IHS Ranks the Top 10 Technologies That are Transforming the World

IHS Ranks the Top 10 Technologies That are Transforming the World

We know that technology has the capability to change the world: from the Gutenberg printing press to the steam engine to the microchip.

But how can we determine which technologies are likely to have the greatest potential to transform the future of the human race? What is the process to distinguish between the innovations that will have limited impact and those that will be remembered as milestones on the path of progress? How can you tell the difference between VHS and Betamax?

To answer these questions, IHS Technology gathered its leading experts representing all segments—electronic components; finished products; applications markets; consumer, media and telecom; industrial; medical and power. These experts were asked to nominate and vote for their top 10 most impactful technologies over the next five years.

Counting down from 10, the winners were:

10. Artificial intelligence
9. Biometrics
8. Flexible displays
7. Sensors
6. Advanced user interfaces
5. Graphene
4. Energy storage and advanced battery technologies
3. 3-D printing
2. Cloud computing and big data
1. The Internet of everything

The paper below details IHS Technology's thoughts on these technologies, explaining why we think these are the areas with the greatest potential to transform markets and human endeavors in the future.

Thank you,

Ian Weightman
Vice President, Research & Operations, IHS Technology

For more information on this white paper, refer to IHS Technology encompassing research across all key technology sectors.

TEN

Artificial intelligence (AI)

Whether you agree with Stephen Hawking that it could be the end of the human race or your views trend towards Ray Kurzweil's vision of a transcendent new era of the technological singularity, everyone recognizes that the advent of true AI will be a transformative event.

Long the province of science fiction, the key building blocks for AI are coming together. Furthermore, some tests designed to identify the threshold for true AI capability have been passed. A Russian computer program this year passed the famous Turing test by convincing a sufficient number of experts that it was a real person, the first time AI has been able to do this.

Influential entrepreneur Elon Musk—who has made a career out of turning science-fiction concepts into viable businesses—has stated that AI technology is making incredibly rapid advancements. While published reports indicate Musk is in the Hawking camp when it comes to the impact of AI, he reportedly believes the emergence of the technology is right on the horizon, set to become reality within five to 10 years.

NINE

Biometrics

Used in mobile devices for both security and health-related purposes, biometrics encompasses a group of technologies that have applications for authentication, lifestyle and medical uses. The key to unlocking the value of biometrics is not in the implementation of individual sensors, but in the combining of sensors, processing the sensor inputs in real time while maintaining low power consumption and creating software for compelling applications.

Advancements in mobile biometrics, such as Apple Inc.'s Touch ID, are having a major impact on security, allowing unlocking of devices, user identification, applications in mobile payment and potentially security applications in corporate and other authenticated environments. The application of biometrics in these areas have enormously improved overall security, two-factor authentication, user experience and reducing transaction cost associated with password use such as constantly changing passwords.

Biometrics will also increase efficiency and efficacy in the expanding market for digital health care, using technologies that include fingerprint identification, retina scan, electrocardiogram, facial recognition and heart rate, pulse oximeter, ultraviolet sensor, 6-axis accelerometer/gyroscope, skin temperature and barometer. In digital health, biometrics will play a major role in the emerging trend of the "quantified self," in other words, a comprehensive approach to self-monitoring and sensing using wearable technologies to oversee an individual's health status. Furthermore, biometric technologies are reducing costs and changing the management of chronic diseases like cardiac arrhythmia by measuring and capturing symptoms while the subject operates in normal lifestyle conditions for best diagnosis.

EIGHT

Flexible displays

Flexible display technology is poised to transform electronic product design from wearables and smartphones to tablets and TVs. Breakthroughs in materials, processes and manufacturing technologies are leading flexible displays toward widespread commercialization.

New developments in flexible display technology, especially in organic light emitting diodes (OLED), are inspiring innovation in wearable devices. Examples abound with recent announcements of smartwatches and fitness trackers that employ curved displays.

