Applying Lessons From 20 Years of Hype Cycles to Your Own Innovation and Forecasting Strategies

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Summary

With a new wave of technology advancement driving digital business transformation, IT leaders must design their organization's technology tracking and adoption activities to account for four timeless principles of technology progress.

Overview

Key Challenges

CIOs, IT leaders and technology strategists must account for the following principles in their technology scanning and tracking:

Technologies progress in bursts or saccades — that is, sudden jumps with imperceptible movement in between — rather than a smooth and even path.

The four predictable obstacles to progress are a lack of performance, infrastructure/ecosystem, user acceptance or return on investment.

Technology silos continually expand and periodically merge with other fields.

Public amazement at a new technology never survives mainstream adoption.

Recommendations

CIOs, IT leaders and technology strategists:

Seek out new ideas continually through deliberate trend scanning of roles and projects. *Revisit* relevant technologies at least annually to see if they have progressed to a point where the benefit and maturity level outweigh the risk.

Follow a distinct process for innovation and emerging technologies that includes a phase for experimentation.

Broaden your environmental and technology scan activities to include disciplines related to but not traditionally included in IT such as robotics and drones, 3D printing and self-assembly, materials science, energy, biotechnology, and brain sciences.

Don't invest in emerging technologies purely for branding purposes unless you are the first in your industry or you have a unique application. *Adopt early* where technologies offer advantages in core or differentiating value propositions.

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Introduction

For 20 years, Gartner has been tracking the annual progress of emerging technologies through the publication of Hype Cycles. The Hype Cycles provide a snapshot of the position of hundreds of technologies along a predictable pattern of enthusiasm, disillusionment and eventual realism (see "Understanding Gartner's Hype Cycles" (/doc/code/251964?ref=ddisp) for a detailed introduction to the Hype Cycle model.) In looking back at the 20 years of technology assessments, we have observed four principles regarding how technologies progress and the relationship between anticipated and actual progress (see Table 1).

Table 1. Four Principles of Technology Progress

Principles of Technology Progress	Recommendations
Technologies progress in bursts or saccades — that is, sudden jumps with imperceptible movement in between — rather than a smooth and even path.	*Seek out* new ideas continually through deliberate trend scanning of roles and projects. Use Gartner's "Toolkit: My Hype Cycle, 2013" (/doc/code/255226?ref=ddisp) as a feeder list for your own technology scan. *Revisit* relevant technologies at least annually to see if they have progressed to a point where the benefit and maturity level outweigh the risk. Incorporate the reason why a technology is not yet ready into your watch list so that you can easily ask, "Are we there yet?"

The four predictable obstacles to progress are a lack of performance, infrastructure/ecosystem, user acceptance or return on investment.	*Follow* a distinct process for innovation and emerging technologies that includes a phase for experimentation. Make sure that the purpose (e.g., evaluating performance or user acceptance) and evaluation criteria for the experiment are defined in advance. *Evaluate* the approach, not just the product or vendor, when working with early-stage technologies. Specific products and providers may not survive as other players emerge, but lessons learned around usability and business impact remain valid.
Technology silos continually expand and periodically merge with other fields.	*Assess* the maturity of the specific approaches and applications of emerging technologies, as not all will be at the same level of maturity or progressing at the same rate. *Broaden* your environmental and technology scan activities to include disciplines related to but not traditionally included in IT, such as robotics and drones, 3D printing and self-assembly, materials science, energy, biotechnology, and brain sciences.
Public amazement at a new technology never survives mainstream adoption.	*Don't invest* in emerging technologies purely for branding purposes unless you are the first in your industry or you have a unique application. *Adopt early* where technologies offer advantages in core or differentiating value propositions. Differentiate how you invest in and develop these early-stage technologies from those that are becoming an expected part of doing business, as business cases and processes will be different.

Source: Gartner (September 2014)

CIOs, architects and strategic technology planners should design their innovation scanning and tracking activities to embrace these principles and their associated recommendations.

For those who wish to uncover additional patterns and principles, the Appendix includes all 20 of the Hype Cycles for Emerging Technologies published between 1995 and 2014 (see Note 1).

Analysis

Principle 1: Technologies Progress in Bursts or Saccades, Rather Than a Smooth and Even Path

In a fast-paced business world, executives often feel that they are being forced to adopt new technologies and practices at an ever-increasing rate. However, fundamental advances in technology are still taking over a decade — sometimes up to 30 years or more — to traverse the Hype Cycle from initial prototypes to mainstream adoption. For example, 3D printing was first highlighted in Gartner research as a technology to watch in 2006; reached the Peak of Inflated Expectations in 2012; and will likely take another five to 10 years to fully realize its disruptive potential in industries such as design, retail, manufacturing, supply chain and construction. Table 2 shows additional examples of slow technology progress through the Hype Cycle.

Table 2. Examples of Slow-Moving Technologies

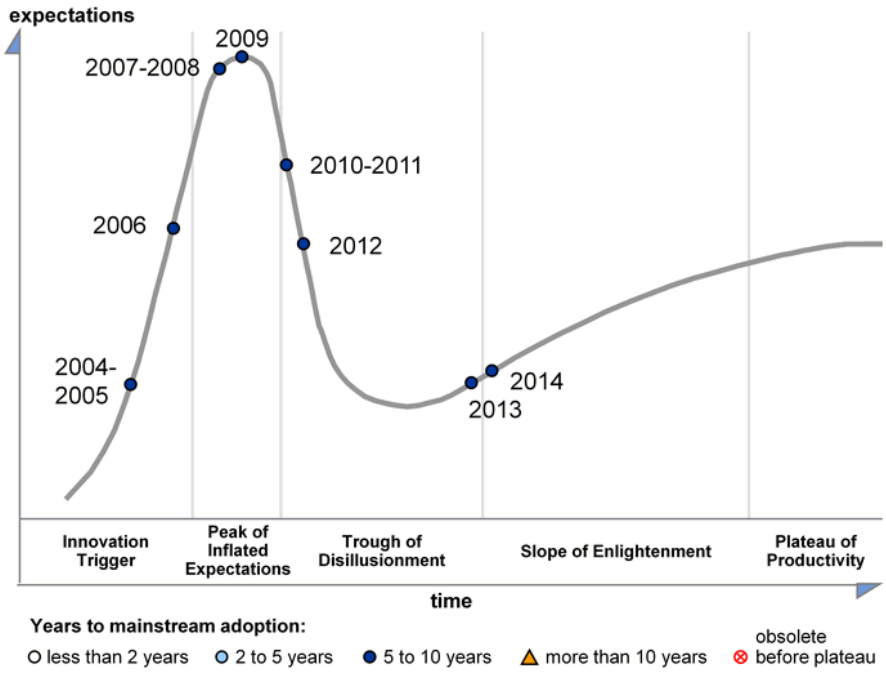
Technology	Pace of Progress
Cloud Computing	6 years from pre-peak (2009) to trough (2014)
Electronic Paper/Digital Ink	15 years from rise (1999) to slope (2013)
Wearable Computers	17 years from rise (1997) to peak (2013)
Speech Recognition	19 years from slope (1995) to plateau (2013)
Virtual Reality	20 years in the trough

