THE RAZORFISH 5

Five Technologies That Will Transform Your Business

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Contents

The Pace of Change

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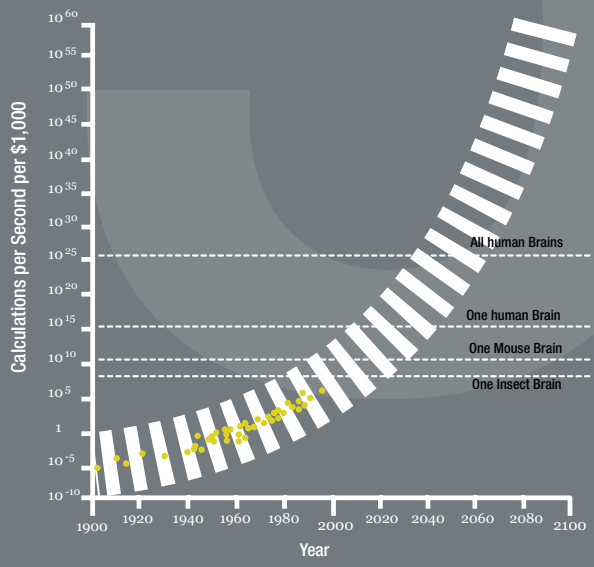
In his book "The Singularity is Near," inventor and futurist Ray Kurzweil predicts a pace of technological change that will make our recent strides feel glacial by comparison. He sees cures for pollution and poverty, aging and illness, even death. Physical products will be conjured out of thin air – or, more accurately, out of very expensive printers. The rise of nanotechnology will bring together man and computer in a way that "will enable us to transcend our biological limitations and amplify our creativity." By 2021, computer power will be equal to that of the human brain, a state of affairs that will make Watson, the IBM-designed supercomputer that recently trounced a couple of flesh-and-blood brainiacs in a series of "Jeopardy!" matches, look like a Commodore 64.

Not everyone is embracing this trend. The bandwagon of people who believe that all this information is actually overloading us or rendering us Google-hooked know-nothings is getting crowded. We believe that the opposite is true. Our brains have been getting faster and faster at processing images, an improvement that helps

Exponential Growth of Computing

Twentieth through the twenty first century



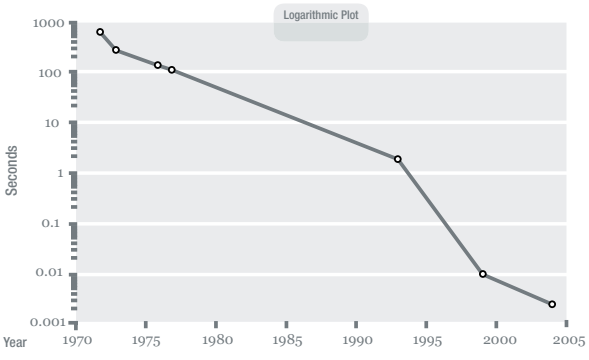
Source: The Singularity is Near by Ray Kurzweil

squeeze more information into our heads. In the past it's been said that most folks only use 10% of our brain. Well, maybe we can up that to 12% or 15%.

Whether all of these predictions come true by the dates assigned by folks like Kurzweil doesn't matter. The point is that change is occurring at a more rapid rate than ever. Our position here at Razorfish is that we

Brain Scanning

Image Reconstruction Time



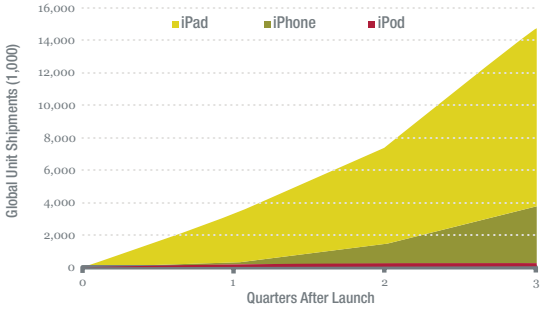
Source: The Singularity is Near by Ray Kurzweil

should simply ride the wave. As businesses, we need to be continually innovating and adopting technologies to keep pace. It's less about science fiction than science fact.

KP CB

iPods Changed the Media Industry… iPhones Ramped Even Faster… IPad Growth leaves its "Siblings" in the Dust

First 3 Quarters Cumulative Unit Shipments, iPod vs. iPhone vs. iPad



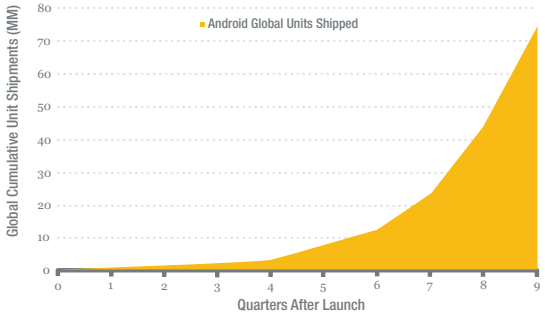
Source: TechCrunch, Ramping Up: Mary Meeker's Latest Mobile Trend Slides

Consider the mobile space. iPods grew fast, iPhones even faster, and iPads left them in the dust. The former Morgan-Stanley analyst Mary Meeker, speaking at Google's Thinkmobile conference, captured some of the key trends that show how the pace of change is quickening. The most breathtaking is the lightning-fast adoption of Apple's tablet, compared even to the other hot products developed by Steve Jobs since 2001. Three months after launch, it's shipped over 14 million units. At a similar point in time, only about three million iPhones were in circulation. But before Apple had a chance to kick back and relax, the Google-developed Android platform basically took over the smartphone market in just 9 months. Think of all the amazing computing power now available to be stuffed into the back pocket of a pair of jeans. We've already seen these devices put mobile application development on the map. That's only the beginning.

KP CB

Android has Hit Critical Mass

First 9 Quarters Cumulative Android Unit Shipments



Source: TechCrunch, Ramping Up: Mary Meeker's Latest Mobile Trend Slides

For the second year, Razorfish's Technology community has compiled a list of five technologies that will become crucial to your business in the coming year. Our best strategic and creative minds have come together to ensure holistic look at upcoming technologies, tying them to key business and marketing priorities.

One of the most exciting areas of innovation is around Near Field Communications, a set of short-range wireless technologies that facilitate the use of contactless payments. Google has built the capability into its Android OS with a production phone in December 2010. Apple is rumored to follow suit, NFC will usher in a whole new way of interacting with our devices and it's not just for payment: think of the implications couponing, added-value information from merchants, and so forth. Paul Gelb, VP, Mobile and Heiko Schweickhardt, Technology lead, will give us an overview of what's to come.

Interface change is going beyond tablets and touch in 2011 as the ways available to interact with computers have gotten more intuitive, attractive and approachable. It seems like the days are numbered for that dynamic duo of the mouse and keyboard. The Razorfish Emerging Experiences team takes us through the new interfaces and their implications.

Two Razorfish technology leaders, Basel Salloum and Salim Hemdani, both group VPs, walk us through Open Digital Services[SM]. ODS is about organizations opening up services in a way that makes them available to any technology at any time, safely and securely. Building on Open APIs, this is a company's best chance of keeping pace with changing business models and technologies.

In the new digital reality, the amount of consumer data available to organizations is colossal. Ignoring it is just as big a missed opportunity. With new cloud-based tools and techniques we can finally make sense of the trillions of rows of data to have better and more targeted conversations with our clients. Whether those conversations are through display ads or on web sites, you need to make sure you are listening to your customers with data and analytics. Ray Velez, Razorfish CTO, and Pradeep Ananthapadmanabhan, CTO of Publicis Groupe's VivaKi's Nerve Center, pull together some of the innovative technologies and techniques we have used to help clients such as a large retail client and others.

Lastly, as the cloud infrastructure has become top of mind for most CIOs, it's important to understand how your business and technology architectures change. Technology directors Jibi Scaria and Mandhir Gidda along with Ray Velez pull together best practices from across the organization learned from work we've done with clients including O2 and Mercedes.

It should be clear by now that we're not going to tell you how to inject nanobots into your customers' bloodstreams. But we'd bet that by the time you're finished reading this

report you're reeling a bit from the sheer speed with which the business scene is changing due to technologies like the ones we've identified. We hope we provide some guidance and, of course, we hope you enjoy.

Near Field Communications

Paul Gelb, VP of Mobile (@ paulgelb)
Heiko Schweickhardt, Technology Lead

In June 2007, a slide in a Razorfish client presentation painted a bleak picture for near field communications (NFC) - "Today, the NFC contactless mobile payment solution that is prevalent in Japan and many emerging countries is not a viable solution in the U.S." We found that the growth and impact of NFC had been stifled by the competitive situation already in place, not by a lack of infrastructure to support it. Because the market for credit and debit cards in the U.S. is saturated, a new payments system would have to provide significantly more value to users and solution providers. NFC technology has been available for years, but it has only attained significant adoption in a few markets as a contactless payment solution. So, given all that, near field communication may seem to be an odd selection for this report.

What's changed in four years?

Apple, Google and Facebook. NFC figures in the immediate plans of these uberdisruptors and that means it's important for everyone to learn the ins and outs of the technology and what it means for commerce, marketing and privacy. In the hands of those companies, NFC yields a much broader opportunity than what arises from the contact-free nature of mobile payments and a slice of merchants' transaction fees. Payments aside, NFC has the potential to ignite billions of dollars of incremental revenue from mobile marketing services. This windfall would finance countless transformative applications of NFC technology. It is in this context that the emergence of NFC in 2011 will be a watershed moment for mobile, impacting every industry.

This new data and integrated service offering could generate billions if not hundreds of billions of dollars in incremental ad revenue. The increase in inventory would come from the number of mobile users and the amount of time that they spend with their mobile phones. There are over 5 billion mobile phones, which is over 4 times the number of TVs. In fact there are more mobile phones than people with access to fresh drinking water.

