THE IT AVENGERS—DRIVING SERVICE SOLUTIONS TO THE THIRD PLATFORM

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Abstract
This Knowledge Sharing article will focus on what will be the next IT (3rd) platform or Unified Service of the future driving solutions. Even though many believe the cloud is that platform, there is more. Is the cloud the be all and end all? Not really. How we get to the cloud and how we use it is constantly changing and expanding. A nexus or interconnection of forces is happening. These forces are building upon and transforming user behavior while creating new business opportunities. These forces are Social, Mobile, Cloud, Big Data, and the underlying fabric of Security. Together they are revolutionizing business and society, disrupting old business models and creating new market leaders.

This interconnection of forces is the basis of the technology platform, or service, of the future. In the interconnection of these forces, information is the context for delivering enhanced social and mobile experiences. Mobile devices are becoming the default platform for effective social networking and new ways of doing our work every day. The social force links people to their work and each other in new and unexpected ways. The cloud enables delivery of information and functionality to users and their associated back end systems.

Over the past half-century, people’s most sophisticated computing experience was at work, and computing at home was limited. Now, in many cases, the opposite is true. The consumerization of IT is a result of the availability of powerful devices, interfaces, and applications with minimal learning curves. As a result, people have become more experienced users of technology, and the user has been enabled to do much more. People expect access to similar functionality across all their roles and make fewer distinctions between work and non-work activities. The social force is one of the most convincing examples of how consumerization drives enterprise IT changing methods and approaches. It includes personal activities such as sharing comments, links, and recommendations with friends. Consumer vendors have been quick to recognize the influence of friends sharing recommendations on what to buy. Many people believe that mobile computing is creating the biggest change to the way people live since the automobile! Mass adoption forces new IT infrastructure changes and paradigms, spawns new businesses, and threatens the status quo.
This leads us to the cloud. Cloud computing and security represents the superglue for all these interconnected forces. It is the model for delivery of whatever computing resources are needed. Without cloud computing, social interactions would have no place to happen at scale, mobile access would fail to be able to connect to a wide variety of data and functions, and information would be stuck inside internal systems.

What about all of this data or what’s termed “big data”? The trend today is that information or data is stored everywhere. The Internet of Things, for example, is driving this frenzy for more and more data. The development and interconnection of social, mobile, cloud, and security fabric technologies make information accessible, shareable and consumable by anyone, anywhere, at any time. To take advantage of the interconnection of forces and respond effectively, organizations must embrace these disruptions and develop the appropriate skills and mind-sets. How do we meet these challenges?

This Knowledge Sharing article will describe how data centers are going soft and why this is pivotal in transforming the data center into a true cloud delivery solution, offering best practices that will align with the most important goal: creating the next-generation data center, which addresses the business challenges of today and tomorrow through business and technology transformation.

**Introduction**

You may remember the 1967 Academy Awarded motion picture classic “The Graduate” starring Dustin Hoffman. It was a film about a young man, Benjamin, who had just graduated from college and was finding his way through a time of cultural and social change. While at his graduation party, with his world open to unlimited possibilities, an older business executive friend, Mr. McGuire, put his arm around him. Mr. McGuire wanted to do right by Benjamin. He wanted to give him insight in new business opportunities. He said, “Young man, I just want to say one word to you; just one word! Are you listening? Plastics.” Benjamin replied, “Exactly how do you mean?” Mr. McGuire replied, “There is a great future in plastics; Will you think about it? Enough said.”

I remember that line so vividly as it impressed upon me how important it is to grasp the trends of the future and how we all need to transform, when necessary, in whatever we do.
Almost fifty years later, pretty much everything we use contains plastics! Today, if Mr. McGuire were going to give advice, he would use a new word. That one word is “Services”, now termed “The Third Platform of Intelligent Industry Solutions”!

**Are you listening?**

The biggest changes in IT today are Solutions through Ubiquitous Services! Let us find out why Services, specifically IT Services, will have such a profound impact on our lives, both personally and in business. Described in Figure 1: Ubiquitous Services, shows the reason why Ubiquitous Services are so important. There is a driving desire to mobile; always be connected and always on. **What** we need to achieve this goal is to have the appropriate infrastructure in place with the right mix of solutions, such as apps designed for the Third Platform and integration touch points and be able to deliver them quickly and efficiently. **How** this is done is with Unified Services that will be discussed or what IDC calls the drivers to the 3rd Platform as shown in Figure 2: The 3rd Platform Driving Intelligent Solutions. IDC describes the “Third Platform” as the next big thing beyond PC’s, LAN/Internet, and Client/Server, which is very much in line with this vision built on Big Data, Cloud, Mobile, Security, and Social technologies.

As we will explore, solutions through services are touching every part of our personal and business lives.

Solutions run on many types of services such as (IaaS) Infrastructure as a Service, (PaaS) Platform as a Service, Legacy Data Centers, Private, Public and Hybrid Clouds. There are also various

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**Figure 1: Ubiquitous Services (Third Platform)**

**Figure 2: The 3rd Platform Driving Intelligent Solutions**
delivery models such as SDDC (Software Defined Data Center) and Software Defined Networks (SDN). I call this ontology “Unified Services” or for you comic book fans “The Avengers”.

**The Avengers - Unified Solution Services to the Rescue**

The avenging forces are “Captain America” (the social force), “Thor” (The Cloud), “Iron Man” (Mobile), “The Hulk” (Big Data) and “The Black Widow” (Security) as shown in Figure 3: The Avengers.

Captain America is a very nice person, social and fun to be around. Thor, with his big hammer has the right tool for the right job. Iron Man, with his rocket boosters is able to fly like the wind making him, you guessed it, mobile. Like big data itself, the Hulk is very big and at times, challenging to manage. Lastly, Natasha Romanova, aka. The Black Widow, trained in security and intelligence rounds out the Avengers!

Why are these Avengers or forces so transformational to IT and to all of us? What is the next big technology transformation? Every few years a new revelation in IT occurs causing major disruptions. As we will see, a unified solution service is ultimately what we are looking for addressing the 3rd Platform.

**Unified Service Theory**

The cloud and software-defined data centers are big news in IT today. Many people are calling this IT transformation and innovation the next big thing, concluding it is going to turn the world upside down. I believe it is. However, I believe we are all missing something. What we are really seeing is a massive shift in how solutions through services are being delivered today and into the future. These IT manifestations are in effect **unified services** that businesses and customers create and consume. Unified Services Theory describes steps and processes, which allow businesses to provide the most highly optimized service solutions for their customers. I call this radical change in services and services delivery The Avengers!
A fundamental, multi-tiered transformation of services is underway. It is so pervasive and of such range, that it entails alterations of many forces of IT. This transformation requires super hero strength, perseverance and teamwork. Now is the time for “The Avengers” to take their places in driving information technology services forward. Next, what is driving these changes in how we view services?

**Services Transformation and the Algorithmic Revolution**

Services have been transforming for some time. Today, we are in the midst of the fourth services transformation called the Algorithmic Revolution. This approach has the potential to transform the services component of the economy, altering how service activities occur and how products and its value drive or create solutions. Services traditionally have been viewed as a dilemma of the economy, immune to significant technology changes and enhancements or reduced organizationally-driven productivity gains. As we will see, IT-enabled reorganizations of services and business processes have become the key factor in productivity!

In the history of services there are four interconnected service taxonomies as shown in Figure 4:

1. The first service model is focused on accounting or financial engineering. Activities outsourced from manufacturing or productions are re-labeled as services. It is a transformation in which activities are given to external resources with the anticipation that they can be performed for less money. For example, most companies pay for cleaning services. The activities stay the same but are conducted by different organizations.

2. The second services transformation, or what is termed as “consumption engineering”, is about changes in what consumers buy and what businesses use to produce and distribute their products and services. There is a shift in what people consume as their incomes rise and commodity products drop in price. Services then become a larger portion of the consumer consumption. Over time, as the complexity of production, management and competition increases, there are more service inputs to “production” in

![Figure 4: The Four Services Transformations]
the form of marketing, branding, accounting, legal and strategic modeling. The result of this transformation of consumer and business purchases is that services become a larger part of the economy.

3. The third service transformation or “Domestic Engineering” is the changing role of women in the workforce. The conversion of unpaid domestic work into commercial services bought and sold in the market adds further to the services slice of the economic pie.

4. The fourth service transformation is the digital transformation or “Algorithmic Engineering”. Service activities themselves are changed when they can be converted into formalized, computable processes with clearly defined rules for their execution.

   Much of the innovation is then around the adoption and effective implementation of IT tools. Examples include business processes from finance and accounting to customer support and CRM, which are transformed into processes of information and data management. Sensor-based networks also change many personal services. For example, with sensors and communications, some services such as the monitoring aspects of home care for the ill or the elderly can be transformed from highly personal activities requiring a continuous presence to a distance activity with sensor data signaling a need for attention. The algorithmic revolution will blur the line between products and services and will shift the optimum point at which distinctive profits can be defended in value creation. Everything will change: what work is, the skills work requires, where work occurs, how firms organize, and how value is captured.

The important point here is it is how the application of rule-based Information Technology tools will alter service activities. Next, let us find out why manufacturing and IT have many things in common.

**The Manufacturing Model**

I think modern manufacturing is one of the most useful analogies to what is happening in enterprise IT today. Many see the factory as a black box with raw materials going in one side and products coming out the other. These days, success in manufacturing means mastering multiple complex disciplines simultaneously: supply chain, quality control, demand planning and so on. Many believe data centers in all instantiations (traditional, public or private
cloud) are the digital factories of the modern era. Raw technology and vendor services in one side, value-added IT services that the business demands out the other. Like manufacturing, being successful at IT means mastering multiple complex disciplines; Virtualization, cloud and now the SDDC are new developments in IT. Operational and organizational models are changing, and we are not done yet. What new control and convergence points will emerge?

