



The Internet of Things and new business opportunities

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Abstract Since the Internet of Things (IoT) is an emerging phenomenon, there is a lack of holistic understanding of what IoT is and what business opportunities it can offer for entrepreneurs and existing companies. This article has three main parts. First, it introduces IoT as a broad, socio-technical phenomenon. As a part of this goal, the article covers various elements within the technological, physical, and socio-economic environments that comprise IoT. Second, this article proposes two approaches for creating new business models using IoT: a sustaining approach and a disruptive approach. The article concludes with a brief reflection on the extent to which the future of IoT can be predicted. This discussion brings up the limitations of the approach for creating new business models outlined in this article and provides guidelines on how this approach should be used. The ultimate goal of this article is to stimulate thinking, creativity, and entrepreneurship in relation to the IoT.

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1. The Internet of things: Opportunities and threats

In March 1875, then-obscure inventor Alexander Graham Bell offered Western Union Telegraph Company President William Orton a patent for Bell's telephone invention at the price of \$100,000, roughly \$2 million today (Carlson, 1994). William Orton turned down the offer. What happened next is history. At the time of Bell's offer, Western Union was the most dominant telecommunications company in the U.S. Within a few years, smaller

companies started to use Bell's telephone invention to cut into Western Union's market share. In an attempt to catch up, Orton attempted to develop Western Union's own version of the telephone. However, this was too little, too late. Western Union was never able to return to the level of prominence it had achieved thanks to its successful business model based on telegraph technology. Today, not too many people remember what Western Union once was. Some think Western Union has always been a service for sending money abroad. The story of Western Union is often used in business texts as an anecdotal proof of how blind business leaders can be in relation to the future potential of a technology (Christensen, Anthony, & Roth, 2004).

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The Internet of Things (IoT)—also called the Internet of Everything or the Industrial Internet—is a new and a potentially disruptive computing paradigm that is likely to change business processes, strategies, and competencies across many industries (Lee & Lee, 2015). IoT has the potential to become a powerful threat even in low-tech industries. For example, who would have thought that wireless sensors for measuring air and soil parameters would be used in farming—a millennia old and previously very low-tech industry? While being a potential threat, IoT can also present entrepreneurs and business leaders of established companies with new opportunities for innovation (Krotov, 2008). Market research companies estimate that the number of devices connected to the IoT will grow from 16 billion in 2014 to 50 billion in 2020, creating a global market for IoT products and services measured in trillions of dollars (Weinberg, Milne, Andonova, & Hajjat, 2015). Given this potential, the main purpose of this article is to educate readers about IoT as a socio-technical phenomenon and discuss possible approaches for creating new value propositions within the IoT paradigm.

2. The lessons from Western Union's story

So why did William Orton turn down what many people believe was the most valuable patent of the 20th century? Did he lack the technical knowledge or business insight to understand how this technology could impact the telegraph business of Western Union? A technology whiz himself and a successful business visionary, Orton understood what the telephone (or acoustic telegraph, as the technology was known at that time) was and how it could potentially impact the telecommunications industry. In a detailed historical account of the story of William Orton and the telephone provided by business historian W. Bernard Carlson (1994), one can clearly see that the story is more complicated than some business writers paint it.

At the time when Alexander Bell made his pitch to Orton, Western Union was facing enormous competitive and legal pressures. Numerous private companies tried to build their own telegraph networks and lure away Western Union's customers via lower prices. The competition was about to become even more intense due to the growing concern of political leaders that Western Union was a monopoly. To make the telecommunications market more competitive, some politicians were proposing to underwrite the creation of companies that could compete with Western Union. Western Union was

even viewed as a threat to national security. At that time, 90% of telegraph messages were transmitted using the company's network (Carlson, 1994). The government was increasingly concerned with Western Union's hypothetical ability to access and even alter the nation's latest information related to business and politics. Bell's father-in-law Gardiner Hubbard, a lawyer and a prominent political activist from Massachusetts, was one of the most vocal critics of Western Union.

Faced with immense competitive and legal pressures, Orton worked diligently to entrench the Western Union's position in the telegraph market. The growing competition created a market for new message transmission inventions. Market participants increasingly believed that a new technology could change the landscape of the emerging telecommunications industry, creating opportunities for smaller players. Because of this, telecommunications executives like Orton were bombarded with new ideas and inventions.

Telephone was one of these promising new technologies. Yet, acoustic telegraph was not the main focus of Western Union at that time. Instead, Orton commissioned Thomas Edison to work on the so-called quadruplex technology—a data transmission mode that would allow Western Union to send four messages simultaneously over a single physical line. Although the quadruplex transmission was the main interest of Western Union at that time, William Orton was quite open to other inventions related to message transmission. In fact, by the time Bell pitched his telephone invention to Orton in March 1875, Orton had already commissioned another employee, Elisha Gray, to develop an acoustic telegraph system (a transmission technology similar the one used by Bell's telephone). By no means was William Orton blind to the emerging telephone technology.

Despite this, Orton was not particularly impressed with Bell's invention. Bell's telephone was not reliable enough for transmitting messages over long distances. Moreover, Orton thought that voice transmission would overload Western Union's existing telegraph lines and distract the company from its core business: sending and receiving short messages for business customers. Once Orton learned that that Bell was associated with his nemesis, Gardiner Hubbard: "Bell was promptly (but politely) escorted out of Orton's office" (Carlson, 1994, p. 170).

Why do business students smile when they hear the story of Orton's failure to embrace the telephone invention? One reason is that they are often not aware of the full account of the events that led to Orton's decision to reject the telephone. This can

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