

Thought Leadership for Education: Cloud Computing, the Mobile User and the K-12 IT Organization

Introduction

Technology is dynamic, always changing and evolving at a staggering pace. Technology leaders are faced with new and better technology before they can finish deploying the technology that just a few years ago was cutting edge. Emerging technologies such as cloud computing and trends like an increasingly mobile workforce will impact how every IT organization provides and obtains its services. While cloud computing adoption is increasing, the structures of many school districts' IT organizations have not changed. Budget constraints and required reductions are now forcing change, as is growing dependence on the IT infrastructure and services to provide always-on reliability and support. It is clear that the thirst for information services cannot be satisfied during the regular school day. How can the IT organization, in light of this emerging dependence on IT service, react and realign? This paper will present technology shifts and trends facing the K-12 IT organization and offer thoughts on an evolving industry that demands organizational changes as the new way of doing business comes to light.

From Local and Wide Area Networks to Cloud Computing

History tells us the shift from centralized to distributed computing was fueled in part by the emergence of the Personal Computer and local area network (LAN). The integration of independent LANs over wide area networks (WANs) subsequently led to the creation of a network of networks: the Internet. Throughout the shift to distributed computing, major investments in research and engineering went into increasing the throughput of the network. This included tremendous advancement in the information transport capacity of wired and especially wireless networks. In addition, while more capacity is squeezed out of the network transport medium, great strides have also been made in the technology for compressing data and making its transfer across these high-capacity networks more efficient. These two complementary technology advancements – wireless throughput and compression – have created an environment where today's mobile technology user has broadband access and information transmission capacity once thought only available to the hard-wired, network-connected user.

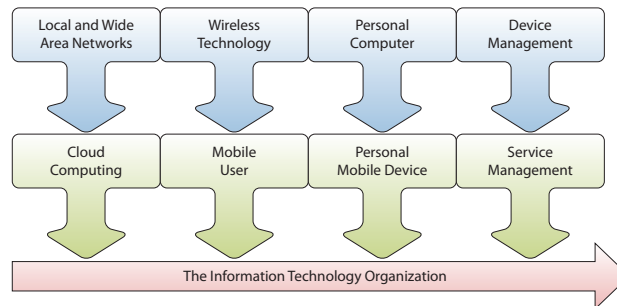


Figure 1 - Evolutionary shifts impacting the IT organization

Increased network speed and data transfer capacity has also fueled new trends: cloud computing and software as a service, (SaaS), both of which offer the ability to obtain and access information services or applications via the Internet ("the Cloud"). For the IT organization, the concept of purchasing a server, installing software, and maintaining this server, is rapidly disappearing. In addition, expansion of cloud-based services into other infrastructure areas such as network and end-point-security are becoming available. The IT decision makers have more choices than ever today and now must answer the question: "What is the best way to obtain and deploy the services we need?" Many factors make the adoption of a cloud-based solution appealing to the IT decision maker:

- Short-term cost avoidance for purchasing more infrastructure to run the service
- Minimized risk and complexities of supporting the service on your own infrastructure
- Elimination of the need to hire or otherwise obtain specialized technical skills for the solution
- Ability to leverage the Cloud to support the anytime, anywhere 24x7x365 mobile user
- Shortened project launch cycle when adopting a new service

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In the short term, cloud-based acquisition of services is making great strides. Recent IDC research shows that “worldwide spending on cloud services will grow almost threefold, reaching \$44.2 billion by 2013.” But can we be certain this is the right choice in the long term? Curiously some schools may find that the most difficult challenge to adopting a cloud solution may not be with any technology at all, it may lie in a basic funding question. How is a “cloud” service classified? As a subscription or an asset to be capitalized? (See sidebar - *Can We Capitalize the Cloud?*) One thing is certain: all IT organizations – in the education sector and otherwise – are moving toward a new way of delivering services to their users - a blended combination and integration of locally deployed and supported components with cloud-deployed components. This shift will require some new thinking and learning for the IT organization to be successful.