**The Infrastructure Delivery Convergence Points**

At some point, everything has to run on physical paraphernalia: servers, networks, storage, residing in a data center, supplied by power, etc., even clouds. Whether or not this physical infrastructure is comprised of commodity servers, proprietary hardware or a mix of the two, these individual physical infrastructure disciplines are quickly converging to being handled by a single team. At a high level, their job is simple: configure the physical resources (compute, network, storage) that are used by other teams. For example, the other teams care that they can provision raw capacity, that has been configured properly, and that it's working as expected. From this view, SDDC brings the promise of better and more efficient inventory management -- using standardized commodity components -- a concern of both large enterprises IT groups as well as manufacturing teams. The biggest change however is how we look at services. Let us now discuss at a high level each Avenger and see how social, mobile, cloud, big data and security are changing what we mean by solutions through tomorrow's services.

**Introduction to Social**

Just as the words “computer” and “email” have become part of our everyday speak, the term “social networking” is now part of our culture. Captain America likes that. In addition, it is obvious why; social networks are not new; humans are fundamentally sociable and have always organized themselves into groups. It is the same behavior, just with new tools. Social media sites such as Facebook, LinkedIn and Twitter are now so engrained into our personal lives that it is only a matter of time before they become part of our work lives. For many, it already happened. This revolution is called the “social business” or “enterprise social networking.” The question for businesses is no longer whether to implement it, but how. While social networking may have its issues in the workplace, in particular security concerns, the key to success is not in fighting against it but in figuring out how to harness its potential while staying in control. Just like swimming in the ocean, the best approach is to stop fighting and
swim with the tide until you reach the shore. On the topic of tides, the power of Internet Streams will be discussed. Captain America will leverage everything mentioned plus the other forces in many unique ways.

**Introduction to Big Data**

Big data is a collection of information from traditional and digital sources inside and outside a company, providing a source for ongoing discovery and analysis. In defining big data, it is also important to understand the mix of unstructured and multi-structured data that comprises the volume of information. Unstructured data comes from information that is not organized or easily interpreted by traditional databases or data models, and typically, it’s text-heavy. Metadata, Twitter tweets, and other social media posts are good examples of unstructured data. Multi-structured data refers to a variety of data formats and types derived from interactions between people and machines, such as web applications and social networks. An example is web log data, which includes a combination of text and visual images along with structured data such as form or transactional information. As digital disruption transforms communication and interaction channels, and as marketers enhance the customer experience across devices, web properties, face-to-face interactions and social platforms, multi-structured data will continue to evolve. The focus of this article, however, is how this data is used with the other forces. This is the key to the Avengers.

**Introduction to Mobile**

Tony Stark, president of Stark industries, also known as Iron Man, loves to be the center of attention, often in front of a camera or microphone. That is why the mobile avenger is now emerging as the seventh mass media. The first six mass media types are Print, Recording, Cinema, Radio, TV, and the Internet. With each mass media, new opportunities, skills, and industries, have emerged. Mobile is the next major transformational media type. This one is big! Stay tuned, we will find out why.

**Introduction to Cloud**

I think it is important to do a level set of what tools are available in the creation of IT services that Thor offers to the Avenger team. Having a taxonomy of the core services offered is a good first step as shown in Figure 5: Cloud Computing Taxonomy, below. A detailed description of cloud computing is beyond the scope of
this article, but the common high level services attributes that distinguish cloud computing from conventional computing are the services are abstracted, massively scalable, easily purchased and billed by consumption, shared with multi-tenant support, elastic and flexible. Most importantly and will be discussed in detail is that the Cloud model is easily accessible over the Internet by any device, including mobile solutions.

Figure 5: Cloud Computing Taxonomy

Introduction to Security

The Black Widow has a lot to say about security. The future of services is transforming the approach to information security as new requirements are brought about by social, mobile and cloud. According to Gartner, Inc. traditional security models will be strained to the point that, by 2020, 60 percent of enterprise information security budgets will be allocated for rapid detection and response approaches, up from less than 10 percent in 2013. With all of the Avengers, the need to understand security issues and how it is changing is critical.

Now that we reviewed who are the IT Avengers, let’s now discuss what Unified Services really means in terms of providing solutions. Then, let us go through each Avenger in detail to see what they provide to ubiquitous services and how they work together to achieve their goals addressing the needs of the Third Platform.
Lastly, we will try to relate these services with examples that all of us can understand. All of us use IT-services and non-IT services every day, from hairdressers to consulting. Services driving solutions is the common thread for all of us!
Unified Services

The Avengers are changing IT solutions and what we mean as IT services. First, IT services are becoming a part of a fundamental dynamic in the global economy, which not only adds to the relative growth of solutions through services, but leads to most businesses integrating a services component into its business model. Secondly, the very nature of services is being transformed. Services are driven by developments in Information Technology tools, the uses to which they are being put, and the networks on which they run. Finally, there is an emerging strategic challenge for services companies that are using IT to address the classical productivity challenge in services, concerning the need to avoid commoditization. The consequences of this fundamental transformation of services affect the nature and the distribution of jobs globally; they change the strategic requirements for success in all kinds of businesses and they pose significant new challenges for economic policy. What then is a Service?

The Historical perspective of Services

As long as there have been organized societies, there have been some services. Historically, services developed around some basic functions: personal (hair cutting, restaurants, security, servants, etc.); maintenance (crafts, cleaning); professional (legal, accounting, clerical, medical, teaching, and religious); trade (merchants, retail, and transportation); entertainment (musicians, poets, artists), and financial (banking). Compared to core industries such as agriculture, raw material extraction, and manufacturing the services were of secondary economic importance and impact, and the growth of a services sector was closely linked to the growth of towns and the urban population. Services have traditionally been defined as everything that is not agriculture, resource extraction, and manufacturing. The growth of services in the 20th century was driven by the developments as shown in Figure 6: Service Drivers.
The Increase in Core Industry Productivity
With the enormous growth of productivity in agriculture, extraction, and manufacturing, a much smaller proportion of the population is now able to support basic material and manufacturing needs, and a higher proportion of the next level of demand would be for diverse services rather than additional material consumption.

1. **Core Job Restructuring:** As we move forward, core jobs within a business remain, but secondary work can be outsourced. For example, when major corporations decide to have the floors in their plants cleaned by a contractor instead of an employee, then that job changes from a manufacturing job to a services job.

2. **Public Sector Growth:** One part of the demand for services was expressed in the steady growth of the state administration and public sector services in developed countries throughout the 20th century—legislative, regulatory, infrastructure, and direct government services delivery: schools, hospitals, prisons, welfare institutions, etc.

3. **Multi Gender workforce participation:** As more women joined the work force during and after WWII and particularly from the 1960s onward, a vast amount of non-GDP female work in the homes was transformed into formal care services jobs outside the homes: child care, nursing, elder care, etc.

4. **Strategic outsourcing:** As companies focus more on their core business and as a result strategically outsource all functions that do not qualify as part of that core, a significant part of this outsourcing ends up being services functions, resulting in additional growth of services.

**Commoditization**
These original drivers summarize the development of services up to the beginning of the information technology revolution. What we are seeing now is a new wave of services transformation, which will become the next driver called commoditization.

**Best Practice – Understand the next Services Driver - Commoditization**
In a globalized economy with impatient competition and accelerated technology development, all lead to a growing pressure of commoditization in all sectors and for all companies. The window of time within which a company can command premium prices based on technology or business model leadership is narrowing. This is forcing all companies to seek new ways to avoid commoditization. The dominant way of achieving this is best known from IBM’s spectacular turnaround in the early 1990s. At this time, IBM had been the dominant IT supplier
for decades, but shifts in technology and new aggressive competition was commoditizing its traditional products and undermining the profitability and capital position of the company. IBM’s response was to capitalize on the close strategic customer relationships that IBM had developed throughout its history, and to enhance these relations by converting from primarily a hardware and software provider into a services company developing solutions to business problems with and for clients. These enhanced relationships proved more long lasting and were remarkably robust in the face of the pressures of commoditization. Since the early 1990s, a substantial number of companies in all sectors have turned into services companies or, at the very least, added a significant services component to their business models. The pressure of commoditization has enticed company after company to seek the relief inherent in the unique and resilient relations that can be developed as part of services delivery. This migration of companies in all sectors towards including a services component (like IBM, HP, Dell, Cisco, GM, GE, Apple, Caterpillar and even EMC) in their business model is a major driver of the growth of services. All of these companies have one thing in common; the goal is to provide Expert Services. What then are Expert Services?

**Providing Expert Solution Services**

There are two key components in how companies have dealt with the effects of this first part of the commoditization transformation. One is pursuing productivity through the application of IT functions through Services Delivery. The other one is the pursuit of a new level of excellence of services, learning from the very best of established services companies. The approach is to develop the skills through learning, planning and preparing and then finally act on those plans as shown in Figure 7: Excellent Services Loop.

**Best Practice – Consider the development of Expert Services**

What is involved in the move towards Expert Services is a pursuit of focus and development. There are six deeply interconnected and overlapping aspects of the Expert Services model:

1. **Specialization:** All services companies are based on an area of specialization, which is hard or costly for the customer to do as well in-house. Growth and strength of the
business depends on being focused on this specialization and developing competencies and additional value propositions on that basis. Specialization in this sense facilitates and helps define the other factors of the professionalization model.

2. **Independence**: For the customer it is often that the value that the service provider is independent and external. For some services, for example auditing and recruiting, independence is the required characteristic of the service. In other cases, the value derives from saved opportunity cost or broader access to markets or knowledge of business and IT processes. This, of course, is a shift from administrative functions internal to the company to external relationships.

3. **Strategic human resources**: Employees in internal service functions are often not highly thought of within the company. For the external service provider, the same people are core employees, who are recruited, trained, career developed, and incentivized to optimize the particular service. This becomes one of the key competitive advantages and development dimensions of a services company.

4. **Efficiency**: A company that is specialized in delivering a service has the opportunity of optimizing all the involved processes and tools systematically. This is true about back office functions, logistics, and throughout the value chain all the way to actual service delivery methods.

