
Making Choices in the Virtual World: The New Model at United Technologies Information Network

BRADLEY GULLIFORD

ABSTRACT

AS THE SERVICES OF THE United Technologies Corporation Information Network have changed from a traditional library system to a virtual system of World Wide Web sites, a document delivery unit, telephone and e-mail reference, and desktop technical support, the onus of choice in seeking information has shifted onto the consumer. The Information Network must educate and empower its customers who were accustomed to the library as a physical place to check out books, talk to reference librarians, and browse journals. Now customers receive information network (IN) services without going to a special place. Staff time is freed for proactive information delivery, filtering, and analysis, as well as outreach and coaching of customers faced with many new choices. Also considered are issues of security and licensing for a diverse worldwide intranet.

INTRODUCTION

United Technologies Corporation (UTC) provides a broad range of high technology products and support services to the building systems, automotive, and aerospace industries.

Each division has been managed relatively independently, and many of those divisions had libraries of their own to provide technical and business information. Most of these libraries have been absorbed into a single library system, now called the Information Network (IN). The IN benefits from centralized management and support services, but end-users benefit from information service that is corporation-wide in its perspective.

The IN is an agent of technology transfer, offering users (called customers) referrals across divisional boundaries connecting people in different parts of the company working on similar projects. IN also offers browsing and current awareness opportunities for customers to do their own cross-fertilization. The IN is one of the few boundary-spanning operations within the corporation.

For over sixty years, UTC employees have been accustomed to library service dedicated to supplying them with information to do their jobs, whether they were solving an engineering problem, conforming to regulations, or finding new business opportunities. As the universe of information sources expanded, employees found themselves with more options to search increasingly more databases and having to make decisions themselves to initiate search strategies. Information Network staff is available to provide some "plain old library service," but customers who want to proceed on their own have to choose which IN service unit would be appropriate for their needs.

Remote service in some form is not new to the UTC Information Network. Formerly known as United Technologies Library & Information Services (UTLIS), the organization provided telephone, e-mail, and walk-in reference services; an online catalog listing resources in all divisional locations with circulation by mail to anywhere in the corporation; and selected databases available to end-users through a dialup ASCII interface. The change to the new model described by Steele (1997) was not drastic for remote users. Walk-in customers noticed that they no longer had an on-site library to use in the conventional manner, and staff found themselves doing more work by telephone and e-mail, but the stage had been set by earlier advances in service.

For many years, library services at United Technologies assumed the responsibility of searching and supplying information in response to specific requests. Unlike academic libraries which support learning, corporate libraries support achievement of business objectives (which may include applied research). Scientists, engineers, and business executives on the job are not evaluated on their original library research and learning progress but on whether they develop the product or complete the project on time and to the required specifications. Rarely do they have time to browse and ponder. The Information Network must ensure that information can be found or delivered quickly from a large universe of business, technical, and proprietary sources. Staff will do whatever is necessary and ethical to get the information needed into the customers' hands, whether by retrieving, photocopying, and mailing a journal article; searching databases; making phone calls to experts; arranging interlibrary loan; or checking out a book. The IN staff goes the extra mile to help customers in their endeavors. This philosophy of active service is fundamental to the culture of IN.

NEW MODEL FOR INFORMATION SERVICE AT UNITED TECHNOLOGIES

The reorganization of UTLIS/IN and the rationale for it, detailed in Steele's (1997) article, will be reviewed here briefly. Before the reorganization, technical and systems services were centralized, but the collection was housed in nine libraries in UTC divisions, each with reference and circulation staff. The new model called for advanced, analytical, and proactive services to a population increasingly located away from division library sites. To achieve this goal, IN centralized its collections and technical and circulation services to reduce duplication of labor and costs in those functions. Although their libraries shrank to offices with ready reference collections, reference librarians remained in their divisions to provide direct services to their customers. Their computer workstations are laptop PCs, well-equipped for dialup and Internet access, and can be used in their offices or wherever they go. Now called information managers, the reference librarians are freed from routine tasks to perform complex online searches, set up SDI alerts, go out and meet clients and potential clients, make presentations, attend meetings, and participate as full members on certain teams. A few have become research analysts, performing business analyses and writing reports. Centralized services comprise three groups:

