MEASURING QUALITY, COST, AND VALUE OF IT SERVICES

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Two elements are crucial for successful delivery of IT services: focusing on services rather than technology and, even more critical, focusing on supporting those services. This session will explain how IU measures the quality, costs, and value of IT services in a world where demands for support are increasing exponentially.

MEASURING QUALITY, COST, AND VALUE OF IT SERVICES[1]

INTRODUCTION

Support for all users of computer hardware, software, and networks is crucial for full realization of the value that these digital intelligence amplifiers can offer a scholarly community. Bloated applications, opaque user manuals, infelicitous interactions among peripherals and the computers and networks to which they are attached, and short mean time-to-failure for some pieces of hardware provide challenges for even the most experienced users. Thus even in the beginning of the 21st Century, when it is asserted the technology has "matured," the value that can be derived from use of IT services is directly proportional to the level of effective IT support that can be provided for the customers of these services. The focus of this narrative is how one maintains and continually improves the quality of that support.

BACKGROUND

Indiana University is not a university system but a spatially distributed university with eight campuses and several learning centers. The campuses stretch the length and breadth of the State: from Gary, on lake Michigan in the northwest, to New Albany, on the Ohio River in the southeast. Indiana University takes pride in the fact that more than 80 percent of the Indiana population lives within 50 miles of an IU campus or learning center. As a whole, approximately 4,000 full time faculty, 2,000 part-time faculty, and 10,000 appointed staff serve 92,000 students. The campuses range from the traditional Big Ten residential campus at Bloomington (ca. 36,000 students) to the urban arts, sciences, engineering and medical school complex in Indianapolis (ca. 25,000 students), to the very small liberal arts and sciences campus in Richmond, Indiana (ca. 2,200 students). The spatial extent and organizational variety of these campuses and their communities present management challenges, not only for administrative and academic programs, but for the information technology organization, University Information Technology Services, that serves many of their common IT needs. Today, the various digital networks that make up IUnet provide video, data, and voice services and other IT services that help bind a dozen locations into one university.

UNIVERSITY INFORMATION TECHNOLOGY SERVICES: QUALITY CULTURE, QUALITY ORGANIZATION

University Information Technology Services (hereafter UITS), which employs 500 full-time and 500 part-time (for the most part student) personnel, serves many of the university's IT requirements. With a budget of more than $70M, UITS offers Inter- and Intranet services, including video services, for the university; it produces administrative, library, and other mission-critical applications for all campuses; it offers many IT support activities across IU, including support for high performance computing and other research computing services on the smaller campuses. In Indianapolis, UITS also provides telephone and media services, research and academic computing, some student computing facilities, and full service support for all these services. In Bloomington, UITS provides all IT services, including service to the Halls of

[1] This paper is a condensed and revised version of an invited presentation by the authors at the 55th Annual Quality Congress, May 7-9, 2001, in Charlotte, North Carolina that was published in the *Proceedings of the 55th Annual Quality Congress of the American Society for Quality.*

Residence and Family Housing. Finally, UITS and Indiana University are home to the Global NOC that manages the Internet2 Abilene Network, the Asia Pacific TransPAC Network, other international networks, and their interconnections at the STAR TAP in Chicago.

The development of systematic quality improvement, customer-based satisfaction measures, and the deployment of the Balanced Scorecard family of metrics (Kaplan and Norton 1996) has been an integral part of the development of UITS at Indiana University over the last decade. Measures of customer satisfaction and internal service and process standards were an indirect effect of the combination of university-wide administrative computing with the academic computing organization on the Bloomington campus in 1989. Over the next two years, with the completion of the campus network, the advent of universal student computing accounts, and universal e-mail, the number of users went from a few hundred to tens of thousands. Activity Based Costing (ABC) metrics were added soon thereafter. In 1995-96 the organization was given a structure that emphasized teams and their members who produced discrete services: e.g., HPC cycles, e-mail services, library computing services, particular kinds of storage services, each of several kinds of support services, and so on. Each team controlled its budget for hardware and software, had a major voice in performance reviews of its individual and collective work, and controlled its training, travel, and personal technology budgets. Each team was responsible for mapping its internal processes, showing where these processes met with those of other teams, and showing how the parts combined to produce services for the students, faculty, and staff of Indiana University.

