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Utilities

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RN24-74	NCR CORPORATION, Gaughenbaugh, Sue	1
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VERTICAL MARKET ANALYSIS

Client/Server
Applications Trends

Utilities

**Client/Server Markets and
Applications Program**

Client/Server Applications Trends

Utilities

July 1994

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I

Introduction

This is the ninth in a series of reports analyzing trends in client/server (C/S) applications by vertical industry. These reports are produced as part of INPUT's Client/Server Markets and Applications subscription service. Each report focuses on a single industry. Additional reports compare industries in their approach to C/S.

A
Objectives

This report addresses the following issues with regard to the utilities industry sector:

- To what degree is the industry as a whole migrating to C/S architectures?

- Which applications are likely to be targeted for implementation over the next two years, and which are headed for a downsized C/S environment?

- Who is managing various aspects of the implementation or conversion of these applications? The central information systems function (IS), user management, its local IS function, or third parties?

- To what degree are industry participants looking to outside vendors for products and services?

B
Scope

The scope of this analysis is limited to the utilities industry sector within the United States. Specifically, INPUT defines this sector as including those industries containing the leading two digit SIC (Standard Industrial Classification) code 49, electric, gas and sanitary services. Ninety six (96%) of the companies in this study came from the electric and gas utilities portion of the sector.

C
Methodology

Data for this analysis was taken from INPUT's applications database. This database is built from a continuous telephone interview program to gather information about companies' applications plans. The field interview process was initiated in 1993.

In some instances more than one interview was conducted per institution. This was particularly true for large firms such as Public Service Electric and Gas, where interviews were conducted with multiple operating units. The number of companies in the utilities sample was 112. The total number of interviews was 136.

These 136 interviews were the primary source of data for this report. They provided information on 282 different applications that will be implemented in the next two years.

Respondents identified the applications or projects they would be implementing over the next two years using their own terminology, rather than being required to categorize applications by some predetermined set of definitions. Once the survey was completed, INPUT analyzed the 282 project descriptions and coded them into application types. The types were then further grouped into application categories for purposes of this analysis. Exhibit I-1 describes the applications by category.

EXHIBIT I-1

Definition of Utilities Application Categories

Application Category	Application Type
Utilities Applications	
Customer Systems	Customer billing, customer service & support, customer service scheduling, customer help desk
Energy & Power Management	Demand history, energy management, environmental management, fault & failure analysis, load balancing, power plant performance monitoring, usage tracking
Engineering	Capacity planning and forecasting, nuclear systems planning, requirements tracking
Facilities Management	Facilities management, facilities mapping, materials management
Field Operations	Field maintenance, field personnel scheduling, field support, meter reading
Transmission & Distribution	Customer delivery system, SCADA systems, service outage reporting, transmission & distribution management, transmission planning
Cross-Industry Applications	
Administration	Business integration, corporate policies, training
Education	Computer assisted instruction
Human Resources	Affirmative action/EEO, applicant tracking, benefits administration, compensation/job evaluation, human resources information systems, labor/job analysis
Infrastructure	Hardware, software & network upgrades, telephone or voice response systems
Legal	Legal support systems, regulatory compliance

EXHIBIT I-1 (Cont.)

Application Category	Application Type
Cross-Industry Applications	
Office Systems	Electronic mail & messaging, desktop publishing, work processing
Planning & Analysis	Decision support systems, executive information systems, spreadsheets
Purchasing	Bar coding, EDI, inventory management, purchasing
Sales & Marketing	Order entry/tracking

Additional information was drawn from secondary research sources and INPUT's existing library of current information on utilities to round out the analysis.

D
Characteristics of the Sample

1. Sample Demographics

In general, the sample represents a cross-section of utilities companies. The breakdown of respondents on the basis of annual company or divisional sales volume is given in Exhibit I-2

EXHIBIT I-2

Distribution of Respondents by Sales Volume—Utilities
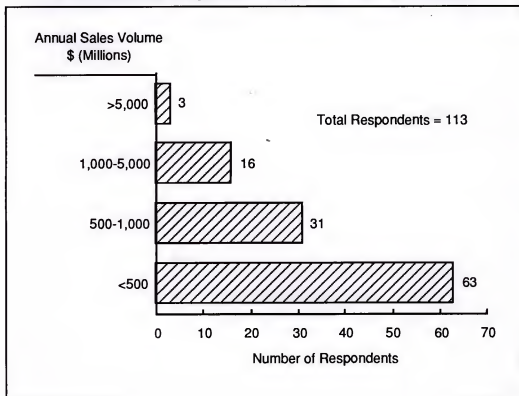
The average sales volume for the sample was approximately $1.1 billion.

The average number of employees was approximately 1,440, with the population distributed as shown in Exhibit I-3

EXHIBIT I-3

Distribution of Respondents by Number of Employees—Utilities

Number of
Employees (000's)

Total Respondents = 71

Category	Value
>10	1
5-10	4
1-5	29
<1	37

Number of Respondents (0, 10, 20, 30, 40)
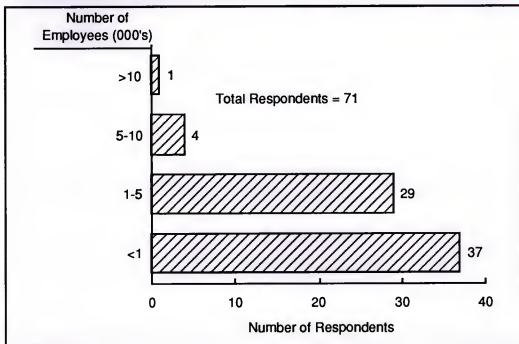
2. Characteristics of Survey Respondents

Although the surveys are targeted at user managers with direct responsibility for line or staff operations, respondents sometimes referred interviewers to the information systems (IS) function for responses to all or parts of the survey. Consequently, respondents included members of the corporate IS function or divisional IS management as well as non-IS line or staff management. Exhibit I-4 gives the distribution of respondents by job class. The following definitions apply.

• **Line Manager** - A manager/executive responsible for line operations at a corporate or divisional level—e.g., VP of operations, VP of sales, director of product distribution, etc.

• **Staff Manager** - A manager/executive in charge of staff operations at a corporate or divisional level e.g., VP of human resources, chief financial officer, or director of purchasing.

- **IS Manager** - A manager/executive whose primary responsibility is the management of information systems activities at a corporate or divisional level.

EXHIBIT I-4

Job Classification of Respondents — Utilities

Job Classification	Proportion of Respondents (%)
Line Manager	8
Staff Manager	47
IS Manager	45

This distribution is comparable to the mix encountered in the discrete and process manufacturing surveys. However, the total proportion of user respondents (55%) is considerably less than the 78% in the banking and finance industry sector study.

