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STRATEGIC MARKET PERSPECTIVE

Notes' Survival in the Intranet-Enabled Corporation

Internet Opportunities Program

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Notes' Survival in the Intranet-Enabled Corporation

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Abstract

Of the applications migrating from hardware and operating system platforms to the Web, groupware is the first. Lotus Notes popularized the genre in the mid-1990s and is the current leading groupware platform. In recent months, however, Notes has come under scrutiny due to the spread of Intranets. Users are questioning the use of Notes in an environment in which information can be produced and distributed easily using low-cost, standard Internet technology such as Web servers and browsers.

Yet for all the attention the issue has received, the comparison of Notes and Intranets is skewed. For all but the simplest applications, Notes' competition comes not from the Intranet platform but from groupware applications designed to run within an Intranet environment, using Web browsers as clients.

This study analyzes the positioning of Notes and Intranet-based groupware. Based on interviews with users and vendors, it forecasts user spending, current and future applications, Notes and Intranet groupware growth over the next five years, and compares and contrasts Intranet groupware products with Notes.

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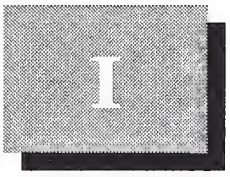


Introduction

A
Objectives and Scope

Lotus Notes has been the focus of attention over the last few months, as users start to question its continued use in the light of Internet and Intranet developments. "Notes vs the Internet" has been a common theme in the business press, yet the real issue is in the growth of Internet-based groupware applications. In the migration of applications from hardware/operating system platform dependency to the Web, networked applications are the first to move. At the heart of this category is groupware, with Notes as its leading light. As Notes migrates to the Web, the question arises: "Will it make the transition before Internet groupware takes its place?"

This study is an analysis of the competitive landscape of groupware platforms based on Lotus Notes and Intranets for the period 1996 to 1999. The primary objectives are to:

- Assess Notes' success in the Intranet-enabled corporation
- Forecast the use of Notes and Intranet
- Identify and analyze the differences between Notes and Internet-based groupware
- Analyze users' purchasing criteria in choosing between Notes and Intranet systems
- Analyze how the groupware market will change between 1996 and 1999

The study excludes:

- Non-Internet competitors to Notes such as Novell's Groupwise and Microsoft's Exchange
- Hardware platforms

B Methodology

INPUT contacted 1,469 small, medium-sized, and large organizations in the US and Europe. Companies were included in the survey if they currently use either Notes or an Intranet, or if they plan to use Notes or an Intranet in the next three years. Of the 1,469 contacted, 166 companies fulfilled these criteria. See Exhibit I-1 for a breakdown by country.

Exhibit I-1

Survey Sample by Country

Country	Completed Interviews	Proportion of Sample (%)
UK	35	22
France	18	11
Germany	15	9
US	98	59

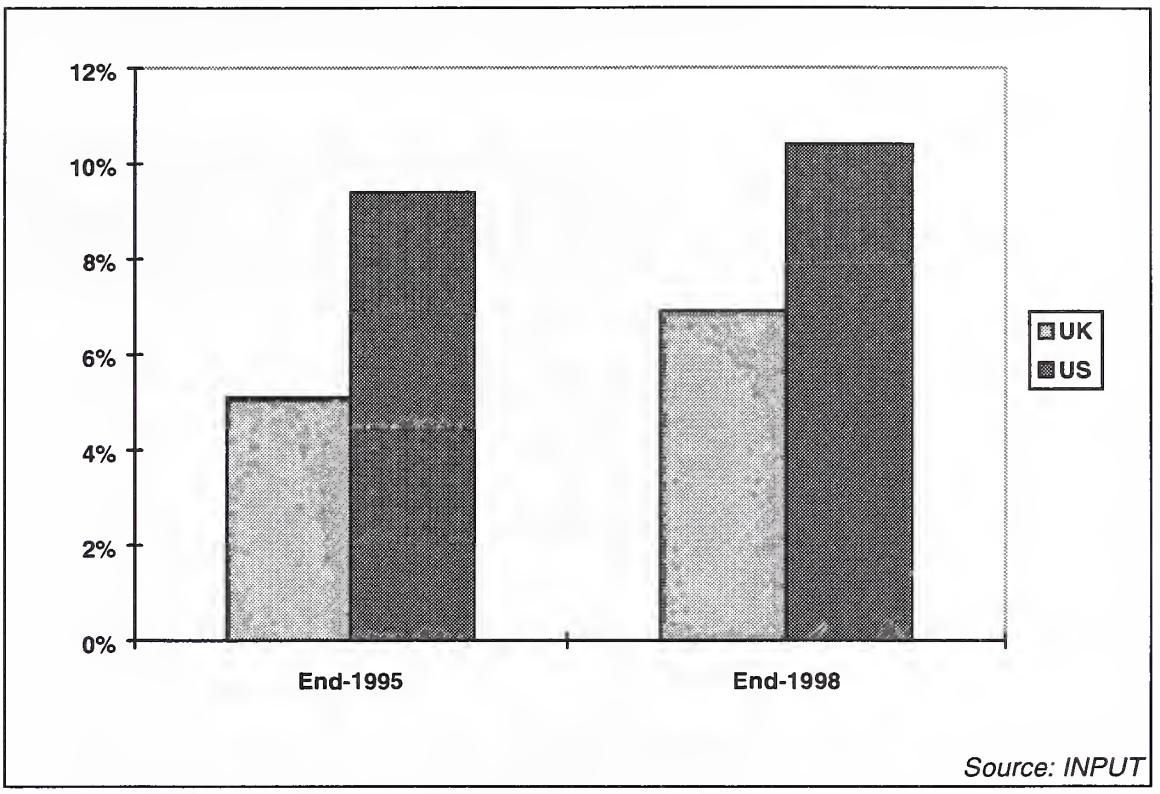
Source: INPUT

Of the remaining 1,303 companies, half indicated no use of either Notes or an Intranet in the next three years. From the sample of approximately 820 companies who gave a valid response, we can therefore estimate that 20% of all companies will deploy Notes or an Intranet by the end of 1998.

Exhibits I-2 and I-3 show this deployment broken down by platform among organizations in the UK and the US, as identified from the sample of approximately 820 respondents. For both Notes and Intranet deployment, numbers of users in France and Germany were too small to obtain reliable result when measured in isolation.

Exhibit I-2

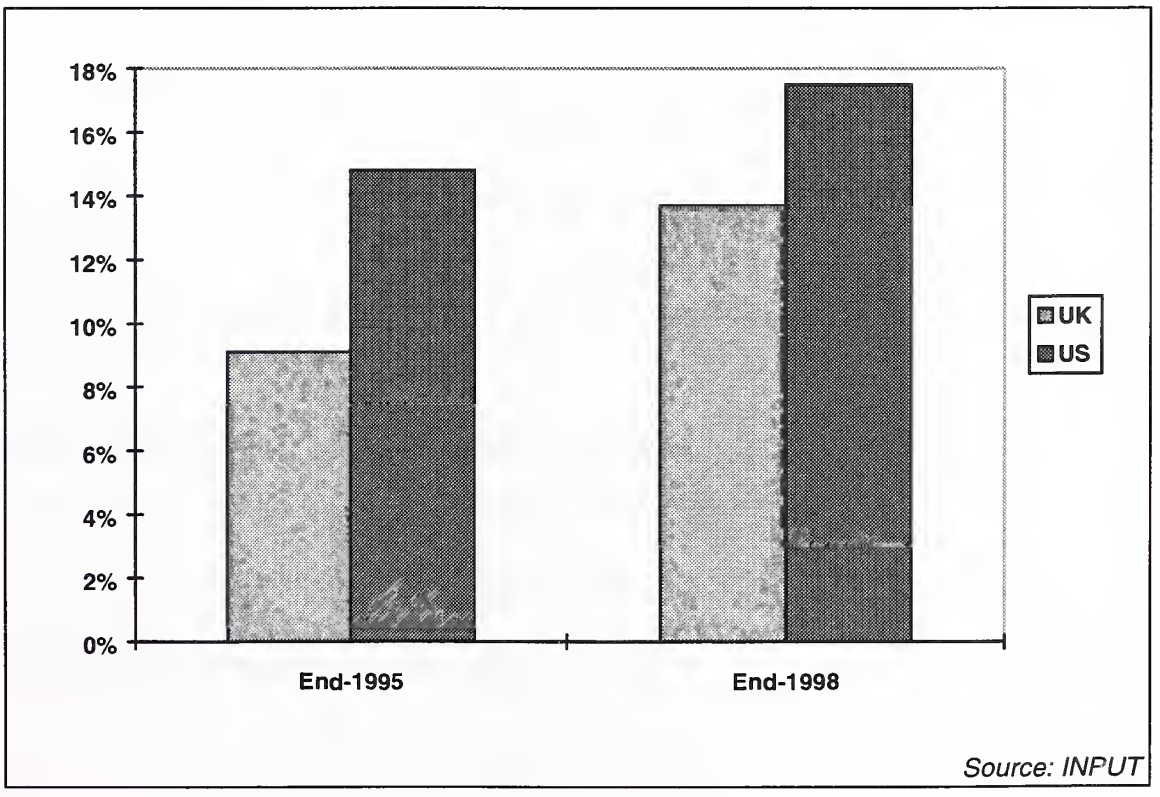
Notes Deployment Among User Organizations, UK and US



Source: INPUT

Exhibit I-3

Intranet Deployment Among User Organizations, UK and US



Source: INPUT

All interviews were conducted during February and March, 1996. The industry profile of respondents is shown in Exhibit I-4. Average revenues were for the whole sample were $1.2 billion.

Exhibit I-4

Industry and Revenue Profile of Respondents

Industry Sector	Proportion of Sample (%)	Average Revenues ($m)
Discrete manufacturing	11	110
Process manufacturing	14	4,500
Transportation	6	99
Communications	2	260
Retail	6	1,500
Wholesale	3	122
Banking/finance	13	150
Insurance	4	120
Medical	1	140
Services	13	110
Education	1	N/A
Local government	1	5
Other industry-specific	23	350
Cross-industry	1	0.25

Source: INPUT

In addition to user organizations, 50 vendors were interviewed for this study in the following categories:

- Lotus Business Partners
- Consultancy and professional services providers
- Public network providers
- Internet groupware competitors

C
Report Structure

The remaining chapters of this report are as follows:

- Chapter II is an executive overview which provides a summary of the major findings of the study
- Chapter III is an overview of the technology and applications of Notes- and Intranet-based groupware
- Chapter IV is an analysis of the user interviews undertaken for this project
- Chapter V is a competitive analysis which examines Internet-based groupware offerings
- Chapter VII is an breakdown of the Notes and Internet groupware markets for the period 1996-2000
- Appendix A is a glossary of terms
- Appendix B is a list of vendors discussed in this study
- Appendix C is the user questionnaire used for this study

D
Related INPUT Reports

Other INPUT reports which address topics related to the subjects discussed here include the following:

IBM's Repositioning of Notes for the Internet — White Paper, 1995

The Future of Web Software — 1996

Application Migration to the Web — 1996

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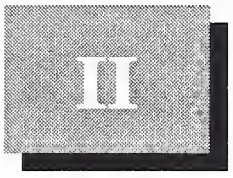


Executive Overview

A
All Groupware Will Migrate to the Web

The way software applications are developed, deployed, and supported will change fundamentally over the next few years. The de facto network platform will be the Internet (internally and externally) and the de facto application environment will be the Web.

It is already theoretically possible to implement most types of cross-industry applications in the Web environment using Java, from a text editor through spreadsheet to full groupware application. However, such applications are still in the early stages of development and many will not be viable until the Web as an application environment is more stable and secure and Web development tools mature. The Web will viable as a mainstream application environment by 1998.

The sequence in which applications shift to the Web is:

- Networked applications
- Database applications
- Personal productivity applications

Groupware is in the first category, hence the interest surrounding Notes and the Internet. Databases are starting to make the move to the Web: witness Illustra Server, for example. Personal productivity applications already reside on users' desktop computers, and so are less affected currently by the application shift, although Corel has implemented its office application suite, Corel Apps (its new version of Perfect Office, which it bought from Novell, itself an acquisition from Lotus), in Java. Corel is competing head to head with Microsoft with Corel Apps and has brought personal productivity applications into line for rapid updating for the Internet environment.

Underpinning the whole sequence is the emergence of Internet application development tools. Java is the first Internet-centric language, but existing client/server development environments are starting to make the transition. SAP's R/3, for example, became "Internet-enabled" early in 1996.

The steps current groupware applications, including Notes, will take in shifting to the Web platform are:

1. The provision of a gateway to allow Web browsers to read from and write to a backend database. This happened to Notes with the release of InterNotes.

2. Full and equal access to all applications within the groupware environment given to Web browsers. When this is accomplished, the need for a proprietary client disappears and the groupware product becomes a backend server (database architecture), or a set of Web browser plug-ins (messaging architecture), or both.

3. The shifting of the groupware server's architecture from proprietary, dedicated server to one based on Web APIs that is integrated into the Web server, not separated from it.

By 2000, over half of all current applications will have been ported to the Web platform and will be offered in traditional and Web versions. Notes is undergoing this transition today, starting with the release of Notes 4 which includes limited native Internet support. By the end of 1996, a native HTTP Notes server will be available, which will blur the divisions between current Notes environments and the Web.

B
Notes' Market Share to Fall From 1998

IBM paid $3.5 billion for Lotus in mid-1995. The acquisition was driven by IBM's desire to own the Notes platform and capture the groupware market as groupware becomes the standard method of internal company communications.

When IBM started looking at Lotus as an acquisition, the Internet application market had barely started. Corporate use of the Web was represented by static public Web pages used for marketing and information distribution purposes. Few companies were using Intranets for internal communications; fewer still were using Intranets for internal applications.

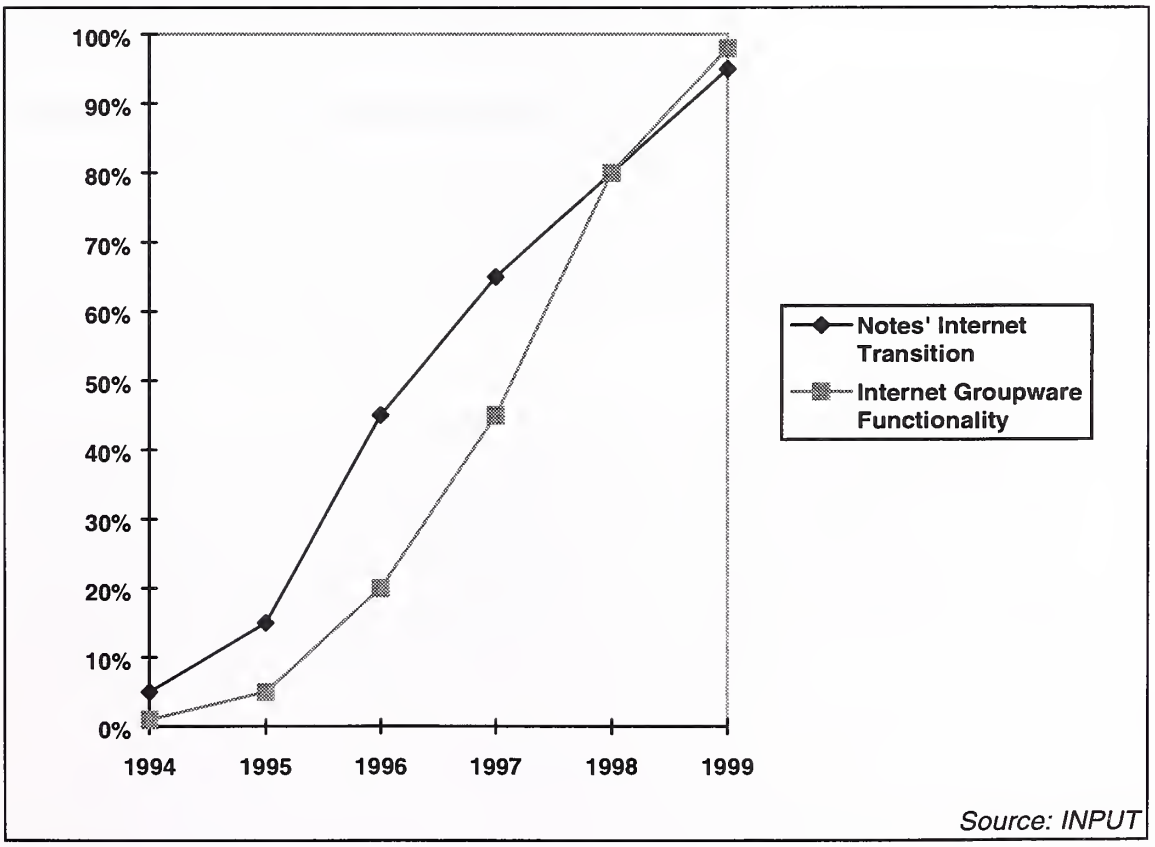
Today, Internet groupware is being developed by multiple companies faster than Notes is making the transition to the Internet. Both are in a catch-up situation: Internet groupware is catching up with Notes' functionality, and Notes is catching up with support for the Internet environment. While the Internet groupware catch-up is only a temporary situation (Internet groupware products will inevitably equal Notes in functionality), Notes' catch-up is a much longer-term condition.

IBM will not throw away its investment in Notes by replacing it with a groupware system built from the ground up on Internet technology. Instead, IBM must massage Notes into Internet form. This is not a question of developing new functionality but of shifting the underlying architecture, a considerably more difficult, costly, and lengthy exercise.

The point at which Notes and Internet groupware products will compete on an equal footing will be reached when IBM has shifted enough of the underlying Notes architecture for it to be considered an Internet-based product. By this time, Internet groupware products will have equalled, possibly even overtaken, Notes in groupware functionality, including functionality new to Notes over the next few years.

Exhibit II-1

Notes Transition to Internet vs Internet Groupware Functionality



Source: INPUT

Exhibit II-1 shows the transition of Notes to the Internet environment and the increase in functionality of Internet groupware software relative to Notes. The two meet by the end of 1998. This is the point at which Notes and Internet groupware products will be equivalent (if not equal) in architecture and functionality.

- 1994—Notes supports TCP/IP. Negligible Internet groupware available
- 1995—Lotus releases InterNotes. Internet groupware products make their entree
- 1996—Notes 4 marks the start of Notes' shift to the Web. Internet groupware starts selling
- 1997—Native Notes Web server furthers Notes' shift to the Web. Internet groupware ramps up rapidly through vendor developments and third-party plug-ins
- 1998—Notes becomes an Internet platform. Competing Internet groupware vendors match Notes functionality

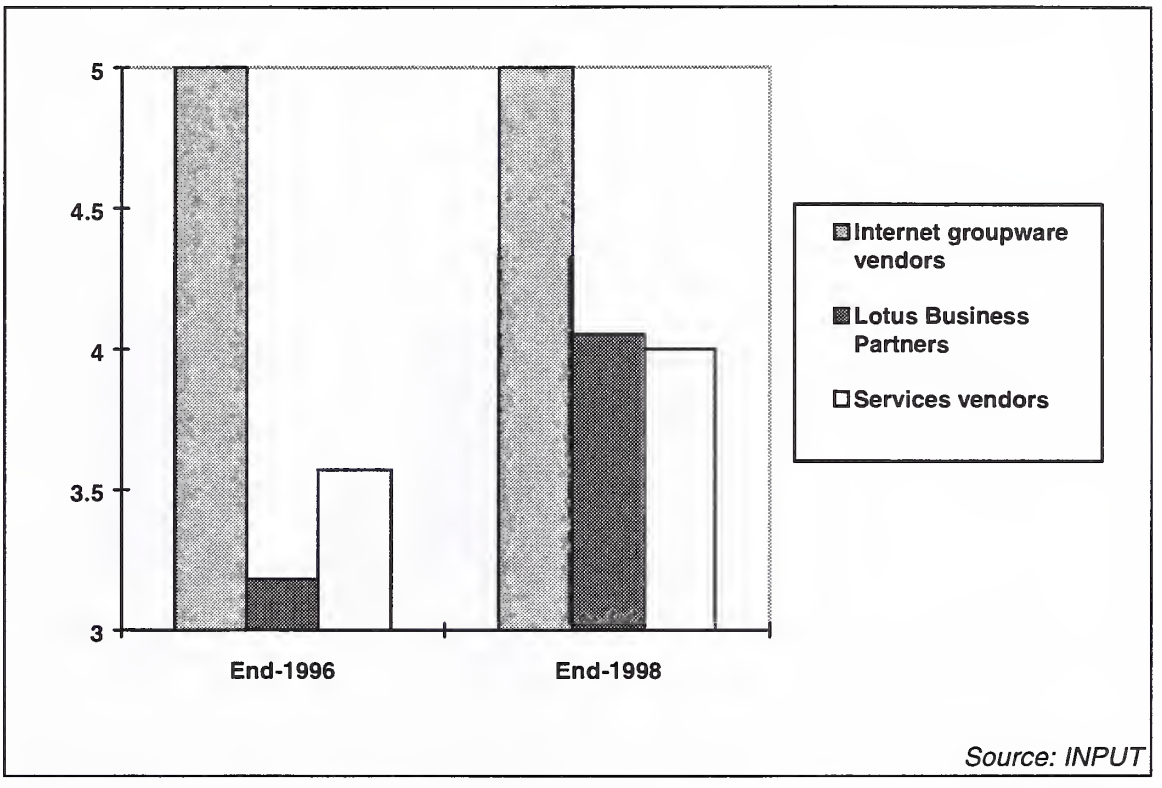
Notes is entering its golden era: two to three more years of dominance in the groupware market. From the end of this period, Notes' market share will start to fall from around 70% (to around 50% by 2000) as Internet groupware products compete on an equal footing.