Source: Gartner (September 2014)

The slower-moving technologies are often those with fundamental challenges of physics and engineering to overcome (e.g., displays, user interfaces). On the other hand, software technologies often move more rapidly, as they have lower barriers to evolution and distribution. There is one type of technology innovation that moves at a particularly accelerated speed: virally selected technologies from the consumer Web world. These technologies, often involving social media communication and sharing (e.g., Twitter, Instagram), are noticed once they rise above the crowd and enjoy the network effect of rapidly spreading adoption. They move quickly from the early adopters to the peak and into the mainstream in a couple of years, although enterprise adoption may still move through a full and slower Hype Cycle as organizations wrestle with identifying the benefits and overcoming the challenges of corporate adoption.

Experience from two decades of creating and reviewing Hype Cycles shows that both fast and slow-moving technologies progress in bursts, rather than on a smooth and even path. For example, the progress of gesture control interfaces has moved forward in jumps, as shown in Figure 1, based on technology advances and commercial factors such the introduction of the Nintendo Wii and Microsoft Kinect. The hard grind of background research goes unobserved, and progress appears as a series of periodic breakthroughs. Similarly, fast-moving Web and consumer technologies can progress from cool curiosity to mainstream adoption in two or three quick jumps (e.g., the World Wide Web jumped from the Peak of Inflated Expectations in 1996 to the Slope of Enlightenment in 1997). We refer to this phenomenon as "technology saccades" because it mirrors the action of the human eye, which progresses in small jumps (saccades) as it reads a line of text or inspects an image, but produces the perception of continuous movement.

Figure 1. Progress of Gesture Control Interfaces, 2004 to 2014



SOURCE: GARTNER (SEPTEMBER 2014)

Sometimes a detailed knowledge of the technology can aid in foreseeing when a jump will happen — for example, the typical two-year chip design cycle that enables longer battery life on a new class of device. Key vendors may be able to help in pointing out current constraints and a likely time frame for them to be addressed.

In addition to the progress of individual technologies, every few years a new wave of energy forms around a convergence of multiple technologies — for example, the flood of innovation around social media and Web 2.0 during 2006 to 2008; the business implications of the Nexus of Forces (mobile, social, cloud and information) during 2010 to 2013; and the current disruptive potential of smart machines (e.g., deep learning, machine intelligence, Internet of Things and robots) and consumerized creation (e.g., 3D printing, app stores, crowdsourcing, crowdfunding).

Recommendations:

Seek out new ideas continually through deliberate trend scanning of roles and projects. Target critical needs that have not yet been resolved through existing approaches. Use Gartner's "Toolkit: My Hype Cycle" (/doc/code/255226?ref=ddisp) as a feeder list for your own technology scan.

Revisit relevant technologies at least annually to see if they have progressed to a point where the benefit and maturity level outweigh the risk. Incorporate the reason why a technology is not yet ready into your watch list so that you can easily ask, "Are we there yet?"

Principle 2: The Four Predictable Obstacles to Progress Are a Lack of Performance, Infrastructure/Ecosystem, User Acceptance or ROI

We have found that all emerging technologies, even fast-movers, go through a certain degree of disillusionment when reality doesn't meet expectations (remember the "World Wide Wait" of prebroadband Web surfing?). We have identified four recurring causes for the Trough of Disillusionment, any of which can lead to delayed uptake of a new technology:

Performance. Technologies may not have reached the core levels of performance needed for widespread adoption. In some cases, there may be niche or targeted adoption where even low levels of performance add some value (such as the early use of biometric fingerprints to deter Social Security "double dipping") or where the application can be designed around the limitations of the technology (such as highly structured speech recognition dialogues in automated call center interactions).

Integration/ecosystem. Even when the core performance of a technology has reached a satisfactory level, there may be requirements for integration into an existing technology or process infrastructure that are not straightforward. Sometimes integration might require cooperation across the broader ecosystem of participants, as with RFID in the manufacturing, logistics and retail supply chains.

Usability/user adoption. For an elective (as opposed to mandated) technology to penetrate a user base, it must offer individual as well as corporate benefits. Users need to take time out from their primary tasks to learn a new approach, which often leads to an initial productivity hit before the value kicks in. The tipping point for ease of use is often not obvious and depends on an unpredictable design breakthrough. For example, videoconferencing appeared close to the trough in the first Hype Cycle, in 1995 (31 years after AT&T demonstrated its Picturephone at the New York World's Fair), as it began to be offered in enterprise conferencing environments. However, it did not achieve mass usage until after 2010, when Skype, FaceTime and Web conferencing tools embedded free, one-click, acceptable-quality video interaction. Social issues may also be an inhibitor, such as the hostile reaction that some wearers of Google Glass experience when people around them resent being filmed and recorded. Of all the reasons why technologies spend so long in the trough, usability and social acceptance can be the most difficult to overcome.

Payback/return on investment. The fourth obstacle to emergence from the trough is often the business case around a new technology. Even if the technology works, the infrastructure is in place, and people are using it, the ability to make or save money may prove elusive. When this happens on a large scale, the deflation of a financial bubble washes a whole class of technology into the trough (see the archived research "The End of E-Business" (/doc/code/84130?ref=ddisp) by Alexander Drobik, which in 1999 predicted the e-commerce market crash of 2001).

Recommendations:

Follow a distinct process for innovation and emerging technologies that includes a phase for experimentation. Make sure that the purpose (e.g., evaluating performance or user acceptance) and evaluation criteria for the experiment are defined in advance.

Evaluate the approach, not just the product or vendor, when working with early-stage technologies. Specific products and providers may not survive as other players emerge, but lessons learned around usability and business impact remain valid.