The Office of the Vice President for Information Technology and CIO for Indiana University was established in 1997. The elevation of this office to the President's Cabinet gave a single point of focus and leadership for IT at Indiana University. The UCS organization on the Bloomington campus was combined with Integrated Technologies on the Indianapolis campus to form University Information Technology Services. The user satisfaction survey and Activity Based Costing were extended to services offered on the Indianapolis campus. In 2002 the full measure of the Balanced Scorecard (Kaplan and Cooper 1998, Kaplan and Norton 2001) will be extended to IT services on all campuses of the university.

At least two lessons were learned during this process of ongoing organizational renewal. First, it is difficult but not impossible to create an organization of teams from either a hierarchical, command and control organization (traditional administrative computing) or a group of individualistic entrepreneurs (archetypical academic computing). Second, it is difficult to shift the focus of a university IT organization from particular technologies to the services these technologies produce. The only way to accomplish the latter is to make the former responsible for the quality and cost of their services and the conservation and renewal of their intellectual capital.

COST, QUALITY, AND OUTCOME MEASURES

Measurement of cost and quality seems inherently valuable. The leadership of any organization will claim, in at least some abstract sense, a desire to deliver high-quality services at favorable costs. Turning such a desire into tangible and effective actions is, however, a critical challenge.

The Indiana University IT organization has systematically surveyed customer perceptions of the quality of its services annually since 1991. The administration of this survey has always been handled by an independent survey organization, thus assuring anonymity of

respondents and credibility of the results. The survey is structured with standard Likert Scale results from 1 (not at all satisfied) to 5 (very satisfied). In addition, there is an opportunity for open-ended comments at the end of the survey. We have assured consistency in the survey structure and key questions over the years, thus making possible long term comparisons and judgments about our services. We use three forms of summary statistic: the percentage of people responding to a particular question indicating that they use a particular service; the average results for any question, and the percentage of respondents responding with a 3, 4, or 5 (which we read as the percentage satisfied with the service). The free text comments are also read carefully to ensure that the IT organization draws the proper conclusions from the survey results.

Details of the survey are available online at http://www.indiana.edu/~uitssur/survey/index.html. The results of every survey, including every comment ever written, are available on the Web. We carefully publicize service changes that result from the user survey. This brings a tremendous amount of credibility to the survey. Response rates are very high. For the 2001 survey, the overall response rate was 44.3% for IU Bloomington and 39.8% for Indiana University Purdue University Indianapolis. Such rates are possible only because the University community recognizes that UITS takes the survey responses seriously and acts to correct failings the survey highlights.

Figure 1 shows the survey results for overall computing services provided by the central IT organization to the Bloomington campus, which on the whole are very high.

Our success in maintaining high satisfaction is the result of many factors, especially giving careful attention to services that customers perceive as inadequate. Over the years survey results have been important in service decisions, including decisions to enhance modem pools and to invest heavily in online support services. Our standards have become so high that any service with an average score below 4 (out of 5), or a satisfaction percentage less than 90%, is considered in need of improvement.
The survey has been of particular value at certain points in the history of the IT organization at IU. In 1994, the central computing organization announced a plan to phase out use of VAX systems within three years. The University community was very unhappy with this plan. However, when user satisfaction was set as the primary goal for the project, public perception began to change. The setting of this user-centric goal was a key element in the IU community's acceptance of the proposed changes and in the project's ultimate success (Stewart *et al.* 1998).

The importance of the customer satisfaction survey to the delivery of excellent services at IU's two central campuses (Bloomington and Indianapolis) has been so great that in 2001 the survey was expanded to all campuses of Indiana University. Each of IU's regional campuses has a campus-specific IT support organization and a campus CIO who reports to the CIO for the University. The results of the customer satisfaction surveys for the regional campuses of IU have already resulted in several important service changes and have helped clarify where service improvements are required.

An interesting anecdotal observation is that the results of the systematic customer satisfaction surveys and the opinions of advisory committees often present different pictures of needs and perceptions of IT services. Both types of input are critically important. However, neither in isolation would give an accurate view of the needs felt by the University as a whole.