C

Groupware Vendors' Futures Lie in Intranets

Exhibit II-2

Importance of Intranet to Vendors



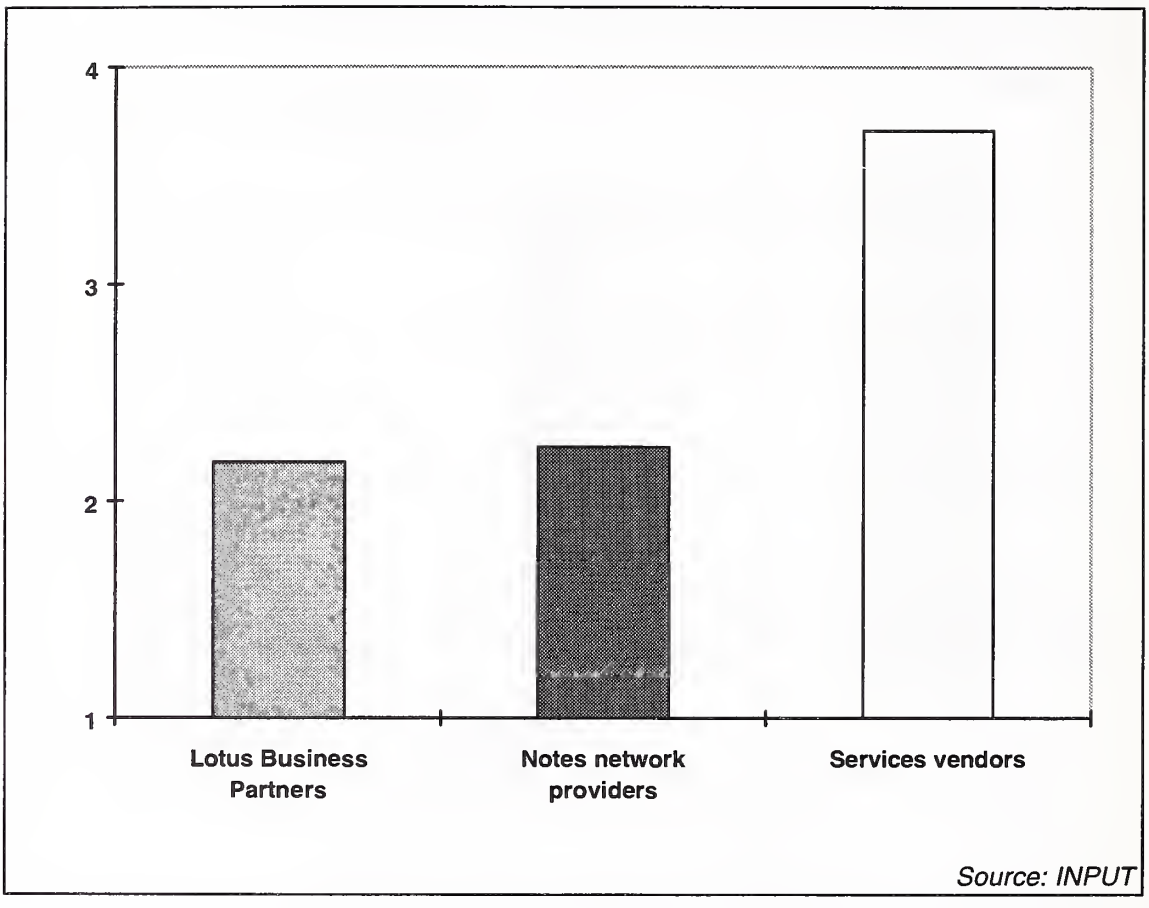
Source: INPUT

Vendors of groupware solutions view support for Intranet products and services as increasingly important (see Exhibit II-2). Lotus Business Partners in particular, the staunchest supporters of Notes, recognize the need to ramp up their Intranet offerings over the next three years, and beyond. Vendors that ignore the Intranet environment do so at their own peril, and future survival.

While many Notes-related vendors see the importance of providing Intranet support in the future, most do not see the advent of Internet technology as posing a serious threat to Notes (see Exhibit II-3). Notes will undoubtedly remain a strong groupware platform, but INPUT believes it will face greater competition from Internet-based groupware products than Notes-related vendors perhaps realize.

Exhibit II-3

Vendor Perceptions of Intranet Threat to Notes



Source: INPUT

D
Recommendations to Users

1. Current Notes 3 Users

Evaluate your need for distinct groupware functions such as conferencing, scheduling, workflow, etc. Map these needs against your current usage of Notes, and against the full feature set of Notes 3 and Notes 4. How much of Notes are you actually using, and how much do you need to use? Be ruthless in your analysis of groupware needs and cut out what you don't need.

Balance the total cost of your Notes installation—count client costs, administrator and programmer resources, third-party add-ons, etc.—against your needs. Compare these costs with the costs of implementing an Intranet groupware environment. At its simplest, this could mean installing a Web server on a machine connected to your internal network, buying an Internet groupware package, and making use of existing Web browsers installed on the desktop. According to your requirements for

functionality and support, this could entail no purchase costs (some Web servers and Internet groupware products are provided free of charge) and minimal internal costs (time allocated to IS personnel to install the software). Some Internet groupware products require the use of specialized client software (either standalone interfaces or Web browser plug-ins). This is not the long-term model for most Web applications, but may currently be necessary.

In some cases, the cost savings will be enough to justify a change of groupware platform to an Internet-based system. But more than cost is involved. Most organizations' applications will start moving to the Web platform over the next few years. Some applications, like groupware, will run by default within the Web environment by 1999. At this time, Notes will be an Internet application like any other, but will carry with it the legacy of backward-compatibility and the accumulated baggage of over ten years of development.

2. Current Notes 3 Users Migrating to Notes 4

It is imperative, at this dawn of the application shift to the Web, that users do not introduce a new groupware platform into their companies that perpetuates vendor lock-in or lays down a proprietary, inflexible architecture. How Lotus develops its product over the next year will determine how much this applies to Notes. In theory, it should not; Notes is gradually becoming 'open' with respect to Internet standards, yet much of Notes, its internal database format, for example, remains proprietary.

Users of Notes 3 who are upgrading or have upgraded to Notes 4 will not be in the mood for a change of architecture. However, they should keep a close eye on Internet groupware developments.

At the least, they should evaluate the Java capabilities of Notes 4 when they become available, and strive to Web-enable their Notes applications in order to access them from Web browsers, not the Notes client. This will save money in the cost of the client, and assist in the company's move to an Internet application environment.

3. Users With No Groupware

Groupware products are rapidly encompassing most network-based collaboration activities with organizations. With the drive towards team-based working, virtual teams, and teleworking, distributed collaborative working systems are becoming increasingly important. Groupware is at the heart of this trend.

Consider very carefully your choice of groupware platform. The days when an organization's choice was between big-name applications (notably Notes but also Novell's Groupwise) and single-function utilities are quickly coming to an end. Internet groupware systems can today provide around 20% of the functionality of Notes. By the end of 1998, Internet groupware will equal Notes in functionality. If your requirement is for essentially a subset of Notes' functionality, as is the case in most situations, then Internet groupware will be able to meet your needs before the end of 1998, possibly even now, depending on your needs. For example, pure conferencing can be accomplished today with Netscape Collabra Share and pure workflow through Action Technologies' ActionWorkflow Metro (see Exhibit II-4 for an overview of current Notes and Internet groupware functionality).

Exhibit II-4

Notes and Internet Groupware Functionality

	Lotus Notes	Digital Workgroup Web Forum	Action Techno-logies Action Workflow Metro	Radnet WebShare	AEX About	Netscape Collabra
Discussion	✖	✖		✖	✖	✖
Document management	✖			✖		✖
Workflow	✖		✖	✖		
Conferencing	✖	✖				✖
Project management	✖	✖				
Calendaring	✖					
Whiteboarding	✖					
Messaging	✖			✖		✖

Source: INPUT

Consider the costs involved in implementing a Notes and an Intranet groupware environment. Notes is now priced at a similar level to Internet software, but the purchase cost may be a small fraction of the total. That fraction decreases as you outsource more of your Notes operations, for example Notes application development and managed Notes networks.

While Notes users can justifiably claim they have the choice of outsourcing elements of their Notes environments whereas Intranet users do not (the outsourcing market for Intranets has yet to form), there are good reasons for the costs of outsourcing Intranet operations to be lower; a greater number of suppliers will feed greater demand, and will compete more aggressively on price.

Within any environment that encompasses the desktop as well as the server, management costs and overheads run high. Notes requires programmer resources and skilled administration. Intranets also require these resources, but such staff are not dedicated to one task; Intranet development and administration skills can be spread around all areas of your organization over the coming years, not just your groupware platform investment.

To keep costs down, cut out specialized client software—i.e., ensure that any groupware application you require can be accessed fully though a standard client interface that you probably already have: a Web browser.

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III

Groupware Technology and Applications

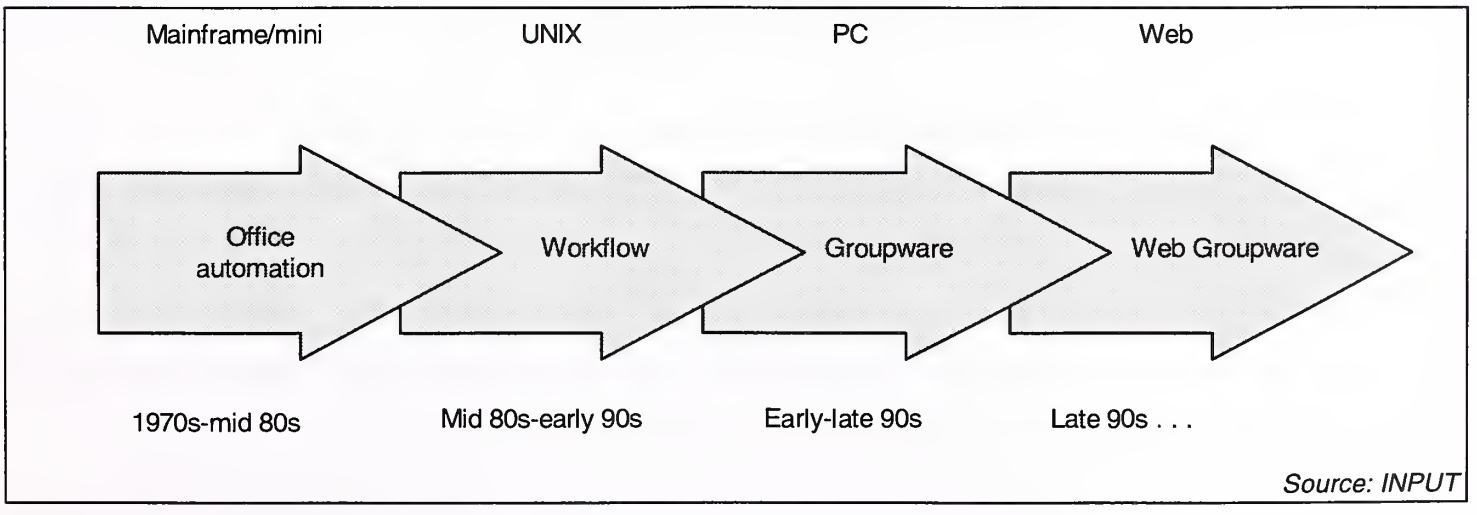
A Introduction

What we term the 'groupware' product today has evolved through several stages of development and terminology, from 'office automation', through 'workflow', to 'groupware'.

Exhibit III-1 illustrates the evolution to current groupware systems and beyond.

Exhibit III-1

Evolution of Groupware



Source: INPUT

1. Office automation

Early products, such as Digital's ALL-IN-1, fulfilled some of the basic functions of current groupware systems. They provided shared information repositories, message exchange, and some scheduling functions.

They typically, however, were designed with a specific hardware and operating system platform combination in mind, such as Digital's VAX/VMS systems. They were not based on open standards, but on the proprietary architectures defined by the underlying platforms. They were large, integrated, and costly systems that served their purpose well at the time but lacked several critical elements required for today's groupware systems, including real-time collaborative working, powerful internal application development tools, and cross-platform support.

2. Workflow

The term 'office automation' eventually gave way to 'workflow'. Workflow products, which included Quadratron's Cliq, Uniplex' OnGo, and Applix' Aster*x, served many of the same purposes as office automation systems in terms of group collaborative working functions. They were, however, available for a wider range of platforms and could be accessed from a wider variety of client types, notably the PC.

Workflow systems arose during the emergence of volume UNIX-based server and workstation environments, and took advantage of many of the benefits of the UNIX environment, particularly cross-platform support and open networking standards.

3. Groupware

Groupware was effectively defined with the rush of support for Lotus Notes, starting around 1993. Notes was the first volume groupware product that was designed specifically for the new client/server environment that recognized that PCs, not UNIX workstations, were the dominant client platform within corporate organizations. As such, Notes was not seen as a UNIX-only or a PC-only product.

At the time of Notes' upsurge in popularity there was no viable alternative that was as cost-effective, rich in functionality, and suited to a PC-style client/server environment. Competing products exist, such as Novell's Groupwise, but they have not achieved a market position anywhere near to that of Notes, and many still support only a limited range of platforms.

There also existed, and continue to exist, many small, single-function products. Most were, and are, so specialized in their functionality as to be utilities rather than full-blown applications. These utilities include calendars and schedulers, whiteboard systems, and group threaded discussion products. All are useful in their own right and fulfil many organizations' (or, more realistically, departments') needs for simple applications.

4. Web Groupware

The emergence of Internet-based groupware systems is initially a change of platform rather than a fundamental change of application. As over the last 20 years, however, as a platform shift gave rise to new application possibilities, so the shift to the Web will enable new types of groupware application.

The benefits of Web-based groupware over proprietary systems include the following:

- Only the server application needs to be purchased; existing Web browsers are used as clients and the application runs over the existing Intranet network infrastructure
- Training costs are reduced as users will already be familiar with the application's interface, the Web browser
- Installation and management costs are reduced as no client software has to be installed. Application upgrades are performed only on the server

Web groupware is a new phenomenon and few products are available. Some early products, such as Bittco Solution's Co-motion, are still in transition to the Web platform and are not fully integrated with the Web; they might still need proprietary client software, for example. Others, such as Radnet's WebShare, are built on the Internet from the ground up but are very young products.

B
Groupware Components and Applications

At its simplest, groupware is about bringing people together to work collaboratively and share information. The term 'groupware' is used to describe many different types of software, but all groupware products share at least some of the following characteristics:

- Communications—access to an existing local network or the Internet
- Messaging and/or database architecture
- Business process automation—the ability to replace an existing paper-based activity with the electronic equivalent
- Workflow—the ability to initiate, coordinate, track, and resolve discrete tasks and transactions
- Conferencing—discussion, either in real time or off-line, privately between individuals or publicly amongst a group
- Application development—the ability to create and deploy new applications either within the groupware environment or by linking in external programs

1. Communications

A prerequisite for any collaborative working environment is the ability to communicate. Companies have several choices of network architecture. Locally, an existing LAN such as Novell NetWare can be used as long as it is supported by the required groupware system. In the case of NetWare, Notes runs as a NetWare Loadable Module (NLM) and Intranets can be partially implemented by running TCP/IP over NetWare. For remote access, an existing WAN (X.25, frame relay, etc.) or the Internet itself can be used.

In the case of Notes, an alternative to sitting and managing a Notes installation within the corporate network exists in the form of public Notes networks providers. These providers, which include WorldCom in the US, BT in the UK, NTT in Japan, and Telstra in Australia, site a company's Notes server and its applications on their site and manage the network and access to it. All the customer needs is Notes clients on its desktops and access to the provider's network. For these providers, Lotus

released Lotus Notes Public Network Release 4 (LNPN R4) in February 1996.

Not all is rosy among Notes Network providers, however. In March 1996, AT&T announced its plans to withdraw Notes Network services as a direct result of the growth of Internet use, citing customer demand for an open, Internet-based architecture as one of the main reasons for its decision. This is as clear an indication as can be made of the direction in which network-centric applications are heading: to the Web.

2. Messaging and/or Database Architecture

There are, broadly, two design philosophies of groupware systems: database and messaging. The database approach, as embodied in Notes, relies on a centralized database, or multiple replicated databases, to coordinate processes and store documents, discussion threads, etc. The messaging approach is a store-and-forward model typically based on an existing email infrastructure. Messaging has grown from manual creation and delivery of messages to a backbone for automated, event-triggered workflow and groupware processes.

When developing or purchasing a groupware system, the database/messaging question is not necessarily an either/or issue. Between the extremes can be found groupware software, including Notes, that uses both methods. A hybrid approach is most likely to succeed over the long term. A database architecture is more scaleable but messaging has lower resource and management overheads for smaller installations and therefore lower costs. As applications and the data being shared become larger and more complex, messaging is broken down into distinct services; for example, temporary message stores become more important and can take on much of the functionality of complete databases, and server-based directory services manage increasingly complex information about users and objects.

A common criticism of messaging architectures is the possible loss of messages. This is a frequent occurrence for many companies due to incorrectly configured email gateways and the non-honouring of control messages from external mail servers, and poses a challenge to companies that do not address the problem. A hybrid messaging/database architecture is less prone to this risk.

Database solutions are more likely to be found in non-Intranet environments—Internet databases are not widely available. Informix' Illustra division is filling this vacuum, however, with the Illustra Server,

a backend database for Web applications. The Illustra Server is an object-relational database management system (ORDBMS) that handles text, video, images, and documents within a single repository. The database is an extendible platform—plug-ins called DataBlade modules provide support for new data formats in a similar manner to Netscape's plug-ins.

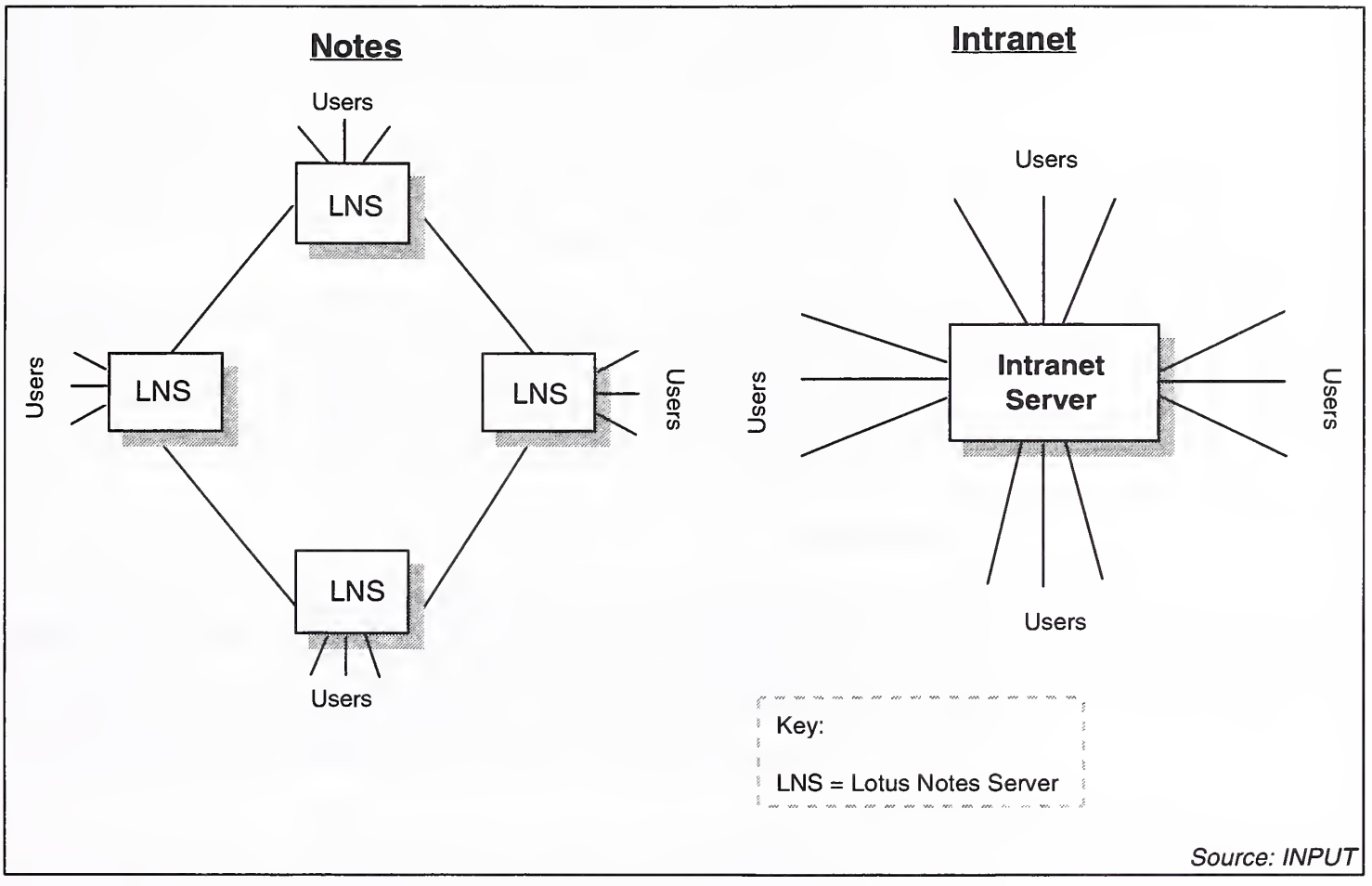
Illustra's database is a new product but it will quickly find application in tying together existing and emerging Internet messaging-based groupware systems to a powerful backend repository. Web conferencing and workflow systems, for example, will be implemented as DataBlade modules. For Illustra users, the result will be a choice of Internet groupware products that rival Notes in their strength of database functionality.

a. Replication

Replication—the synchronization of multiple databases—is a central element of Notes. It was a necessary function until recently because a low-cost, near globally-available access mechanism did not exist for commercial organizations. That mechanism now exists for commerce, of course, in the shape of the Internet. One can argue for either heavy replication or easy, quick access to a central server. Both aim to achieve the same thing: efficient access to geographically dispersed users (see Exhibit III-2).

Exhibit III-2

Notes and Intranet Topologies



Source: INPUT

Replication is good for remote Notes sites with low-speed network connections. Notes is not based on a remote access architecture, unlike the Web, and so is not suited to many remote users accessing a central server. This has cost and management implications: for every remote site, a local Notes server and administrator is required. Contrast this with an Intranet: one server located anywhere in the world with adequate network bandwidth can serve a theoretically unlimited number of users; users are not categorized as local or remote; clients need only support the required level of HTML conformance (typically HTML 3.0). For demanding, realtime applications requiring guaranteed and/or sub-second responses, such a configuration is not suitable if users remote to the central server connect over the public Internet; for such users connecting over a private circuit, however, such a configuration will work perfectly well depending on the WAN's bandwidth and bottlenecks at either end.

A very limited form of replication-on-demand is available with caching Web browsers that store local copies of pages as they are downloaded, for fast subsequent accesses. This is not true replication as changes to a cached page cannot be transmitted back to the server, and so can only work as unidirectional replication. Nevertheless, for read-only access, it fulfills the same function, without the need for a local server to hold the data that is being replicated and an administrator to manage that server. This is replication at the platform, not application level, and is crude. Some Internet-based groupware applications, such as Netscape Collabra Share, have full replication mechanisms.

With the database-centric architecture of Notes, Lotus is committed to replication as a strategy for distributing information and access. Notes' replication capabilities include selective, field-level and concurrent replication, as well as a conflict resolution mechanism.

3. Workflow

There has been a general shift of terminology in recent years, from 'workflow' to 'groupware', driven largely by the success of Notes. Many products are described as groupware that meet only a very small number of the basic criteria, and which in reality are single-function utilities. Similarly, dedicated workflow products are increasingly described as groupware.

This shift has reduced, rather than increased clarity of product types. With the adoption of the catch-all 'groupware', the term 'workflow' has been devalued. True workflow systems are easier to define than most groupware products, as the term 'workflow' has clearer meaning.

Workflow systems automate, route, and track tasks at each stage of their execution within an organization. For example, the processing of an expense report is an ideal task to be automated with a workflow system. The task is clearly definable, goes through a known set of sub-actions, and is terminated with a finite set of results. Workflow processes can be charted in a state transition table (a matrix that defines how a task will change between known states according to a known event) but the same is not true of many groupware functions which are less structured.

A full groupware system will include workflow, but there are many true workflow products on the market optimized for structured tasks. Like groupware (and all networked applications), they too are undergoing a transition to the Web. Action Technologies' ActionWorkflow Metro, for example, is an Internet-based workflow system.

4. Application Development

Application development has traditionally separated full groupware systems from workgroup utilities. The distinction is not as clear when comparing Notes and Internet groupware systems, however. Notes includes a full application development environment, but this will not be true of future Internet groupware.

