View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by AIS Electronic Library (AISeL)

Communications of the Association for Information Systems

Volume 16 Article 13

8-6-2005

USA Swimming: The Data Integration Project

Donald J. McCubbrey
University of Denver, dmccubbr@du.edu

Paul Bloom
Statera, Inc

Brad Younge
Statera, Inc

Follow this and additional works at: https://aisel.aisnet.org/cais

Recommended Citation
McCubbrey, Donald J.; Bloom, Paul; and Younge, Brad (2005) "USA Swimming: The Data Integration Project," *Communications of the Association for Information Systems*: Vol. 16 , Article 13.
DOI: 10.17705/1CAIS.01613
Available at: https://aisel.aisnet.org/cais/vol16/iss1/13

This material is brought to you by the AIS Journals at AIS Electronic Library (AISeL). It has been accepted for inclusion in Communications of the Association for Information Systems by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Communications of the Association for Information Systems

USA SWIMMING: THE DATA INTEGRATION PROJECT

Donald J. McCubbrey
University of Denver
dmccubbr@du.edu

Paul Bloom
Brad Younge
Statera, Inc.

ABSTRACT

USA Swimming (USAS) is the National Governing Body for the sport of swimming, one of more than 40 National Governing Bodies for amateur sports in the United States. Their mission is, in part, to "administer competitive swimming in accordance with the Amateur Sports Act", and to "provide programs and services for our members, supporters, affiliates and the interested public" The USAS membership community consists of athletes, non-athletes, and clubs. One of the most important functions USAS performs is to gather and maintain information on members in all categories. Maintaining individual swimmers' times in sanctioned meets, for example, forms the basis for swimmers to be ranked nationally. The responsibility for the gathering of data is relegated to 2,800 clubs and 59 local swimming committees scattered across the US. In their previous system, data needed for the USAS master databases was gathered by the clubs and sent to the local swimming committees, which consolidated the data and forwarded it to the national headquarters in Colorado Springs. Unfortunately, by 2002, it became clear that the hodgepodge of different hardware platforms and software used by the clubs and local swimming committees made the data gathering process ripe for errors, which resulted in unreliable data in multiple database systems at USAS headquarters.

This case describes the process USAS management followed to establish and manage the development of a new system whose principal features include a new centralized database with a pre-posting "holding tank" for data cleansing as well as a Web portal providing valuable new functionality to the user community. The project involved significant risks, not the least of which was the widely dispersed user community. Risks were mitigated by the development of a prototype and by engaging an independent verification and validation firm.

The new system achieved the benefits that USAS projected when the project was first conceived. The complicated technical infrastructure was replaced by a Web-based architecture that provides faster and more reliable service to the USAS community at a lower cost. The problem of inaccuracies in the data caused by data being stored in multiple databases was eliminated with the establishment of the new centralized database and the "holding tank's" data cleansing capabilities. Users at USAS headquarters and in the field embraced the new system because it simplified the data gathering process and greatly improved the reliability of the information they obtain from the centralized database.

Further, the Web-based portal provides a stable operating environment for day-to-day operations and a platform that allows adding enhancements easily to the system.

Keywords: case, centralization, consulting, database, data cleansing, IV&V, .Net, prototype, web portal, web services

I. INTRODUCTION

John Burbidge, Information Technology Director for USA Swimming (USAS) sat in his office overlooking Pikes Peak in Colorado Springs, Colorado. With the help of Statera, an Information Technology (IT) consulting firm based in Denver, USAS recently successfully completed a much needed project to replace its fragmented, decentralized, data collection and reporting system with a state-of-the art Web portal supporting a more current and accurate centralized database so that USAS could serve its members better. Moreover, the new Web portal system provided considerably more functionality to the USAS community of users. As Burbidge reflected on the progress that had been made, he knew that USAS could not stand still in its systems development initiatives. In addition to correcting serious operational shortcomings in the old system, he knew that the new system gave USAS the technical platform to provide even more new and innovative services to its members beyond those just added. The question before him now was how to find and select the best options for moving forward from the many possibilities, known and unknown, that lay open to USAS.

II. BACKGROUND ON USAS

USAS is the National Governing Body (NGB) for the sport of swimming, one of more than 40 NGBs for amateur sports in the United States. Their mission is, in part, to "administer competitive swimming in accordance with the Amateur Sports Act", and to "provide programs and services for our members, supporters, affiliates and the interested public". As illustrated in Figure 1, the U.S. Olympic Committee is the National Olympic Committee for NGBs in sports ranging from Track and Field, Wrestling, and Taekwondo, to Bobsleigh, Curling, Volleyball, and Luge. Typically, young athletes participate in sports in their local areas, either through their high school or college and university teams, or through clubs. Local units join an NGB in order to obtain the many benefits of association as well as to permit their athlete members to qualify for regional, national, and, ultimately, Olympic competition as a member of a U.S. national team.

THE MEMBERSHIP COMMUNITY

The USAS membership community includes athletes, non-athletes, and clubs:

1. **Athletes**. Swimmers of all ages are eligible for individual memberships in USAS. Fees for individual members range from $41 per year for a basic membership to $750 for a lifetime membership. Age groups consist of under 10, 11-12, 13-14, 15-16, 17-18, and 18+. USAS individual members number over 300,000.
2. **Non-athletes**. Non-athletes include other persons interested in supporting the athletes in various ways, including coaches, family members, officials, alumni, supporters, and sports medicine specialists. Membership dues for such individuals are in the same range as those for athletes.
3. **Clubs and other organizations**. This category consists of some 2,800 swim clubs where athletes train and compete against swimmers from other clubs. High school and college swimming teams also fall into this membership category.
4. **Outreach members**. USAS's active outreach program is focused on attracting minorities and athletes with special needs to the sport. Membership dues for individual outreach members are $5 per year.

Winter Sports

- alpine skiing
- biathlon
- bobsleigh
- cross country skiing
- curling
- figure skating
- free style skiing
- luge
- nordic combined skiing,
- skiing
- ski jumping
- snowboardi
- speed skating

Summer Sports

- archery
- badminton
- baseball
- basketball
- bowling
- boxing
- canoe/kayak
- cycling
- diving
- equestrian
- fencing
- field hockey
- gymnastics
- judo
- karate
- modern pentathlon
- racquetball
- roller sports
- rowing
- sailing
- shooting
- soccer
- softball
- squash
- swimming
- synchronized swimming
- taekwondo
- team handball
- tennis
- track & field
- triathlon
- volleyball
- water polo
- water skiing
- weightlifting
- wrestling

Figure 1. U.S. Olympic Committee Sports

USAS also supports geographically-based Local Swimming Committees (LSCs). The LSCs consist mostly of volunteers who manage the registration of swimmers and meets within their geographic area. There are 59 LSCs.

