

The Investors and Entrepreneurs of the Industrial Revolution

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ABSTRACT

The Industrial Revolution was the work of inventors and entrepreneurs. Inventors produced the ideas and machines for the productive process, but entrepreneurs sponsored inventors, put inventions to effective use, and exploited the full potential of inventions. Because entrepreneurs were necessary to convert inventions from mere novelties to widely-used, viable instruments that significantly improved the productive process, this essay argues that entrepreneurs were more important for facilitating the Industrial Revolution than inventors. However, some exceptional inventors distinguished themselves by becoming entrepreneurs and transforming the productive process on their own.

Introduction

In his 1803 edition of *Traité d'Économie Politique*, the French economist Jean-Baptiste Say wrote: “Mere knowledge of the technological information that underlies innovation is insufficient...It also requires the appearance of an entrepreneur with the means necessary to transform the knowledge into practice” (Lowrey & Baumol, 2013). The inventor provides the idea, but the entrepreneur commits the capital and labour needed to transform the idea from just a curiosity into a practical tool that invites widespread use and greater productivity. A working relationship between inventors and entrepreneurs was essential to produce the economic changes of the First Industrial Revolution (1750-1830) and the Second Industrial Revolution (1870-1914). Although inventors introduced promising ideas and machines, entrepreneurs were arguably more important in this relationship, because many inventors needed to satisfy entrepreneurial interests to sell patents and entrepreneurs applied the intellectual resources of inventors to industry.

Background

Inventors continue to play an important role in modern industry. Many choose to work as researchers or engineers for well-established companies, and others lead startups or small businesses that promise innovation. Widespread economic disruption brought by the COVID-19 pandemic has forced thousands of small businesses to close, while a few massive corporations have grown. The relationship between business owners and inventors is changing, as large businesses gain greater prominence while small enterprises disappear. An analysis of the largely unequal relationship between entrepreneurs and inventors during the First Industrial Revolution may improve our understanding of current circumstances. Some historical sources value the innovations of inventors for causing industrialization, while other sources focus on the contributions of entrepreneurs instead. These differences pose an interesting question: were entrepreneurs or inventors more important for facilitating the Industrial Revolution? In many cases, the inventor played a subordinate role to the entrepreneur, although there existed exceptions in which the inventor, by assuming the role of an entrepreneur, achieved prominence. Nevertheless, this study concludes that during the Industrial Revolution, entrepreneurs were generally more important than inventors from a practical standpoint, posing implications for the present day.

Methods and Results

To access information on the Industrial Revolution, I used the JSTOR database and inputted different combinations of these keywords: “Industrial Revolution”, “entrepreneurs”, “inventors”. After reading through several sources and recording notes, I began inputting new keywords based on those notes: “steam engine”, “George Stephenson”, “Bessemer process”, “locomotive”. To narrow down search results, I searched by the subjects: “American Studies”, “British Studies”, “Business”, “Economics”, “Engineering”, “European Studies”, and “History”. My results, which were sorted by relevance, were mostly journal articles and book chapters that had been published during the twenty-first century or the twentieth century. I chose to study the sources that were most related to the topic.

Discussion

The evolution of the steam engine over the eighteenth century shows how the vision and capital of entrepreneurs motivated inventors to create a machine to satisfy business needs. As early as 1690, inventors like Denis Papin and Thomas Savery speculated that machines with pistons moved by steam could perform work at little cost (Kerker, 1961). Savery’s claim that such a machine could pump water from mines, which had the major problem of flooding, interested mine-owners, but his first steam-powered pumps had very limited lift height and often exploded. Nevertheless, a connection between inventor and entrepreneur emerged at this point when the concept of a steam engine began to translate into something commercially viable. In 1712, Thomas Newcomen, a working-class inventor with little formal education, adapted Savery’s model into a practical version that started earning money for profit-oriented mine-owners and businessmen who had bought Savery’s patent (Kerker, 1961). By 1725, Newcomen’s engines received widespread use in mining by 1725, showing that the commercial success of inventors depended on the satisfaction of entrepreneurs. In a sense, inventors like Savery and Newcomen were workers who needed to present an acceptable product to the bourgeoisie which sponsored them. The relationship between inventor and entrepreneur takes shape with the partnership between the inventor James Watt and the avid entrepreneur Matthew Boulton. Watt recognized a way to make the Newcomen engine much more efficient, but lacked the tools, workmen, and money needed (Scherer, 1965). He shared his ideas with Boulton, who needed a steam engine to pump water for his factory. Boulton chose to fund Watt and provided him with the facilities and craftsmen needed to develop a working engine that performed the same work as a similar Newcomen engine with only a quarter of the fuel (Scherer, 1965). Boulton also lobbied Parliament to extend Watt’s patent and marketed Watt’s work, convincing several mines to wait for Watt’s invention rather than purchase Newcomen engines. Mines in Cornwall, where fuel was expensive, quickly began to adopt Watt’s fuel-efficient engines. After Boulton saw a water-powered copper mill that summer droughts left inoperable, he urged Watt to modify the engine into a rotative version that they could sell to mills (Scherer, 1965). As a result, Watt redesigned Newcomen’s engine into a much more efficient version that could drive machinery without a waterwheel, allowing new factories to open away from rivers and accelerating the First Industrial Revolution. From 1775 to 1800, the Boulton & Watt firm installed about 450 steam engines in mines and factories (Scherer, 1965). By extending Watt’s patent, publicizing Watt’s product, encouraging Watt to revamp his invention, and, most importantly, providing Watt the capital needed to create a marketable engine, the entrepreneur Bolton ensured the development and diffusion of Watt’s engine, which radically stimulated the growth of large-scale industry in Britain and advanced the Industrial Revolution.