In some instances line managers were unable to deal with questions regarding platforms, but were very clear regarding their applications requirements and plans. IS executives filled in the gap with more information on platforms, overall spending and discussion of the general direction of the IS function.

E
Organization

- Chapter II, *Executive Overview* provides a summary of the findings of this study.

- Chapter III, *Utilities Applications Trends* discusses the key applications that will undergo conversion or re-implementation by utilities companies over the next three years. It addresses such issues as:

  - Target platforms and platform combinations

  - Near-term investment levels in applications development

  - Project management and control strategy

- Analysis of the applications by application category

- Chapter IV, *Client/Server Directions in Utilities* analyzes the data at a more detailed level with particular emphasis on the role that client/server will play in utilities companies.

II

Executive Overview

This chapter summarizes the report.

- Section A provides a background on the utilities industry

- Section B discusses key findings

- Section C provides key statistics

- Section D gives recommendations

- Section E summarizes conclusions

A
Industry Background

1. Business Issues

For the utilities industry, the last decade has been one of change, and there is every indication that change will be the order of business for the 1990s. The primary factor in this change has been deregulation of the business, resulting in increasing competitive pressure in an environment of business and social uncertainty. In recent years it has become increasingly apparent that the "business as usual" approach to management in the industry is not only ineffective, but potentially fatal. New competition comes from several sources.

- Competition between different energy sources creates a high level of uncertainty regarding future demand. The growing environmental pressure for reduced vehicular emissions alone could change the entire supply/demand equation as pressure mounts for alternative vehicular power systems.

- Independent power producers and cogenerators frequently use gas as the power-generating fuel, feeding electrical power into the system and consequently changing the traditional value and price equations of these energy sources.

The net effect is supply and demand uncertainties resulting in an overall requirement within the industry for more business-like management of assets and expenses than existed in the days when most utilities held a real monopoly position.

In addition to these issues, the industry has had to cope with the country's growing consumerism. Public utilities commissions (PUCs), in theory, represent a balanced view on utilities' related issues. Rising consumerism coupled with the fact that many PUCs are made up of elective commissioners, has tended to weight the scales in favor of the consumer on a wide variety of issues ranging from prices to environmental concerns. As a consequence, the industry has spent an increasing amount of time and effort placating, selling, and in some instances fending off, its constituents.

The overall impact has been to gradually pressure the industry into a less bureaucratic, more aggressive business posture for the 1990s. This results in increased downsizing and process integration which significantly impacts the systems environment.

2. Information Systems Management

The utilities industry may be unique in that until recently, the concept of a totally centralized systems strategy, much less organizational approach has been practically nonexistent.

Essentially, three areas of systems development and management have evolved:

- Commercial systems, including financial and customer information systems, have consistently been managed and developed at a corporate level on large-scale mainframe environments.

- Engineering computing has maintained a separate domain, operating more like a Bechtel Corporation than the engineering arm of a manufacturing corporation.

- Energy management and power distribution systems have evolved as part of utilities operations, from the days of analog computers to the large scale on-line real-time mainframe environments.

In most instances the organizations responsible for each of these three classes of systems have maintained a level of independence from each other unprecedented in other industry sectors.

The current emphasis on business integration and competition is likely to change this approach in the current decade.

B
Key Findings

1. Client/Server Migration

Despite the centralized approach to industry management for decades, client/server migration is a key strategy for the industry. Sixty percent (60%) of the planned applications are looking to C/S architecture as the platform of choice over the next two years. This level of C/S penetration is significantly higher than industries like retailing and somewhat lower than the rush to C/S technology in the manufacturing sector. The key driving forces include:

- The requirement to downsize organizational structures

- To meet growing requirements for customer responsiveness

- To reduce costs and improve the margins of utilities operations

- To make available to executive management the integrated information required to support business, as well as regulatory-based, management decisions.

This strong movement in the direction of C/S is leading to some decentralization of business and operational systems. Applications from all three major systems groups—commercial, engineering and operations are looking at C/S technology.

Despite the industries reliance on large-scale mainframe environments, most of the investment in new computing

infrastructure (62%), will support C/S applications. So while the mainframe remains, sometimes as a server, C/S appears to be the long-range direction.

2. Applications Opportunities

The key opportunities for C/S applications in the near future are:

- Integrated financial systems

- Human resource information systems

- Customer information systems

- Supervisory control and data acquisition (SCADA) and energy management systems (EMSs)

- Materials and facilities management systems

As the infrastructure to support C/S is further developed other systems will move on to the list of high opportunity.

3. Other Industry Trends

- *Outsourcing* is not nearly as popular in utilities as it has become in some other industries. Engineering and operational applications are directly tied to the delivery facilities and are usually unique. Even in the area of commercial systems, most utilities feel the management of their customer information systems is mission-critical and are reluctant to consider outsourcing.

- *Downsizing* from a business perspective is a significant trend and one of the reasons that utilities are looking to a more decentralized systems environment.

- As the industry moves into a more competitive environment, the demands for highly integrated financial, operational and human resource management information continue to grow. This is resulting in a more holistic approach to the management of the systems activity including:

  - Joint planning of infrastructure between engineering, operational and commercial systems functions

- Adoption of common standards for workstations and software platforms where possible

- The development of some integrated data architectures to support multiple aspects of the business

C
Key Statistics

- The survey covered 112 companies and 282 applications. In some instances more than one interview was conducted per company. The total number of interviews was 136. The emphasis was on electric power and gas utilities.

- The percentage of applications moving to C/S was 60%. This percentage is significantly higher than in health care, insurance and retail, but lower than the percentage of C/S penetration in the manufacturing sector.

- Budgets for new applications systems are growing at an average rate of 16% for the next two years. Total IS budgets will grow at a rate of 19%, reflecting a strong investment in infrastructure by the industry.

- There were 28 companies that reported annual budget growth rates in excess of 20%. The bulk of these will be investing in major C/S infrastructure to support application migrations.

D
Recommendations

1. For Vendors

The utilities industry is on the cusp of a major migration to C/S architecture. Furthermore, the management of IS, traditionally depicted as having a "not invented here" attitude is more open to packaged solutions and outside support. The net result is a window of opportunity for software and services vendors.

- Cross-industry applications in finance and human resources are in for a major overhaul and the trend is definitely to C/S. Packaged solutions will be acceptable, but vendors must be willing to accommodate some of the peculiar requirements associated with the regulatory reporting required by the industry.