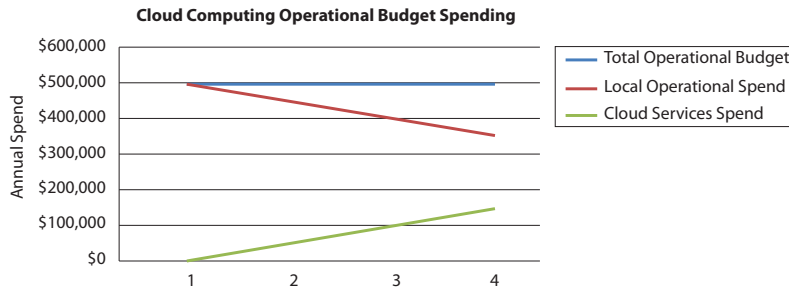


Figure 2 - Cloud Computing Impact on the Local Operational Budget

Everyone is learning - as the cloud-based service delivery trend grows, vendors are developing new and innovative ways to leverage the cloud to address the challenges facing school districts. For example, new solutions deployed in the cloud can easily support the increasingly mobile users and devices that schools are challenged to support today. Flexible cloud-based platforms where endpoint security and content filtering can continuously be maintained regardless of location thus solving a key concern with supporting the mobility movement. In addition, new cloud-deployed solutions offer a unified and single cloud-based management console, thereby streamlining the management and reporting functions while reducing the administrative burden on the IT organization. Improved methods to integrate between the local schools directory services and the cloud services offer the mobile user a single-sign-on authentication in or out of the network. A new hybrid or “flex” delivery model is also evolving in which a service includes a combination (or choice) of locally deployed devices and cloud-deployed services that transparently combine to make up a hybrid offering.

From the Personal Computer to the Personal Mobile Device

It is widely accepted today that the technology user is going mobile, the single personal computer on the desktop is fading and the access to information must be accessible on demand, at any time. “Mobile learning—the use of mobile devices for educational purposes by students—is rapidly moving from an experimental initiative by a few innovative districts over the last five years to a broadly accepted concept,” according to District Administration (Eisele-Dyrli, n.d.). Recent changes in the E-rate program support a shift to mobility as well. For example in the National Broadband Plan’s recommendation 11.23, the Federal Communications Commission “should initiate a rulemaking to fund wireless connectivity to portable learning devices. Students and educators should be allowed to take these devices off campus so they can continue learning outside school hours.” It further recommends the subsequent release of funding in support of a pilot “to investigate the merits and challenges of wireless off-premises connectivity services for mobile learning devices, and to help the Commission determine whether and how those services should ultimately be eligible for E-rate support” (Federal Communications Commission, 2010).

According to the Horizon Report, 2010 K–12 Edition, the trend toward mobile learning is expected to accelerate as “the devices we carry are becoming ever more capable, and the boundaries between them more and more blurred” (New Media Consortium, 2010). In its 2011 edition, the Horizon Report states “Mobile (devices) enable ubiquitous access to information, social networks, tools for learning and productivity, and much more. Mobile devices continue to evolve, but it is the increased access to affordable and reliable networks that is driving this technology now. Mobile (devices) are capable computing devices in their own right — and they are increasingly a user’s first choice for Internet access” (New Media Consortium, 2011). What school IT organizations now face are students, teachers and administrators equipped with extremely capable and powerful mobile technology that can have more functionality than the computers deployed at some schools. In addition, these mobile devices are

Can We Capitalize the Cloud?

When considering traditional IT funding models, there are operational budget and capital budget expenditures. Operational budgets typically provide for core ongoing operational staffing and renewable IT ancillary services that require ongoing licensing (i.e. anti-virus, software and equipment maintenance, etc.). As more Infrastructure expenses that may have been capitalized previously begin to move to the cloud and also the operational budget, what will the impact be? This impact may eventually see the operational budget for local staffing and resources decrease in proportion to the increase in cloud spending. Also, as more services are moved to the cloud, can the IT organization reduce resources and the latent demands on the operational budget in alignment with this change? Another thing to consider is the loss to the school district of the bonus years of equipment use after the capital expense is retired. For capital budgets, it is common to find funding with restrictions based on identified sources such as bonds for capital improvement programs (CIP), special-purpose-local-option-taxes (SPLOST), E-rate priority-2, and various grants. Major technology initiatives are often funded as capital projects, with the systems capitalized over the life of the investment. It is not uncommon to find restrictions placed on these funding sources whereby equipment or infrastructure purchases are allowed but services and subscriptions (such as cloud based services) are not. This must be considered when assessing the cloud versus locally-deployed IT solutions. What will be the long term impact of funding infrastructure traditionally paid out of capital funds in the operational budgets? More importantly, as more demand for the operational budget is placed on paying for cloud adoption, what reductions in the operational budgets will be made to pay for this?

accessing cell networks with capacity to download audio and video streams with amazing quality. What will the future bring for school districts as they face this awesome and evolving future? (See sidebar – *The Local Infrastructure Bypass*).