INFORMATION MAINTAINED ON MEMBERS

USAS gathers and maintains information on members in all categories. It also maintains a comprehensive and informative Web site at www.usaswimming.org.

Typical information gathered on athletes includes name, address, age, club affiliation (if any), ethnicity, disabilities, and times in competitive events. For non-athletes, typical information gathered includes name, address, club affiliation, and roles (e.g. coach, parent, official). For clubs, USAS gathers such information as the club's name and address, head coach, web site address, and other descriptive information. All of the information on individuals and clubs is maintained in databases at USAS headquarters.

Individual swimmers' times in sanctioned meets are important since they form the basis for swimmers to be ranked nationally. For example, the top 16 swimmers in each event are posted nationally in a USAS database so that a consistent method is used to know who the top-ranked swimmers in the nation are in each event. Individual posted times are how swimmers qualify to participate in regional and national events. Times posted in national and international events are used to determine the top swimmers in the country, who qualify for the U.S. National Team. In addition, a National Junior Team is sponsored for athletes under the age of 17.

A complete listing of information gathered and maintained in the centralized database is shown in Figure 2.

Subject Area	Data Collected	Subject Area	Data Collected
Members	Contact information	Miscellaneous	Message Center
	Age and gender		User configuration options
	Disabilities		Month/Year end close and reporting
	Ethnicity	National Team	Contact information
	Mailing options		Parent information
	Address validation		Travel information (frequent flyer, passport, etc)
	User Defined fields		Height, weight, hair color, eye color, etc
	Registration History		Current and past coaches
	Club Transfer History		Training facilities and times
	Citizenship		Trips attended
	Coach certifications		User Defined Fields
	Coach education		Notes
	Officials certifications		Missed Drug Test history
	Member ID history		File attachments (photos, forms, etc)
	Duplicates merged indication		Sports medicine participation
	Committees		Trip tracking
	Holding tank upload club registration files		Race Analysis reporting
			Lactate Clearance
Clubs	Contact information		Land Water Strength
	Web site	Reporting	Lists
	Head Coach		Labels
	Safety Coordinator		Membership Cards
	Treasurer		Various output types (PDF, HTML, CSV, etc)
	Registrar		Merge with Microsoft Word documents
	Registration History	Public Site	Online Store
	Coach History		Online Tests
	User Defined Fields		Content Management
	Facilities/Pools used		Events and Results
	Club Profiles (Parent Info. Survey, Athlete Statistics, Team Operation, League Relations, Computer/ Video, Training/ Testing, Sports Medicine)		Online Conference Registration
	Club Visits (Q&A interview notes from visit, rating, coaching philosophy)		ECoach
	Satellite Clubs		Club portals
			Swimmer portals (my USA swimming)
			Times/Club Search
			Forums and Online Chats
			Nutrition Tracking
			Video library
			DartSwim
			Online Meet Registration
			Newsletter distribution
			Sports Medicine
			Swimmer Bios

Figure 2. Information in the Data Base

III. THE INITIAL IT ENVIRONMENT AT USAS

While the membership constituencies of USAS depended on the headquarters operation in Colorado Springs to maintain accurate and timely information to support the sport of swimming in the U.S., by early 2002, the network of computer-based data gathering systems which supplied data to the master database systems at headquarters contained serious deficiencies. As a result, information obtainable from the master database systems was often inaccurate and out-of-date.

The crux of the problem with the network of data gathering systems in 2002 was that the responsibility for the gathering of data was left to the 2,800 clubs and the 59 LSCs. Basically, data needed for the USAS master databases was gathered by the clubs and sent to the LSCs, which consolidated the data and forwarded it to the national headquarters in Colorado Springs. The overall problem with this process was that the clubs and LSCs were using a hodgepodge of different hardware platforms and software that made the data gathering process ripe for errors. Headquarters suffered from similar problems. For example, the STAR database, which maintained swimmers' times, was written in a lesser known programming language called Delphi (www.borland.com/delphi) using Paradox database software. The system operated on a laptop computer and volumes were reaching the point where they were testing the limits of the Paradox software's capabilities.

DETAILED PROBLEMS WITH THE INITIAL IT ENVIRONMENT

John Burbidge recalled some of the problems with the initial IT environment that caused problems for USAS and its constituents at the time. They included:

1. Membership systems were outdated. Not only were they outdated, they were built in a variety of ways and operated on several different hardware and operating system platforms. For example, all of the LSCs used software originally supplied to them by USAS which could only record two years of historical data. Some LSCs and headquarters departments developed software of their own. Since this process was essentially a "home-grown" and distributed process, they were developed using such disparate packages as Delphi, dBase IV, Progress, Paradox, and a mix of Microsoft Access databases and Microsoft Excel spreadsheets [Microsoft 2004]. Although most used Microsoft Windows as their Operating System, others were on UNIX platforms. Hardware from several different manufacturers was used. Most were Intel-based PCs, but some LSCs used Macintoshes.

2. No LSC was given access to the master membership database at headquarters or any of the databases in the other LSCs. Membership data was forwarded to USAS HQ in various ways, and under various time schedules. For example, some LSCs emailed the data and some sent floppy disks by U.S. mail. The majority of individual members register in the fall. As registrations were received, the club entered membership data into whatever computer application (e.g. Microsoft Excel or Hytek) or paper form they used to keep track of their members and then forwarded it (by email or U.S. Mail) to their LSC. The LSC entered the information from all of its affiliated clubs into the Delphi application furnished to them by USAS. When information was received from the LSCs, USAS uploaded it into their Progress database application[1].

