

The Journey from Premise to Hosted to SaaS - A CPA's Travel Guide

A CPA2Biz White Paper

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Today's mobile and web technologies have changed the way we do business, and the continued migration into more cloud services affects our costs, capabilities, and offerings. We are entering a new era in software, mobility, and consolidation of computing resources. The market-driven demand for real time financial reporting and consulting requires significant changes to existing business processes. This change is as significant of a change as the switch from manual ledgers to computer based accounting software was for Baby Boomers.

The Current State of Technology

Over the last 45 years, the industry has migrated successively through a series of technology platforms, including mainframes, minicomputers, personal computers, and local area networks (LAN). The current technology, client server installations, is in the early phases of being phased out in favor of a Cloud environment. Each of these migrations took about a decade. Today, firms choose the method of deployment that they believe fits their culture best, and viable options exist for on-premises installation, hosted desktops and servers, Software as a Service (SaaS), as well as hybrid cloud environments, which are a combination of these methods. **On-premises systems** create islands of data isolation, and may be the root cause of some of the current issues in firms that need attention. Many of these systems require staff to spend more time inputting, manipulating, and outputting data rather than using and analyzing the resulting information. Common issues include the cost, availability, and time to receive on-going technical support, complex remote access

Comparing On-Premises, Hosting, SaaS, and Hybrid

- **On-premise computing** includes traditional desktops and servers as well as remote access tools like LogMeIn, GoToMyPC, and Citrix. On-premise computing has the advantage of more local control, and, overall, this approach may cost less.
- Using **hosted solutions** is the implementation approach where we move all applications and data into a data center. Sometimes we use a vendor's equipment, and sometimes we use equipment that we have purchased. Less local expertise is needed for this solution, and integration and updates become the responsibility of the hosting company.
- **Software as a Service** or SaaS applications are browser-based, multi-user, multi-tenant cloud applications. SaaS solutions can solve a single problem like workflow or be broader in nature such as a complete accounting system. SaaS applications tend to be easier to mobilize and to require minimal local installation.
- A **hybrid approach** is a combination of any of the other implementation methods. Hybrid solutions allow firms to solve a problem that is not available in single on-premise, hosted, or SaaS platform.

procedures, and security lapses. This model of working with client data is inefficient, and frequently requires reconciliation of the client's records to those maintained by the accounting firm. There are barriers which hinder a firm's ability to provide certain types of services, and compliance with privacy regulations is a significant challenge as well.

Although the cloud technology is interesting, the primary reason for the discussion of the cloud is the need for more efficient and effective processes for client service delivery. Note the opportunity involves not just the technology, but the processes and client service. Just as a hammer doesn't build a house without the skilled labor of a master carpenter, technology tools must be utilized as part of a well-designed process used by an effective team to help them organize, perform, review, and revise their work product. The collaborative nature of cloud solutions makes it possible for clients and service providers to work on the same product in real time from any location in the world. This technology eliminates location as a barrier for most client accounting consultations.

New technologies bring with them risks, however, we believe that the cloud represents a very significant, fundamental change and improvement to existing business models. Although cloud-based accounting is not demanded by all clients today, we believe that this model will be demanded by most clients in the intermediate term, and will be the standard of client service in the long term.

