

Understanding the Internet Revolution

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Definition of revolution: noun, a dramatic and wide-reaching change in the way something works or is organized—or a fundamental change in people’s ideas about it (source: Google Dictionary).



Revolution changes human society. And, history is created by waves of revolution, a continuous loop in which change molds and chips away at society. Each revolution builds upon one another, creating distinct lifestyles that are uniquely specific to each revolution. In retrospect (Fig. 1), our definition of history creates analysis and perspective to contextualize and understand what revolution has wrought.

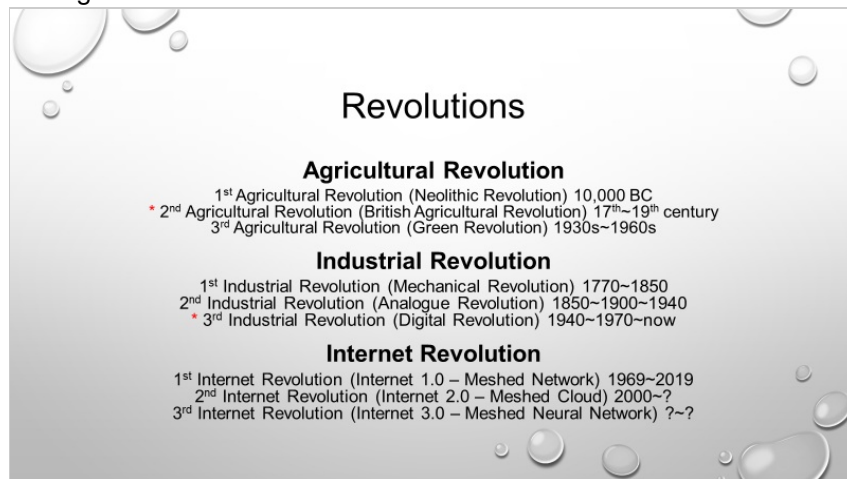
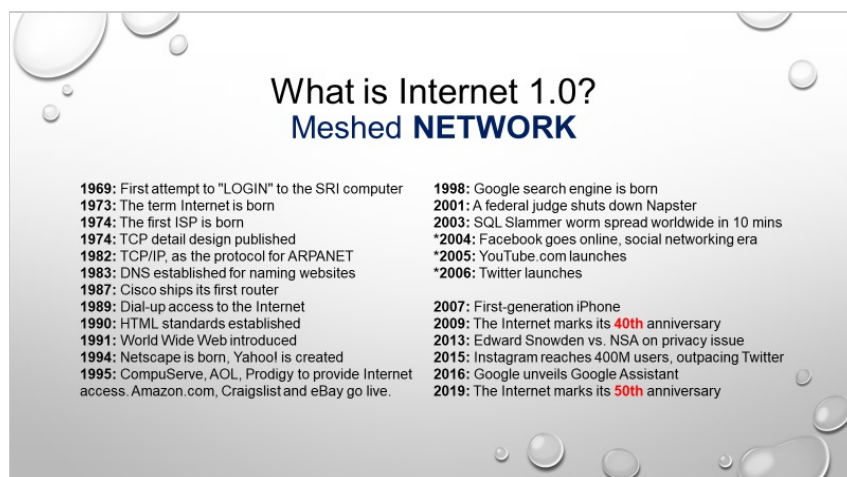


Figure 1: History of Revolutions

At this very moment, we find ourselves in a rare opportunity to talk about the ‘Internet Revolution’ while it is happening. To see the full impact of the Internet Revolution, one must understand the changes that past revolutions and Internet 1.0, 2.0, and 3.0 contributed—and utilize these experiences to adapt to future changes.

Internet 1.0: Meshed Network



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Figure 2: What is Internet 1.0, Meshed Network

When we play out the meshing of network in Internet 1.0 (Fig. 2), we see the progression from centralized dial-up network and utilizing telephone wire network to dedicated cable-DSL-fiber and mobile wireless networks. With the upcoming evolution to 5G, we will push the meshed network to another level. To show the impact on society of Internet 1.0, Fig. 3 on the next page visually charts the progression to a 50-million-users adoption rate.

