

Arts Management &
Technology Laboratory

Navigating the Cloud:
A Practical Guide for Arts Organizations

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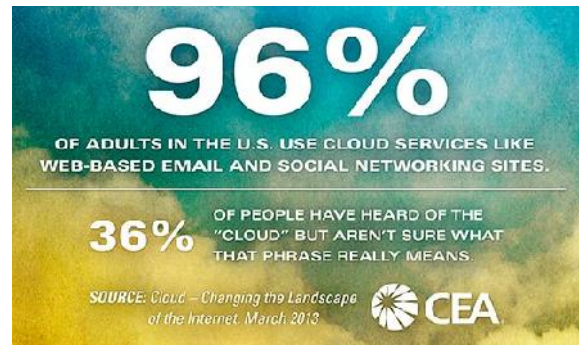
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INTRODUCTION AND OBJECTIVES

According to a recent report from the Consumer Electronics Association, 96% of U.S. adults use cloud services. However, 36% of those surveyed could not define the cloud and only 19% said they “know a lot about the cloud” (Cassagnol 2013). Cloud computing has become quietly ubiquitous. Despite the fact that almost everyone interacts daily with cloud services in the form of social networks, webmail, or content providers such as Netflix, fear often accompanies the amorphous concept of the cloud.

The goal of this report is to help technology decision-makers in the arts make sense of the broad range of cloud offerings, and to determine what first steps they might take to gain the greatest return from these offerings for the least cost. Though no organization will have identical needs, by understanding how cloud services are classified and provided, arts leaders will gain the knowledge necessary to oversee successful cloud implementation.

Generally, no arts organization should feel rushed to move all of its IT infrastructure to the cloud. While cloud servers provide certain advantages in terms of redundancy, uptime, and scalability, for many small arts organizations the costs of migration and monthly leasing expenses remain a significant barrier to entry. It is expected that such costs will decrease in time, leading to more widespread cloud adoption, but for the time being arts organizations should proceed cautiously. For most, the best opportunities will be in cloud-based software—internet-based services that can increase the efficiency of staff, facilitate



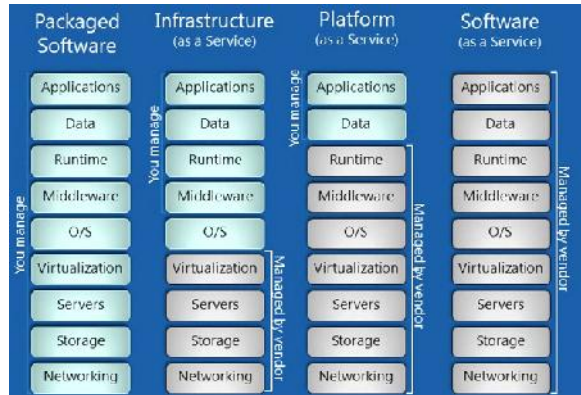
Source: [Digital Dialogue](#)

collaboration, and address basic needs including ticketing, CRM software, word processing, and centralized document storage.

It should be understood from the outset that “the cloud” is a very general term; no single document could hope to catalog every application and permutation. The suggestions presented here are a starting point for further research. Long-term, the key to successfully integrating cloud services into organizational strategy is curiosity, adaptability, and the ability to recognize both advantages and risks. Arts organizations should be excited by the possibilities of this technology and eager to embrace it, but must be careful to do so in a deliberate and selective manner that will maximize both cost-efficiency and overall efficacy.

WHAT IS THE CLOUD?

Simply put, the cloud is really just another word for the Internet; it is a powerful network of shared servers. Cloud services include any service that exists and is accessed primarily online, and which stores most of its data not on the user’s computer. Such services are based on the idea of distributed access to a shared set of hardware with a designated function, ranging from file storage to delivery of an app (Fee 2013). Many users may



Comparison of levels of management responsibility across different types of services. Source: [VentureBeat](#)

simultaneously access a given application or the computational power of this shared hardware. To better understand the broad range of forms and applications of cloud offerings, it is helpful to break the cloud concept into several sub-categories. The *International Journal of Computer Science* describes the three widely accepted classifications (Ahmed 2012):

- **Infrastructure as a Service (IaaS)** involves replacing physical servers with virtual ones that are hosted in the datacenter of a separate, contracted company. These virtual servers can provide any service that would normally be provided by on-site infrastructure. Typically, IaaS works in a utility pay-by-usage model rather than charging flat leasing fees. Compared to a traditional IT setup where an organization pays to maintain its own servers, including specialized staff, this model offers the flexibility of paying for only the capacity needed. IaaS also offers additional benefits regarding uptime, security, and scalability. Amazon currently holds an impressive level of dominance in the U.S. market, with more than 5 times the capacity of its next 14 rivals (Edwards 2013).