Some Internet groupware systems include software development kits (SDKs)—Digital's Workgroup Web Forum and Action Technologies' ActionWorkflow Metro for example—while some include no development capability. Halfway between is Radnet's WebShare. WebShare includes a GUI builder to design and prototype interfaces to groupware applications and the links between forms, fields, and applications. The applications themselves are written by the user in JavaScript or VisualBasic Script. This is how applications will be developed for most Intranet-based environments: tools such as JavaScript for trivial macro-style scripts and Java for larger applications-within-applications.

Notes 3 included a macro language based on that within Lotus 1-2-3, as well as APIs that could be called from external programs. Notes 4 retains these and adds a much more powerful development tool, LotusScript, compatible with Visual Basic.

The most important addition to Notes' application development environment is eApps—a set of tools and templates for giving Internet support to existing Notes applications and for deploying applications over the Web. What InterNotes does for publishing documents on the Web, eApps does for deploying applications. eApps includes eight building blocks with which applications are developed:

- Publishing—Web page and Notes document templates designed to be more glossy than InterNotes-translated pages. Includes a preview facility and translation between HTML, Notes, and RTF formats
- Interactive—threaded discussions
- Catalog—catalog shopping applications
- Order processing—purchase history management and routing

- Payment—a credit card validation system. On receipt of a credit card order, a validation request is sent to the credit clearing house and a reply sought before the transaction is processed

- Subscription management—based on Notes workflow elements to manage customer subscriptions

- Security—matches a Web user's username and password with existing login details stored in a Notes database, to grant or deny access to the database

- Legacy integration—links data stored in RDBMSs (including Oracle, Sybase, and DB2) to eApps

Four template applications using these building blocks are included in eApps, for publishing, marketing, customer service, and commerce.

In parallel with the launch of eApps, Lotus released a full eApps application, Newsstand on the Web. Newsstand is for delivering subscription publications over the Web and managing those subscriptions. The application runs on Lotus' Web site, and acts as a meta-publisher, passing user subscription requests onto the publishers, managing the payment process, and delivering the customer to the publisher who supplies the URL and login access to the product. Publishers create Web versions of their magazines and journals with the eApps authoring templates. Newsstand is built on the publishing eApp template, itself comprising four eApp building blocks: publishing, interactive, subscription management, and security.

5. Groupware Applications

Groupware encompasses a wide variety of applications. These can be broken down into the major groups of (including application examples):

- Business process automation and workflow

  Customer service and support

  Project management

  Human resources

  Sales force automation

- Communication

Discussion groups

Calendaring and scheduling

Multimedia group conferencing

Whiteboarding

- Publishing

  Document authoring and distribution

  Courseware

C
How Do Notes and Intranets Compete?

1. Where Do Notes and Intranets Reside?

The issue of 'Notes vs the Internet' has created a lot of confusion among users and even vendors. There are three main elements involved:

1. Network
2. Environment
3. Applications

a. Network
Notes is independent of users' choice of networks. While the same could possibly be argued for Intranets, this is not the case—being a replica of the Internet, an Intranet must run over a specific network protocol, TCP/IP, or at least an imitation of it. An Intranet is therefore defined partly by the network. Notes and Intranets do not clash at the network level.

b. Environment
The environment, or platform, level is where Notes and Intranets are most often seen as competing.

Notes is partially defined at this level by its infrastructure: the middleware that ties together a Notes installation. This includes database access, management, and replication, directory services, security,

messaging, and the services such as conferencing on which applications are delivered and accessed.

An Intranet exists mostly at this level in the form of email, messaging, Web server hosting and management, newsgroups, and the Web browser itself. It is an Intranet's existence at this level that defines it as an application platform, hence the application shift to the Web.

c. Applications

Notes provides ready made applications and an application development environment. Intranets provide neither: email and Web clients are not applications but environmental components.

Both Notes and Intranets include the ability to extend the environment through third-party or self-developed applications. It is here that a lot of the confusion between Notes and Intranets arises. Notes is both an application platform and an application. An Intranet is only an application platform.

Strong application development tools have not been available for Intranets until recently. Applications have been implemented as CGI scripts, typically written in Perl, which is a crude method of development, lacking most of the features developers are used to, such as prototyping and library management. Java, however, brings a full development and deployment environment to the Internet, and by extension Intranets, and will change the way applications are delivered, run, supported, and paid for. As Intranet application development tools increase in sophistication, so will the range and quality of available applications.

2. Applications Compete With Applications

For all but the simplest uses, such as document publication with a low management requirement, therefore, Notes and Intranets do not compete. Notes' competition comes from groupware applications and development environments designed specifically for Intranets. See Chapter VI (*Internet-Based Groupware Competitors to Notes*) for a discussion of some of these Internet groupware products.

D
Notes Repositioned for the Internet

Notes was designed before the Internet could be used for commercial applications, and came to prominence only as commercial restrictions on use of the Internet began to be lifted. Until recently, Notes environments were homogenous. While data could be accessed and replicated over a variety of network architectures, both client and server had to be registered Notes installations.

Lotus recognized the emergence of the Internet as the future platform for business applications before it was acquired by IBM. Work began on incorporating Internet support into Notes around a year before a repositioning statement was issued by IBM and Lotus in December 1995.

This statement was issued a few weeks before the official release of Notes 4. This urgency made it clear that IBM and Lotus had to make their stand immediately. With the incredible growth in Internet technology, products, support, and users, each month that passed without comment from Notes' owners damaged its credibility. Notes' repositioning for the Internet was mandatory for the continued survival of the product.

The main demands for any networked application that is to survive as applications shift to the Web are for:

- Internet infrastructure to be supported natively at all levels, i.e. HTML, http, Java, etc. to be integrated tightly into the product
- Open access from any client, internal or external
- Automated translation between existing document formats and HTML
- Low, or no client costs
- Cross-platform application development tools

In addressing these demands, Lotus first released InterNotes, a tool which translates pages between Web and Notes formats. With this release, Notes was no longer confined totally to its internal environment. Documents stored in Notes databases could relatively easily be converted to Web pages for public access over the Internet.

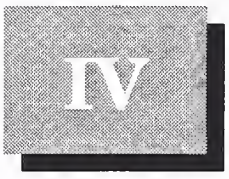
InterNotes is only an interim solution, however. It introduces a thematically unnecessary extra layer between the user and server. This extra layer adds cost and management overhead. InterNotes sits between the Notes server and Web user, acting as a buffer between the two. It does not give Web users access to Notes databases but instead interprets requests for information and passes these to the Notes server, as a Notes user would. In the next step in migrating Notes to the Web, Lotus must cut out this extra layer by supporting Web users natively at the server level.

In the statement at the end of 1995, IBM and Lotus announced the rest of the measures to be taken to drive Notes along the Internet path.

Notes is gaining support for Internet standards: a release of the Notes 4 server, due mid-1996 will support HTTP, HTML, and Java. Truly integrated support within the Notes server itself of these standards is crucial if Notes is to complete its transition to the Web which was started with InterNotes. As with Notes, extensions are becoming available for many proprietary systems to provide some level of interoperability with the Web. Like InterNotes, these are only interim solutions.

The Notes client now includes a Web browser, InterNotes Web Navigator. The browser can translate between Notes document and Web page formats and takes advantage of server-based Web page caching. It supports HTML 3.0 tags and Netscape extensions.

In addition to Internet technology, IBM and Lotus realigned the price of Notes with the Internet client/server pricing model. The price of the Notes client was halved to $69 and the Notes server was increased to $495 for single-processor machines and $2,295 for multiprocessors. Web and Notes clients and servers are now similarly priced, although Notes remains slightly more expensive.



User Views

This chapter presents an analysis of the 166 user interviews conducted for this study. That sample comprised organizations that use either Notes or an Intranet now, or that expect to use either Notes or an Intranet in the next three years. The sample is therefore intended to be representative not of all user organizations but of those with groupware interests.

A
Notes and Intranet Deployment

Exhibits IV-1 and IV-2 show the pattern of Notes and Intranet deployment to 1999 among respondents that made up the sample for this survey. It is immediately apparent that Intranets are experiencing rapid growth. Currently around 55% of respondents have no Intranet (including pilot sites). By 1999, only around 25% will have no Intranet, and 50% of all companies will have enterprise-wide Intranet deployment.

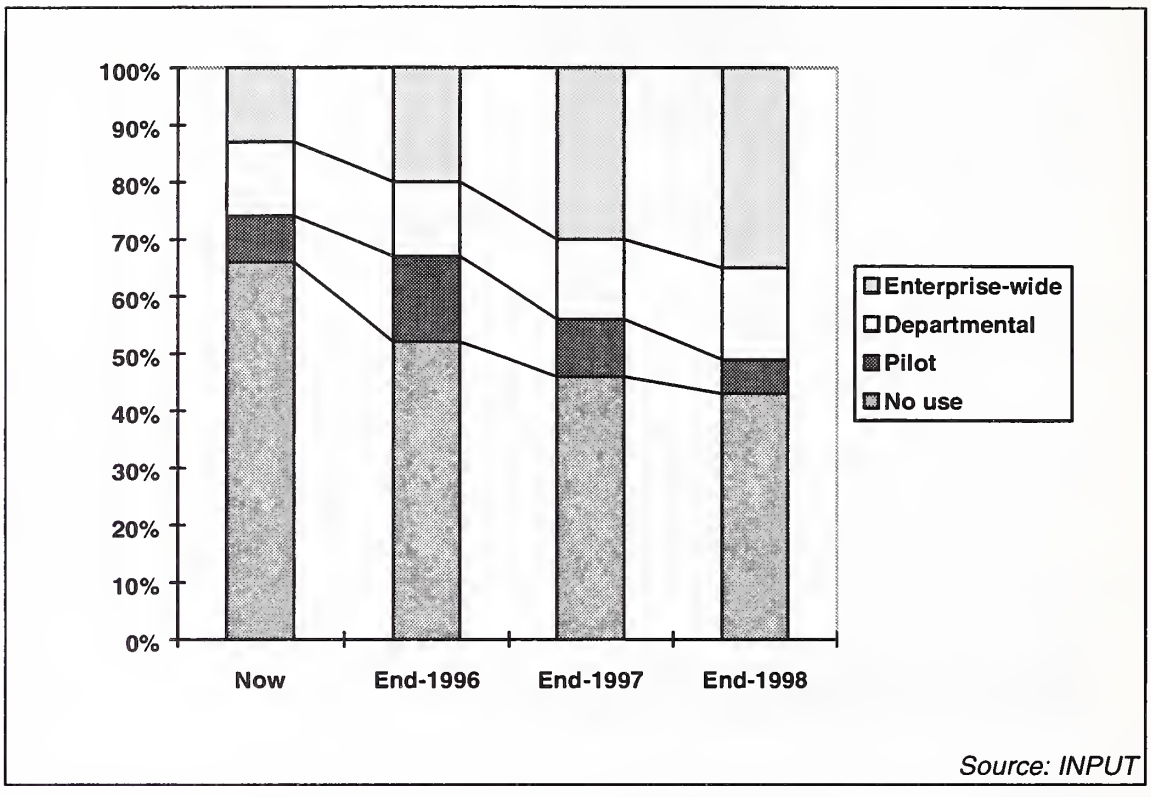
Being less mature technology, a higher proportion of Intranet sites will be pilot sites, compared with Notes sites. This bodes well for the future of Intranets beyond 1999.

The proportion of companies within the sample with no Notes system (including pilot sites) will fall from 65% currently to around 45% by 1999. At that time, around 35% of installations will be enterprise-wide.

The survey showed that 40% of current Notes users (excluding pilot installations) are also running an Intranet. This figure will increase to 50% of those users over the next three years. Conversely, one third of current Intranet users are also using Notes. This figure will decrease to around a quarter of those users over the next three years.

Exhibit IV-1

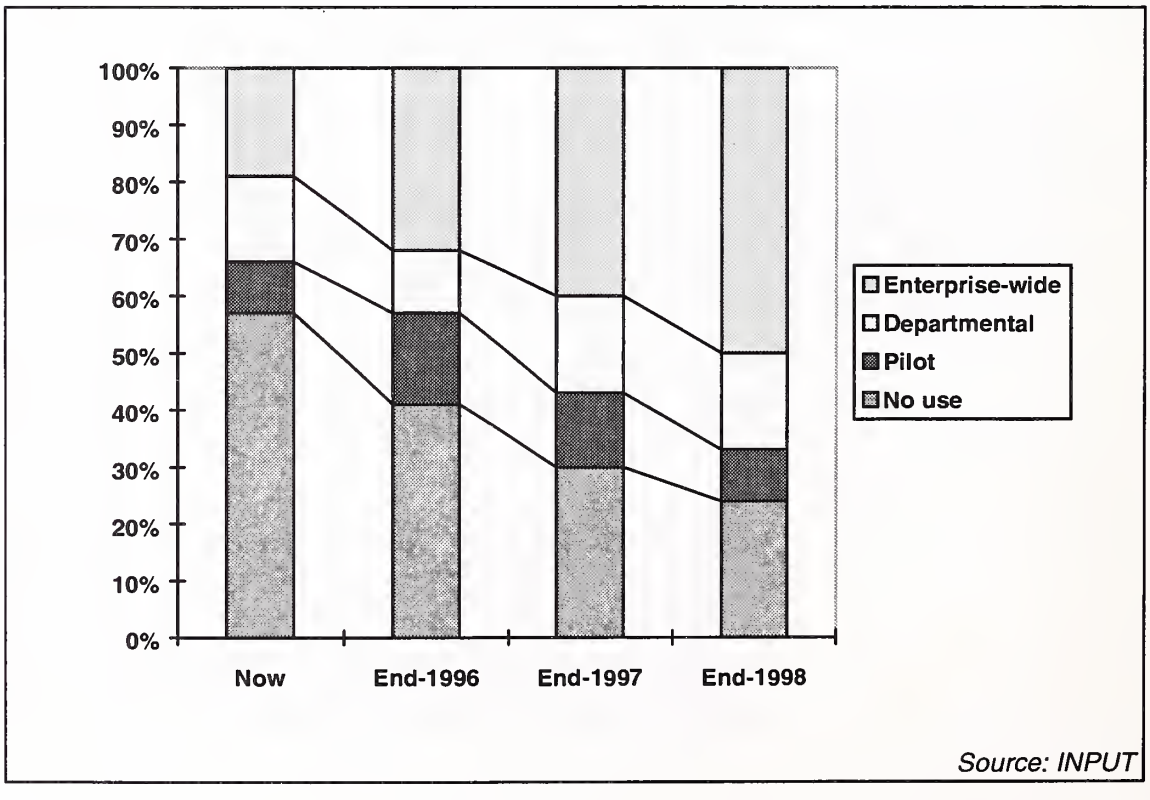
Notes Deployment



Source: INPUT

Exhibit IV-2

Intranet Deployment



Source: INPUT

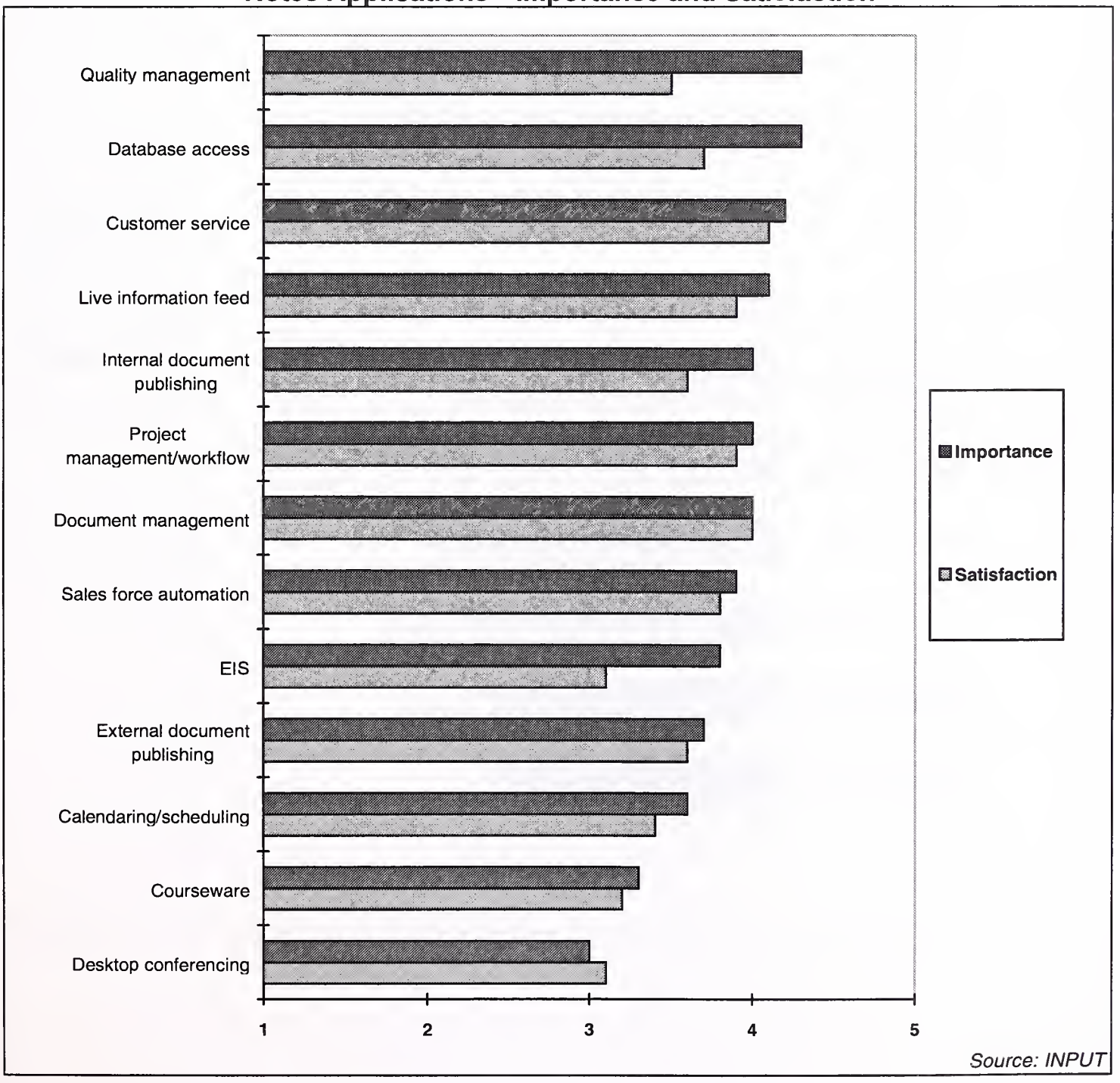
B

Groupware Application Importance and Satisfaction

Respondents were presented with 13 groupware applications and, depending on which platform they currently use, asked to indicate the importance of each application and how satisfied they were with any current implementation of each application on their Notes or Intranet platform. Exhibits IV-3 and IV-4 show the results for Notes and Intranet users respectively.

Exhibit IV-3

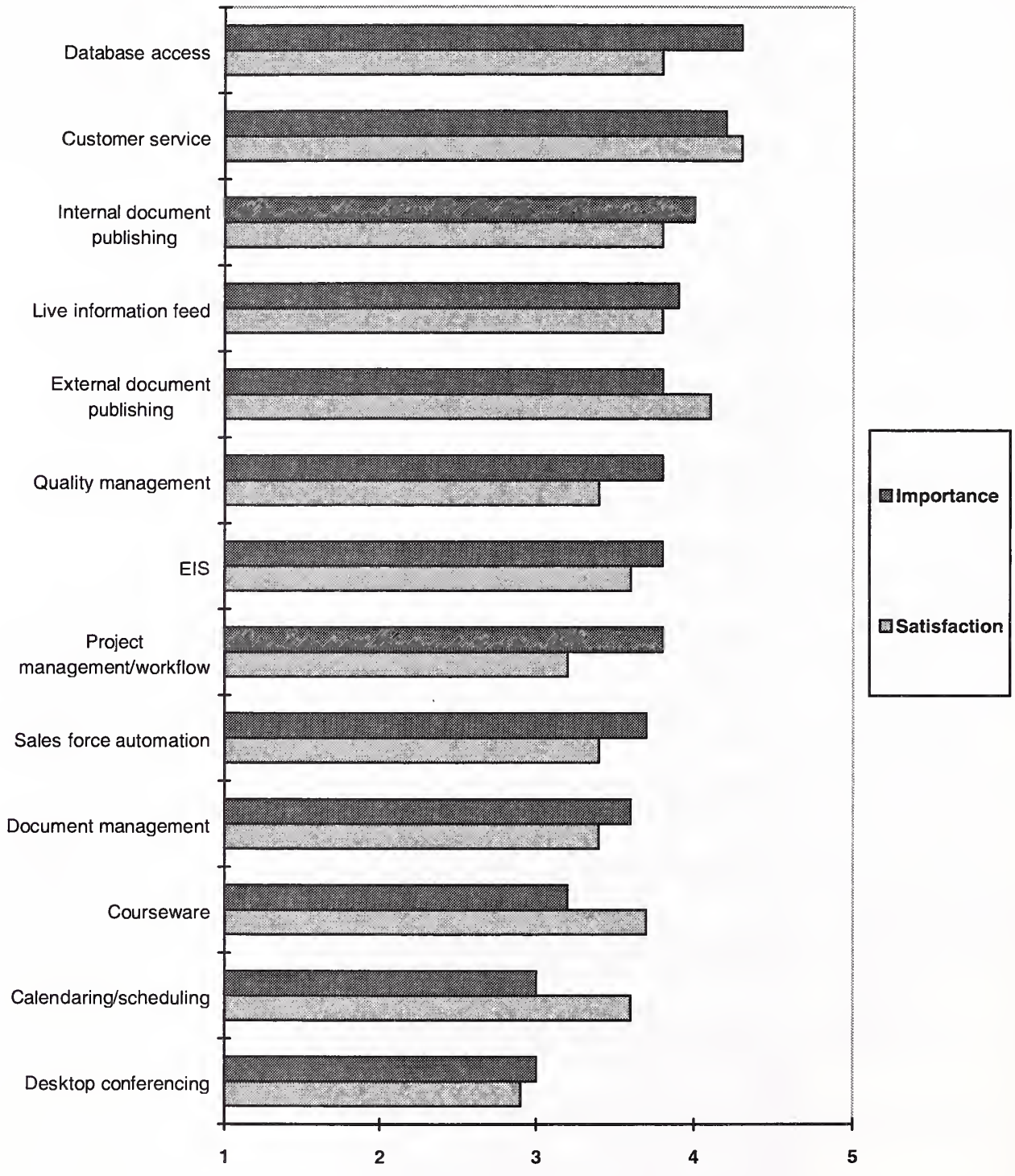
Notes Applications—Importance and Satisfaction



Source: INPUT

Exhibit IV-4

Intranet Applications—Importance and Satisfaction



Source: INPUT

Exhibit IV-5 shows the average importance of and satisfaction with the 13 applications rated by Notes and Intranet users.

Exhibit IV-5

Average Application Importance and Satisfaction by Platform

Platform	Importance	Satisfaction
Notes	3.9	3.6
Intranet	3.7	3.6

Source: INPUT

Among Notes users, satisfaction with current applications equals or is greater than the importance attached to those applications in two instances. Among Intranet users, this is the case for four applications, and the margin by which satisfaction is higher than importance is significantly greater.

For all 13 applications, Intranet users were more satisfied with their implementations than Notes users are with theirs in seven cases. Exhibit IV-6 shows for each platform which three applications were rated especially highly in comparison with the other platform. For example, Notes users gave a satisfaction rating of 3.9 for their Notes-based project management applications, compared with the rating of 3.2 received for Intranet project management applications by Intranet users, 22% higher.