Principle 3: Technology Silos Continually Expand and Periodically Merge With Other Fields

Many of the concepts published as full Hype Cycles in 2014 began their Hype Cycle careers as individual points on earlier Hype Cycles (see Table 4). This is a typical path of progression as a single concept develops multiple techniques, applications and management requirements (e.g., security), each of which is at a different stage of maturity. For example, cloud computing first appeared as an entry on the Hype Cycle for Emerging Technologies in 2008 (after being tracked as "Web Platforms" since the 2006 Hype Cycle for Web Technologies), formed an entire Hype Cycle in 2009, and in 2012 had four different Hype Cycles dedicated to it — cloud computing, cloud security, cloud services brokerage and cloud application infrastructure services (PaaS). Other recent examples of expansion from single data point to entire Hype Cycle include 3D printing, the Internet of Things and in-memory computing technology.

In addition to technology expansion, we are also seeing an inclusion of technologies not traditionally associated with IT. 2014 Hype Cycles include sustainability, smart city technologies and solutions, telemedicine, and photovoltaic solar energy. This reflects the ongoing information technology/operational technology convergence, the growing impact of digital technology in every area of scientific endeavor and everyday living, and possibly the next "long wave" of technology evolution incorporating biologically integrated technologies into ongoing advances in smart machines, materials science and human augmentation.

Recommendations

Assess the maturity of the specific approaches and applications of emerging technologies, as not all will be at the same level of maturity or progressing at the same rate.

Broaden your environmental and technology scan activities to include disciplines related to but not traditionally included in IT, such as robotics and drones, 3D printing and self-assembly, materials science, energy, biotechnology, and brain sciences.

Principle 4: Public Amazement at a New Technology Never Survives Mainstream Adoption

We have traditionally viewed the Peak of Inflated Expectations as a period of unrealistic enthusiasm about what the technology will achieve, with the Plateau of Productivity representing the point where realistic expectations are shaped by the actual value of the technology. However, there is an additional factor that

dampens the final height of the plateau in terms of expectations: the rapid social acceptance of the "new normal." Even in cases where the technology can be viewed after the fact as delivering transformational value, the "wow" factor is relatively short-lived.

The Internet, social media, mobile phones, virtual assistants and online universities were awe-inspiring when first introduced, but are now viewed as routine conveniences. Once 3D or holographic TVs reach over 20% of living rooms; once our packages are routinely delivered by Amazon drones; once cars can park themselves at the shopping mall, we will cease to be amazed at these incredible advances and forget the decades of research behind the new capabilities. Some of us who have tracked the (lack of) progress of these technologies over many years may savor the achievements for a little longer, but still, the new capabilities will rapidly become a fact of life rather than a source of wonder. As Aldous Huxley wrote in *Brave New World* , "Most human beings have an almost infinite capacity for taking things for granted."

Table 3 shows the strong effect of "impact deflation" that has occurred over multiple years of Hype Cycle creation. The percentage of technologies rated as "transformational" benefit (as opposed to high, medium or low) drifts down for later- versus early-stage technologies.

Table 3. "Benefit Deflation" for Maturing Technologies

	Percent of All Technologies Rated as "Transformational"	Percent of Technologies Maturing in More Than 10 Years Rated as "Transformational"	Percent of Technologies Maturing in Five to 10 years Rated as "Transformational"	Percent of Technologies Maturing in Two to Five Years Rated as "Transformational"	Percent of Technologies Maturing in Less Than Two Years Rated as "Transformational"
2009	10%	30%	14%	7%	4%
2010	10%	24%	15%	7%	5%
2011	9%	25%	13%	6%	3%
2012	10%	26%	13%	8%	6%
2013	11%	27%	13%	8%	5%

SOURCE: GARTNER (SEPTEMBER 2014)

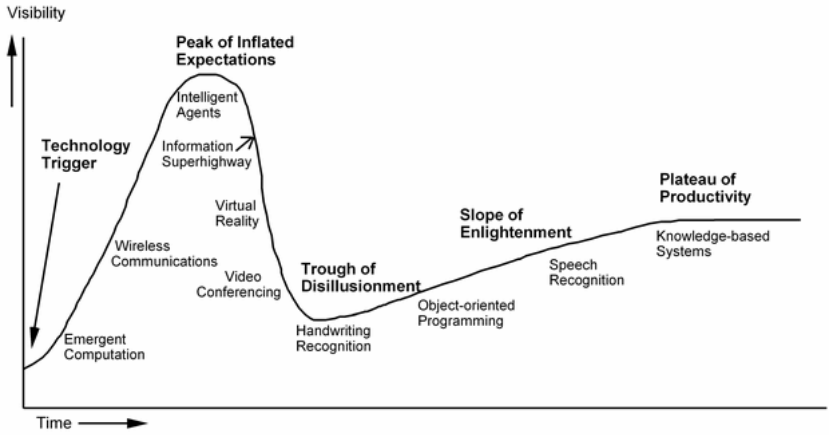
Recommendations

Don't invest in emerging technologies purely for branding purposes unless you are the first in your industry or you have a unique application.

Adopt early where technologies offer advantage in core or differentiating value propositions. Differentiate how you invest in and develop these early-stage technologies from those that are becoming an expected part of doing business, as business cases and processes will be different.

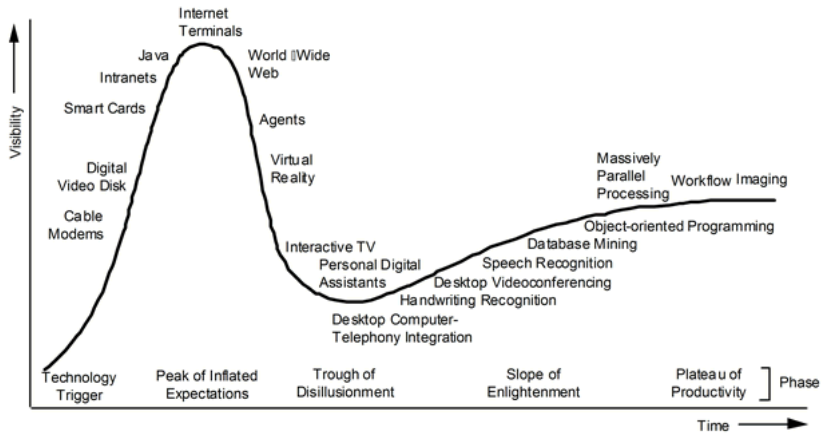
Appendix

Figure 2. Hype Cycle for Emerging Technologies, 1995



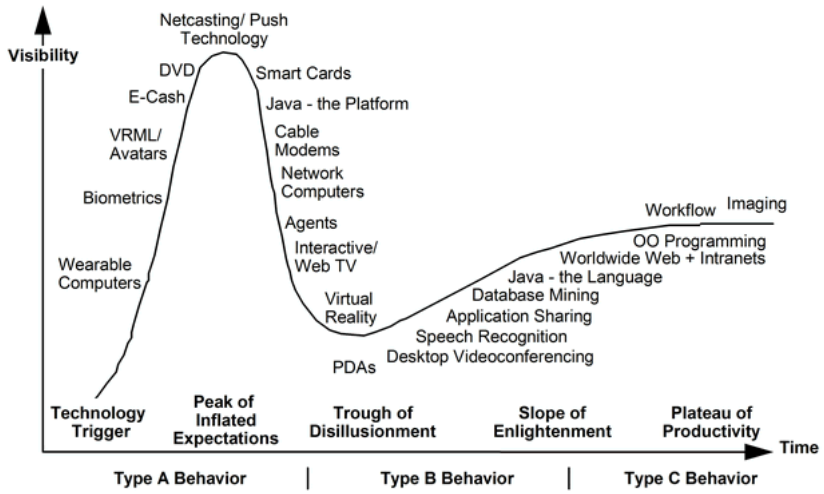
SOURCE: GARTNER (1995)

