

From Railroads to the Speed of Light

It is difficult as an investor to talk optimistically about the Information Revolution after the last two-plus years. The Standard & Poors Technology Sector Index has lost over 70% of its value since March 2000. However, if you had invested in this index from the end of 1994, you would have still averaged a return of 14% per year versus 9% for the broader market. The technology developed during this relatively short time period has already dramatically transformed many aspects of our society and will continue to have a profound impact in the foreseeable future. Regardless, one has to wonder if investing in stocks, and more specifically technology stocks, will reward investors again. A review of the Industrial Revolution and the subsequent rise of the railroad industry may provide some insight.

In an article written in *The Atlantic*, Peter Drucker suggests that “the Information Revolution is now at the point at which the Industrial Revolution was in the early 1820s, about forty years after James Watt’s improved steam engine (first installed in 1776) was first applied, in 1785, to an industrial operation – the spinning of cotton...Almost

everybody today believes that nothing in economic history has ever moved as fast as, or had a greater impact than, the Information Revolution. But the Industrial Revolution moved at least as fast in the same time span, and had probably an equal impact if not a greater one. In short order, [the steam engine] mechanized the great majority of manufacturing processes, beginning with the most important industrial commodity of the eighteenth and early nineteenth centuries: textiles...” Though not as dramatic as Moore’s Law, which states that the number of transistors one can place on an integrated circuit doubles every eighteen months, “the price of cotton textiles fell by 90 percent in the fifty years spanning the start of the eighteenth century. The production of cotton textiles increased 150-fold in Britain alone in the same period. And although textiles were the most visible product of its early years, the Industrial Revolution mechanized the production of practically all other major goods, such as paper, glass, leather, and bricks.”¹

¹ “Beyond the Information Revolution.” Peter Drucker: <http://www.theatlantic.com/issues/99oct/9910drucker.htm>

By the mid-1800’s, manufacturing companies could produce more product with higher quality and at a lower price. In the nascent United States, the only way to distribute these products was through an extensive canal and “roadway” system. Keep in mind, at this time, there were no cars, so this roadway system consisted of dirt paths for the horse and buggies. By 1825, Baltimore (a major seaport) was in fierce competition with Philadelphia and New York. New York had the advantage of the Erie Canal. In 1828, Charles Carroll, the last surviving signer of the Declaration of Independence, began building the Baltimore & Ohio Railroad (a.k.a. the B&O) as an alternative to this canal and roadway system. By 1830, the first 13 miles were complete, but only horse drawn carts moved freight and passengers over the lines. On August 25, 1830, the “Tom Thumb”, a small steam powered locomotive, began to move the freight. By 1840, there were 2,800 miles of track in the United States, and by 1860 there were over 30,000 miles. Despite the Civil War (1861-1865), President Lincoln signed the Pacific Railroad Act of 1862 giving permission to begin the

first transcontinental railroad. By 1869, The Union Pacific Railroad and the Central Pacific joined together to complete the first transcontinental railroad.²

New inventions created within the railroad equipment industry helped fuel the growth of the railroad while making the working environment safer. In 1868, Eli Janney patented a coupler that closed automatically when train cars came together. Prior to its invention, a brakeman had to walk between cars, out of site of the engineer, and put a pin in place to link the cars together. In 1869, George Westinghouse invented the air brake. After several years of improvements and marketing, the railroads began to use it to help stop these heavy trains in a reasonable distance. It also allowed the trains to travel faster. In the 1870's, steel, a much stronger metal, began to replace iron as the metal of choice for the rails. The Bessemer steel making process increased the quantity of steel rail available to the railroads.

With everything seemingly falling into place, the railroads expanded at an incredible pace in the 1880's. Lee Niedringhaus wrote in an article in Financial History, "Railroad expansion in the United States had been reckless during the decade, with

93,000 miles of track laid at the outset and 167,000 miles by 1890, twice the amount per capita of Europe. The investment banks in New York, Boston and London had been busy underwriting new debt, which had doubled during the decade. Railroad directors, on the other hand, were not very concerned about earnings, as savvy railroad men, such as Jay Gould, Russell Sage and many others were making fortunes from stock market manipulation, takeovers, threats of parallel lines and other techniques. The overbuilding also contributed to severe rate wars between the major railroads, which they could ill afford."³

The similarities to today's Information Revolution are too blatant to ignore. The seeds for the present revolution were sewn in 1969 when two scientists at UCLA successfully linked two computers together with telephone lines. At the time, a slide ruler for calculation purposes or the U.S. Postal Service for message communication were faster alternatives than using this "Internet" just as a horse was faster and more powerful than the early locomotives. However, after continued improvements to this base technology combined with new inventions in equipment and

other ancillary fields, the Internet became more efficient by orders of magnitude. Fiber optics replaced copper wire as the transmission means of choice. Now messages could travel at the speed of light, and voice communication was so clear, "you could hear a pin drop."⁴ Personal computers became useful machines. In 1994, the first broadly used web browser (Mosaic) was created. In 1995, Microsoft upgraded its Windows operating system making it user friendly enough for the masses. As more people connected to the Internet, more fiber optics were needed. At this point, I could rewrite the previous paragraph and change the dates, people's names and the word "track" to "fiber" to describe the rest of the 90's.