Exhibit IV-6

Top Rated Applications—Platform Comparison

Top three applications	Notes satisfaction	Intranet satisfaction	Difference (%)
Notes:			
Project management/workflow	3.9	3.2	22
Document management	4.0	3.4	18
Sales force automation	3.8	3.4	12
	Intranet satisfaction	**Notes satisfaction**	
Intranet:			
EIS	3.6	3.1	16
Courseware	3.7	3.2	16
External document publishing	4.1	3.6	14

Source: INPUT

Notes received higher satisfaction ratings for applications designed for collaborative working. For example, the largest difference in satisfaction with applications between Notes and Intranet was in project management/workflow, a core groupware function. Intranets are rated more highly for applications where collaborative working is not a central theme. For example, external document publishing, an area in which an Intranet would be expected to work well: Intranet servers are the same as public Web servers and so include the mechanism (HTTP) required to publish documents externally. Notes has not been particularly strong in this area, which has only recently begun to be addressed with the release of Notes 4.0. Only later in 1996 will the Internet document publishing capability of Notes, InterNotes, be included in the standard Notes package.

According to respondents' perceptions across both platforms, the two most important elements of a groupware environment are customer service applications and database access. Intranet platforms are rated slightly higher for both applications. Like external document publishing, customer service relies heavily on external communications, not a traditional strength of Notes. Customer support is increasingly taking place over the Internet—through email, online knowledge bases, FAQs, and the emerging Internet-based workflow systems that can track customer support queries initiated from a public Web page. As Notes 4 becomes deployed en masse and third-party Notes applications based around Internet connectivity increase in number, more Internet-based customer service applications will be performed in Notes.

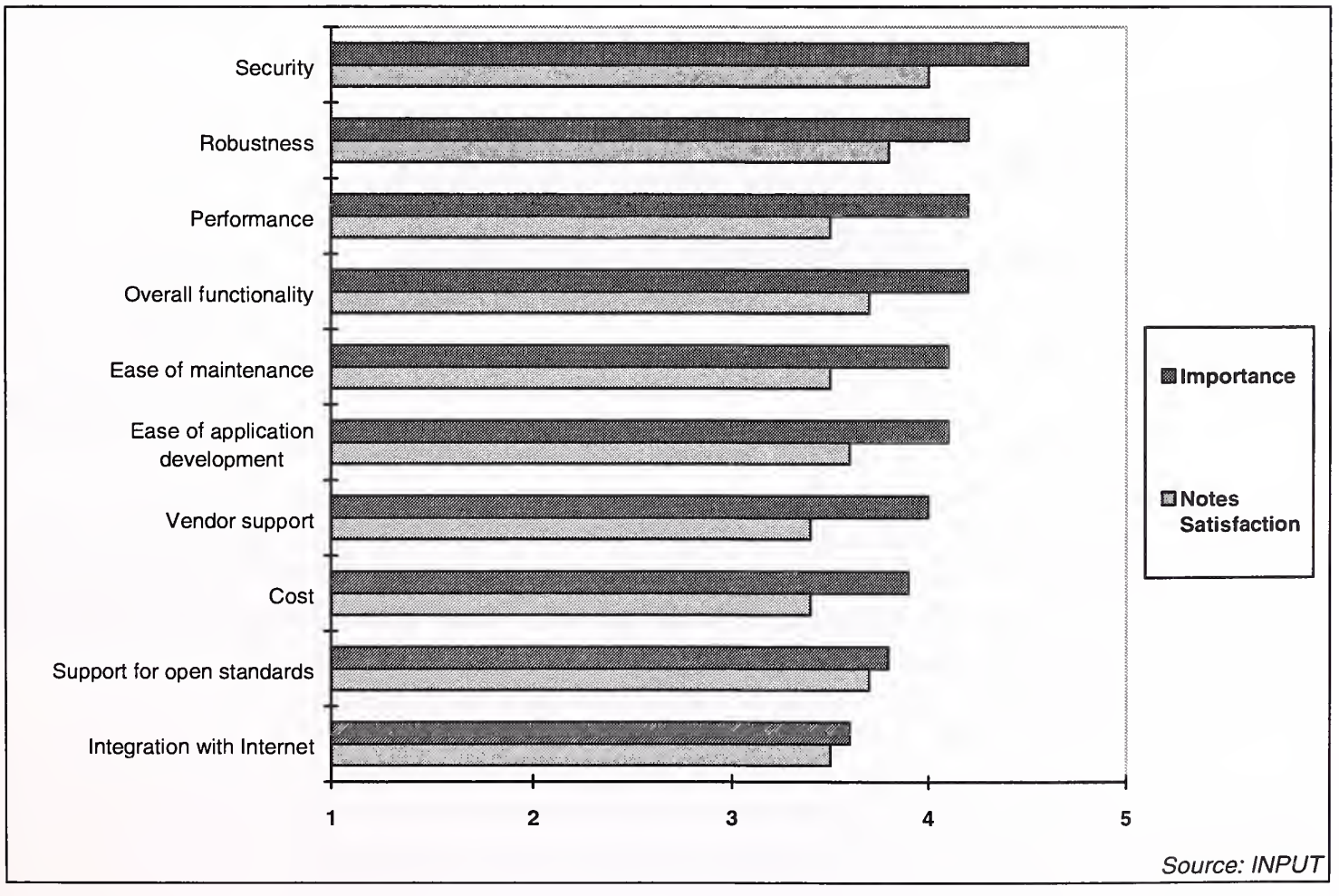
The near-equal satisfaction with database applications on both platforms may be surprising, given Notes' strong database architecture. Notes is a database-centric environment and support for multiple format database access from an Intranet is still immature. As Internet-based databases, such as Informix/Illustra's Universal Server, make their mark, the integration of Intranet clients and servers with RDBMSs will facilitate the development of industrial-strength database applications, enabling Intranet groupware products to compete even better in the database as well as the messaging arena.

C
Groupware Characteristics Importance and Satisfaction

Exhibits IV-7 and IV-8 show the importance attached to a number of groupware system characteristics by Notes and Intranet users, and how satisfied those users are with their current platforms for each characteristic.

Exhibit IV-7

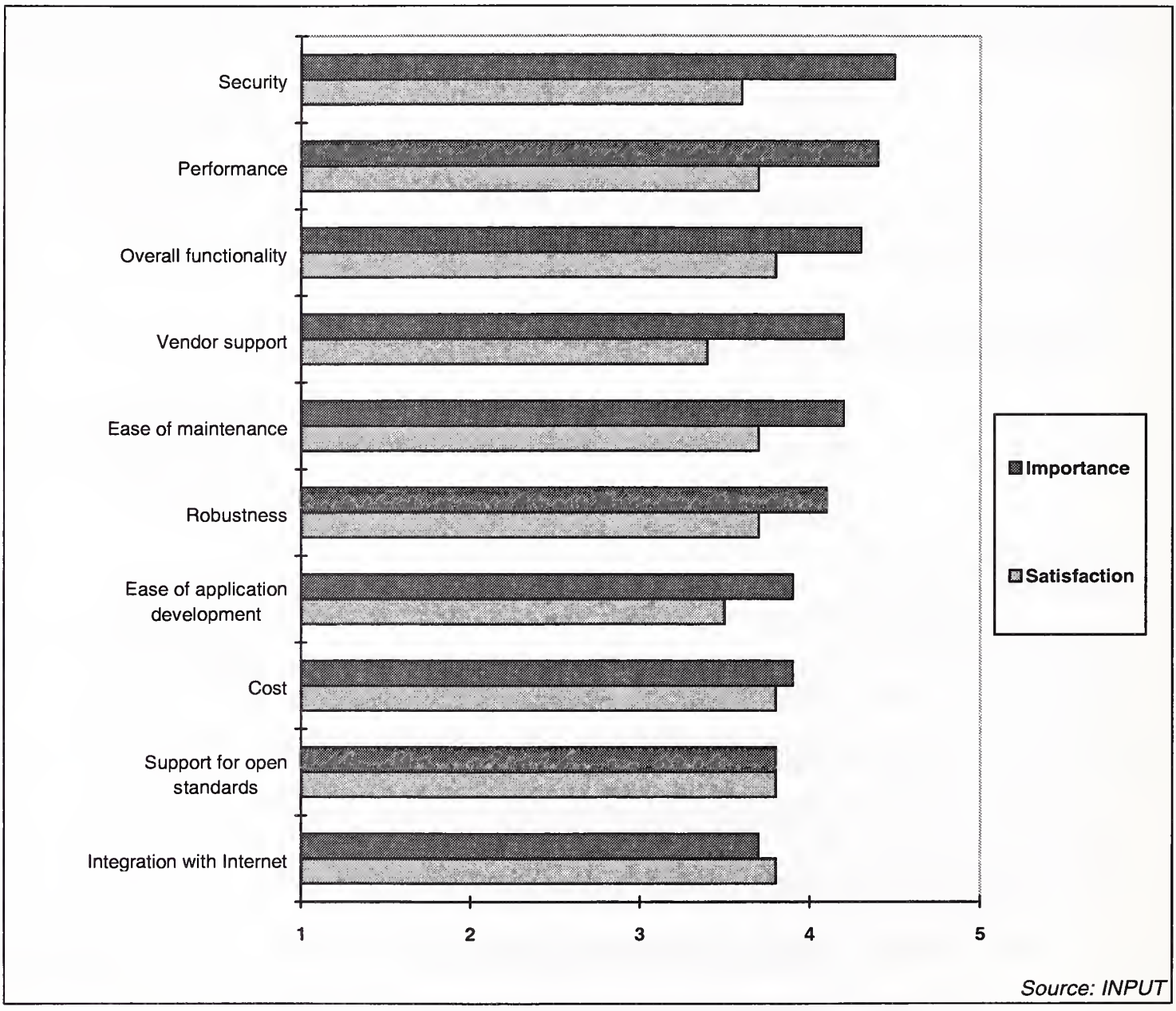
Notes Groupware Characteristics—Importance and Satisfaction



Source: INPUT

Exhibit IV-8

Intranet Groupware Characteristics—Importance and Satisfaction



Source: INPUT

Overall, security, performance, and functionality were considered the three most importance characteristics of a groupware environment. Notes is rated highly on security, and Notes and Intranet are rated more closely on performance and functionality.

Security is understandably stronger currently in Notes than within most Intranet environments. Like most aspects of Notes, security is part of the whole integrated system, and security technology from RSA Data Security is provided at the server, database, form, and field level. But it is the lack of a commonly accepted, universal security framework for the Internet and therefore Intranets, that is the cause for the low rating.

Very strong security is achievable over the Internet today (and again, therefore, Intranets). But only in certain situations—where a Netscape client talks to a Netscape server for an SSL- (Secure Sockets Layer-) based transaction, for example. The Internet security issue is a temporary issue. Soon after an industry-wide security system is agreed, Internet commerce and confidential transactions will explode. Such an industry-wide solution will be available during 1996 or early 1997, and will be in widespread use in 1998. By this time, issues such as US government security exportation restrictions, which limit mechanisms used outside the US to low-grade security, will have been resolved. The major financial and Internet technology vendors (including Visa, Mastercard, American Express, Microsoft, and IBM) are currently working co-operatively on a security system based on RSA's technology.

Notes was also rated higher on overall functionality. Breadth of functionality is one of Notes' strongest selling points, and is one of the most common criticisms levelled at Intranets, due to that platform's immaturity. Notes was not rated considerably higher, however. The relative ratings bear out analysis of other software application usage—large, all-purpose applications provide most of the functionality needed for most purposes but at the same time too much functionality for most of the time. The Pareto law applies: 80% of time spent with an application involves 20% of that application's functionality.

When applied to Notes and Intranet platforms, we see that Intranet groupware products provide around 20% of Notes' functionality. As dedicated application platforms, therefore, they fulfil many users' needs well without a Notes-style cost, installation, and management overhead, although users must take care to make sure any prospective Internet groupware product meets requirements. In addition, the open nature of Internet technology and products makes integrating different systems, to combine functionality, easier than in a proprietary environment.

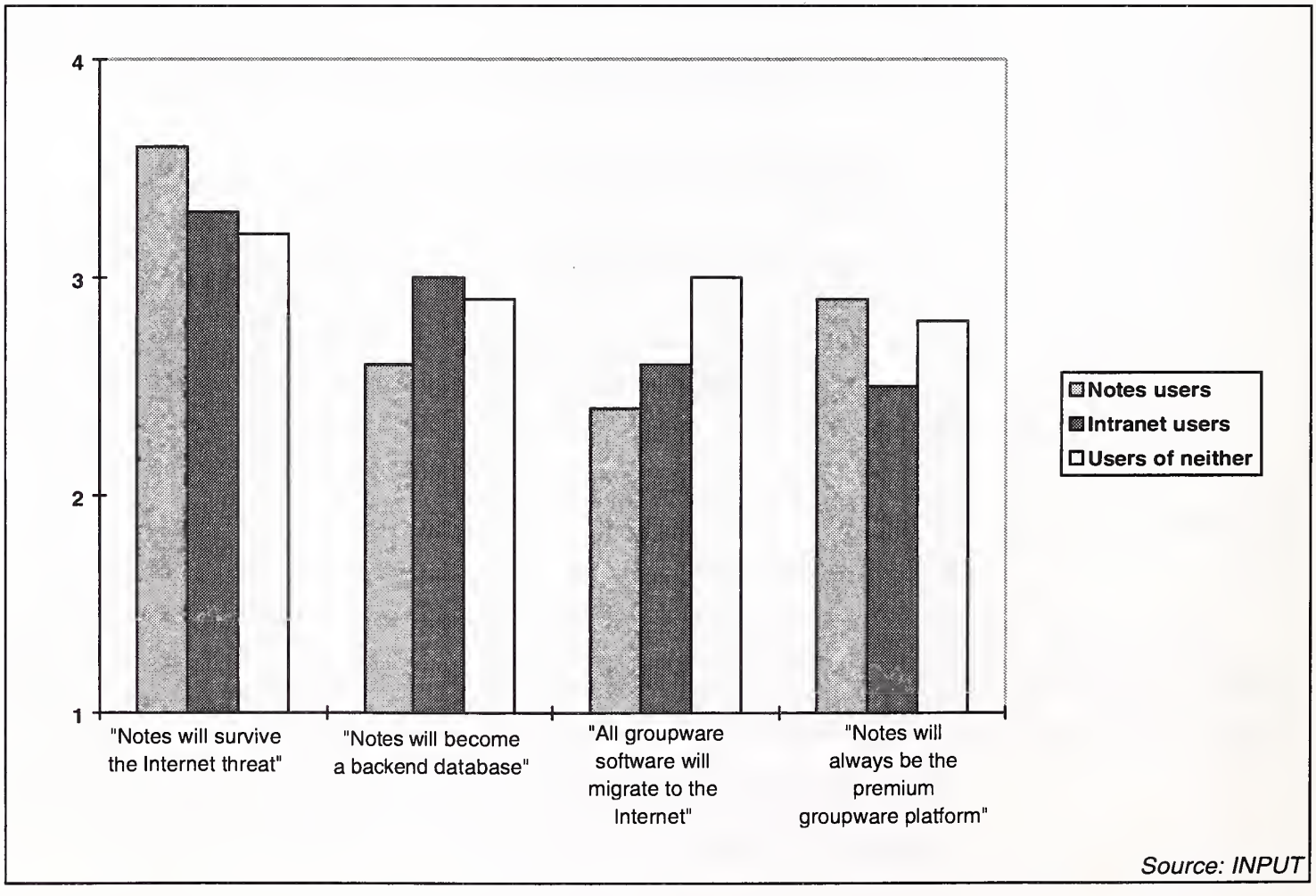
Intranets are favored on cost. Until recently, the purchase price of a Notes installation was considerably higher than for an Intranet environment. While the overall cost of a Notes installation has dropped, particularly

when Notes applications are accessed within a company from a Web browser instead of a Notes client (i.e. when Notes applications operate in the style of Intranet applications), IS overhead can still be one of the biggest cost factors. This overhead includes application development, which will remain more of an issue for Notes than for Intranet sites, as a higher proportion of Notes applications are, and will in the future be developed in-house.

D
User Perceptions of Notes' Future

Exhibit IV-9

Users' Perceptions of Notes' Future



Source: INPUT

INPUT asked interviewees to signify their level of agreement with four future scenarios. Most were relatively pessimistic, with the exception of those expressing a higher level of belief that Notes will survive the Internet threat. Current Notes users were predictably the most enthusiastic about Notes' future. Overall, respondents disagreed most strongly with the statements "All groupware software will migrate to the Internet" and "Notes will always be the premium groupware platform".

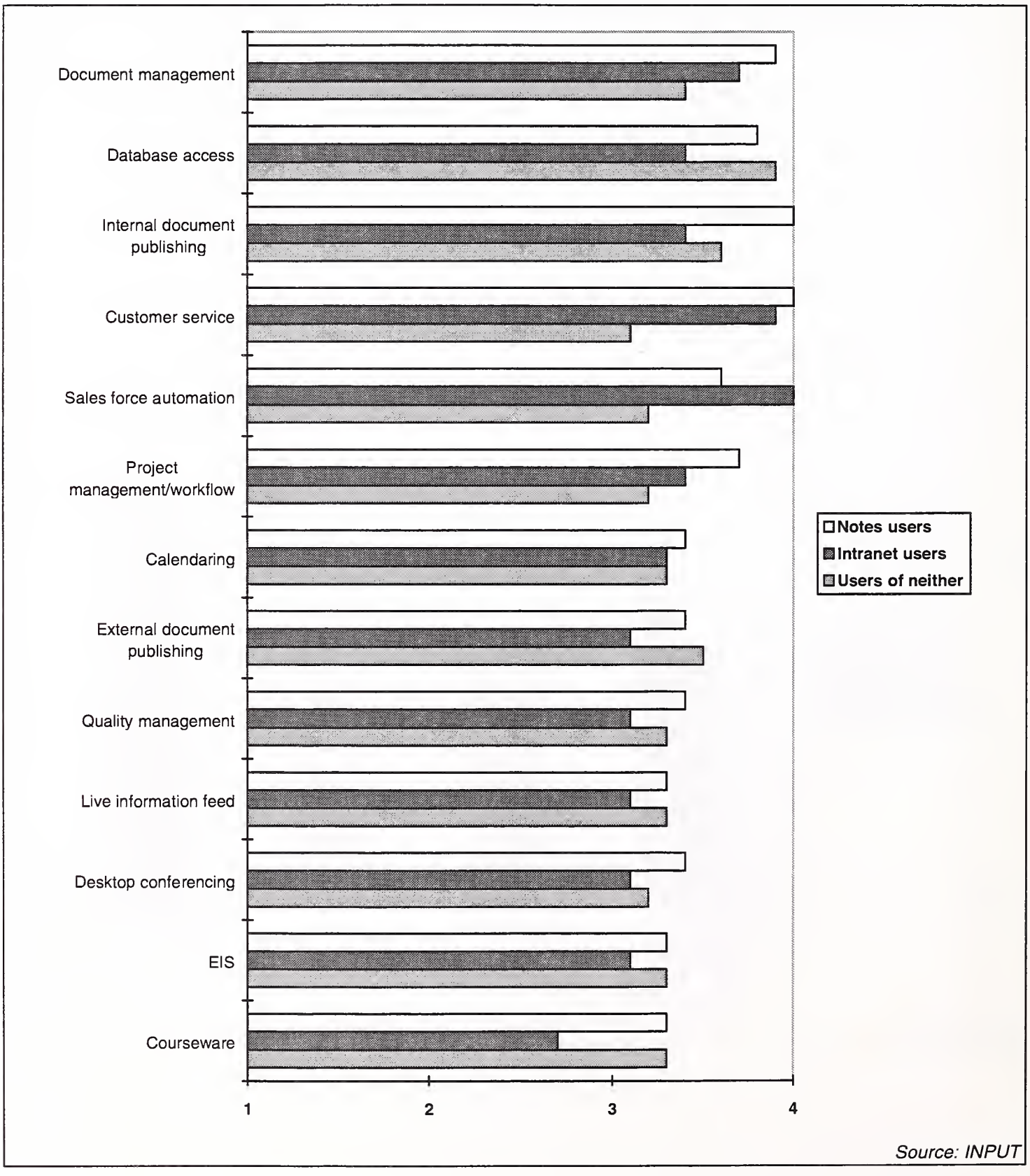
This indicates that users perceive Notes' future competition coming from non-Internet products, which currently include Microsoft's Exchange and Novell's Groupwise.

E

Suitability for Groupware Applications

Exhibit IV-10

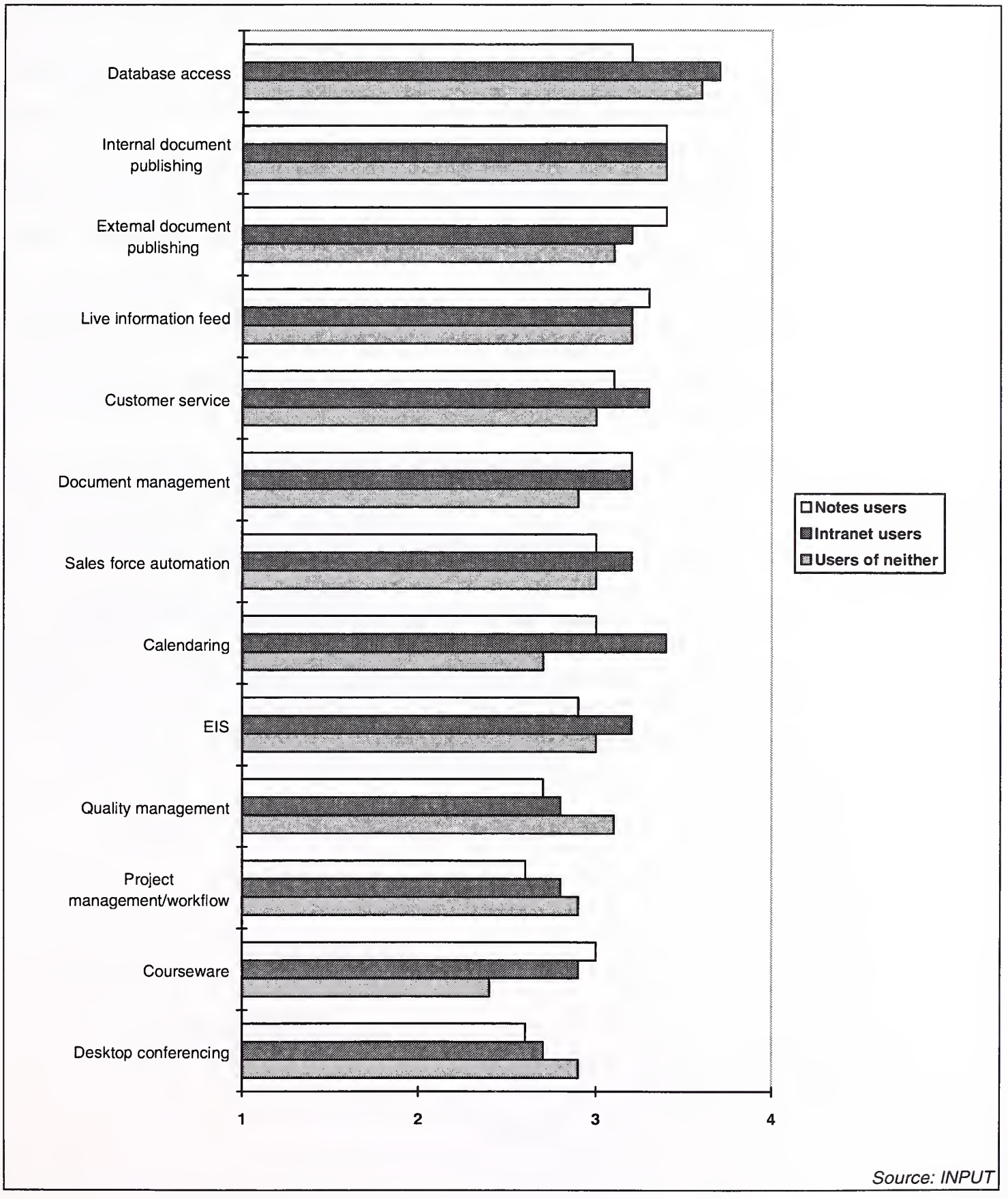
Perceived Suitability of Notes for Groupware Applications



Source: INPUT

Exhibit IV-11

Perceived Suitability of Intranet for Groupware Applications



Source: INPUT

Notes is perceived as a more suitable platform than Intranets for groupware applications, by a significant margin. However, whereas the satisfaction ratings given for Notes applications highlight Notes' collaborative working capabilities, users' perceptions of Notes' suitability for applications emphasize the more static applications. Document management, database access, and internal document publishing are seen as the top candidates for application of Notes, rather than classic groupware functions such as project management/workflow, calendaring, and conferencing. For all applications but one, sales force automation, Notes users perceive Notes to be more suitable than do Intranet users.