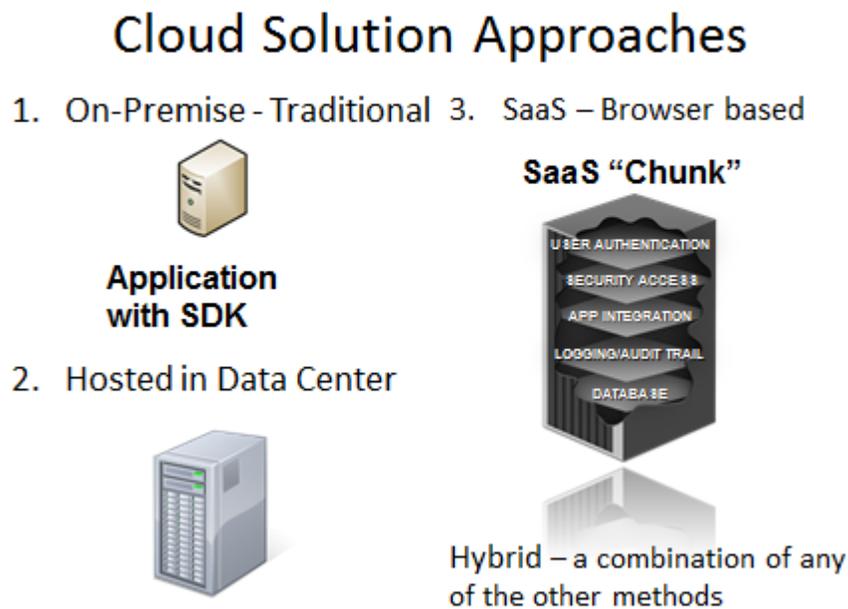


Figure 1

Moving to any new technology platform seems risky because of the change involved; however, avoiding change can also be risky. Use of legacy applications can cause incompatibilities with replacement hardware and software, may limit an organization's ability to innovate, and frequently results in extra work for employees. The safety of a legacy system may seem more tolerable compared to jumping to a

new system. This short-sighted approach frequently ignores the cost of the damage to a firm's reputation, its recruiting and retention efforts, and its process efficiency associated with using software which contains portions of the code which are over a generation old.

The Evolution from “Systems of Record” to “Systems of Engagement”

Systems are evolving from data entry and calculation to process-oriented systems of minimal data entry “zero entry” and collaboration. In a 2011 white paper for the Association for Image and Information Management (AIIM) entitled “A Sea Change in Enterprise IT” (Moore, 2011), author and consultant Geoffrey Moore suggests that many businesses have emphasized developing and enhancing “systems of records,” which are designed to meet back office and regulatory compliance needs, instead of creating systems which are designed to help people work together more efficiently. Moore argues that the next stage of development for successful enterprises will be to create what he calls “systems of engagement”, which are collaboration and communication systems which overlay these systems of record (e.g. accounting and document management systems).

Many modern versions of traditional enterprise tools and applications include features which interface with private, internal social networks and mobile applications. These same tools and applications have evolved from being focused on the accounting for a transaction to holistic solutions which include content management, routing, approval, and tracking. Customizable features make it possible for organizations to replace home grown operational management systems with electronic systems tailored to meet the individual needs of their organization.

Current Costs and Limitations

A significant issue when evaluating the value of a firm's technology strategy is the lack of many specific measures and values related to the incumbent strategy's opportunity costs. For example, an hour of downtime for a senior manager could be valued at a wide range of values, including “standard” billing rate (\$400), average blended billing rate for the type of work being performed (\$150), and the employee's fully loaded cost per hour (\$75), or just treated as a “cost of doing business”. Unfortunately, many organizations do not monitor and track downtime, resulting in an information technology service which has no management data to support its quality, reliability, or effectiveness. This results in information technology investments being treated as costs to be managed and minimized instead of resources to be optimized for the best rate of return. Firms that do not aggressively measure and manage technology efforts risk blindly minimizing expenses and missing strategic opportunities for stronger relationships with clients.

Just as many firms dismissed the transition from handwritten paper working papers to template-driven document management and retrieval, many of these same firms ignore the transition to online, real-time cloud-based services at their peril. Firms who ignore this fundamental shift in technology face a future filled with unsustainable costs, new offshore competitors, weak demand for their outdated business model, and staffing problems. This new technology model makes it easier to move from hourly engagements to efficiency-based engagements using a new business model based on value priced, fixed

fee arrangements which provide more value to clients by giving them real time reporting of key performance indicators (KPIs) for all areas of the business.

Firms who view their current method of operations as transactional engagements using the same processes from a generation ago can reap huge rewards by refining the processes used to provide client service. Leading firms who are making the transition to zero entry systems already recognize the benefits of downloading transactions from banks and credit card companies, and need to move to automating more business processes for their firm and its clients.