While service quality is critically important, it is also important to determine the cost and value of services delivered. The methods used in Activity Based Costing for UITS services generally follow those in publications by Robert Kaplan and colleagues (e.g. Kaplan and Norton 1996, 2001), and this discussion is based on Peebles and Antolovic (1999). Activity Based Costing allows any organization to allocate costs in such a fashion that it understands the total and per-unit costs of every service. The first step in this process was to develop an exhaustive list of all services delivered to its customers, itself an important accomplishment. The entire UITS budget is allocated in one fashion or another among this list of services. All costs — wages and benefits, computer hardware, and computer software – are allocated among the services offered by UITS. Leadership and infrastructure costs that span the entire organization (such as costs of the senior leadership of UITS, the Human Resources Office, and the Business Office) are distributed proportionally among the many external services. Campus networks and Internet connections are taken as a service in and of themselves, with their costs calculated on a per-packet basis.

As with the customer satisfaction survey data, UITS ABC data are widely publicized and publicly available on the Web (http://www.indiana.edu/~uits/business/scindex.html). Since IU does not bill UITS for the buildings, building maintenance, or utilities, these figures must be adjusted upward by 13% for comparison with private sector benchmarks (Peebles and Antolovic 1999). As with the customer satisfaction survey, the ABC data have been important in establishing fact-based discussion with the University and its financial leaders. This is particularly important in a responsibility-centered management structure (Whalen 1991). ABC metrics have been particularly helpful in discussion within the University to determine which IT services are best centralized, and which are best decentralized.

The measurement of productivity in academe is a topic of considerable debate, and few methodologies have been established and accepted in the same fashion as Activity Based Costing. UITS is building upon its quality and cost assessment processes by implementing a Balanced Scorecard (Kaplan and Norton 1996). Current measures of outcomes are the number of publications by University researchers that depend upon UITS research computing facilities and the grant funding received each year by the IT organization. While such measures are just a beginning, it seems essential at this point to begin drawing as clearly as possible the relationship between IT services provided for the University and the outcomes that these services facilitate.

GENERAL SUPPORT SERVICES

Information technology (IT) has permeated our lives and culture at work, at home, and even at play. IU has experienced tremendous growth in the number of students bringing computers to the University to assist with their studies. In 2001, 92.4 percent of students had personal computing workstations at their residences. To add more complexity, the number of faculty, staff, and students who own/use a computing workstation has increased, along with the number of devices per individual. General-purpose, end-user IT support at IU consists of a set of services provided by the central IT organization (UITS).

The Support Center provides general-purpose IT support to approximately 400,000 contacts per year. The subject matter of these contacts varies greatly. Unlimited support is provided free of charge to IU faculty, staff, and students via the Call Center, Walk-In Center, or online. Walk-in support is delivered from two central locations. Consultants help users with issues that require face-to-face transactions, they configure and troubleshoot workstations, and answer general support questions from people who stop in. This group also focuses on account distribution and provides accounts and training for the 12,000+ new students attending Orientation each summer. Online Support is delivered via e-mail and from the international-award-winning Knowledge Base.

The annual UITS survey provides valuable data; however, it is necessary to measure support processes on a daily basis to find problems before the process is out of control. To measure the quality of the support contacts, each day 45 customers who contacted the Support Center the previous day are randomly selected and sent e-mail asking these three questions, and given a space for general comments.

1. Did the customer receive a solution
2. in a timely manner
3. and delivered with courtesy and respect?

Many users prefer to ask *a person* the answer to their IT questions. Although this is a valuable function that has its place in today's support model, the resources available for such support typically do not scale to the demand.

The Indiana University Knowledge Base (KB, http://kb.indiana.edu) is a Web-based collection of IT problems and their associated solutions stored in a database and retrievable upon demand, 24x7x365. The KB is accessed approximately 75,000 times per week. By comparison, our other means of support (telephone, e-mail, and walk-in) are capable of answering only about 7,000 questions each month.

The Knowledge Base came into existence in 1988, as a radical idea of collecting information electronically and sharing it with other IT staff. *Yahoo! Internet Life* magazine hailed the KB as the “Best Online Support" tool (Microsoft is second) (*Yahoo! Internet Life*, October 1997). While focusing on information for IU affiliates, it is available and heavily used worldwide for answers to IT support questions. The KB will likely have over 7M hits this year. The goal of the KB is to provide the answers to

questions that are asked repeatedly, thus saving our human resources for those questions or problems requiring human logic, problem solving, and intervention.

UITS maintains more than 1,200 workstations, located in more than 40 Student Technology Centers distributed around the Bloomington campus. (Similar facilities are available at IUPUI, but not all are managed by UITS.) Approximately 190 student consultants are employed, trained, and tested in the skills most needed by the 60 percent of the student body that uses these Centers each year. Shifting the training content from purely technical issues to a focus on service orientation and such technical support resources as the Knowledge Base has led to 94 percent of students rating these services as "Satisfactory" or better.