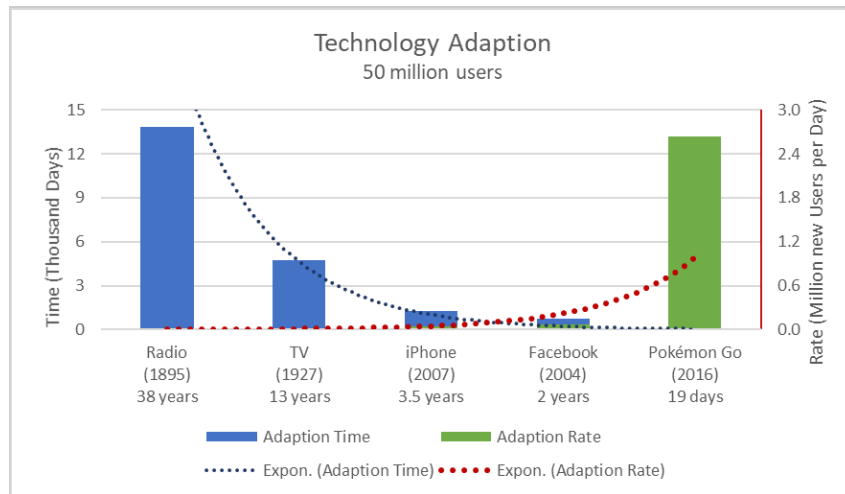


Figure 3: Technology Adaption to achieve 50 million users

Another impact of Internet 1.0 is the rapid increase in information availability and knowledge-sharing. We all remember when knowledge was much harder to come by. For instance, you called the reference desk at the public library for a research fact or you had to attend in-person training to learn a specific skill. Now, a simple Internet search turns up many readily available educational videos on a variety of subjects—knowledge we can tap into and share in an instant.

We also used to rely on physical advertisements in newspapers, magazines, and flyers to find out about products and upcoming events. The use of physical advertisements, however, was not cost-effective. As time moved on and our sophistication progressed, advertising also changed to adapt to technological advancements. Today, digital is a key part of every successful company's strategy; without it, companies are eliminated through competition. Examples abound of companies in former leadership positions that have fallen by the wayside of relevance because they did not adapt to technological advancements.

Internet 2.0: Meshed Cloud

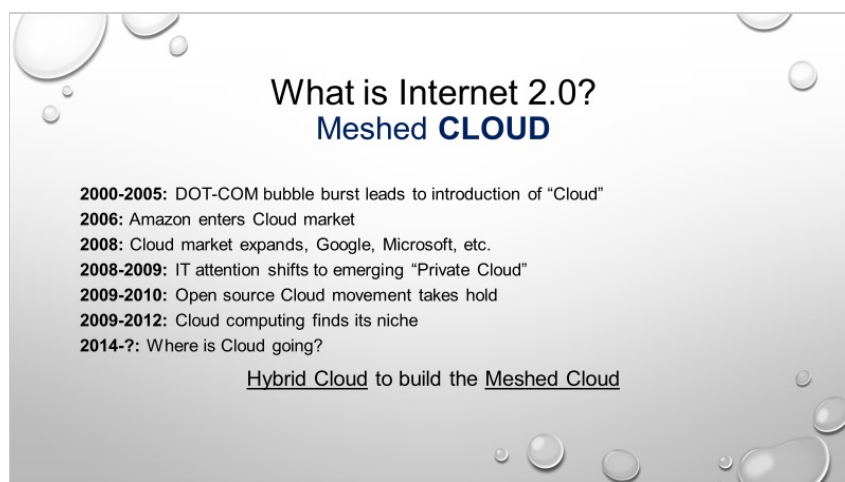


Figure 4: What is Internet 2.0, Meshed Cloud

With Internet 2.0 (Fig. 4), the cloud provider and user relationship debuted. From the arc of Internet 1.0 history, we can see the natural progression from a centralized to distributed to a meshed network, a series of advancements made in the interest of enhancing user experience. We already

recognize large centralized cloud players, including Amazon, Google, Microsoft, CenturyLink, and many other cloud providers. Each centralized cloud player has its own specific unique set of strengths and weaknesses and its particular cadre of targeted users.

As in the arc we see in Internet 1.0 history, the rise and fall of cloud companies will be the norm, measured by the 'adaption rate.' Since Internet 2.0 is in its formative stage, hybrid cloud strategy is recommended. Many major cloud companies are expanding their cloud data centers, further enhancing cloud data center efficiency and operation. Edge computing effort is very active as a way to bring the cloud closer to users. Hybrid networking, in combination with traditional network, software defined network (SDN), and network function virtualization (NFV), expands cloud topology to achieve meshed cloud. Thus, one can see that the distance between end user and cloud is going to determine the maturity of Internet 2.0.

Yet, we still must keep in mind that all revolutions are built on top of previous revolutions. For Internet 2.0 to continue evolving, it must utilize the underlying the meshed network while it builds its own cloud mesh topology. We can see companies such as Microsoft exhibiting this behavior in, for example, Microsoft ExpressRoute. Google and Amazon also recognize the changes and offers Virtual Private Cloud interconnections to build towards a meshed cloud topology.

Another way that Internet 2.0 promotes better user experience and relationship is through cloud applications. Cloud provides a platform for new applications and ideas to touch human life. With the matured meshed network, cloud applications can powerfully influence human society. The openness, always-on, and integration of cloud enables industries to make noticeable progress in Big Data, Machine Learning, and Artificial Intelligence. By overlaying data together, we can extract more value than sum of individual data sets and, with AI-assist, we can gain insight and experience faster than through traditional learning methods. Cloud also pushes operational cost and efficiency beyond what traditional data centers can offer. Because of this reality, owning a data center will no longer be an advantage. The cloud-provider-to-user relationship that rose from Internet 2.0 is another key component necessary in adapting to the digital future.