Examination of processes and business models is not driven by the desire for the newest technology tools, but instead represents an assessment of the existing structures, services, and business models used by the firm. A generation ago, gasoline service stations had to transition from models based on auto repair and full-service gasoline into miniature grocery stores that provide self-service fuel and convenience items. Accounting firms must evaluate how long it will be before compliance services like after the fact bookkeeping and simple tax returns are either automated or outsourced to levels which make the current cost structure unsustainable in the long run.

Looking for Solutions: On Premises, Cloud-Based, or Hybrid?

New technology tools permit businesses to work in ways which were not feasible just a decade ago. Traditional technology models such as local area networks and client-server relationships have been joined by hosted desktops, hosted servers, and web-based applications. Just as mobile telephones and e-mail have replaced “land-line” telephones and typewritten letters as our primary methods of communicating with clients, we are no longer tethered to our desktop computers. Practitioners should evaluate whether they should use dedicated on-premises solutions (a “private cloud”), web-based commercial services provided over public networks (“public cloud” services), or some combination of the two approaches (a “hybrid cloud” solution).

On-Premises (Private Cloud) Solutions

Today’s on-premise solutions include sophisticated, reliable technology including high performance disks in the form of Storage Area Networks (SANs), virtualized servers, remote access, and sophisticated firewalls that allow us to build our own “private cloud.” A private cloud extends traditional technologies by adding technologies that enable mobile, web, and remote access.

Private clouds can be made more flexible by making computer applications and functions independent of the underlying hardware by “virtualizing”. Virtualization technology packages physical servers or workstations into a disk package that looks, acts, and feels like a real machine, but will actually run on any computer which has the necessary “hypervisor” hosting software installed. Virtual machines become independent of hardware, running, instead, on a software abstraction of a real machine. Virtualization extends the IT lifecycle, provides more flexibility, and enables new solutions to be tried while the entire firm continues to run on existing virtual machines. Catastrophic failure of a single physical server or a single critical part is also not as devastating as it was in the traditional physical file server approach.

In addition to virtualization, backup appliance technology can reduce data loss by copying files and applications locally and off-site on an almost continuous basis. Backup appliances will frequently back up changes made to data every 15 minutes and make a complete off-site copy every night. Even with all of these innovations in on-premise technologies, there are still potential service outages due to power failures, communication line outages, and other natural disasters like fires or floods. Some organizations have attempted to address these issues by choosing a hosting provider and moving their virtual and real servers into shared commercial server hosting facilities. It is clear to us that virtualization has made hosting and cloud computing possible and that obtaining software and hardware as a service is an additional, new strategy to add to the mix.

It is important to look at the risk versus reward of maintaining an on-premise system. Firms will invest in acquisition costs, installation costs, software licensing costs, personnel costs, and on-going maintenance costs to make hardware and software tools available to their employees. One reasonable solution that has evolved for maintaining some on-premise systems is outsourcing some or all of these tasks to a specialized firm. This approach, referred to as “Managed Services,” allows a practitioner to pay a fixed monthly fee instead of attempting to hire and train a team of in-house professionals to meet all of their needs. The concept is to have critical systems such as communication lines, firewalls, and servers remotely monitored on a continuous, 24x7x365 basis. Beyond the monitoring capability, most managed service providers will also manage updates and patches to applications and operating systems. When Managed Service providers do their job properly, the internal IT people have only to deal with training, minor maintenance, and new project management. The key elements that on-premise and managed services implementations do not address continue to be unforeseen power failures, communication line outages, and other natural disasters. However, day to day reliability and availability is greatly improved in a typical managed services implementation.

Hosted Desktops and Servers

The selection of hosting facilities to house mission-critical servers was initially done for safety reasons to address the issues noted above. Server hosting operations are frequently expanded to include running standardized instances of all client operating systems and applications. Hosting involves moving all traditional servers and the applications that run on them into a Tier I, II, III, or IV data center. Firms can own their own equipment in a rented rack in the data center but more commonly simply rent the capacity from the data center itself, eliminating the need to select and install or upgrade servers and SANs. When hosting is used, many common risks are eliminated. Data centers typically have redundant power sources,

What Tier is Your Data Center?

