THE OPPORTUNITIES OF CLOUD COMPUTING

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Abstract : When Cloud Computing first came on the scene, channel partners steered their clients to migrate business applications. Today, deploying cloud-based apps such as Office 365, Sales force, service now, Drop box, and Workday has become the de facto standard for cloud computing. Yet, simply focusing on business apps as the primary cloud play is no longer a differentiator for channel partners. As the cloud model of delivering IT services continues to gain traction, channel partners seeking growth can turn to new opportunities, namely cloud networking, managed clouds, cloud monitoring, and cloud security. According to IT market research firm IDC, half of all IT spending will be cloud-based by 2018, and by 2020 spending on cloud services, including related hardware and software as well as services for implementing and managing cloud services, will surpass $500 billion. That's a big market for the channel. This paper deals with the technology, opportunities for interaction designers, concerns and misconceptions about the cloud and concluded with cloud-based applications is that they are continuously, ubiquitously available to users and their collaborators. The cloud facilitates our breaking out of the confines of a single-workstation, single-user paradigm.

***IndexTerms* - Cloud Computing, monitoring, security, networking.**

I. INTRODUCTION

Cloud computing has become the new norm for information technology (IT) in all kinds of companies.There are a number of technological drivers that are affecting the way interaction design is currently evolving. Even more than artificial intelligence and virtual and augmented reality, cloud computing has become the new norm for information technology (IT) in all kinds of companies. What does this mean for interaction designers?

This article explains what cloud computing is and its four major benefits for designers *and* users:

1. Democratized innovation
2. Seamless, personalized experiences
3. Native collaboration
4. Robust user experiences

1.1 The Technology

This new model has improved companies' digital services both quantitatively and qualitatively. One of the most evident gains is scalability Cloud computing is mostly an IT thing. Simply put, *cloud computing* describes the shift from companies' owning their own servers to renting server capacity on a global scale. Cloud computing is already a billion-dollar business worldwide and is still growing rapidly. When people talk about cloud computing, they often focus on specific cloud-platform providers. In 2017, the four biggest Western cloud providers were Amazon Web Services (AWS); IBM Cloud, formerly Bluemix; Microsoft Azure, and Google Cloud Platform. Figure 1 depicts their logos. Gartner has estimated that 2016 revenues for public cloud services exceeded $22 billion—Amazon leading with over 40% of the market.

Cloud computing moves organizations away from the old IT infrastructure model, in which a company hosts its own Web servers. In the new cloud-computing model, cloud providers share an almost unimaginably large number of servers that can be dedicated to very specific tasks.

This new model has numerous consequences for all businesses—both in terms of costs and the services they provide. It has improved companies' digital services both quantitatively and qualitatively. One of the most evident gains is scalability—because cloud-computing services can just as easily be used by 100, 100,000, or 100 million users. Among software developers, cloud-computing skills are increasingly in demand. The cloud offers and requires new ways of working.But does cloud computing make a difference to Web and mobile application design? Does it really matter what kind of computer is doing the work?

1.2 The Cloud with a Silver Lining

Many of the tools that interaction designers, UX designers, and UX developers use daily are already cloud based.

Interaction designers don't usually care greatly about technology per se. Often, technology presents frustrating limitations that cripple our innovative efforts to delight users. In fact, we tend to be proud if we can design a high-quality user experience *despite* a technology's constraints. Cloud computing is already changing that state of affairs for the better. Ironically, you'll find the strongest manifestation of the cloud's silver lining on your computer.

Many of the tools that interaction designers, UX designers, and UX developers use daily are already cloud based—and no, I'm not referring just to Adobe's Creative Cloud, for which moving to the cloud is primarily a business-model change. Cloud-based tools include Dropbox, InVision, Sketch Cloud, Google Suite, Figma, and other cloud-native productivity applications. And let's not forget iCloud, SoundCloud, YouTube, and the many other services that provide entertainment over the course of a day.