In March, 1999, UITS assumed responsibility for providing IT support to the 11,000+ students living in the residence centers on the Bloomington campus. This support includes in-room IT assistance provided by 40 part-time student employees, and 400 workstations in the Residential Technology Centers that are distributed among the residence centers. Training, tools, and resources have been implemented, and metrics and quality control techniques are being applied to these services. The result is marked improvement, with 94.1% overall satisfaction in under one year.

Better educated/trained users are better able to support themselves. At IU, this education is free (highly subsidized) through programs that equip users with the basic skills to use IT effectively, including traditional, in-class instruction and computer-based training (CBT). The challenge is for the user to carve out time to attend the courses and learn the information. Segments of CBT courses have been incorporated into Knowledge Base topics to serve those who have only a few minutes to learn a specific topic. The number of learners who are satisfied has been consistently high over the last six years, with 97 percent of the faculty, staff, and students in 2001 rating this program as "Satisfactory" or better.

The delivery of high-quality IT support depends on the teams mentioned here and requires attention from each division of the IT organization. Careful implementation and change management processes must be in place. Communication between UITS divisions and the customer must be effective and concise. All divisions must keep user satisfaction in the forefront of all plans and products.

SPECIALIZED SUPPORT SERVICES

The largest part of the University community uses a fairly standard suite of computing tools – word processing, e-mail, spreadsheets, and Web browsers. However, the intellectual accomplishments that distinguish IU and differentiate it from many of its peers come from people with more esoteric computing challenges. IU recognized and began addressing specialized support needs in 1991, when it created the Center for Statistical and Mathematical Computing. The Stat/Math Center delivers and supports statistical and mathematical software applications ranging from such commonly used applications as SPSS to highly specialized applications that provide critical functionality. Based on the initial success of this specialized service, UITS created other specialized

consulting groups for creating and delivering online humanities texts, supporting Unix workstations, and developing and supporting advanced visualization and virtual reality systems. These groups provide services that a small fraction of the University community uses. But this population spans multiple academic areas. By targeting specialized areas of strategic importance, UITS attends to specialized needs at the same time as it supports the University's research mission.

DISTRIBUTED SUPPORT SERVICES

In today's information technology environments, several support models for distributed support services have emerged (McClure et al. 1999). The classic set includes:

- *Centralized:* The preponderance of support is based on resources in a centrally located organization and service is delivered directly to end users;
- *Decentralized:* Formerly centralized support resources are divided into parts then assigned to sub-units of the enterprise to deliver support to end users;
- *Haphazard:* No one in the enterprise exercises leadership or fulfills user expectations to their satisfaction; and
- *Distributed:* Centralized and sub-unit-based resources blend in some fashion to meet the support needs of the enterprise.

The latter model seems the most widely deployed and the most successful in delivering support for users at larger institutions and enterprises. In the IU model support stratifies into three basic components, each with its own role to play (Voss, Alspaugh, Workman, & Schau, 1998):

- Support provided by the central IT organization
- Support provided by IT users
- Support provided by staff in organized segments of the enterprise.

Distributed support services started out at IUB in the late 1980s as part of an effort to establish local support in departments. Through a program called "Distributed Support Assistants" (DSA) support resources were provided to departments in a two-year commitment. In the first year, DSAs were hired and funded by UITS (then called UCS). They located in departments and were assigned "supervisors" within the department's administrative structure, though a UITS coordinator provided supervision in matters of technology and service. In the second year, the department and UITS shared funding (50-50), and at the end of the contract UITS funding ceased, and the position continued only if the department elected to fully fund the service. In all cases (approximately 26 DSA agreements), the departments elected to continue funding the positions and in several cases augmented the investment with additional staff positions.

This seeding had several advantages. First, it enabled UITS to help department administration, faculty, and staff see the value of local IT support over a period of time. This "try and buy" approach encouraged local acceptance of the investment. Second, it allowed the support structures to develop in departments under the tutelage of UITS, thus

ensuring consistency of support quality and methodology across the campus. Third, the bipartisan partnering efforts created a sense of common purpose, rather than a competitive environment, between distributed and central support providers. But even the success of the DSA program did not meet all the latent demand for local support. Many departments, on their own, established local support positions. What soon became clear was that these positions, isolated and not part of the DSA program, lacked the best-trained people.