The growth of the steel industry during the Second Industrial Revolution shows the importance of entrepreneurs, who put the ideas of inventors to effective use often through much trial and error. Henry Bessemer reportedly had a conversation with Napoleon III about the necessity of steel for better artillery, but at the time steel was too expensive to build large items like cannons. After conducting testing with equipment provided by the steam-engine manufacturer W & J Galloway and Sons, Bessemer patented the Bessemer process in 1856, which he promised would

produce large quantities of cheap steel (“Mr. Mushet,” 1865). However, the first five iron companies that he licensed his patent to struggled to produce good quality steel with his method. While Bessemer spent tens of thousands of pounds on experiments failing to solve the issue, the businessman Robert Forester Mushet discovered a simple fix after thousands of experiments at his foundry (“Mr. Mushet,” 1865). Mushet’s fix improved the steel’s quality and made the Bessemer process economically viable. In this case, technical challenges prevented a seamless transition from invention to production, and it was the entrepreneur, not the inventor, who resolved these challenges. In 1857, Mushet’s business produced the first durable rails out of steel instead of cast iron, which proved their worth at Derby railway station by lasting sixteen years instead of the typical three-to-six months of cast iron rails (“Mr. Mushet,” 1865). After Mushet fixed the Bessemer process, some innovative entrepreneurs from the United States, notably Andrew Carnegie, recognized the promise of the process and set up several Bessemer steel mills, which significantly reduced the cost of steel from \$100/ton in 1873 to \$18/ton by the 1890s (Sisson, 1992). Before Carnegie’s Bessemer steel mills, the US produced about 157,000 tons of steel annually. By 1910, American steel companies were producing about 26 million tons of steel annually (Sisson, 1992). Bessemer steel became the primary construction material for railroads, since steel rails were several times more durable than iron and could carry heavier locomotives, which allowed for longer trains and greater distribution capacity. Railroads built with Bessemer steel opened sparsely populated regions in the US to settlement and trade, creating more industrial activity (Sisson, 1992). Bessemer may have designed the original process that eventually led to all this, but the Galloways provided Bessemer with the means to develop the process, Mushet modified the process into something workable, and Carnegie implemented the process on an industrial scale to build an American steel empire. Therefore, by producing cheap Bessemer steel for railroads and buildings during the Second Industrial Revolution, entrepreneurs contributed more to the commercial success of the Bessemer process than the inventor Bessemer himself.

Inventors usually brought their techniques and machines to entrepreneurs who could use their resources to turn the idea into something practicable to advance industrialization, but sometimes, an inventor was forced to take on the role of the entrepreneur due to a lack of interest from established businesses to innovate. After Watt’s rotative steam engine, inventors began to tinker with the concept of steam-powered locomotives. In 1812, the inventor Matthew Murray improved upon Richard Trevithick’s steam-powered locomotive, the engines of which were too heavy for cast iron rails, and created the first commercially used locomotives for the Middleton Colliery (Rolt, 1962). These early locomotives had issues and limitations however. They could only haul a small load, so the weight would not break the iron rails. Out of Murray’s four locomotives, two exploded and the other two grew unreliable after twenty years, so the colliery returned to horse haulage by 1835 (Rolt, 1962). These first locomotives inspired George Stephenson, a self-educated inventor of working-class origin who made key improvements to the design of the locomotive and rails. He distributed weight across several wheels and realized the need for rail tracks to be as level as possible (Pridmore, 1979). His successful work, *The Blucher*, and his persuasion impressed the directors of the Stockton and Darlington Railway, and they changed their plan of using horses to using a steam locomotive to haul coal carts (Pridmore, 1979). Here, the inventor not only imparted vision to the entrepreneur, but resolved the technical challenges and made the steam locomotive practical for businesses. The rail company’s new plan needed a manufacturer to produce the locomotive, and since no such manufacturer existed yet, Stephenson founded the first locomotive manufacturing company, *Robert Stephenson and Company* (Pridmore, 1979). Stephenson completed the first commercially successful locomotives and used more durable malleable iron rails to increase distribution capacity. Other rail companies, recognizing the large profits that a steam locomotive could earn in place of horses, began recruiting Stephenson’s company to build their rail lines and locomotives (Pridmore, 1979). Stephenson interestingly faced opposition from certain businesses during this period, as the owners of Bridgewater Canal, turnpike trusts, and coach companies attempted to sabotage the construction of a nearby railway that could pose an economic threat to them. Due to the objections of Bridgewater Canal trustees and Parliament, Stephenson constructed an alternate route through a peat bog, Chat Moss, which was thought impossible (Pridmore, 1979). The inventor not only became an entrepreneur, but successfully overcame his competitors. *Robert Stephenson and Company* built steam locomotives for Britain, the US, much of Europe, and Egypt over the nineteenth century, stimulating the Industrial Revolution by enabling efficient

transport of raw materials and finished products. Stephenson's career was responsible for both insightful innovations and the commercial success of the steam locomotive, proving that an exceptional inventor could impact the course of the Industrial Revolution more than non-innovative entrepreneurs.

Conclusion

In most cases, the inventor was less important than the entrepreneur who sponsored him, since innovative entrepreneurs invested the capital and labour necessary to put promising inventions to effective use. This service from the entrepreneur, not the invention on its own, led to greater productivity and industrialization. From a socioeconomic perspective, inventors were also subordinate to entrepreneurs, since inventors sold their intellectual property and labour to entrepreneurs. Entrepreneurs made this intellectual property commercially viable often through much trial and error. By enabling the technological shifts of the Industrial Revolution with their capital and vision, entrepreneurs were therefore more important than inventors, although a few exceptional inventors could prove their importance by escaping their subordinate role and becoming entrepreneurs themselves.

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