Technology Trends in Consumer Electronics

INTRO/EXECUTIVE SUMMARY

In an industry largely driven by consumer desire for the next big thing, constant innovation is a must. Inspiring excitement and capturing the imagination of the end user requires new devices and technologies that improve people’s lives and offer them capabilities to do things they couldn’t before.

Wearables, virtual and augmented reality, 4K televisions, smart homes, 3D printers, autonomous vehicles, drones, communication robots—these are just some of the emerging technologies that hope to find a foothold and secure their role in people’s lives now and in the coming years. However, as is seen at annual expos like CES, game-changing technologies often emerge only to end up disappearing within a few short years. For many consumer electronics technologies, the dividing line between maturing to the point of widespread use and failing to stick can be razor thin.

Speed is a critical success factor for manufacturers of consumer electronics. Product lifecycles are short, consumer interests change fast, and companies must be agile in their response to stay competitive. Those who are late to recognize shifting tastes or miss the signs heralding the next generation of a product will fall behind. But determining what will be in demand is just one part of the equation. The other, more challenging part is overcoming the technological hurdles and barriers that present themselves during design, development, and production.

Delivering innovative products that are smaller, faster, more durable, more affordable, have better battery life—you name it—is only possible through the successful application of breakthrough technologies and innovative use of materials. This requires assessing and exploring new avenues to find solutions that close the gap between where technology is and where it needs to be. This paper takes a look at some of the biggest trends currently currently shaping the consumer electronics industry, as well as technology needs relevant to those trends.
The amount of internet-connected devices has vastly expanded over the past decade. Everything from watches to lightbulbs, refrigerators, and even crockpots, is now capable of wirelessly communicating with users via the internet. The reality is that connectivity and communication is becoming ubiquitous, not only in consumer electronics, but across many other market sectors such as automotive and healthcare.

### 6.4 billion
connected things will be in use worldwide in 2016—up 30% from 2015—and will reach 20.8 billion by 2020.¹

The worldwide Internet of Things market is estimated to grow from $655.8 billion in 2014 to $1.7 trillion in 2020.²

There will be a quarter billion connected vehicles on the road by 2020.³

The pervasiveness of electronics means there is a great need for technology that can adapt to all manner of shape, size, and application. For example, flat, rigid sensors and chips may not be a viable option for wearable devices that must be able to comfortably conform to the human body. With an already broad and ever-expanding spectrum of smart devices, breakthrough manufacturing technologies must continue to be explored, tested, and implemented.

### DEVICE MINIATURIZATION

With each new generation of devices, consumers expect to receive more and more features in the same size (or smaller) package that they have come to expect. In addition, nobody wants to pay more or receive those additional features at the expense of quality or safety. This presents a wealth of challenges for manufacturers. Delivering sleek, feature-rich products consumers want to buy will require pushing the limits of technology—specifically, the miniaturization of next-generation electronic components and systems.

New manufacturing technologies will need to be developed for micro-scale components, including equipment and systems for micro-scale automated assembly, micro-scale sensors, and micro-scale electrical connections. Particularly critical will be developing new microjoining techniques and increasing the efficiency of existing techniques.

EWI’s Expertise in Microjoining
- Wire bonding
- Ribbon bonding
- Diffusion bonding
- Resistance welding
- Parallel-gap welding
- Micro-TIG welding
- Laser welding
- Ultrasonic metal welding
- Soldering
- Ultrasonic soldering
- Brazing
- Data collection
- Failure analysis
- In-process monitoring
- Materials Science
- Design of experiments
Flexible and printed electronics, while a young technology, offers revolutionary flexibility in both the literal and figurative senses of the word. Using flexible circuitry, manufacturers have the potential to create devices with functionality that conventional electronic devices cannot achieve. Displays, sensors, and printed memory that can be bent, wrapped, rolled, and stretched give manufacturers the potential to make great strides in reducing cost, weight, and power consumption of electronic devices. Progress will have to be made in reducing and optimizing development cycles, as applications for the technology will continue to rapidly emerge in the coming years.

THE TOTAL MARKET for printed, flexible and organic electronics will grow from $26.54 billion in 2016 to $69.03 billion in 2026\(^4\)

HIGHER ENERGY DENSITY BATTERIES

Longer battery life is frequently cited as one of the biggest desires among consumers of electronic devices. Though laptops and smartphones are now capable of lasting several hours longer on a single charge than they were five to ten years ago, tech advancements have significantly outpaced battery advancements over the last few decades. While devices have continued to get more and more powerful, battery technology has seemingly progressed at an incremental pace.

IMPROVED BATTERY LIFE was the leading answer in a 1000 consumer survey of the most exciting new or improved smartphone feature\(^5\)

New, higher energy density batteries will be critical to enabling the kinds of products that deliver the performance consumers want. Much work is being done to improve the technology, but many challenges still remain in the pursuit of a better battery.

3D AND 4D PRINTING

A hot topic these days, 3D printing sees widespread application in both manufacturing and in the homes of users of consumer-grade machines. Additive manufacturing has many potential useful applications in the consumer electronics industry, but one of particular note is the printing of electronic circuits. The ability to print circuitry gives manufacturers a new level of flexibility in designing innovative electronic devices, but technical challenges of joining conductive materials to the 3D printed circuit materials will need to be addressed.

4D printing refers to the concept of using smart or shape-memory materials to print objects that can self-assemble into multiple configurations. The technology is in its infancy, but the ability to transform between multiple shapes represents tremendous potential.
CONCLUSION

Consumer trends come and go, and a technology that is poised to be “the next big thing” in electronics can change in a hurry. What doesn’t change is the need for rapid technological advancement in the pursuit of better, faster, lighter, stronger, and cheaper products. The future promised by cutting-edge consumer technology is contingent on manufacturers consistently finding ways to apply breakthroughs and innovation to deliver new features and functionalities, and create the devices, gadgets, and appliances that consumers can’t live without. As new technologies emerge, and new applications are found for existing technologies, the technical expertise necessary to design and develop new generations of electronics will be broader than ever. Companies will need to leverage expertise across a wide range of manufacturing technologies to be competitive and deliver the products that change the world.

ABOUT EWI

EWI is the leading engineering and technology organization in North America dedicated to developing, testing, and implementing advanced manufacturing technologies for industry. EWI feeds the innovation cycle of electronics manufacturers through technical expertise in materials, micro-scale joining, laser welding and surface finishing, metal forming, and dissimilar materials joining.

2http://fortune.com/2015/01/07/what-do-consumers-want-better-batteries-not-wearables/
3http://www.gartner.com/newsroom/id/3165317
4http://www.idc.com/getdoc.jsp?containerId=prUS25668015
5http://www.gartner.com/newsroom/id/2970917