II. OPPORTUNITIES FOR INTERACTION DESIGNERS

Cloud computing offers several opportunities to interaction designers—in addition to changing the tools we use. I'll discuss these next.

2.1. Democratizing Innovation

Cloud computing reduces the costs of sophisticated software solutions by making them available in the form of services….

Cloud computing is democratizing innovation—at least in the sense that it is making the latest technologies available to all software developers without major capital investment. Cloud computing reduces the costs of sophisticated software solutions by making them available in the form of services—*software as a service* (SaaS). Developers can leverage these services—often without major development effort—in developing products. For instance, advancements in artificial intelligence (AI), machine language (ML), chatbots, and other assistive technologies are available as services in the cloud. Instead of building things from scratch or just integrating existing solutions, small organizations can employ APIs that provide capabilities such as machine translation and image recognition affordably and efficiently.

Because cloud computing lets us develop diverse software services with little effort, features whose priority was low because they would take too much time and effort to implement are suddenly achievable. For instance, the AWS Elastic Transcoder service makes it easy to convert media files to many different formats, allowing you deliver content to people across a variety of devices. Just recently, AWS launched a plugin for the world's most popular Web content-management system, WordPress, which transforms text content in several languages to speech files and podcasts at a minimal price.

As interaction designers, we need to understand what we can potentially do with such powerful, new capabilities. In my article, "Applications of Machine Learning for Designers," I explored three points that I'll summarize here:

1. Detection—AI-enabled applications can be valuable to users because they *detect* things for us—for example, identifying spam or sorting photos.
2. Prediction—They can *predict* what music, movies, or restaurants we might like.
3. Creation—In the future, intelligent applications will work together with creative people to *create* user interfaces, compose music, or edit movies.

The benefits of these capabilities are huge—especially when they reduce manual work.

2.2. Seamless, Personalized Experiences

A major opportunity of the cloud is enabling seamless experiences across locations and devices. Because the essence of a service experience is not on the device, but in the cloud, a personalized service can remember users' interaction histories and continue interactions even when the touchpoint or device changes.

Spotify is one of the best applications for illustrating this capability. The company has worked hard to provide several ways for users to enjoy music, including Spotify Connect. Their achievement is in making the service feel much the same across devices and platforms. Users can play music on several types of devices, picking up wherever they left off—for example, when jumping out of their car and returning home.

Creating seamless experiences requires both application design and the supporting infrastructure and devices. In the case of Spotify, supplementary devices such as Google Chrome cast let users enjoy audio and video content on their TV. In other environments such as cars, such opportunities remain scarce, but they would be impossible without designs that bridge various devices using cloud technology.

Personalization is a big trend right now, combining personal data and machine learning. The cloud enables personalization to take place by lowering the technical hurdles that are associated with performing the complex computations that are often necessary for personalization—for example, to produce personalized recommendations. Spotify has implemented personalized playlists—so users' personal content is conveniently accessible regardless of the client device or application version.

2.3. Native Collaboration

Cloud-based services enable people to communicate and collaborate.In the virtual world, you never need to be alone. Cloud-based services enable people to communicate and collaborate. With traditional desktop applications, all of the computing power and data reside in the box on your desk. With cloud computing, your friends and colleagues are always at hand and you can share data with one another.

Facebook is probably the best and worst example of this. At best, you have increased insight into your friends' lives—if they decide to share with you. At worst, commercial interests compromise free communication. But Facebook does provide awareness of what other people are doing, how they're feeling, and what you could achieve together.

With today's technology, designers are more limited by their ideas and current design patterns than by the ability of technology to foster collaboration. Once new design patterns emerge, technological solutions will follow. Modern computers and networks can help people work together if we can just determine what we need from them.

As an example, in 2008, Etherpad demonstrated how to enable real-time collaboration through word processing in a Web browser. However, in the years following Google's acquisition of this application and its incorporation into Google Docs, the application has not progressed much from a user-experience perspective.