5. **Knowledge optimization and reuse**: Solving any given problem can be a one-time event for a company. However, a service company specialized on that particular type of problem would have a wealth of experience and proven, documented solutions, enabling quality and confidence. For example, EMC’s Vspex provides a proven solution as well as EMC Service engagements offers optimization and re-use of well-vetted services.

6. **Relations and brand**: Services have a unique personal delivery aspect that can be the basis for longer-term relations and partnership with the client.

These associations become the core of the service company’s brand, the inherent promise and the resulting resilience attacking the commoditization trend. What characterizes the first level of the services transformation or the move by companies in all sectors to avoid commoditization by integrating a services component into their business model is that these companies are much more focused in their pursuit of services professionalization. There is still another problem. Having migrated into services, they are still stuck with the classical weakness in any conventional services business, the fact that services
hamper productivity. This is where the second level of the services transformation is defined, which is called the algorithmic revolution. Let us consider what this means.

**IT and Services: The Algorithmic Revolution (Software Defined Everything)**

As discussed in the introduction, many service processes can be distilled and described in algorithms. This means that IT can be applied to automate the process; once that happens, the very nature of services and the productivity that is created transforms services to a new level. For example, EMC has defined a federated approach to the Algorithmic Revolution (AR) as shown in Figure 8: EMC Federated Strategy. EMC II (Information Infrastructure) focuses on offering storage with VMware offering the data center and Pivotal, focusing on the application and enterprise all in a software defined AR approach.

**Best Practice – Understand the importance of the power of Algorithms in Services**

Early examples are many and by now so pervasive that it can be hard to remember the world before automated services. The ATM has replaced the bank teller for anyone in need of cash withdrawals from their bank. Now the replacement of cash by electronic payments (using cards, mobile phones, and electronic transfers from online banking) is beginning to make the ATM obsolete. It now seems that video rentals, bookstores and travel agencies are service areas where human delivery is disappearing. The actual digital transformation process has taken many forms. In some cases, an existing human service function has been automated, as illustrated by the example of the ATM. In other cases, a new product has been made more valuable by becoming a portal for an automated service (a special case of adding a services component to your business model) as when Apple made the iPod into a portal to the online music service, iTunes. In some very powerful cases new services have been created as algorithms as represented by Google’s search engine that made a fully
automated service of information search possible and attracted hundreds of millions of users who would “google” within a newly available universe of online information. Some services have been created through IT and are essentially automated. For example, EMC’s ViPR® offers automated provisioning, leveraging algorithms providing excellent services.

Other services are so personal and human in nature that they are very hard to reduce to algorithms and therefore remain relatively unaffected by the algorithmic revolution (hairdressers and psychotherapists come to mind). Most services, however, are deeply influenced and changed by IT and elements of services transformation. Some service elements of banking have remained unchanged and fully based on human bankers, but the banking industry is vastly impacted by IT and automation, from ATMs to advanced derivative financial products that could not even be conceived without sophisticated IT tools.

The algorithmic revolution has resulted in two transformative developments in services:

1. **Moore’s Law in Action** - The classical understanding of services is that they are the productivity dilemma of the economy. Due to the one-on-one person-to-person nature of the services business model, there is no possible productivity growth. However, with the change of the business model, the productivity of services is no longer locked, but can be augmented with the full power of Moore’s law as it applies to IT. In other words, the services transformation consists of two interlocked dynamics. Commoditization forces more and more companies to include a services component in their business model, making services all pervasive, but also making the productivity problems of services into a general problem in our economies. IT applied to services seems to offer a solution to this problem of productivity, while fundamentally changing the services business model.

2. **Consumer-Producer Disconnection** - The classical services business model is transformed from a paradigm where a service was produced, delivered, and consumed in the same process, time, and place. For example, through simultaneous presence in the same place of both the hairdresser and the customer can the haircut be produced, delivered, and consumed. This has transformed to a radically different paradigm where production of the service might be the joint work of hundreds of people in different places (think of several Google development teams working in different locations). Delivery can be entirely disconnected from this production without involving any of the same people (sometimes involving no people at all). Consumption of the service can be done by thousands of people in multiple locations and at very different times. This transformation
of paradigms changes the very nature of services and what success and innovation in services requires. It also changes the economic and political importance of services.

With these two transformation methods, it appears that the answer is through IT algorithms. There is however another aspect to this. While IT applied to services seems to resolve the problem of services productivity, the very solution makes the original commoditization problem reappear. Whatever can be reduced to an algorithm and thereby automated, can also be copied and therefore will be commoditized. Therefore, the challenge to competitive services is the continuous improvement of the algorithm to stay competitive. Let us understand why.

**Best Practice – Consider that Unchanged, Services is a Productivity Dead End**

If we do not continuously adapt and change our approach to services, productivity will never offer sustainable growth in adding value to a business. Let us discuss an example. When IBM did its big strategic shift from a product to a solution services company in the early 1990s, it was seen in most ways as a significant success. A declining giant that had lost its ‘above the competition’ status and had to downsize by a six-digit number of employees, came back on a path where a unique competitive position allowed renewed profitability and growth. However, as IBM became a services company, productivity improvements started lagging, both by the standards the market used to measure IBM’s productivity as well as the standards of the tech industry. For IBM, one of the answers to the productivity problems of their services business model was sought through a large-scale research program that has continued for more than a decade on services science. In 2011, the achievements of this program were celebrated by IBM as one of the 100 breakthrough contributions by IBM during its 100-year corporate history. In the posting announcing services science as one of the breakthroughs, IBM highlights that due to the services science contributions, from 2005 onwards, IBM has been able to achieve 13 percent or higher annual yield gains from the service business. In 2002, IBM purchased the consulting arm of PricewaterhouseCoopers, forming IBM Global Business Services, and IBM Research pioneered the creation of the field of Services Science. The result was in 2010, IBM reported record profits! This shows continuous services improvement should be considered.

**Best Practice – IT must turn Services into a Production Environment**

Another aspect to consider in the algorithmic revolution can be found by what Gordon E. Moore, the co-founder of Intel, pronouncing what was outlined in the article “Cramming more
Components onto Integrated Circuits,” in 1965 as discussed above. What was the first formulation of what later became known as Moore’s law stating the processing and storage power of IT will grow exponentially, enhances services. For services, this applies whenever any function or process involved in a service can be reduced to an algorithm. Once IT applies this law, it will yield higher productivity. IBM’s services science efforts provided significant parts of the process of developing, producing, and delivering services that are automated by the application of IT. In effect, Services is becoming an IT production environment.

For example, when we need cash, we no longer go to the bank teller and make a withdrawal from a human being who delivers the personal service of verifying the holdings on our account and counting the cash we want to withdraw without any human intervention. The same is true for airline bookings, ticketing, and check-in.

Whereas these examples are all about existing human-delivered services that were automated, recently, numerous new services that have been defined and developed based on the functionalities of IT systems, and that would never have existed in a comparable form as a human based service have appeared: Google, eBay, and Facebook are all examples of this.

After the algorithmic revolution, services no longer adhere to the classic definition of services. The various paradigms where production, delivery, and consumption of a service are completed based on a “person to person” in the same time, place, and process is no longer true. Google users do not interact directly with any Google employees when they make use of a Google service. Of the twenty-some thousand Google employees, very few are involved in delivering a direct person-to-person Google service. Production and delivery is automated and runs on the Google cloud, powered by hundreds of Google computing centers, each representing hundreds of millions U.S. dollars in capital investments. Use of the Google service is made by billions of people in whatever location at whatever time and with whichever process suits them. It is easy to see that Google, similar to other IT-based or IT-enabled services, are mitigating any characterization (being obsolete) of services as the dilemma of productivity. Building a fully automated service like Google search is making information available for billions that millions of human librarians could never achieve.
They key point is increased service productivity will not stop. Once key components and key processes of a service have been reduced to algorithms, Moore’s law ensures exponential growth in productivity at some basic level but not all levels. The reason is the transformation of process performance into economic value can be difficult. Once the information on which most services are based has been digitized, Moore’s law has a point of impact. However, not all services are easily converted, as we will see.

Best Practice – Consider not all services can be converted to an algorithm
For obvious reasons, these transformations do not happen the same way or have the same impact across the different types of services. The number of new, fully automated services that are made available daily by the touch of a screen at Apple’s and Android’s App stores is counted in the hundreds, if not thousands. In contrast we find human services or the human delivered services. These are much more resistant to the algorithmic revolution. There is at this time no algorithmic reduction of the work of the hairdresser, and the same is mostly true of work in the health sector, in hospitality, and in many professional services such as lawyers and consultants. Therefore, human-delivered services are to a high degree where services continue to remain the productivity dilemma of the economy. Three points are important in relation to this type of service model:

1. **Human Quality and Aesthetics** - The fact that they remain mostly human-based with no component of automation does not imply that there cannot be a very high degree of differentiation within the category in terms of both value added and professionalization. Even with services like hairdressing, there is a large difference among providers.

2. **IT Augmentation** - The fact that services remain human-based does not mean that IT and other technologies do not play an important and increasing role. Even though the primary human service offering of a restaurant is mostly unaffected, the work and the service interaction with the customer by the waiter and the chef, the functioning business models of restaurants have still been dramatically impacted by important peripheral technologies such as reservation and procurement systems, customer rating systems, website presence, online coupons, etc. As it relates to consulting knowledge management systems; automated data mining and data heavy analyses is changing competitive landscapes and other quantitative offerings.
3. **Error Checking** – Human services can be error prone. As a result, human-based services are affected by the algorithmic revolution. For example, in healthcare, computerized systems take over the task of ensuring that the patient gets the right medication at the right time (actually eliminating one of the more severe causes of failed care).

The systems and approaches stated obviously do not eliminate the need for the human service, but they leverage that service and enable efficiencies and productivity gains. By automating some of the routine tasks, the systems can allow human services more uninterrupted time for the real value this venue can provide.

**Best practice – Understand the innovation Crossroads - Hybrid Services and solutions will be the answer long term**

This introduction of the algorithmic revolution into previously pure human-based services bring us to the category of hybrid services, which increasingly is turning out to be the dynamic, economically, and competitively most important category of companies as shown in the Venn Diagram to the right.