Data centers which follow accepted industry minimum standards developed by The Uptime Institute, LLC are classified into four groups, or “tiers”. These levels describe the minimum hardware and communications resources available to tenants of the data center to prevent user service outages. The classifications include:

- Tier I - Basic site infrastructure (non-redundant)
- Tier II - Redundant capacity components site infrastructure (redundant)
- Tier III - Concurrently maintainable site infrastructure
- Tier IV - Fault tolerant site infrastructure

multiple generators with alternate fuel sources, redundant communication lines from multiple providers, multiple paths for internal communications, high levels of physical security, fire suppression, and a building that can withstand notable forces of nature.

The issues in hosting include sufficient, redundant communication line bandwidth at the data center and from your office, maintaining adequate performance which can be beyond your control, getting and granting appropriate access to the servers that provide your services, authorizations from software publishers for the applications that will be run in the hosted environment, and service level outages at the data center for other issues beyond your control. In general, we believe that the risks in data centers are notably less than in traditional offices and computer server rooms. The key reward can be stated in one word: **economics**. Other benefits include **faster program access** in the hosting center than you get from your own network because of implementation strategies; **simplified use** because you continue to use software that you already know; **working anytime, anywhere**; Certified Data Centers providing **data back-up**, network, and server redundancies to give you a great start on your Disaster Recovery Plan; and **eco-friendly** hosting. **Physical security** in the data center is typically superior to what you would have in your office with security people, badge level access, biometric scans and passcodes, and frequently isolated passage spaces called a “Man Trap.”

The only critical pieces that you will need in your office include redundant communication lines from multiple providers, a high availability and automatic failover firewall, strong switches, certified cabling, and desktop or laptop computers. You should try to maintain around 256K of bandwidth per user when connecting to the cloud, although the technology used will cause your actual required bandwidth to vary greatly. Accumulate the recommended amounts of bandwidth from all vendors involved to get an aggregate amount of performance needed for each user. We are conservative and double the estimates but still find situations where the amount of communications needed is even greater. When negotiating your redundant lines, choose technologies that can easily be scaled up or down and that come from different technology providers. One provider should be telephone-based, such as DSL, T1, Frame Relay, or MPLS, and the other communication line should be from an alternate carrier type such as Cable Modem, Metro Ethernet, or wireless.

Hosting sometimes starts with a single application like QuickBooks and progresses to other applications that are not core to the practice; portals, email, and accounting software are often the first to go. As a few applications are hosted, then the reality of being able to host all applications is recognized. If all applications are hosted by a single provider, you can logically picture your existing on-premise servers and disks being picked up and moved into a data center with all the extra protection. This is even easier to do if all of your servers and desktops have been virtualized.

However, you will also recognize the need for a better solution for your users and clients when they are out of the office. Technology shifts to the Web, giving more browser access to more applications, and the evolution of more mobile phones and tablets have all changed the way many practitioners and clients do business. Today, applications to solve specific problems are frequently written as cloud applications, making them immediately available to you whether you are on-premise, hosted, or completely SaaS. Another traditional bottleneck has been in integrating traditional all-in-one or

monolithic systems. Integration issues to traditional all-in-one systems, third-party products, and home-grown systems were never easy. In fact, there has always been an integration bottleneck. The limited skills of your internal IT team, reseller partners, or direct vendors have driven costs up. Estimates of integration costs vary from 5-10% or more of the cost of your system. Integrated systems also frequently have issues with support and “finger pointing” blame. SaaS allows most firms to use small application parts or “apps” instead of what used to be delivered as one huge, often difficult to learn, program. Local access, anywhere-anytime access and the ability to run from the Web or mobile devices have driven both the private and public cloud offerings. Entrepreneurs have discovered the need for many point solutions, including workflow management, bill payment, payroll preparation, outsourced accounting, and sales tax compliance.