- **Platform as a Service (PaaS)** is essentially an online development platform that allows for the creation and distribution of apps and software while removing the need to maintain the onsite capacity to manage them. This model is becoming increasingly popular with software developers as it allows them to focus solely on their product instead of underlying hardware concerns. However, due to its focus on application and software development, the PaaS model currently is not relevant for most nonprofit arts organizations.
- **Software as a Service (SaaS)** is by far the broadest and most familiar category of current cloud services. Online CRM systems such as Salesforce.com or Artful.ly fall into this category, as do a wide range of ticketing software solutions such as Brown Paper Tickets and Ovationtix. Social media, webmail, and online storage services like Dropbox or Google Drive are other examples of SaaS. Because many of these services are free or offer discounted rates for nonprofits, they represent the easiest way for small arts organizations to leverage the power of the cloud.



Amazon AWS Datacenter. Source: [New York Times](#)

IaaS: ADVANTAGES & RISKS

CLOUD MIGRATION

Replacing physical hardware with a cloud-based equivalent has been touted as an inevitable result of the growth of the cloud, with advocates promising both savings and increased levels of reliability. But from an arts perspective this outlook is flawed, since the primary means by which IaaS cuts costs is by exchanging fixed hardware costs with variable usage charges. Nonprofit arts organizations, which are likely to have modest technological needs, will reap comparatively limited benefits. IaaS does offer advantages with regards to simplified logistics and consistent quality of service, but small arts organizations risk incurring significant costs for relatively little return. Similar to an insurance policy, many of IaaS's greatest benefits only become apparent in the wake of a catastrophe.

Therefore, the decision to undertake a transition from traditional server infrastructure to an IaaS model should be based on an understanding of IaaS's benefits, not from a desire for reduced expenditures. Such a decision should come only after careful deliberation and consultation with technical experts familiar with an organization's specific needs.

REDUNDANCY

A key advantage of IaaS service is the manner in which it protects data. Datacenters are specifically designed with redundancy in mind, ensuring that even if individual machines fail duplicate copies of documents are immediately available. Such failures are typically imperceptible to the end user, leading to typical guarantees of "99.9% uptime." Large providers operate multiple geographically diverse datacenters and store multiple copies of user data across various locations, offering protection from even the most catastrophic of failures (Amazon 2013). While it is certainly possible to achieve similar levels of reliability by conducting nightly backups of onsite servers and storing them securely off-site, IaaS offers a guarantee of redundancy without any additional cost or labor on the part of the client organization.

SCALABILITY

IaaS servers exist as a series of virtualized instances, meaning increased server capacity is a simple matter of duplication. The ease of expanding computing power ensures (at least hypothetically) that servers never fail under increased or unexpected server load. Typically, arts organizations do not face the same highly variable demand as more technically intensive

Redundancy in Action: Fire at The Internet Archive

At 3:30AM on November 6th 2013, The Internet Archive, a San Francisco-based nonprofit dedicated to providing a digital archive of the web, suffered a massive fire causing upwards of \$600,000 in damages (Shu 2013). For a traditional library this would have been catastrophic, but although the loss of scanning equipment was unfortunate, the only documents the Internet Archive lost were the small selection which were in the process of being digitized. Redundant backup systems safeguarded their data, while keeping it available to both users and developers as needed via the cloud.

industries, limiting the relevance of this specific advantage. But organizations that provide online content directly from their own servers, especially bandwidth intensive audio or video, could still face crippling loads at peak times, such as during popular on-sale dates or in the wake of a major news story. In such situations, scalable servers would prevent otherwise inevitable outages.