- Turnkey C/S systems that support plant and/or transmission and distribution SCADA (Supervisory Control and Data Acquisition) will be in demand. Vendors will need to be able to demonstrate the advertised savings and be willing to tailor these systems to sometimes extremely unique facilities requirements.

- Distributed database systems that manage geographical facilities information should be a key technology for vendors in the mapping and imaging environments.

- Systems integrators should find a wealth of opportunities in utilities for re-engineering and the subsequent SI projects to make business management information out of here-to-for standalone functional systems.

Overall, the prospects for information services vendors are good to excellent.

2. For Utilities Companies

Client/server technology meets new systems requirements generated by downsizing and increased competitiveness in the industry. However, to achieve these benefits, some organization will need to take control of overall architectural planning in an environment where three different organizations traditionally went their separate ways. The key opportunities for IS in the utilities industry will be to:

- Form coalitions with the engineering and operational systems functions to establish architectural standards for data and platforms

- Actively seek outside C/S solutions which generate reduced costs for cross-functional applications and provide opportunities to generate the high-quality information required by utilities' executive in the 1990s

- Develop or demand from suppliers, applications implementation with built-in flexibility and low maintenance costs.

E
Conclusions

The utilities industry appears to be looking to C/S technology as one component of re-engineering its business strategy for the 1990s. Despite the large machine orientation and fragmented approach to information systems management, the technology is offering solutions that reduce costs and support the industry in adopting a more competitive and customer-oriented posture. Most applications that are obviously adaptable to C/S technology are already moving in that direction. Innovative solutions are being sought to deal with applications traditionally thought to be "un-doable" without mainframes.

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III

Utilities Applications Trends

This chapter presents a detailed analysis of the utilities subset of the applications database. The chapter is organized as follows:

- Section A analyzes the general trends identified in the survey.

- Section B analyzes target platforms and the types of resources that will be used to manage and accomplish the implementation.

A
General Trends in Utilities IS

The survey examined a number of key trends with regard to the evolution of old and the development of new applications over the next two years. Subject areas included:

- Anticipated changes in hardware and software platforms

- Expected levels of total IS and applications spending

- Anticipated changes in the IS organization

- Major IS issues

1. Anticipated Changes in the Systems Environment

Respondents provided information on specific changes in their systems environment over the next two years. Responses fell into three categories.

- **Upgrades** - Thirty-seven percent (37%) of the respondents anticipate that upgrading their existing systems will be the predominant change for their systems environments over the next two to three years. There is practically no variation as a function of company size.

- **Migration to C/S** - A significant proportion of utilities companies are adopting C/S migration strategies. Of the total survey population, 46% indicated that migration to C/S would be a primary strategy for upgrading the existing systems environment. This is approximately twice the proportion of companies in the financial industry and approximately equivalent to the proportion for manufacturing. In the case of utilities, the larger companies, more than $1 billion in sales, are being somewhat more aggressive in terms of adopting a general C/S strategy with 53% in the more than $1 billion range adopting the strategy as compared to 42% of those in the under $1 billion class.

  This difference is probably attributable to the fact that many of the larger companies are undergoing significant operational downsizing efforts in order to become more responsive to new market forces, including new sources of competition.

- **Increased/Decreased Standardization** - Movement toward increasing standardization in platforms and operating environments was predicted by 30% of the respondents, with only five respondents anticipating any decrease in standards. Close to 60% of those migrating to C/S expect to see improved standards as C/S systems that have grown up in various departmental organizations move to more common platforms and operating systems.

2. Expectation Levels for IS Spending and Application Improvements

On the average, respondents anticipate growth in spending for information services to be approximately 19% per year for the next two years. Growth in spending for applications development is anticipated to be at a 16% rate for the same period. However, both rates were weighted heavily toward the high end by several companies reporting rates in the 100% to 600% levels.

The median growth rates probably provide a more realistic measurement. For over all IS and applications development, the median growth per year for the survey sample was 5%.

Exhibit III-1 shows the distribution of annual spending growth rates for applications development by growth rate category.

Exhibit III-1

Annual Spending Growth Rates for Applications Development—Utilities
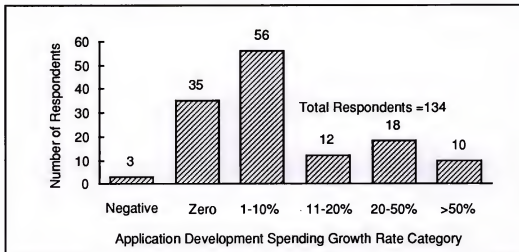
The twenty-eight companies that make up the greater than 20% category are undertaking major infrastructure or applications changes. Of this group greater than 55% will be migrating to C/S architectures in the process. Key applications areas mentioned by this group include:

- Major rewrites of customer service and billing applications

- Purchasing, inventory and work order management systems

- Rewrites of all financial applications

- Dispatching

Exhibit III-2 shows the distribution of expenditure levels for applications change in the next two years.

Exhibit III-2

**Expected Investment in Systems Change
1993-1995—Utilities**

Application
Development
Expenditures

Category	Value
>$10M	11
$5-10M	8
$1-5M	36
$500K-1M	20
$100-500K	28
<$100K	18

$ Millions (Excluding Hardware)
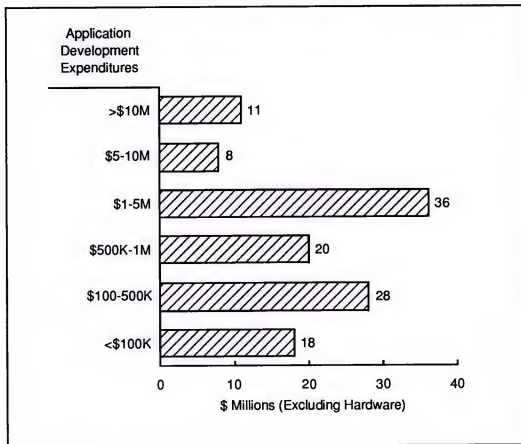
Considering that respondents were speaking about systems
investments for their individual departments or operating units
(not about total company investment in IS), it is significant that
more than 45% of the respondents expect to be spending more
than $1 million in improvements over the next two years.

Further analysis of the group of departments and divisions that
anticipate expenditures of $1 million and above over the next two
years indicates:

- Sixty-two percent of these organizations will be migrating to
  C/S. This is a full 16% of the sample average.

- For the most part, the expenditures will be made on large
  operational systems such as customer service and billing,
  work order, inventory and plant management and total
  rewrites of major financial suites.