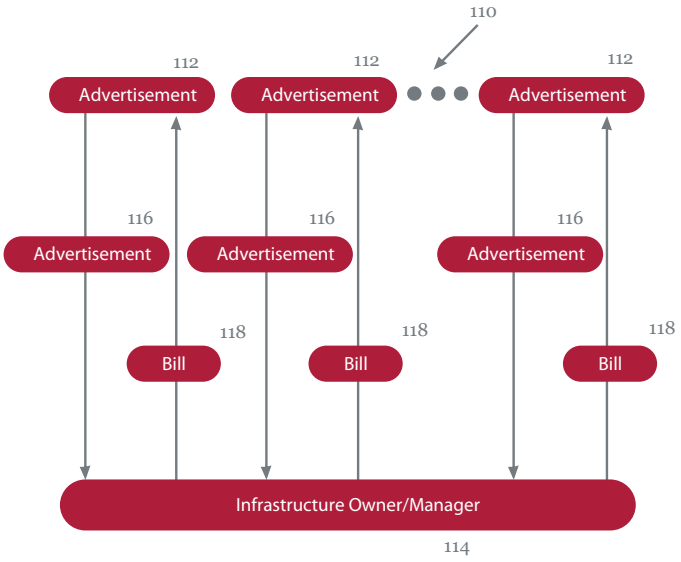
The penetration of smartphones and the devices marketers will predominantly be able to target are growing exponentially. The device is always with the consumer, creating the possibility for it to trigger a targeted ad on nearby digital signage or any other digital consumer touch point. Last, and most importantly, the additional data would increase ad effectiveness and efficiency by allowing marketer to target the most valuable consumers with the most effective ad content at the time they would be most receptive to the message.

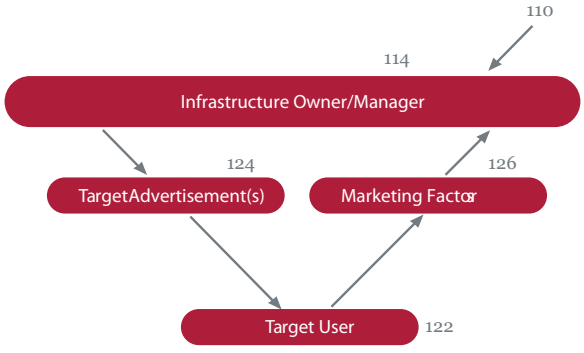
NFC's advertising potential is what is of the most interest to new NFC market entrants such as Google, Microsoft, Apple and Facebook. In fact, Apple has submitted a patent for a dynamically priced advertising system in which they match ad requests from advertisers with consumer profiles that reside in a database that they control. According to the patent request description, an advertiser, using the dynamically-priced system, may pay a unique price for an advertisement based on an assessment of characteristics unique to the target recipient.

A great deal of NFC's value is in its ability to replicate ancillary value streams from credit and debit cards. For example, the aggregated data from each user's purchase behavior creates purchase histories that are integrated into data from various sources by credit report firms to create robust consumer profiles. These profiles are used to create highly targeted lists of consumer sales leads that can be sold at high prices to

Apple´s Dynamically - Priced Advertising System

www.patentlyapple.com
Patently Apple





direct marketers. The list of consumers can be targeted by geography, demographics, behavior (lifestyle activities like golf or gardening), methods (preference for online purchasing vs. mail order) and life stage events (new parents or new home owners). Some banks and credit card companies have even sold highly targeted ad space on account statements directly to marketers.

This value stream provides an opportunity for NFC to generate exponentially more value than credit or debit cards. NFC can connect a consumer with the physical world in ways that generate an infinite number of interactions or valuable profile data points. Consumer profiles could now include a user's current location, where they have been, who they have been in contact with, who is in their social network, what media content (across multiple channels) they have consumed and even how much influence they have on other consumers' purchase decisions.

NFC providers can also close the loop between mobile marketing programs and conversions. Evidence from NFC Pilots, posted job descriptions and registered patents has revealed the imminent release of several integrated mobile marketing and commerce solutions. These solutions would enable one service provider to deliver targeted ads and promotions (coupons), integration of consumer profiles with product/store databases, promotion redemption, retailer support for enabling m-commerce at the POS and consumer NFC contactless payment. The ability to see a consumer's full behavioral pattern will allow marketers to reach a whole new level of analysis and optimization of marketing programs.

Privacy

Most readers by now have likely started to think, if not scream out loud, about privacy issues. A comparison to other similar products and user behavior patterns shows that privacy concerns will not impede mass market adoption rates. As previously discussed, credit and debit cards provide numerous institutions with consumer data, which includes more personal information than any digital property currently collects. Adoption and usage of these cards skyrocketed when loyalty point programs emerged. Consumers clearly demonstrated their willingness to relinquish the anonymity of cash as long as they were compensated.

When Amazon provided product recommendations, based upon items the user had viewed but not purchased, many were apprehensive. Consumers' fears were assuaged when Amazon communicated the value of those recommendations. Netflix and Pandora provide more extreme examples. Both companies are able to provide and communicate enough product value from information submitted by users that the average user is now submitting all kinds of data in the form of content ratings and movies in account queues.
These examples clearly prove that privacy issues are removed when a company

communicates the value the user will get from data collection, there is transparency around the data collection and/or the user is given a choice to opt in.

NFC providers could follow these tactics by having a personal information and loyalty program management application for mobile devices. Users would be able to opt in to a collection of their personal information and select what bits could be used for ad targeting. In exchange for opting in, users would be compensated by mobile wallet dollars. These rewards dollars would be based on events in which their information was shared with advertisers and could be redeemed during any m-commerce / NFC transaction. These virtual dollars could be financed by a nominal percentage of the incremental revenue generated from ads that leverage the consumer's information for targeting.

User Experience

Consumers would benefit from a highly improved user experience with NFC as well. While contactless payments can be technically achieved in different ways, the ease and swiftness of waving a mobile phone in front of a retail register is far more likely to be understood and embraced than is a process where you have to scan visual codes with an embedded camera app.

However, again extending our focus beyond payment reveals a value that can be significantly increased by providing NFC touchpoints for consumers. Potential interactions with touch points include virtual check-ins to participate in loyalty programs, special offerings and related product recommendations or virtual concierge services like indoor augmented reality and floor plans. All these services can be consumed with an intuitive wave gesture. Touch points like these will likely drive more consumers back into retail stores, providing them a richer, hands-on experience through the integration of services.

Security

Security will likely be a greater challenge than privacy for NFC. The high value of access to a person's financial assets and personal data will increase the risk of potential threats. Several NFC providers are planning to offer remote deactivation of the NFC functionality and deletion of profile information. Another security protection will be a biometric sensor that can read fingerprints or other anatomical features. Once again the revenue potential of this opportunity will allow market leaders in the space to invest in and constantly improve security protections. While NFC may never be completely secure , there should be the same level of protection as personal information data bases and financial services companies offer on other digital channels. Ultimately, we have witnessed significant database breaches over the last few years, but there has been a negligible effect on consumer adoption.

The last hurdle for mass implementation of NFC is the cost of producing and distributing hardware to stores that are capable of receiving payments from consumers' mobile devices. NFC providers and public institutions have already demonstrated their willingness to absorb all or at least a portion of this cost. This is especially true when mobile devices are leveraged as the receiver hardware. Google is said to be poised to distribute as many as eight million "custom mobile devices" to small businesses around the U.S. Apple has pilots with several retailers, that includes IOS devices with preloaded m-payment receiver accessories, dedicated customer support agents, expedited dispute resolution, invitations to VIP events and merchant rewards. Bling Nation, an NFC start up that leverages stickers with embedded NFC chips, is currently offering businesses in pilot cities free NFC receiver hardware when they participate in ongoing tests. Even governments have begun to invest in the technology. The French government has spearheaded the purchase and distribution of thousands of receivers for businesses in 13 cities that are participating in one of the largest NFC pilot testing programs ever. As well, public transportation authorities in several U.S. cities have begun to invest in testing and implantation of NFC payment receivers for rider mobile payments.

The large number of players investing in NFC is evidence that the costs of addressing challenges presented by privacy concerns, security threats and receiver hardware costs are not prohibitive to the NFC business model. However, to maximize ROI and profit

Communication Between Controlling & Controllable Devices

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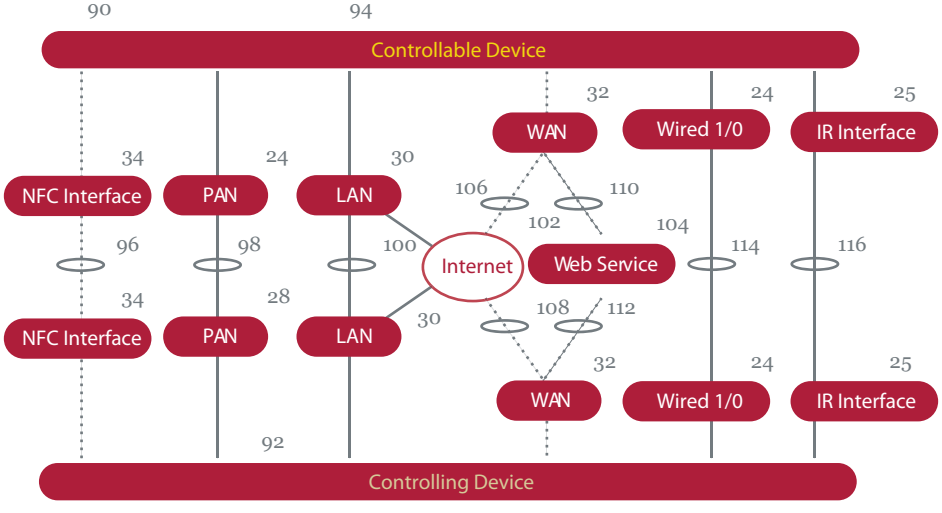

margins, potential NFC providers are investing in the development of nonpayment NFC applications for users. These utility and entertainment applications will provide non-monetary benefits to consumers and generate additional value in creating consumer profile data. These innovative NFC products could be offered as part of the compensation for opting into data collection.

For example, Apple has already patented an NFC application that could align with this strategy. The patent describes mobile devices that leverage NFC as becoming universal remotes capable of controlling any other NFC device, including TVs, DVRs, DVD players, gaming consoles and even garage/doors. Data generated from this application of NFC technology would include what content and commercials a user had seen across multiple media channels.

NFC powered remotes are just the tip of the iceberg. Numerous executions have been patented, prototyped and/or piloted. Social applications will enable users to share music, videos, contact information, a social network connection request or even an app. Travel applications will create virtual room keys, ID and ticket submissions and baggage check in. The list of potential functions is only limited by the creativity of the developers.

NFC, a technology that is not new or particularly sexy, will open up nearly unprecedented opportunities for ad revenue and ground-breaking consumer experiences for companies that have looked beyond mobile payments to uncover its untapped potential. What will make NFC's emergence in 2011 even more exciting are the potential revelations from innovative companies that are able to take the next step. Applications and device accessories have exploded alongside the recent rapid growth of smart phones and tablets. When we look beyond NFC entirely, what new opportunistic industries will be revealed?

