

# What fax machines can teach us about electric cars

March 7 2017, by Jonathan Coopersmith

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No common standard: CHAdeMO, CCS and Tesla Supercharger plugs. Credit: CHAdeMO: C-CarTom; CCS: Hadhuey; Tesla: Paul Sladen, CC BY-SA

Imagine if you could gas up your GM car only at GM gas stations. Or if you had to find a gas station servicing cars made from 2005 to 2012 to fill up your 2011 vehicle. It would be inconvenient and frustrating, right? This is the problem electric vehicle owners face every day when trying to recharge their cars. The industry's failure, so far, to create a universal charging system demonstrates why setting standards is so important – and so difficult.

When done right, standards can both be invisible and make our lives immeasurably easier and simpler. Any brand of toaster can plug into any electric outlet. Pulling up to a gas station, you can be confident that the pump's filler gun will fit into your car's fuel tank opening. When there

are competing standards, users become afraid of choosing an obsolete or "losing" technology.

Most standards, like electrical plugs, are so simple we don't even really notice them. And yet the stakes are high: Poor standards won't be widely adopted, defeating the purpose of standardization in the first place. Good standards, by contrast, will ensure compatibility among competing firms and evolve as technology advances.

[My own research into the history of fax machines](#) illustrates this well, and provides a useful analogy for today's development of [electric cars](#). In the 1960s and 1970s, two poor standards for faxing resulted in a small market filled with machines that could not communicate with each other. In 1980, however, a new standard sparked two decades of rapid growth grounded in compatible machines built by competing manufacturers who battled for a share of an increasing market. Consumers benefited from better fax machines that seamlessly worked with each other, vastly expanding their utility.

At present, there is not a single standard for plugs to recharge [electric vehicles](#). That means that people who drive electric cars can't rely on refueling at any of a wide range of nearly ubiquitous stations on street corners the way gas-vehicle drivers can. This creates an additional barrier, slowing the adoption of electric cars unnecessarily. Several potential standards are competing in the marketplace now; as we saw with fax systems, the sooner one standard becomes dominant, the sooner the electric vehicle market will take off.

## **Making a new standard**

The two basic approaches to creating standards involve letting the market decide or forging a consensus among participants. Both have benefits and risks. A free-market approach often splits a young market

into several competing and incompatible systems. Believing in their technical or commercial superiority, firms gamble that they will create de facto standards by dominating the market.

In reality, as my research into the first two attempts at standards for fax machines in the 1960s and 1970s showed, competing incompatible equipment can slow the growth of an entire market. In the case of the fax, poorly written standards attempted to codify into common use certain fax machine manufacturers' methods for connecting two machines and sending information between them. As a result, many firms sold machines that could not work with other companies' devices. Some manufacturers even deliberately made their machines incompatible to lock their customers into their equipment.

No single firm dominated the marketplace, and nobody agreed to use a single common standard. As a result, the fax world consisted of several smaller self-contained markets, not one larger market. And many potential users didn't use faxes at all, preferring to wait until an obvious winning standard emerged.

## **Third time's the charm**

Crowning that winner can take many years. So can creating standards by consensus. In the meantime, the spread of fax technology stagnated.

But then a force outside the marketplace began to call for a real fax standard. In 1977, the Japanese government [pushed competing Japanese firms and telephone corporations to cooperate](#) and create one standard. The government then convinced the International Telecommunications Union to adopt this as the [worldwide standard](#) in 1980. What ensued was the fax boom of the 1980s and 1990s.

This standard found two keys to its success. First, it was royalty-free,

meaning any company could adhere to the standard without paying a fee to its creators. (A similar approach decades earlier proved essential for the adoption of [standard dimensions for shipping containers](#).) The Japanese officials and companies calculated that the profits from a larger market would more than compensate for any lost income from the lack of licensing fees.

Second, the standard was not so restrictive as to prevent fax machine manufacturers from introducing other features – such as faster transmission. That allowed companies to compete on more than just price. The result was a continued flow of new, more capable and cheaper machines that attracted new users.

## **The need for a standard for electric cars**

Successfully commercializing electric vehicles will similarly depend on the development, acceptance and implementation of standards. So far, just as happened with fax machines, incompatible chargers have slowed the spread of electric cars.

Depending on the type of car and its age, it may have [one of four incompatible chargers](#). If the charging station you pull up to lacks the appropriate charger for your car, you are out of luck.

People considering buying electric cars already worry about how far they could travel between recharge stops. Then they realize that they can't use just any charging station – the way a gasoline-powered vehicle can use any [gas station](#). That doesn't relieve their concerns and [dampens sales of electric vehicles](#).

## **Developing a standard**

Like fax machines, [electric vehicles' incompatibility](#) reflected both evolving technology and groups of manufacturers promoting their own systems in hopes of dominating the marketplace. Already, the [first generation](#) of chargers is essentially obsolete because they take so long to recharge a car battery.

The real battle is among the three [incompatible fast charging systems](#) available in the United States: the Japanese [CHAdeMO](#), the [European-American CCS](#) and [Tesla Supercharger](#). (China is developing its [own standard](#).)

CHAdeMO works only with Japanese and Korean vehicles like the Nissan LEAF and Kia Soul. CCS works only with European and American cars like the BMW i3 and Chevy Spark. The third system, Tesla's Supercharger, works only with Tesla's own cars. Tesla sells its customers a US\$450 [adapter to use a CHAdeMO](#) charger but does not offer adapters that would let CHAdeMO or CCS vehicles use Tesla charging stations.

## **The end of the battle?**

This three-way split is changing. In the last few years, Tesla has veered from its initial exclusivity to cooperation. In 2014, Tesla announced it would [share its patents royalty-free](#) – including its charger and plug designs – to encourage the spread of electric vehicle technology. In 2015, the company agreed to make its cars and charging stations compatible with [China's new standard](#), possibly by using adapters at charging stations.

And in 2016, Tesla [joined CharIN](#), an industry group promoting the CCS standard. That raised the tempting possibility that the company might allow CCS charging at Tesla stations, probably by providing adapters. It also threw Tesla's significant support behind an effort to

create a new standard for even faster charging. This could lead CCS to market dominance, effectively establishing a standard by out-competing CHAdeMO.

Fax machines needed three generations of standards before real compatibility emerged, thanks to Japanese government pressure to cooperate. For electric vehicles, Telsa's embrace of CharIN may provide that needed pressure. The real winner would be the cause of electric vehicles.

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