Again answering customer-communicated needs, UITS launched a program to train and inform these "feral" local support staff. The Technical Information for Excellent Support (TIES) program was launched. TIES was a semester-long series of 10-12 weekly sessions, each focused on a given topic of technology or support. These short "how to" sessions were focused on imparting skills and increasing the sense of being in touch with the central support staff and the rest of the distributed support providers. The success of TIES affirmed that well-trained staff do a better job of supporting their constituencies.

As the years progressed, TIES evolved into focused technical training programs. A second piece was needed – certification. And with this was born in the mid-1990s the ED/Cert training programs that exist today.

We had seeded a feral-but-friendly local support system. Just as the period of DSA seed funding was ending we realized we had to find ways to remain closely in touch with the developing local support community. We needed to maintain that partnership, in spirit and practice. The answer was PICS – Partners in Computing Support.

PICS started out as a philosophy and a wish for something beyond a traditional user group. To begin, UITS leveraged a small amount of central funding to provide a set of tools (centrally served CDs of support information) that departments could not afford to buy on their own. PICS also provided forums – monthly roundtables to discuss breaking technology news, or share information. Through these forums, LSPs became the first to hear of new services – and were given a chance to react and provide input into their deployment.

The years passed and separate programs came and went. What remains is a central support organization designed around the existence of a local, distributed support environment. LSPs are both customers and partners in delivery of support.

As customers, LSPs are given special care. When LSPs call the Support Center, we recognize them as trained professionals. As customers, LSPs have special services at their disposal, including a Departmental Support Lab where they can examine technology in detail alongside application area specialists who offer in-depth expertise. A LAN Lab provides local area network services. ED/Cert continues to provide no-cost training to Local Support Provider (LSP) participants, who are well aware of the role training plays in a successful support model.

As partners, UITS communicates with LSPs and actively seeks their input. The UITS culture values the contribution the LSP community makes to the success of the university's technology support structure. This partnership is seen as key to IU's success in the deployment and use of information technology.

The UITS organizational structure serves the needs of the distributed support model. LSPs have two distinct types of needs. They need someone to pay attention to what is coming down the pike, and they need someone to back them up with existing technology. LSP support in UITS is divided into two focus groups. The first serves an assessment and advising function, providing the LSP community with information about newer technologies. The second takes care of LSPs' current needs, providing detailed consulting and support in the technologies deployed on campus.

Departmental Computing Advising and Support Services (DCAS) is the home of the Departmental Support Lab (DSL). Here, application area experts research new desktop and groupware technologies and help LSPs understand how changes in these areas will impact their environments. LSPs can go to the DSL, away from the press of frontline support, to work with knowledgeable colleagues and test equipment, thus building their understanding of the changing IT world in which they live.

Local Support Provider Services (LSPS) supports LSPs once they deploy a given technology, providing help with everything from minor annoyances to crises. LSPS encompasses the LAN Lab, a facility that replicates the many local area network environments deployed across IU campuses and provides a safe test environment for replicating and resolving problems in local installations. LSPS is staffed with experts in electronic mail clients – the most widely used application at Indiana – and in operating systems and hardware environments. LSPS serves as LSPs' "general practitioner," drawing on technology resources across UITS to refer LSPs to the right specialist resource when needed for problem resolution. Finally, and most importantly, LSPS serves as an advocate for the LSP community within UITS.

The quality of these distributed services is measured in the UITS annual survey. The chart below (Table 2) shows the overall satisfaction rate as registered by the community of LSPs over the past four years.

2000	1999	1998	1997
93.3%	90.1%	90.8%	91.4%

Table 2. Overall satisfaction with UITS Distributed Support Services

This survey also asks: How satisfied are you with the computing support personnel employed by your department? The following chart (Table 3) shows responses to this question over the same period.

2000	1999	1998	1997

89.1%	85.4%	85.7%	86.8%

Table 3. Satisfaction with LSPs in departments

In the end, the need for distributed support, and the way UITS has developed and deployed the leveraged support model, have been key to our successes in delivering high-quality, valued services to our user community. Some key factors (Voss, Alspaugh, Kava, & Porter, 1998) are visible in all institutions that are effectively managing the Support Crisis, and that are effectively leveraging knowledge across all players. These include:

- Organizing to deliver support
- Emphasizing the Local Support Providers (LSPs)
- Emphasizing building LSP skills
- Emphasizing building user skills
- Providing deep target areas of specialized support
- Providing tools that enable user self-support.