The Interface Revolution

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Crystal Surrency, Strategy Analyst

The Mouse, as We Knew It, is Dead

Once revolutionary, the 25-year dominance of the mouse and keyboard as the main interface for communicating with computers is nearing the end of its lifecycle. The mouse, after all, is merely a pointing device we awkwardly use as a substitute for the finger. We click a button when we mean to point; we slide a mouse across the table when we mean to swipe; we bang away at a keyboard when we mean to simply speak. These mediated input methods are behaviors we have learned because the technology, up until now, has not been available to allow us to do what comes most naturally to us — touch, speak and gesture.

The mouse and keyboard as input devices will still have their place for some time to come –driving graphical user interfaces (GUI) that are relegated to more precision and data-oriented niche tasks. However, smartphones, tablets (mainly the Apple iPad), game consoles like Microsoft Kinect, Nintendo Wii, and Playstation Move, advanced TVs with built-in cameras and microphones, and touch-enabled monitors, all remove mouse and keyboard mediators. As a result, consumers have begun a mass migration away from GUI experiences toward interactive interfaces that are closer to the natural human experience, also known as natural human interfaces (NUI).

Consumers are responding to this revolution by purchasing devices driving NUI experiences in record numbers. Brands must be prepared to adapt to the demand by providing experiences that leverage these interaction metaphors across multiple devices.

By observing the tablet as one of the outcomes of the interface revolution, we see how content, natural interfaces, and form factors shape the technology of the future.

Rise of the Tablets

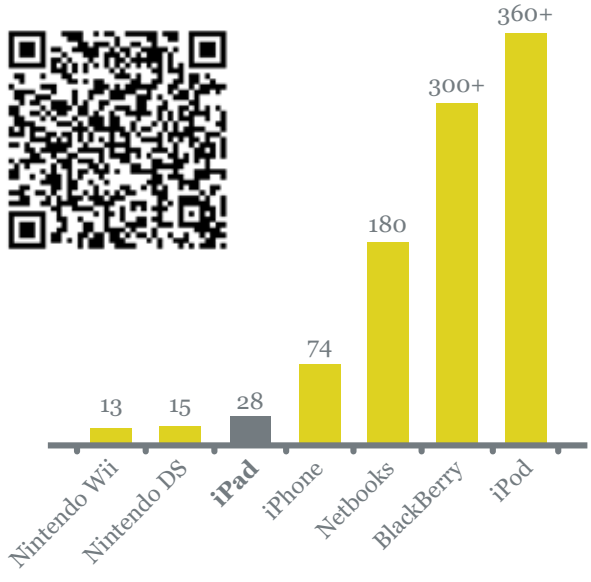
Think of the tablet computing concept this way: it's an idealized vision of a digital book, an object that shares the size, weight, and feel of a book or a clipboard but does so much more. Early tablet devices consisted of laptop computers with convertible screens on a hinge. These devices allowed for traditional interaction – keyboard and trackpad or stylus – when in tablet mode. The operating system used on these devices was often a tablet-friendly version of a standard OS and not optimized for more natural human interaction.

In the years following the release of the first tablets over two decades ago, the device had failed to find mass adoption until April 3, 2010, when Apple released the iPad. Like nothing before, the sleek gadget popularized a new tablet computing slate form factor: no keyboard, touch-only interaction and a new gesture-based operating system. The combination of the hardware, software and the established Apple eco-system helped create a neo-tablet experience which captured the heart of consumers.

Nine months later, 15.7M tablets have been sold globally. At CES 2011, a wave of over 100 neo-tablets was announced. Not surprisingly, today's tablets represent a multitude of fragmented form factors, resolutions, and features. From a hardware perspective, tablets are getting thinner, lighter and more powerful thanks to innovation around chip technology from

3.3 million iPads sold in three months

Compare the numbers of days it took these devices to reach 1MM units sold



Source: International Newsmedia Marketing Association, "Mobile Future of Newspapers", 9/2010

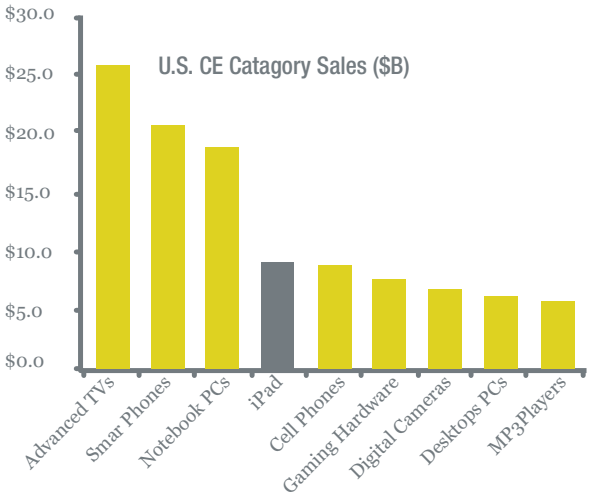
companies such as Intel, ARM, nVidia and Qualcomm. However, it's not just the hardware that defines tablets. That job is done by the instant-on, lightweight form factor coupled with the robust gesturebased interface that simplifies experiences. The intuitive discovery of richer content has been the catalyst that brought neo-tablet computing to the masses and created the fourth largest consumer electronics channel overnight.

Computing Without Tears

The various interfaces employed in the tablet category for personal computing did not exist in the mind of the average

Exhibit 1

The iPad could potentially become the 4th largest CE category next year



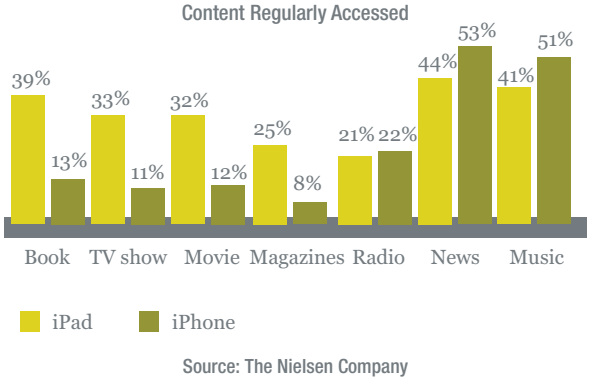
Source: NPD, Bernstein estimates, analysis

consumer less than a year ago. But the iPad has transformed the computer electronics industry and the way users expect to interact with digital content. In doing so, Apple has created sustained demand for a product that no one knew they wanted until it was released.

But in addition to adding to Apple's ever expanding bottom line, tablet devices are changing the user's expectations of what computing means in a number of ways. They are not laptops, nor are they mobile devices (who is really going to walk around with a tablet in their pocket?); so what makes them so unique?

Size: The iPad is smaller than a laptop, but larger than a pocket-sized phone. Plus, the interface can adapt to the device orientation allowing users to hold it with one hand, two

Print and Video Benefit from the iPad's Larger Screen



Source: The Nielsen Company

hands, or no hands. Because of the larger screen size users have more robust ways to interact and explore larger amounts of content.

Speed: Responsive, fast-loading, simple and intuitive apps are winning over users.

Intuitive: Tablets have opened up a new way of thinking about how we interact with computing devices using inutitive gesture-based interactions through metaphors that draw from real-world experiences.

Sized to share: The shape, weight and touchscreen interface enables multi-user, simultaneous or sequential experiences while sitting or standing.

Curated Computing: Tablets excel at delivering more relevant and less complex experiences – consider how its personalized media consumption has been a boon to casual games like Angry Birds. The devices also allow for light productivity experiences like document editing and email.

It just works: The interface and the device operate together in a way that consumers can easily learn and master. The tablet is closer to an appliance than a computer; users expect it to work like a TV. When it's on, it's on. Additionally, you simply tap the screen to do something.

"The fact that you can't do everything with a [tablet] like you can with other PCs - is exactly what makes it successful" - Forrester, May 2010

Clearly, the tablet's user-friendly touch interface, convenience, portability and high degree of usability signifies the beginning of the end for a computing experience that had become almost painful for consumers. With the release of the iPad and forthcoming devices from other manufacturers, like the Samsung Galaxy Tab and Motorola Xoom, the tablet device has finally fulfilled the promise of delivering a truly transformative computing experience.

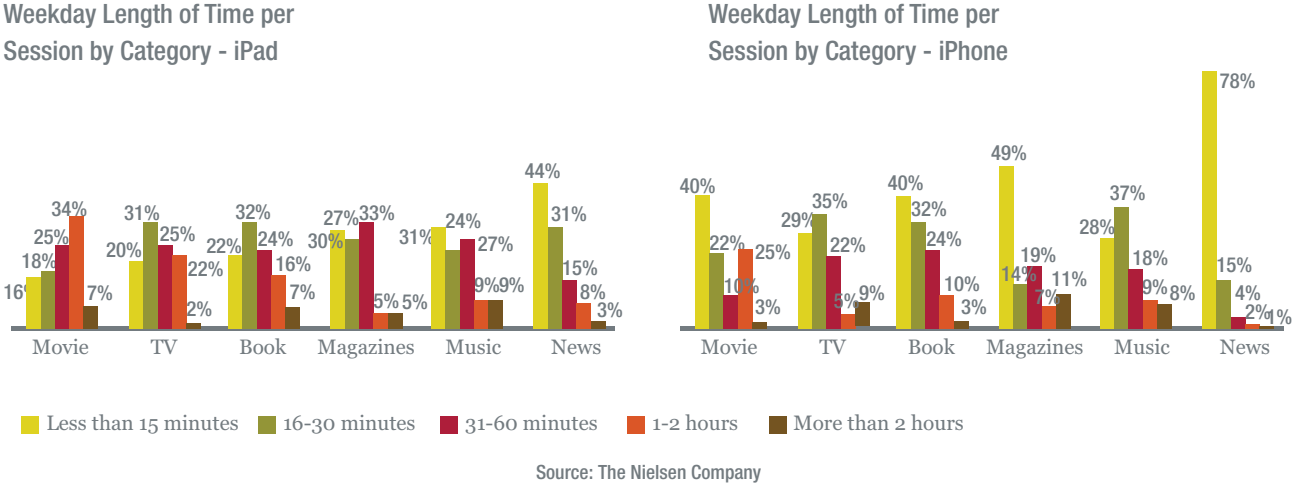
One Size Does Not Fit All

With projections of global sales reaching +100 million units by 2012 and the plethora of choices in form factors and operating systems, the neo-tablet signifies the next generation in end-user computing. However, one of the driving forces for creating multi-purpose tablets is the ability to create and consume content on the same device. After all, the content that's available on the tablet is critical to the experience, whether it's user-generated or not.

In these early days, the iPad commands 85% of the tablet marketshare, despite the fact that it is often disparagingly viewed as a device suitable for content consumption rather than content creation.