Figure 3. Hype Cycle for Emerging Technologies, 1996



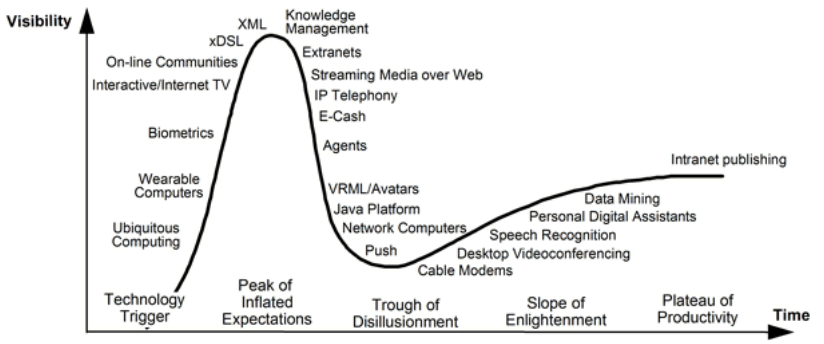
SOURCE: GARTNER (1996)

Figure 4. Hype Cycle for Emerging Technologies, 1997



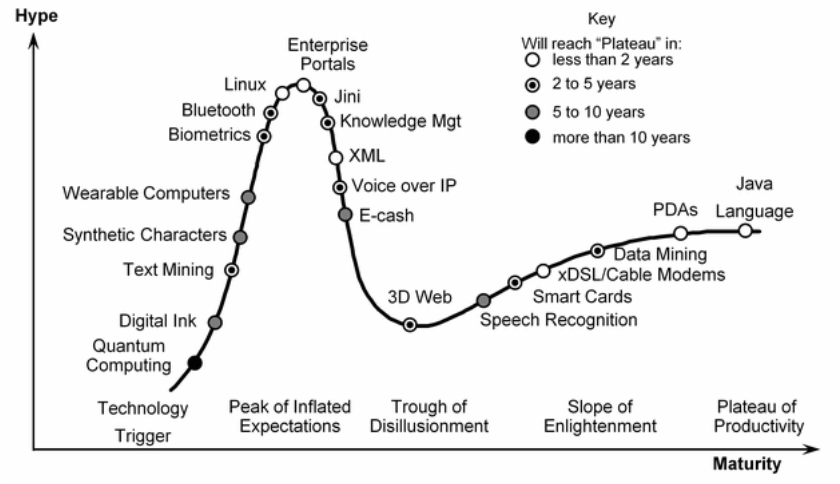
SOURCE: GARTNER (1997)

Figure 5. Hype Cycle for Emerging Technologies, 1998



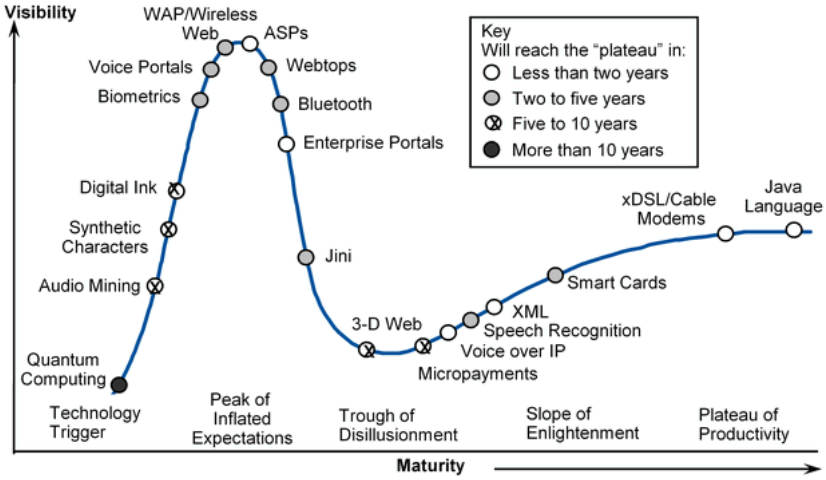
SOURCE: GARTNER (1998)

Figure 6. Hype Cycle for Emerging Technologies, 1999



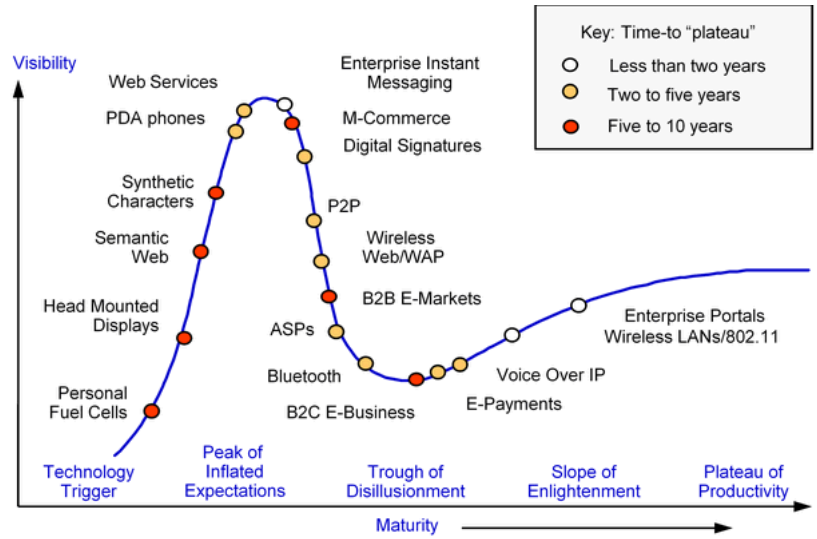
SOURCE: GARTNER (1999)

