The Internet of Things (IoT) Provides Valuable Growth Opportunities for All Industries

The Internet of Things (IoT) can be thought of as a network of physical objects or "things" that have been embedded with electronics, software, sensors, and connectivity to enable these objects to collect and exchange data. The IoT allows these objects to be sensed and controlled remotely across the existing network infrastructure. This creates opportunities for more direct integration between the physical world and computer-based systems which results in improved efficiency, accuracy and economic benefit. A key aspect of the IoT is that although each "thing" is uniquely identifiable through its embedded computing system, each is able to interoperate individually within the existing Internet infrastructure.

The IoT will and is currently beginning to impact a wide array of sectors and industries, ranging from automotive to utilities, to reduce inefficiencies and improve performance. Current or near-term applications are only scratching the surface of the way applications or use cases will be impacted.

As it continues to develop, SAI believes that new applications and new inefficiencies will be addressed in other industries not yet known. Key areas impacted today include:

1. **Utilities:** Smart meters for electric power and water, and smart grid enabling better management of resources

2. **Insurance:** Telematics in automotive insurance, leading to more accurate risk pricing

3. **Capital goods:** Reduction of down-time and energy conservation efficiency

4. **Mining:** Monitoring of mining equipment and autonomous mining

5. **Agriculture:** 'Precision agriculture' using data analytics and real-time recommendations for farmers

6. **Healthcare:** Optimization of human capital in hospitals, cost reduction for clinical trials, smart patient monitoring

7. **Factory automation:** Process monitoring and optimization in factories

8. **Lighting:** Smart lighting in residential applications

9. **Leisure:** Improving customer satisfaction and cost control

10. **Retail/Brands/Apparel:** Improved supply chain management and smart marketing

11. **Food retail:** Improved shopping experience, food traceability, operational efficiencies

12. **Consumer Wearables:** Extending brands' digital eco-systems and engaging customers further

13. **Transport:** Smarter logistics

14. **Automobiles:** Connected cars

A number of significant technology changes have come together to enable the rise of the IoT. These include the following.

- **Inexpensive sensors** - Sensor prices have dropped by half to a range of 50 to 60 cents in the past 10 years.

- **Inexpensive bandwidth** - The cost of bandwidth has declined steeply over the past 10 years, enabling more devices to be connected with enough embedded intelligence to know what to do with all the new data generated or receiving.

- **Smartphones** – Have become the personal gateway to the IoT, serving as a remote control or hub for the connected home, connected car, or the health and fitness devices consumers are increasingly starting to wear.

- **Connectivity** - is available for free or at a very low cost, given Wi-Fi utilizes unlicensed spectrum and thus does not require monthly access fees to a carrier.

- **Big data** - As the IoT will by definition generate voluminous amounts of unstructured data, the availability of big data analytics is a key enabler.

- **IPv6** - Most networking equipment now supports IPv6, the newest version of the Internet Protocol (IP) standard that will replace IPv4. IPv4 supports 32-bit addresses, which translates to about 4.3 billion addresses – a number that has become largely exhausted by all the connected devices globally. In contrast, IPv6 can support 128-bit addresses, translating to approximately 3.4×10^{38} addresses – an almost limitless number that can amply handle all conceivable IoT devices.

The largest area of adoption will be in the manufacturing industry for the foreseeable future. The IoT has already been employed by many manufacturers in both discrete and process manufacturing. However, its use will continuing to accelerate with increasing pressure to: automate and drive out inefficiency in manufacturing processes; to develop new revenue streams through creation of remote services; and to improve production uptime.

Some of the most common IoT solutions today are in:

1. Production asset management

2. Manufacturing operations control and measurement

3. Remote diagnostics of industrial equipment and vehicles

4. Plant floor communications to programmable logic controllers

5. Next-generation supply chain management

6. Inventory management

7. Remote maintenance

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