[1] More information on the Progress database software is available at www.progress.com

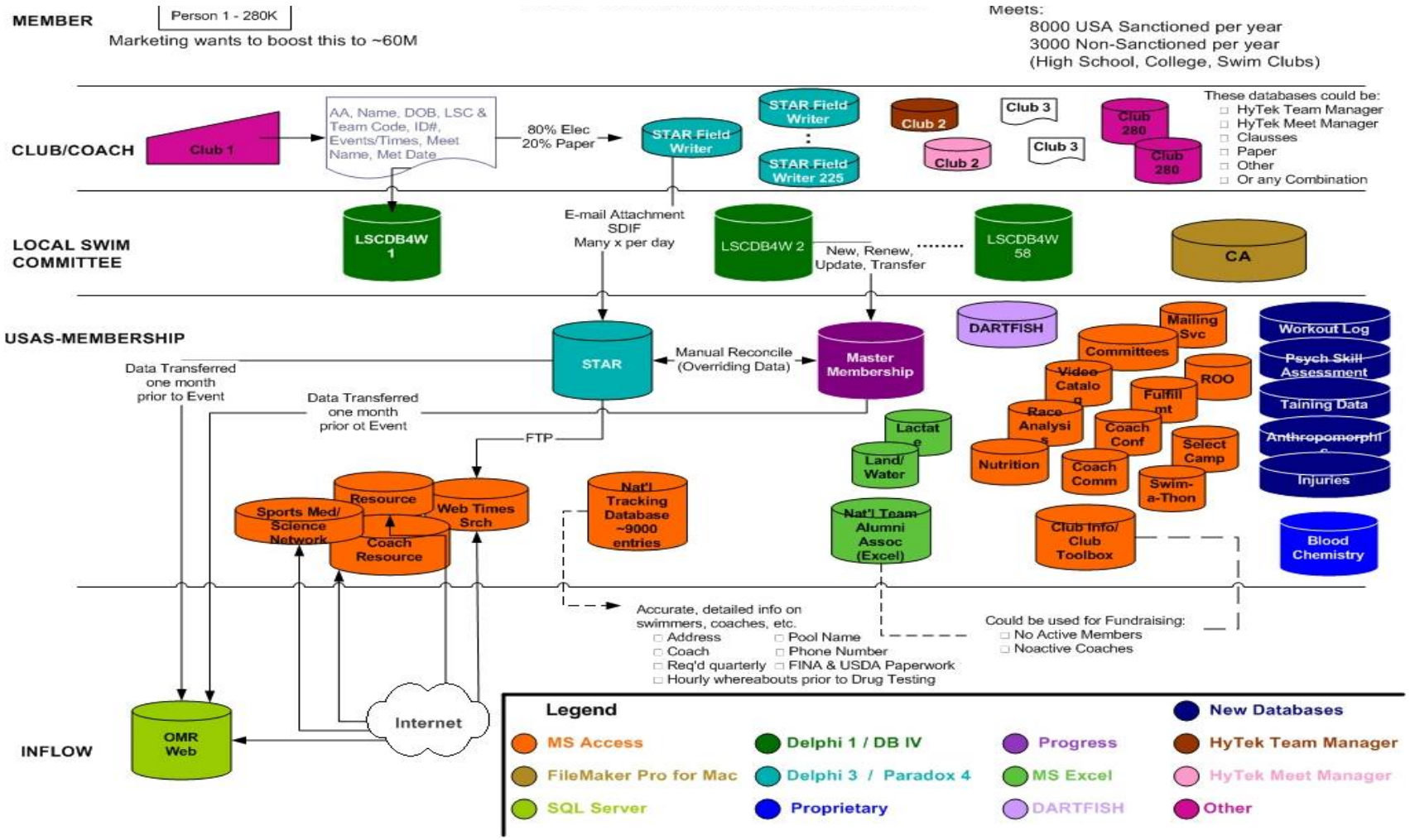

Figure 3. USAS Current Database Architecture

3. Because of the disparate software used, information was often entered manually at USAS headquarters. As a result, errors were introduced into the process. Typically, information was sent to USAS monthly, although depending on the time of the year, some LSCs would not update their membership information for two months or more. The earliest information was available at USAS was after month-end, although in some instances, information was two months old or even older.
4. As illustrated in Figure 2, data collected on individual members included demographic data as well as their times in events in sanctioned swimming meets. Demographic data was recorded in a Progress database and times information in a Paradox database at USAS. Information on the National Team and on alumni was recorded in separate MS Access database systems at USAS. The Membership and Times databases were separate and not related to one another. The end result of this arrangement was that different information on individuals could be recorded in separate USAS database systems. One of the key advantages of using a relational database management system is that it facilitates recording all the data (or attributes) of an entity (in this case, a human being) just once. Experience with computer systems shows that anytime the same attribute of an entity is stored in more than one database (or computer system), sooner or later the values of the two attributes will be different, and neither computer systems nor users will be able to discern which one is correct.

   In the USAS instance, an individual member's address could be different in the Membership database and in the Times database. In addition, a swimmer named Nancy Wilson, for example, could move from California to Georgia and join an LSC in Georgia, which would submit her member information to USAS. The USAS information system would record her current name, address, and LSC association correctly, but would have no way of knowing about the meet event times recorded in the Times database. Because the Membership database and the Times databases were in two separate database systems with no common membership identification number (i.e. primary key), the fact that the Nancy Wilson in the two systems was the same human being was lost. As far as the databases were concerned:

   - The Nancy Wilson reported by the California LSC dropped out of competitive swimming. No new times were recorded and she did not renew her membership.
   - The Nancy Wilson reported by the Georgia LSC started a career in competitive swimming. The times she recorded while a member of the LSC in California were not associated with her database record as a member of the Georgia LSC.

5. USAS maintained separate MS Access database systems for the USA National Team and for alumni, as well as several other single-purpose systems, as illustrated in Figure 3. The problem of combining all relevant information for a single individual also existed in these systems. For example, Nancy Wilson's information recorded in the National team database might be different than the information recorded for her in the Membership and Times database *and* when she moved into alumnus status *that* system could contain information about her that was inconsistent with information in the other three systems. These disparate systems could not communicate automatically with one another to identify discrepancies. Further, there was no easy way for IT to provide a composite view of a single individual's information from all systems. Worse, as described in item 3, some systems required manual data entry at USAS headquarters. For example, it took a full day for one person to enter athletes' times from a single meet into the Times database system. USAS staff recognized that these problems needed to be fixed if USAS was to

Table 1. Single Purpose Systems Maintained at USAS HQ

Data	Software Used
Membership	Progress
Times Database – (STAR)	Delphi and Paradox
National Team	Access
Online Meet Registration	Chilisoft asp and SQL Server
Nutrition Tracker	SQL Server and asp
Race Analysis (3rd party race stroke breakdown-HQ)	Access and VB5
Alumni, Land Water Strength, Lactate Clearance, Sports Medicine, Coaches Resource, Coaches Conferences and Coaches Camps, Club Profile/Toolbox	Access
Blood chemistry	proprietary
Dartfish videos	proprietary
Various stand alone web systems(Video Catalog, Fulfillment)	SQL Server
Web times/club search	SQL Server and asp

provide accurate information to its large and varied membership constituencies, to headquarters managers, the media, and the public at large. As IT Director, John Burbidge was responsible for making the databases work together successfully.