Figure 7. Hype Cycle for Emerging Technologies, 2000



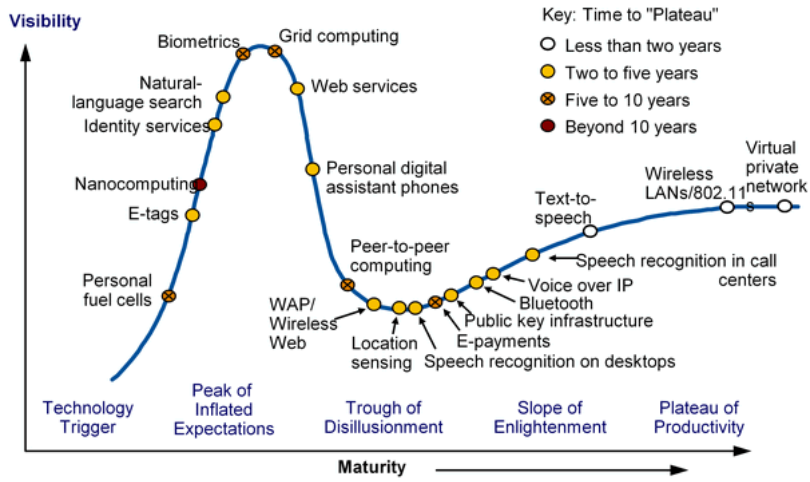
SOURCE: GARTNER (2000)

Figure 8. Hype Cycle for Emerging Technologies, 2001



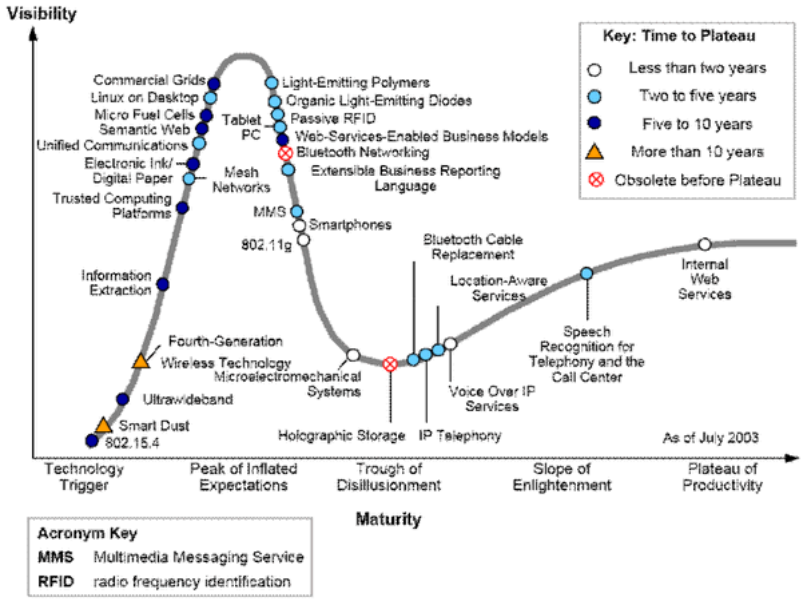
SOURCE: GARTNER (2001)

Figure 9. Hype Cycle for Emerging Technologies, 2002



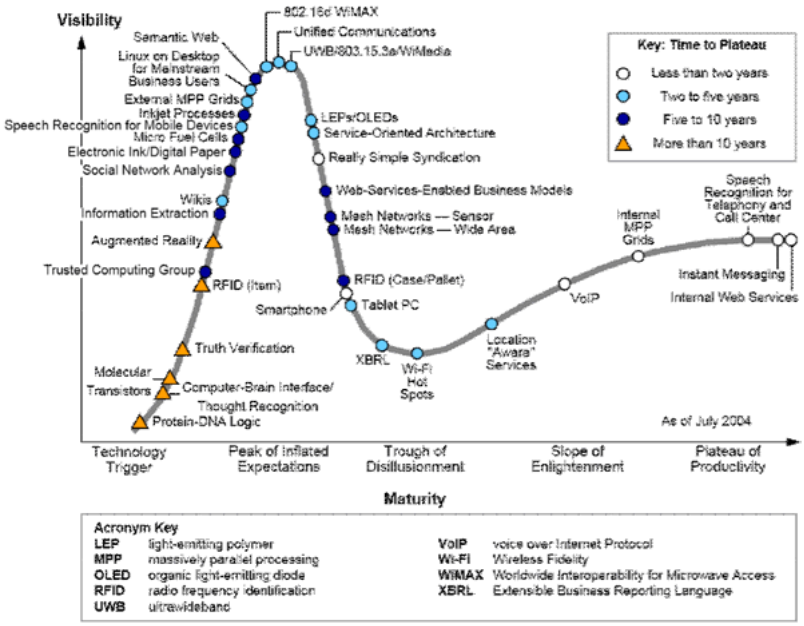
SOURCE: GARTNER (2002)

Figure 10. Hype Cycle for Emerging Technologies, 2003



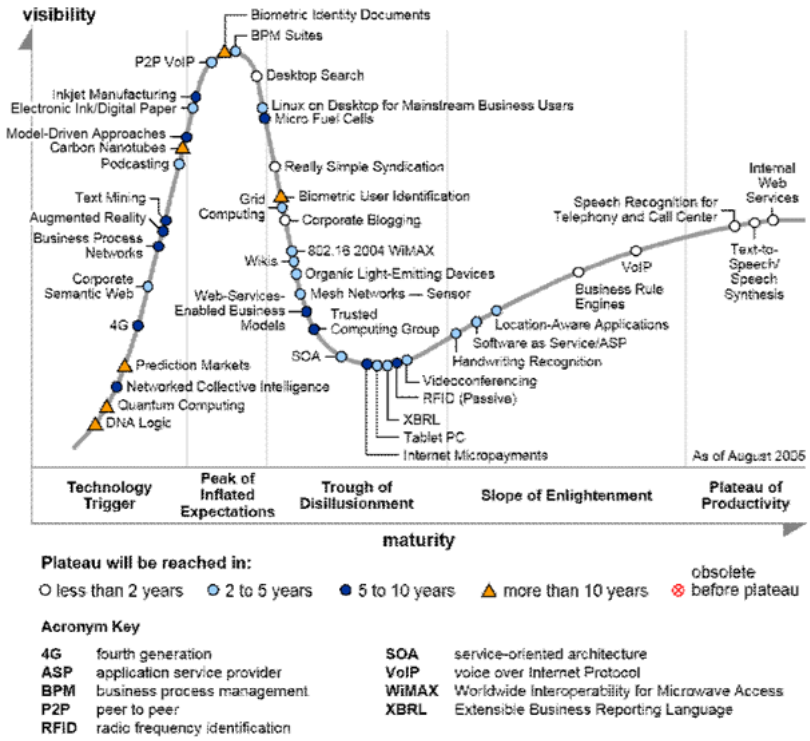
SOURCE: GARTNER (JULY 2003)