However, scalability alone is a poor reason for arts organizations to switch to IaaS, since both web-hosting and video hosting are easily available from providers like Wordpress and Youtube, each offering significant capacity at little to no cost.

COST

The current technology paradigm and the associated fixed costs of server ownership, replacement, and maintenance represent a significant drain on limited organizational resources. Hardware depreciates every year, requires maintenance, and must eventually be replaced. IaaS providers, on the other hand, upgrade their hardware invisibly to the end user, providing uninterrupted service at a steadily decreasing cost based on consumption rates. For-profit businesses have increasingly found that they are able to save money with the IaaS pay-for-usage model but for nonprofits, which often have limited numbers of users and access to donated or reduced cost hardware, potential savings of IaaS are limited. Under IaaS's utility

computing model, monthly costs can vary widely from organization to organization, so that advance pricing requires a keen understanding of computing consumption habits, even when using tools like Amazon's price calculator. As a result, creating a generalized estimate of pricing for the purposes of this report was impossible. It is recommended that on top of budgeting for the transitional and upkeep costs of a move to IaaS, arts organizations factor in the cost of consulting a technology expert familiar with the market.

CONCLUSIONS

While it is true that cloud servers offer unmatched advantages when it comes to reliability and scalability, the up-front and monthly costs of transitioning to IaaS may be more than what a frugal nonprofit organization could achieve by only occasionally upgrading their servers. Additionally, because most arts organizations have only modest technology needs, they are unable to benefit from the economies of scale IaaS provides. Due to these barriers to entry and possible low return on investment, the vast majority of arts organizations will be better served by simply instituting regular backup policies and seeking out specific SaaS solutions as needed. Indeed, it is questionable whether small arts organizations need centralized servers at all as internet-based solutions for sharing files and collaboration become more widespread.

Maximizing the Benefits of IaaS: Reddit's Transition to the Cloud

Reddit, the popular user driven news and entertainment aggregator and self-dubbed “front page of the internet” made its jump to the cloud in 2009. Reddit replaced its 15 physical servers with a suite of IaaS services provided by Amazon. Servers and databases are now run on EC2, traffic processing and analytics by Amazon's more computing power intensive EMR service, short term storage on S3, and archiving using Glacier. The new setup was put to the test when President Obama ran a Q&A on the site during election season. Reddit quickly realized that even the extra server instances it had brought online for the event were insufficient, but within 10 minutes was able to secure 30 additional virtual servers, keeping the site from crashing. While arts organizations are unlikely to see this type of extreme demand, Reddit's cloud migration experience exemplifies many of IaaS' key advantages (AWS Cloud 2013).

SaaS: USING THE CLOUD TO ENABLE COLLABORATION

SaaS is by far the broadest cloud subcategory, and the aspect of the cloud users and organizations currently utilize most frequently. Websites and apps are two common SaaS delivery models, providing a range of services limited only by the imagination of developers. For arts organizations, these services are especially appealing, given that many have a free tier.

Behind the scenes, SaaS providers are able to leverage existing IaaS perks such as scalability, redundancy, and high levels of uptime since such services are typically cloud hosted themselves. However one of the most appealing aspects of SaaS is how such services provide opportunities for collaboration through the creation of shared workspaces. Successful integration of SaaS provides new ways for data to be quickly distributed, analyzed, and augmented.

PRODUCTIVITY IN THE CLOUD

Productivity software is essential to every organization's day-to-day operation. Examples include Microsoft Office (Word, Excel, Powerpoint and Outlook), Apple Pages, and open source solutions like Open Office. Most organizations have become accustomed to upgrading every few years to newer versions at a significant per-computer cost. The office software industry is experimenting with transitioning to a more cloud-centric model, exemplified by Google Apps and Microsoft's Office 365.

