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Dear Colleague:

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Client/Server Applications in the Process Manufacturing Industry

This is provided through your participation in the Client/Server Markets and Applications Program (formerly INPUT's Downsizing Information Services Program).

Data for this report was provided by INPUT's continuing interview program which identifies targets of opportunity for clients as well as trends in the market.

Please call me if you have any comments or questions.

Sincerely,

Dan Ryan

Client/Server Research

Enc.



Report Quality Evaluation

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VERTICAL MARKET ANALYSIS

Client/Server Applications Trends

Process Manufacturing

Client/Server Markets and Applications Program



CLIENT/SERVER APPLICATIONS TRENDS

PROCESS MANUFACTURING



San Francisco • New York • Washington, D.C • London • Paris • Frankfurt • Tokyo



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Client/Server Markets and Applications Program (DSP)

Client/Server Applications Trends— Process Manufacturing

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Introduction

This is the second 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 applications.

A Objectives

This report addresses the following issues with regard to the process manufacturing industry sector.

- To what degree is the industry as a whole migrating to client/server architectures?
- Which applications are likely to be targeted for implementation over the next three years, and which are headed for a downsized client/server environment?
- Who is managing various aspects of the implementation or conversion of these applications? The central information systems function (IS), end-user management, its local IS function, or third parties?
- To what degree are industry participants looking to outside vendors for products and services?

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Scope

The scope of this analysis is limited to the process manufacturing industry sector within the United States. Specifically, INPUT defines this sector as including those industries containing the two digit codes shown in Exhibit I -1

EXHIBIT I-1

SIC Code	Description	
0xx	Metal mining	
2xx	Coal mining	
3xx	Oil and gas extraction	
4xx	Mining/quarrying nonmetallic minerals	
20xx	Food and kindred products	
21xx	Tobacco products	
22xx	Textile mill products	
24xx	Lumber and wood products, except furniture	
26xx	Paper and allied products	
28xx	Chemicals and allied products	
29xx	Petroleum refining and related industries	
30xx	Rubber and miscellaneous plastic products	
2xx	Stone, clay, glass and concrete products	
33xx	Primary metal industries	

С

Methodology

Data for this analysis were taken from INPUT's applications data base. This data base is built from a continuous telephone interview program to gather information about companies' applications plans. The field interviewing process was initiated in January of 1993. Over 1,200 interviews have been completed to date.



The number of companies in the process manufacturing sample was 139. In some instances more than one interview was conducted per company. This was particularly true for extremely large firms such as ARCO and Corning, where interviews were conducted with multiple divisions. The total number of interviews was 178.

These 178 interviews were the primary source of data for this report. These interviews provided information on 289 different applications that are planned for implementation 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 289 project descriptions and coded them into 27 application types. The 27 types were then further grouped into application categories for purposes of this analysis. Exhibit I-2 provides definitions for the 27 applications or project types in alphabetical order.



EXHIBIT I-2

Definition of Process Manufacturing Application Types

Application Type	Description/Examples
CAD/CAM	Computer automated design/computer automated manufacturing
Customer Service	Customer inquiry management, hotline, service and support
Data Base Conversion	Conversion to a new data base environment; includes all platform levels. (Relational and distributed relational categorized separately.)
Data Conversion	Projects to convert data.
Desktop Software	Installation of workstation/PC software environments, such as spreadsheets, WP, business graphics, Windows, etc.
Engineering Graphics	Upgrades or conversions of engineering graphics environments
Financial Reporting	Financial reporting systems as opposed to transaction processing systems
Financial Suite Upgrades	Upgrade of the entire suite of financial applications
General Engineering	Engineering applications not otherwise uniquely identified
General Ledger	General ledger
Hardware Upgrades	Projects involving the upgrade of hardware to meet growing requirements or accommodate platform changes such as migration to client/server
Inventory	Inventory management, control, reporting
Logistics	Logistics management, control, reporting
Manufacturing Operations	Applications utilized directly in the manufacturing process, including time card reporting
Manufacturing Planning	MRP, MRPII and other applications utilized in planning manufacturing operations
Manufacturing Reporting	Applications reporting on operational aspects of the manufacturing process
Order Entry/Management	Order entry, order control, order processing, etc.
Payable/Receivable	Accounts payable and/or accounts receivable.
Network Upgrades	Infrastructure projects to upgrade or modify some significant aspect of the data communications network, such as conversion to LAN and WAN environments
Payroll	Payroll processing
Personnel/HR	Human resources, benefits management, HR information systems, etc.
Purchasing	Purchase order processing, management, reporting.