Figure 11. Hype Cycle for Emerging Technologies, 2004



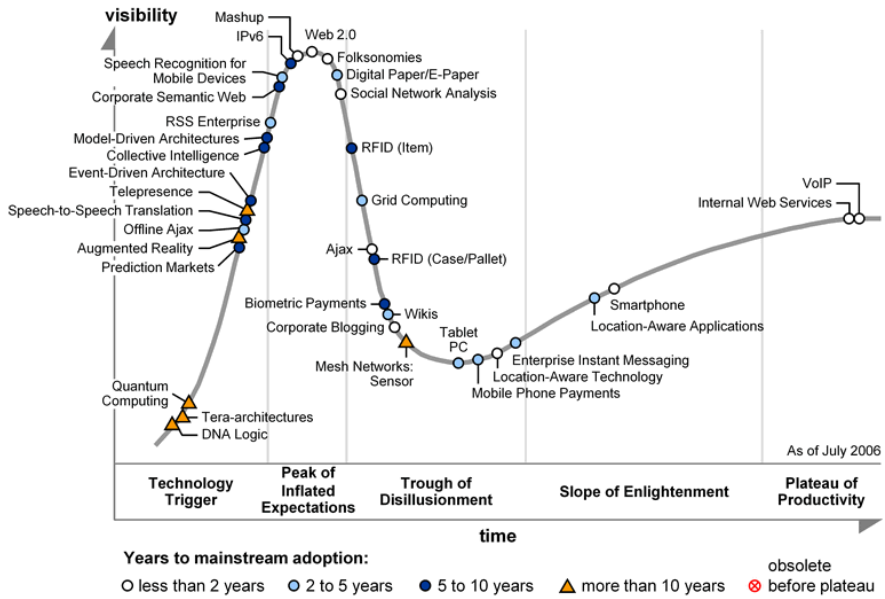
SOURCE: GARTNER (JULY 2004)

Figure 12. Hype Cycle for Emerging Technologies, 2005



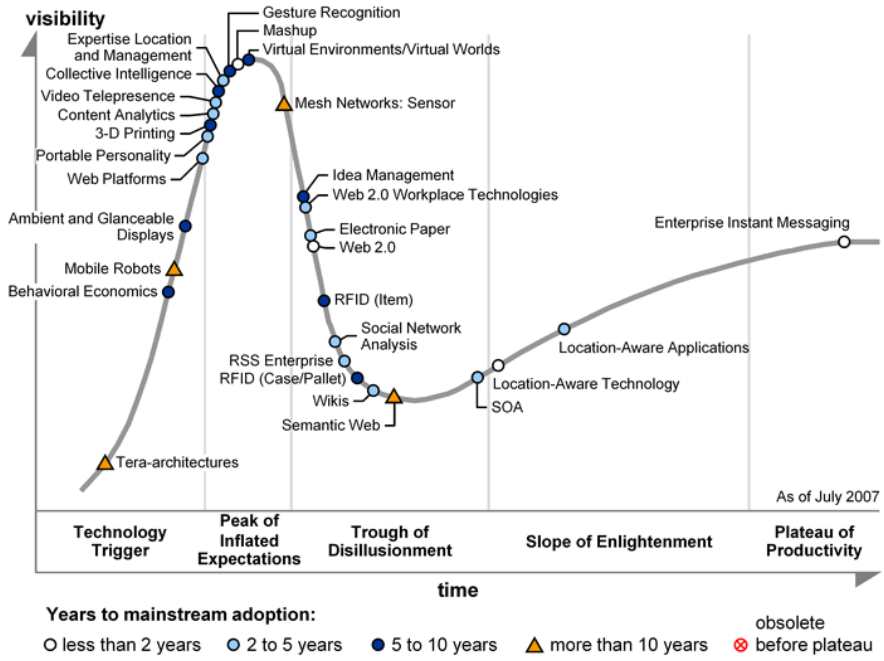
SOURCE: GARTNER (AUGUST 2005)

Figure 13. Hype Cycle for Emerging Technologies, 2006



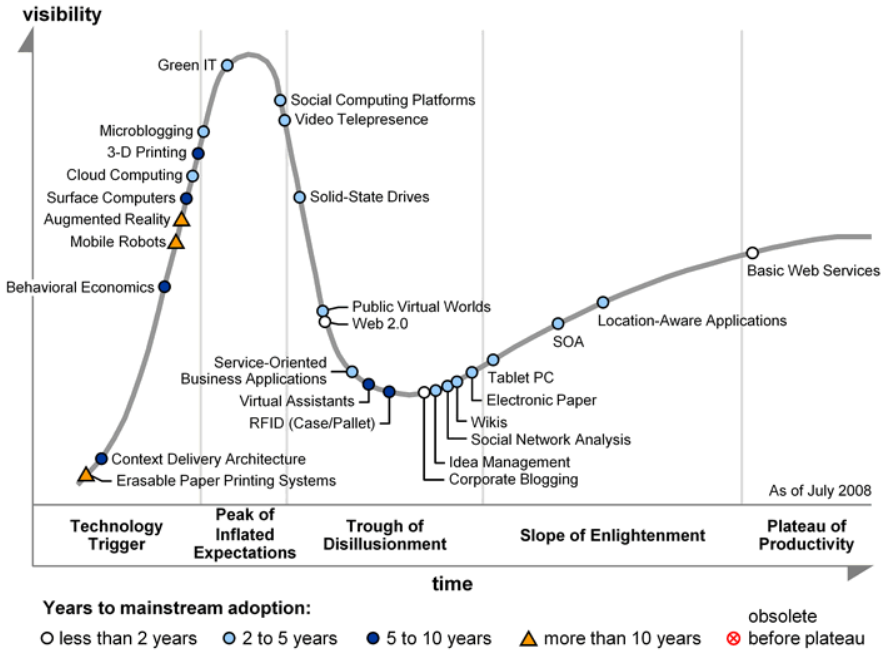
SOURCE: GARTNER (JULY 2006)