3. Major Information Systems Issues

As shown in Exhibit III-3, the most frequently mentioned IS issue was C/S migration.

Leading IS Issues—Utilities

Issue

Issue	Number of Responses
C/S Migration	32
Systems Upgrades	24
Responsiveness	18
Downsizing	14
Cost	13
Technology	8
Skills Improvement	8
Standards	4
Network - SI	4
Other	22

Total Reponses = 147

Number of Responses: 0 5 10 15 20 25 30 35
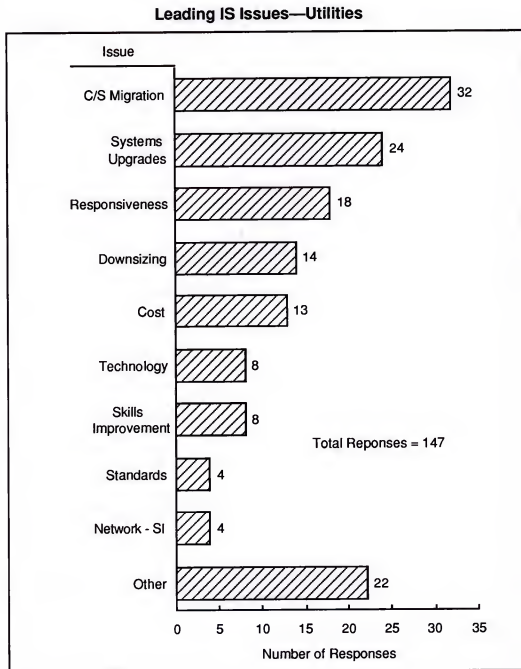
A brief explanation of each category follows.

- **C/S Migration** - Planning for, implementing or downsizing to C/S technology

- **Systems Upgrades** - The need to upgrade existing systems to handle new requirements or increased capacity

- **Responsiveness** - The ability of the systems environment to respond to changing application needs and user management information requirements

- **Downsizing** - Adapting the systems environment, applications and infrastructure, to deal with downsized business operations

- **Cost** - Downsizing or distribution of existing staff or general budget reductions involving systems expenditures

- **Skills Improvement** - "Re-tooling" in-house staff to deal with changing skill requirements brought on by new technology

- **Technology** - Using new technology to add functionality or improve the operational characteristics of systems

- **Network/Systems Integration** - Network integration itself or the integration of applications across a distributed network

- **Standards** - Improved connectivity, the portability of applications across multiple platforms and the adoption of common standards for workstation/PC and network interfaces

- **Other** - Miscellaneous other responses

In general, utilities companies tend to be focused on fundamental adjustments in technology. Traditionally, utilities companies have been users of large mainframes on the business side of the house, and highly tailored systems (also involving large-scale compute capacity) on the engineering and operational management sides. Frequently, these three sides of the house were under the management of totally independent systems functions. In recent years, the operations side has migrated to workstations and mini-computers. Now it appears that as the business side of the utilities industry begins to downsize and decentralize decision making authority, it will be looking to C/S technology to provide the flexibility to meet a growing number of

user demands. This is particularly true in the area of customer service and billing. Issues are summarized below.

- Responsiveness to changing business conditions and growing competition are also major concerns and ranked third in the list of issues.

- The need to enhance or re-engineer systems in a manner that improves flexibility and reduces operating costs as well as providing information to support decision making.

- Cost remains an issue, but not as critical as in some other industries due to the fact that to some degree, costs can be passed on through regulatory rate adjustments.

- Skills improvement is not as big an issue as it is with some other industries. In many instances, utilities companies have been leaders in the use of C/S technology in engineering and operations and have developed in-house expertise in these areas. At least five respondents felt that these in-house skills could be leveraged to support the migration to C/S technology for business applications.

Overall, the utilities industry appears to be taking a more technology driven approach to C/S migration. To some degree the question of whether C/S computing will address future needs is already decided. The issues confronting the industry focus on how to put C/S infrastructure into place.

B
Utilities Applications Trends

For each application identified as critical in the next two years, respondents were asked to provide information on:

- Target platforms

- Project leadership strategy

- Project staffing

- The use of software packages

- C/S and/or downsizing strategy

1. Target Platforms

Approximately 46% of the applications developed over the next two to three years will employ a workstation/PC-based platform component, as shown in Exhibit III-4

Exhibit III-4

Target Platforms for Applications—Utilities
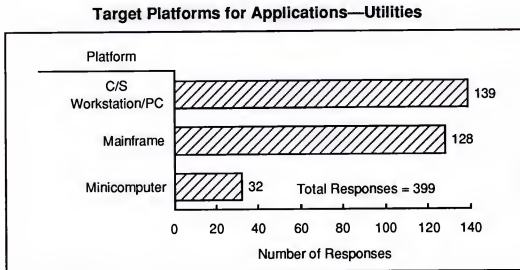
However, mainframes will play a much more significant role in utilities companies' applications plans than in the manufacturing sectors. While mainframes will be a key platform component in 42% of new or re-engineered applications in utilities over the next two years, the comparable percentages for discrete and process manufacturing will be 28% and 36% respectively. The utilities industry's continued reliance on mainframes is comparable to the financial sectors where 48% of insurance and 42% of banking and finance planned applications will use mainframes as a platform element.

However, the data shown in Exhibit III-5 indicates that in the utilities sector the applications being developed over the next two to three years will make significant use of mainframes as part of the C/S architecture. For example, 40 out of 243, or 16% of the applications will make use of C/S architecture coupled with mainframes operating in a super server capacity. In addition,

the "other" category mentions mainframes as part of a three-tiered architecture.

This appears to be a particularly popular strategy for providing data connectivity between centralized billing and increasingly distributed customer service functions.

Exhibit III-5

Target Platforms for Planned Applications Development—Utilities

Platform
Combination

C/S	91
Mainframe	80
Mainframe and C/S	40
Minicomputer	20
Other	12

Total Responses = 243

Number of Applications
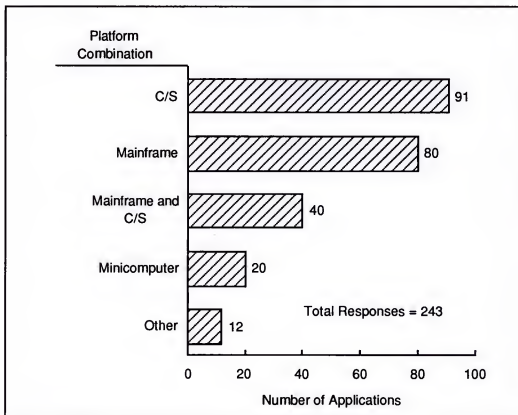
This distribution of platform combinations is similar to that of the financial sectors where huge databases represent a challenge for current C/S technology, but the need for better customer service as a differentiating factor and distributed information to support local operations requires access to information on a decentralized basis.