- **Printed Resources.** Performs circulation, acquisitions, cataloging, interlibrary loan, and document ordering from specific requests not requiring verification. Printed Resources draws on the centralized collection and certain full-text databases.
- **Global Information Services.** Handles ready reference and relatively focused searches. Global Information Services handles routine or time-consuming retrievals such as economic data.
- **I-Net Team** (named for the Internet and intranets). Identifies, evaluates, and licenses information services available over the Internet for access through the corporate intranets. The I-Net Team designs and implements desktop access to internal and external resources. The team provides technical support through a telephone hotline and frequent contact with customers, vendors, and computing services departments throughout the corporation.

These groups are located in the same area along with the collection and cooperate easily and quickly. Global Information Services can refer a document delivery to Printed Resources; Printed Resources can consult with the I-Net Team in case of technical difficulty. The I-Net Team can ask Printed Resources or Global Information Services to try out a new product.

As remote users come to outnumber in-person users, the centralized services were designed to interact with clients through mail, telephone, fax, and e-mail. Face-to-face contact is still available with the information managers. While information managers serve clients remotely, they are also available as a one-stop point of contact for everything from book re-

newals to extensive reference work. Thus customers have a fourth option—i.e., mediated services—if they cannot or will not use computers.

Another important function of information managers is navigation. Customers can talk with information managers who have a systemwide perspective about search strategies, source selection, document delivery, and anything else customers need to know. Research analysts can offer the same guidance.

PANOPLY OF SERVICES, PANOPLY OF DECISIONS

Customers seeking information from the Information Network have many options now. They have access to several different formats of almost everything. They can do their own searching and document retrieval or have IN staff do it for them. They can call on staff to whatever degree they desire, avoiding other humans entirely if they wish. They have alternatives among staff members and groups. Some of those groups provide the same service, distinguished only by degree. Customers have choices, and the onus is now on them to choose. The price of more access and value-added service is more attention to the information-seeking process and more burden of choice on the customer.

Under the old model, each library had a front desk, staffed by a library worker, where everything from circulation transactions to reference interviews were available. Customers did not have to be conscious of how their request was filled or what kind of request it was. They never had to evaluate their information need to determine if it was a simple retrieval from a certain source, a reference question entailing identification and selection of sources, a problem requiring evaluative analysis and commentary, a computer access problem, or a simple circulation transaction. Their visit to the library may have entailed one or more of these.

Customers who prefer to use a single point of contact for everything from book returns to complex reference projects may still do so if they are in a location served by an information manager in an office. However, customers have the option of direct access to a variety of information services if they choose to navigate among the many choices available. For remote users, some of the Information Network services are now available for the first time. Remote users and on-site users enjoy equity as they face the same multiplicity of options.

Information Network staff must educate customers to become end-users while continuing to supply information whether the customer is “educated” or not. Of the three hotlines in operation, two are for supplying information (one to order documents from Printed Resources and one staffed by Global Information Support with extended hours) and one, staffed by the I-Net Team for technical and connectivity problems, incidentally affords opportunities to educate customers. The IN takes advantage of vendors’ offers for end-user training—i.e., arranges and publicizes

the sessions in the appropriate divisions. Information managers spend considerable time educating and re-educating customers in individual sessions on their own computers. Together, information managers, top IN management, and the I-Net Team continue to refine resource descriptions (on IN Web pages, publicity materials, and signage) that will enable customers to make informed choices.

Indeed, customers are implicitly invited to understand information services and what they entail. They have varied backgrounds, and some are better prepared than others to help themselves. Customers walking into Information Network's central facility, when shown directional signs, sometimes reply, "I don't want Circulation. I want to check out a book." Independent customers must analyze their own reference questions to determine if the need is specific enough for Printed Resources, a reference question but routine enough for Global Information Support, or complex enough for an information manager. Global Information Support and the information managers evaluate requests and forward these to each other as appropriate. The services are transparent to the customer, and no customer is ever embarrassed for not knowing exactly where to send a request.