It can perform some light productivity tasks such as email or word processing, but the on-screen keyboard is not optimal for data entry or programming. Additionally, the

iPad owners spend a longer amount of time with their content



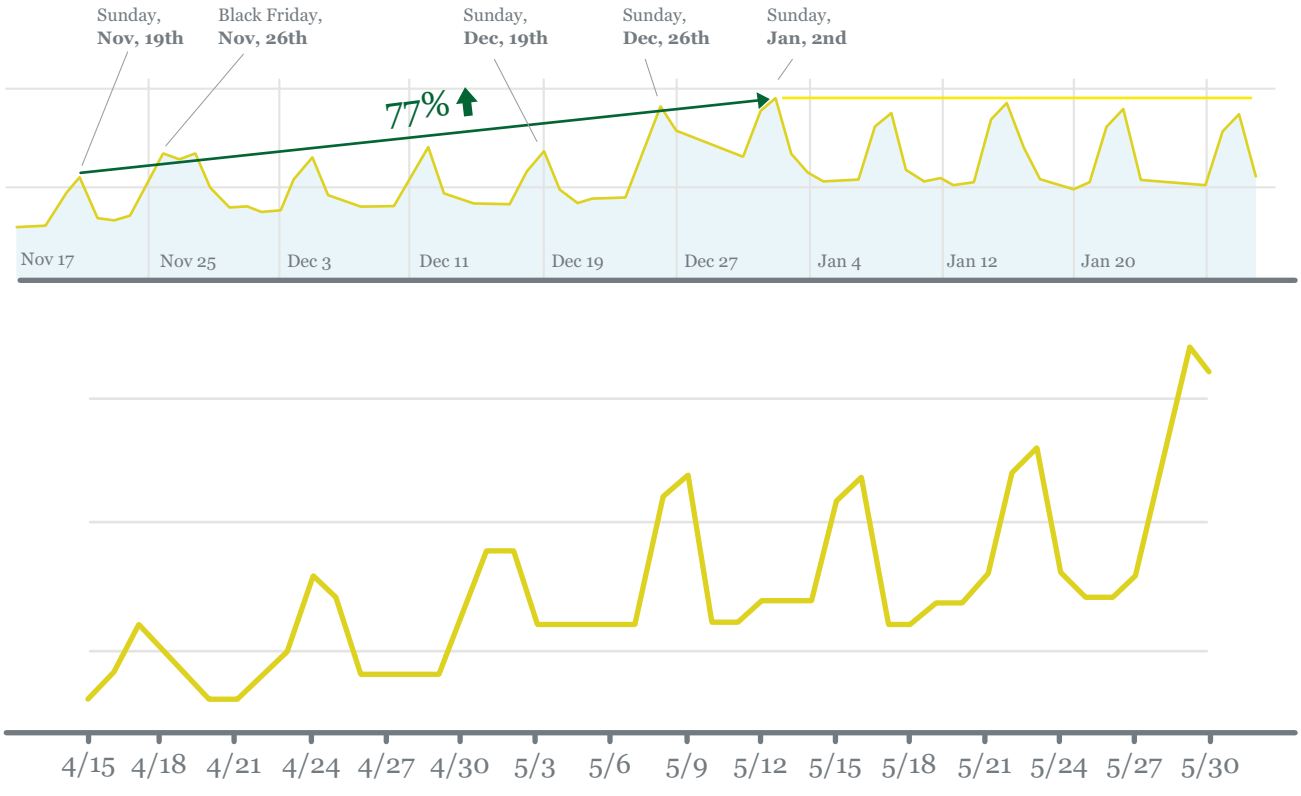
Source: The Nielsen Company

touchscreen interface is not ideal for editing photos or creating commercial content. It is, however, great for surfing the web, flicking through photos and bringing previously static experiences to life by connecting your digital appliances together. For example, Disney has created a new platform that leverages your Blu-ray player, wifi and tablet to create a second screen experience which unlocks content that allows you to control and interact with your movies like never before. And while smartphones are making a huge impact on pre-purchase research behavior by enabling consumers' ability to research products from anytime, anywhere, and increasingly in-store, tablet devices are becoming not only a research platform, but a commerce platform.

Traffic is up 77% and growth continues. This is not only attributed to the ease of use (simple, intutive interface), form factor (much better ability to view content vs mobile) and convenience (portability is great when in bed or relaxing on the couch), but consumers are using their devices during

iPad: Is this a device for a weekend?

Web browsing activity of iPad users grows significantly on Saturdays and Sundays



Source: European newspaper

consumption hours when they are most likely to make purchases (prime time has always been the most expensive slot for a reason, and now users have a device to satisfy those sudden urges).
As the devices unlock additional capabilities and flexibility, there will be more producivity options for the average user. Some companies are already working to solve this, providing peripherals that add keyboards, while others are creating dual purpose tablet/netbooks still others are working on optimizing input and interaction methods like stylus and speech support. There will also be continued exploration of form factors and experiences as the market matures. There are some key considerations when it comes to optimizing the end-user´s experiences:

- Design the experience for the particular method of interaction and for the screen real estate. This should include human input factors, like occlusion (obstructing the user's view of the screen with a hand) and finger vs. thumb size.

- Introduce simple interactions at the beginning of an experience, more complex interactions later.

- Make the path to gestural learning smooth, clear and direct so as to ensure that users understand how to maximize their own interactions.

- Consider the size, orientation and single or multitouch capabilities of the device.

- Simplify processes and tasks while maintaining rich and powerful content.

"Maybe the new thing that everyone recognizes is the unit of economic value is the platform, not the device." - Forrester, Feb. 2011

The rapid level of adoption has proven that these devices are beyond a novelty and must be treated as a new channel that offers new and unique opportunities to connect with consumers.

To Infinity and Beyond

Tablet devices are a great example of the way consumers are responding to the interface revolution, but there are many more devices and platforms emerging in the market that leverage the NUI paradigm. The technologies going beyond the touch experience are so sufficiently advanced they can feel like magic.

Technology like Microsoft's Xbox Kinect, leverages cameras and infrared to recognize enough of your actions to enable full gesture recognition without needing a controller or touching a screen. With the release and success of Xbox Kinect the gesture control market is heating up.

Much like the original iPhone brought touch interaction into the mainstream by putting millions of devices in the hands of consumers, Xbox Kinect will do the same for gesture control. Imagine being able to

virtually try on clothes from the comfort of your own home. Or order a pizza with a flick of the wrist while sitting on your couch.

Gesture control technology is not just for the living room either. There is a growing community of developers and designers experimenting with these technologies in retail and digital out-of-home experiences. Gesture-based interaction is great when touch isn't practical. For instance, on a large screen projected display it is difficult or physically impossible to control the entire area using touch. For example, the Discovery Channel recently created an out-of-home experience that allows users to participate in the story as well as share the content with their social networks.

It's not just Xbox Kinect that's getting in on the fun, there are people grabbing basic web cameras and creating algorithms to recognize moods and emotion as well as gender and age. Toshiba has built basic face recognition and tracking into its laptops. Mercedes-Benz has a feature that detects drowsiness and the warning icon is a cup of coffee. If you've sat in any of the new cars hitting the market most of them have some kind of voice control. And InnerScope Research has been using a biometric sensor vest that measures responses in heartbeat, skin conductivity and perspiration, respiration and physical motion. But wait there's more.

Some really exciting opportunities on the bleeding edge are using mind control, yes mind control, to drive experiences. In the case of a Autonomos Labs, they are taking this literally. They have engineered an experience that allows you to drive your car with your thoughts alone. (George Lucas would be proud.)

All of these will continue to transform the interface and in turn transform all our touchpoints, including in-venue retail, desktop, tablet, mobile or out-of-home.

Delight the Eye Without Distracting the Mind

In dumping the old mouse-enabled interaction paradigm, the tablet and its bretheren have opened up a new way of interacting with computing devices. Using intuitive actions as metaphors that draw from real-world experiences means that touch, gestural and voice interfaces provide additional opportunites to interact with customers and potential customers in more personalized ways.

What does this mean for your brand?

- Brands must first acknowledge that the revolution in NUI means that there is no "one size fits all" solution, and they will need to adapt and interact with consumers on multiple platforms or channels.

- Brands should not fixate on the devices themselves but rather on how they can best leverage the new interface capabilities to enhance the user experience.

• Brands should weigh the pros and cons of native apps vs. device optimized web-based experiences, as both are expected to take advantage of cloud computing over the next few years. In fact, Google, Microsoft and Amazon are all betting on this as they invest even more heavily in their respective cloud infrastructures. Because tablets will have less available storage space than the typical PC or netbook, storage for tablet-based apps is expected to take place in the cloud.

• Brands will need to offer deeper, more interactive content. It's not about a single task but the customer journey. The experiences need to evolve and adapt to the consumers' lifestyle and how they want to consume or create content.

• Brands must recognize that ubiquitous, portable content will enable a better connection with consumers by being where the consumer is, no matter what platform they are using.

• Connected experiences weave brands into the consumer's life. However, ultrapersonalization is the key to making the devices and content invaluable to consumers and transforming them into brand advocates.

Brands that can successfully leverage these new user environments by creating personalized, natural user interfaces will build stronger and more lasting relationships with their existing customers and open doors to potential new customers. Tapping consumer buying power in ways never before possible will usher in the next revolution, not just in computing, but in design and marketing.

Open Digital Services℠: Open API Platforms Enabling Consumer-Driven Innovation

Basel Salloum, Group VP, Technology
Salim Hemdani, Group VP, Experiences and Platforms (@shemdani)

So after more than a few late nights, you've gotten your branded iPad app out the door. It's moving well, but it's no, well, iPad. Your customers seem to like it well enough. A few four star ratings, but there are many more three and two-star reviews. You can't help wondering if it was worth the time, cost and energy; and if there's a better way to engage with your consumers, to cut to the heart of how they understand your brand in a digital age where new devices and interfaces are invented on a daily basis.

There is a way, and it's the path that allow companies like Facebook, Google, and Twitter to innovate so rapidly: Open APIs. All these companies have been built in no small part by their user communities. It's pretty clear by now that there's no better way to give your consumers the digital experiences they want and need than to let them do the innovating themselves.

Now you're probably thinking that it's easy for those companies to open up. They were built that way; it's hardwired into their culture. I don't work at an Internet company. I sell physical items work at a large company with a big bureaucracy. It's like comparing apples and oranges.

Wrong!

For most brands, even the stodgiest among them, there is huge potential in Open API. There is an enormous opportunity for true innovation by connecting with consumers and empowering them to transact with your brand on their own terms. This is where an Open Digital Services (ODS) model is essential.