The key is that for all companies involved in the services transformation, hybrid combinations of human-based and automated services become a primary strategic focus area. For the many companies that have entered services as part of their quest to avoid commoditization, the hybrid spans from products, to services, to IT automation. There however, challenges in achieving a hybrid model leveraging IT automation. There is resistance to the application of IT to the core elements of many services, for example health care. It can be seen as dehumanizing and as a violation of the very ethos of the nursing profession to automate this task. Another example is the very human and personal nature of the service of sales. The sales function is the foundation of resilient relationships that make services companies hard to displace by competitors. Second, the fact that macro technology development from the Internet over mobile platforms and their world of apps to the cloud makes applicable technologies so available that it becomes clear that someone is going to take the opportunity and drastically innovate. Let us see why Mobile is so important.
The Mobile Avenger

Ironman is a very mobile person and that is an important attribute. Why then is mobile so important for the rest of us? The non-technical answer is we all love mobility and our mobile device. We love them so much that many believe they are making us sick. Let us look at the facts;

1. Sleep deprivation - Doctors at the Mayo Clinic say smartphone and tablet use before bed disrupts sleep cycles. Three-quarters of 18-to-44-year-olds sleep within reach of their phones.
2. Nomophobia (no-mobile-phone phobia) - According to one recent study, 66 percent of people suffer from it. The thought of even a late night bathroom trip without a smartphone can cause separation anxiety, with symptoms like trembling, sweating, and nausea.
3. iPosture (cervicalgia) - Eighty-four percent of 18-to-24-year-olds report neck and backaches in the past year. As it happens, more than 8 trillion texts were sent during that time, giving the global condition its catchy if clichéd name, first introduced by a British health-care provider.
4. Phantom-vibration syndrome - Also jokingly called ring-xiety, the belief that your phone is vibrating or ringing when it's not affects as many as seven in ten cell phone users.

The question then is how did we get here? The answer lies in the fact that we are now moving into the seventh mass media.

The 7th Mass Media - Mobile
As discussed previously in the introductory section, the seventh mass media (mobile) emerged in the early 2000’s. Mobile, like the previous Mass Media—the Internet—is capable of cannibalizing all of its older siblings, even devouring the Internet itself. The consumption of news, playing music, watching TV, listening to radio, even viewing movies are all possible on a mobile device. In addition, the Internet’s two unique capabilities, interactivity and search, are also available on the mobile platform. While still nascent in business, mobile is growing, capturing business revenues and content from its older media siblings. Therefore, mobile can replicate all the capabilities of the other six Mass Media types.
Best Practice – Consider the enormous benefits of the 7th Mass media

Mobile has many benefits; there are actually six unique benefits. In many ways, mobile is omnipotent. Iron Man (Mobile) can be characterized as six degrees of freedom:

1. The first personal mass media
2. The first always carried media
3. The first always-on media
4. The first media with a built in payment mechanism
5. The first media always present at the point of creative impulse
6. The first media where the audience can be accurately identified

The 7th Mass Media is Personal

It’s a fact that people today are more wedded to their mobile phones than to their wallets. In many ways, mobile is rapidly cannibalizing our wallet. It is no longer surprising that we will not leave home without our phone. A global survey by BBDO in 2005 found that 6 out of 10 people sleep with the mobile phone physically in bed. In context of mobile and the web, the mobile web is focused on the user as the creator and consumer of content. We are using the mobile platform to share information with a trusted network, we are collaborating, and we are using our mobile as a media production tool. From a marketing perspective, the value of Mass Media is to clearly identify an interested audience. The marketing term “what gets measured gets made” outlines the concept that the more accurately we know who the audience is, the more precisely advertising and marketing can be targeted. With the seventh Mass Media, every phone is identified and all web traffic and service content usage can be tracked. On TV, 1% of audience data is captured, the Internet is about 10%. However, on mobile, about 90% of audience data is captured. This is unprecedented accuracy in any mass media ever. This has aroused the interest of brands and advertisers as they see the effectiveness of traditional marketing communications as a pale shadow of its old self.

The 7th Mass Media Always Carried

People go everywhere with their mobile devices. A Unisys survey revealed that if we lose our wallet, on average we report it in 26 hours. However, if we lose our mobile phone, on average we report it in 68 minutes. Meanwhile, a 2006 survey by Wired found that 60% of married mobile phone owners would not share their phone with their spouses. A Carphone Warehouse
survey found that 68% of teenagers would not let their parents see what is on their phones. It is that personal.

**The 7th Mass Media is Always On**

Some early opinions by the newspaper publishers were that maybe the Internet could offer a similar experience to the printed newspaper, but the mobile phone screen has so little “real estate” that it could not fulfil this need. This is also being proven not to be true. Mobile offers an active screen, which can be far superior to the static printed-paper view of a newspaper or magazine (See Best Practice – Consider Responsive Web Design in Mobile Applications on page 32). It just took a while for the mobile content industry to develop its formats to capitalize on the power of mobile.

**The 7th Mass Media is offers Accurate User Identification**

Many believe the predominant strength for mass media is to clearly identify an interested audience. We know what gets measured gets made, as previously discussed, and so the more accurately we know who the audience is, the more precisely advertising and marketing can be targeted. With previous mass media there was no accurate way to measure and identify users. For example, with radio and TV we can only measure audiences by Nielsen ratings, a sampling of 1000 families telling us what millions watch. The Internet promised “a segment of one” – that we could identify by the IP address of the computer, the actual user base. This proved very inaccurate due to corporate networks, firewalls, multiple PCs, and multiple users on a given PC such as a family PC shared by teenagers and parents, or a university computer lab shared by thousands. Not to mention Internet cafes. That is the exact opposite with mobile. With the seventh Mass Media, every phone is identified and all web traffic and service content usage can be tracked. There still are imperfections, in that some mobile phone users have two phones or phones are “prepay” accounts (where the user name is not known), but overall, the aggregate data can be measured. That is what has aroused the interest of brands and advertisers as they see the effectiveness of traditional marketing communications as a pale shadow of its old self.

**Creative Impulse: Convergence of User & Creator**

In the context of mobile and the web, the mobile web is focused on the user as the creator and consumer of content. We are using the mobile platform to share information with a trusted network, we are collaborating, and we are using our mobile as a media production tool.
Best Practice – Understand the importance of agility and efficiency in media production

Another important aspect in the transitional history of Mass Media is the aspect of the amount of time it takes to produce media content and the intensity of labor that is required. As shown in the figure titled “Mass Media – Labor vs. time;”, it shows the diversity of the various media types describing the time it takes to produce content vs. the effort required. It is important to note that as each media matures to the next generation, the effort or agility of creation becomes less and the time it takes becomes substantially less. Also note that the trend is towards a “live” creation model compared to a pre-produced model, meaning that older media types typically require non-real time creation in contrast to a produce-on-the-go approach. Mobile devices excel at the on-the-go approach.

The 8th Mass Media – Augmented Reality

The next big question is what is after Mobile? Can there be more? The answer is yes, Augmented reality (AR), a real-time view of a physical, real-world environment whose elements are complemented by computer-generated sensory input such as sound, video, graphics, GPS information or other digital data. It is related to a more general concept called mediated reality, in which a view of reality is modified (possibly even diminished rather than augmented) by a computer. The goal is to enhance ones perception of reality. This is different from virtual reality, which replaces your world entirely (think “World of Warcraft”). This form of technology has been around for some time. For example, automobiles and jet fighters have had “Heads up displays” for a number of years. However, here is the difference; personal mobility using this technology is still ancient. Companies like Google and DARPA are working on AR solutions today such as Google Glass and AR contact lenses, respectively.
**Best Practice – Understand the challenges of Augmented Reality in Mobile**

To better understand the challenges, let us look at Figure 9: AR Device Architecture, which illustrates the components of a conceptual mobile AR system. In this system, sensor (including both the camera sensor and others) inputs are used to estimate the six degrees-of-freedom as previously discussed on the mobile device. The sensor inputs are also used by a user interaction module which implements functionality of gesture control. An I/O module reads graphics models from a database and provides them to a rendering module. The latter combines rendered graphics with live video. As the orchestrated output of all the modules, the interactive and augmented scene is presented to the end user. Now we examine the necessities to make the illustrated system capable of providing smooth user experiences. First of all, the system needs interactivity, fidelity (audio and video resolution), scalability and robustness allowing operation under complex environmental conditions. Meeting these requirements calls for fast video processing, high I/O bandwidth and efficient algorithm computation. Even though smart phones are increasing in performance, doing this type of functionality is not possible. These have been equipped more or less by modern mobile devices, but more is needed. Therefore, we will see that the solution is to use cloud-based augmentation resources that will address the limitations in mobile devices. This will be discussed in detail in the section titled “Cloud-Based Augmentation for Mobile”, starting on page 44.

**Best Practice – Consider Mobile Device limitations within the cloud**

Despite significant improvements in mobile computing capabilities, computing requirements of mobile users, especially enterprise users, is often not achieved. Several intrinsic deficiencies of mobile devices encumber feasibility of intense mobile computing and motivate augmentation. Leveraging augmentation approaches, which includes performing intense mobile operations and control such as remote surgery, on-site engineering, and other scenarios will become a reality.
As shown in Figure 10 - Mobile Device Challenge taxonomy, describing the challenges of mobile devices, many issues need to be addressed:

1. **Processing Power**: Processing deficiencies of mobile clients due to slow processing speed and limited RAM is one of the major challenges in mobile computing. Mobile devices are expected to have high processing capabilities similar to computing capabilities of desktop machines for performing computing-intensive tasks to enrich user experience. Realizing such a vision requires a powerful processor able to perform large number of transactions in a short course of time. Large internal memory/RAM to store the state of all running applications and background services is also lacking. Besides local memory limitations, memory leakage also intensifies memory restraints of mobile devices. Memory leakage is when memory capacity is unnecessarily occupied by running applications and services or those cells that are not released after utilization. Garbage-collector-based languages like Java in Android contribute to memory leakage due to delayed removal of unused objects from memory. Android’s kernel level transactions can also leak memory in the absence of memory management mechanisms.