EXHIBIT I-2 CONT.

Application Project/Type	Description/Examples
Rel./Distributed DBMS Conv.	Projects involving the conversion of traditional data base structures to relational or distributed relational data base systems such as Oracle, Paradox, Sybase, etc.
Sales Forecasting	Sales forecasting.
Sales/Marketing Management	Sales management, market planning, advertising, etc.
Systems Software	Operating system conversions, not specifically identified with a given application single application. Migration to UNIX, etc.
Other	Any application or implementation could not be classified in a more specific category.

Exhibit I-3 shows the grouping of application types into application categories. The categories are arranged in alphabetical order.



EXHIBIT I-3

Application Category	Application Type		
Data Base	Data Base Conversion		
	Rel/Distributed DBMS Conv.		
	Data Conversion		
Engineering	Engineering Graphics		
	CAD/CAM		
	General Engineering		
Financial	Financial Reporting		
	General Ledger		
	Payable/Receivable		
	Payroll		
	Financial Suite Upgrades		
IS Infrastructure	Desktop Software		
	Hardware Upgrades		
	Network Upgrades		
	Systems Software		
lanufacturing	Manufacturing Operations		
	Manufacturing Planning		
	Manufacturing Reporting		
ales/Marketing	Customer Service		
	Order Entry/Management		
	Sales Forecasting		
	Sales/Marketing Management		
ther	Personnel/HR		
	Purchasing		
	Inventory		
	Logistics		
	Others		

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



D Organization

The remainder of the report is organized into three chapters:

- Chapter II, Executive Overview, provides a summary of the findings of this report.
- Chapter III, Process Manufacturing Applications Trends, discusses the key applications that will undergo conversion or re-implementation by process manufacturing firms over the next three years. It addresses such issues as:
 - Industry demographics
 - 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 Process Manufacturing, analyzes the data at a more detailed level with particular emphasis on the role that client/server will play in process manufacturing applications over the next two years.

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CLIENT/SERVER APPLICATIONS TRENDS - PROCESS MANUFACTURING



Executive Overview

The process manufacturing industry has felt significant pressure over the past several years to re-engineer its manufacturing and business processes. Much of this pressure is coming from the increasing global competition in an industry whose output is primarily commodities. With little chance to differentiate the final product, segments of the industry including chemicals, petroleum, and mining and other raw materials firms must compete largely on price. This is forcing firms in these major segments of the industry to move from vertical integration to business unit structures by downsizing vertical organizational structures and decentralizing decision making. Many are shedding entire business units, and others are outsourcing non-critical operations.

The impacts in the systems area have been, and will continue to be, major. The trend toward the direct integration of information systems technology into the manufacturing and manufacturing control processes is accelerating. And, new downsized technologies are causing a rethinking of how systems should be architected and implemented. As was the case when INPUT examined near-term applications strategies in discrete manufacturing, process manufacturing firms seem to be migrating rapidly to Client/Server (C/S) technology as a primary architecture for the implementation of new, and re-engineering of old, systems.

To gain a greater understanding of the depth and rate of this migration, INPUT analyzed data collected from 178 interviews with manufacturing organizations on 289 applications that are scheduled for implementation or conversion over the next two to three years. Respondents to the survey consisted of user managers, divisional or user IS executives, as well as managers and executives from corporate IS functions.



For purposes of this analysis, the 289 applications were grouped into application categories.

Expenditure Plans and Key Issues

The respondents to this survey planned to increase their spending over the next two years as follows:

- Total IS spending will grow at an annual rate of 5.6% per year.
- Applications development spending will grow at a rate of 6.7% per year.

Twenty percent of respondents identified C/S migration as their major IS issue. Network integration, either at the platform or application level, was the second most frequently identified IS issue.

Applications Trends in Process Manufacturing

1. The Movement to Client/Server

According to the survey, investment in new or re-engineered IT applications in the process manufacturing sector is likely to exceed investment rates of 3%-5% rates common in the late 80's. A modest recovery in the manufacturing sector coupled with the continuing pressure of off-shore competition will apparently drive investments in new applications at a growth rate of about 6%-7%/year over the next two to three years.

Controlling or managing information systems cost remains a priority. However, data from the survey indicate that many firms feel they can accomplish the goal of regenerating the applications portfolio at a 'reasonable' cost through the use of C/S technology.