Once the brand/consumer connection is established through an ODS platform, empowering consumers to innovate opens

up endless possibilities. A large retail client, Amazon, eBay and Netflix have also embraced the idea of open platforms. They have experimented with this new model for marketing their products and services at almost no cost. For instance, a large retail client Open APIs - BBYOpen - allows other brands across the world to freely access product information, store details and reviews. So a developer can create an app that allows a purchase from a large retail client to be performed right in the app itself. eBay made a similar move, with respect to auctions. Netflix, as another example, has incentivized its community by holding a competition to build the next generation recommendation engine. These brands are tapping into the passion of the developer community to further enhance their marketing cause. And, bear in mind, they're all publicly-traded companies for whom there is a lot at stake in these kinds of programs.

What is ODS℠?

At Razorfish we have been helping clients build these sorts of programs since the advent of the web. Back in 1999, we helped MLB.com build its open video platform that aggregated all content across the clubs. More recently we helped a large financial services company build open feeds around learning content.

In the simplest terms, Razorfish Open Digital Services℠ (ODS) is a platform that allows you to expose your business services to the public in a secure and scalable manner, using a modular or service oriented architecture (SOA) as the backbone of this platform (e.g., APIs or Web Services). It provides consumers with a highly customizable mechanism for consuming content and executing transactions through a set of "digital services" available for a wide audience such as developers, publishers and advertisers. ODS must be designed and built specifically to your business, it is not a product that you can acquire and customize, although there are middleware products that could complement your platform architecture.

As a technology platform, a typical ODS implementation has a set of public-facing digital services that are inter-linked and integrated with your existing back-end systems and/or third party systems. That integration is managed through a middletier "broker," which could be a custombuilt engine or a middleware product such as an enterprise service bus, which is primarily responsible for security, transaction integrity, entitlement and service deployment. This model promotes many advantages around security, code reusability, rapid application development, ease of maintenance and much more. In addition, your legacy systems are expensive to maintain, modify or replace, and their proprietary APIs should never be opened up directly to the outside world.

Advantages of ODS℠

Lower cost and ease of integration:
Having an enterprise-wide ODS platform will eliminate the need for direct integration with each back-end system every time an application or a functionality needs to be built. The separation of existing backend systems from consumers through an ODS platform, will lower development cost and increase the ease of integration. Increased

Flexibility and Agility:
One of the key benefits of this platform is it allows companies and/or consumers to transact in a dynamic and agile manner. Whether it's consuming a content feed or executing a financial transaction, marketers will have the ability to quickly create experiences that pertain to their consumers and provide a benefit to both parties. Over time, these experiences can be greatly enhanced from learning through iterative development cycles of consumers. A framework for flexible experiences ultimately results in a happy customer.

Extensibility:
Extensibility is also a core principle and an advantage when users are no longer limited to in-house and on-payroll developers building applications. Suddenly the new ideas landscape is virtually unlimited to all audiences; providing extensive variety of media through many digital channels, all of which revolve around the user´s needs and behavior´s changes. Open Digital Services℠ puts the tools for innovation, new functions, applications and ideas in the hands of your most loyal advocates—your customers.

ROI

Imagine what consumers will be able to do if the automotive industry provided API access to Bill of Material (BOM) for every single vehicle they ever built? What if the consumer goods industry provided an API for nutrition details of every edible product they market? What if technology companies provided APIs to a set of unique and cutting edge features of their latest R&D projects? What if financial services companies opened up access to product and services they offer? What if insurance companies allow API access to their claims data? Imagine the possibilities. Consumers will create meaningful and engaging experiences using these APIs on their own terms. ODS can facilitate and support the process of building a community of brand evangelists with a lifetime customer value that can beat the ROI of any other campaign! Additional sales and the introduction of new sources of revenue can be recognized through channels that are re-using API, including suppliers, partners, etc. And brand evangelists are happy too.

ADVICE

Not every brand or organization is a candidate for ODS. While in most cases ODS is a solution, you should first go through an applicability and feasibility exercise to validate whether or not it's advantageous to your business and consumers. Even if there isn't a strong business case for it, you'd be

amazed by the benefits that it can bring to your consumers.

Once you do get the platform in place, rely on the power of community to help you find new methods of marketing and expanding your products and services. Some of the most powerful and most used mobile applications are ones that were built by a single developer who had access to an open platform through an enterprise.

While ODS provides agility and flexibility and promotes innovation, it can be complex to create, not only from a technology standpoint, but also organizationally. This is why it's crucial to adhere to the guiding principles listed below. Building a true ODS platform is more than putting together a bunch of web services and calling it a platform. Definitely prioritize which services you want to open up, and create a SOA based architecture utilizing a middleware engine such as an enterprise service bus.

ODS Guiding Principles

1. Self-Contained Services: Any service you wish to open up has to be self-contained. Every service shall have one and only one response type for all requests. A service response can be an array of an object type but service shall never respond with two different types of objects irrespective of request parameters. If a conflict situation arises then consider creating two different services.

2. Loose Coupling of Services: It is inevitable that in some instances, service output will be processed by the client in order to engage in further transactions with the platform. After the first service call from the client in a given transaction, it is possible that subsequent calls to other services may be highly dependent on values returned in previous calls. Despite this dependency scenario you must always keep all of your services selfcontained and allow loose coupling that will let the client (e.g., developer) manage the transaction integrity. Do not force the service coupling by making things mandatory or prescribing specific coupling mechanism. Each service should maintain awareness of other services offered but shall always be independent. It is tempting to force your audience to the follow same procedures as your business does and this temptation must be avoided to allow free thinking.

3. Industry Compliant Access Model: Service Oriented Architecture (SOA) is a highly evolved discipline. SOA prescribes various methods, models and guidelines for authentication, authorization, service contract, payload management, security and service orchestration for developing and deploying interoperable services. These industry standards shall be meticulously followed to avoid any one-off rules or practices that are specific to your company and utterly unnecessary.

4. Start Small and Simple: Your business as it exists today has evolved over a period of time. Your business model is no longer as easy as buying low and selling high, or introducing simple services with high ROI. Over the years, one-off exceptions, internal processes, regulatory compliance, promotions, discounts and a myriad of other things have shaped your business rules. How can you open-up APIs without considering these business rules? Yes, you will get caught-up in these discussions when identifying what products and services shall be made public. The solution is to follow the rule: Keep it simple! Identify the minimum set of self-contained services that you can open and roll them out. Let your consumers define what is next.

PREDICTIONS

Some organizations will trail behind and some will not survive unless they create an open digital platform based on service or modular based architecture, and give their consumers the ultimate flexibility and agility. We're going to see more traditional organizations overcoming their fear of certain standards around security and scalability and join the Open Digital Platforms movement. Financial Services brands in particular have been reluctant, although companies such as E*TRADE, PayPal and MasterCard have embraced it. The notion of "private data centers" and "hardware procurement" is on the path to becoming obsolete. Organizations will turn to cloud computing to address their concerns about scalability, high availability, upfront hosting cost and time to market. ODS will no longer be optional or a nice-to-have; it's already becoming an industry best practice and a key standard for organizations. This revolution of connecting consumers with brands will create more service providers specializing in open architecture platforms as an offering, and it will push existing technology service providers to revisit their capabilities around SOA based architecture and web services..

Marketing in the Age of Big Data

Ray Velez, Chief Technology Officer (@rvelez)
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When we talk about information overload, we usually associate it with consumers who, in the course of going about their day, are smothered by thousands of bits of data, branded or otherwise. But these days marketers, too, can be overwhelmed by the sheer amount of data pouring in from the billions of online interactions they have with their customers on an annual basis. Consider just this partial list of data sources:

- Clickstream data available from tools like Atlas and Doubleclick—who have cookied over 90% of the Internet

- Site or digital experience data that organizations track through logs and/or analytics tools like Omniture, Webtrends and Google Analytics

- Other channel data across various touchpoints (email, call center, mobile, etc.)

- Client data

- Transactional data

- Survey-based data available from the Nielsens of the world

- Vast amounts of social data available through open APIs and connections to Facebook, Twitter and tools like Open Social

Historically, these data sets have been simply too large to allow any meaningful data analysis and processing to take place. Now we have new technologies to help us make sense of and use the data. With big data techniques, all of these touchpoints become usable assets and present an enormous opportunity for almost any organization that wants to improve the dialogue with its consumers. Technologies such as MapReduce, noSQL, and cloudbased Massively Parallel Processing (MPP) databases have pushed the limits of the amount of data that marketers can process without having to blow their entire budgets.

This has enabled us to not just manage big data but to, simply, think big. We have progressed from a technology culture based

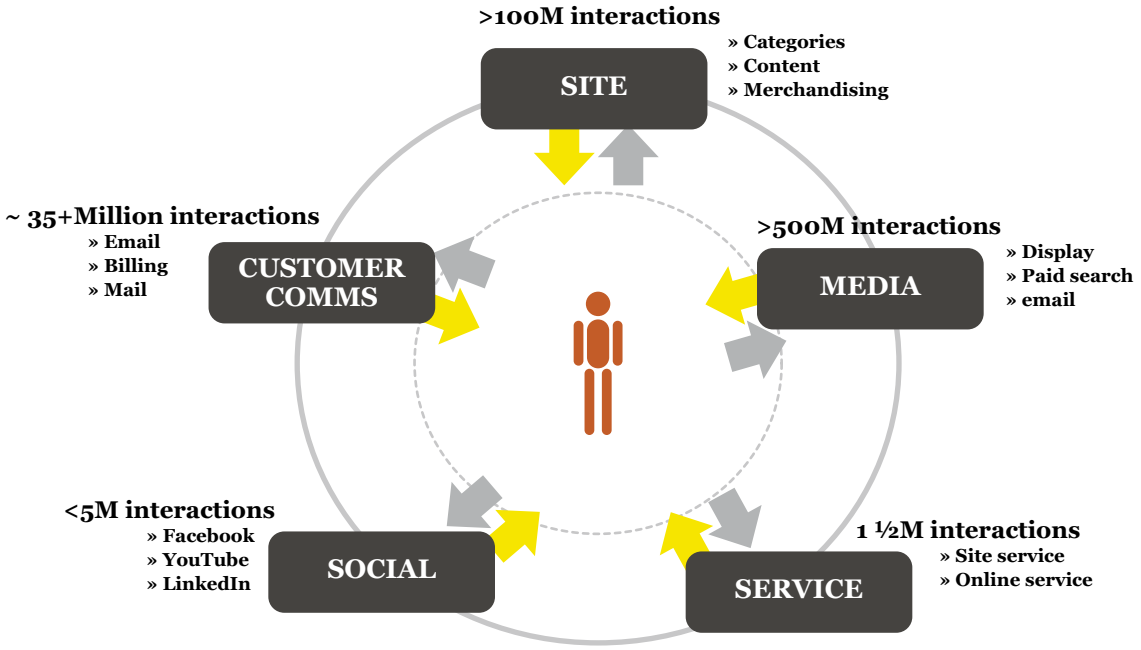
around constraints and managing known parameters to an environment of innovation where we continue to explore the frontiers of what we can do. This changes marketing in a major way—not just in the technology organization, but across the whole framework of how a company does business with consumers. But this is no cakewalk. There is a major challenge in the form of consumer privacy, which is shaping us a cultural issue as well as a legal one. With the influx of data comes great responsibility to respect customers' information while working to give them and your clients the most efficient communications strategy possible. What follows is your guide to striking that balance.