Figure 14. Hype Cycle for Emerging Technologies, 2007



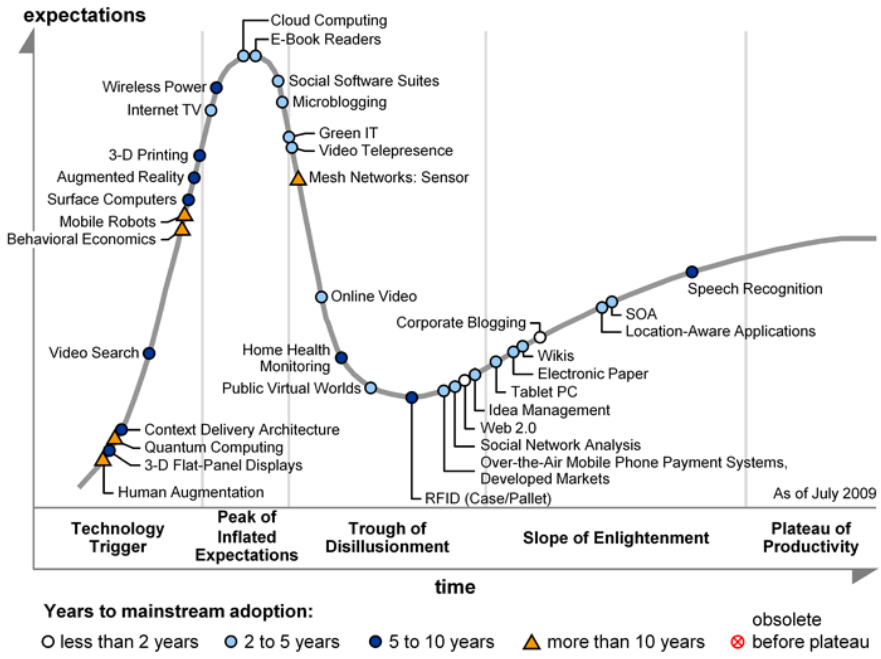
SOURCE: GARTNER (JULY 2007)

Figure 15. Hype Cycle for Emerging Technologies, 2008



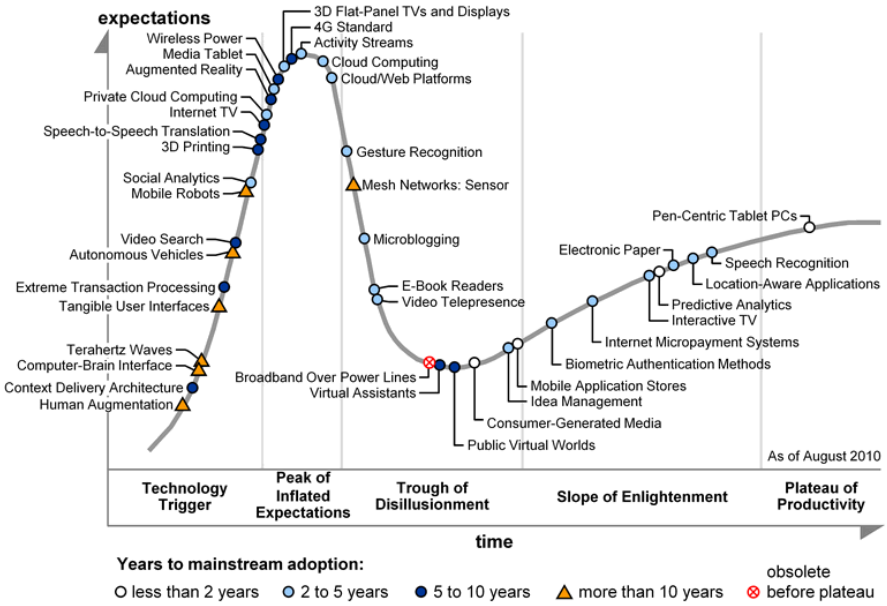
SOURCE: GARTNER (JULY 2008)

Figure 16. Hype Cycle for Emerging Technologies, 2009



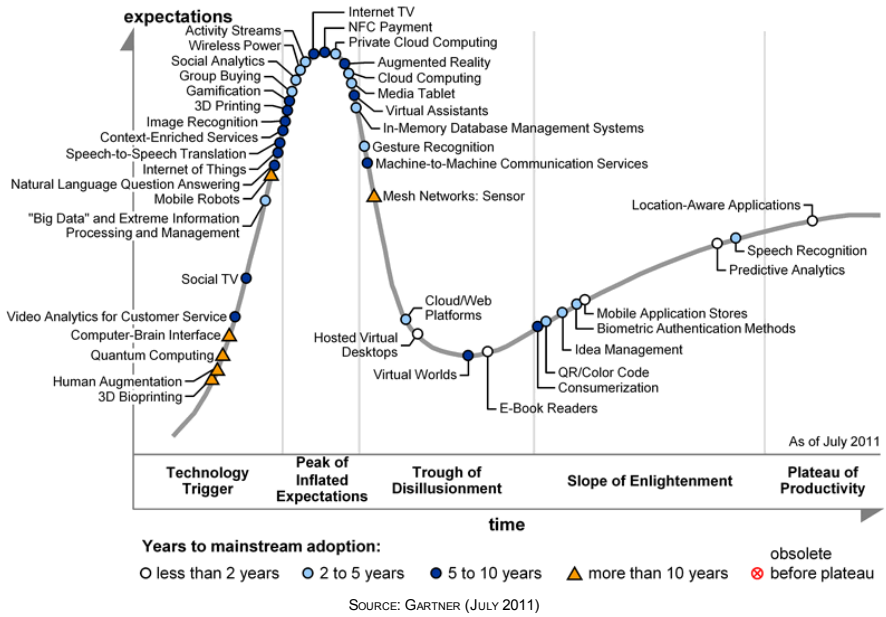
SOURCE: GARTNER (JULY 2009)

Figure 17. Hype Cycle for Emerging Technologies, 2010



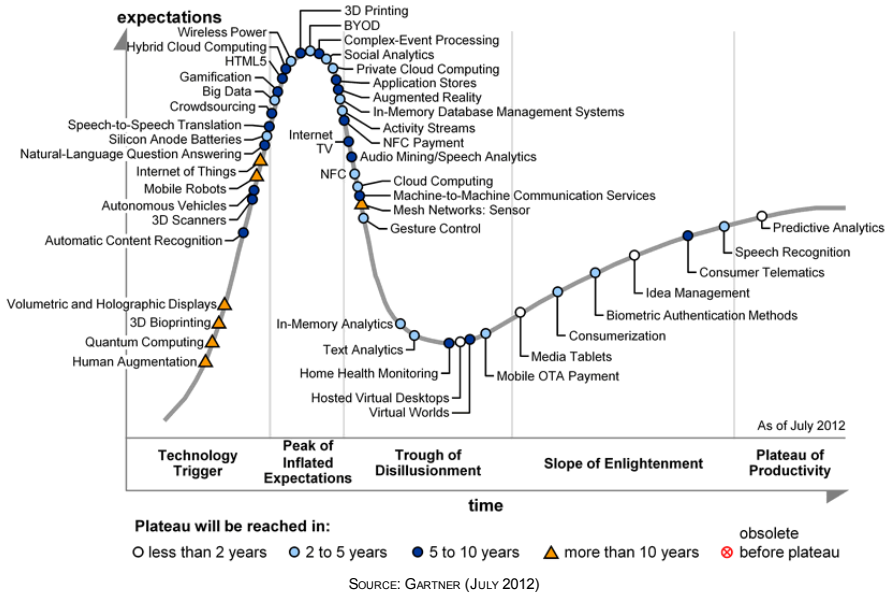
SOURCE: GARTNER (AUGUST 2010)