 Respondents indicated that C/S implementation and related network activities were the most important issues facing IS over the next two to three years. Close to 30% of the respondents mentioned C/S or network systems integration in this regard.

B

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 Of a total of 289 applications planned for implementation over the next two to three years, respondents indicated that workstation/PC (WS/PC) platforms will be utilized in implementing 36%.

2. Approach to Managing Applications Development

The survey also provided insight into the management of applications development in process manufacturing. The direction is clearly toward the user in terms of project direction and project staffing.

- 19% of the new implementations analyzed in the survey will be managed by user executives directly.
- 44% will be managed by IS functions under the direct control of user or divisional IS.
- Approximately 28% will be managed by the central or corporate IS function.
- The remainder (9%) will be managed by outside systems integrators, or professional services organizations.

In addition to taking a greater role in the management activity, user or divisional organizations will also play a role in accomplishing the implementation by providing professional staff to project teams, as shown in Exhibit II-1.







C Key Client/Server Applications in Process Manufacturing

1. Client/Server Penetration by Application Category

Regardless of the application category, INPUT's analysis shows that C/S will play a role in most new process manufacturing implementations. Whether the applications are focused on upgrades of the existing infrastructure, re-organization of data bases or applications, C/S architecture is a common element.

Proportion of Responses (289 Projects)

Exhibit II-2 shows the distribution of applications by category, and the number of applications in each category that will be implemented using a client/server architecture.



CLIENT/SERVER APPLICATIONS TRENDS - PROCESS MANUFACTURING

EXHIBIT II-2



'IS Infrastructure' applications represent responses where platform changes will be made.



2. Leading Applications for C/S Implementation

The key applications that will migrate to C/S over the next two to three years in process manufacturing will be:

- · Manufacturing operations
- · Order entry/management
- Inventory
- · Financial reporting
- · Manufacturing planning
- · Payables/receivables
- Payroll

Applications of these types will represent approximately 63% of all the applications cited for implementation and 58% of all the planned C/S implementations.



Process Manufacturing Applications Trends

This chapter presents a detailed analysis of the applications data base. The chapter is organized as follows:

- Section A analyzes the demographics of the sample population and discusses the characteristics of the survey respondents.
- · Section B analyzes the general trends identified in the survey.
- Section C presents the breakdown of applications by class, target
 platform and the types of resources that will be used to manage and
 accomplish the implementation.

A

Characteristics of the Sample

1. Sample Size and Characteristics

The total number of companies interviewed was 139, the total number of interviews was 178 and 289 applications were analyzed.

In general the sample represents a cross section of process manufacturing firms, including such firms as Alcoa, Chevron, CITGO, Dupont, Georgia Pacific, James River, R. J. Reynolds Sara Lee, Union Carbide, etc. The breakdown of respondents on the basis of annual company or divisional sales volume is given in Exhibit III-1.







The average annual sales volume for the sample was approximately \$700 million. The sample is heavily weighted to medium-sized manufacturing sites, many of which are divisions of larger corporations.

The average number of employees was approximately 3,800, and the population was distributed as shown in Exhibit III-2.

III-2



EXHIBIT III-2



The distribution of respondents by industry classification is shown in Exhibit III-3.

III-3



EXHIBIT III-3

SIC Code Category	Description	Sample Count	% Total
20xx	Food and kindred products	46	26
29xx	Chemicals and allied products	29	16
28xx	Paper and allied products	28	16
33xx	Primary metal industries	26	15
30xx	Rubber and Plastic	12	7
29xx	Petroleum refining & related ind.	12	7
32xx	Stone, clay, glass and concrete	9	5
21xx	Tobacco products	5	3
22xx	Textile and mill	5	3
13xx	Oil and gas extraction	4	2
24xx	Lumber and wood	2	1
OTAL		178	100

The only two industries not represented in the sample were metal and coal mining.

2. Characteristics of Survey Respondents

Although the surveys are targeted at end-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 III-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., vice president of manufacturing, 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., vice president of human resources, chief financial officer, director of purchasing.



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

	Proportion of Respondents (%)	
Job Classification		
Line Manager	12	
Staff Manager	32	
IS Manager	56	

EXHIBIT III-4

These figures are comparable to those obtained in the analysis of the discrete manufacturing sector.

Many of the line managers were unable to deal with questions regarding platform, but were familiar with their applications requirements. The IS executives filled in the gap with more information on platforms, overall spending, and general direction of the IS function.