2.4. Robust User Experiences

To provide a good user experience, digital services must simply work, functioning as specified. They must be fast, reliable, and consistent in their operations. Delays, outages, and errors annoy and frustrate users. Functionality precedes usability and both are necessary to deliver great user experiences.

The infrastructure of the cloud can help make digital services more stable, allow more frequent updates, and thus, reduce annoying errors. I'll illustrate what happens in the absence of cloud computing by describing an issue that has repeatedly affected my life. Here in Finland, the market-leading cinema chain Finnkino has for several years in a row received negative publicity because of their repeated failures to respond to predictable peaks in ticketing demand for upcoming Star Wars premiers.

The last time their servers crashed, they sold no tickets on the Web for four hours. While a business selling scarce products might be able to afford alienating their customers and still remain in business, most cannot. This kind of technological blind spot would be totally catastrophic for any normal ecommerce company during, for example, Black Friday sales. This is a case in which the benefits of cloud computing could prevent much customer frustration.

III. CONCERNS AND MISCONCEPTIONS ABOUT THE CLOUD

Some ever-present difficulties include the perpetually unfinished nature of many cloud-based tools, the rising speed of software development, versioning troubles, and the fragmentation of markets.

Despite all of the benefits of cloud computing, it does have several worrisome aspects, including cost, privacy, security, downtime, and getting locked into a particular vendor, or *vendor lock-in*. These issues are disturbing to every individual dealing with cloud computing. Are there design-specific problems?

Some ever-present difficulties include the perpetually unfinished nature of many cloud-based tools, the rising speed of software development, versioning troubles, and the fragmentation of markets. In fact, these worries are exacerbated because multiple people now need to work collaboratively on projects in the cloud. Teams require a common toolset, which might mean buying a lot of redundant tools from different vendors.

There are few common misconceptions about cloud computing that I would like to clarify. The first is that working in the cloud would move your data and computing to somewhere unknown or, at worst, to untrusted foreign soil. Remember that, despite the cloud's abstract name, data is always stored physically on a computer somewhere. In most cases, the builders of a digital service can choose, with at least country-level precision, where to store the data. Cloud-service vendors promise not to move your data anywhere else. But, for small countries such as Austria or Finland, at least for now, most cloud companies unfortunately do *not* provide infrastructure inside their national borders.

The second major misconception is that cloud applications require constant Internet connectivity. Yes, the cloud is inherently an Internet thing, and this means users can derive its full benefits only when they are connected to the Internet. However, good application design ensures that users can get some level of service even when offline. Anyone who has used IMAP and POP email clients such as Thunderbird, Apple Mail, or Outlook knows how this can work. Most modern streaming-media solutions such as Netflix and Spotify offer some type of download solution for off-line listening.

But off-line use is a solvable challenge. Intelligent systems could predict both periods of off-line use and what a particular user might want to access offline. For example, if a user had a six-hour flight on his calendar, Google Play Music might suggest that he download enough music to keep him entertained throughout his journey.

Earlier, mentioned vendor lock-in as a concern. When a single vendor holds all of an organization's assets, it restricts their opportunities to employ other vendors and their platforms. However, in reality, cloud systems are not walled gardens. Many of them have adopted a policy of letting data come in freely, but charging a premium for letting it out. So even though it is not technically difficult to use several cloud platforms, it is not cost effective.

Finally, cloud computing is *not* the same thing as *server less computing*—an approach that replaces one traditional layer of digital-service creation, Web servers, with a new type of action- or business-oriented technological solution. These still use servers—just a different kind of server.

IV. CONCLUSION

Working in the cloud is convenient for designers, and the technology affords several use cases that offer radical new design opportunities. Many companies are currently making at least a partial transition to the cloud. The cloud-computing model presents many lucrative opportunities for software development, as well as cost efficiencies. Plus, working in the cloud is convenient for designers, and the technology affords several use cases that offer radical new design opportunities. The main benefit of these cloud-based applications is that they are continuously, ubiquitously available to users and their collaborators. The cloud facilitates our breaking out of the confines of a single-workstation, single-user paradigm.

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