ENLISTING THE USAS HQ MANAGEMENT TEAM IN THE NEED FOR CHANGE

John Burbidge graduated from Coleman College with a degree in Computer Information Science in 1987. He began his career as a Systems Analyst with the New Mexico Public Utility Commission in Santa Fe, New Mexico. Following that, he worked as a Network Administrator for the WIC Program, a Federally-funded supplemental nutrition program for women, infants, and children administered by the New Mexico Department of Health. He joined USAS as Information Technology Director in 1999. Burbidge's experience as an IT professional made him well aware of the necessity of making sure that business unit managers recognized the need for IT-enabled change. He knew that without the support of business unit managers, a new IT system was at serious risk of failing. He was also aware, for example, of studies like the Chaos Reports published by the Standish Group on IT project successes and failures. For example, as reported in the *Economist*, "in 2004, only 29% of (IT) projects "succeeded", down from 34% in 2002. Cost over-runs averaged 56% of original budgets and projects on average took 84% more time than originally scheduled." [Economist 2005]. In their 2003 report, based on a survey of 13,522 U.S. IT projects completed in 2002, Standish reported that 51% were "challenged" and 15% were dubbed as outright failures. The 2003 report also calculated that "The lost dollar value for U.S. projects in 2002 was estimated at $38 billion with another $17 billion in cost overruns for a total project waste of $55 billion against $255 billion in project spending". [Standish 2003]. In John's experience, as well as in the experience of most seasoned IT professionals, the reason for failed or less than successful projects was, more often than not, a failure to get the business requirements of a new system right. And, in turn, the failure to get the requirements right was most often due to insufficient involvement and commitment from the users for whom a new system was being designed.

Accordingly, John assembled a meeting of the USAS key business unit managers (Table 2) to obtain their support for a project to correct the shortcomings of their current IT environment and to lay the foundation for accommodating future IT system needs.

Table 2. Members of USAS Management
Focused on the Data Integration Project

Mike Unger - Managing Director, USAS
Cathy Durance – Membership
John Walker - National Team
Tom Avischious - Club Development
Larry Herr – National Times collection
Robb Hinds – Software Developer

The meeting concluded with unanimous agreement that the old system was so dated and convoluted that it needed to be tossed out and replaced with one that was totally new, designed from the ground up, using the latest technologies. The question John needed to wrestle with next was how to accomplish the task. It would not be easy, given the limited in-house resources available to him.

THE IT ORGANIZATION AT USAS

To say that the IT organization at USAS was "thin" was an understatement. It consisted of just four people: John Burbidge, the Director, Robb Hinds, a software developer, Chris Detert, the network administrator, and Lambert Hubel, who handled the stream of inquiries from people at USAS and from the membership community. While John knew that his staff was doing a great job in keeping the old system working up to its limited capabilities, he also knew that undertaking the design and installation of a new system would require additional resources. First, John needed to seek approval from USAS Managing Director Mike Unger to move ahead with the project. John put together the business case for replacing the system, the highlights of which are shown in Table 3. Briefly, it described the operational problems of the current system, and how

Table 3. Highlights of Business Case for New System

1.	Duplicate membership data
2.	Inability to match members to times
3.	Large effort and significant delay in getting times posted to public site and to online meet registration
4.	Inability to report on data across systems (membership, times, national team, alumni, etc)
5.	Outdated hardware and software
6.	Manual effort of transferring data from club to LSCs to National Headquarters for registrations
7.	Delays in transferring registrations to headquarters
8.	Growth of standalone Microsoft Access databases as short term problem solutions
9.	Public web site had become hard to manage with frequent broken links

they were only likely to get worse with the passage of time. After sending Mike Unger the business case document, a meeting with key managers was scheduled to discuss the next steps. John Burbidge led the discussion and proposed that USAS begin by hiring a consulting firm to lead an analysis of the current database and business environment, identify the system requirements and technologies for a new system, and draft a Request for Proposal (RFP). He concluded by asking Mike Unger for approval to move ahead. After Mike asked several pointed questions and got good answers, he agreed that something needed to be done, and quickly.

SELECTING THE IT CONSULTANT

Literally hundreds of thousands of IT consulting firms in the U.S. offer services, ranging from very large companies like Accenture, CSC, EDS, and IBM Global Services, to one person companies operated out of the consultant's home. The large firms employ more than 100,000 people from offices in most major cities in the world. Some IT consulting firms, particularly mid-range firms with between 100 and 1000 employees, are often located in just one city or in a region (e.g. the U.S. West Coast). Many smaller firms carve out niche markets for themselves, such as industry verticals in health care, or government, or in a technical area such as data warehousing and data mining.

John Burbidge, who used consultants in the past, knew that engaging the right consultant for a particular task was sometimes easier said than done. He also knew that simply engaging a consultant was not enough to ensure success. Many failed IT projects involved reputable consultants who were found to be at fault when dissatisfied clients sued them.

After receiving proposals from and interviewing several consulting firms, USAS chose a Denver-based company, Statera, (www.statera.com) to work with them on the new system's

requirements and design. The key factors in Statera's selection were the quality and experience of the personnel who would actually be working on USAS's project, their understanding of the business issues, and, therefore, the support and acceptance they would receive from the USAS business unit managers. Additional background information on Statera is shown in Sidebar 1.

SIDEBAR 1

BACKGROUND ON STATERA

Statera is the Latin word for "balance". It was founded in 2001 by its President, Brad Weydert and CEO, Carl Fitch—who had grown a previous IT consulting firm, Raymond James Consulting, from a startup in 1992 to a company with over $70 million in revenue in 2000 when they sold it to a larger firm.

As stated on its Website (www.statera.com), Statera strives to achieve balance not only in the business and technology needs of its clients – but also between work and family – and employees, clients and partners. Statera's management team and staff gained significant experience in technology and business consulting with firms such as Accenture, Cap Gemini Ernst & Young, EDS, and Raymond James Consulting, in many industry sectors including insurance, communications, healthcare, energy, and financial services. Their personnel are experienced with small firms, start-ups, private industry, Fortune 100, and Fortune 500 firms. Statera is headquartered in Denver, Colorado with a branch office in Colorado Springs. The firm employed over 90 professionals in 2005 and continues to grow at a fast pace. Statera was ranked as the sixth fastest-growing privately held Colorado company by the Denver Business Journal in July, 2004, and was named as a finalist for top Colorado company of the year by ColoradoBiz magazine in August 2004. CEO Carl Fitch was named the Colorado Technology Executive of the Year by the Colorado Software and Internet Association in May, 2005. [Statera 2004a and Statera 2004b]

To ensure effective knowledge transfer, the project team was composed of both a USAS Task Force and Statera personnel. Members of the project team and their roles are listed on Table 4. The project kicked off on March 4, 2002.