The model has only been in place for a few months, and it is unclear if the newness of the service or the inability of the customers to direct their requests appropriately is to blame for their continued need for staff to route requests. Some customers couldn't care less since they drop off all their requests and have them routed by information managers; other customers express a strong desire to understand and interact directly and immediately with Information Network staff or other resources available to them. The latter are empowered by learning how our services work so that they can enjoy the speed, asynchronicity, and serendipity of meeting their own information needs.

Other customers might not possess such a high level of expertise and interest but have enjoyed doing their own searches in printed and CD-ROM resources in the reference areas of their divisional libraries. In the new model, they are expected to learn to access resources online. Parallel to visiting the physical library to leaf through journals and trade periodicals, users now "point and click" to browse the electronic journals on their desktop. These changes require customers to change their information retrieval habits and to gain familiarity with electronic resources. In fact, demand seems to be sensitive to ease of use (for a sophisticated user's perspective on the electronic "remotization" of the library, see van Groenendaal, 1997). The payoff may be that users have access to a greater variety of resources without having to leave their offices but the cost is that users often have to learn several search protocols to search and retrieve information from the various publishers' products. The cost is all the

higher since each publisher seems to design user interfaces differently (Barnes, 1997, pp. 411-12).

In general, customers are presented with more options to access the increasing universe of electronically available information. At the same time, they must learn about resources, examine their needs, and make decisions that will benefit them in this information universe.

The opposite approach to diverse options is for the library staff to normalize them as much as possible, taking back some of the burden electronic resources are placing on the customer. The Information Network has designed databases for years, following a policy of consistency in field naming and screen design. Some of the proprietary products IN uses, such as the TechlibPlus integrated library system, provide for local design options, and IN maintains a strong concern for consistency where possible. On the IN Web site, electronic journals may be accessed from one single page. Many publishers interpose an entry page with options at the location of their e-journals allowing the customer to select from that publisher's titles. The IN believes that its customers should encounter as few intermediate steps as possible between them and the information they need. To do this, the titles on the IN e-journal page have direct hyperlinks to the journal's home page or actual text. The page also has other columns to indicate full-text coverage, presence of abstracts, availability of back issues at the site, and a brief descriptive phrase. Each entry requires human editing and is time-consuming. Differences in interfaces might be made transparent to the end customer, but they are designed at a high cost of considerable staff time. The "15 minute rule" (van der Woort, 1998, p. 60) might be useful for patrons, but how does staff know when to stop labor-intensive detail work? Choices and decisions must be tested and evaluated by staff as well as users.

TECHNICAL AND LICENSING ISSUES

As libraries start to emphasize access over holdings, their work will involve rerouting and redistribution of external resources accessed over the Internet. The Information Network negotiates "site licenses" with vendors and publishers to allow access to publishers' servers from individual employees' desktops on the corporate intranet. Contracts are negotiated and finalized by the manager of IN, but the I-Net Team is responsible for investigating details as well as for maintaining all connections, adapting to changes in service, and arranging with vendors for staff training. The I-Net Team handles types of access (IP address, password) and interface customization, and they deal directly with the technical staffs of publishers and vendors once a contract is signed. They also work with the computing services departments of the UTC divisions, each one of which controls the software and support available to end-users in each division. The

I-Net Team serves as a go-between to provide a technical environment where information flows smoothly.

Some information flows are internal. The I-Net Team designs Web pages for Information Network staff to share information (team meeting minutes, upcoming professional conferences, passwords for product trials, collaboration for virtual teams) or for other departments in the corporation as requested. Unlike Digital Equipment Corporation's "Web library" (Callaway, 1998), however, IN does only limited internal document management, concentrating on bringing in outside resources comparable to the way a conventional library brings in books and periodicals.

Contracts and licenses gain higher visibility in the world of electronic information. Acquisitions is no longer a simple matter of paying invoices for familiar products like books. The new function requires negotiating multicustomer agreements of site licenses to bring information products in over the Internet and redistribute them through the intranet. Publishers are concerned about simultaneous multisite access to their products. In pre-electronic times, publishers knew precisely how many books they sold and how their revenue would be calculated. In the new information infrastructure, they demand an accurate count of end-users. Some publishers' contracts specify how many users may be at public workstations, or they expect a one-to-one correspondence between copies sold and end-users. Corporate environments are quite fluid. Employees are reassigned and change offices frequently. Ad hoc teams may involve independent contractors. United Technologies is a large corporation with approximately 180,000 employees. The Information Network knows how many employees are registered patrons in its online catalog at any one time. Many transactions take place with nonregistered employees who might never check out books; however, they do browse public CD-ROM workstations or use IN-licensed desktop services.