What to do with all this data?

Here at Razorfish, we have been innovating data-led marketing for years. Our DNA is grounded in data innovation, including the creation of the ATLAS platform (a technology spun out of Razorfish and acquired by Microsoft) and any number of patented techniques that leverage advanced analytics against clickstream data. Now that we have greater access to big data solutions, we're innovating faster.

In the past, the industry process has been very linear: marketers plan campaigns, buy ad space, run the ads and measure the results, often with weeks in between each stage. Now, we test multiple

Each touchpoint is an identifiable interaction and an opportunity to communicate to your customers intelligently at scale.



creative executions and media plans, and immediately tweak them to deliver the best-performing ads and reach the optimal audiences, even as measurement data starts to come in. To enable this, our analytics approach has become advanced and sophisticated enough to identify true relationships across the data that will be meaningful for consumers and profitable for clients.

Amid the vast sets of data, it's the tiny subsets that have the most significant impact on our customer interactions. We have already altered the way we design our analytics and data management solutions by initiating strong measurement and KPI [key performance indicator] strategies alongside our technical solutions to drive our clients' business goals.

These Razorfish-led innovations ensure sound business logic and measurement techniques combine with our Business Intelligence to drive down latency to a near real-time basis, creating an almost immediate feedback loop. The renaissance in data-driven display ad planning and measurement is just one example of big data in action.

Targeting or Personalization

Targeting is one of those hot-button marketing terms that means different things to different people. Its vaguely threatening sound doesn't hold – no one wants a bullseye on them after all – especially among the growing crowd concerned with privacy matters. Let's back up and define targeting or, to use a more benign synonym, personalization. At the highest level, it is using data that can be gathered from either anonymous web users or from people who are identifiable because they're logged into a website. This process allows us to create consumer segments and those segments are used to create relevant experiences. For example, if the data tells us that you are in a particular segment and we know that that segment is interested in mountain bikes, we can show you mountain bike experiences instead of road bike ads. Think about it this way—lots of data sources map into segments, and segments drive experiences and messages anywhere you can create an experience for your consumers.

In our experience, just about every display ad is somewhat targeted and personalized. Have you ever noticed that when you start looking for a product, ads for that product start showing up more often? Combating the low clickthrough rates challenge of display ads, advertisers have used targeting data for years. However, it is far too rare that this data and targeting information is used beyond display ads, and leveraged across multiple channels, from websites, to mobile, to email, to social applications, and beyond. Often times someone will click through an ad to end up on a web experience, and all that wonderful information that was available in the ad never makes it to the desktop or mobile site, or even in-venue kiosk. That is the opportunity we have here.

Privacy

Since data is so abundant, it's critical to ensure that all data practices follow privacy laws that govern whether and how personally identifiable information can be used. Netflix learned during a contest it created so its community could develop a new recommendation engine that even with large, highly anonymized data sets it is still possible to identify a unique user. That is probably the best way to think of personally identifiable information: data that can identify a unique person when it is captured. If that person has opted in, you can store you the data. If there was no opt-in, you're out of luck. Most wide-scale segment data providers, like ad servers or firms like Nielsen, enable the capturing and sharing of anonymous data in a way that is consistent with U.S. legal and general consumer guidelines. Often times this is enabled with anonymous user cookies. However, it is important to note that Europe is looking at anonymous segment data in a different way than the U.S. The EU Privacy Directive may require that users must consent before placing an anonymous cookie. The final interpretation is due out in April.

Where's the Value?

From a customer perspective, a qualitative benefit comes from the fact that you are observing and listening to your consumers. Every action or piece of information a customer provides is a form of communication. You wouldn't ignore the information from a conversation with a customer in the store or on the phone, would you? And, quantitatively, we can increase relevant and meaningful engagement time, increase conversation and increase referrals—all of these metrics leading to increasing revenue. It takes a focused effort and time to correlate metrics, but you are creating a framework that enables understanding of the impact of the targeting updates. Inevitably some will increase and some will decrease.

Our clients have seen huge benefits within single channels like display where near real-time marketing decisions generate increase in relevancy and conversion. The next phase of benefit realization is being seen in cross-channel intelligence combined with targeting across multiple touchpoints. This provides an incremental return-oninsight that is in turn leveraged to drive greater relevancy, while improving delivery incrementally across channels that are typically working in siloes.

Platform Led Process

These are truly historic times for marketing. Just a couple of years ago the tools to comb through colossal data numbers were not available. Trillions of rows of data and petabytes of information are created daily and in some cases every hour or less. And it is only growing. Traditional RDBMS would choke and fail on numbers of these sizes, or would

Big Marketing: Moving past single channel siloes to drive customer-centric insights and experiences.

From behavior in a single channel or session or by product (for example: conversion, visits, orders, etc.)

To a holistic view of the customer and segment groups over time

be prohibitively expensive and fragile. But having the capability is only part of the story.

To do this right, process is key. The data warehousing technology landscape has traditionally been dominated by two types of solutions:

1. Traditional databases such as Oracle, SQL Server, Informix etc. These are used when data size is on the order of gigabytes.

2. Data warehousing appliances such as Teradata, Netezza, etc. These are used for data processing needs in the terabytes. Datawarehouse appliances, with their massively parallel processing capabilities, can be quite expensive and so were not unaffordable for most marketers. However the landscape has changed dramatically over the last five years primarily due to a few developments in the data processing world in general:

- Google making its MapReduce algorithm publicly available. This is the algorithm that allows Google to index the vast swaths of data across the web in a distributed fashion using thousands of servers across the world.

- Yahoo! open-sourcing Hadoop—an implementation of the MapReduce algorithm—thereby making the power of "MapReduce" and big data processing available to the world at large.

- Amazon launching a cloud-based implementation of Hadoop through their Elastic MapReduce service, solving the problem of getting access to large amounts of hardware on an as-needed basis to run Hadoop for large data processing needs. These developments provide the ability to process data in the order of petabytes at vastly lower price points than previously

available and in a much faster and more flexible manner. For example, at Razorfish we have been able to bring down the time it takes us to process 90 days' worth of Atlas cookie data (a data set that could be 5-10TB in size) from an average of 15-16 hours to 3-4 hours by using Amazon's Elastic MapReduce service a roughly 400% increase in processing speed, not to mention the cost-savings gained by moving to a pay-peruse service and the elasticity to increase the number of servers needed at will!

The other important development is the emergence of what are called "noSQL" databases sporting names such as, Cassandra, membase, CouchDB, etc. These have been developed primarily to meet the massive data storage and processing needs of social media firms such as Facebook, Digg, and Zynga. In simple terms, noSQL databases offer extremely fast read/write capabilities at the cost of not guaranteeing ACID (Atomicity, Consistency, Isolation and Durability) properties associated with traditional SQL databases. These databases offer marketers a solution to scenarios where speed and volume are more important than accuracy.

To get a sense for the data processing capabilities that these technologies have ushered in, consider this: Facebook started with a commercial RDBMS-based infrastructure that began to crumble when it reached around 15TB in size. The infrastructure at that time was so inadequate that some daily data processing jobs were taking more than a day to process and the situation was getting worse with every passing day. Fast forward to 2009 where the Hive/Hadoop cluster at Facebook stores more than 2PB of uncompressed data and routinely loads 15 TB of data daily!

Finally, new types of Massively Parallel Processing or "analytic databases" such as Asterdata and Vertica, which leverage MapReduce/Hadoop technologies in the cloud, offer another attractive alternative to marketers. They offer most of the benefits that commercial data warehousing appliances have traditionally offered but at a lower cost and with the flexibility that a cloud-based architecture can offer.

For a large retail client, Razorfish was able to leverage Amazon's implementation of Hadoop, Amazon Elastic MapReduce, and use it to generate amazing results. We created about 36 different personalization segments for the retailer. Those segments were able to drive close to 2 million personalized messages. We would import about .5 trillion rows of data into 100 machines AWS EMR cluster on demand to personalize our experiences. This all happened in about 8 hours a day and resulted in about 500% return on advertising spend. Doing this with old world big data technologies would have taken weeks to months simply to get the servers provisioned. And the servers would sit around idly between sessions.

Practical Implications

It's a fundamental rule of statistics that the larger the sample size you use for your calculations, the more accurate the results. Marketing intelligence is no exception. As previously mentioned, marketers have been traditionally constrained by the amount of data that they could look at to understand their consumers and predict their future behavior. That is, until now.