Table 4 The Project Team

Statera Project Team	USAS Task Force
Carl Fitch, Client Liaison Executive	Mike Unger, USAS Managing Director
Dan Fox Gliessman, Project Management	John Burbidge, USAS Information Technology Director
Paul Bloom, Team Lead and Developer	Cathy Durance, Member Services Coordinator
Brad Younge, Lead Developer	Larry Herr, Sports Science Coordinator
Daniel Grandestaff, Database Analyst and Developer	Tom Avischious, Programs and Services Director
Jim Soiland, Developer	John Walker, National Team Technical Support
Keith Nobles, Quality Assurance	Robb Hinds, Programmer/Analyst
Andrea Estes-Rank, Documentation	

THE DESIGN OF THE NEW SYSTEM

Good systems development practices are usually built around a standard development methodology. Many methodologies are in use, but most use some variation of a phased approach to system development consisting of elicitation of user requirements, system design, system construction, and implementation.

Statera's development methodology in the USA Swimming instance consisted of four phases labeled Discovery, Design, Approval, and Implementation. The major steps in each phase are shown in Table 5.

Table 5. Major Steps in the System Development Methodology at USA Swimming

Phase	Activities
Discovery	Interviews
	Current system architecture
	High level requirements
	Discovery Document
Design	Gather requirements from task force and key users
	Prioritize requirements
	Develop Use Cases
	Create Database model
	Complete design documents
	Create Swim lane diagrams
	Create new system architecture
Approval	Prototype review
	LSC review
	Risk Analysis
Implementation	Coding
	Risk mitigation
	Hardware procurement and configuration

The Discovery Phase

The name used by Statera for the overview of a client's requirements is the "Discovery Phase". For USAS, the project team's primary focus was to understand fully what data (in all forms) was received by, and distributed from, USAS headquarters. Over the course of several weeks, the project team interviewed over twenty individuals at USAS Headquarters, as well as USAS board members and representatives from current USAS software providers. At the conclusion of the Discovery Phase, the project team had gathered complete information about current systems in use at USAS and the movement of data between USAS and affiliated external entities.

The Discovery phase also gathered requirements for the Task Force and key users. They prioritized the requirements using various methods, including perceived need, Task Force judgment, political complexity, and technical complexity.

One of the confounding factors in this project in comparison to many other IT projects was the loose network of entities that were involved. In a typical corporate environment, even in a global corporation, the influence that a headquarters organization can exert on local entities to see the benefits of a common solution is much greater than what an organization like USAS could exert on its LSCs. The LSCs enjoyed a degree of independence beyond what is seen in a typical corporate setting. For example:

1. The LSCs maintained a strong role in the process of adding, deleting, and updating membership information since this process was performed at the local level, not at USAS headquarters.
2. Software vendors such as HyTek and Clauson, which provided software to the clubs, were in a position to influence local LSC officials if a proposed solution turned out to be detrimental to the vendors interests.
3. The normal process followed in a Statera Discovery Phase would have been to engage the LSCs' opinions, needs, and wants, in coming up with a set of new system requirements. This process was not followed, however, because of the large number of LSCs. The project team was concerned that any solution might be considered as unwieldy or too costly by a significant segment of the LSCs, and that

gaining consensus on a common solution could take "forever". Consequently, the project team, with the approval of the Task Force, decided to consider the LSCs as "off limits" during the Discovery Phase. While this approach was potentially risky, in the end, the project team was able to gain a sufficient understanding of LSC requirements by speaking to LSC members informally (e.g. when attending meets), by speaking with Task Force members who were well aware of LSC needs and opinions and, as discussed below, by developing and displaying a prototype of the system to a subset of the LSCs.

Summary of Findings of the Discovery Phase

When the project team completed its documentation of the processes being followed in the current system, it was clear that there was ample opportunity for significant improvement. It should be noted that while most widely-accepted system development methodologies call for documenting the current, or "as-is" system, this step is not always done in practice. On occasion, IT practitioners will immediately move to design and construct the new, or "to-be" system, perhaps because of the press of time, or because they feel they know what is needed in the new system. The danger in not documenting the as-is system, however, is that the movement of information and the opportunities for process improvement are not fully appreciated before beginning the design of the to-be system.

The understanding the project team came away with after documenting the as-is system was that the business processes in the USAS network were developed over time, by necessity, and in the absence of the more efficient technologies that became available, most notably Web-based system architectures. The as-is system(s) were not created out of a lack of understanding of the value of a centralized database, but simply because the technologies at the time did not support such a system architecture in a manageable and economical manner. The team confirmed that the proliferation of small, heavily manual applications and databases resulted in a considerable amount of rework, data duplication, and frustration among all members of the USAS network,

THE DESIGN FOR USAS

The two central pillars of the "to-be" system were that it be Web-based, with a portal accessible by all authorized members of the USAS community, and that, of course, it incorporate a single, centralized, database.

The Web Portal

According to one authoritative source[2], "*Portal* is a term, generally synonymous with *gateway*, for a World Wide Web site that is or proposes to be a major starting site for users when they connect to the Web or that users tend to visit as an anchor site. Some portals are general and others are specialized or niche portals. Some major general portals include Yahoo, Excite, Netscape, Lycos, CNET, Microsoft Network, and America Online's AOL.com. Examples of niche portals include Garden.com (for gardeners), Fool.com (for investors), and SearchNetworking.com (for network administrators)".

In the case of USAS, the niche portal concept was applied. The USAS Web site would serve as a gateway to all of the Web-based services that USAS offers to its members. Members could view, enter, and change information 24 hours a day, 7 days a week.