The Intranet platform is seen as most suitable for database access, internal document publishing, and external document publishing. The document publishing applications are to be expected—Intranets are replicas of the public Internet, which is still dominated by static document publication—but database access may be less obvious to some.

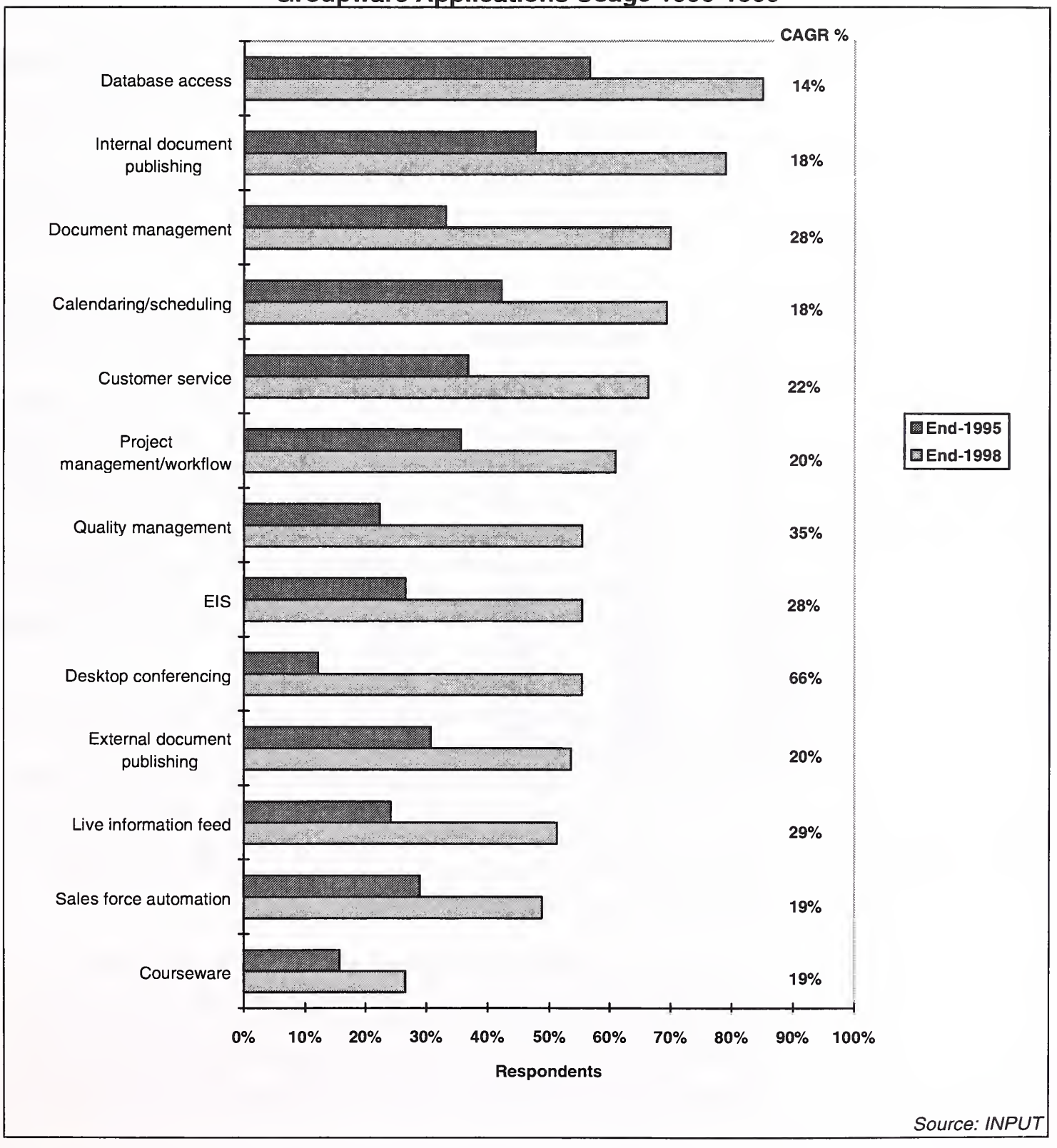
This is an indication that organizations are beginning to realize the broad potential of Intranets. Far from being restricted to publishing internal Web pages, they can be used to tie together existing information systems, be they PC LAN, client/server or legacy mainframe/minicomputer systems. This can be partly achieved by using a Web browser as a front end to a database server, either through third-party tools that allow Web browsers to connect to SQL (structured query language) or ODBC (open database connectivity) databases, or through a new breed of databases (such as Illustra's Illustra Server and Oracle's Universal Server) that support Internet protocols by default.

F

Application Usage

Exhibit IV-12

Groupware Applications Usage 1996-1999



Source: INPUT

Exhibit IV-12 shows the penetration of groupware applications currently and by the end of 1998 for all respondents using Notes or an Intranet now or who will do so within three years. Desktop conferencing, live information feeds, EIS, quality management, and document management are the fastest growing applications.

Desktop conferencing is the outstanding 'hot' application, with the number of respondents making use of it between now and 1999 more than trebling. It is currently the least used, and perceived as the least important application.

As bandwidth drops in price, so multimedia conferencing will become a commonplace, hence the high growth rates predicted over the next three years.

Many low-cost multimedia conferencing products are becoming available for the Internet, and these can be applied very successfully to an Intranet. The greatest limiting factor of conferencing, particularly videoconferencing, is network bandwidth. For internal company local networks, be they existing LANs or Intranets, bandwidth is not a major problem. While full-screen, full-motion video requires upwards of 10Mbps, which, being the same as Ethernet speed, would swamp many LANs, videoconferencing can be accomplished satisfactorily with lower resolutions, color depths, and frame rates, so lowering dramatically the bandwidth required. With compression, video can be transmitted over relatively low-speed lines, although quality quickly drops to unacceptable levels.

On most LANs, videoconferencing uses the fact that data packets put on the network reach all machines connected to the network. On the Internet, the same does not apply: packets are routed from one node to another, with no guarantee that it will pass any particular node on the way. A very limited solution is available: Mbone is a protocol layer that allows multicasts to take place without the data being transmitted separately to every conference attendee.

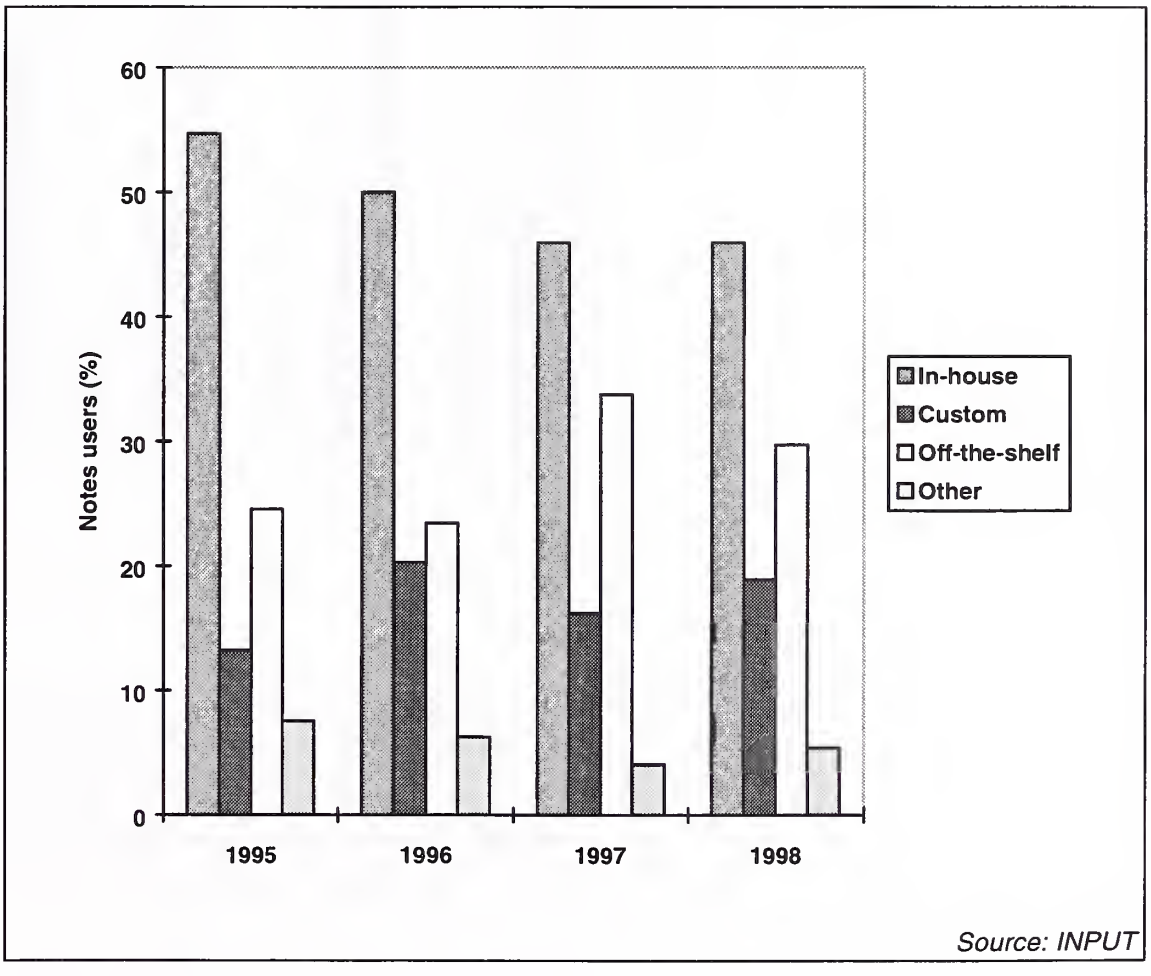
In reality, no reliable widespread solution exists, and external conferencing with customers and partners is not within easy reach of many companies. Sufficient bandwidth has to available at both ends to make it work, and many companies' customers and partners are small organizations not yet able to budget for high-speed Internet connections.

G
Application Procurement

Exhibits IV-13 and IV-14 show how groupware application procurement will change over the next three years. Notes users expect to change the ways in which they procure applications, from in-house development to shrink-wrapped applications. Intranet users do not perceive a great change in the ways in which they procure applications.

Exhibit IV-13

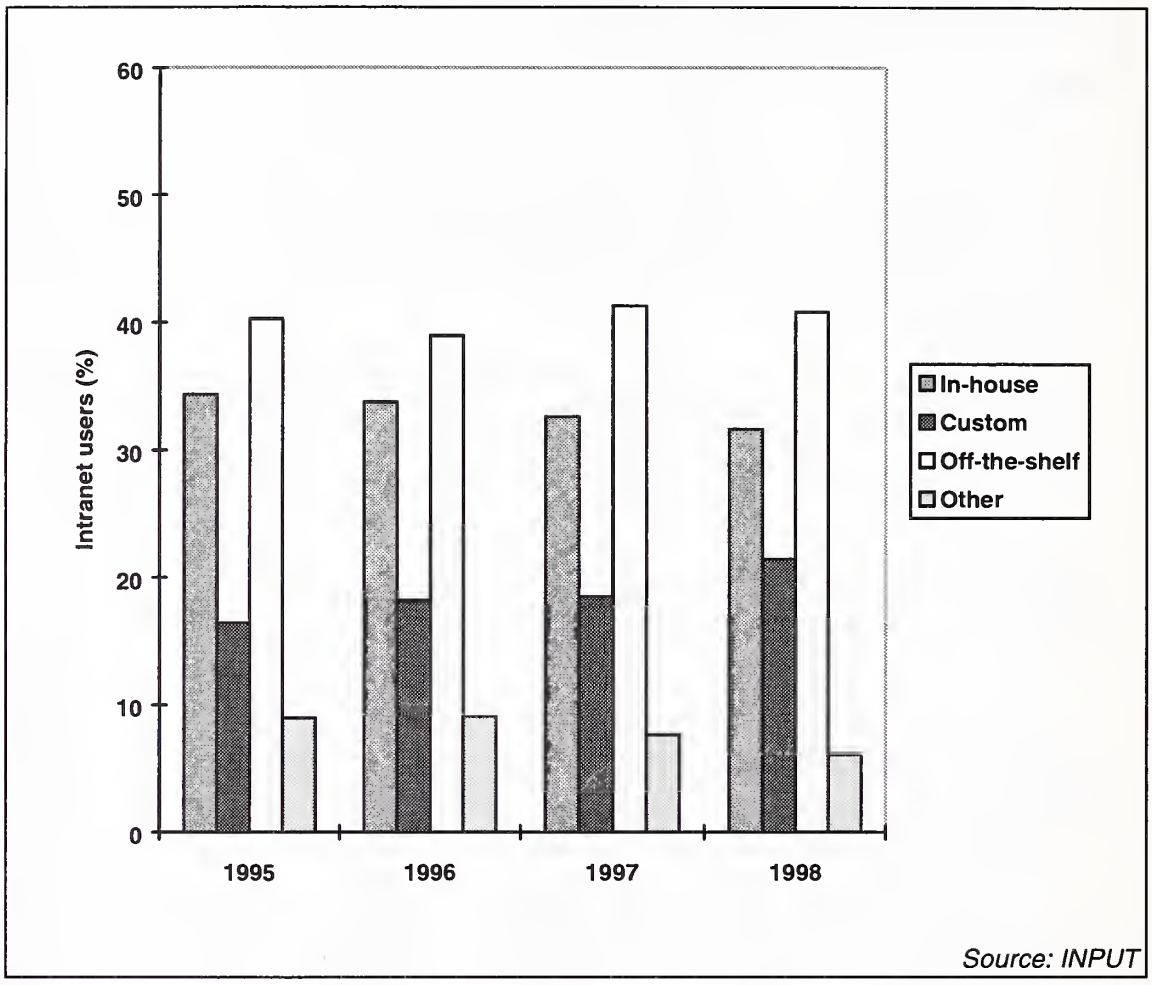
Notes Groupware Application Procurement



Source: INPUT

Exhibit IV-14

Intranet Groupware Application Procurement



Source: INPUT

Application development in Intranet environments is currently not as sophisticated as with Notes. Only some groupware applications include a development capability. Others rely on linking to applications written in high-level Internet languages such as Java, JavaScript, and VisualBasic Script or in low-level scripts such as Perl.

The potential size of the Internet application software market is enormous. It was measured at $780 million worldwide at the end of 1995, increasing to $28 billion by the end of 2000 according to INPUT's *Worldwide Internet Market, 1995-2000* forecast. This rapid growth, combined with low-cost distribution mechanism (the Internet itself as opposed to distributors) and global reach are highly attractive to Internet application developers. The Internet has given rise to a thriving industry of small, low-cost applications developed by very small companies. This plays a large part in the popularity of ready-made applications for an Intranet environment, as does the tradition of peer support and collaborative development found on the Internet.

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Internet-Based Groupware Competitors to Notes

A
Digital Equipment: Workgroup Web Forum

1. Introduction

Digital was an early supplier of collaborative group working technology with its office automation system, ALL-IN-1. While this was firmly entrenched in the minicomputer era, it gave the company valuable early experience in team working software which lead first to Workgroup Web (Digital's team collaboration software for LAN-based PC clients) and then Workgroup Web Forum, Digital's current offering for Internet-centric groupware. Workgroup Web Forum combines team collaboration services with Internet technology to provide file-sharing and online conferencing capabilities.

2. Product

The server software can be installed on top of existing Web servers (NCSA, Netscape, and Purveyor) running on Windows NT or Digital UNIX platforms. While Workgroup Web Forum runs over TCP/IP networks, existing files stored on LAN file servers or locally on clients can be uploaded to Workgroup Web Forum servers.

The Workgroup Web Forum server can be accessed by any Web client (Digital has developed a modified version of Mosaic for PCs, Apple Macintoshes, and Digital UNIX-based workstations) from within or without an organization via TCP/IP. A multi-level password system grants or denies clients read/write access to files and participation in conferences.

Users can sort databases, discussion threads, and conferences by user name, project name, and data type into nested folders. Within the folder system, keyword searches, document abstracting, and content-based retrieval can be used to navigate and access information quickly, using a Web-like hyperlinked environment. A 'What's New' facility is also available.

Realtime polling within the conferencing facility allows discussion groups to reach consensus quickly. Result of polls can be sorted and graphed post-ballot to provide quick analysis of meetings.

A Workgroup Web Forum Software Developer's Kit (SDK) is provided that includes templates of pre-written sample applications to use as building blocks. The SDK includes sorting, filtering, navigation, and automation tools.

3. Conclusion

As more Digital users install Intranets and begin using Internet-based software, Workgroup Web Forum is a natural first choice for certain groupware applications—notably conferencing and discussion. For a more complete groupware configuration, users will need to use Workgroup Web Forum in conjunction with a document management and publication system for more centralized applications.

Digital's strategy is to tie together its disparate and largely incompatible systems based on OpenVMS, Windows NT, and Digital Unix. The company needs to do the same with its groupware systems, which include ALL-IN-1 and TeamLinks Office. The best platform on which to do this is the Internet, and Workgroup Web Forum is Digital's starting point in integrating its groupware products around the Internet.

B
Action Technologies: ActionWorkflow Metro

1. Introduction

Action Technologies was founded in 1983 to develop workflow software products. The company's ActionWorkflow system was designed for Lotus Notes and Microsoft SQL Server, and this has been extended into a new product, ActionWorkflow Metro, launched in December 1995, that works over the Web. A US company, Action sells in 25 countries through direct sales and through systems integrators, VARs and distributors.

2. Product

Metro is a set of HTML 3.0 forms that are linked to server-based applications. As the forms are implemented in standard HTML and the applications reside and run on the server, external and mobile users can access the underlying applications through a standard HTML 3.0-compliant Web browser without having to install add-ons.

The top-level modules of Metro are:

- Metro Application Center—a suite of 20 business operation workflow management applications
- Metro Development Center—an optional application development environment for extending and creating new Metro applications

The Application Center is the set of forms and related applications (including customer service, sales, marketing, human resources, finance, accounting, and administration applications). Through their Web browser, users interact with these forms to initiate and monitor requests, handled on the server. Company staff can route and track these requests using the Action WorkBox, which provides a realtime status display of current workflow actions.

Three types of form are provided to manage the overall workflow process:

1. WorkBox forms provide each user with a realtime view of his or her workflow status
2. Initiation forms are used to activate a workflow item

3. Status and interaction forms are the heart of the workflow management process. They allow users to track and respond to requests, review the status of requests, view the workflow history of any action, and interact with any action's originator

Action identifies three basic types of interaction suitable for automating with Metro:

1. Personal coordination, allowing users to manage work, track requests and commitments, and engage in collaborative projects

2. Consumer business processes, including customer service, technical support, tracking of requests and commitments, and applications for credit or job approvals

3. Business-to-business interactions, for electronic commerce

Action's view of electronic commerce is based around the process of managing the complete transaction, not necessarily just the receipt of payment and delivery of goods. While commerce transactions can be initiated and fulfilled over the Web, not all eventualities are typically catered for. Order alterations, product returns, and billing problems often have to be resolved by traditional methods of communication. Metro includes commerce applications that treat transactions as workflow processes and provide services to address problems within the Metro framework. Only S-HTTP (Secure-HTTP) is currently supported for secure transactions.

Metro also supports document creation and publication, with or without the need for HTML coding depending on the complexity of the documents. Documents can be attached to workflow processes and disseminated among workers involved in any individual process.

Macromedia, developer of Director and Shockwave, has deployed Metro in a pilot project linking the company with one of its suppliers, and expects to extend its use to include inter- and intra-company workflow applications.

3. Conclusion

The breadth of applications bundled with ActionWorkflow Metro makes the product suitable for smaller organizations who need to automate their workflow processes with minimal administrative and application development overhead. As the application development facility is an optional extra to Metro, users pay for what they need.

The strength of Metro is its near-complete workflow automation capability. The major elements of workgroup automation—dynamic task status displays and task initiation and routing—are all supplied and the 20 predefined applications cover most typical situations.

Metro is limited by its relative lack of database capability, notably sophisticated document authoring and distribution. While documents can be attached to workflow processes, advanced document creation and editing is best performed with an external tool.

C
Radnet: WebShare

1. Introduction

Radnet is a startup created specifically to develop Web-based groupware in the form of its WebShare product. Its founders include Reed Sturtevant, former Director of Product Management and Design for InterNotes at Lotus.

2. Product

WebShare serves three major purposes: discussion, structured document management, and workflow tracking. All applications run on the server and are accessed by users via any HTML 3.0-compliant Web browser (some support is also provided for HTML 2.0 browsers).

The discussion system is based around fielded documents: within ordinary textual articles, users see and interact with embedded fields that exist in isolation or as a complete Web form. Forms-based interaction such as questionnaire filling and customer contact reports can therefore be performed within a discussion thread.

At the heart of WebShare is an ODBC-conformant database in which all documents are stored in SQL format. An automatic translator converts incoming and outgoing documents between HTML its internal format. This database, which currently runs only on Windows 95 and Windows NT servers, is the engine for all WebShare applications and discussions, and contains an embedded Web server, so does not require an existing Web server to be present. The internal SQL format enables existing non-Intranet SQL databases to be queried, and information extracted from them for inclusion within WebShare applications.

WebShare includes a development environment. A graphical tool allows users to construct the interface—structured, fielded documents—and JavaScript and VisualBasic Script code can be associated with documents and their fields to provide event-triggered processing. This enables event-driven tracking of documents and tasks, driven by intelligent document routing. A small number of pre-defined general-purpose applications are included with WebShare which can be used out of the box or modified for specific requirements.