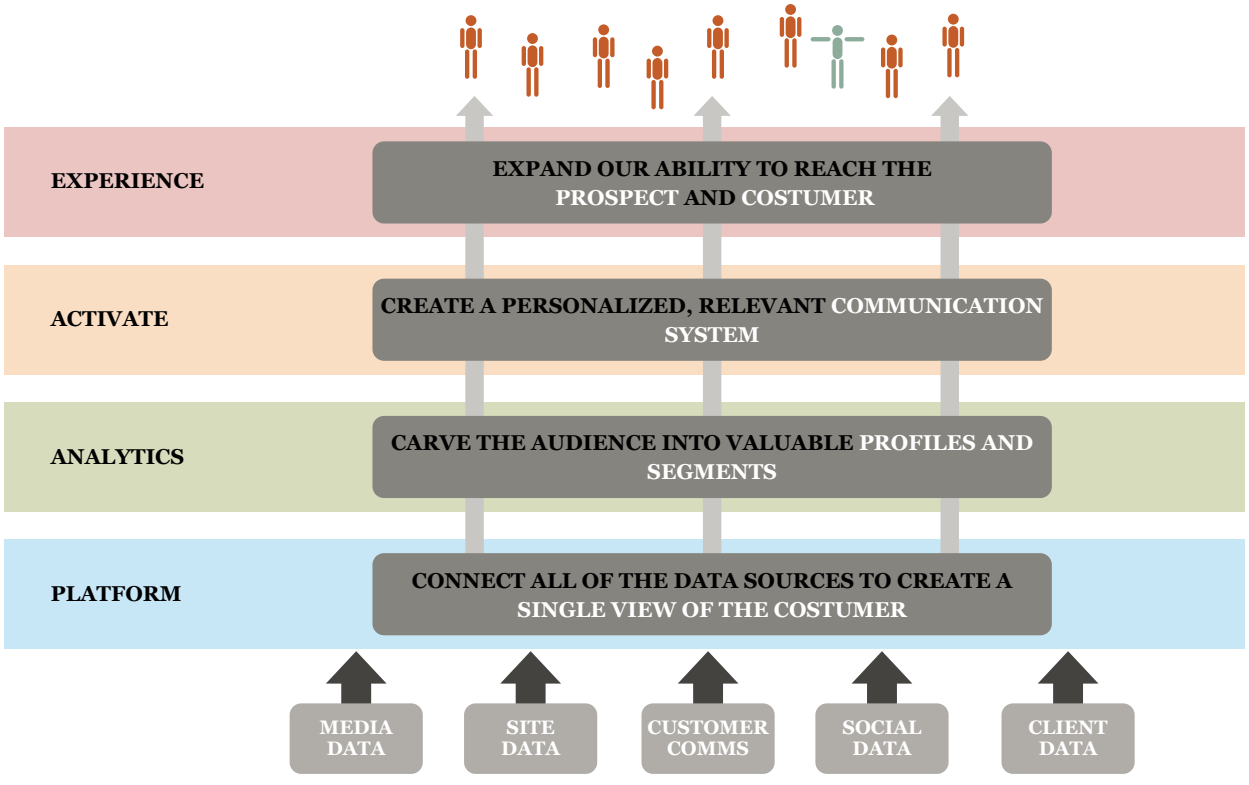
The timing couldn't have been better. As consumers spend more and more time online there has been an explosion in the digital exhaust that accompanies their online activity. A majority of online cunsumer activity is also social in nature—from tweeting about their latest obsession to "liking" the hottest new restaurant in town to watching videos of a family member's most recent vacation. From a marketer's point of view, the deeper they can look into a customer's social activity, the better they can target their marketing programs and maximize the ROI on their budgets.

A critical component is to think about how your new data architecture will bring all these data sets together for targeting and still retain a usable and meaningful understanding of your customer. To create a line of sight to your customers, regardless of channel, depends on harmonizing disparate data sets, recognizing that they are available and that they refresh at different frequencies and velocities. They must be organized on a unique level to ensure a greater understanding of the same customer groups interacting across multiple touchpoints in a non-personally identifiable way.

A good example of a channel whose data set works at different frequencies and velocities is social media. Social can pose a number of unique challenges from an analytics point of view. For one, it is very real-time. Ideas are formed, enter the collective stream of consciousness, and can propagate very quickly. Marketers therefore need to react in real-time to happenings in social media if they want to effectively communicate their message, especially in cases where negative feedback about the company is involved. Real-time analytics is therefore critical as it can help steer the marketer's focus and attention to where it is most needed at any given point in time. Unlike a traditional media campaign where a message is created and mass-delivered to the target audience, social media campaigns involve continuous interaction with the target audience throughout the duration of the campaign.

Given this scenario, it's vital that the marketer is able to gauge the reaction to the campaign throughout the process, instead of at the end of the campaign, and make modifications as appropriate along the way. Social media analytics also need to factor in processing of unstructured data to be able to paint a complete picture of the customer. It's not enough to know the "volume of buzz" your product is creating. It is also vitally important to understand the nature of the buzz. For example, you need to be able to

Platform approach for data-driven, targeted branded experiences



parse a tweet like, "Flight delayed, yet again. Gotta love United!" and determine it to be one that needs to be counted as negative sentiment.

Brave New World

The future really is in the hands of those who are set to benefit the most: consumers. Consumers will have access to much of the same data that companies have historically only had access to. This is a shift from B2C (Business-to-Customer) to a more C2B (Customer-to-Business) model, enabled fundamentally by big data management. In order to work, our systems will need to become absolutely transparent and it's critical that we design solutions that factor this in. Consumers need to understand the power of their actions and interactions with brands and, in the long-term, we need to do our best to make these things clear for consumers as well businesses.

Today, we are finding huge potential in our big data solutions to execute compelling personalized experiences and relevant messages, but consider our next-generation personalization where open innovation is a norm. We are already thinking about how we can help our clients develop experiences for consumers who are increasingly able to

connect with your employees, compliment or complain about your company or redesign the product or experience. They can influence thousands of customers in real time with a simply click, more effectively than a corporation can with a million dollar media campaign.

Historically power resides with governments. Now powerful entities are increasingly multifaceted influencers, brands and individuals who even can influence the geopolitical landscape with social media such as in the Middle East revolutions. Once we move big data solutions from simply doing the same thing better (improving messaging), and start embracing customer dialog and crowdsourcing as part of our business, marketing and data process, then we will see radical change in the relationships between companies and people.

Companies like yours will be turning to innovation to compete in the race to win and retain consumers by using big data techniques that embrace people's interactions and their explicit voice. Ultimately what benefits the customer will benefit your brand.

The Cloud's Influence On Enterprise Architecture

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Mandhir Gidda, Technology Director

Introduction

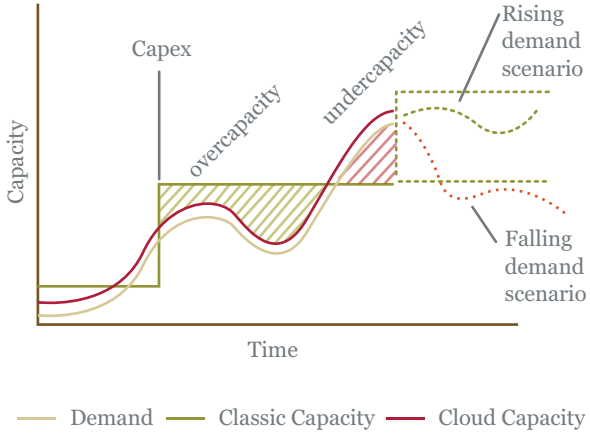
During the past few years, business has had its head in the cloud. We're not talking about not paying attention to your surroundings, though some could be accused of that too. We're talking about the vast shift away from physical servers to a more flexible system. Moving to the cloud is demanding new web application architectures and changes to the way we do business planning. Cloud infrastructures act more like software and less like rigid physical devices. Security can be an issue, but these setups can be more secure than traditional approaches. Technologies like Amazon Web Services are forcing architectures to be able to deal with IP addresses that may change without notice or a backup plan that leverages two different cloud services for better redundancy. Architectures that depend on traditional datacenters aren't in a position to take advantage of cloud services and addressability. Large infrastructures at companies like O2, Netflix, and others are reaping huge advantages in cost, scalability, security, performance, and fault-tolerance. And that is just the beginning. In many cases these large infrastructures are building on what startups and marketing campaigns have already learned.

In this article we will talk about these business and technology architecture changes. In essence, the business advantages will force adoption. Forcing change at the infrastructure level is difficult, but the benefits are too great to ignore.

Business Changes

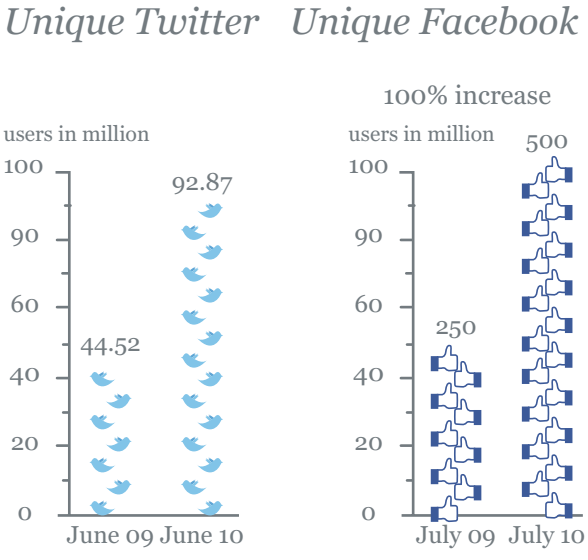
So, why are businesses excited about moving to the cloud, other than it being a priority for CIOs? The first consideration is capex vs. on-demand. The cloud has been referred to as a utility payment model i.e. it works more like your electric bill.

You only pay for what you use. Traditional computing resources were purchased either ahead of or below business needs. Basically you paid for a computer and everything that went along with it in terms of space, HVAC, operations, etc. whether you used it or not. In the new cloud computing world, you pay for only what you use when you need it. If everyone stops using a computer at night, you could even shut the operation down and restart when folks are back to work. We have only started to envision the new use cases.



Capacity vs Utilization curves

The big impact here is on an organization's budget. Often times organizations will allocate dollars for hardware even if they don't use it-the inefficiency that got Amazon into this business, the retailer was trying to figure out what to do with all the hardware it needed to be ready for the holiday buying cycles. Now organizations don't have to budget ahead of the cycle and instead keep pace with business - even scaling automatically on demand.
So, your marketing team purchases media or keywords, causing a spike in traffic and your infrastructure scales without administrator intervention. That was never possible with traditional hardware, which required someone to procure, install, and configure hardware ahead of time. There was always the guessing game about how much traffic a campaign would drive. With the unpredictability of social traffic, organizations need to be prepared. Look at the huge increase of social networks and imagine what happens when your site experience dives into that wave.



Source: SocialMediaToday.com &

Rackspace put it best: moving to the cloud is a revolution, not an evolution. They list four main areas that are changed thanks to the cloud.

- Virtualization – The ability to increase computing efficiency

- Democratization of computing – Bringing enterprise scale infrastructure to small and medium businesses

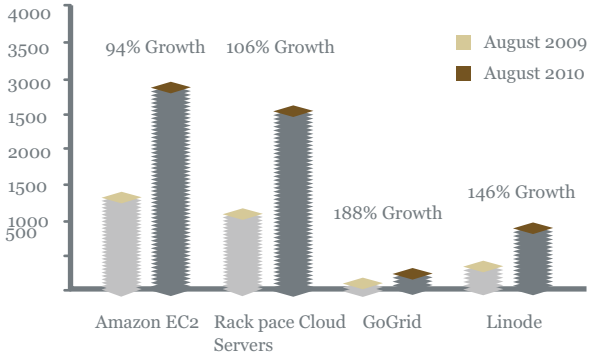
• Scalability and fast provisioning – Bringing web scale IT at a rapid pace

• Commoditization of infrastructure – Enabling IT to focus on the strategic aspects of its role

All of these factors are increasing the pace at which companies are moving to the cloud. We are seeing this tangibly on an almost daily basis. The number of websites using Amazon Web Services and Rackspace Cloud Services is exploding at a meteoric pace. From the start there have been concerns around security. The greatest concern is really about the security practices that a cloud provider follows. The best way to prove these processes is by following auditable processes that have passed key standards. For example, when the cloud providers started they didn't have Payment Card Industry (PCI) compliance. As expected not much commerce was happening on the cloud. They've now added that compliance and now we are seeing commerce in the cloud. Increased compliance standards on the cloud will help allay concerns and continue to grow adoption.