B

General Trends in Process Manufacturing 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. It included examinations of:

- Anticipated changes in hardware and software platforms
- Expectation levels for IS spending
- · Anticipated changes in the IS organization
- Major IS issues



1. Anticipated Changes in the Systems Environment

Respondents were asked to discuss specific changes in their systems environment over the next two years. Responses fell into the three categories described below.

- Upgrades Thirty-eight percent (38%) of respondents anticipated that upgrading existing systems would be the likely path for application migration rather than major platform change.
- Increased/Decreased Standardization Movement toward increasing standardization in platforms and operating environments was predicted by 15% of the respondents. Only 1% anticipated any decrease in the level of standards.

The percentage forecasting an increase in standards is significantly lower than the 30% identified in the analysis of discrete manufacturing. This is probably because the process manufacturing industry as a whole, has generally been more integrated from a systems perspective, and has achieved higher levels of standardization in the past.

 Migration to C/S - The results of the survey indicate a strong migration to C/S as a company direction. In fact, 33% of the respondents indicated a general migration to C/S.

The conclusions are that C/S is a dominant directional force and that firms anticipate moving in that direction without reducing and perhaps increasing the overall level of standardization.

2. Expectation Levels for IS Spending and Application Development

One hundred fifty-eight of the 178 firms responded to the questions regarding spending for the next two years. On the average they estimated that increases in spending on applications development and upgrades to existing applications suites would be 6.7% per year. Their estimates for increases for total IT spending, including the applications development and maintenance segment, averaged 5.6%. These numbers are both about 2% percentage points less than comparable figures for the discrete manufacturing sector, and indicate that the investment in new applications will take precedence over infrastructure development for most process manufacturing firms.



Exhibit III - 5 shows the number of respondents as a function of the size of their anticipated annual investments in new or upgraded applications.







3. Major Information Systems Issues

A total of 133 of the respondents provided 164 responses on the questions regarding key issues facing IS within their organizations. The data was then coded into categories for analytical purposes. Exhibit III-6 shows how the major categories compared in terms of number of responses.

EXHIBIT III-6



A brief explanation of each category follows.

- Migration to C/S Planning for, implementing or downsizing to C/S technology
- Network Integration Network integration itself or the integration of applications across a distributed networks



- Responsiveness The ability of the systems environment to respond to changing application needs and end-user management information requirements
- Cost Reduction/Control Downsizing or distribution of existing staff or general budget reductions within the IS function
- Skills Improvement "Re-tooling" in-house staff to deal with changing skill requirements brought on by new technology
- Downsizing The need to deal with the general impact of downsizing of organizational structures in terms of the impacts on systems
- Standardization Improved connectivity, the portability of applications across multiple platforms and the adoption of common standards for workstation/PC and network interfaces
- Systems Upgrades The need to upgrade existing systems to handle new requirements or increased capacity.

The responses in these categories accounted for 80% of the total of 164. Client/Server and network/applications integration issues account for just under 30% of the total number of issues cited by respondents. While this is 20% lower than the comparable statistic for discrete manufacturing, it still indicates a significant preoccupation with the deployment of C/S architecture.

С

Process Manufacturing Applications Trends

For each application identified, respondents were asked to provide information in the following areas:

- Target platforms
- Project leadership strategy
- Project staffing
- · The use of software packages
- EDI utilization
- Outsourcing
- · C/S and/or downsizing strategy

1. Target Platforms

Respondents were asked to indicate the primary target platform (workstation/PC, minicomputer, or mainframe) for each application. Multiple responses were permitted. Exhibit III-7 shows the response levels for each category, and indicates that 40% of the applications to be developed over the next two to three years will utilize a workstation/PCbased platform strategy.



Target platforms were further analyzed by the following categories.

- C/S Alone (workstation/PC, LAN-based platforms)
- Minicomputer Alone
- Mainframe Alone
- · Combinations of mainframe and C/S architectures
- · Combinations of minicomputers C/S architectures
- · Combinations of mainframe and minicomputers

The data was then cross-tabulated for applications in which respondents indicated that downsizing was a specific strategy for the application in question. The results appear in Exhibit III-8.

EXHIBIT III-7

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EXHIBIT III-8



When downsizing is a specific strategy, the dominant platform is a C/S architecture based on workstations and PCs. Out of the 96 applications utilizing PC/WS architectures, 68 or approximately 70% will be implemented to meet a downsizing objective. Minicomputers alone will be used approximately 20% of the time and mainframes alone in approximately 5% of the implementations

2. Project Management

The dominant role in project management for applications in the process manufacturing sector appears to be moving to user or divisional IS departments. Exhibit III-9 shows who will take responsibility for the management of 287 of the 289 applications projects covered in the survey.