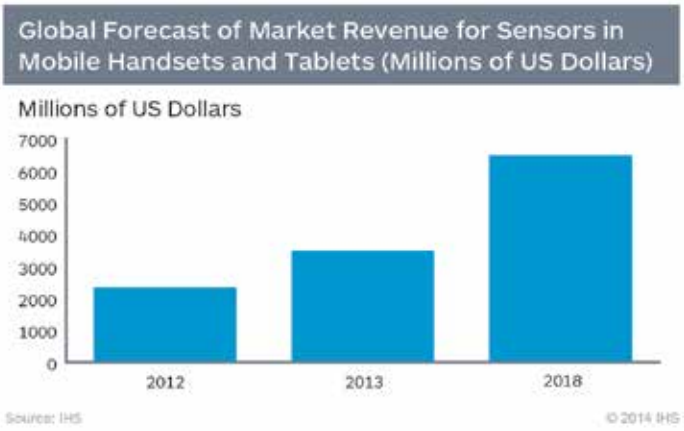
Thinner, lighter and bendable displays that are less prone to breakage are opening up new opportunities for wearable devices. Flexible displays are starting to appear in smartphones and are poised to spur transformational designs in the tablet market. Meanwhile, flexible displays are also bringing waves of curved TVs into the market.

SEVEN

Sensors

The proliferation of sensor technology enables many of the technologies described in this whitepaper—the cloud, big data, biometrics and the Internet of Things (IoT). From image sensors in smartphones to gyroscopes and accelerometers, sensors are the elements that convert the real world into the digital world where it is processed, stored, used for control and output in myriad forms. They are essential to driving the entire value chain that includes software, services, electronics and semiconductors.

Sensors are probably the most underrated technology in terms of their impact. The global sensor market for mobile handsets and tablets alone is expected to nearly double in the coming years, rising to $6.5 billion in 2018, from $3.5 billion in 2013.



SIX

Advanced user interfaces

There are a lot of new uses for devices that have not yet been clearly integrated into a single, clean user experience. These uses include new device types such as wearables and new services such as the combination of linear and on-demand content. Other areas include the IoT, smart homes and industrial applications.

User interface technologies that are applied to these applications include navigation, intuitive interfaces, search, control and predictive/adaptive elements. Advances in user interfaces also encompass AI and involve developments in devices like smartphones and tablets.

One key area of advancement in user interfaces is in touch, gesture and motion. Devices are increasingly shifting to a touch-centric world. Displays are functioning as both input and output devices.

Innovative solutions in touch, proximity based sensing, and gesture and motion based interactivity are coming to market at a rapid pace. Non-contact gestures are enabling new intuitive interface for varieties of products. For example, consumers will be able to rotate their hands in the air to change the volume on a car radio or turn off light with the wave of a hand.

The recent launch of Apple Watch demonstrates the trend towards increasing adoption of haptic technology, which provides tactile feedback in response to user inputs.

These new innovations will open up opportunities for companies to create new products with increased revenue and profitability. Development in this field will also impact the electronic value chain from semiconductors and sensors to display materials and devices.

FIVE

Graphene

Imagine a material only one atom thick yet 100 times stronger than steel. Envision super-fast-charging capacitors with enough energy to power electric cars. Picture light-speed electronics, ultra-efficient solar cells, highly flexible digital displays and impermeable body armor.

This is graphene, and these are just a few examples of the applications that are in development.

The major obstacle to delivering this breakthrough to consumers is the astounding cost to produce high quality graphene in sufficient quantity. However, advancements are occurring at a rapid pace with manufacturers around the world focused on cracking the graphene production conundrum.

Earlier this year Samsung announced a breakthrough in producing graphene in manufacturing quantities, a development that could transform everything from building materials to semiconductors.

FOUR

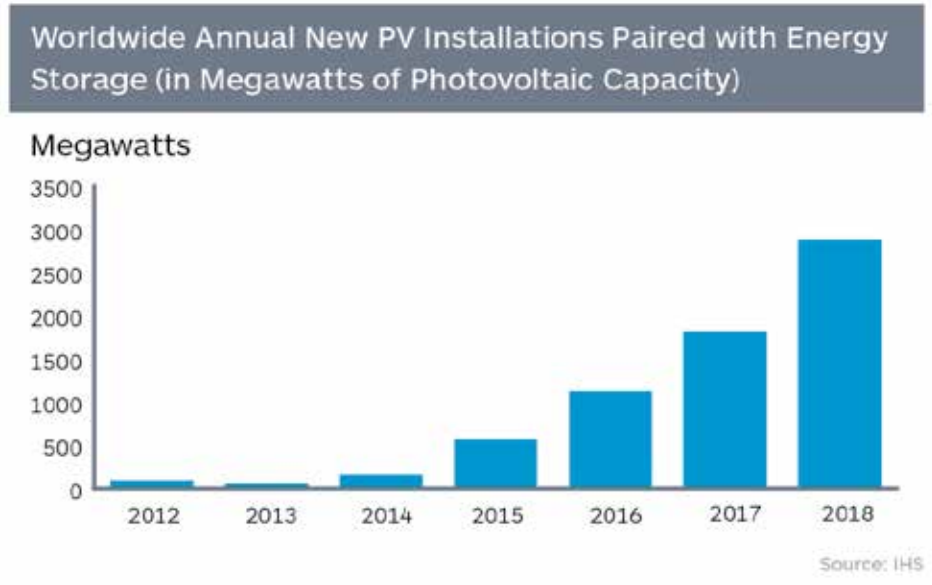
Energy storage and advanced battery technologies