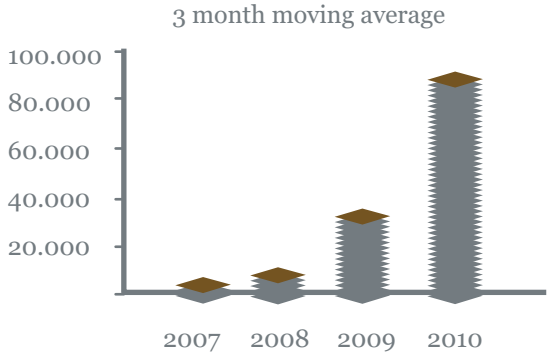
New cloud technology architectures are enabling amazing innovations and driving business at a faster pace than ever. We are seeing innovations that are happening in real time that we never would have thought possible. Organizations, like Etsy and Flickr are using the cloud to release code to their production environments very frequently, sometimes even daily. Many large enterprises are pleased if they can launch code to production environments once a quarter. The low cost and rapid turnaround enables us to make decisions based on real-world working software instead of document speculation. We can have working servers in the cloud in less time that it takes to reboot most laptops. The cloud enables what users and business experiences have always wanted, experiences that learn from users

Number of Websites Using Cloud Providers



Source: Jack of All Clouds

Amazon´s Virtual Computers Created Per Day



Source: The Economist

quickly. I think Werner Vogels, Amazon´s CTO put it best, “The cloud lets its users focus on delivering differentiating business value instead of wasting valuable resources on the undifferentiated heavy lifting that makes up most of IT infrastructure”.

Technology Architecture Change

We’re about to get really technical. So if you don’t know your Hadoop from your chatty protocols, you might want to fire up the Angry Birds. Otherwise, read on. Over a decade ago when server virtualization software like VMWare and later Zen was introduced it was hard to predict the massive impact it would have on physical technology infrastructures. In fact, it has taken us close to a decade to start to harness its potential. At its core, what virtualization and modern day cloud computing APIs have made possible is the ability to treat physical hardware more like software. Cloud computing allows us to automate more than ever before - enabling greater automation for system recovery, monitoring, scaling, and even software application deployment. However, to really enable these things we have to cut the chains to the old ways of doing things. Rigid three-tiered architectures based on traditional SQL Relational Databases have to change.

Recently, Netflix’s cloud architect, Adrian Cockcroft, did a presentation that he shared on Netflix about the changes that come from using the cloud when compared with traditional datacenters. I really liked the architecture he laid out:.

Old Datacenters vs. New Cloud Arch

Central SQL Database	Distributed Key/Value NoSQL
Sticky In-Memory Session	Shared Memcached Session
Cahtty Protocols	Latency Tolerant Protocols
Tangled Service Interfaces	Layered Service Interfaces
Instrumented Code	Instrumented Service Patterns
Fat Complex Objects	Lightweight Serializable Objects
Components as Jar Files	Components as Services

*from Netflix slide share by Adrian Cockcroft

Let’s look at these transitions, one by one:

Central SQL Database becomes a distributed key/value NoSQL approach – the central SQL database has been the weakest link in traditional data center architectures. RDBMS clustering is a complex and difficult task, with the number of nodes in a cluster eventually being finite. NoSQL or distributed key/value-based databases systems are built from the bottom-up for scaling. Technologies such as Hadoop or Amazon’s implementation of Hadoop, Elastic MapReduce, enable scaling without limits. Of course this has had a huge impact on how we treat our data, but provides a scalable alternative. If your data still requires relational elements, than the traditional RDBMS with techniques like sharding or memory caching layers like Memcached or Microsoft’s Velocity will help, but NoSQL provides a much simpler alternative.

One of the biggest issues with traditional RDBMS is that new releases or schema changes often require some complex way to take the RDBMS offline, update it and bring it back online. Often times it is easier to take the site down for a short amount of time. With NoSQL, there isn't a schema to change, so there is no outage. Our own experience of working with O2 on a telecommunications product catalogue has lead us to consider a NoSQL solution as the natural path in the ecommerce platform evolution. The O2 business model and the types of products that it now sells includes not only handsets, tariffs, and accessories but broadband, games, ringtones, consoles, financial services, content, and could progress onto many other yet-not-envisioned physical and logical product offerings. We have been looking at NoSQL 'Graph' databases as a way of modeling products, their attributes, relationships, and eligibilities to customer segments in an attempt to develop a product catalogue that can continue to offer flexibility as the business evolves.

As we have learned from Google's approach, dealing with colossal data requires a departure from traditional fixed servers and RDBMS. Traditional databases have physical limits on server clustering . NoSQL is based on an unlimited scaling model. Consider Razorfish's own EDGE platform. Historically this application and its data would have made exclusive use of Enterprise level database infrastructure, hosted in a proprietary datacenter with an appropriate 'disaster recovery' configuration. The volume of data however has been growing exponentially, as has the compute power required, necessitating an entirely new approach. We have chosen to use Amazon EMR consisting of the Apache Hadoop/Hive/HBase product sets, to host and process the increasing data volumes. This approach makes the most use of Amazon's cloud offering, as well as the frameworks that others have positioned on that cloud e.g. NoSQL databases.

Sticky In-Memory Sessions become shared Memcached sessions – traditionally, load balancers use sticky load balancing to avoid having multiple application server nodes share in-memory sessions. This usually happened because it was difficult to get application server nodes to share session data or it was inefficient to store session data in the database. This forced odd workarounds that would drive our services to get heavy to avoid round trip requests. Enter the more flexible cloud design pattern that uses roundrobin load balancing. This requires external shared caching, but increases application redundancy and encourages better design of lighter weight services based on REST. This leads us to the next traditional data center anti-pattern, chatty protocols.

Chatty Protocols become latency tolerant protocols – traditional protocols required and expected internal networking low latency requests, often based on serializing Java objects. Satisfying one use case means that the client has to make more than one request - typically a series of requests - to a

service layer to obtain the final result. This is slow and inefficient. This usually happens when both objects and service layers are too fine-grained, so finding the right balance for the service layer - between coarse-grained services and batch requests - is critical. New lightweight protocols like REST and JSON allow for a lighter way to define services and share objects. Building technology architectures that support asynchronous services and efficient caches makes this possible. As with many of these innovations, these approaches were built on the heels of great traditional architecture advances. The cloud pushes us to adopt these best practices more aggresively, given the cost savings and the push to do more with less.

Tangled Service Interface becomes layered service interfaces – as mentioned earlier, traditional technologies like Spring and Java have provided the platform to jump to the cloud based architectures. The key design principle to follow is to decouple your business logic from your data layer, for example. Learning from Netflix and their outstanding APIs, build service layers that have two core components - one is the SAL or service access library, providing basic object serialization on top of the business logic. The other is to provide an ESL or extended service library, that enables caching, promotes consistency and helps developers better understand your API intent, avoiding misuse. The layered service interface allows us to use instrumentation service patterns instead of mixing instrumentation logic with the core business logic.

Fat complex objects and components as JAR files become lightweight services and serializable objects – focusing on a layered approach to exposing your services, both externally and internally, helps you build flexible and scalable architectures. It's easy to look at Java or JAR files as ways to publish new services, but that drives an architecture that tries to build everything into one overweight object. Long term this decreases maintainability. As with many things, strive to keep things simple and focused in your architecture.

In summary, the core design guideline is to keep your design architecture resilient to failure. As described above there are too many areas in our traditional architectures that are fragile. To truly take advantage of the cloud we need to weed out those weaknesses, which will eventually enable us to focus more on business value and less on keeping the infrastructure up and running or scaling up for new business.

Looking Ahead: Predictions from our Authors

NFC

- NFC will be used to provide real world interfaces for our digital handsets, connecting ourselves with transportation and public services, retail touch points, digital signage and other physical objects. In the long-term we will be able to find tags in urban areas just about anywhere.

- NFC coupled with motion-enabled technologies will help move creative experiences out of the home and into public areas.

- NFC will be adopted at a much faster pace than expected, even while standards and approaches are being worked on by the big three: Apple, Google, Microsoft.

Interfaces

- Brands that successfully leverage new user environments by creating personalized, natural user interfaces will build stronger and more lasting relationships with customers.

- Connected experiences weave brands into the consumer's life, but ultrapersonalization is the key to making the experience invaluable to consumers and transorming them into brand advocates.

Open Digital Services

- More and more brands will look beyond the construct of paid, owned and earned media to embrace open and innovative ODS models as part of marketing efforts.

- In the next three years, all major brands will have a de-facto "developer.<brandname>.com" property to support community participation.

Marketing in the Age of Big Data

- Big Data is clearly becoming a top IT priority as evidenced by IBM's acquisition of Netezza and HP's acquisition of Vertica.

- The role of 'Data Scientists' is going to become more and more critical for a lot of companies across industries.

• Being able to interpret and glean insights from data will be just as important as collecting, monitoring or listening to it.

The Cloud

• Cloud vendors will be more compliant with standards like PCI and others driving faster and greater adoption.

• Enterprises that don't embrace the cloud will lag among the competition.

About Razorfish

Razorfish creates experiences that build businesses. As one of the largest interactive marketing and technology companies in the world, Razorfish helps its clients build better brands by delivering business results through customer experiences. Razorfish combines the best thought leadership of the consulting world with the leading capabilities of the marketing services industry to support our clients' business needs, such as launching new products, repositioning a brand or participating in the social world. With a demonstrated commitment to innovation, Razorfish continues to cultivate our expertise in Social Influence Marketing, emerging media, creative design, analytics, technology and user experience. Razorfish has offices in markets across the United States, and in Australia, Brazil, China, France, Germany, Japan, Spain, Singapore and the United Kingdom. Clients include Carnival Cruise Lines, MillerCoors, Levi Strauss & Co., McDonald's and Starwood Hotels. With sister agencies Starcom MediaVest, ZenithOptimedia, Denuo and Digitas, Razorfish is part of Publicis Groupe's (Euronext Paris: FR0000130577) VivaKi, a global digital knowledge and resource center.

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