DV2




EXHIBIT III-9



In total, 19% of these projects will be implemented with end-user line or staff management assuming direct project management responsibility. This percentage is somewhat less than in discrete manufacturing but still reflects the trend toward more direct systems project management by users. Including the 125 projects that will be managed by user or divisional IS functions, the total percentage that will be implemented outside of the corporate IS function jumps to 63%, clearly reflecting the trend toward more decentralized management of the IT activities in the process manufacturing sector; and comparable to the results of INPUT's analysis of discrete manufacturing.

The 27 projects in the "other" category will generally be managed by either systems integrators, or in three instances by the consulting or development arms of the software firms providing the core applications software.



3. Sources of Development Resources

Respondent firms will utilize a wide variety of resources to staff the planned implementations. INPUT asked respondents to indicate which of each of the following types of resources would be used to implement each application:

- Divisional IS Systems professionals from organizational units within operating divisions
- · Corporate IS Systems professionals from the corporate IS unit
- End-User Staff Professional staff from outside the corporate or divisional IS units. These would typically be professionals directly associated with on-going management or use of the application being implemented

In addition, respondents were asked to identify whether they anticipated significant use of software packages or outside professional services as part of the implementation. Multiple responses were permitted. Exhibit III-10 summarizes the responses.



EXHIBIT III-10



This distribution emphasizes the significant role the users are beginning to play in developing applications in the process manufacturing sector. User staff will participate in just over 39% of all implementation teams, and user or divisional IS functions will be directly involved in just under 50% of the implementations.

As shown in Exhibit III-11 only a small proportion of the applications will be developed by corporate IS alone.



EXHIBIT III-11

The implementation of 52% of these projects with little or no involvement by corporate IS is significant. The statistic is 12% higher than the comparable figure for discrete manufacturing, and probably indicates that the process manufacturing sector is further along in the decentralization of applications management than many other industry sectors.

4. Use of Software Products and External Resources

Over 22% of the implementations will make use of applications software packages. This reflects a considerably lower (by 14%) utilization of outside software packages than was identified for discrete manufacturing. This result is driven by the fact that the availability of off-the-shelf software for manufacturing applications is considerably lower in the process industry than in discrete. There is tighter integration in this sector with the systems links to the actual manufacturing processes than in the discrete sector.



The use of systems integrators and other outside services is lower than anticipated. Systems integrators will only be used in approximately 2% of the implementations, and other outside professional services (largely as part of in-house project teams) will be used in 12% of the implementations.



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Client/Server Directions in Process Manufacturing

The preceding chapter addressed trends with regard to process manufacturing applications development. This chapter addresses 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 appears to be playing for each of the major classifications of applications.
- Section B identifies the leading client/server applications for the process manufacturing industry group.

А

Client/Server Applications Analysis

1. Sample Summary

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



EXHIBIT IV-1

		Strategy		Platform		Resources								
Application Category	Number of Application:	C/S - Client/Server	Downsizing	Workstation/PC	Minicomputer	Mainframe	Corporate IS	Divisional IS	User Staff	Systems Integrators	Oth. Outside Svcs.	Packaged Software	Utilizing EDI	Outsourced
Financial	81	32	28	21	29	18	21	26	21	1	17	32	37	11
Manufacturing	76	34	29	26	15	29	20	39	31	2	5	17	24	7
Sales/Marketing	41	23	16	21	4	13	11	25	18	1	1	3	26	1
Infrastructure	28	16	5	15	4	7	8	16	8	0	2	5	12	2
Inventory	26	9	8	7	5	13	10	15	13	0	3	1	9	1
Purchasing	13	6	3	4	5	3	1	8	7	1	3	1	6	C
Engineering	9	2	1	2	0	4	1	2	6	0	2	2	3	1
Data Base	8	2	1	2	1	5	3	6	3	0	2	1	3	2
Logistics	5	4	2	3	0	2	2	3	4	0	0	1	0	0
Personnel	2	2	2	2	0	0	1	2	1	0	O	1	0	C
	289	130	95	103	63	94	78	142	112	5	35	64	120	25

An explanation of the column headings follows:

- "Number of Applications" is the total number of applications for each of the application categories.
- The "Strategy" heading contains two subheadings, "C/S" and "Downsizing". The "C/S" 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 that are being implemented as part of a general downsizing strategy.