The global movement towards generating power from renewable sources, like solar and wind, has created huge economic and environmental benefits. However, the nature of these technologies dictates that power generation is intermittent and fluctuates throughout the minute, hour, day and year in a relatively unpredictable manner. The power system is evolving away from the traditional and relatively simple system of one directional flow, from large-scale central generators through transmission lines and distribution lines to consumers, to an increasingly complex mix of small distribution of generators and consumers at all points in the electricity grid. This change is bringing about huge challenges in balancing the supply and demand of electricity on the grid.

Energy storage has the potential to dramatically transform the way the power system is operated and overcome many of the challenges presented by the growing penetration of renewable energy. To date, the single biggest obstacle to mass deployment of battery-based energy storage has been the relatively high lifetime cost of such batteries, which has restricted the business case to a small number of niche applications. However, technological improvements and cost reductions have been rapid and the commercial deployment of energy storage solutions is gaining huge momentum.

Energy storage will be critical to maintain reliable electricity grids and enable renewables to make an even more significant contribution to the energy mix.

IHS predicts that global installations of new solar storage systems in the residential, commercial and utility-scale segments will rise to 2,875 megawatts in 2018, up by a factor of nearly 18 from 163 megawatts in 2014.



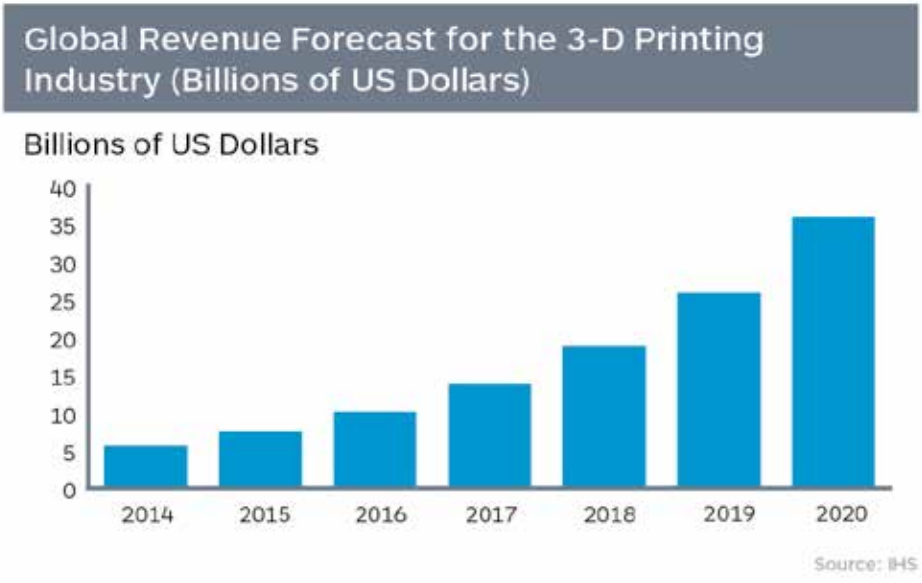
THREE

3-D printing in industrial applications

Also called additive manufacturing, 3-D printing encourages design innovation by facilitating the creation of new structures and shapes and allows limitless product complexity without additional production costs. It also greatly speeds up time to market by making the idea-to-prototype cycle much shorter.

The 3-D printing sector has witnessed robust growth over its nearly 30-year history, with revenue growing by double digit rates nearly every year since the late 1980s. However, since the expiration of patents related to fused deposition modeling (FDM) technology in 2009, the industry's growth has accelerated, especially on the consumer side of the market. In 2014, key patents for selective laser sintering (SLS) technology are also expiring, which is expected to act as another catalyst in fueling further expansion of the 3-D printing sector.