2. **Energy Resources**: Energy is the only resource in mobile devices that demands external resources be replenished. Currently, energy requirements of a mobile device is supplied by lithium-ion batteries that last only a few hours if the device is computationally engaged. Energy harvesting efforts seek to replenish energy from renewable resources, particularly human movement, solar energy, and wireless radiation, but these resources are mostly intermittent and not available on-demand. As a result, alternative cloud augmentation approaches play a vital role in maturing mobile and ubiquitous computing.

3. **Local Storage**: With drastic increases in the number of applications and the amount of digital content being created, such as rich media content, have increased demands on storage within mobile devices. Additionally, delivering offline usability, which is one of the
most important characteristics of contemporary applications, remains an open challenge since mobile devices lack large local storage.

4. **Security, Privacy, and Data Safety**: Mobile end-users are concerned about security and privacy of their personal data, banking records, and other online transactions. The dramatic increase in cybercrime and security threats within mobile devices, cloud resources and wireless transactions makes security and privacy more challenging than ever. In addition, performing complex cryptographic algorithms is challenging because of computing deficiencies of mobile devices. Securing files using traditional credentials is also less realistic in the absence of large keyboards. Data safety is another challenge of mobile devices, because information stored inside the local storage of mobile devices are susceptible to safety breaches due to high probability of hardware malfunction, physical damage and loss.

5. **Visualization Capabilities**: Effective data visualization on small mobile device screens is a non-trivial task when current screen manufacturing technologies and energy limitations do not allow significant size extensions without losing device handiness. Therefore, efficient data visualization in small smartphone screens necessitates software-based techniques similar to tabular pages, 3D objects, multiple desktops, switching between landscape and portrait views, and verbal communication to virtually increase presentation area (See Application Development on page 31).

**Application Development**

Small-screen applications are not new, but for mobile devices there are challenges in what the user sees. In the world of Mobile, there is a high importance on what you see, when you see it, and how you see it. Many argue that in the seventh and eighth mass media, this is priority number one. The trend today is for application developers to take mobile technologies and design methodologies into account. This trend has a name; it is called Responsive Web design. Responsive Web design (RWD) as shown in Figure 11: New Mobile App Design Approach, is a Web design methodology aimed at creating web sites to provide an optimal viewing experience. This includes an easy reading and navigation experience with a minimum of resizing, panning, and scrolling, across a wide range of devices from mobile phones to desktop computer monitors. A site designed with RWD adapts the layout to the viewing environment by using fluid, proportion-based grids, flexible images, and CSS3 media queries.
Best Practice – Consider Responsive Web Design in Mobile Applications

As discussed previously, Responsive Web design is an approach where a designer creates a Web page that “responds to” or resizes itself depending on the type of device it is using. That could be an oversized desktop computer monitor, a laptop, a 10-inch tablet, a 7-inch tablet, or a 4-inch smartphone screen. The purpose of responsive design is to have one site, but with different elements that respond differently when viewed on devices of different sizes. For example, when viewed on a desktop computer, the website might show three columns. However, when you view that same layout on a smaller tablet, it might force you to scroll horizontally, something users do not like. Alternatively, elements might be hidden from view or look distorted. However, if a site uses responsive design, the tablet version might automatically adjust to display just two columns. That way, the content is readable and easy to navigate. On a smartphone, the content might appear as a single column, perhaps stacked vertically. With responsive design, the website automatically adjusts based on the device.

Best Practice – Consider Mobile first methodologies in Application development

Mobile first is a relatively new approach to application and web design. As the name implies, focus os on the mobile user first and then the desktop. One of the major catalysts for the rise of mobile first web design was the announcement from Eric Schmidt in 2010 that Google was going to be taking this approach from now on, going so far as to say “I think it’s now the joint project of all of us to make mobile the answer to pretty much everything”. How then does one design to the approach? It is done through implementing a Graceful Degradation vs. Progressive Enhancement methodology.

Figure 11: New Mobile App Design Approach
Best Practice – Consider Graceful Degradation vs. Progressive Enhancement approaches

Graceful degradation arose out of a need to have a design function on as many browsers and platforms as possible. Designers and developers wanted to take advantage of new technology without excluding users with setups that did not have support. The result was to create and serve up the best experience possible, and then account for each possible degradation possibility and ensure that despite any shortcomings, the site would remain functional. In terms of mobile web design, this meant that a full, standard website would scale back and gradually remove content and features as the viewport became smaller and the system simpler (no Flash support, etc.).

Out of this trend arose a powerful new idea: progressive enhancement. In this approach, a best view approach is derived on the mobile platform, providing the users with minimal screen real estate, processing power, and third party plugins an amazing experience that both looks great and functions perfectly. As the need arises, the site can gradually be “enhanced” and even completely rethought for larger platforms with fewer constraints. At a glance, these two methodologies seem roughly equivalent. Who cares where you begin the design process as long as it gets done, right? The answer is Progressive Enhancement is usually the best approach. The reason is when you start with the desktop platform, you tend to want to take advantage of everything that platform has to offer. You build an amazing product that leverages lots of great technology, only to realize that none of it scales down to mobile. This can and does lead to a function-reduced mobile product that feel more like an afterthought than a polished, finished product. If one examines the progressive enhancement workflow, the result tends to be a different story. In this situation, start with a project that is both super lean and robust. When it’s time to bring this design to the desktop, instead of facing the decision of what to cut and how to reduce functionality, you instead get to decide how to make it even more robust! Therefore, the result tends to be better if a mobile first approach is taken. With a mobile first viewpoint, one starts by loading the absolute bare essentials on the smaller platforms. This leads to a robust
experience that avoids unnecessary lag. The additional resources are loaded strictly on an as-needed basis to platforms that can handle them well.

**Context Awareness**

The big thing about mobile is with all our surrounding inputs; how do we relate them? Emerging pervasive computing technologies transform the way we live and work by embedding computation in our surrounding environment. To avoid increasing complexity, and allow the user to focus on the specific use case or solution, applications in a **pervasive computing environment** must automatically adapt to their changing context, including the user state and the physical and computational environment in which they run. Applications must aggregate context from heterogeneous sources and locate environmental services depending on the current context. Context information is derived from an array of diverse information sources, such as location sensors, weather or traffic sensors, computer-network monitors, and the status of computational or human services. While the raw sensor data may be sufficient for some applications, many require the raw data to be transformed or fused with other sensor data before it is useful. By aggregating many sensor inputs to derive higher-level context, applications can adapt more accurately. A fundamental challenge in pervasive computing is to collect raw data from thousands of diverse sensors, process the data into context information, and disseminate the information to hundreds of diverse applications running on thousands of devices, while scaling to large numbers of sources, applications, and users, securing context information from unauthorized uses, and respecting individuals’ privacy.

**Best Practice – Understand what defines Mobility**

What, then, is Mobility? As shown in Figure 12: Definition of Mobility, four aspects make mobile devices different from fixed or non-mobile systems. One is the “User Mobility” interaction model, or how the user inputs and receives information. The second is “Device Mobility”. With smaller, battery-driven devices using multiple heterogeneous networks and in some cases no network, creates location awareness. Another aspect is issues in data distribution as it relates to session mobility. Keeping and maintaining a consistent session or process active is very important. Lastly, device or code mobility addressing the distributed lifecycle management of security is a big issue and

![Figure 12: Definition of Mobility](image-url)
needs to be addressed. In many cases, a virtual desktop architecture is one possible solution. One specific attribute to device mobility is context awareness.

**Best Practice – Understand the input sources of Context Awareness**

How does one utilize mobility systems to their advantage? The answer is by utilizing Context Awareness. To implement a context aware system, the following input sources are required. As shown in Figure 13 - Context Awareness, the first is an “Aspect”. An Aspect is a classification, symbol or value-range, whose subsets are a superset of all reachable states. An “Entity” is a person or place or, in general, an object. Finally, input data, or the information that is used to characterize or the state of the entity concerning a specific aspect is included. This information then needs to be processed through a relevant filter, which creates a set of associated tasks of the context, entity, and aspect. A system is context aware if it uses any kind of context information before or during service provisioning or service usage.

For example, as shown in Figure 14 - Context Awareness example, the undertaking is for a traveler to reach a plane using public transport. Using the process defined above, the relevant entities are analyzed and then the relevant aspects or entities are then enumerated. The context aware system can then use these attributes allowing the traveler to get there on time using all the relevant context information available.

![Figure 13 - Context Awareness](image13)

![Figure 14 - Context Awareness example](image14)
context awareness are adaptation of services to changes in the environment that reduces the interaction with the user. The second is the improvement of the user interface particularly on small form factor devices.

The Social Avenger

We are all social and Captain America is at the top of the heap. However, when it comes to adoption, the initial resistance in the enterprise seems to be that social networking is not typically associated with working. To put it directly, there are laggards who think that if it’s “social,” it cannot be business. Changing the way we talk about it by using the terms “social business” and “enterprise social networking” will re-align the way we think about social tools in the workplace. In turn, the minds of those aforementioned stragglers will begin to open up and see that social can have a place in business. Social however, needs three basic needs described in Figure 15 - Social Needs as shown. Social needs mobility, cloud scale and access, and big data to feed the appetite. Changing the way we talk about it by using the terms “social business” and “enterprise social networking” will re-align the way we think about social tools in the workplace.

Best Practice – Social networking should be simple and easy to use

Social networking solutions need to re-define simplicity and ease of use. This aspect is key. Introducing a social business environment should make life easier, not more complicated. For the business, the challenge of ease of use is also important. The iPhone is a great example of simplicity done right. All of the basic functions that people want are readily available and incredibly intuitive – such as making calls, checking email, downloading a new app, searching, or texting. Because of that, it is very popular. The same is true for rolling out a social business environment, it must be intuitive and secure or it will not thrive.