Multiple levels of security can be assigned from the server: users can be categorized as , for example, anonymous, self-registered, and controlled, and documents and applications can be made available as required to each type of user. Developers can also assign permissions from within an application.

3. Conclusion

With its mix of discussion, document management and workflow tracking capabilities, WebShare is more fully-featured than most Internet-based 'groupware' software. It is based around the Notes model of a database rather than messaging architecture which lends itself to structured document management and server-based discussion as much, if not more, than it does to peer-to-peer applications such as scheduling and conferencing.

The SQL nature of WebShare will be attractive to many companies with large SQL databases and no budget to convert them to HTML. The on-the-fly translation between SQL and HTML eliminates much of the effort of running an Intranet systems parallel with existing legacy databases.

D
AEX Software: About

1. Introduction

AEX, a US startup, develops and sells the About server for Web-based discussion forums. The server is limited in its scope, like most Web-based workgroup products, but has the potential to provide a key element in the groupware mix when combined with other Web workgroup tools. It is not a full-featured competitor to Notes on its own, therefore.

2. Product

About organises group discussions into hierarchical folders which can be read and modified by users through any Web browser. Discussions can be embedded into Web pages containing other information, so integrating Web publishing and discussion.

About is a CGI script application that runs on an existing Web server. Its internal database format is proprietary, although the view presented to the user is standard HTML.

The product is designed to be used in place of Usenet groups and LAN-based discussion groups for internal communication, as well to offer additional advantages over such systems. Multiple levels of security are built into the server, and AEX claims particular strengths of performance and ease of system administration.

Every discussion is linked to predefined groups of users. Company workgroups, departments or other logically connected groups of employees need to be defined by the system administrator just once, as the groups are carried over across multiple discussions.

Secure read/write access, through use of passwords, can be granted based on individual or registered group access requirements, and discussions can be encrypted. Actions as well as discussions can be secured: for example, searching can be restricted to the owner or originator of a discussion.

Binary attachments to articles are not supported in the current release of About, but will be supported in subsequent releases.

About is a single-server environment; discussions are not replicated across multiple servers. This limits the possibilities for remote collaboration between separate sites where sub-optimal communications links are in place, but obviates the problem common with Usenet (NNTP) servers of propagation delays and misordering of articles.

Server administration is carried out over the Web; no explicitly local actions are required, such as editing of configuration files, so allowing administration from any location. Administrative access can be regulated by IP address filtering if necessary.

As with typical Usenet clients, discussions can be searched. In the current release of About, full body text searching is not supported and searching is limited to article subject and author. Users can also configure their view of discussions by including or excluding article attributes and limited administrative information such as access statistics per article.

Support for headers and footers is provided on a per-discussion basis, allowing a limited amount of information to be included in every article, such as posting policy, purpose of the discussion, and discussion owner contact details.

3. Conclusion

The major advantages of About are its relative simplicity and its tight integration with the Web. It is a server-only product and so does not require client software to be purchased, installed, and managed. This is attractive to companies requiring group-based discussion across an indefinite number of departments or employees. It also brings the phases of pilot and post-pilot deployment much closer together—as long as employees have existing access to the Web server on which About runs, there is no cost obstacle to indefinite scaling. The transition from pilot to full deployment becomes purely a business issue, not a technology issue.

While there is no client cost, the server is around the same price as the Notes server, at $500. (A version limited to single discussions is available at lower cost.) Comparing the functionality available in both products, Notes is vastly greater value for money. Yet for companies that do not require the all-encompassing functionality of Notes and the IS overhead it entails, but need group discussion, About is a good choice. The lack of replication makes it ideal for single-site environments or remote sites with reliable Internet connections, but is not the best tool to link large numbers of small sites.

E
University of Georgia: TCBWorks

1. Introduction

TCBWorks has been developed by the Terry College of Business at the University of Georgia. It is an evolving Web-based groupware system with emphasis on project management, meeting scheduling, and group voting.

Due to the evolving nature of TCBWorks, its developers encourage user participation to feed back into the development process. In addition to installing and running the software in-house, it is possible to create groupware projects on the College's server itself and access and administrate projects remotely.

2. Product

All information in TCBWorks is contained in 'projects', organized hierarchically into trees of sub-projects. The use of projects and sub-projects can give rise to meeting schedules and agenda, where each sub-project has a defined action program. Each project in turn is defined as a set of 'topics', also organized hierarchically. Similarly, each topic has a set of 'comments', a simple list of short descriptive notes.

Project members can vote on the topics contained in each project to reach consensus defining future actions. Voting is performed using a simple spreadsheet with up to 10 criteria. Votes and criteria can be changed during the voting process and final voting results can be displayed in a variety of ways including by topic order and by criteria results.

All access to TCBWorks projects is through any HTML 3.0-compliant Web browser (HTML 2.0 browsers will display most but not all information correctly). TCBWorks' interface is based around access and data entry. Access pages allow users to navigate around projects, create new projects, etc., and data entry pages allow information updating and voting through Web forms.

TCBWorks is still an immature product and will be enhanced during 1996 and beyond to enhance such elements as administration (whereby project owners will be able to select which users are able to participate in which projects and the level of access granted to individual project members) and security (which will feature a post-login encrypted user authentication code).

3. Conclusion

TCBWorks provides an organized framework for project management and group discussion. As it is an information rather than an application engine, it does not currently provide full-function applications behind that framework—automated tracking and dynamic status displays of workflow actions, and advanced event triggers, for example, are not supported.

Companies should treat TCBWorks as an experimental system that can be applied to practical applications today but which has the potential for more valuable applications over the next year, including team-based functions not found in all groupware systems such as group voting. Its hierarchical organization is best suited to project teams that operate according to well-defined project specifications rather than to an unstructured brief.

F
Netscape

1. Introduction

Netscape does not currently sell a full groupware product. Its present offering is Collabra Share, a document sharing and group discussion system the company took over when it acquired Collabra Software (announced in September 1995).

Netscape is currently developing the next major release of Netscape Navigator, to follow Navigator 2.0. This release will be the first of Netscape's 'universal window' onto networked applications. Navigator 1.x was primarily a Web browser with limited email and Usenet support; Navigator 2.x provides full email and Usenet functionality but is still primarily a window onto the Internet. The next version, to be released in the second half of 1996 and as yet unnamed, will be the full integration of Collabra Share and Navigator, designed as much for internal business groupware and workflow applications as for Internet use such as Web browsing, email, and Usenet.

Netscape intends its client to be not only a window onto the Internet but the platform on which any information-based application can be delivered and executed.

In addition to the client, Netscape is developing its next generation of Internet server to serve the expanding range of applications Netscape is designing its client to access. For discussion groups, it is extending the

Netscape News Server which will host forums currently residing on Collabra servers in addition to existing Usenet-based newsgroups.

2. Product

Netscape Navigator is already a general-purpose Internet client. It includes a two-way email client and Usenet client, but more importantly is based on an extendible architecture: through plug-ins, new data formats and specialized clients can be integrated as they appear. The aim is to develop Navigator to the extent that it can serve as a user's single window onto the Internet, and Netscape intends this to be true of groupware as well (and ultimately not just of groupware but of all network-based applications).

The release of the integrated Web browser will incorporate most of the Collabra Share functionality, notably the messaging and discussion elements.

Messaging will be based on both the existing Netscape and Collabra email systems. Share's use of email as the messaging backbone for directory services, login, notifications, and replication will be carried forward, as will Navigator's integration of email with discussion groups and Web pages. Netscape will also offer a mail server that will act as a messaging backbone within a company for internal communications.

For group discussion and conferencing, Netscape is extending its Usenet client to include features designed for internal as well as external (i.e. Usenet) discussions. New features taken from Collabra will include support for 'rich' content (such as graphics, embedded objects, Java, JavaScript, and plug-ins), news/email integration, searching capabilities, discussion group security, and, a first for Netscape, an offline capability. The lack of an offline functionality has always been evident to modem and ISDN users, but its introduction will be of equal value to mobile users.

Some of the planned new features currently exist in Collabra Share; others will be new developments.

To encourage customers of both Netscape and Collabra to move to the integrated product, Netscape is making available the Migration Agent, a set of tools that facilitate coexistence of Netscape and Collabra systems as well as assist in the transition to the new product when it becomes available.

The Migration Agent will perform bidirectional replication between Collabra discussion groups and Usenet newsgroups, in preparation for the move to the new discussion group architecture. Current Share documents include rich text, attachments, OLE objects, and hyperlinks to URLs and other internal documents, which the Migration Agent will move to the News Server.

Editing of OLE objects will not be supported in the initial release, however. Another problem users will face, notably where large numbers of users currently access lengthy discussion forums, is that the read/unread status of discussions will not be preserved in the new product. While this is not a big problem for casual users of newsgroups, it has the potential to cause confusion for large discussion groups. Either Netscape or an enterprising third party has the opportunity to address this migration problem which will affect to some degree nearly all current Collabra users.

Typically, replicated Collabra servers are connected hierarchically. Collabra's Replication Agent is in principle similar to the Notes replication engine, and assigns and manages 'hub' servers. This is different from the way Netscape News Servers will be connected; they will replicate in less hierarchical, distributed fashion, more like NNTP-style propagation. This is another area in which potential problems could occur in the transition between Collabra and Netscape environments.

3. Conclusion

Netscape is not offering a full-featured groupware application in the style of Notes, but rather a platform well suited to groupware applications. All the important messaging-based groupware elements will either exist in the forthcoming integrated Netscape product, exist today, or will be provided as plug-ins or Java applications by Netscape and third parties.

The most groupware-like element of the Netscape/Collabra integrated system will be the group discussion and conferencing capability. This is the most popular aspect of Collabra Share, and its implementation will mean that the integrated product provides enough functionality on its own to fulfil groupware needs in some cases.

Netscape aims to develop the de facto standard platform on which any information-based application can be delivered and executed. The company is clearly aiming at the future space currently occupied by Microsoft—Windows is the standard application environment today, but is not necessarily suited to this role in the networked world.

We have yet to witness the explosion of Java applications that will propel the use of Web servers and browsers like Netscape's, which include Java development and execution environments as well as published APIs. When this explosion happens, the availability of native Web-based groupware products will increase dramatically. Platforms such as Netscape's, rather than top-level applications such as Notes, will be in a prime position to benefit. For these reasons, Netscape is a 'safe bet' for corporate purchases.

G
Bittco Solutions: Co-motion

1. Introduction

Bittco's Co-motion is a realtime Internet-based group conferencing system for the Apple Macintosh and PC that has been developed from the company's LAN-based conferencing technology. With the emphasis on realtime conferencing, typical applications include virtual meetings and classrooms, customer focus groups, and brainstorming.

2. Product

Co-motion is built around realtime conferencing 'sessions', designed to function as virtual meeting rooms. The primary design goal is to enable idea-sharing and voting meetings to be held between group members regardless of location. The product is not currently fully integrated into the Web, as a proprietary client is required.

A session is a shared document that contains all information pertaining to the meeting the session represents, including agenda, comments and discussion, action points, ad hoc ideas, idea brainstorming, and idea evaluation. As sessions unfold, members can introduce new ideas and actions which are flagged on each user's screen for attention and subsequent voting.

Users can take part in multiple simultaneous sessions, with each session being associated with a defined group of members. In addition to discussion, documents can be shared between individuals and private members.

While Co-motion is not fully integrated into the Web (i.e. it does not run within a Web browser), it supports linking from and to the Web. URLs can point to sessions so they can be entered from a Web page as well as from the Co-motion client, and URLs exchanged during a session remain active links, so that clicking launches a user's local Web browser and loads the page. As well as Web pages, URLs can include email and FTP addresses which invoke the user's email or FTP client.

As ideas are created and discussed through the methods available (brainstorming, agenda items, etc.), they can be evaluated by session members. Individual items are voted on and result reports can be generated and disseminated instantly. Ideas, sessions, minutes, and voting results are stored, for immediate and future review and analysis.

As well as the virtual meeting rooms, private (one-to-one) and public (many-to-many) chatting is supported.

Multiple levels of security can be applied to individual sessions—sessions can be open to all, restricted to defined groups, or held on an invitation-only basis. Access is granted by a password entry system.

3. Conclusion

Co-motion is useful tool but far from a full groupware product. Its strength is that its single-purpose nature addresses a highly common problem well, yet it is also flexible enough, with its meeting formats, voting, and unstructured chat facility, to find application in a wide variety of situations. Its relative simplicity brings with it low cost and low administrative overhead, although this must be offset by its need for a proprietary interface.

This requirement for a separate client application is Co-motion's main weakness, and it limits the product's scalability. As applications shift from the platform-specific, local environment to the Web, specialized, proprietary interfaces will be tolerated less frequently for most types of application. Realtime conferencing has not been possible until recently on the Web, due to the lack of server push capabilities within Web servers. This is not an insurmountable obstacle, today, however.

Co-motion has undergone the shift of network platform; now Bittco must complete the transition with a client interface shift to the Web. In the short term, this may be accomplished with a Web forms-based server application. For the longer term, a port to Java will be necessary. Either way, Co-motion must move away from a clientside to a serverside architecture.

H
Groupware Functionality Comparison

Exhibit V-1 is a comparison of Notes and Internet groupware functionality.

Exhibit V-1

Notes and Internet Groupware Functionality

	Lotus Notes	Digital Workgroup Web Forum	Action Technologies Action Workflow Metro	Radnet WebShare	AEX About	Netscape Collabra
Discussion	✖	✖		✖	✖	✖
Document management	✖			✖		✖
Workflow	✖		✖	✖		
Conferencing	✖	✖				✖
Project management	✖	✖				
Calendaring	✖					
Whiteboarding	✖					
Messaging	✖			✖		✖

Source: INPUT

(Blank)

VI

Market Forecasts

Exhibit VI-1

Notes and Web Groupware Users, Worldwide

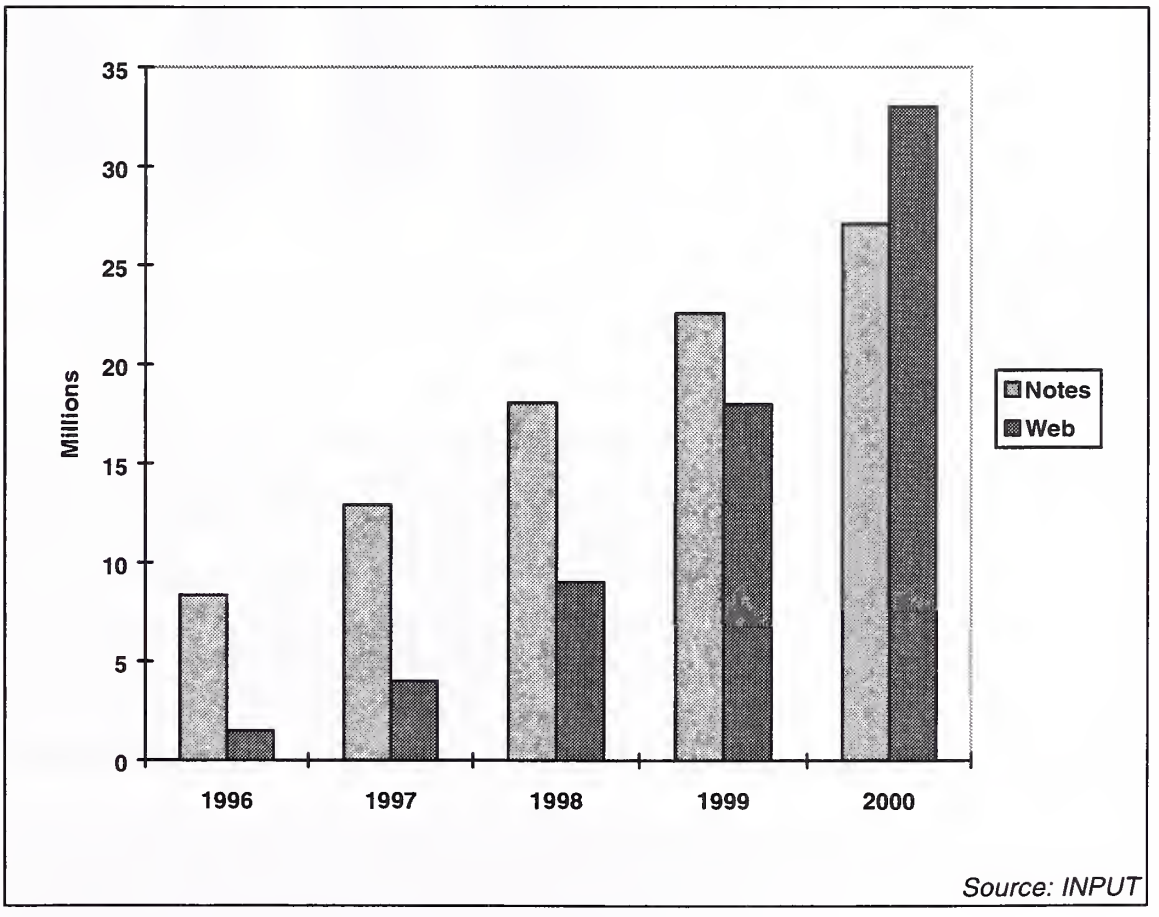
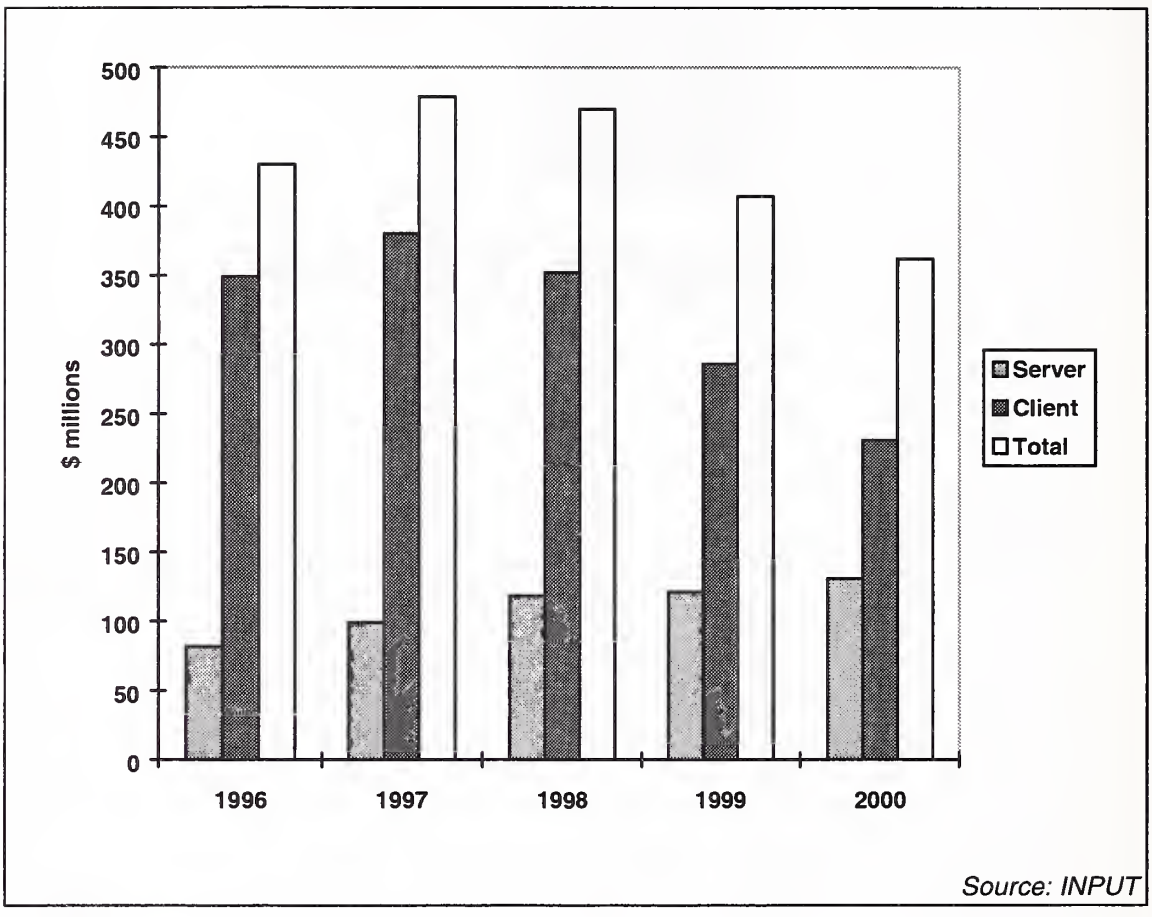


Exhibit VI-1 shows the numbers of groupware users of Notes and Web applications, measured in millions. Users of Web groupware applications will outnumber Notes users by the end of 2000. Notes 4 will fuel continued near-linear growth, and support for Internet technology, with eventual incorporation into the Web, will drive Notes to the end of the century.

Exhibit VI-2

User Spending on Notes Clients/Servers, Worldwide



Source: INPUT

Exhibit VI-2 shows user spending on Notes clients and servers, in US$ millions. 1996 and 1997 will see strong sales of Notes followed by an overall decrease to 2000. Sales in 1996 and 1997 will be driven by Notes 4 which has been met with enthusiasm from both users and non-users. With support for Internet standards included in Notes 4, which will increase during 1996 with the release of an HTTP Notes server, plus enhancements to the rest of the product and a revised pricing model, Notes 4 will remain attractive in the medium term to many companies.

Sales will drop from 1998 onwards as fully featured groupware systems for the Web platform become accepted. While such products are available now, they are immature and it will take two years for them to have a significant affect on sales of Notes.

