those skills) for design, coding, documentation, and continuous troubleshooting at the beginning of the project. Alternatively, they can turn to third-party companies offering technical and general consulting expertise.

We found that by meeting target dates and establishing a good plan for rolling out the system, companies alleviate numerous management and organizational, computer architecture, and conversion and maintenance problems. Moreover, companies with adequate management support, a user-oriented IS group, a working partnership between IS and functional management, and an integrated IT plan do more extensive system testing of clients and servers. Companies with these characteristics apparently take a rigorous, formal, and integrated approach that carries over to extensive system testing. Thorough testing of client/server applications is essential because of their complex architecture.

## Better for Users and IS Staff

Our findings indicate that when users' job performance is enhanced by a client/server application, such as by allowing them to accomplish tasks not previously feasible, companies can expect fewer management and organizational problems, such as inad-



equate management support, disjointed IT strategy, poor partnership between IS and functional management, and counterproductive internal policies and politics, as well as fewer problems involving computer architecture, conversion, and maintenance. When management promotes client/server applications that make sense for users and nurtures an atmosphere conducive to implementation success, users are capable of improved performance.

When users are not favorably affected by the client/server application and provide little input during its implementation, management should not be surprised by mounting problems. Conventional implementation wisdom accumulated during the 1970s and 1980s strongly supports getting users involved as early and as completely as possible. We found the same is true for client/server implementations—perhaps even more so given the expanding scope and scale of these applications.

By having IS staff and users participate in developing and supporting client/server applications and giving users more freedom to satisfy their information needs, management fosters a close working relationship between IS and users, alleviating numerous management, organizational, and technical problems. These results do not imply that users should make technical decisions but that their perspectives have to be included in the technical decisions made by the IS staff. In client/server environments, management should give users ample opportunity to articulate their views on the technical future and furnish them with relevant education and training, allowing them to engage in substantive interaction with IS professionals.

We found user resistance to be directly related to almost all management and organizational, computer architecture, and conversion and maintenance problems. When users feel threatened and begin using old or alternative systems, companies have a tough go of it, experiencing serious management, organizational, and technical problems. Although there is no substitute for user cooperation, we view such cooperation as a function of doing other things well, including making sure management provides strong support throughout the project, like the necessary resources.

Companies can establish close working relations between users and IS in client/server environments by doing the following:

- Allow users to participate in requirements specification, systems design, and testing activities and provide them with relevant education and training.

- Have the IS staff and users cooperate in developing and supporting client/server applications.
- Encourage partnerships among IS professionals and users and distribute responsibility according to mutually beneficial arrangements.

## Conclusion

We found considerable benefit from client/server technology, but the transition to client/server isn't easy. Client/server applications can produce numerous valuable benefits, including improved integration of business information and system accessibility and reduced costs. However, managers might have to struggle with several problems, including inadequate internal skills, counterproductive corporate politics, and inadequate security capabilities, that can diminish the benefits. Moreover, when companies introduce significant organizational change as part of their client/server implementation efforts, they exacerbate the problems. Managers can ease the transition to client/server by recognizing the potential benefits, deciding to move forward, and refining their implementation approach to include the steps advocated here. **C**

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