As the infrastructure shifts from the physical and local to the virtual and cloud-based, what will the new infrastructure support requirements in schools be? How does this change impact the IT organization? In addition, as mobile devices' computing power and capacity continues to increase while their prices decrease, how will the adoption and acceptance of the use of personal mobile device in schools impact the IT organization? As we obtain more services delivered via the cloud, what is left for the IT organization to manage and support? How will this transition take place?

From Device Management to Service Management

What does the evolving IT landscape mean for today's K-12 IT organization, which is structured to manage a complex combination of expensive IT infrastructure and locally deployed technology devices? In addition, how will the shift to cloud computing impact the IT organization? From the legacy IT organization's perspective, there must be local capacity to manage, support and secure the independent infrastructure and devices. From the service management perspective, there needs to be an understanding of how the combinations of the independent infrastructure and devices deliver the service to the end user. Legacy IT organizations are comfortable with a user-centered model in which they have control and can provide the security (see Figure 3). As we move toward cloud services the user and the organization starts to move

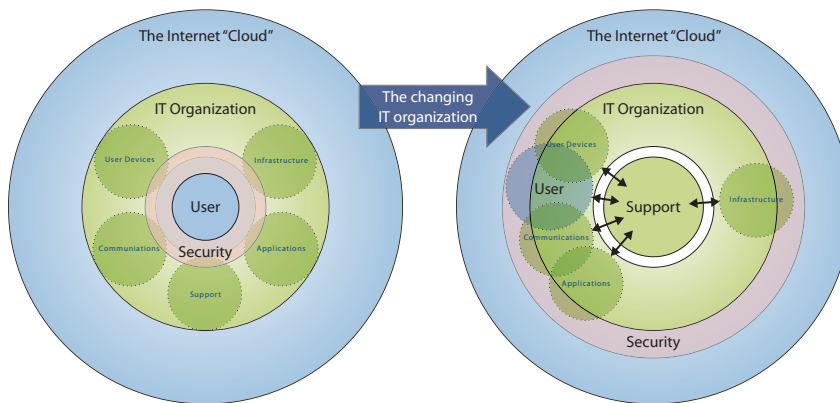


Figure 3 - The impact of cloud computing on the IT Organization

away from the user-centered model and with change, the security ring must expand, and support will become more critical and move toward the center. The legacy IT organization focuses on managing the individual components that are spread across the organization, and it works hard to maintain and keep these up and running at all times. Unfortunately, how all these components add up to deliver the service to the user is often never monitored or measured. From the end users' perspective, a single broken link in the service delivery chain is not important: they only know that the chain is broken and delivery of the service they need has failed (see Figure 4). How will service delivery be monitored and measured as the components that make up the service move toward the Cloud?

As the user and IT organization services shift away from the comfort of the controlled center, the IT organization must focus on how it will support this new paradigm and provide the support and security for the services it delivers to the user. A service delivery model embraces the total chain of IT infrastructure, systems and devices. It manages expectations from the user's perspective and answers the question of how well the IT organization is doing in delivery

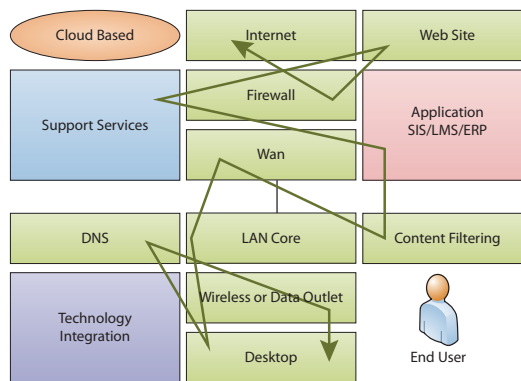


Figure 4 – Internet Service delivery chain

The Local Infrastructure Bypass
 What will the future hold for the IT organization? The advent of high speed wireless networks, personal and mobile devices, and cloud computing make for an interesting prospect. It is not hard to imagine a day when a single cell/wireless tower positioned at or near a school in a district could service the entire school campus with high capacity network service, eliminating the schools need for locally supported LAN and WAN. In addition, all students and teachers could have their personal mobile devices, minimizing the need for school-based device support. These personal devices can roam on or off school campus and be securely connected to the school via the new "education app" which is supported on any mobile device available on the market. The IT organization would support the seamless integration of cloud services through the education app, managing a variety of cloud service vendors offering everything from infrastructure to applications.