Best Practice - Consider that social solutions should enhance interaction

Generally, the enterprise is looking to solve a problem when adopting new technologies. This mindset works against social business adoption since it is really not solving anything, per se. However, it is enhancing the way things already work, which is just as valuable. Think about the car – when Henry Ford invented the motor vehicle, we already had means of transportation via horse
and buggy. Nevertheless, with the car, we can travel faster and for longer distances over a shorter time. Similarly, there is always room to improve processes in the enterprise. Therefore, in the enterprise, we can already communicate and collaborate, but there is a way to do it more efficiently with enterprise social business.

**Best Practice - Understanding Business Value in Social Networking**

While social networking tools may be about enhancing rather than fixing, users will be slow to adopt these tools if they do not understand the value as shown in Figure 16: Social Personal to business interaction. Organizations must first recognize the business value and communicate to users exactly how social business will advance current processes and activities. Social media can enhance innovation, learning, connecting, and most of all value in how products are sold. If a user knows they can save time or improve an existing process with the help of social tools, they will be much more inclined to be motivated in embracing social processes.

**Best Practice – Consider BYOD as a driving factor in Business social acceptance.**

In light of the barriers discussed, the enterprise is beginning to consider integrating social business as part of its normal day. Historically, the enterprise is very slow to adopt, often lagging consumer adoption. The Bring Your Own Device (BYOD) trend is a driving factor. Consumers started working on their own devices remotely without authorization, and once adoption got really deep within the organization, the IT department or CIO in charge realized it was not under control and lacked certain controls. This is how BYOD evolved. BYOD is driving standard practices, and social business is following suit. Already the enterprise is beginning to see how social business benefits such as structured conversation and simpler communication have value. Even though, businesses are in the early stages of ROI and more quantitative results will likely be needed before enterprise social networking becomes the new norm. Now, let us take a look at how data streams will enhance social networking.
Streams

Internet Streams are nothing new. However, streams will be changing social media methods and other Internet technologies in big ways. Traditional Social streams are a syndicated messaging marketing activity that integrates directly within your company social media program or other related activities. Like other syndicated marketing activity types, Social Streams are created by the Client and syndicated to the partner (with the option of setting your account to automatically publish messages or to be reviewed before they are sent), or created by the partner (non-syndicated social stream) and sent to the connected social streams (Twitter, LinkedIn, and Facebook). However, as we will see, streams will be having an effect on a lot more aspects to the Internet in general.

Best Practice – Understand that Streams will change the Web, Search, and Computer as We Know It

Another aspect of how social is changing the way we use the Internet is “Time streams”. The space-based web we currently have will gradually be replaced by a time-based world-stream; some call it a life-stream. What, then, is a life steam? A Life-stream is a heterogeneous, content-searchable, real-time messaging stream similar to blog posts and RSS feeds. Twitter and other chat streams as well as Facebook walls and timelines have similar attributes. Its structure represented a shift beyond the static single dimension desktop where our interfaces ignored the time-based element. Time streams flow and can therefore serve as a concrete representation of time.

It is a bit like moving from a desktop to a charmed diary: Picture a diary whose pages turn automatically, tracking your life moment to moment. Then, when you touch it, the page turning stops. The diary becomes a sort of reference book: a complete and searchable guide to your life. Put it down, and the pages start turning again.

Today, this diary-like structure is supplanting the spatial one as the dominant paradigm of the Cyber-Sphere: All the information on the Internet will soon be a time-based structure. In the world of bits, space-based structures are static. Time-based structures are dynamic, always flowing, like time, as we know it!
Best Practice – Consider the web will become the history of us all

Until now, the web has been space-based, like a magazine stand. We use spatial terms such as “second from the top on the far left” to identify a particular magazine. A diary, on the other hand, is time-based: One dimension of space has been borrowed to represent time, so we use temporal terms like “Thursday’s entry” or “everything from last spring” to identify entries. Time as a metaphor may seem obvious now, especially because it is natural for us to see our lives as stories, organized by time. Traditionally, the most important function of the Internet is to deliver the latest information, to tell us what is happening right now. That is why so many time-based structures have emerged in the cyber sphere: to satisfy the need for the newest data. Whether tweet or timeline, all are time-ordered streams designed to tell you what is new. Of course, we can still browse or search into the past: Time moves forward and back in the cyber sphere. Any information object can be added at “now,” and can flow steadily backwards into the past. You can drop files, messages, and conventional websites (those will appear as static, single elements) into the stream, which acts as a content-searchable cloud file system.

But what happens if we merge all those blogs, feeds and chat-streams By adding together every time-stream on the net, including private life streams that are just beginning to emerge into a single flood of data, we get the world stream: a way to picture the cyber sphere as a whole. No one can see the whole world stream, because much of the information flowing through it is private. Nevertheless, everyone can see part of it. Instead of today’s static web, information will flow constantly and steadily through the world stream into the past.

Best Practice – Consider that Streams will Completely Change the Search Game

Many believe that today’s operating systems, browsers, and search models are becoming obsolete. People no longer want to be connected to computers or “sites”. What people really want is to tune in to information. Since many millions of separate lifestreams will exist in the cybersphere soon, our basic software will be the stream-browser: like today’s browsers, but designed to add, subtract, and navigate streams. Searching content in a time stream is a matter of stream aggregation. Add two time streams and get a third. Content search is a matter of stream subtraction. The simple, practical features of stream aggregation allow made-to-order information.
Best Practice – Understand the value of life streams to E-commerce

We should not have to work to find what is new, yet the way the web is currently architected is no different logically from having to visit a thousand separate physical shops. The time-based world-stream lets us sit back instead and watch a single, customized view across sites. People no longer want to be connected to computers or ‘sites’. World-streams let users blend and tune our information any way we like. Applications do not do this today. The reason is they cannot until the millions of different streams each providing its own time based data sharing the same interface for the stream browser to draw on.

Some argue that this sort of precise control may limit the serendipitous nature of the web. However, it is really about time: “Bring me what I want” is almost always more useful than “Let me rummage around and see what I can find”. In a way, using time (i.e. the time-based structure) is a way to gain time. Finally, the web will soon to become the cybersphere.

The Cloud Avenger

Thor offers to the Avenger team common high-level tools that are abstracted, massively scalable, easily purchased and billed by consumption, shared with multi-tenant support, elastic, and flexible. All of this mentioned, what is new in the cloud under this solutions through services umbrella? There will be a next generation of service providers that offer ways to build apps, host them anywhere, and do it all in a fluid fashion. Customers want on-demand services, not a reinvention of what they already have. Customers need new ways to accelerate their production, as app development becomes more industrial in nature. Apps will be built a lot easier than ever before, as increasingly there are discreet services that can be pieced together.

It is important to understand who consumes cloud-computing resources. We identified primary categories of cloud computing service. As shown in Figure 17: Cloud computing service consumption models on page 41, it shows the value and visibility to the enterprise end users. Though most of these category names were already in use within the industry, this taxonomy defines two new categories: cloud client and service as a service. These address the areas of user experience and interoperability, respectively.

Software as a service (SaaS) is a model of software deployment in which an end user or enterprise subscribes to software on demand. SaaS applications are built with shared back-end services that enable multiple customers or users to access a shared data model.
Platform as a service (PaaS) is the delivery of a cloud-computing platform for developers. It facilitates development and deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers. PaaS provides all the facilities required to support the complete life cycle of building and delivering Web applications and cloud services over the Internet.

Infrastructure as a service (IaaS) is the delivery of technology infrastructure—such as network, storage, and compute—as a service, typically through virtualization. Users subscribe to this virtual infrastructure on demand as opposed to purchasing servers, software, data center space, or network equipment. Billing is typically based on the resources consumed.

Service as a service is the delivery of a horizontal service, such as billing, as a service. These services can be used, usually on a subscription basis, as a component within other cloud services such as SaaS, PaaS, or IaaS offerings.

Cloud software is purchased or packaged software that is uniquely used to build and run cloud services, for example cloud management software. Our goal was to include the market sub segments, ISVs, and products not typically found in a traditional enterprise or consumer ISV taxonomy.

Cloud client contains client-centric services, runtimes, and runtime optimizations that can influence the overall cloud computing user experience.

Customers now operate static IT environments that exist in silos. They will increasingly have to consider the fluid nature for how apps and data run in this mesh-like environment. Data has to be orchestrated and managed with the machines, databases, compute, networking, and storage. It means that there have to be underlying systems and services that can keep that data

Figure 17: Cloud computing service consumption models
flowing without encumbrance. Pushing legacy technologies as new cloud services can only go so far. Calling for more hardware and more virtualization for enterprise environments is not enough. Virtualization in and of itself will not provide the speed and on-demand self-service that is needed to innovate; more is needed.

**The industrial model – From Crafting to Factory**

For many of us who are developers and programmers, we feel the most important part of developing value for the business is to craft new applications and systems. Even though this type of effort is important, the real value is developing an overall solution that allows us to create an IT factory!

The trend today is less about the craft and more about the delivery. Organizations and businesses really find programming and the crafting (customization) that goes along with it a means to an end. Delivery is what they are really looking for. Crafting or code development is the deep technical work that needs to be done such as building the operating system, the deployment infrastructure, and other things. However, the true value of what we think today as the cloud is the platform or the factory that churns out consumable services. What the business needs is an IT factory that provides high volume and velocity products or services to LOB’s when, where and how they want it. What also needs to be considered is existing IT functions and how to transform the silo’s to one common platform. Legacy IT constantly thinks about the “system” and only that system. However, most IT departments have to consider how to maintain the past as they move forward.

**Best Practice - Decouple the infrastructure**

Let’s face it, business IT departments of the future will no longer really care about what are the servers, hypervisors, VM’s, instances, level of the OS, data storage devices, network components or any other part of the infrastructure. What they really care about is the delivering applications
services needed to get the work done to the business. If you are a service provider, then you definitely want to care about this stuff, but for the business, it is not so important. Customers want to de-couple from the infrastructure and build once.