Going forward, will we continue along parallel tracks with the Industrial Revolution? The overbuilding of the 1880's led to the "Panic of 1893". "Nearly 15,000 companies failed, 500 banks went into receivership, and nearly 30 percent of the country's rail system was financially insolvent. For the next three years, the United States went into deep depression."⁵ Stock data for the time period is difficult to get. Charles Dow and Edward Jones created the first stock index in

² "Railroad History."
<http://www.nationalrrmuseum.org/EdPacket/html/Tguide1.htm>

³ "The Panic of 1893." Lee I. Niedringhaus:
<http://www.financialhistory.org/fh/1998/61-1.htm>, page 2.

⁴ 1985 Sprint slogan.
⁵ "The Panic of 1893." Lee I. Niedringhaus:
<http://www.financialhistory.org/fh/1998/61-1.htm>, page 5.

1884 as a way for the average person to get a feel for how well the economy was doing by giving a reasonable, representative picture of the general market. They published this index in the "Customer's Afternoon Letter" which was the precursor to "The Wall Street Journal." In 1884, the index consisted of 11 stocks, 9 of which were railroad companies. In other words, the railroads were the economy. If the telecommunications industry today had the same weight in the economy as the railroads did then, we would already be in a very severe depression.

The railroads helped the industrial sector of the economy thrive as more markets opened up to many of these companies. In 1896, Mr. Dow and Mr. Jones thought it would be better to separate the railroad stocks into their own index from the other stocks that represent the rest of the economy. The railroad stocks were put in the Railroad Index (now call the Dow Jones Transportation Index) and the other stocks were put in the Dow Jones Industrial Average. In some respects, this first industrial index is akin to the modern day Nasdaq index as these companies were more speculative than the blue chip railroads (that survived). From 1896 to 1916, which is considered the peak year for railroads, the Dow rose from 41 to 110. This is about a 10.4% return per year when you

include dividends, which yielded about 5.3% during that time period. Thus, despite the harshest depression ever to hit the United States up until that time, the economy came back. In many respects, the economy was even stronger than it was before as the industrials helped lower our dependence on the fortunes of the railroad industry.

In addition, the railroads came back. Surprisingly, despite the "overbuilding" of the 1880's, an additional 87,000 miles of track were laid between 1890 and 1916. In fact, this time period could be considered "the 'Golden Age' of railroading. Almost every city and town in America was reached by rail. Almost all passenger travel and freight shipments were by rail...Most of the small rail companies eventually combined into seven major and several smaller systems."⁶ The trains continued their efficiency improvements too. The time to travel from Los Angeles to Chicago was reduced from 60 hours to 39 hours. Time and distance shrank. The railroad system allowed a means to accomplish things that were impossible before. For example, one could sell Californian fruit in Chicago. Competition was no longer local (to a city). It changed American culture in too many ways to articulate here. New technology became

possible. Technology used in the railroad industry was used elsewhere. Eventually, one such technology transfer, the automobile, made the railroads almost obsolete for passenger travel.

This part of history will certainly repeat: Time and space will shrink again. Competition will no longer be local (to a country). American culture will undoubtedly continue to change. New uses of the technology will be created and new technology will obsolete the old. Our country still needs the equivalent of an additional 87,000 miles of track. Although Internet connection speeds have increased for some, it is by no means pervasive. Also, today's "high-speed Internet" isn't fast enough to affect real change. As more people become connected and as connection speeds increase, things will be possible that weren't before. The Napster model of computing could be applied to other "legal" uses. Napster was a piece of software that allowed users to share music files with each other. It was the first truly unique use of the Internet. However, it broke copyright laws. The software utilized a peer-to-peer model of computing where all computers connected with this software were equals as opposed to having one large central computer that did all of the work. By linking computers together with smart software we

⁶ "Railroad History."
<http://www.nationalrrmuseum.org/EdPacket/html/Tguide1.htm>, page 10.

could more effectively harness their power. This network could become so intelligent, we may be able to use it to someday predict the weather or discover the cure for cancer.

The Industrial Revolution led to the rise of the railroads, which led to the most exciting and

dynamic century in history. Computers and the Internet have led to the Information Revolution. While we might not be able to fathom the changes this will bring, we know that in some aspects, the more things change, the more they stay the same. For example, one rudimentary business use of the

Internet is commerce. A buyer's computerized inventory system in Chicago can order fruit from a farmer in California without human intervention. The fruit is then transported...by rail.

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