2. Project Leadership Strategy

Corporate IS will continue to play a major role in project management for applications development in the utilities sector, as shown in Exhibit III-6.

Applications Development Project Management—Utilities
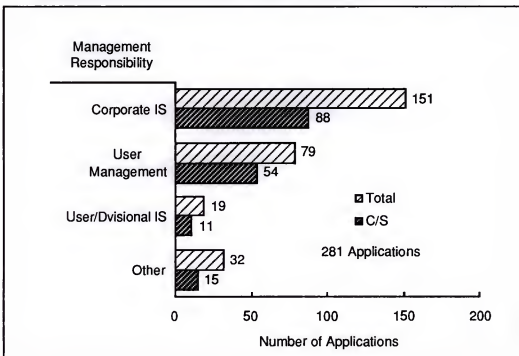
About 54% of the projects will be implemented with corporate IS assuming direct project management responsibility. Line management will dominate the remainder, leading 28% of the efforts. Many of these will be focused on the engineering and operating side. The other category consists mainly of joint efforts, or projects that will be managed by systems integrators.

Corporate IS will play a more dominant role than INPUT has seen in other industry sectors, where user management seems to be playing an increasingly larger role in direct project management. In fact, as shown in Exhibit III-7, the proportionate use of corporate IS for applications implementation is significantly higher for utilities than the other major industries analyzed to date, including banking and finance where centralized IS has always played a dominant role.

Use of Corporate IS for Project Management

Industry

Utilities	54
Banking and Finance	40
Insurance	37
Discrete Manufacturing	32
Process Manufacturing	28

Proportion of Projects Manage by Corporate IS (%)
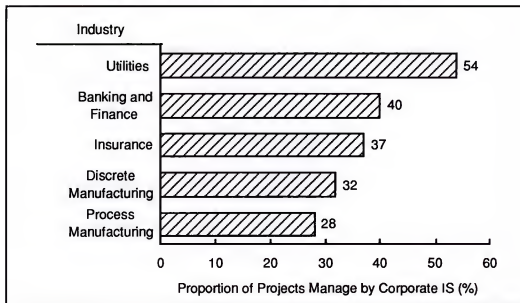
3. Sources of Development Resources

When it comes to the actual development process, corporate IS is still the leading provider of resources, as shown in Exhibit III-8.

Internal Sources of Applications Development Resources—Utilities

Source

Divisional IS	110
User Staff	69
Divisional IS	33

Number of Responses

However, the participation of user staff and IS resources from divisional operations in project implementation is significant. This pattern is more consistent with other industry sectors than the findings on project management for the utilities sector.

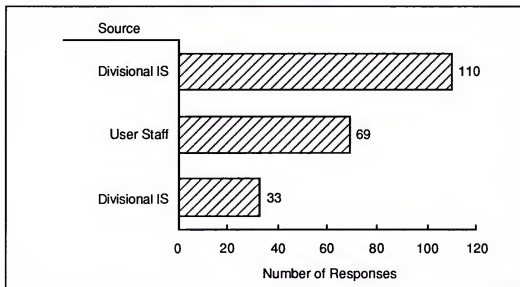As shown in Exhibit III-9, a high proportion of applications projects will be implemented jointly. Survey data indicates that those projects implemented totally with user resources are likely to be engineering- or plant management-oriented.

So, it appears that despite the high propensity to migrate to C/S environments, the utilities industry continues to maintain more centralized control on the applications development process than several other industry sectors showing a strong migration to C/S environments.

Exhibit III-9

Internal Application Project Staffing

All IS
26%

Combination
55%

All User
19%

Proportion of Responses (282 Projects)
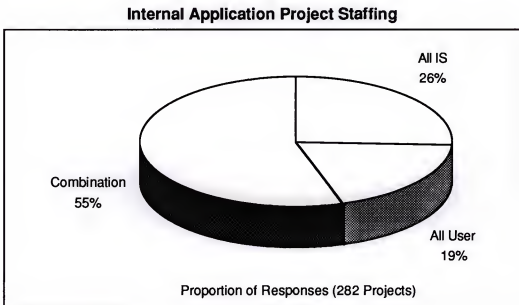
4. Use of Software Products and External Resources

Over 47% of the implementations planned for the next two years will make use of licensed or purchased software packages. This usage level is on the high end for the range of industry sectors studied to date, and comparable to one of the highest banking and finance at 51%. The problem expressed by several respondents, is that there is not enough software available, particularly for C/S environments, that can be easily tailored to individual needs.

It should be noted that an industry research association, EPRI (Electric Power Research Institute), may play a growing role in providing software to the industry. This organization, funded by the largest power utilities, has been in place for many years and conducts research projects of mutual interest to companies in the industry. In recent years, much of this research has resulted in the generation of software packages. EPRI has undertaken a study to determine to what degree and under what operating policies it should produce packaged software. Depending on how that study comes out, EPRI could become a major force in utilities packaged software, particularly in the area of operations and engineering.

The use of systems integrators is also higher than most industry sectors. Respondents indicated that they would be using systems integrators for more than 17% of their development efforts. This use is between 5% and 15% higher than the other industries analyzed as part of INPUT's C/S service, indicating that there are significant opportunities SI firms.

Further analysis of the data shows that utilities companies plan to make heavier use of third party software and outsides services for C/S applications than traditional implementation efforts.

Exhibit III-10 summarizes the use of each class of service for the sample along with the percentage of instances where third party software outside resources will be targeted at C/S applications.

Exhibit III-10

Use of Outside Products and Services—Utilities
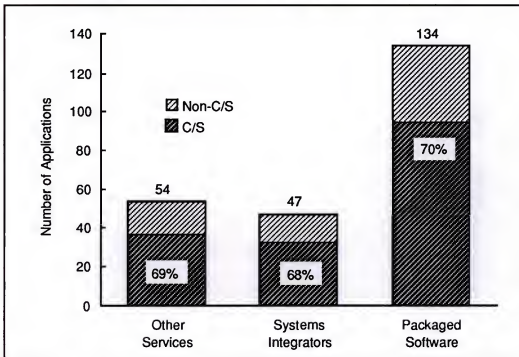
For each class of outside service the use for C/S development projects is targeted at approximately 70%. Since the total proportion of C/S projects in the sample is 60%, the 70% penetration for outside software and services indicates a stronger tendency to use these services for C/S projects.