Part of the difficulty lies in the loose relationship computing service departments have with end-users and the Information Network. United Technologies Corporation comprises multiple domain names and IP subnets. IP and e-mail addresses can change within a division, and IN has no way of finding out until a user reports a problem. The I-Net Team must report specific addresses or classes of addresses on license applications, and those addresses become the only ones authorized for access. The I-Net Team uses different strategies—from computer programs to telephone calls—to update its master list of IP addresses.

IP address verification is one form of security. Security is a concern for both the publishers and the Information Network. Publishers are extremely concerned about access to users not specified in the contract. They need constant assurance that the intranet not be open to the general Internet public. A significant amount of information on the corporate intranet is proprietary and release of it outside the corporation would

be deleterious. It is the responsibility of UTC IN to assure there is no breach of the security contract that could be harmful to the corporation. While unauthorized release of publishers' data would not damage UTC, IN is under contractual obligation to protect these data. Occasionally the I-Net Team encounters concern from computing services personnel when the team asks them for Internet firewall information—necessary for publishers to secure inflow of data but carefully watched among computer personnel. Because of these corporate security concerns, IN is not considering extranet technology. IN works with vendors and publishers to honor their concerns while still providing full service to end-users. Occasionally agreement cannot be reached with a publisher, in which case IN will look elsewhere for similar services.

The I-Net Team fields constant calls and e-mail messages reporting access problems. The team first isolates the source of the problem. If it is a systemwide or server problem, the team will correct it or refer it to computing services staff at United Technologies Research Center, the facility in which Information Network's centralized resources are located. If it is a problem residing with the vendor or the publisher, the team will contact technical support at that location. Usually the I-Net Team serves as the contact to communicate and resolve the problem with the vendor. Often a contact person is provided by the vendor when the contract is signed, but sometimes the team has had to search independently for a remote ally. If a customer reports a problem which the I-Net Team determines to be due to a local configuration, the team will try to offer instructions or suggestions to fix the problem, but sometimes the team has to tell the customer to request assistance from her/his local computing services support personnel.

A common time-consuming task is tracking down and making adjustments in services designed to route to individual customers. As mentioned above, e-mail addresses change often at United Technologies. Services, such as ISI Corporate Alert, which operate through e-mail and other information intranet "push products," continually run afoul of these frequent changes. Adjusting to these requires human intervention. End-users hardly ever report changes of address. They may not be aware of the change if their system administrator has set up forwarding from their old address. That works well for incoming mail, but their old address, under which they are registered with an outside service, does not appear on their outgoing messages, so the outside service does not recognize them anymore. The I-Net Team must explain this to customers who report problems and must learn what steps to take and then solve the problems. Troubleshooting must be done, but it is a distraction from information service.

Many customers do not have address problems because their division's management simply does not allow them Internet access or even use of a

Web browser for intranet access. This is particularly true in non-U.S. locations. The Information Network must decide how to accommodate such customers (or would-be customers). The information manager on site can do whatever she/he can to serve those customers (which still does not provide for browsing), but IN's policy is not to be held back by the lowest common denominator anymore. In the past, full consideration was given to the most primitive levels of computer technology; however, with prices decreasing and the gap between most and least advanced users widening, IN has changed its policy in this regard. Division management in underserved areas must choose how much technological support its customers need to access IN services.

Resource description has been a traditional function of technical services. In the electronic environment at UTC, the distinction between functions of Information Network's I-Net Team and the technical services unit has become more blurred. For example, who handles an "electronic acquisition"—technical services (for ordering and payment of acquisition) or the I-Net team (for electronic services issues)? The same is true for cataloging. The outcome of the latter may be that, as the library becomes more electronic, the electronic services group would assume most of the functions of the entire library with specific departments like acquisitions, cataloging, and hardware maintenance (formerly known as bindery). The old departments would wither away. Currently, the I-Net Team does most of the license and subscription work with Printed Resources (technical services) paying invoices and maintaining financial records. The I-Net Team hopes to serve only as consultants in the future. The boundary with Printed Resources is still in flux.