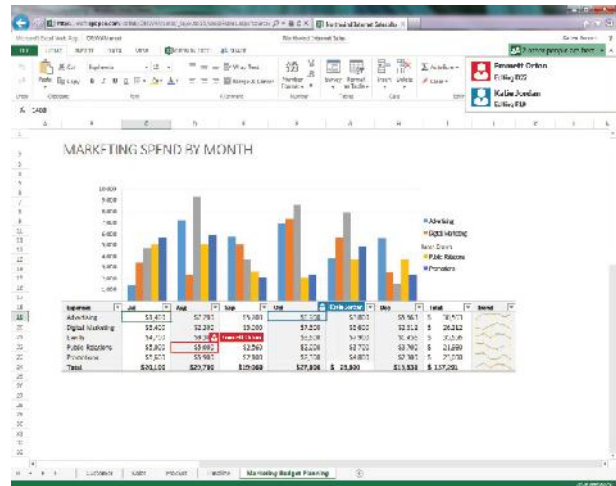
While consumers have been somewhat wary of this shift, productivity software is an area which stands to gain tremendously from a move to the cloud. Traditionally, creation of documents in any of these suites has been an isolated process; while successive drafts may be passed back and forth, perhaps marked up using editing tools, only one author can typically access a document at a time. The cloud offers a new model, where multiple authors can co-create a document in real-time. A longstanding feature of Google Apps,

Microsoft recently added the feature to Office 365 (Lardinois 2013).

Office 365 is Microsoft's attempt to couple its move to the cloud with a subscription service model, where customers and businesses pay a monthly per-user fee for access to a complete suite of Office products. For a time, the service lagged behind, but new ventures into SaaS for nonprofits and other recent developments make the service worth re-examining. This report focuses on the two most competitive companies in the marketplace: Microsoft and Google.

Organizations have a few options when it comes to their Office productivity plan. Microsoft's Office 365 "E1" service is primarily web-based, most easily described as being analogous to Google Apps in its implementation. Normally \$4 per user per month, a recent change and competitive action against Google, Microsoft now offers the E1 service as a donation to registered nonprofits. The package includes online versions of Word, Excel, Powerpoint, and One Note, 25GB of Sky Drive storage per user, hosted email, web hosting, 24/7 phone support, and a slew of features designed to facilitate organizational collaboration.

For organizations in need of more functionality, the E3 tier is \$4.50 per user per month for nonprofits, a 75% discount compared to retail prices. E3 service includes desktop versions of the complete Microsoft Office suite, Office Mobile for user's smartphones, archiving capability, unlimited email storage, and online voicemail (Microsoft 2013).



Example of a shared Excel workspace. Source: [TechCrunch](#)

Google for Nonprofits offers a range of web-based applications functionally similar to Word, Excel, and Powerpoint, 30GB of storage per user, 24/7 support, and hosted email service. A significant perk not yet matched by Microsoft is the Google Grants program, which provides up to \$10,000 per month in donated AdWords advertising (Google 2013). Efficient use of this in-kind support can drive traffic to an organization's website, ideally raising awareness and promoting engagement.

It is worth noting that although both of these services are now free to nonprofits, organizations still should consider the costs associated with data migration. In this regard, Google is at a significant disadvantage. The vast majority of organizations and users are familiar with Microsoft's Office suite, and with the creation of a free tier for nonprofits they have opened the door for simple low-cost transitions. While Google's apps are generally able to convert Microsoft file types, formatting and other details are not always perfectly preserved.

Regardless of what choice is made, the ability to access important documents from any location (with Internet access) and to have multiple users collaborate within the same workspace simultaneously carry potential productivity gains that make either suite an attractive choice. At the time of this paper's publication, Microsoft seems to have an advantage, but organizations should consider applying for the nonprofit versions of both suites and seeing which one works best for them. In particular, the Google Grants program provides \$10,000 of free online advertising that all nonprofits should be using.

ONLINE STORAGE

SaaS providers also offer solutions for easily sharing and distributing large files, both externally and internally, through cloud storage sites. Many multi-service providers have a presence in this market, including Google via Google Drive, Microsoft with its Skydrive, and Apple's iCloud. Numerous storage-only providers are also available, with Dropbox alone counting over 100 million users. Other notable providers include Carbonite, YouSendIt, Box, and JustCloud.

Cloud storage services offer a low-cost means of creating limited off-site backups. But prices for storage steepen quickly, making it cost prohibitive to use these providers to store large amounts of data in the cloud long-term. When multiple terabyte hard drives can be acquired for under \$100, it is somewhat surprising to see, for example, that Dropbox charges \$99/year for its 100GB Dropbox Pro service. Organizations truly dedicated to cloud storage are forced to consider models like Dropbox's Enterprise Plan, which

provides unlimited storage for five users at \$795/year (Dropbox 2013).

