

Chapter 1 The world's oldest profession

it's how we make things
it's built our society
manufacturing

Look around yourself right now. Look around and take note of the things you see. Look especially closely at the things you use every day. Even though I'm not sitting with you at this moment I know something about almost all of those things, they were manufactured!

Our entire society is built with manufactured goods. Society as we know it could not even exist without manufacturing and it is the profession – manufacturer - that began it all.

I would argue that it was the first hunter gatherer who traded finely crafted arrow heads or spear tips for a share of the hunt who was the first professional. Making manufacturing the world's

oldest profession, despite the ravings of Rudyard Kipling.

What is manufacturing?

A Google search for the phrase “define manufacture” returns upwards of 70 million responses in about a half of a second (at least it did just now as I’m writing this chapter.) Merriam-Webster lists the first definition as

“to make a product suitable
for use”

, and the Oxford English Dictionary says

“The making of articles on a
large scale using machinery”

Both dictionaries state that if you manufacture you must make something. All manufacturing engineers and companies know that the use of machinery is optional and the companies that succeed know that the word **product** is key when we manufacture. You see **product** implies customer and without customers there is no point in manufacturing.

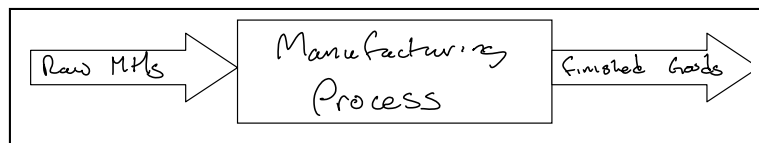
Merriam-Webster, but not the OED, goes on to indicate manufacturing requires *raw materials*. This may be one of the reasons that we won the Revolutionary War, a better understanding of raw materials and manufacturing...

For this text we will consider manufacturing to be:

The process or processes used
to transform raw materials
into something somebody else
wants

Without a customer there is really no point manufacturing anything, because manufacturing is done by companies and companies have expenses. If they don't pay their expenses either the bank or the government will close them down and they will lock the doors for them too.

In this most basic sense manufacturing is really any activity where raw materials are transformed



into finished goods, goods that someone else

wants. The way we know that someone else, our customer, wants the goods that we have manufactured is that they pay us for them. Viewed in the abstract this makes any manufacturing process like a transfer function with an input and an output.

In most instances the raw materials have gone through some previous process and the finished goods or the product of the current process will move to another process as raw materials. The Big Mac® for example was assembled (assembly being a manufacturing process) from previously processed materials:

- beef,
- sauce,
- lettuce,
- cheese,
- pickles,
- onions, and a
- bun.

The previous process for the raw material lettuce was washing and cutting. The beef, well that was

butchered, ground, formed in to patties, flash frozen, shipped to your local “restaurant”, warehoused in the freezer, and finally heated, then stored again before being assembled into that famous burger that was served to you.

It’s possible the process has changed since I had direct experience as a poor college student working for beer money but I doubt it has changed much.

Mac Donald’s is probably one of the most successful manufacturing companies in the world. Mostly because they understand their customer and the customer’s “needs.”

Manufacturing processes can range from assembly, simply putting components together, to innovative new processes where materials are printed in 3D or even microscopic processes involved in making MEMS Devices and today’s computer chips. There are literally tens of thousands of processes in the world that can be considered manufacturing processes. In this test we will only consider a handful of these processes but we will look at some

of the processes which are the most important in the world today and into the foreseeable future.

No matter what you are making, manufacturing requires:

- raw materials
- a transformation process, and
- a customer.

Manufacturing is almost always conducted by companies, these companies may employ tens or even hundreds of thousands of people, or may operate as sole proprietorships, but they all have one thing in common.

If for any extended period of time the total cost of the raw materials and the operation of the transformation process exceeds the revenue from sales they will fail.

At the time of this writing 17% of the GDP of the Commonwealth of Massachusetts, my home state, is produced by manufacturing companies. Not

only that, most of those companies have fewer than 50 employees.

Some of these companies operate at the edge of failure and others generate millions of dollars of net cash to their owners. It often comes down to management, systems, and a fundamental understanding of manufacturing science and engineering to determine which fail and which prosper. Throughout this text I intend to give you, the tools and understanding it will take to make sure the companies you work for or own will be among the latter.