An important role for Information Network centralized staff is interaction with various information vendors, whether as customers, negotiators of contracts, or technicians maintaining incoming streams of information from outside sources. Unlike a book purchase, which is a once-and-done transfer of possession, a license for online information requires mutual agreement—it is a contract and requires continuous attention like any other relationship. Vendors' technical support phone numbers are distributed widely among the staff, and more staff see vendor representatives regularly than under the old library model.

Staff members of all departments have become consumers of technical support. Electronic resources have to be maintained in a way that printed resources do not require. Examples of these include interruption in access, networks that go down, change of IP addresses of firewalls, servers that get bogged down, file reloads, and data that fail to arrive in time. The I-Net Team assists or intervenes where possible, but staff members also have occasion to interact with outside services or vendors.

As acquisition of items gives way to license for access, it has become less clear whether negotiation and management of licenses is the respon-

sibility of Printed Resources (acquisitions function) or the I-Net Team. Are electronic information sources simply items in the collection or are they utilities of some sort or are they a new class of entities entirely? The purchasing agent, an employee of the financial services department of the corporation, depends on the I-Net Team to review each contract for technical matters. The I-Net Team deems the contracts to be unremarkable since technical details (compatibility, user authentication, restrictions on electrocopying) have been examined when the product was selected. Boundaries between the I-Net Team and other departments are still being determined. The question we face is: Is electronic access an extension of conventional library functions or a radically different form of library service deserving a special department? Licensing, network support, and interface design will be "the technical services of the future," yet books are not likely to disappear soon. Traditional technical services may stay the way they are and duplicate the content of an electronic access department, or they may expand their scope to include electronic access. If they choose the former, all departments concerned will need to establish common understandings, responsibilities, and procedures.

CONCLUSION

Unless they can get an information manager to handle everything for them—an option not feasible for many—customers are forced to make decisions, choose resources, and plot their own information search strategies. At the Information Network, there is strong commitment to equip the users for this situation. An unanticipated result of the shift to an electronic library is the many roles IN staff are now juggling, including analyst (expertise value adder), educator (teacher), navigator (consultant), and provider (traditional corporate librarian). Between the extremes of insisting that customers learn to fulfill their own information needs and bending over backward to save customers all effort, the two groups must reach a common ground to establish a new kind of relationship.

The analyst role has not been difficult to assume. Information Network customers have been requesting such evaluative service for years. Research analysts employ the services of Global Information Services both to refer routine customer requests and to retrieve information for their own analytical work. Librarians performing reference work for librarians seemed unusual at first; however, some negotiating is taking place as both groups define their roles in working together. Somewhat more political is IN's developing role in knowledge management. As the staff's expertise grows, IN is identifying champions to promote IN leadership in knowledge management throughout the entire corporation. IN staff plan to conduct information audits and train UTC groups to design and implement their knowledge management plans. The analyst role points to the partner relationships IN now seeks with its customers.

Educating users, while not unique to academic libraries, certainly falls naturally within the academic mission. Remarkable among digital libraries with a strong training approach is the Welch Library of Johns Hopkins Medical Institutions, as developed by Nina Matheson (1995). Welch allocates staff resources specifically to training and offers courses in medical information, some even for academic credit. Learning is their mission. Johns Hopkins students, faculty, and staff can also receive reference assistance at Welch. UTC's mission is to produce goods and services and to earn a profit. Learning to use resources is not a primary mission, and employees can devote only limited time to it. Information Network staff, especially information managers, find themselves providing customized training, often to individual customers. Sometimes sessions are offered to larger groups, introducing the Internet or IN services. Online help files and responses to hotline calls are other limited teaching resources that IN employs.