SaaS – The New Opportunity

Because of these and other factors, we see cloud-based software as a service (SaaS) as a new opportunity. Although SaaS products have been built and sold for more than a decade, many of the most useful services have been developed in the last few years. The evolution of the technology and the speed of the applications, browser, and the robustness and reliability of the Internet connection make the experience of using a cloud-based application more like running an application locally or like accessing a traditional desktop application from a remote desktop provided by a hosted provider. SaaS apps generally run from the safety of the data center with many of the attributes described above. Further, Service Organization Controls or SOC certification provides assurance that the data center has procedures in place to protect the data, applications, and the processing environment from unauthorized snoopers.

Firms who access their applications from a web browser will likely see a downward change in their staffing levels. One caution on staffing: configuration services and training are still required, and may remain dedicated, on-site resources. If your contract from your provider performs all of these tasks, then the monthly charge will be higher, and less local labor will be needed. Firms who have simply moved server equipment into a hosting center may actually experience an increase in the labor required to

Key Service Organization Terms

SOC-1 – A reporting framework used for evaluating internal control over financial reporting (ICFR) for restricted use by other external auditors and management.

SOC-2 – A reporting framework used to evaluate security, systems, and privacy in accordance with trust services principles for restricted use by knowledgeable parties.

SOC-3 – A reporting framework used to evaluate security, systems, and privacy in accordance with trust services principles for general use by anyone. Unlike SOC-1 and SOC-2, this framework can be used for marketing purposes (e.g. similar to a “seal of approval”)

There are two types of SOC reports:

Type I Report – Evaluates the design of the internal controls.

Type II Report – Evaluates the design and effectiveness of the internal controls.

SSAE 16 is the attestation standard which largely replaces **SAS 70** for use when evaluating service organizations such as data centers.

support users. It is clear that SaaS vendors will have safeguards like redundant power, communications, and other things which do not make economic sense for an independent site. On premises users have business interruption risks today which are mitigated by business continuity planning and data backup strategies. Although some of this risk will be mitigated by using either SaaS solutions or a hosting company, these contingency plans are still required. Even though data may be stored in a building which more closely resembles a military bunker, firms will still have data breach risks when applications are housed in a data center. While most contracts transfer the liability associated with a breach to the SaaS or hosting vendor, practitioners must still perform adequate due diligence on proposed vendors. We believe that large scale breaches will occur even though vendors are expending a lot of effort and money on physical security and sophisticated firewall and monitoring hardware and software. Criminals from around the world are drawn by the possibility of gaining access to a large volume of sensitive information, and attempt to break into big data centers. Some authors believe that many cybercriminals are discouraged by failed attempts to breach the strong security provided by these organizations, and have instead focused their efforts on small office environments, where security is historically very weak.

Some of the key areas for SaaS software due diligence include redundancy and mirroring of hosting facilities, service level agreements, external examinations such as SOC or SSAE 16, backup power and data connections, and what costs to expect for implementation and ongoing support. It is particularly important for users to read the SaaS Service Level Agreement (SLA) or End User License Agreement (EULA) thoroughly and understand the implications for your organization. For example, backup planning and end user-controlled export of the data can tell you how accessible your data will be. Some SaaS companies claim to own your data and they restrict your ability to export the data or to back up the data to your own site...an approach we call reverse backup. It is helpful to ask about how the product was and is developed and supported. Where are the majority of the workers? Ask for the organization to share metrics for what work was and is performed by remote workers. What will it take for you to get access to advanced support? Inquire about how the SaaS product interfaces with other systems. Some SaaS products operate in their own world, while others have an active strategy to integrate to other popular products.

SaaS Contract Terminology

SLA (Service Level Agreement) – The document which describes in detail the nature and quality of services to be provided to a subscriber. The SLA typically includes guarantees related to system availability, reliability, and outlines penalties for failure to meet these standards.

EULA (End User License Agreement) – The contract which governs the use of a product or service. Most EULA's are electronically executed when a user clicks on a button labeled "I Agree" during the installation or configuration of an application or service.

Extending SaaS: Platform as a Service Tools for Custom Development

Some SaaS publishers are making parts of their system available to other developers to use as a base or "platform" for development. In the industry, this is referred to as Platform as a Service or PaaS. The

tools provided can permit your organization or a motivated third party to build products based on the core SaaS publisher's technologies. Companies like SalesForce, Google, CCH, and Intacct have all made PaaS available with their products.