Figure 18. Hype Cycle for Emerging Technologies, 2011



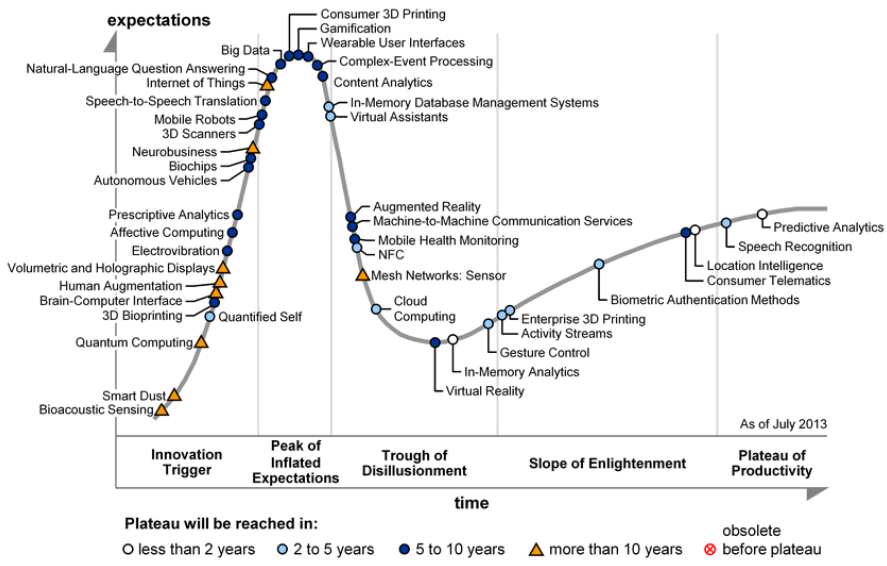
SOURCE: GARTNER (JULY 2011)

Figure 19. Hype Cycle for Emerging Technologies, 2012



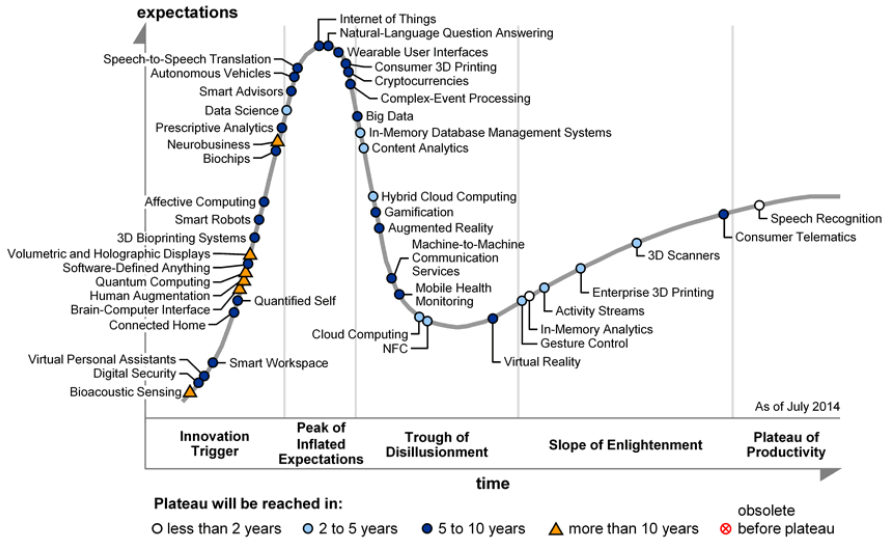
SOURCE: GARTNER (JULY 2012)

Figure 20. Hype Cycle for Emerging Technologies, 2013



SOURCE: GARTNER (JULY 2013)

Figure 21. Hype Cycle for Emerging Technologies, 2014



SOURCE: GARTNER (JULY 2014)

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Understanding Gartner's Hype Cycles" (/doc/code/251964?ref=ddisp)

"Toolkit: My Hype Cycle, 2013" (/doc/code/255226?ref=ddisp)

"Hype Cycle for Emerging Technologies, 2014" (/doc/code/264126?ref=ddisp)

"Gartner's Hype Cycle Special Report for 2014" (/doc/code/268778?ref=ddisp)

"Seven Strategies to Boost Technology Innovation" (/doc/code/238484?ref=ddisp)

Evidence

This research is based on an analysis of 20 years of technology tracking (between 1995 and 2014) by hundreds of Gartner analysts through the use of the Hype Cycle model. See Appendix for the graphics from the annual Hype Cycle for Emerging Technologies report (one of many Hype Cycles published each year).

Note 1
Purpose of the Hype Cycle of Emerging Technologies

The Hype Cycle for Emerging Technologies features a subset of the more than 2,000 technologies covered in Gartner's annual Hype Cycle Special Report. It highlights technologies that are the focus of attention because of particularly high levels of hype, or those that may not be broadly acknowledged, but that Gartner believes have the potential for significant impact.

Because the Hype Cycle for Emerging Technologies pulls from such a broad spectrum of topics, many technologies that are featured in a specific year because of their relative visibility are not necessarily tracked throughout their life cycles and so appear to "come and go." Gartner publishes around 100 other Hype Cycles each year that provide a persistent view of these technologies' progress. Interested readers can refer to Gartner's annual "Toolkit: My Hype Cycle, 2013" (/doc/code/255226?ref=ddisp) for the full database of 2,000 technologies for items of ongoing interest. See also "Understanding Gartner's Hype Cycles" (/doc/code/251964?ref=ddisp) for a detailed introduction to the Hype Cycle model.

Note 2

For more insight into the Hype Cycle, see "Mastering the Hype Cycle: How to Choose the Right Innovation at the Right Time," by Jackie Fenn and Mark Raskino, Harvard Business School Press (2008).