In summary, the utilities industry indicates that the migration to C/S computing is well underway. The management processes used to implement changes in the infrastructure and applications are likely to remain more centralized than in some other industries. Mainframes will continue to play a role and the opportunities for applications software and systems integration vendors are significant.

IV

Client/Server Directions in Utilities

The preceding chapter addressed trends with regard to utilities applications development. This chapter discusses the types of applications that will be implemented over the next two years, and the role that client/server architecture will play in the implementations. The chapter is organized as follows:

- Section A provides an analysis of the role that client/server is playing for each of the major classifications of applications.

- Section B identifies the leading client/server applications for the utilities industry group.

A
Client/Server Applications Analysis

1. Sample Summary

Exhibit IV-1 shows responses to key survey questions by application category.

Exhibit IV-1

Implementation Plans by Application Category—Utilities

Application Category	Number of Applications	Strategy		Platform			Resources						
		C/S - Client/Server	Downsizing	Workstation/PC	Minicomputer	Mainframe	Corporate IS	Divisional IS	User Staff	Systems Integrators	Packaged Software	Utilizing EDI	Outsourced
Financial	58	33	17	27	6	23	17	7	18	14	36	14	7
Human Resources	52	36	18	27	6	20	14	6	11	9	24	11	13
Facilities Management	29	18	8	13	1	16	16	5	11	5	14	2	5
Utilities Operations	27	12	5	11	2	10	13	2	3	5	13	11	5
Infrastructure	26	16	7	13	7	9	6	4	7	2	10	8	3
Utilities Customer Systems	23	12	4	10	2	15	14	5	7	3	8	6	1
Engineering	20	12	4	11	1	8	9	1	1	4	9	4	3
Planning & Analysis	13	10	1	10	2	3	6	1	3	1	6	4	1
Unidentified	11	4	0	4	2	2	6	3	1	0	5	6	1
Staff Department Support	10	6	4	5	2	4	2	0	7	1	4	5	3
Office Systems	7	6	2	5	0	2	3	0	0	1	4	4	2
Sales and Marketing	6	3	1	3	0	4	3	0	0	1	2	2	2
Totals	282	168	71	139	31	116	109	34	69	46	135	77	46

An explanation of the column headings follows:

- "Number of Applications" is the total number of applications for each of the application categories.

- "Strategy" contains two subheadings, "Client/Server" and "Downsizing." The "Client/Server" count by category indicates the number of applications within the category that will be implemented using a C/S architecture. The count under the heading "Downsizing" represents the number of client/server applications out of the total that are being implemented as part of a general downsizing strategy.

- "Platform" indicates the number of times that one of the three major platform classes was mentioned as the key implementation platform.

- "Resources" covers six sources of potential resources that will be employed as part of the implementation process. As was the case with the question regarding platform, more than one response per application was permitted.

- Finally, for each application, respondents were asked to indicate whether the application would use EDI or be outsourced. The last two columns give a tabulation of those responses.

2. Observations on the Sample Mix and Categories

The sample contains a balanced mix of applications with 35% coming from the four categories that represent applications unique to the utilities industry facilities management, utilities operations, customer systems and engineering. As is the case in several other industry sectors such as financial services, there appears to be a heavy emphasis on financial applications. This is due to the following:

- Changes in federal and state regulatory reporting requirements are out-stripping the capabilities of existing financial systems.

- Re-engineering of financial systems offers opportunities for the downsizing of staff activities.

- A number of applications managed by corporate finance, and considered staff support in other industry sectors, are considered operational systems in utilities. Applications to account for power interchanges between utilities, as well as between private companies and utilities grids are a good examples.

The large number of human resource applications is largely due to growing regulations to track exposure to environmental hazards, as well as increasing requirements for human resource information systems.

3. Client/Server Applications by Category

Exhibit IV-2 shows planned application changes by category compared to those that will use C/S architectures.

Exhibit IV-2

Planned Applications Changes and Use of C/S by Category—Utilities

Application Category

Category	Total	C/S
Financial	58	33
Human Resources	52	36
Facilities Management	29	18
Utilities Operations	27	12
Infrastructure	26	16
Utilities Customer Systems	23	12
Engineering	20	12
Planning & Analysis	13	10
Unidentified	11	4
Staff Department Support	10	6
Office Systems	7	6
Sales and Marketing	6	3

Legend: ▨ Total ▨ C/S

Number of Applications (0 10 20 30 40 50 60)

Comparing the industry specific applications to those that are considered cross-industry (applicable to many industries) shows that the targeted use of C/S for industry applications is about 8% less than for cross-industry applications. Exhibit IV-3 shows the sample broken down by these two major classes of applications.

Exhibit IV-3

Use of C/S for Cross-Industry and Industry Specific Applications—Utilities
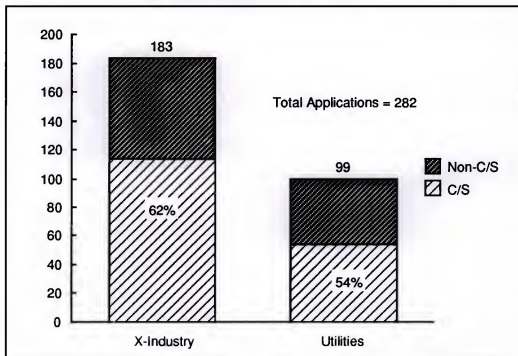
There are two primary reasons why utilities applications lag cross-industry applications in their migration to C/S:

- Many of the applications in the "utilities operations" category involve the real-time, on-line monitoring of power distribution and management. The nature of these applications implies central operational control and direct interaction with power grid monitoring devices, etc. They are more like process control applications than transaction processing systems. Consequently, the industry is just beginning to attempt to apply C/S technology in these areas.

- Given the huge investments in utilities operational systems, it requires significant investment to move them to C/S and this has to be undertaken in planned phases.

Some more insight into the best opportunities for C/S technology can be obtained by analyzing C/S penetration rates for each application group. Exhibit IV-4 ranks the application categories by their proportionate use of C/S technology.