The Centralized Data Base

Underpinning the membership information available on the new Web site is a centralized database which replaced USAS's previous array of independent databases (Section II). One innovation that Statera created was the "holding tank" database where incoming data was held

[2] http://www.searchsmb.techtarget.com/sDefinition/0,290660,sid44_gci212810,00.html

until its accuracy could be established before it was posted to the centralized database. For example, assume that an event time came in from an LSC for a swimmer named Carolyn McGuire that contained (among other items) the following information:

Name:	Carolyn B. McGuire
USAS Member number:	042390CARBMCQU
Meet number	553
Location:	San Diego, CA
Event:	200 meter backstroke
Time:	2:26:43

The system would first put all of the incoming information in the holding tank database. Next, the application software programs would perform tests on the incoming data to be sure it was reasonable. For example, the time for Carolyn McGuire would be compared to her previous times and to record times for her age group. If her best previous time was 3:02:32, the system would flag the incoming time as a possible error for someone in Larry Herr's National Times collection group to follow up on. That person would contact the LSC to be sure the new time was correct. Similar tests for reasonableness and accuracy were designed for other incoming data items. The key features of the overall architecture of the new system are shown in Table 6 and the architecture itself in Figure 4.

Table 6. Key Features of the New Architecture

Single Unified Database under USAS HQ Control	Integration with 3rd Party Software; Member ID Validation Service
Single Well-Controlled Gateway into the Central Database	HQ Membership Pages
Integrated Solution – No Rogue Databases	National Team Pages
Scalable/Maintainable/Recoverable Architecture	On-line Meet Registration
Clustered Hardware -Availability -Performance	Read-only Data Warehouse
Membership Input Features	Public Website Pages
Meet Results Upload Capabilities	Password Protected Pages

GAINING APPROVAL FOR CONSTRUCTION AND IMPLEMENTATION OF THE NEW SYSTEM

Statera prepared a comprehensive set of system documentation that the primary users of the proposed new system reviewed and approved. Included were such deliverables as a detailed design of the centralized database, and working prototypes of the Web site. In the same way as the owners of a new custom home satisfy themselves that the end result will be exactly what they want before construction workers bring in equipment to prepare the foundation, users of the new system were given a clear understanding of what their new system would look like, what functions it would perform, what advantages it would give them in supporting their responsibilities, and how much it would cost to build and maintain. With this information in hand, John Burbidge convened a meeting of the Task Force (with Mike Unger in attendance) to seek approval to move ahead with building the system. Key to convincing Mike that it made good business sense to move ahead with the new system as designed was the enthusiastic support he heard from the business

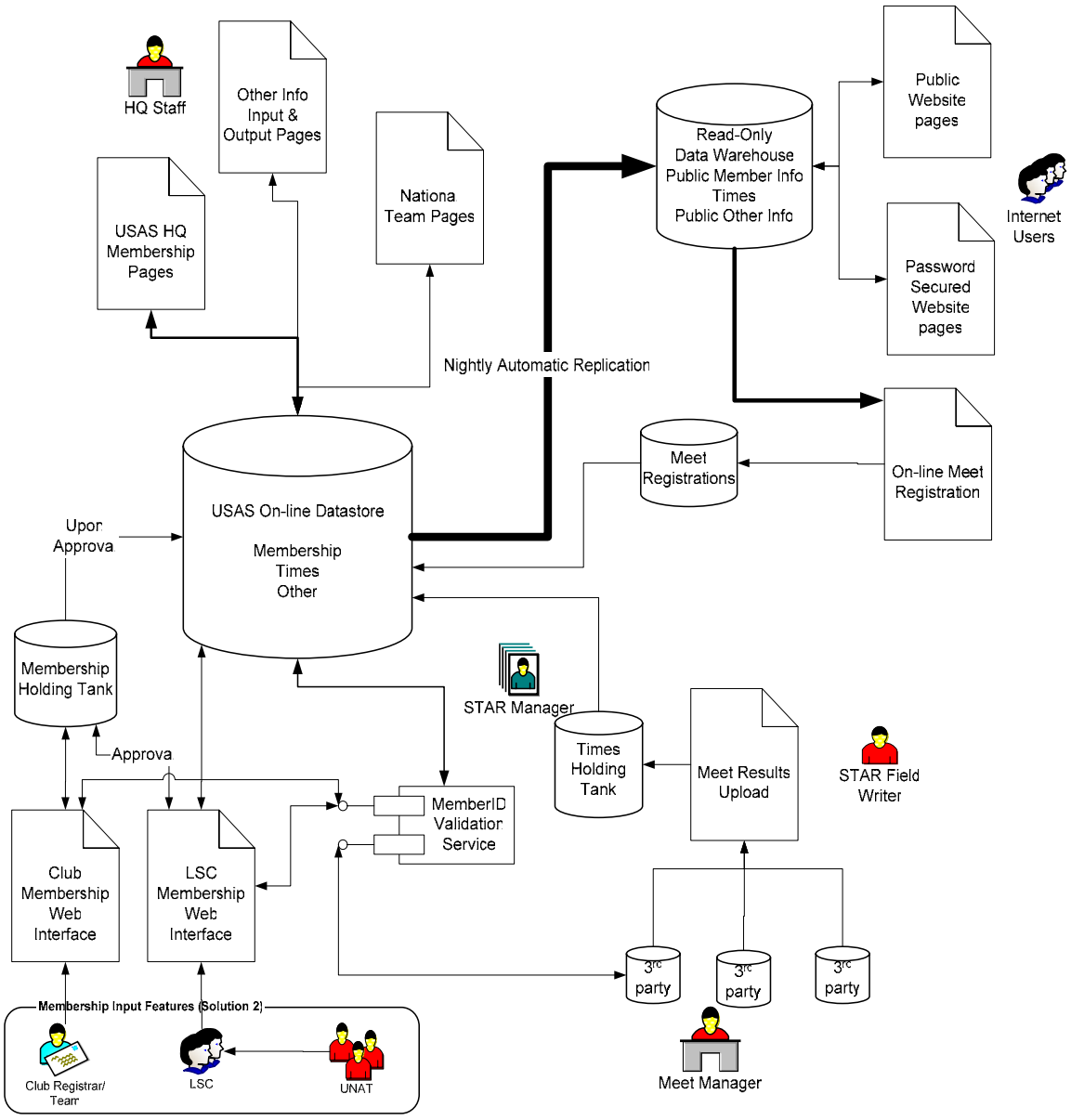

Figure 4. Diagram of the New Systems Architecture

unit managers around the conference table and from members of USAS's IT organization. Ultimately, the Task Force decided to not release an RFP and selected Statera to complete the design, construction and implementation of the new system.

Statera completed the design phase in the last three months of 2002. One of the steps they took in this phase was to develop and preview a prototype of the system with a representative set of LSC users in order to obtain their feedback on the design, and their support for moving forward with the system's construction and implementation. This step proved critical for the project. It not only got buy-in from the LSCs and made them feel they were involved in the process, but it also provided valuable validation of the design before coding began. Thus, any misunderstandings between a key set of system users and the development team were clarified early on, avoiding the more expensive rework required when errors are discovered after coding is well underway.