Notes spending is decreasing despite overall growth in numbers of users. This is caused by:

- The revised pricing model initiated at the beginning of 1996. While the cost of a server increased, client pricing halved. The drop in client price has a significant affect on Notes revenues and is the primary cause for overall revenue decrease

- The extension of Notes to include support for non-Notes users accessing applications through Web browsers. This ability is currently provided through InterNotes and will become a native feature of Notes by the end of 1996. By the end of 2000, only around 55% of Notes users will use a dedicated Notes client/server combination

Exhibit VI-3

User Spending on Web Groupware Clients/Servers, Worldwide

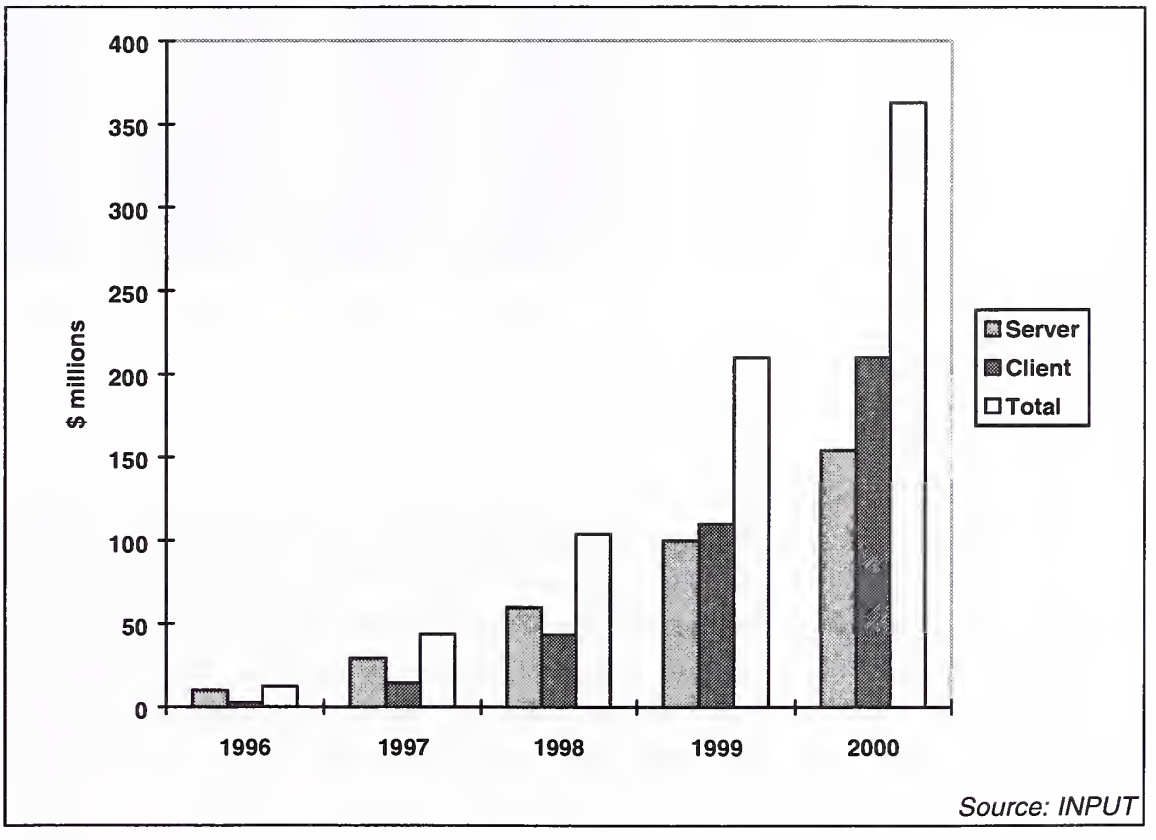
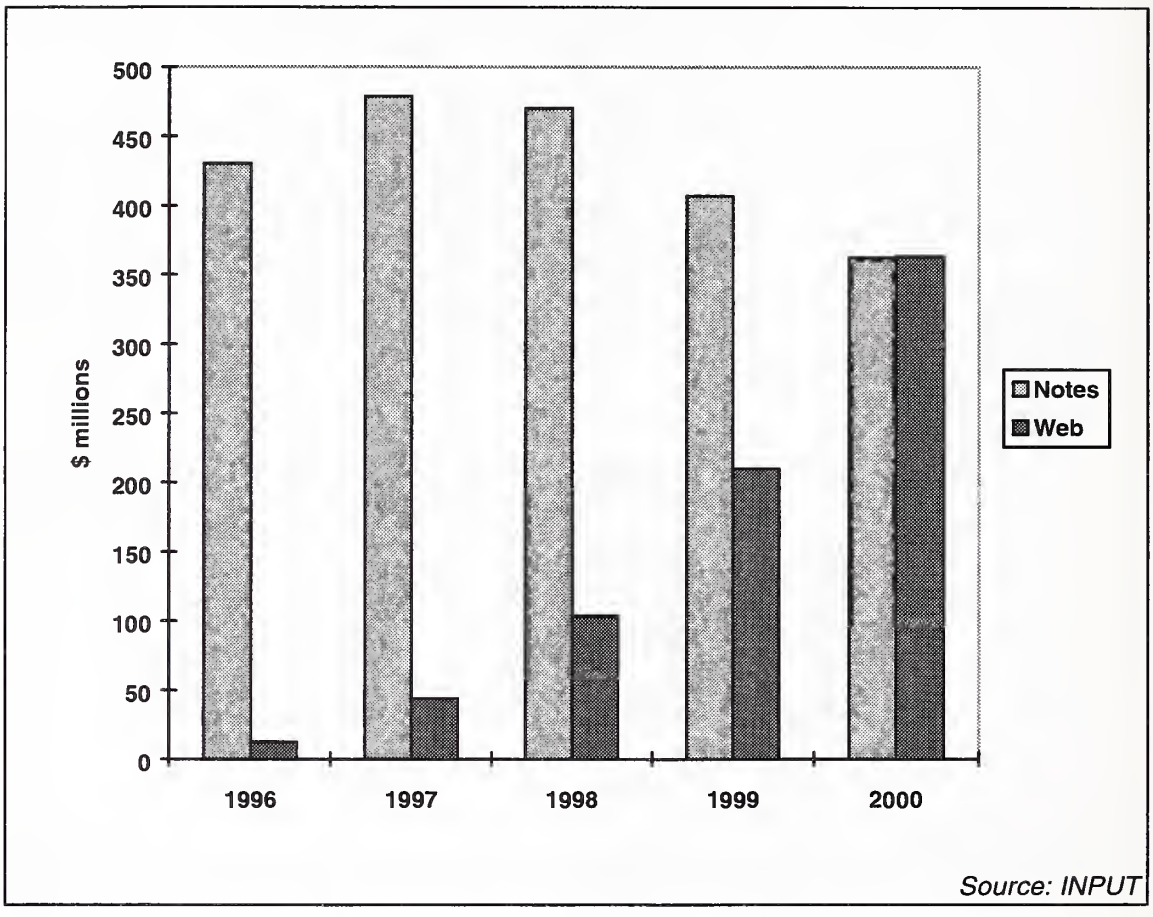


Exhibit VI-3 shows user spending on Web groupware clients and servers, in US$ millions. Web groupware is immature yet about to take off. Much of the current Web groupware offerings are server-only products that are accessed through existing Web browsers. While this is the standard model for all Web applications, more use will be made in the future of Web browser plug-ins to effect advanced groupware functions and provide specific functionality unavailable in a plain vanilla Web client. This accounts for the increase in Web groupware client spending relative to server spending.

Exhibit VI-4

Notes and Web Groupware Client/Server Spending Congruence



Source: INPUT

Exhibit VI-4 shows that spending on Notes and Web groupware clients and servers (excluding add-ons) will meet by the end of 2000. While the number of Web groupware users will be greater at this time, the lower cost of Web groupware application servers and, particularly, clients (in many cases no client cost exists) means lower spending overall for Web groupware.

Exhibit VI-5

Total Notes-Related Software, Worldwide

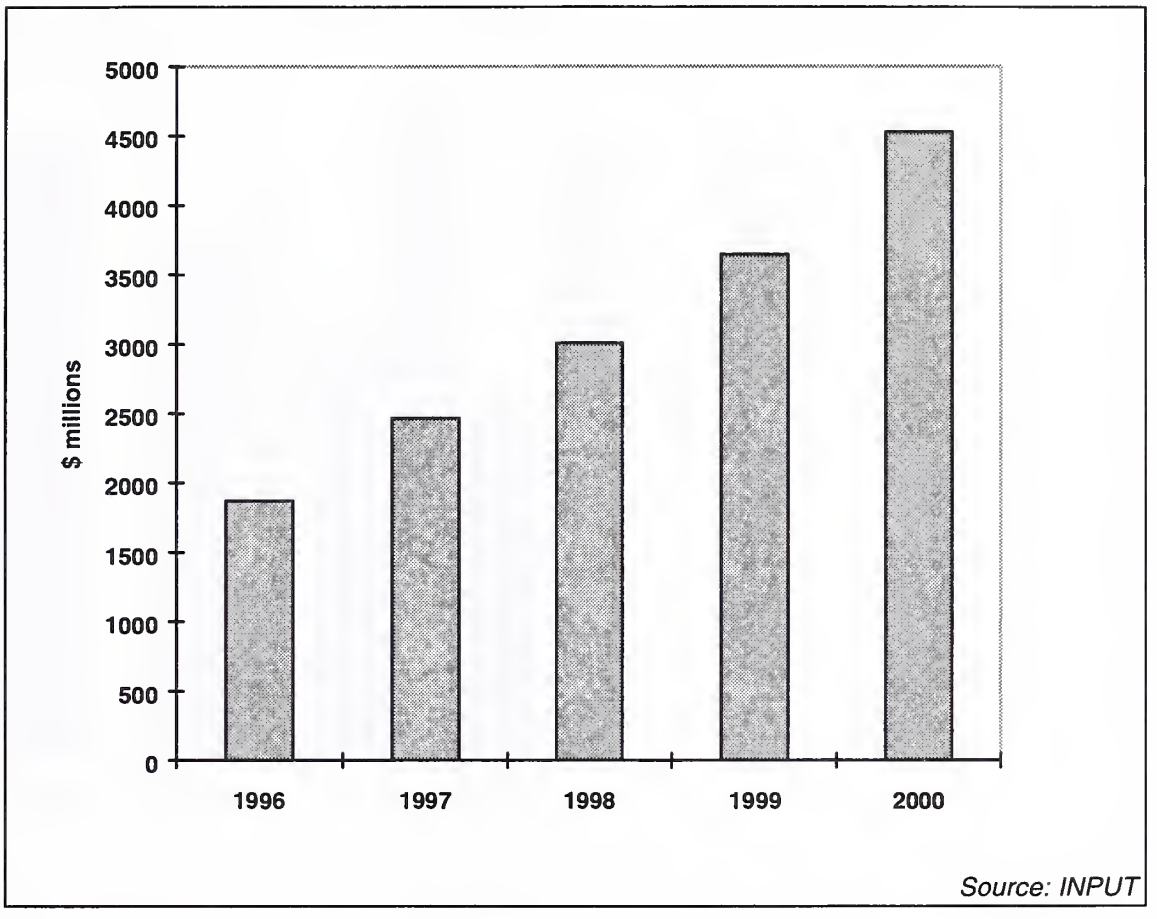
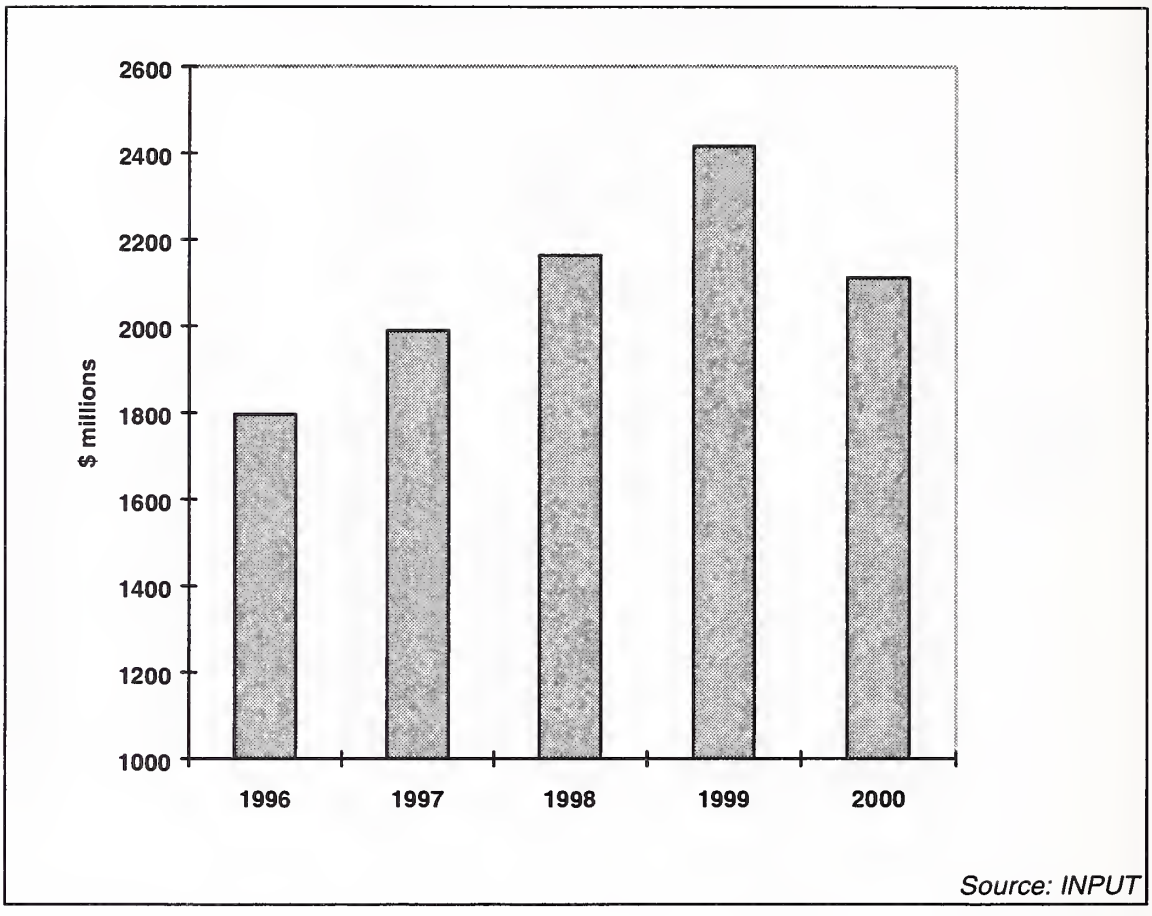


Exhibit VI-5 shows the total software market relating to Notes, in US$ millions. This includes sales of the Notes client and server, add-on products sold by Lotus and third-parties, and software revenues generated by major and minor Notes resellers and integrators. Growth is almost linear, reaching $4.5 billion by the end of 2000, with the falling Notes client price being compensated by the increased market for add-on products extending Notes' functionality and incorporating Notes into the Web.

Exhibit VI-6

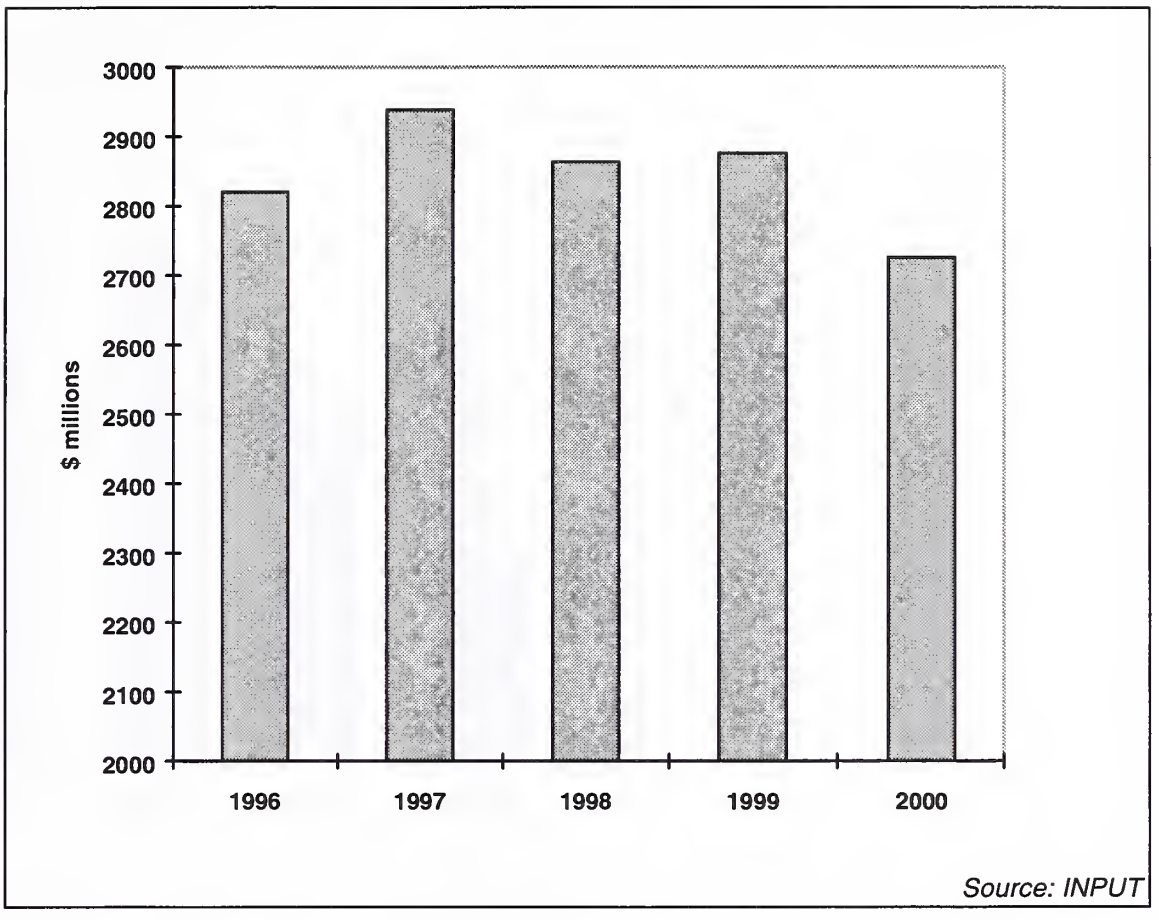
Notes-Related Professional Services, Worldwide



Source: INPUT

Exhibit VI-7

Notes-Related Systems Integration, Worldwide



Source: INPUT

Exhibits VI-6 and VI-7 show the total professional services and systems integration markets, respectively, relating to Notes, in US$ millions. Both markets start to fall from 1999, reflecting the previous four years' increase in the adoption of Internet technology within companies. As the penetration of Intranets increases, so networks and systems become integrated by default, in terms of underlying platforms and technology. Services and integration become increasingly accounted for by Intranet environments, and Notes will gradually fall into this category.

Exhibit VI-8

Notes-Related Network Services, Worldwide

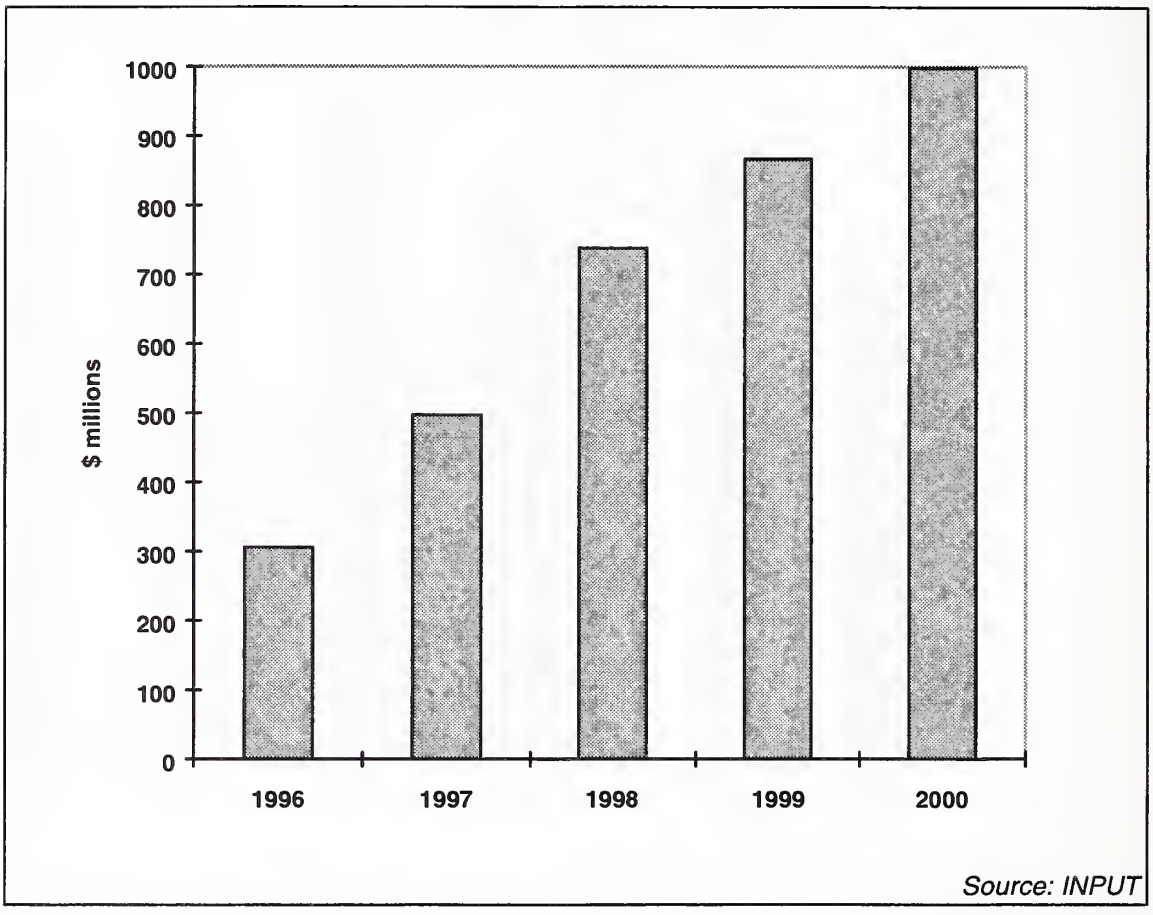


Exhibit VI-8 shows the total network services market relating to Notes, in US$ millions. Strong growth will be experienced over the next five years, albeit from a low base, relating largely to incorporating Notes environments into the Internet and the hosting of Notes servers on Internet providers' sites.

Exhibit VI-9

Total Notes Software and Services Market, Worldwide

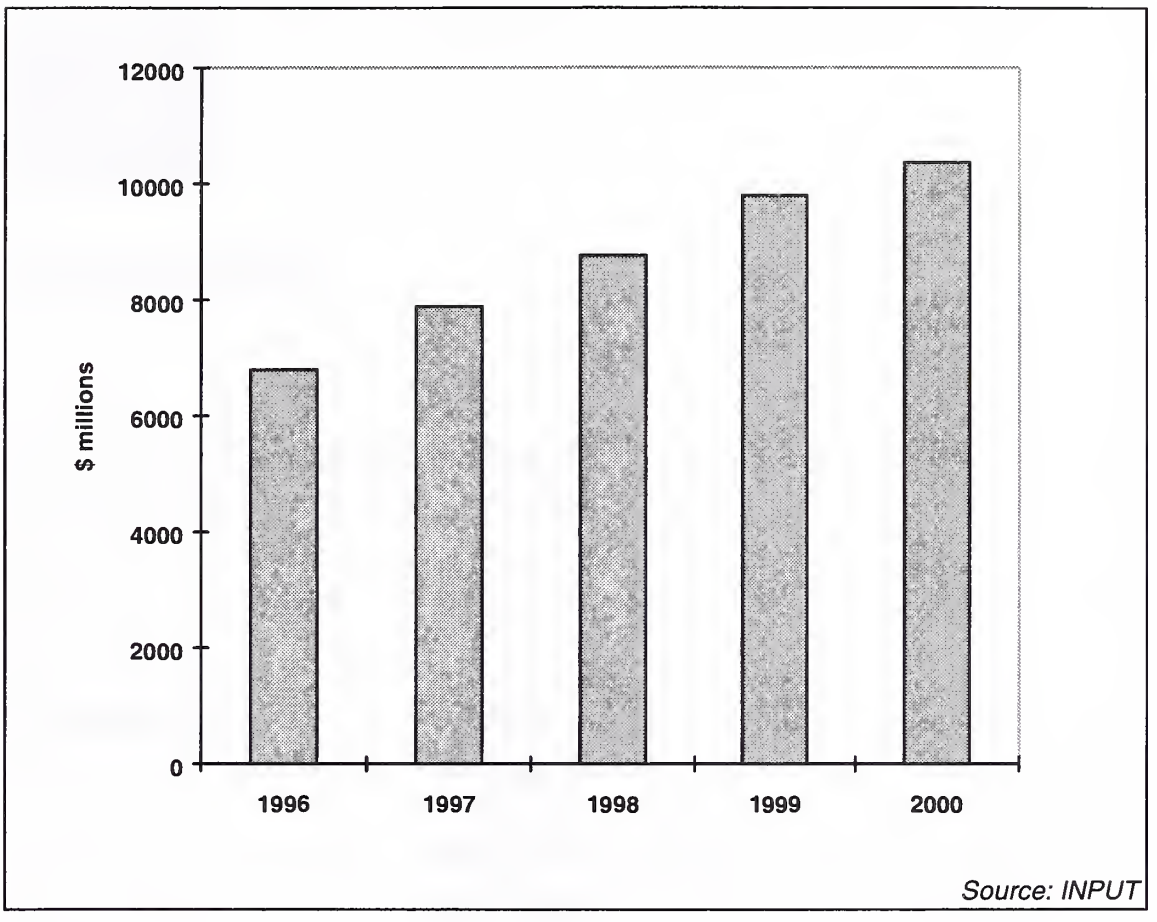


Exhibit VI-9 shows the total software and services market relating to Notes, in US$ millions, including all software, professional services, systems integration, and network services spending. Continued, relatively linear growth is seen, with an increasing share of the market going to software and network services suppliers providing Internet-based products and services.