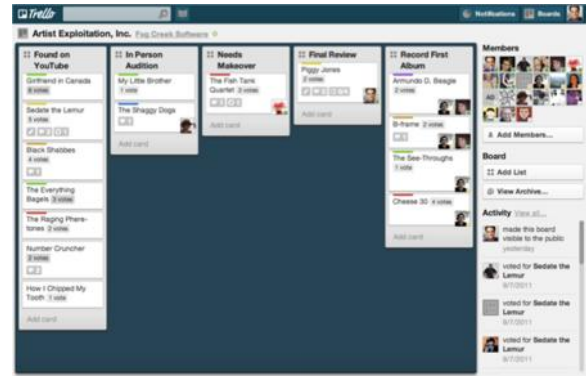
Given space limitations and the lack of cloud storage plans specifically for nonprofits, the best use of free cloud storage for an arts organization would be either as an emergency backup or as a collaborative space facilitating the temporary distribution of files. Though server administrators can easily create shared network drives, many small organizations either do not have servers or the on-site expertise required to do so. Cloud storage accounts can easily be created and access can be shared, providing a space where files can both be shared internally and accessed outside of the office as needed.

Care must be taken with cloud storage for it to be used responsibly and advantageously. Old files should be regularly deleted, backups should be maintained to preclude accidental deletion by users, and sensitive data such as financials, employee reviews, or copyrighted works should not be uploaded. While advanced levels of cloud storage services typically provide administrative tools and log user activity, arts organizations attempting to use only free services will not have these features and should remember that uploaded files are accessible by anyone with the password to the drive.

ADVANCED TOOLS

While shared workspaces and online storage solutions are two of the most easily implemented options for small nonprofits, technically adept or adventurous organizations should not be afraid to look at more complex solutions. Suggestions:

- **Artful.ly** – Developed by Fractured Atlas, Artful.ly tackles an essential need of all arts organizations, customer relationship management (CRM) software. A relatively new undertaking, having launched in November of 2013 after several years of beta-testing, initial reactions to this online system are promising. Artful.ly features low cost ticketing (\$2 per ticket and a 3.5% card processing free), free contact management, integration with MailChimp’s emailing services, and was built from the ground up in collaboration with small arts organizations. Especially compared to other ticketing programs, which can be either light on features or expensive, Artful.ly is an excellent tool to reach the next level in managing client relationships without breaking the bank.
- **Trello** – Billed as a tool for project management, Trello provides a visual means for teams to collaborate. A typical use might be to create a “board” for each department, with separate lists for each project. Users can add individual cards to these lists, attaching documents, images, video, or other information on project progress. Trello is a simple but effective concept, which it describes as essentially “a list of lists” (Spolsky 2011). When widely adopted within an organization, Trello provides an easy and searchable way to track and document progress.
- **Evernote** – Another tool that encourages collaboration and the exchange of ideas, Evernote is premised around the creation of “notebooks.” Users create notes as a

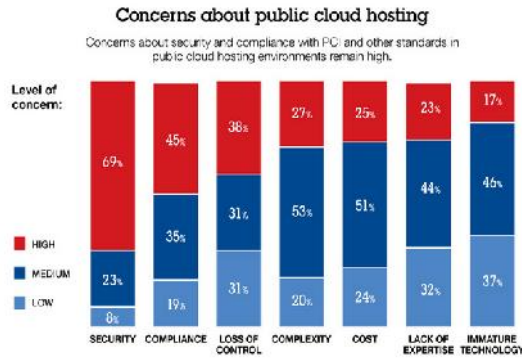


Example of a typical Trello board. Source: [Joel on Software](#)

place to store links, images, or text, which can then be accessed through Evernote’s web, desktop, and mobile applications. Notebooks can be shared easily with other users, and a robust community of developers has created a variety of extensions that offer functionality ranging from drawing on PDFs to business card scanning. While the business version of this program may be too expensive for small arts organizations (\$10 per month per user), a single premium account is just \$45 per year and can be used to create shared notebooks that both free and premium users can edit, creating allowing a space for synchronous collaboration and brainstorming.