of the services to the user. It is not uncommon for the education industry to lag behind other industries, and this is true in the adoption of the service management philosophy. The movement toward service management, particularly the best practices frameworks of the Information Technology Infrastructure Library (ITIL), has been widely adopted by the IT industry in general (See sidebar – About ITIL). ITIL is built around:

- **Service strategy**, which includes financial, service portfolio, and demand management
- **Service design**, which includes service level management, service continuity and availability management, information security, service catalog management, and supplier management
- **Service transition**, which includes change, release & deployment, service asset & configuration management, and service testing and validation
- **Service Operation**, which includes incident, problem management and request fulfillment
- **Continual service improvement**, which includes service reporting and service measurements and service improvement

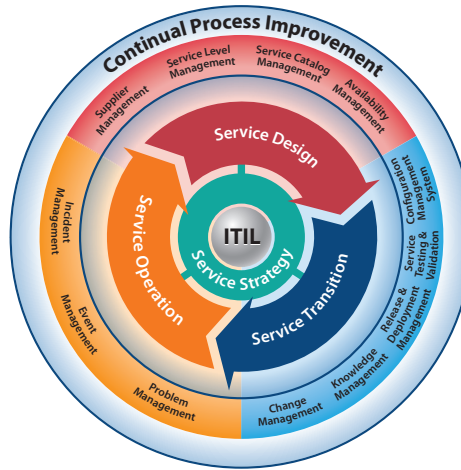


Figure 5 - ITIL Process Model

At this pivotal time, school districts' IT organizations must evolve, and service management and ITIL is a model and best practices framework to review and consider for adoption while in the midst of change.

K-12 IT Organizational Change with the Times

We know that the K-12 IT organization must change, and that wireless connectivity, mobility, and cloud computing will all have an impact on this change. Looking at the makeup of most K-12 IT organizations today we typically see the following:

- **Enterprise Applications:** Maintain all district-wide applications such as student information systems, Finance/ERP systems, and Human Resource systems; often includes database administration and programmers
- **Support Services:** Provide onsite support for desktops at the schools for break-fix, as well as helpdesk
- **Infrastructure Systems:** Maintain the networks, Internet, security, servers and datacenters, backups and desktop operating systems support and patches
- **Technology Integration:** Support professional integration of technology with the educational teaching and learning in the classroom.

Each of these high-level areas typically monitors and manages its own set of devices and systems with its own set of performance metrics; living in their own silo of administration. Most IT organizations do not have a measure of how well the combination of devices and systems in each area are delivering the IT service from the end user/customer perspective. For example, most IT organizations have a robust network monitoring system: when a network link goes down, it is reported immediately to the infrastructure group, which starts recovery procedures immediately. But how does this impact the IT services being delivered to the end user; what services depend on that specific network link? How does the IT organization monitor and measure its performance against the services delivered as a whole?

For the CIO, how can service quality be assured as the control is being outsourced to the cloud? "What will change as cloud computing gets more popular...will mean a change for IT department's role, not the reduction or elimination of it" (Zyskowski, 2010). So, what new roles and skills does the K-12 IT organization need? If the IT organization adopts the service management philosophy and rethinks its structure, changing from managing infrastructure and systems to managing contracts and relationships with external cloud suppliers, it is clear that a high-level skill it will need is the ability to carefully craft service level agreements. In addition, as the complex combinations of cloud services offers new challenges, this will create demand for skills to provide security of the information and integration of data with the cloud.

About ITIL

ITIL's Best Practice IT Service Management is used by many hundreds of organizations around the world. A whole ITIL philosophy has grown up around the guidance contained within the ITIL books and the supporting certification and qualification scheme. The ethos behind the development of ITIL is the recognition that organizations are becoming increasingly dependent on IT in order to satisfy their corporate aims and meet their business needs. This leads to an increased requirement for reliable, high-quality IT services. ITIL provides the foundation for quality IT Service Management through documented, proven processes that cover the entire Service Lifecycle. It is easy for organizations to learn, tailor and implement to suit their environment. (Hornbill, 2009)

Full adoption of the entire portfolio of these ITIL frameworks for most IT organizations is overwhelming and it is not practical to try and do it all at once. Also, as the IT organization determines how it functions, it realizes that many of these processes are common sense, are needed and may already be occurring in some capacity across the organization without formal recognition of them. The adoption of a service management philosophy generally begins with recognizing the need to change the focus to the user, establish clear measures of service delivery and manage to service level agreements (SLAs) with the service sponsor in mind. A focus on service delivery from the user's perspective will become more important as increasingly more parts of the service move into the cloud.