Successful institutions see great benefit in acquiring all-encompassing software license agreements that cover basic tool sets, for this pares the variety of generations of software products in users' hands. Such deals need not constrain users to one vendor's products. They achieve their success in the support arena by eliminating the constraints (usually financial and logistical) that make it difficult for users to employ the latest – and most easily supported – versions of products (Voss & Schunk, 1998).

Just as critical as keeping the software at current, supportable levels is the need to ensure that the computer hardware is also modern, and on a reasonable life cycle program — usually three years — that ensures its currency. When users, LSPs, and central IT organization support staff work in an environment equipped with modern desktop and departmental hardware, problems of failed equipment and outdated technology are vastly reduced. Freed from these nuisances, they can concentrate on gaining the skills to be successful participants in the support model and focus on productive use of the technology.

SUMMARY

For the last decade, University Information Technology Services (UITS) at Indiana University has measured the satisfaction of its customers – students, faculty, and staff – with the organization's IT services. It has used the results of these surveys to improve the range and quality of its services. For the last five years Activity Based Costing measures have been applied to all UITS IT services. Through major organizational realignment, profound cultural changes, and the rapid evolution in hardware, software, and network technologies, UITS has pursued quality improvement, process improvement, and implementation of the Balanced Scorecard family of measures.

This focus on objective assessment of cost and quality has provided a systematic and reliable basis for factual discussion of the University's IT services. This focus on objective measures has enabled the central IT organization to deliver excellent services and empowered the University to understand these services (and their associated costs and qualities). Support is fundamental to the value of information technology in an academic environment, and the systematic measurement of its quality is fundamental to the excellence of its delivery.

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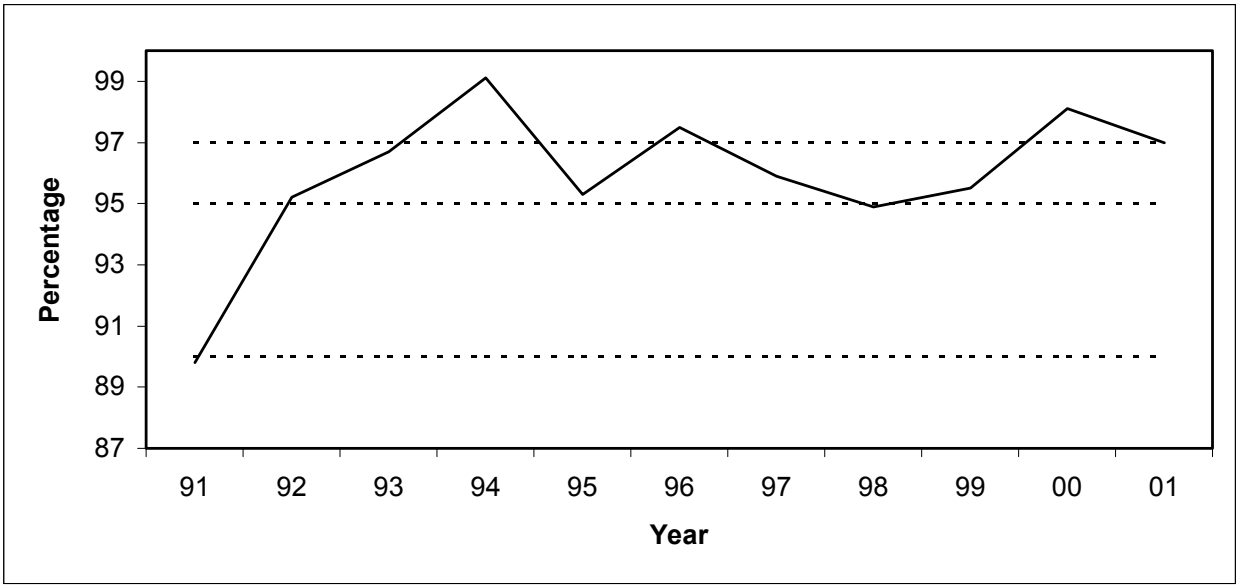
Figure1



Satisfaction percentage (percentage of respondents rating services as 3 or higher) for overall computer services provided to IU Bloomington by the central IT organization.