IHS predicts that over the next five years, the fastest growth will come from the sales of industrial-grade 3-D printing systems and from the production of tools, molds, prototypes and final end-use parts. Both of these sectors are projected to witness average annual revenue growth in excess of 50 percent. Total revenue for the 3-D printing industry is forecast to grow by nearly 40 percent annually through 2020, when the aggregated market size is expected to exceed $35 billion, up from $5.6 billion in 2014.



TWO

Cloud computing and big data

The cloud has become a ubiquitous description for on-demand provisioning of data, storage, computing power and services that are touching nearly every consumer and enterprise across the globe. Together with data analytics and mobile broadband, the cloud and big data are poised to reshape almost every facet of the consumer digital lifestyle experience and dramatically impact enterprise IT strategies, while creating new opportunities and challenges for the various nodes in the entire ICT value chain.

The cloud is transformational in the business landscape, changing the way enterprises interact with their suppliers, customers and developers. The elasticity of demand and the capability of supply to match demand are giving rise to new services, promoting different business models and value chains for servers, and compute, storage and device manufacturers. Consequently, companies all over the world and in almost every industry are looking at how to best leverage the capabilities of the cloud and create new business models.

The big data and data analytics segment is a separate but related transformational technology that harnesses the power of the cloud to analyze data for disparate sources to uncover hidden patterns, enable predictive analysis and achieve huge efficiencies in performance.

IHS projects that the enterprise market for cloud, big data and data analytics is poised for explosive growth as an increasing number of enterprises move their applications to the cloud and look to data analytics to drive new insights into their consumer behavior. In the enterprise market, cloud services coupled with big data and data analytics will reshape the way enterprises in almost every industry interact with their suppliers, partners, shareholders and customers.

IHS forecasts that global enterprise IT spending on cloud-based architectures will double from about $115 billion in 2012 to about $230 billion in 2017. The market consists of storage, servers, applications and content that can be configured and delivered in a framework that is rapidly scalable, dynamically provisionable, on-demand and has minimal management requirements. As enterprises increasingly migrate to a cloud strategy, IHS projects that cloud and big data will become an increasingly larger portion of the annual global enterprise IT spending, which is currently at approximately $2 trillion.

The migration to a cloud-based enterprise IT structure requires the adoption of new technologies as well as new business models. The rise of the cloud will cause enterprise spending to transition from capital expenditures to operational expenditures. In addition, enterprise IT currently has concerns regarding security and transparency of data and applications in the cloud. This transition will require new levels of data security and backup and disaster recovery—especially in the enterprise IT environment—to ensure that critical elements of the corporate knowledge base are protected. These concerns must be addressed by cloud IT service providers in order to drive even more widespread adoption of the cloud.

ONE

The Internet of everything

The world is becoming increasingly digital thanks to the reality of near ubiquitous connectivity, inexpensive processing and sensor solutions, and the use of the Internet to facilitate communication between electronic devices. As such, society is in the early stages of the Internet of things (IoT)—a technological evolution that is based on the way that Internet-connected devices can be used to enhance communication, automate complex industrial processes and generate a wealth of information. To provide some context on the magnitude of this evolution, nearly 86 billion Internet-connected devices are projected to be in use in 2024, up from less than 20 billion in 2014.

While the concept of the IoT is still relatively new, it is already transforming into a broader concept: the Internet of everything (IoE). The metamorphosis is not just about the number of devices; it is really about the complete departure from the way these devices have used the Internet in the past.

Most of the connected devices in place today largely require direct human interaction and are used for the consumption of content and entertainment. The majority of the 86 billion future connections will be employed to monitor and control systems, machines and objects—including lights, thermostats, window locks and under-the-hood automotive electronics.

As this installed base of connected devices continues to grow and diversify, the question will not be how to connect but rather how to maximize the benefit from these devices. Much of today's focus on the IoT surrounds the hardware—the shiny, sleek, smart devices that are going into the connected device ecosystem. However, as with any new wave of technology, suppliers and OEMs alike will have to move beyond the hardware to consider the necessary combination of hardware, software and services that will truly enable the IoE experience we envision. The IoE can be used to provide unique value propositions and create complex information systems that are greater than the sum of the individual components and the impact will resonate in virtually every field of human endeavor.