USING THE CLOUD SECURELY

One of the top concerns about the cloud, across sectors, is security. A recent study conducted by Lockheed Martin and the Cyber Security Alliance listed security as a top concern for government IT staff, despite increasing adoption of cloud technology within the sector (Hoffman 2012). Security is a multifaceted issue, ranging from issues of data ownership when information is



“Security and the Cloud.” Source: [CloudTweaks](#)

uploaded to the cloud, to protection against unauthorized access and data theft. But no matter how secure a provider is, some risk will always exist when organizations place their data in the cloud. Use of any cloud service means ceding day-to-day control of at least some data. Users have no idea in which physical datacenter, or even in which country, their files are currently stored. They must rely on cloud service providers to manage their data responsibly, protect it from loss, and ensure that access is tightly controlled. When breaches do occur, users typically will not know about them unless notified by the provider.

Compared to thefts of actual computer hardware, major data heists are comparatively rare, but minimizing overall risk exposure should be the goal of any organization’s security policy. Always consider carefully whether a file needs to be uploaded to the cloud, especially when that file contains potentially sensitive data.

CLLOUD STORAGE AND IP RIGHTS

Cloud storage in particular has been a battleground for issues of intellectual property. Soon after Google Drive’s launch in April 2012, concerned users noticed the following paragraph:

“When you upload or otherwise submit content to our Services, you give Google (and those we work with) a worldwide license to use, host, store, reproduce, modify, create derivative works (such as those resulting from translations, adaptations or other changes we make so that your content works better with our Services), communicate, publish, publicly perform, publicly display and distribute such content. The rights you grant in this license are for the limited purpose of operating, promoting, and improving our Services, and to develop new ones.”

Google claims that the terms read very much like those of the competition, and advised people pay attention to the previous paragraph which reads, “Some of our Services allow you to submit content. You retain ownership of any intellectual property rights that you hold in that content. In short, what belongs to you stays yours.” Google’s defense largely holds true, though other providers are more direct in their language. For example Dropbox’s terms say, “You retain full ownership to your stuff. We don’t claim any ownership to any of it,” and “We may need your permission to do

Risks of the Cloud: Security Breach at Dropbox

On June 19, 2011, a seemingly innocuous code update led to a major Dropbox glitch, whereby any account could be accessed with any password for nearly four hours (Ferdowski 2011). Dropbox estimates that less than 1% of all users were affected by this bug, and is to be commended for immediately informing the community, but the incident is a stark example of the risks of cloud storage.

things you ask us to do with your stuff, for example, hosting your files, or sharing them at your direction... You give us the permissions we need to do those things solely to provide the services." Microsoft's Skydrive terms state, "We don't claim ownership of the content you provide on the service. Your content remains your content," (Patel 2012).

Perhaps Google's ambiguity comes from the fact that it is attempting to use one set of terms to cover all of its services, but critics continue to take issue with the derivative works clause, a phrasing that no other provider uses (Hardy 2012). Thus far no incidents have been reported that involve theft (or derivation) of data based on any of these Terms of Service, but as with any contract, it is always good practice to read the fine print before entrusting proprietary information.

CONCLUSION

Looking ahead, cloud usage is expected to become even more widespread, especially as IaaS prices continue to drop. While the future proposed by technologists, where computational power is provided as broadly as utilities like power or water, may be a ways off, how the cloud will transform the use of technology is already visible. The ongoing shift in the computing market of broadly useful services being hosted online and available to users worldwide should not be feared, but rather embraced as an opportunity for organizations that might otherwise be technologically limited.

For arts organizations with leaders able to take the time to conduct research relevant to their

operations, the cloud offers a chance to leverage the imagination and output of developers in sectors far removed from the arts. Useful software and services that would be impossible for small arts organizations to develop independently abound on the web, with the examples discussed in this document but a small fraction.

Individual arts organizations and the nonprofit arts sector as whole must leave behind the aversion to new technology. Instead they should meet the new opportunities presented by online technology head on, embracing the shift to the cloud in a confident, if cautious manner.

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