- The "Resources" heading 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 utilize EDI or be outsourced. The last two columns gives a tabulation of those responses.

There are a number of observations that can be drawn from analyzing the summary data.

- Forty-five percent (45%) of the 289 applications identified in the survey, are planned to migrate to some type of C/S architecture. Although this is 12% less than the percentage identified for discrete manufacturing, it still represents a significant change in direction for an industry that traditionally focused on process control and large mainframe applications.
- One hundred twenty applications or 42% will utilize EDI, showing that electronic commerce is an important factor in this industry.

2. Client/Server Applications by Category

Exhibit IV-2 shows planned implementations by category, compared with those that will use C/S architectures.







 Ranging from 81 planned financial applications to 28 for infrastructure, the first four categories represent 226 or 78% of the total number of planned implementation projects over the next two years. The heavy emphasis on the these four categories clearly indicates a move on the part of the process manufacturing industry to re-tool and integrate its manufacturing processes, the systems that monitor them; and to rethink

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monitor them; and to rethink the use of technology in its sales and marketing efforts. Even if the 28 applications to improve the general IS infrastructure are removed from the count, reducing the number to 198, these top applications categories for process manufacturing still represent approximately 68% of all implementation projects.

- The sales and marketing application category represents about 14% of the sample, reflecting a growing interest in automation in a function which has typically lagged behind its counterparts in the nonmanufacturing sectors.
- The fourth highest number of planned implementations was in the IS Infrastructure category. It will represent a significant investment on the part of process manufacturing firms over the next two years. The installation of WANs (Wide Area Networks) and LANs (Local Area Networks), and the upgrade of workstations to graphical interfaces represented over 70% of the projects identified in this category.

Although the percentage of C/S implementations for process manufacturing is somewhat lower than that for discrete, several of the major categories show C/S implementation rates in excess of 45%, as shown in Exhibit IV-3. These rates are likely to increase over the next several years as:

- Proven C/S-based applications software packages for manufacturing operations come onto the market.
- Some of the infrastructure projects identified in this survey are completed, creating the platform environment for upgrades to the C/S based applications software.





Exhibit IV-3 shows the percent by category of applications planned C/S implementation in process manufacturing.

EXHIBIT IV-3

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Propensity to Use C/S in Planned Applications

Exhibit IV-4 shows the number of each type of application identified for change in the next two years and the proportion of each type that will use C/S.



EXHIBIT IV-4

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Application		Number	Number	Share
Category	Application Type	Apps.	C/S	C/S (%)
Financial	Financial Reporting	22	10	45
	Payable/Receivable	19	5	26
	Payroll	14	4	29
	General Ledger	12	3	25
	Financial Suite Upgrades	4	3	75
	Other	10	7	70
Total	Constant and the second	81	32	40
Manufacturing	Manufacturing Operations	50	22	44
	Manufacturing Planning	19	8	42
	Manufacturing Reporting	3	1	33
	Other	4	3	75
Total	and a former	76	34	45
IS Infrastructure	Desktop Software	9	7	78
	Systems Software	8	4	50
	Hardware Upgrades	5	2	40
	Network Upgrades	5	2	40
	Other	1	1	100
Total		28	16	57
Engineering	CAD/CAM	5	0	0
	General Engineering	4	2	50
Total		9	2	22
Sales/Marketing	Order Entry/Management	32	18	56
	Sales/Marketing Mgt.	7	4	57
	Sales Forecasting	1	0	0
	Other	1	1	100
Total		41	23	56
Database	Rel/Distributed DBMS Conv.	4	2	50
	Data Base Conversion	2	0	0
	Data Conversion	2	0	0
Total		8	2	25
OTHER	Inventory	26	9	35
	Purchasing	13	6	46
	Logistics	5	4	80
	Personnel/HR	2	2	100
Total		46	21	46
Grand Total		289	130	45

Exhibit IV-5 ranks the applications to be developed over the next two years by frequency of mention and shows the corresponding use of C/S.

EXHIBIT IV-5

Application Type	Number Apps.	Number C/S	Share C/S (%)	
Manufacturing Operations	50	22	44	
Order Entry/Management	32	18	56	
Inventory	25	9	36	
Financial Reporting	22	10	45	
Manufacturing Planning	19	8	42	
Payable/Receivable	19	5	26	
Payroll	14	4	29	
Purchasing	13	6	46	
General Ledger	12	3	25	
Desktop Software	9	7	78	
Systems Software	9	4	44	



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