Internet 3.0: Meshed Neural Network

Internet 3.0 presents the improvement of AI technology—specifically the Meshed Neural Network. We are at an early stage in the development of the meshed neural network, which requires mature AI technology capabilities and meshed cloud to provide required compute capacity. Today, AI is the most-used phrase in technology, for it grabs the audience's attention despite the fact that not much "real" AI technology is currently being used. Nonetheless, the majority of current AI systems are simple systems without a feedback loop. A mature AI system is an enhanced system with feedback loops. In simple terms, it is:

Simple Act + Risks = Enhanced Act (Walk + Falling = Run)

Most robots are designed to walk straight up, so all the energy is focused on driving the motor to make the robot to move forward; this is a simple system. There are only a very few robots designed to manage falling risks, so the energy is used to manage and balance the robot's center of mass to achieve the desired moves; this is an enhanced system. To avoid total disaster, enhanced systems must have feedback loops and be able to process sensor data in real-time. Apply the enhanced-system-with-feedback-loops concept to an application function or unit and it is called 'neural cell.' Most of our application functions are simple systems, single-input and single-output; that is the reason we design oversubscription and timeshare features in compute infrastructure. When we step into the era of enhanced systems with feedback loops—once an enhanced application system is enabled—feedback loops will keep that application always running; it requires constant cloud compute resource assignment and, therefore, cannot be oversubscribed and time-shared. Currently, we can see the beginning stage of application transformation from traditional application platforms to server-less, container, and microservice technologies. This evolution of application platform technology will be mainly driven by meshed cloud evolution and AI systems thinking. This Internet 3.0 stage of Internet Revolution is very powerful and almost limitless, on both sides of the extreme.

Navigation and Survival

Each Internet era has provided crucial information to advance to the next era. It is important to note, however, the weaknesses as well as the strengths. When Internet 1.0 started, the focus was to get connected. Thus, TCP/IP and HTTP protocols were focused on transport but *not* security. At that time, you must recall, privacy was not even a concern.

As Internet 1.0 is more mature now, we demand security; thus, the use of SSL certificate (HTTPS) to secure web sites is a common understanding and expectation. With the introduction of Internet 2.0 and the initial phase of centralized cloud, we are awakened by the daunting privacy concerns. Today, our data privacy can be summarized as “trust us, we will safeguard your data.” We *cannot* use security to solve privacy; security and privacy are two different dimensions of concerns. To solve privacy, we must give a user or individual the power to reveal data. With the combination of edge computing to users’ home, encryption and blockchain technologies, the advancements of mesh cloud topologies will put the power of privacy into users’ hands. We will continue to see the industry evolve toward to ‘trusted network’ in Internet 2.0, meshed cloud.

Given all the weaknesses and the strengths of Internet 1.0, 2.0, and 3.0, one can construct a survival guide to adapt to change. One must understand that the advantages are shifted. The Internet Revolution has already leveled—and will further level—many previously considered advantages. The adaption and rejection rate are inevitable. With Internet Revolution maturity, the technology adaption rate is going to be faster and faster; the same will apply to the technology rejection rate.

Change is also inevitable. The “pick a horse and ride it” era is gone. We must be able to adapt to constant change in life and in work. The environment should be designed to efficiently adapt to changes in all shapes and forms. Access to knowledge has expanded. Our educational system framework was designed based on teaching knowledge to adapt and survive during and immediately following the Industrial Revolution. In the Internet Revolution, the ability to acquire knowledge is at everyone’s fingertips, literally. We must rethink our educational system framework based on learning ability and knowledge availability. The same principle should be applied to innovation. It should not only be focused on technology innovation; we also need to consider service innovation and ideas of how to use technology differently.

The Internet Revolution is shifting our environment to new never-before-seen ground. Its journey has matured automation and orchestration, so RPA (Robotic Process Automation) is an important part of digital transformation. We need to view RPA as a pre-form of Digital Employee. As technology industries mature, Digital Employee will tap into the power of Internet 3.0.

A crucial factor in survival is to know the point in time and space. Knowing the point in time and space in the Internet Revolution as well as being sensitive to the concerns of social responsibility and the education framework are the most important factors to pay attention to. When a company goes through digital transformation, re-educating and re-aligning its workforce is required. Nonetheless, the means are usually through workforce reduction and new hires. Layoff in digital transformation is to shift Enterprise Social Responsibility (ESR) to the society; company will gain reputation through ESR by taking on the responsibilities of workforce re-education and re-alignment.

A company must be ahead of change to adapt to change; waiting for change to settle is akin to watching windows of opportunity pass by. Every change comes with new knowledge to teach and learn; every change introduces a certain amount of unknown. Failure is the best value of the unknown, so it is key to fail fast. We must break through our traditional success-focused and knowledge-based educational framework and allow our next generation of leaders to embrace their learning abilities without boundaries.

Conclusion

Recognize and understand the Internet Revolution. Lead and ride the evolution wave—don’t wait

for history to wake you up or pass you by. The impact of the Internet Revolution is larger and deeper than we think. We see evidence that the Internet Revolution creates brand-new opportunities as it revolutionizes the agricultural and industrial industries. We must re-evaluate our advantages with the Internet Revolution in mind and reposition for the future, as individuals, families, societies, countries, and companies.