Best practice – Understand the importance of Data as a Service
Make Data as a Service. Data plumbing is very complex. Put the semantics into the services, not the database. If you build a data service layer, run a polyglot architecture. Change the semantics and not the underlying databases. Simplicity is the key; put it in the ELT (Extract, Transfer, and Load) layer.
SDL/waterfall the design to migrate, bring in the data when required or on demand.

Best Practice – Decompose the application as much as possible
One needs to decompose the applications in terms of development and delivery within a cloud environment. Creating a set of agile components that can build the application is important. Minimize development streams and optimize the development in creating the smallest code footprint. Duplication is the application developer’s challenge. Building service development efforts that offer ease of service discovery and simplify developer on-boarding are crucial from both internal developers as well as external customers, since much of the API’s being developed will most likely be consumed externally. An example of this approach is when the platform being sold as a product is consumed by external customers.
The Enterprise as a Service

The CEM (Component Enterprise Model) approach is based on the need to ensure seamless alignment between business operations and IT services because no matter how routine, all business is digital today. Historic disconnects between IT and the business, from a function and rate of change perspective, are addressed under the CEM approach by creating structural alignment between business operations and the technology architecture.

The design principles behind COM and CAM are identical. Decompose everything to the most ‘atomic’ level, enable independent execution, interoperate through clearly defined interfaces, and share information openly. It does not matter whether you are designing a business function or software component the same principles apply.

The goal of this approach is to facilitate processes, increase rapid adaptability, response to changing demand patterns, and flexible and robust operations.

Cloud-Based Augmentation for Mobile

As discussed in the previous section titled “The 7th Mass Media - Mobile”, getting a mobile device to do what it needs to do such as augmented reality takes a lot of resources. The question is what is unique to Mobile devices that require a change in how these devices are built. The constraints are outlined in Figure 18.

1. **Architecture difference** – It is often the case that mobile application processors are designed to have different architectures from high-end servers and even low-end PCs. The rationale for such differences is mostly for power efficiency. At the price of this design, choice is the performance discrepancy introduced by architecture difference.

2. **Hardware capability** – It is not uncommon for mobile devices to share the same or similar architectures with their stationed counterparts. However, even under this

![Figure 18: Mobile Device Architecture constraints](image-url)
situation, a significant capability gap may still exist. Take multi-core architecture for example: the number of cores in a mobile multi-core processor is usually much fewer than that of a desktop multi-core processor. Programmable GPU architecture is another example: most mobile GPUs implement only a subset of the functionalities of the desktop products.

3. **System availability** – Because mobile devices do not have the luxury of unlimited power, energy conservation is a must-have for them. This impacts system availability accordingly. For instance, we cannot assume a smart phone can execute an intensive computer vision task overnight without being plugged with external power supply.

Up to now, the approaches to tackle these constraints have been mainly focused on designing algorithms as efficient as possible on the mobile devices. From this point of view, the endeavors of making AR (see page 28) to work on mobile devices are very similar to those of making AR to work on PCs a decade ago. However, unlike PCs, mobile devices now often find themselves surrounded by abundantly available cloud-based resources.

**Best Practice – Consider Cloud resource remote execution options for Mobile Devices**

Although remote execution efforts have yielded impressive achievements, several challenges such as reliability, security, and elasticity of remote resources (surrogates) hinder execution adaptability. For instance, the resource sharing and computing services of surrogates can be terminated without prior notice and their content can be accessed and altered by the surrogate machine or other users in the absence of a Service Level Agreement (SLA).

The emergence of cloud resources created an opportunity to mitigate the shortcomings of utilizing surrogates in augmenting mobile devices. Cloud-based Mobile Augmentation (CMA) is the current mobile augmentation model that leverages cloud-computing technologies and principles to increase, enhance, and optimize computing capabilities of mobile devices by executing resource intensive mobile application components in the resource-rich cloud-based resources.

The architecture shown in Figure 19: CMA Architecture, depicts the major building blocks of a typical CMA system. These building blocks are often an optional superset, and specific CMA systems may not have all these functions. CMA exploits various cloud-based computing resources, especially distant clouds and proximate mobile nodes to augment mobile devices. Distant clouds are giant clouds such as Amazon EC located inside the vendor premise offering
infinite, elastic computing resources with extreme computing power and high WAN (Wide Area Network) latency

Proximate mobile node architectures are clusters of mobile computing devices scattered near the mobile clients offering limited computing power with lower WAN latency than distant clouds. Although heterogeneity among cloud-based resources increases service flexibility and enhances users' computing experience, determining the most appropriate computing resources among available options and performing upfront analysis of influential factors (e.g. user preferences and available native mobile resources) are critical in the adaptability of CMA approaches. Thus, 'resource scheduler' and 'analyzer and optimizer' components depicted in Figure 19: CMA Architecture, are needed to analyze and allocate appropriate resources to each task in a typical CMA system. During augmentation process, the local and native application state stack needs synchronization to ensure integrity between native and remote data. Upon successful outsourcing, remote results need to be returned and integrated to the source mobile device.

Empowering computation capabilities of mobile devices is not a new concept and there have been different approaches to achieve this goal, including load sharing, remote execution, cyber foraging, and computation offloading that are described as follows. The results are in Table 1: Mobile Empowerment approaches on page 47.
Table 1: Mobile Empowerment approaches

<table>
<thead>
<tr>
<th>Approach</th>
<th>Architecture</th>
<th>Client Load</th>
<th>Migration</th>
<th>Partitioning</th>
<th>Server</th>
<th>Mobility</th>
</tr>
</thead>
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<tr>
<td>Load Sharing</td>
<td>Client-Server</td>
<td>Entire Task</td>
<td>Entire task</td>
<td>NA</td>
<td>Server</td>
<td>NA</td>
</tr>
<tr>
<td>Remote Execution</td>
<td>Client-Server</td>
<td>Entire Task</td>
<td>Entire/partial</td>
<td>Static</td>
<td>Server /desktop</td>
<td>No</td>
</tr>
<tr>
<td>Cyber Foraging</td>
<td>Client-Server</td>
<td>Entire Task</td>
<td>Entire/partial</td>
<td>Dynamic</td>
<td>Surrogates</td>
<td>No</td>
</tr>
<tr>
<td>Mobile Computation Augmentation</td>
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<td>Entire/partial</td>
<td>Entire/partial Nil</td>
<td>Static &amp;</td>
<td>Server, surrogate</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Client-server</td>
<td>/Nil</td>
<td>Nil migration (Use remote services)</td>
<td>dynamic</td>
<td>&amp;mobile</td>
<td></td>
</tr>
</tbody>
</table>

Best practice – Consider the driving factors to Mobile Cloud Empowerment

When trying to understand the best approaches in how mobile devices integrate into a cloud based architecture, the following is considered.

1. **Load Sharing**: The approach of load balancing in distributed computing which is a strategy which attempts to share loads in a distributed system without attempting to equalize its load. This approach mitigates the whole computation job for remote execution. It considers several metrics such as job size, available bandwidth, and result size to identify if load balancing and transferring the job to the remote computer can save energy.

2. **Remote Execution**: The concept of remote execution for mobile clients emerged in the ‘90s. This approach enables mobile computers to perform remote computation and data storage to conserve their scarce native resources and battery. Remote execution can save energy if the remote processing cost is lower than local execution. Remote execution involves migrating computing tasks from the mobile device to the server prior to the execution. The server performs the task and sends back the results to the mobile device. However, the difference between computation power of client and server is not a metric of decision making in this method. The whole task needs to be migrated to the remote server prior to the execution, an expensive effort. It also neglects the impact of environment characteristics on the remote execution outcome. Static decision-making is another shortcoming of this approach.

3. **Cyber Foraging**: Cyber foraging is a process to dynamically augment the computing resources of a wireless mobile computer by exploiting a wired hardware infrastructure. Resources in cyber foraging are stationary computers or servers in public places, connected to wired Internet and power cable, that are willing to perform intensive
computation on behalf of the resource-constrained mobile devices in vicinity. However, load sharing, remote execution, and cyber foraging approaches assume that the whole computing task is stored in the device and hence, it requires the intensive code and data to be identified and partitioned for offloading, either statically prior to the execution or dynamically at runtime.

4. **Mobile Computation Augmentation**: Mobile computation augmentation or augmentation in brief, is the process of increasing, enhancing, and optimizing computing capabilities of mobile devices by leveraging varied feasible approaches, hardware, and software. Approaches to augment mobile devices can be hardware- or software-based. The hardware approach involves manufacturing high-end physical components, particularly CPU, memory, storage, and battery. Software approaches can be, but not limited to, computation offloading, remote data storage, wireless communication, resource-aware computing, fidelity adaptation, and remote service request (i.e. context acquisition). Augmentation approaches can increase computing capabilities of mobile devices and conserve energy. Apps that would benefit from this approach include computing-intensive software such as speech recognition, natural language processing, data-intensive programs such as enterprise applications, and communication-intensive video streaming applications.

**Long Live Cloud Service Management**

Legacy Data Center IT managers and CIOs were looking for maximum control over the infrastructure. In the era of cloud computing, CMOs and other departments are increasingly taking control and creating their own IT budget. This raises an interesting question: “How can IT keep control on the cloud (consumption, cost, security, and service level agreements) without disrupting the “new way of work” adopted by developer/operators and non-tech service consumers?

I believe this calls for new tool sets to replace the old, traditional ITIL (Information Technology Infrastructure Library) solutions. New tools will manage everything from self-service request management and cost estimates to provisioning, governance, cloud monitoring, and access control. An essential
component of cloud service management is the service catalog that contains all cloud services the organization can use.

Best Practice – Understand that the true driver to the cloud is services and Cloud Brokers
Cloud Brokers serve as intermediaries between providers of cloud services and the companies that buy them. Cloud brokers who combine technology, consulting, and financial buying power represent a new and exciting business model in the cloud. Following EMC’s focus on Infrastructure service management, Dell’s acquisition of EnStratus and CSC’s acquisition of ServiceMesh, these and other broker services will give cloud consumers the freedom to choose what services they want to buy, from whom, and when, based on their preferences and variety of supported services. In addition, customers will use broker management platforms to get clearer insights into their cloud and orchestrate and provision workloads faster and smarter.