This brings us to a possible new business model for the future. If firms are successful at taking one or more products into the Cloud, this will make the data from these applications more accessible anytime, anywhere. Firms who stay with traditional, on-premises applications may be able to accomplish similar capabilities in the short term with hosting, allowing a new business model without needing a new application. With some luck and technical expertise, firms will be able to get all of their applications into the Cloud and integrated together. This new computing paradigm gives new capabilities and provides potential new service offerings. In a Cloud-based world, firms can offer services in bookkeeping, consulting, payroll, and CFO Services in addition to traditional compliance work like taxes and audit from anywhere to anyone in the world with an internet connection. This allows clients to do the tasks that they should be doing to support their businesses, including managing the data of the organization, operations, timesheets, job costing, Point of Sale, and making real time performance reporting for all business functions available through a constantly updated dashboard. The firm can assist with suggestions of what to measure in the dashboard and potentially provide measures from other sources. The key phrase to describe all of these services is "collaboration between the firm and the client." This collaborative processing leads to many of the new opportunities.

For example, a common function in all businesses is paying bills or collecting money. The bill-paying process using traditional methods involves many steps. Automating the process correctly can cut this down to a few steps, eliminating many manual steps. Bills can flow into the system from many sources including fax, email, or scanning, and be put through a process of classification, approval, and payments. This "business process outsourcing" is a natural evolution from "after the fact write-up" and is made practical only by SaaS technologies. Collecting receipts can be almost as painful for business, particularly when customers don't pay as expected. Again, business process outsourcing can assist the client in being consistent with customer collections. When both cash outflows and inflows are managed through a single system, the ability to project cash flow becomes far more achievable. Automating cash flow forecasts has high value for businesses that experience periodic working capital deficiencies.

The Future

New opportunities abound from collaborative technologies.

- First, there is a **digital branding** opportunity. Firms can structure their self-service client interaction to be a secure portal login using the firm's website. This model not only increases traffic (and search engine ranking) of a firm's website, but also provides users with an opportunity to market new services to existing clients and the people with whom they do business. The portal functionality available in most SaaS products makes it easy to add this functionality to an existing website by using portlets or small snippets of code.
- A second opportunity is to provide near **real time reporting**, including alerts and dashboards. Working with clients throughout the month can allow practitioners to analyze business

performance in many different categories. Discussing, implementing, and changing dashboards as needed is just one way that cloud-based technology can help firms function as an outsourced accounting departments, controllers or CFOs. Financial reporting, continuous auditing, and other client services become possible with the change in technology strategy. New generation products have rules and machine learning capabilities built in, and practitioners can assist clients by setting up rules which alert users about problems in real time.

- A third opportunity is support for **business process automation**. This includes mobile access from smartphones and tablets as well as for remote users through browsers and other mechanisms. Many SaaS and hosting platforms have been focusing on mobile apps as well as web-friendly versions of their applications. Some clients and customers need simple access to information, and these new offerings allow users to access management data and reports in real time from smart phones and tablets. User expectations about timeliness and availability of data are much higher now than just ten years ago. This comes, in part, from the integration of the internet into our daily lives over the last generation and the advent of computer games as a recreational activity. Increased consumer adoption of real time technologies and information like gaming networks and online news networks push service providers to replace paper and historical business information with data in real time. End users expect a more elegant and simple experience. Successful firms will find a way to provide these services to clients and employees, or they will cease to exist.
- As we pointed out earlier, another possible service offering opportunity will be to help build virtual suites of applications. These services may require integration between multiple web-based services, or between SaaS apps and legacy on-premises applications. This is not a programming task but instead a function of creating the “digital plumbing” to support real time connections to new or existing management databases. This “**process-based consulting**” will be high value and highly billable work.
- Another opportunity for firms to consider is the role of **project and product/service management consulting**. Clients will want to implement solutions for their businesses to satisfy customer needs. As solutions are found, assisting with product due diligence, providing application implementation consulting, and managing enhancement projects will become highly valuable. In the old on-premise world, this task was often handled by a system integrator or channel-partner installer. The new systems frequently require less technical skills and more business process and management skills to implement them successfully, and require skills more consistent with financial and management consulting, and less consistent with traditional engineering-based technology services.