THE IMPLEMENTATION PHASE

Once the design of the new system was approved, the Statera team began work on developing the new system. Statera decided, (with agreement from the Task Force) to develop the new system in a Microsoft .Net development environment with Microsoft SQL Server 2000 as the database management software, a popular and widely used approach in the IT world. This course of action was chosen to avoid the problems USAS encountered previously in maintaining a wide variety of software packages.

USAS wanted the new system to be up and operating by June 9, 2003 so that it could be used for a few months before the heaviest registration activity began in September. Coding of the new system began in January 2003, so the time frame for Statera was tight. Accordingly, Statera did a comprehensive risk analysis and reviewed it with the Task Force. Oftentimes, IT professionals are aware of technical, scope, and other risks associated with the implementation of a new system but do not share them with their business unit partners (or clients). For example, a project where a new technology is being employed by the project team for the first time is inherently riskier than a project where the team used the software development tools and architecture many times before. Statera knew it was important to make the USAS Task Force aware of any risks associated with the project so that risk-mitigation processes would be in place at the outset, thus giving greater assurance that the June 9 target date would be met[3]. The key risks Statera identified were:

1. No comprehensive requirements gathering took place directly with LSC representatives. What contact took place was somewhat informal and at a high level.
2. Unforeseen requirements might arise after the coding began. When implementation team members try to please their business unit customers by adding features not in the original requirements documents without modifying the project plan to reflect the additional time or resources required, projects tend to fall behind and go over budget. This phenomenon is not uncommon, and is one of the primary reasons IT implementation projects exceed their budgeted times and costs. IT professionals call it “scope creep” and learned to avoid it wherever possible.

Accordingly, Statera adopted the following risk mitigation procedures:

1. They planned to meet with LSC representatives when they came to Colorado Springs to obtain their comments on the new system’s design. During this meeting they walked them through the prototype of the system..
2. They planned to estimate and manage the project’s scope carefully so that the most critical design issues would be addressed and implemented first. In this way, the system could still be converted by the target date and less-critical features added at a later date, if necessary.

As a result of the careful review of the as-is systems, definition of requirements for the to-be systems, involvement of the USAS Task Force, risk assessment and mitigation, and project planning and management, Statera was able to deliver a working system on time and on budget.

The USAS Task Force adopted an unusual, but highly effective risk mitigation procedure of its own. They engaged National Systems and Research Co. (NSR), a local firm which specializes in independent project verification and validation (IV&V) to provide them with an impartial evaluation of the project. First, they asked for a second opinion on the wisdom of engaging Statera to complete the design, construction and implementation of the new system on a “sole source” basis and received NSR’s endorsement of the decision. Secondly, NSR was asked to provide the Task Force with independent quality assurance reviews of the project’s progress at key project milestones.

[3] They wanted to avoid their project appearing in the wrong column of the next Standish Chaos Report

BENEFITS ACHIEVED

The new system achieved the benefits that USAS hoped for when the project was first conceived. The complicated technical infrastructure was replaced by a Web-based architecture that provides faster and more reliable service to the USAS community, at a lower cost. The problem of inaccuracies in the data caused by data being stored in multiple databases was eliminated with the establishment of the new centralized database and the "holding tank's" data cleansing capabilities.

> *"users at USAS headquarters and in the field have been very receptive to the new system because it not only makes their work much easier, but they now know that they can rely on the accuracy of the information they obtain from the system in ways they never could before".* John Burbridge

> *"Going beyond that, the Web-based platform developed using Microsoft software gives us not only a stable operating platform for our day-to-day operations, it also gives us the ability to add enhancements to the system much more easily. We no longer have to deal with the myriad of outdated technologies we had to deal with in the past. Now, we are well-positioned to provide the new and innovative services the USAS community will demand in the future"* John Burbridge

An additional feature is the ability for applications on the USAS public website to draw on data stored in the central database. For example, individual swimmers can establish personalized portals called the My USA Swimming Page to display their times, meet event results, and graphs that chart their progress. Similarly, clubs can establish portals tailored to the interests of their members, including the ability to display coach contact information and facility information with maps to club pools.

NEXT STEPS

Even though the new system made USAS a leader among the National Governing Boards for sports in the U.S., Burbidge's experience told him that there would always be additional opportunities to provide innovative solutions to the user community. With the new system operating as planned, his thoughts turned to what the appropriate next steps for IT at USAS Swimming might be.

Editor's notes: A teaching note for faculty listed in the ISWorld Faculty directory is available from Donald J. McCubbrey (dmccubbr@du.edu)

This case was received on April 20, 2005 and was published on August 3, 2005.

DISCUSSION QUESTIONS

1. The case mentioned a number of problems with the initial IT environment at USAS. What additional problems can you see from the perspective of a user of the system at USAS headquarters?

2. What additional problems can you see with the initial IT environment at USAS from the perspective of a user at one of its 2,800 affiliated clubs or 59 LSCs?

3. What additional problems can you see from the perspective of the USAS IT organization, which was responsible for maintaining and enhancing the initial IT environment?

4. Why did John Burbidge feel that the support of business unit managers was critical to the success of a new systems development project?

5. Explain why it is absolutely necessary to "get the requirements right" if a new IT system is to be successful? Why is getting the requirements right such a stumbling block for many IT projects?

6. CIO magazine in its July 15,2002 issue (www.cio.com/archive/ 071502/ control_sidebar1.html) gives 10 hints about how to use consultants effectively. Go to this location on the Internet and read these hints. DO NOT copy them as they are copyrighted and you don't have permission to do so. Do you agree with them? Can suggest others?

7. The project team in the case consisted of USAS and Statera personnel. What are some of the advantages of this approach? Could there be disadvantages in some cases?

8. Comment on the USAS Task Force's decision to engage the services of NSR to give them an independent oversight of the project. What are the advantages and disadvantages of using a firm like NSR on an IT project?

9. What additional innovative applications can you suggest to USAS to capitalize on its new IT platform?

REFERENCES

EDITOR'S NOTE: The following reference list contains the address of World Wide Web pages. Readers who have the ability to access the Web directly from their computer or are reading the paper on the Web, can gain direct access to these references. Readers are warned, however, that

1. these links existed as of the date of publication but are not guaranteed to be working thereafter.
2. the contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. the authors of the Web pages, not CAIS, are responsible for the accuracy of their content.
4. the author of this article, not CAIS, is responsible for the accuracy of the URL and version information.