For the school district IT organization, the ITIL frameworks offer a tested and structured best practice model to consider for adoption. ITIL or service management has been adopted by most industry IT organizations and is accepted globally.

Summary

Never before have we seen a shift where the potential impact on the IT organization has had greater ramifications. Over the years, we have seen technology's explosive growth followed by consolidation, but the traditional IT organization continued to function in much the same way. Now we are seeing a consolidation of the distributed systems at the organization level, where a centralized vendor-supported model provides services and all we need to do is subscribe to the cloud and provide our users with access. This has many advantages and, unfortunately, risks. On its own, cloud adoption is attractive, but when it is combined with increased network capacity and efficiency, as well as powerful mobile user devices, we have an environment in which the user is shifting away from the center of the IT organization. The IT organization will need to adapt and even completely change.

The IT decision makers will need to obtain new services that not only support the cloud adoption, but may also be delivered via the cloud as well.

All of this is not new, the concept of information as a utility is at our doorstep and, unlike electricity or water, information lives at a layer where everyone contributes and everyone can be a provider. It is now the responsibility of the IT organization to understand how its cloud adoption will improve the delivery of services to the user while facing diminishing budgets. The relationship between the IT organization and the cloud- vendor is new and the ability of the cloud-supplier to manage and support the services they provide are removed from its control. This relationship between the IT organization and the cloud-vendor opens up a whole area of integration, management, oversight and responsibility. The IT organization must prepare for this and change.

The Cloud Adoption Consideration Checklist

The checklist below is designed to assist the CIO/decision maker when considering deployment of cloud-based solutions.

Cloud Computing Adoption Checklist	
What are the top three drivers for migration to the cloud?	
What is the return to the IT organization; i.e. people, processes and quality?	
Have the ongoing processes and procedures that will be necessary following the migration to the cloud been identified?	
Who is providing the necessary processes and procedures after the change?	
Can any resources be released as a result of moving the component to the cloud?	
Does the cloud services contract include a service level agreement (SLA)?	
Can you tour the datacenter of the provider? What is the network connectivity?	
What processes and systems are established to monitor and manage the service delivery?	
What are the measures that will be used to evaluate the cloud service? Are these tied to the SLA?	
What are the remedies if the SLA is breached? Is this enough?	
Is the cloud solution secure? Have you vetted the security practices with the provider?	
What service improvements are anticipated? How are they monitored and measured?	
Who has control of the data if the cloud service fails and what is the recovery process?	
What is the support plan after hours?	
Have you defined a proper test/pilot plan?	
Can any of the costs for the cloud service be capitalized?	
Can a large up-front payment be made to reduce the ongoing operating costs?	
Can the solution integrate with local directory services?	
Is off-site data replication available? How can I gain access to my data?	
Can we customize any components of the service/application provided in the cloud?	
What is the total cost of ownership?	

CELT Acknowledgement

This white paper was developed for Barracuda Networks Inc. by Jeffrey Bajgot of the Center for Educational Leadership and Technology, or CELT (www.celtcorp.com) located in Marlborough, Mass. For nearly two decades, CELT has helped align leadership, learning, and technology in support of improved student achievement, by working collaboratively with educational organizations to support and transform teaching, learning, and administrative processes. CELT's mission is to help learning organizations attain their vision, mission, and goals by integrating high-quality programs, services, and technology with the organization's people and processes in a timely, efficient, and cost-effective way. For the past several years, CELT has been a leader in assessing and designing learner-centered, instructionally focused, and affordable decision support/accountability systems that are valid, reliable, and replicable at the student, classroom, school, school district, state, and federal levels. In addition, to helping establish data definitions and systems architecture, CELT assists with the alignment of data systems with contemporary research, best practices, proven business processes, and governance policies.

About Barracuda Networks Inc.

Barracuda Networks Inc. combines premises-based gateways and software, virtual appliances, cloud services, and sophisticated remote support to deliver comprehensive content security, data protection and application delivery solutions. The company's expansive product portfolio includes offerings for protection against email, Web and IM threats as well as products that improve application delivery and network access, message archiving, backup and data protection. Coca-Cola, FedEx, Harvard University, IBM, L'Oreal, and Europcar are among the more than 130,000 organizations protecting their IT infrastructures with Barracuda Networks' range of affordable, easy-to-deploy and manage solutions. Barracuda Networks is privately held with its International headquarters in Campbell, Calif. For more information, please visit www.barracudanetworks.com.

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