How much are customers' choices due to the remote electronic environment and how much due to Information Network's particular reorganization? Some customers seem bewildered by the new model whether they walk in, talk to an information manager, or send questions and inappropriate requests by e-mail. Even if customers did not have to check ISI Current Contents Connect, Ei Village Journal Shelf, IN's electronic journals page, and IN's listing of hardcopy periodicals to find out about a journal to read, they still have to determine where to place their request—i.e., Printed Resources, an electronic source supported by the I-Net Team or a lookup of data by Global Information Services. Some customers have discovered or created e-mail address groups which they use to send requests for materials or reference service to the entire IN staff. One customer routinely sends such requests to the Information Services group which comprises all employees in computing services, photocopying, artwork and desktop publishing, as well as library services. These customers obviously cannot or will not distinguish between different facets of information service regardless of whether they are electronic or not.

Ideally, a single contact point is desirable for all types of requests. Such a scenario would have increased services where more staff time would be required to mask the diversity and complexity of advanced services to the customer. Such an arrangement is quite beyond the Information Network's budget. However, it raises the issue of whether to allocate funds for purchasing more services or for more staff assistance. IN generally prefers to leverage technology to enable staff to provide high levels of service while still remaining technologically accessible to the majority of its clientele.

One area where technological solutions are always sought is automation to increase staff productivity. Getting information can seem effortless for end-users. Behind the scenes, staff spend hours pulling and pho-

tocopying, keeping records, tracking down and cajoling remote computer personnel, determining and registering new IP addresses. Circulation, of course, entails more than sitting at a check-out desk and scanning barcodes when patrons approach. The Information Network's patrons cannot come to the library, so a mailing service similar to interlibrary loan must be provided for them. Searches must be packaged when they are delivered to the customer. Many of these behind-the-scenes tasks are routine and time-consuming and are thus candidates for automation. Some of them, such as keeping up with IP address changes, may not be thought of as low-skilled, but they are not high-level information service either, causing the I-Net Team to think that such duties might be performed by a support staff paraprofessional. The library literature presages an electronic age when librarians become information navigators (Ojala, 1993; Oder, 1997; Leonard, 1997; McCook, 1997), but such essays make no mention of another possible outcome—i.e., librarians becoming information clerks.

The goal of the Information Network's reorganization was to deploy limited resources to provide the highest level of service to the greatest number of people. Since online and walk-in customers have the same choices, it can be concluded that the remote electronic environment does not allow the user to make unbiased choices. Rather, the remote electronic environment affects those choices or the way they are made.

Because off-site customers cannot handle and examine sources directly, descriptions are critical in remote online service. A short paragraph on the screen may be all that connects a customer to the right resource. The I-Net Team devotes considerable time and effort in choosing the right words for headings and links. The rest of the Information Network staff provide feedback on their own and also engage end-users in the description process. Staff members also spend time describing and explaining IN services over the telephone to customers who have no access. Reference librarians, who are navigators by definition, are not always available for real-time interaction, so navigation is well aided by careful resource description.

The library literature proclaims that, as access is emphasized over holdings and "disintermediation" eliminates searchers' jobs, librarians of the future will become "information navigators" advising patrons about electronic information resources. Certainly, the proliferation of available sources has made professional assistance more important to ensure optimum selection of information resources. If a UTC customer would but ask, the Information Network's information managers, research analysts, and I-Net Team are on hand to discuss information needs, search strategy, and source quality. Some customers are sophisticated enough to ask questions and make demands for formatting and update frequency, sharing responsibility with IN staff for their information support. Information navigators work best with proactive users.

However, Information Network staff cannot restrict their activity to telling patrons where to look. As corporate librarians, IN staff are committed to "doing patrons' homework for them" if patrons request information delivery. Sometimes a file can be downloaded and e-mailed in a few effortless minutes. At other times the data have to be aggregated or formatted extensively before delivery. In the case of data massage, an information manager or research analyst is responsible either for doing the work or seeing it through to its completion by Global Information Services. In the case of an electronic problem, the I-Net Team can be called on but, in extreme cases, information managers will print electronic documents on paper and fax or hand-deliver them. UTC IN does not distinguish too strictly between navigator and provider roles, and it does not position its staff to be only navigators. Occasionally, IN staff are faced with the delicate matter of having to make fiscally sound choices when too much time is spent on customer requests that clearly do not justify the end results.

As the Information Network gives more options to its customers and enhances their choices, it is also finding ways to help manage the burden of choice by working with customers as partners in fulfilling the corporation's mission.

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