Economist (2005) "Overdue and Over Budget, Over and Over Again", *The Economist,* June 11th 2005, pp57-58.

Microsoft (2004) "Swimmers Organization Delivers Better Data Faster with Integrated IT Solution" Microsoft Windows Server System Customer Solution Case Study, May 26.www.microsoft.com/resources/casestudies/casestudy.asp?CaseStudyID=15424, (accessed March 14, 2005).

Standish (2003) "Press Release: Latest Standish Group CHAOS Report Shows Project Success Rates Have Improved by 50%", March 25, 2003. www.standishgroup.com/press/ article.php?id=2, accessed March 14,2005.

Statera (2004a) www.statera.com/StateraWeb/ViewNewsArticle.aspx?TabId=32& Alias=Rainbow &Lang=en-US&ItemId=40&mid=87, accessed March 14, 2005.

Statera (2004b) www.statera.com/StateraWeb/ViewNewsArticle.aspx?TabId=32&Alias=Rainbow &Lang=en-US&ItemId=41&mid=87,accessed March 14, 2005

searchSMB.com Definitions (2005) searchsmallbizit.techtarget.com/sDefinition/0,,sid44_gci 212810,00.html, accessed March 14, 2005.

LIST OF ABBREVIATIONS

IV&V	Independent Verification and Validation
LSC	Local Swimming Committee
MS	Microsoft
NGB	National Governing Body
USAS	USA Swimming

ABOUT THE AUTHORS

Don McCubbrey is Clinical Professor in the Department of Information Technology and Electronic Commerce and Director of the Center for the Study of Electronic Commerce in the Daniels College of Business at the University of Denver. He joined the Daniels College faculty in 1984 after a career in information systems consulting with Andersen Consulting/Arthur Andersen & Co. Since then, he concentrated his teaching and research in the areas of strategic information systems and electronic commerce. He is a co-founder and board member emeritus of the Colorado Software and Internet Association.

Paul Bloom is a senior consultant at Statera, an IT business and technology consulting company in Denver, Colorado. His technology career started in Atlanta, Georgia where he worked for Lanier Business Products from 1983 to 1993 developing enterprise manufacturing applications. Moving to Denver in 1993, Paul joined Raymond James Consulting focusing on Oracle consulting in the Rocky Mountain region. In 1996 Paul shifted his technical focus to Microsoft solutions. Joining Statera in 2001, he fills a variety of consulting roles in business analysis, database design, project management, and software development.

Bradley Younge is a senior solutions architect at Statera, an IT business and technology consulting company in Denver, Colorado. After receiving a B.S. in Electrical Engineering from Cornell University and an M.S. in E.E. from the University of California, Berkeley, Brad participated in two startup companies as a software architect, drugstore.com and CriticalArc Technologies. Following his move to Denver, Colorado, he joined Statera in September of 2001. Since then, he narrowed his technological focus to delivering customized solutions on Microsoft Platforms and led teams delivering custom solutions for USA Swimming, ProLogis, SwitchPoint Networks, USA Rugby and Great West Life.

Copyright © 2005 by the Association for Information Systems. Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and full citation on the first page. Copyright for components of this work owned by others than the Association for Information Systems must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists requires prior specific permission and/or fee. Request permission to publish from: AIS Administrative Office, P.O. Box 2712 Atlanta, GA, 30301-2712 Attn: Reprints or via e-mail from ais@aisnet.org.

Communications of the Association for Information Systems

ISSN: 1529-3181

EDITOR-IN-CHIEF
Paul Gray
Claremont Graduate University

AIS SENIOR EDITORIAL BOARD

Jane Webster Vice President Publications Queen's University	Paul Gray Editor, CAIS Claremont Graduate University	Kalle Lyytinen Editor, JAIS Case Western Reserve University
Edward A. Stohr Editor-at-Large Stevens Inst. of Technology	Blake Ives Editor, Electronic Publications University of Houston	Reagan Ramsower Editor, ISWorld Net Baylor University

CAIS ADVISORY BOARD

Gordon Davis University of Minnesota	Ken Kraemer Univ. of Calif. at Irvine	M.Lynne Markus Bentley College	Richard Mason Southern Methodist Univ.
Jay Nunamaker University of Arizona	Henk Sol Delft University	Ralph Sprague University of Hawaii	Hugh J. Watson University of Georgia

CAIS SENIOR EDITORS

Steve Alter U. of San Francisco	Chris Holland Manchester Bus. School	Jaak Jurison Fordham University	Jerry Luftman Stevens Inst.of Technology

CAIS EDITORIAL BOARD

Tung Bui University of Hawaii	Fred Davis U.ofArkansas, Fayetteville	Candace Deans University of Richmond	Donna Dufner U.of Nebraska -Omaha
Omar El Sawy Univ. of Southern Calif.	Ali Farhoomand University of Hong Kong	Jane Fedorowicz Bentley College	Brent Gallupe Queens University
Robert L. Glass Computing Trends	Sy Goodman Ga. Inst. of Technology	Joze Gricar University of Maribor	Ake Gronlund University of Umea,
Ruth Guthrie California State Univ.	Alan Hevner Univ. of South Florida	Juhani Iivari Univ. of Oulu	Claudia Loebbecke University of Cologne
Michel Kalika U. of Paris Dauphine	Munir Mandviwalla Temple University	Sal March Vanderbilt University	Don McCubbrey University of Denver
Michael Myers University of Auckland	Seev Neumann Tel Aviv University	Dan Power University of No. Iowa	Ram Ramesh SUNY-Buffalo
Kelley Rainer Auburn University	Paul Tallon Boston College	Thompson Teo Natl. U. of Singapore	Doug Vogel City Univ. of Hong Kong
Rolf Wigand U. of Arkansas,LittleRock	Upkar Varshney Georgia State Univ.	Vance Wilson U.of Wisconsin,Milwaukee	Peter Wolcott U. of Nebraska-Omaha
Ping Zhang Syracuse University			

DEPARTMENTS

Global Diffusion of the Internet. Editors: Peter Wolcott and Sy Goodman	Information Technology and Systems. Editors: Alan Hevner and Sal March
Papers in French Editor: Michel Kalika	Information Systems and Healthcare Editor: Vance Wilson

ADMINISTRATIVE PERSONNEL

Eph McLean AIS, Executive Director Georgia State University	Reagan Ramsower Publisher, CAIS Baylor University