Exhibit IV-4

Use of C/S by Applications Categories—Utilities

Application
Category

Office Systems	86
Planning & Analysis	77
Human Resources	69
Facilities Management	62
Infrastructure	62
Staff Department Support	60
Engineering	60
Financial	57
Utilities Customer Systems	52
Sales and Marketing	50
Utilities Operations	44
Unidentified	36

0   20   40   60   80   100

Proportion of Applications Planned for C/S (%)
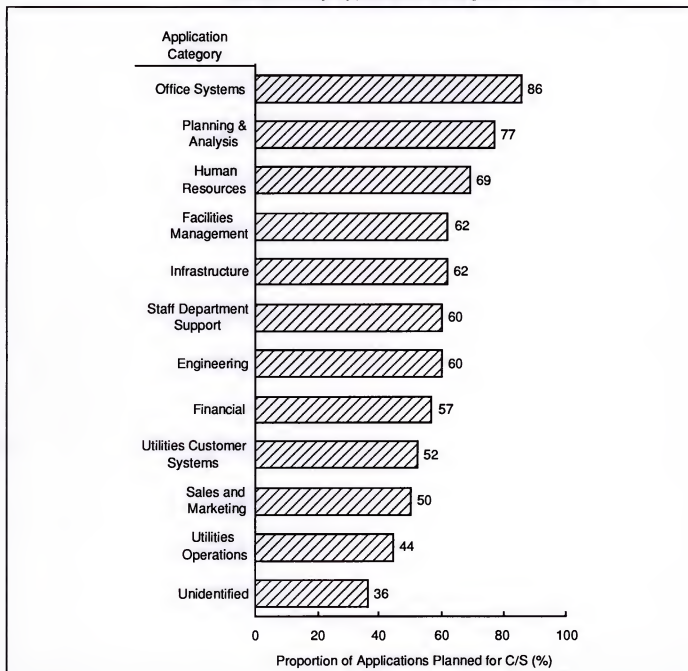
The *office systems* and *planning and analysis* categories contain
applications that naturally lend themselves to C/S architecture.
There is little doubt that more and more of those types of
applications will continue to migrate to C/S in utilities as well as
all other industry categories.

                                             DV9

The heavy migration to C/S in applications within the *human resources* category is significant and is primarily being driven by the large number of human resource information systems scheduled for development over the next two to three years. Twelve of the seventeen HR information systems identified in the sample will use C/S technology. The only hold out for mainframe architecture left in this category of applications is payroll. In fact, if the fourteen payroll applications in the human resources group are excluded, close to 75% of the remaining applications will move to C/S.

Utilities operations (44% C/S penetration) and utilities customer systems (52%) which represent the bulk of the industries operational systems fall below the 60% average C/S penetration for the entire sample. As pointed out earlier, the very nature of transmission and distribution management lends itself to a mainframe architecture. However, there has been recent successes in improving customer service by using workstations to access.

However, despite the fact that many of the industry's core applications will continue to require mainframe computing environments, the industries major infrastructure investments appear to be in support of C/S migration. The 62% C/S penetration for infrastructure investments is significantly higher than the 39% for insurance, or 35% for retail trade, and about equivalent to the 62% penetration for banking and finance. The only industries with significantly higher C/S penetration rates for infrastructure projects are in the manufacturing sectors.

B

Use of C/S in Specific Applications

Exhibit IV-5 shows the number of each type of application in the survey sample and the proportion of each targeted for use of C/S platforms. Applications are grouped by application category and ranked in descending order by number of applications per group.

Exhibit IV-5

Detailed Distribution of Planned Applications and Use of C/S Utilities

Application Category	Application Type	No. Apps.	No. C/S	C/S(%)
Financial	Integrated Financial Systems	15	10	67
	Accounts Payable/Receivable	12	4	33
	General Ledger	7	4	57
	Financial Reporting	4	3	75
	Property Mgt. Systems	4	3	75
	Budgeting	3	2	67
	Fixed Assets	3	3	100
	Cost Accounting	2	1	50
	Financial Forecasting	2	1	50
	Financial Tracking	2	0	0
	Billing/Invoicing	1	0	0
	Cash Management	1	0	0
	Financial Modeling/Planning	1	1	100
	Management Accounting	1	1	100
Total		58	33	57
Human Resources	Human Resource Info. Systems	17	12	71
	Payroll	14	8	57
	Applicant Tracking	12	8	67
	Affirmative Action/EEO	3	3	100
	Benefits Administration	2	2	100
	New Employee Orientation	2	2	100
	Compensation/Job Evaluation	1	0	0
	HR - Other	1	1	100
Total		52	36	69
Facilities Management	Material Management Utilities	11	8	73
	Work Orders	10	4	40
	Facilities Management-Other	6	5	83
	Facilities Mapping	2	1	50
Total		29	18	62
Utilities Operations	Transmission/Distribution-Other	8	3	38
	Demand History/Usage Tracking	4	2	50
	Energy Management-Other	3	2	67
	Performance Monitoring	3	0	0
	Field Operations Support	3	2	67
	Field Maintenance	2	0	0
	Customer Delivery System	1	0	0
	SCADA Systems	1	1	100
	Service Outage Report/Restore	1	1	100
	Transmission Planning	1	1	100
Total		27	12	44

Exhibit IV-5 (Continued)

Application Category	Application Type	No. Apps.	No. C/S	C/S(%)
Infrastructure	Data Base Upgrade - General	4	3	75
	Data Base Upgrade - Rel/Dis	4	1	25
	Platform Migration - C/S, Dist	4	3	75
	LAN Upgrade	3	2	67
	Operating System Upgrades/Conversion	3	2	67
	Software Development Tools	2	0	0
	Wireless Wide Area Network	2	2	100
	Hardware Upgrades	1	1	100
	Imaging Systems	1	1	100
	Laptop or Portable Upgrade	1	1	100
	Software Upgrades (General)	1	0	0
Total		26	16	62
Utilities Customer Systems	Customer Support/Service/Help	18	9	50
	Utilities Customer Billing	4	3	75
	Customer Service Scheduling	1	0	0
Total		23	12	52
Engineering	CAD/CAM/CAE	8	5	63
	Requirements	2	1	50
	Engineering-Other	3	1	33
	Environmental Management	2	2	100
	Geogrphic Information Systems	1	0	0
	Nuclear Systems Planning	1	1	100
	Production/Capacity Force/Plan	2	1	50
	Geology/Seismic Info Systems	1	1	100
Total		20	12	60
Planning & Analysis	Spreadsheets/Databases	8	7	88
	Forecasting	2	1	50
	Executive Information Systems	1	1	100
	Project Management	1	0	0
	Planning & Analysis - Other	1	1	100
Total		13	10	77
Unidentified	Unidentified	11	4	36
Total		11	4	36
Staff Department Support	Materials Management	3	2	67
	Training	2	0	0
	Business Integration	1	1	100
	Corporate Policies/Stds	1	1	100
	Purchasing	1	1	100
	Regulatory Systems	2	1	50
Total		10	6	60

Exhibit IV-5 (Continued)

Application Category	Application Type	No. Apps.	No. C/S	C/S(%)
Office Systems	Desktop Publishing	2	1	50
	Integrated Office Systems	2	2	100
	Word Processing	2	2	100
	Office Systems - Other	1	1	100
Total		7	6	86
Sales and Marketing	Marketing Mgt./Support	3	2	67
	Sales Analysis & Reporting	2	1	50
	Sales & Marketing - Other	1	0	0
Total		6	3	50
GRAND TOTAL		282	168	60

There are a number of application categories where C/S has taken a foothold, and others that are likely prospects for future migration. Some examination of the specific applications within each group provides insight into likely future trends.