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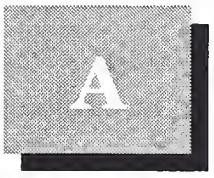


Glossary

This appendix provides definitions of terminology associated with the Internet that is not in INPUT's *Definition of Terms*.

A
Definitions

56Kbps/64Kbps Line	A digital phone-line connection capable of carrying 57,344 (U.S.) or 65,536 (Europe) bits per second. At this speed, one megabyte will take about 3 minutes to transfer, around four times faster than with a 14.4Kbps modem.
ADN	Advanced Digital Network – usually refers to a 56Kbps leased line.
Archie	A software tool for finding files stored on anonymous FTP sites. You need to know the exact file name or a sub-string of it.
ARPANet	Advanced Research Projects Administration Network, the precursor to the Internet. Developed in the late 1960s and early 1970s by the U.S. Department of Defense as an experiment in wide area networking that would survive a nuclear war.
Audit	The collection of information about security events on a network. Auditing is used for logging events, identifying network attacks, and ensuring that network security is working effectively.

Authentication	Verification of the claimed identity of a computer or computer network user.
Backbone	A high-speed line or series of connections that forms a major pathway within a network. The term is relative as a backbone in a small network may be much smaller than many non-backbone lines in a large network.
Bandwidth	How much information can be sent through a connection. Usually measured in bits per second. A full page of English text in a book totals around 20,000 bits. A fast modem can move about 30,000 bits in one second (30Kbps), rising to around 120,000 bits per second (120Kbps) depending on the type of information being transferred and the compression used. Full-motion, full-screen video would require roughly 10,000,000 bits per second (10Mbps), depending on compression.
Bastion Host	Another term for firewall host.
BBS	Bulletin Board System – a computerized meeting and announcement system that allows people to carry on discussions, upload and download files, and make announcements without the people being connected to the computer at the same time.
Bit	Binary digIT – a single digit number in base 2; in other words, either a one or a zero. The smallest unit of computerized data. Bandwidth is usually measured in bits per second.
Browser	A client program (software) that is used to look at (or browse) various kinds of Internet resources.
Byte	A set of bits that represent a single character. Usually there are 8 or 10 bits in a byte, depending on how the measurement is being made.

Client	A software program that is used to contact and obtain data from a server software program on another computer, often across a great distance. Each client program is designed to work with one or more specific kinds of server programs, and each server requires a specific kind of client.
Cyberspace	Currently used to describe the whole range of information resources available through computer networks such as the Internet.
Domain Name	The unique name that identifies an Internet site. Domain names always have 2 or more parts, separated by dots, for example 'input.com'. The part on the left is the most specific, and the part on the right is the most general. A given machine may have more than one domain name but a given domain name points to only one machine.
DNS	Domain name server - a means by which numeric IP addresses (e.g. 198.93.130.56) are converted into character-based names (e.g. www.input.com) and vice versa.
E1	A leased-line connection capable of carrying data at 2.048Mbps. At maximum theoretical capacity, an E1 line could move a megabyte in less than five seconds. That is still not fast enough for full-screen, full-motion video, for which you need at least 10Mbps. E1 is one of the fastest speeds commonly used to connect networks to the Internet.
E3	A leased-line connection capable of carrying data at 34Mbps. This is more than enough to transmit full-screen, full-motion video.
Email	Electronic mail – messages, usually textual, sent from one person to another via computer. Email can also be sent automatically to a large number of addresses via a mailing list.

Encryption	A method of protecting data so that if it is accessed, it cannot be understood without the use of a secret encryption key.
Ethernet	A very common method of networking computers in a LAN. Ethernet will handle about 10Mbps and can be used with almost any kind of computer.
FAQ	Frequently Asked Questions – FAQs are documents that list and answer the most common questions on a particular subject. There are thousands of FAQs on subjects as diverse as pet grooming and cryptography. FAQs are usually written by people who have tired of answering the same question many times. FAQs are often associated with Usenet newsgroups.
Fast Ethernet	The latest Ethernet standard that specifies a data transfer rate of 100Mbps, a ten-fold increase over traditional Ethernet performance.
FDDI	Fiber Distributed Data Interface – a standard for transmitting data on optical fiber cables at a rate of approximately 100Mbps.
FTP	File Transfer Protocol – A very common method of moving files between two Internet sites. FTP is a special way to login to another Internet site for the purposes of retrieving and/or sending files.
Finger	An Internet software tool for locating people on other Internet sites. Finger is also sometimes used to give access to non-personal information, but the most common use is to see if a person has an account at a particular Internet site. Many sites do not allow incoming finger requests.

Gateway	A hardware or software configuration that translates between two dissimilar protocols, for example CompuServe has a gateway that translates between its internal, proprietary email format and Internet email format.
Gopher	A widely used method of presenting material available on Internet sites as textual menus. Although gopher spread through the Internet rapidly in only a couple of years, it is being largely supplanted by the World Wide Web (WWW).
Host	Any computer on a network that is a repository for services available to other computers on the network. It is quite common to have one host machine provide several services, such as Web and Usenet.
HTML	HyperText Markup Language – the coding language used create hypertext documents for use on the World Wide Web.
HTTP	HyperText Transport Protocol – the protocol for moving hypertext files across the Internet. Requires a HTTP client program at one end, and an HTTP server program at the other. HTTP is the most important protocol used in the World Wide Web today.
Hypertext	Generally, any text that contains "links" to other documents – words or phrases in the document that can be chosen by a reader and which cause another document to be retrieved and displayed.
IP Address	A unique number consisting of 4 numbers separated by dots. Every machine that is on the Internet has a unique IP address – if a machine does not have an IP address, it is not really on the Internet. Most machines also have one or more domain names that are easier for people to remember. For example, the IP address of

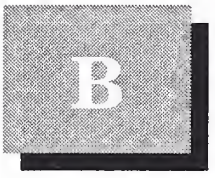
	www.input.com is, at the time of writing, 198.93.130.56.
IRC	Internet Relay Chat – a large multi-user live chat facility. There are a number major IRC servers around the world which are linked to each other. Anyone can create a channel and everything that any member of a channel types in is seen by all users in that channel. Private channels can be created for invitation-only conference calls.
ISDN	Integrated Services Digital Network – a 64Kbps digital telephone line connection. ISDN acceptance is still low due to high equipment prices, but as prices fall individuals and companies are benefiting from leased line performance on a dialup line. Connect time charges are normally the same as for a regular analog telephone connection.
Internet	The vast collection of interconnected networks that all use the TCP/IP protocols and that evolved from the ARPANET of the late 1960s and early 1970s.
ISP	Internet Service Provider – an organization (usually commercial) that offers individuals and other organizations access to the Internet through a dialup connection, ISDN, or leased line.
Kilobit	1,024 bits. Abbreviated to Kb.
Kilobyte	1,024 bytes. Abbreviated to KB.
LAN	Local Area Network – a computer network limited to the immediate area, usually the same building or floor of a company building.
Leased line	A phone line that is permanently held open for data transfer between two locations. The highest speed data connections require a leased line.

Listserv	The most common kind of mail list, Listservs originated on BITNET but they are now common on the Internet.
Login	The account name used to gain access to a computer system or network.
Megabit	1,024 kilobits. Abbreviated to Mb.
Megabyte	1,024 kilobytes. Abbreviated to MB.
Mail list	An automated system that allows people to send email to one address, whereupon their message is copied and sent to all of the other subscribers to the mail list. In this way, people who have many different kinds of email access can participate in discussions together.
Mosaic	The first WWW browser that was available for the Macintosh, Windows and UNIX through a consistent user interface. Mosaic created the explosion in popularity of the Web. The source code of Mosaic has been licensed by several companies and there are now several other browsers as good as or better than Mosaic, most notably Netscape.
Newsgroups	The name for discussion groups on Usenet.
Node	Any single computer connected to a network.
Packet Switching	The method used to move data around on the Internet. In packet switching, the data coming out of a machine is broken up into chunks, each chunk containing the address of where it came from and where it is going. This enables chunks of data from many different sources to coexist on the same lines, and be sorted and directed to different destinations by special machines along the way. This way many people can use the same lines at the same time.

Password	A code used to gain access to a locked system. Good passwords contain letters and non-letters and are not simple combinations.
PPP	Point to Point Protocol – most well known as a protocol that allows a computer to use a regular telephone line and a modem to make a TCP/IP connection and thus be on the Internet. PPP is gradually replacing SLIP for this purpose.
Proxy Server (Proxy)	An application that controls traffic between a protected network and the Internet.
RFC	Request For Comments – the name of the result and the process for creating a standard on the Internet. New standards are proposed and published on-line, as an RFC. The Internet Engineering Task Force is a consensus-building body that facilitates discussion establishes new standards.
Router	A software package or special-purpose computer that handles the connection between two or more networks. Routers spend all their time looking at the destination addresses on the packets passing through them and deciding which route to send them on.
Server (see Client)	A computer, or a software package, that provides a specific kind of service to client software running on other computers. A single server machine could have several different server software packages running on it, thus providing many different services to clients on the network.
SLIP	Serial Line Internet Protocol – a standard for using a regular telephone line (a "serial line") and a modem to connect a computer as a real Internet site. SLIP is gradually being replaced by PPP.

T1	A leased-line connection capable of carrying data at 1.544Mbps. At maximum theoretical capacity, a T1 line could move a megabyte in less than 10 seconds. That is still not fast enough for full-screen, full-motion video, for which you need at least 10Mbps. T1 is one of the fastest speeds commonly used to connect networks to the Internet.
T3	A leased-line connection capable of carrying data at 44.736Mbps. This is more than enough to transmit full-screen, full-motion video.
TCP/IP	Transmission Control Protocol/Internet Protocol – a collection of communication protocols that define the Internet and allow different computers to communicate with one another over a common network.
Telnet	The command and program used to log in from one Internet site to another. The telnet command/program gets you to the "login:" prompt of another host.
Terminal	A device that allows you to send commands to a computer somewhere else. At a minimum, this usually means a keyboard and a display screen and some simple circuitry. Usually you will use terminal software in a personal computer; the software emulates a physical terminal and allows you to type commands to a computer somewhere else.
Terminal Server	A special purpose computer that has places to plug in many modems on one side, and a connection to a LAN or host machine on the other side. Thus the terminal server does the work of answering the calls and passes the connections on to the appropriate node. Most terminal servers can provide PPP or SLIP services if connected to the Internet.

Trojan Horse	A program that performs a desired task, but also includes unexpected functions, usually unpleasant, such as random file deletion.
URL	Uniform Resource Locator – the standard method of addressing resources on the World Wide Web, such as Web pages themselves. For example, http://www.input.com/
Usenet	A worldwide system of discussion groups, with comments passed among hundreds of thousands of machines. Only about half of all Usenet machines are on the Internet. Usenet is decentralized, with over 13,000 discussion areas, called newsgroups.
Veronica	Very Easy Rodent Oriented Net-wide Index to Computerized Archives – developed at the University of Nevada, U.S., Veronica is a constantly updated database of the names of almost every menu item on thousands of gopher servers. The Veronica database can be searched from most major gopher menus.
Virus	A segment of code which replicates by attaching copies of itself to existing executables.
WAIS	Wide Area Information Service – a commercial software package that allows the indexing of huge quantities of information, and then making those indexes searchable on the Internet according to keywords.
WAN	Wide Area Network – any network that covers an area larger than a single building or campus.
World Wide Web	The whole constellation of resources that can be accessed using gopher, FTP, HTTP, telnet, Usenet, WAIS and other tools. WWW is the universe of hypertext servers which are the servers that allow text, graphics, sound files, etc. to be combined together.



Vendor Names and Addresses

Exhibit B-1 lists the vendors of groupware products discussed in this study.

Exhibit B-1

Vendor Names and Addresses

Vendor	URL	Product
Lotus	http://www.lotus.com/	Lotus Notes
Digital Equipment	http://www.digital.com/	Workgroup Web Forum
Netscape	http://home.netscape.com/	Collabra Share
Action Technologies	http://www.actiontech.com/	ActionWorkflow Metro
Radnet	http://www.radnetinc.com	WebShare
Bittco	http://www.bittco.com/	Co-motion
University of Georgia	http://tcbworks.mgmt.uga.edu:8080/	TCBWorks
AEX	http://aex.com/	About

Source: INPUT

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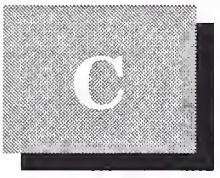

User Questionnaire

This survey is to determine your perceptions of Lotus Notes and Intranets for groupware applications and to understand your plans in this area over the next three years.

1. What were your company's total revenues for the last fiscal year?

_____

2. Please indicate your deployment of Lotus Notes and of a company Intranet

	No use	Pilot Scheme	Departmental use	Enterprise-wide use
Notes (currently)	[ ]	[ ]	[ ]	[ ]
Intranet (currently)	[ ]	[ ]	[ ]	[ ]
Notes (end-1996)	[ ]	[ ]	[ ]	[ ]
Intranet (end-1996)	[ ]	[ ]	[ ]	[ ]
Notes (end-1997)	[ ]	[ ]	[ ]	[ ]
Intranet (end-1997)	[ ]	[ ]	[ ]	[ ]

Notes (end-1998)	[ ]	[ ]	[ ]	[ ]
Intranet (end-1998)	[ ]	[ ]	[ ]	[ ]

3. If you anticipate 'No use' for all of the above timescales for Notes and Intranet, why not? If you are satisfied with an existing groupware system, what is that system?

'No use' of Notes

_____

_____

_____

'No use' of Intranet

_____

_____

_____

4. How many Notes and Intranet clients and servers do you have for groupware applications now and how many do you expect to have in the future?

	Currently	**End-1996**	**End-1997**	**End-1998**
Notes clients:				
1-50	[ ]	[ ]	[ ]	[ ]
51-200	[ ]	[ ]	[ ]	[ ]
201-500	[ ]	[ ]	[ ]	[ ]
501-1,000	[ ]	[ ]	[ ]	[ ]
1,001-5,000	[ ]	[ ]	[ ]	[ ]
5,001-10,000	[ ]	[ ]	[ ]	[ ]

10,001-50,000	[ ]	[ ]	[ ]	[ ]
50,001-100,000	[ ]	[ ]	[ ]	[ ]
Over 100,000	[ ]	[ ]	[ ]	[ ]

Notes servers:

1-5	[ ]	[ ]	[ ]	[ ]
6-10	[ ]	[ ]	[ ]	[ ]
11-50	[ ]	[ ]	[ ]	[ ]
51-100	[ ]	[ ]	[ ]	[ ]
Over 100	[ ]	[ ]	[ ]	[ ]

Intranet clients:

1-50	[ ]	[ ]	[ ]	[ ]
51-200	[ ]	[ ]	[ ]	[ ]
201-500	[ ]	[ ]	[ ]	[ ]
501-1,000	[ ]	[ ]	[ ]	[ ]
1,001-5,000	[ ]	[ ]	[ ]	[ ]
5,001-10,000	[ ]	[ ]	[ ]	[ ]
10,001-50,000	[ ]	[ ]	[ ]	[ ]
50,001-100,000	[ ]	[ ]	[ ]	[ ]
Over 100,000	[ ]	[ ]	[ ]	[ ]

Intranet servers:

1-5	[ ]	[ ]	[ ]	[ ]
6-10	[ ]	[ ]	[ ]	[ ]
11-50	[ ]	[ ]	[ ]	[ ]

51-100	[ ]	[ ]	[ ]	[ ]
Over 100	[ ]	[ ]	[ ]	[ ]

5. If you use or will use Notes, what proportion of the clients connected to your Notes servers are Notes clients and what proportion are Intranet clients (e.g. Web browsers), now and in the future?

	Currently	**End-1996**	**End-1997**	**End 1998**
Notes clients	_____ %	_____ %	_____ %	_____ %
Intranet clients	_____ %	_____ %	_____ %	_____ %

6. For each of the applications below, please indicate: if you use it now or will in the future, how important it is to you (1=not important, 5=very important), and how satisfied you are with your current Notes and/or Intranet implementation of it (1=not satisfied, 5=very satisfied)

Calendaring/scheduling:

Now	**End-1996**	**End-1997**	**End-1998**	**Importance**	**Notes satisfaction**	**Intranet satisfaction**
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Courseware:

Now	**End-1996**	**End-1997**	**End-1998**	**Importance**	**Notes satisfaction**	**Intranet satisfaction**
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Customer service/support:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Database access:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Desktop conferencing:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Document management:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Executive information systems:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

External document publication/distribution:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Internal document publication/distribution:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Live information feeds:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Project management/workflow:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Quality management:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Sales force automation:

Now	End-1996	End-1997	End-1998	Importance	Notes satisfaction	Intranet satisfaction
[ ]	[ ]	[ ]	[ ]	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

7. How well suited do you think Notes and an Intranet are for the following groupware applications? (1=not suitable, 5=very suitable)

	Notes	Intranet
Calendaring/scheduling	1 2 3 4 5	1 2 3 4 5
Courseware	1 2 3 4 5	1 2 3 4 5
Customer service/support	1 2 3 4 5	1 2 3 4 5
Database access	1 2 3 4 5	1 2 3 4 5
Desktop conferencing	1 2 3 4 5	1 2 3 4 5
Document management	1 2 3 4 5	1 2 3 4 5
Executive information systems	1 2 3 4 5	1 2 3 4 5
External document publication/distribution	1 2 3 4 5	1 2 3 4 5
Internal document publication/distribution	1 2 3 4 5	1 2 3 4 5
Live information feeds	1 2 3 4 5	1 2 3 4 5
Project management/workflow	1 2 3 4 5	1 2 3 4 5
Quality management	1 2 3 4 5	1 2 3 4 5
Sales force automation	1 2 3 4 5	1 2 3 4 5

8. What are your main ways of procuring groupware applications, now and in the future?

	Currently	1996	1997	1998
Notes:				
Develop in-house	[ ]	[ ]	[ ]	[ ]
Custom developed	[ ]	[ ]	[ ]	[ ]
Buy off-the-shelf	[ ]	[ ]	[ ]	[ ]
Intranet:				
Develop in-house	[ ]	[ ]	[ ]	[ ]
Custom developed	[ ]	[ ]	[ ]	[ ]
Buy off-the-shelf	[ ]	[ ]	[ ]	[ ]

9. How much have, and will, you spend on Notes and Intranet groupware application software?

During:	1995	1996	1997	1998
Notes:				
0-5,000	[ ]	[ ]	[ ]	[ ]
5,001-10,000	[ ]	[ ]	[ ]	[ ]
10,001-50,000	[ ]	[ ]	[ ]	[ ]
50,001-100,000	[ ]	[ ]	[ ]	[ ]
100,001-500,000	[ ]	[ ]	[ ]	[ ]
500,001-1m	[ ]	[ ]	[ ]	[ ]
Over 1m	[ ]	[ ]	[ ]	[ ]

Intranet:

0-5,000	[ ]	[ ]	[ ]	[ ]
5,001-10,000	[ ]	[ ]	[ ]	[ ]
10,001-50,000	[ ]	[ ]	[ ]	[ ]
50,001-100,000	[ ]	[ ]	[ ]	[ ]
100,001-500,000	[ ]	[ ]	[ ]	[ ]
500,001-1m	[ ]	[ ]	[ ]	[ ]
Over 1m	[ ]	[ ]	[ ]	[ ]

10. How much have, and will, you spend on Notes and Intranet groupware-related services (for example, systems integration, consultancy etc.)?

During:	**1995**	**1996**	**1997**	**1998**
Notes:				
0-5,000	[ ]	[ ]	[ ]	[ ]
5,001-10,000	[ ]	[ ]	[ ]	[ ]
10,001-50,000	[ ]	[ ]	[ ]	[ ]
50,001-100,000	[ ]	[ ]	[ ]	[ ]
100,001-500,000	[ ]	[ ]	[ ]	[ ]
500,001-1m	[ ]	[ ]	[ ]	[ ]
Over 1m	[ ]	[ ]	[ ]	[ ]
Intranet:				
0-5,000	[ ]	[ ]	[ ]	[ ]
5,001-10,000	[ ]	[ ]	[ ]	[ ]
10,001-50,000	[ ]	[ ]	[ ]	[ ]

50,001-100,000	[ ]	[ ]	[ ]	[ ]
100,001-500,000	[ ]	[ ]	[ ]	[ ]
500,001-1m	[ ]	[ ]	[ ]	[ ]
Over 1m	[ ]	[ ]	[ ]	[ ]

11. How important are the following in your groupware environment (1=not important, 5=very important), and how satisfied are you with Notes/Intranet for each category? (1=not satisfied, 5=very satisfied)

	Importance	**Notes satisfaction**	**Intranet satisfaction**
Security	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

	Importance	**Notes satisfaction**	**Intranet satisfaction**
Cost	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

	Importance	Notes satisfaction	Intranet satisfaction
Ease of application development	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Ease of maintenance	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Performance	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Overall functionality	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Vendor Support	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

Robustness	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Support for open standards	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Integration with the Internet	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

12. How many IS staff do you have now and how many will you have in the future dedicated to your Notes and Intranet environments?

	Currently	**1996**	**1997**	**1998**
Notes:				
0-5	[ ]	[ ]	[ ]	[ ]
6-10	[ ]	[ ]	[ ]	[ ]
11-25	[ ]	[ ]	[ ]	[ ]
26-50	[ ]	[ ]	[ ]	[ ]
Over 50	[ ]	[ ]	[ ]	[ ]

Intranet:

0-5	[ ]	[ ]	[ ]	[ ]
6-10	[ ]	[ ]	[ ]	[ ]
11-25	[ ]	[ ]	[ ]	[ ]
26-50	[ ]	[ ]	[ ]	[ ]
Over 50	[ ]	[ ]	[ ]	[ ]

13. How much you do agree or disagree with each of the following statements? (1=strongly disagree, 5=strongly agree)

"Notes will survive the Internet threat"

1 2 3 4 5

"Notes will become little more than a back-end database"

1 2 3 4 5

"All groupware software will migrate to the Internet"

1 2 3 4 5

"Notes will always remain the premium groupware platform"

1 2 3 4 5

14. What other comments would you like to make on Lotus Notes and Intranet groupware?

_____

_____

(Blank)