Collaborative, Real Time Services – An Example of a New Opportunity

Many clients do not understand or use the 45 day old GAAP-based historical financial information provided by many accounting firms, and would like assistance moving to a model of real time reporting and key performance indicators. Although this new, real-time collaborative client bookkeeping model accomplishes many of the same compliance-oriented tasks as traditional bookkeeping, it also provides information which is timely, relevant, and targeted at the specific needs of the business. The increased

timeliness of the work (which is performed throughout the month instead of in a single batch after the end of the period) provides more value to the client, and requires that both parties have connected systems where they can collaborate in real time.

Many cloud-based business management systems automatically download and classify transactions from financial institutions, point of sale systems, and credit card companies, and present these results on a real time “dashboard” which can be viewed from anywhere. These “zero entry” systems also commonly allow accountants to create real time exception reports called “alerts” which notify both the CPA and client about exception conditions which need immediate attention (e.g. upcoming tax payment deadlines, overdrawn bank accounts, and expenses which are in excess of the amounts budgeted). Accountants who utilize these tools to reinvent their client bookkeeping practices are spending less time keying in transactions, and are more effective business partners to their customers.

Conclusion

Just as petroleum companies, communications providers, and retailers have had to reinvent themselves to remain relevant in the internet economy, traditional compliance-based accounting services are being threatened. Practitioners must identify and take advantage of opportunities to transition obsolete business models to high value services with more frequent, higher value client interaction. Firms must consider how they can provide clients more timely reporting, provide better insights, create more close integration with operational management systems, and ultimately find ways to help clients be more profitable. The successful accountant of the future will collaborate with a wide range of business professionals and will do more than prepare compliance reporting. Business process workflow integration with strong links between operational management tools and process-oriented financial management systems will continue to enhance the effectiveness of real time reporting over the next decade. Individuals who can maintain flexibility in solving client problems will provide new insights that clients would probably not have figured out on their own, and will be able to thrive in the new economy.

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Glossary: Key Internet Connection Terms

Cable Modem – A device which converts digital network traffic to radio signals transmitted over a network designed to transmit television signals. Cable modems can transmit data at speeds up to 1.5 Gbps, but speeds vary widely and are frequently less reliable than dedicated T1 or T3 lines.

DSL (Digital Subscriber Line) – A method of transmitting digital data over existing analog phone lines. This technology requires that the user be no more than three miles from a telephone company digital transmitter (DSLAM). DSL connections operate at speeds from 800Kbps up to a theoretical maximum 40 Mbps, depending on factors such as distance and line quality.

Frame Relay – A method of linking two networks together over a dynamic, virtual data connection. Frame Relay connections are frequently used to create a wide area network between multiple locations of a single business over the public internet.

LAN (Local Area Network) – A digital network connecting a group of computers using the Ethernet protocol within an office or a small campus of buildings.

Metro Ethernet – A direct digital connection to a wide area network which connects directly to a business location using a traditional RJ-45 network jack connection.

MPLS (Multiple Protocol Label Switching) – A communications protocol which allows a private data network to be created using a series of public networks without using direct, point-to-point leased connections like T1 or T3 lines.

T1 – A telephone company standard for a bundle of connections somewhat analogous to twenty four 64Kbps ISDN telephone lines (1.544 Mb per second). This type of connection is also referred to as E1 or DS1 line.

T3 – A telephone company standard for a bundle of 28 T1 connections, which results in a high capacity dedicated digital line capable of transmitting 44.7 Mb per second. A T3 connection is also referred to as an E3 or DS3 line.

SAN (Storage Area Network) – A data storage network which is designed to allow multiple computers to share and allocate a pool of storage resources.

WAN (Wide Area Network) – A digital network connecting two or more distant facilities to each other.