1. Financial Systems

The utilities industry has a number of unique accounting practices brought on by regulation and tradition. To a large degree the requirements for regulatory reporting reflect the industry's monopolistic period. As deregulation has evolved, most utilities find themselves in a situation where many of their accounting practices do not accurately reflect the realities of running a business in a more competitive environment. Consequently, there appears to be a major effort to rework the financial systems portfolio. In fact, as shown in the exhibit, the financial systems category has the largest number of planned implementations of any category in the sample.

The data indicates the driving force for change in the utilities financial suite will be the implementation of integrated financial systems. These will use C/S architecture in two out of three cases. C/S will provide a better opportunity for making the analytical information available to permit the kinds of financial analysis, forecasting and cost accounting required to view the business in a competitive environment. Of the total suite of financial applications, it appears that only the high-volume transaction processing systems such as accounts payable and receivable will remain on traditional centralized platforms.

2. Human Resources

This category, second largest in the sample, is also being driven by the need to obtain a more integrated set of data to support better decision making. The lead application in the group will be the implementation of human resource information systems. A full 70% of these systems will move to C/S technology.

As is the case in the financial suite, it appears that only the high-volume transaction processing systems, for example, payroll, will remain on traditional mainframe environments.

3. Facilities Management

This is the third largest group in the sample and shows an overall penetration of C/S over the next two years of more than 60%. The collection of applications in the suite is focused on all management aspects of distribution facilities—e.g., poles, pipes, transformers, transmission towers, etc. The information describing these assets is critical and used by a variety of other operational and financial systems. There is a strong geographic element to the information, as most of these assets have a fixed geographic location. Difficulty in maintaining the accuracy of the information on facilities has been a traditional problem due to the following:

- The requirement to maintain maps of varying levels of accuracy to support other applications requiring the data

- The fact that in the past different departments have attempted to maintain the same information from different data sources

The result has sometimes been redundant and conflicting information.

C/S offers an opportunity to rectify this situation by distributed data acquisition and management of the core information on a regional or district basis. Department-wide or more centralized applications can then access the data on an "as needed" basis. This direction is reflected in the survey results which show a heavy migration to C/S for materials management and general facilities management applications. The one significant hold-out appears to be the "work order" application which has traditionally been run on a centralized basis.

4. Utilities Operations

These systems are the heart and soul of the utilities industry and ranked number four in terms of the number of implementations over the next two years. Notably, they also showed the lowest penetration of C/S architecture—44%.

The two core applications for this category are:

- Supervisory Control and Data Acquisition (SCADA) systems for both plant operations and Energy Management Systems (EMSs)

- Transmission and Distribution (T&D) systems

Both have a heritage in analog process control and have evolved for most utilities into large-scale mainframe applications. Since these systems monitor and control the utilities network in real time, their performance is central to the economical and reliable operation of the entire system. Furthermore, access to utilities networks by co-generators and other third parties has complicated the management process.

The survey only identified four SCADA/EMS systems planned for implementation over the next two years. For that small group the C/S penetration rate is 75%. However, secondary research supports the notion that there is likely to be a large migration to C/S for these applications.

- All major suppliers in this turnkey market are pursuing the benefits of distributed workstation-based architectures; and claim that the cost is (or will be) half the price of traditional mainframe approaches.

- The advent of open systems facilitates the development of C/S-based applications which require the kind of real-time data acquisition and instrument monitoring required for these applications.

The prospects for C/S transmission and distribution (D&T) systems are not nearly as good. At least for the moment, only 38% of the planned D&T applications are adopting a C/S architecture.

5. Customer Systems

Customer accounting is a huge undertaking in the utilities industry. These systems evolved over the years from batch accounting applications to on-line customer inquiry and related functions. Today, most utilities view this entire suite of related applications as Customer Information Systems (CISs), handling order processing, meter reading, billing, credit and collection, adjustments, cash and customer information.

Most of these systems came into existence during the 1970s, running on large mainframe environments and, as a result, are becoming extremely difficult and expensive to maintain. Many rewrites appear to be remaining on the mainframe migrating to relational database environments and integrated applications suites to achieve an upgrade in functionality and reduced maintenance costs. However, a number of rewrites have attempted to move to some type of distributed technology for a solution. So far, the success rate has not been that good.

Nevertheless, survey data indicates that about 50% of these systems will be targeted for C/S environments over the next two years. Many, however, are likely to use a model which keeps the mainframe at the core of the activity as a giant server.

C
General Observations

From a historical perspective the utilities industry has traditionally had a nonintegrated systems function, divided into three distinct parts.

- Commercial or corporate business applications

- Engineering systems for the design and construction of facilities

- Operational systems emerging from primitive process control to full blown on-line real-time management systems.

The demands of deregulation resulting in increased competition are, in effect, forcing the industry to take a hard look at where and when it is appropriate to integrate these traditionally disparate activities, and C/S is playing a role. As shown in Exhibit IV-6, 13 of the myriad of applications identified in the survey will account for more than 50% of the applications development over the next two years, and 57% will migrate to C/S technology.

Exhibit IV-6

Leading Applications—Utilities

Application	Number Apps	% C/S	Cum. % Of Sample
Utilities Customer Systems	18	50	6
Human Resource Information Systems	17	71	12
Integrated Financial Systems	15	67	18
Payroll	14	57	23
Accounts Payable/Receivable	12	33	27
Applicant Tracking	12	67	31
Utilities Materials Management	11	73	35
Other Applications Systems	11	36	39
Work Order Processing Systems	10	40	43
CAD/CAM/CAE	8	63	45
Spreadsheet and Modeling	8	88	48
Transmission and Distribution	8	38	51
General Ledger	7	57	54

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For Vendors—analyze:

- **Market strategies and tactics**
- **Product/service opportunities**
- **Customer satisfaction levels**
- **Competitive positioning**
- **Acquisition targets**

For Buyers—evaluate:

- **Specific vendor capabilities**
- **Outsourcing options**
- **Systems plans**
- **Peer position**

OTHER SERVICES

Acquisition/partnership searches