The Big Data Avenger

Big data is the term for a collection of data sets so large and complex that it becomes difficult to process and manage, like the Hulk, using on-hand database management tools or traditional data processing applications. The challenges include capture, management, storage, search, sharing, transfer, analysis, and visualization.

Ironman and the Hulk meet

Social and Big Data are coming together in a big way. Today social media generates more information in a short period than was previously available in the entire world a few generations ago. Making sense of it and understanding what it means for your business will require all new technologies and techniques.

As discussed in the previous section discussing the social aspects that are changing today, the world continues to become more and more social. A competitive advantage will come to those who understand what's happening better than their peers and can directly connect it to their business outcomes. Social networks and enterprise social applications are enhanced by the
connections between the people that use them and the information they share. Just as Facebook uses the insights derived through its analytics on how people behave to enable personalization and better user experiences, the same phenomenon has been happening on the Enterprise 2.0 space. While gleaning insight and contextualizing interaction in social environments is nothing new, the challenge in doing so has been pushing the boundaries of available technology for some years now. Organizations across the social business spectrum (consumer and workplace) are only now beginning to understand the vast intelligence that can be derived by looking at millions of conversations taking place, mostly non-secure, between those engaging in social media. While there is privacy, legal and regulatory issues, even with internal social networks, it’s not likely to delay the growing adoption of such capabilities, given their potential value.

In the shorter term, the ability to analyze and mine data in scale within social networks is enabling a range of intriguing and useful applications that can plug into social media networks and make use of the knowledge inside them. Doing it well, however, has proven to be difficult, such as making analytic sense of content types that are very large and non-transparent, such as high definition video, or sensing the connections between the thousands of unstructured natural language messages. Each of these require technologies that can handle the enormous scale, complexity, speed, and computation requirements in a way that remains cost effective inside a rapidly-rising exponential window. From this you can begin to see the challenge of traditional approaches to large data, which tend to break down fairly soon under large geometric growth. As shown in the diagram to the right, the Hulk and Captain America need to work together so that Cloud Storage, database technologies, and Business intelligence issues address the comingling of big data and social drivers.
Perhaps more to the point, and where the discussion of big data comes in, is that the key to social media interactions between people is that it leaves knowledge behind for others to find and reuse. This can be the original content that started the conversation or the subsequent comments, discussion, ratings, ranking, retweets, etc. These conversations will remain on the network afterwards and forms an invaluable history and knowledge repository of society, culture, and business that can be discovered. Some data is not inherently valuable by itself. In addition, finding what one is looking for in the vast sea of a million or billion human conversations is a difficult task. Thus, separating the signal from the noise is where big data, and the analytics it makes possible, go hand-in-hand. Social analytics will allow us to make sense in the large and endless flow of our activity streams and social news feeds.

Best practice – Understand that Social and big data is the next business intelligence Inflection Point

Though social networks may soon become the primary contributor of humanity's communication and interaction, the challenges of deriving what is increasingly called social business intelligence are as follows. First, big data sets itself apart from previous approaches because it applies new ways of thinking about the capture, storage, and processing of truly vast amounts of data. This includes the supporting technology, often starting with emerging tech such as data mining grids or Map Reduce infrastructures as well as software architectures that is often surprisingly non-deterministic and non-linear in design. This means that there is a distinct generational and technical divide between how most organizations are dealing with data today, and the very different things they'll need to do in the future.

Best practice – Consider that IT job roles and Technology will change

The second issue goes back to the old adage that "you manage to what you measure." In the big data world of social media, this means that one analyzes what you know of to analyze. The goal however is to "spot trends", to "know what's going to happen before it actually happens", to "get ahead of the conversation and see where it's going." Sentiment analysis, knowledge mining, aggregating conversations into trends, these are all possible when you know what you're looking for. It also helps if the tools you use are smart enough to tell you what there is to know, but that you don't know what to ask for.
Big data is now moving into the realm of mainstream IT. With this development, competitive advantage will come to those who understand what’s happening better than their peers and can directly connect it to their business outcomes and other useful pursuits.

**Best Practice – Understand where social media and big data are headed**

Social media and big data are moving is some very specific directions. They are:

1. **Applications will become Social/Big Data aware:** Big data-enabled applications will be plugged into consumer and enterprise social networks. As third party software becomes increasingly embedded into social networks, these are analytic applications that can give you the latest social media status. It allows you to data mine; ask queries, view top trends, and display insights of various kinds only because big data approaches make it possible to happen quickly enough in the face of the full sum of social media knowledge.

2. **The blurring of external and internal big data:** The interconnectedness of everything is only continuing as the Internet drives the IT conversation to a greater and greater extent, including a growing blend of the consumer world and the enterprise. Tomorrow’s big data solutions, particularly when it comes to business intelligence, will include a fully integrated view of this entire social media landscape.

3. **Privacy, governmental, and regulatory concerns will grow:** There are concerns that Big Brother is watching. This is already a significant issue in the social media space but the increasing mechanization and maturity of big data, social media, and analytics will only make it more pronounced. Those engaging in crawling, analyzing, and sharing data garnered from social media, whether it is from consumers or employees, will have to think carefully about the implications.

4. **Analytics that finds you:** Knowing what to ask for is an essential skill when it comes to extracting value from today’s social media landscape. However, the convergence of social media and big data will allow vital new intelligence to find you, before you know you need it. The field of predictive analytics, for example, requires very smart software combined with the ability to quickly run enormous amounts of speculative queries in a timely fashion.

5. **Cloud big data analytics emerges:** The sheer size of data and compute volumes, combined with the highly decentralized nature of social media, is ideal for a cloud computing approach. Look for products that combine big data, analytics, and social
media for on-demand, cost-effective solutions. Companies like EMC, IBM, and HP are likely to lead the way here.

The Security Avenger

An increasingly mobile workforce is demanding access to systems and information anytime from anywhere. The Black Widow can help. In this interconnected and virtualized world, security policies tied to physical attributes and devices are becoming redundant and businesses must learn to accommodate new demands being made on IT while also maintaining more traditional security controls.

Static security policy enforcement models no longer are acceptable. The Information security infrastructure must become adaptive by incorporating additional context at the point when a security decision is made, and there are already signs of this transformation. Application identity and content awareness are all part of the same underlying shift to incorporate more context to enable faster and more accurate assessments of whether a given action should be allowed or denied.

Best Practice – Understand the four phases in security in services model

Bring your own device (BYOD) is one of the most significant IT transformations happening today. It is driven by an intense desire among employees to use personally-owned devices. IT organizations have realized that they can potentially benefit from the model as well. The transition to enable BYOD takes an organization through four phases as it related to security as shown in Figure 20: Security vs. Time. The first phase includes IT’s rejection of personally-owned devices. This becomes an unsustainable resolution, leading the organization to move to the second BYOD phase, accommodation. At this second stage, organizations recognize that end users want to use personally-owned devices, and IT must accommodate that demand by implementing compensating controls. Data protection is the organization’s primary concern. The third phase is to adapt to the new levels and processes of security required. In many organizations, mobility represents an opportunity to improve externally-facing customer services, internal business processes, productivity, and employee
satisfaction. This means that IT organizations must focus on issues beyond traditional security models such as perimeter defense in support of personally-owned devices. In this phase, the enterprise focus shifts to productivity and employee satisfaction and from a reactive to a proactive approach. The fourth phase is integrate, which represents the realization of the personal cloud. Integrating the user experience (application and data accessibility) is a key focus at this phase. Here, BYOD is fully adopted, and the focus of the enterprise is to optimize, operate, and evolve the defense in depth strategy.

The megatrends of consumerization, mobility, social, and cloud computing are radically transforming the relationship between IT, the business, and individual users. Organizations are recognizing and responding to the need to move from control-centric security to people-centric security. People-centric security focuses primarily on the behavior of internal staff – it does not imply that traditional ‘keep the bad guys out’ controls have become redundant. Indeed, many of these will be essential for the foreseeable future. However, people-centric security does propose a major change of emphasis in the design and implementation of controls – always trying to minimize preventative controls in favor of a more human-centric balance of policies, controls, rights and responsibilities. It tries to maximize human potential by increasing trust and independent decision making.
Conclusion

The Avengers are the next (3rd) IT platform or Unified Service of the future. A nexus or interconnection of converging forces is happening. Social, Mobile, Cloud, Big Data, and Security are innovative and disruptive in their own right, but together, they are revolutionizing business drivers, goals and even the society we live in. Mobile devices are becoming the de facto platform for effective social networking and new ways of doing our work every day. The consumerization of IT is a result of the availability of powerful devices, interfaces, and applications with minimal learning curves and it will continue down that path. Cloud computing and security is the superglue for all the interconnected forces. We need to take advantage of the interconnection of forces and respond effectively.

While searching in a sea of change looking for that next big thing, realize that similar to Benjamin realizing the importance of plastics, grasping that businesses must embrace these new disruptions moving to the third platform and develop the appropriate skills and mind-sets is very important.

Let’s work with our super heroes, the IT avengers, combining our interconnection of forces as we lead the charge to driving Service Solutions to the Third Platform.

Author’s Biography

Paul Brant is a Senior Education Technology Consultant at EMC in the New Product Readiness Group based in Franklin MA. He has over 29 years’ experience in semiconductor design, board level hardware and software design, as well as IT technical pre-sales solutions selling as well as marketing, and educational development and delivery. He also holds a number of patents in the data communication and semiconductor fields. Paul has a Bachelor (BSEE) and Master’s Degree (MSEE) in Electrical Engineering from New York University (NYU), located in downtown Manhattan as well as a Master’s in Business Administration (MBA), from Dowling College, located in Suffolk County, Long Island, NY. In his spare time, he enjoys his family of five, bicycling, and other various endurance sports as well as other things that have wheels like muscle and sports cars. Certifications include EMC Proven Cloud Architect Expert, Technology Architect, NAS Specialist, VMware VCP5, Cisco CCDA, and CompTIA Security +.
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