

Industrialization of the Construction Industry

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The quality of life for every American relies on the products of the U.S. construction industry. The construction industry accounts for between 4 to 7 percent of the Gross Domestic Product (GDP) annually in the United States over the past 10 years and employs 5 to 9 million workers or 3 to 6 percent of the total U.S. workforce. But such a key industry is under constant pressure to improve productivity, reduce cost, and minimize waste in the operation. While the productivity in the manufacturing industry has improved by 400 percent over the last century, the construction industry's productivity has, in the best case, stayed flat or turned negative (Figure 1).

One main reason for the improvement of the manufacturing and other industries' productivity is the "industrialization" of those industries. The manufacturing industrialization led by American Society of Mechanical Engineers (ASME) from the late 1800s advanced productivity and lowered the relative price of an automobile dramatically. The cost of an automobile has gone from 140 percent in 1910 of the average national per capita income in the United States down to 33 percent in 2012, but for the construction industry, the cost of an average dwelling has gone up from 333 percent to 619 percent of per capita income during the same period.

According to a study conducted by the National Research Council of the National Academies on behalf of the National Institute of Standards and Technology (NIST), the two main challenges and obstacles facing the construction industry were fragmentation of the industry and lack of interconnectivity and interoperability of projects:

- Huge number of construction companies vs. small number of workers per company make it difficult to apply new technologies, best practices, or other innovations across a critical mass of owners, contractors, and subcontractors.
- Four segmented sectors—residential, commercial, industrial, and heavy construction.
- Diverse and fragmented set of stakeholders: owners, contractors, users, etc.
- Segmented processes: planning and financing, design, engineering, procurement, construction, operations, and maintenance.
- Variation in the standards, processes, and technologies required by states and different projects.
- Lack of industrywide strategy and effective performance measures tasks and projects.

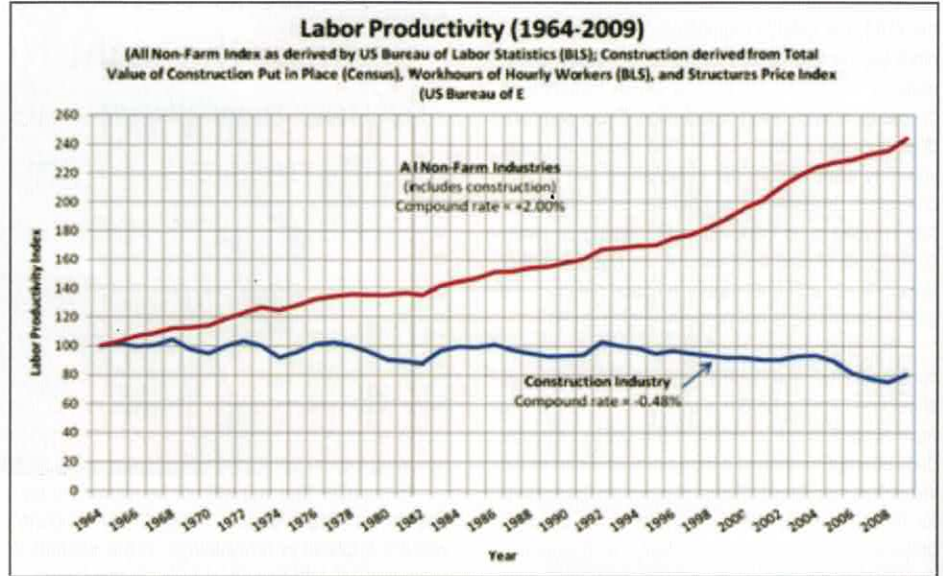


Figure 1

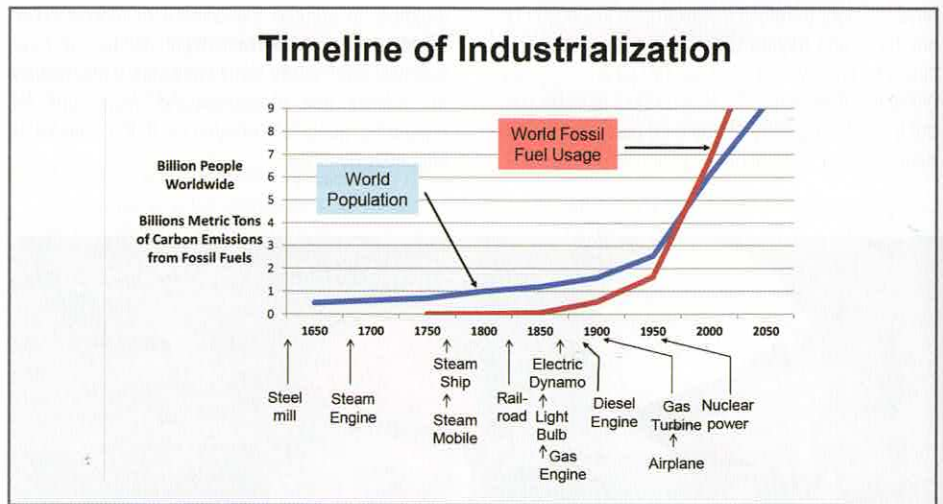


Figure 2

Furthermore the same study identified solutions for breakthrough improvement of productivity in five areas:

1. Widespread deployment and use of interoperable technology applications.
2. Improved jobsite efficiency through a more effective interface of people, processes, materials, equipment, and information.
3. Greater use of prefabrication, preassembly, modularization, and offsite fabrication techniques and processes.
4. Innovative, widespread use of demonstration installations.

5. Improved performance measurement to drive efficiency and support innovation.

These findings are very much in line with what the manufacturing industry had realized after the advent of industrialization. The Industrial Revolution, started in the mid-1700s (Figure 2), brought the first time in the human history that production levels were higher than self-consumption of the working man, changing increased population from a liability in the traditional Malthusian economy to an asset in the traditional Adam Smith's view, or capitalistic economy.

Continued on page 38.