ECONOMIC EFFICIENCY AND MANUFACTURING EFFECTIVENESS ARE THE NECESSARY ASSUMPTIONS OF COMPANY’S SURVIVAL

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Abstract

This contribution is about the two main themes that every company has to understand, because without understanding this, it is very problematic to produce on the competitive level. Contribution consists of 2 general sections. First part treat with the economic and the technological efficiency as the two best-known forms of efficiency. Second part is about the manufacturing effectiveness and you can find there the scheme of classic production process with their basic elements.

Key words

Economic efficiency, manufacturing effectiveness, technological efficiency, and production process

Introduction

In the face of increasing competition, manufacturing companies have to consider new methods of increasing the value of their products. [1] Improved production efficiency to reduce costs, and higher product specification to raise levels of quality are needed to maintain existing business.

The increase in business competitiveness is forcing manufacturing companies to adopt new technologies to redesign business processes, improve products, and support organizational changes necessary for better performance. [2,3] To implement their strategic vision (take advantage of strategic opportunities and address problems) manufacturing companies have to implement changes to their business processes, products, and/or to the organization itself.

Economic and technological efficiency

Economic efficiency is a term typically used in microeconomics when discussing product. Production of a unit of good is considered to be economically efficient when that unit of good is produced at the lowest possible cost. Later economics literature gives a useful introduction to the difference between economic efficiency and technological efficiency. There are two concepts of efficiency [6,8]:

1. Technological efficiency occurs when it is not possible to increase output without increasing inputs. Technological efficiency is an engineering matter. Given what is technologically feasible, something can or cannot be done. Technological efficiency is measured by the ratio of units of output to units of input [9]:

   Technological efficiency = \frac{\text{Units of output}}{\text{Units of input}}

2. Economic efficiency occurs when the cost of producing a given output is as low as possible. Economic efficiency depends on the prices of the factors of production. Economic efficiency is defined as the ratio of the value of output to the value of input [9]:

   Economic efficiency = \frac{\text{Value of Output}}{\text{Value of Input}} = \frac{(\text{Price of output}) \times (\text{Units of Output})}{(\text{Price of input}) \times (\text{Units of Input})}

Something that is technologically efficient may not be economically efficient. But something that is economically efficient is always technologically efficient. A key point to understand is the idea that economic efficiency occurs "when the cost of producing a given output is as low as possible". There's a hidden assumption here, and that is the assumption that all else being equal. A change that lowers the quality of the good while at the same time lowers the cost of production does not increase economic efficiency. The concept of economic efficiency is only relevant when the quality of goods being produced is unchanged.

When the companies wants to work on the high production level, they have to distinguish two deferent efficiencies [10]:

- Static Efficiency,
- Eco-efficiency.

Static efficiency exists at a point in time and focuses on how much output can be produced now from a given stock of resources and whether producers are charging a price to consumers that fairly reflects the cost of the factors of production used to produce a good or a service. There are two main types of static efficiency:

a) Allocation efficiency is achieved when the value consumers place on a good or service (reflected in the price they are willing to pay) equals the cost of the resources used up in production. Condition required is that price = marginal cost. When this condition is satisfied, total economic welfare is maximized.
b) Production efficiency refers to a company’s costs of production and can be applied both to the short and long run. It is achieved when the output is produced at minimum average total cost.

Eco-efficiency of production is an important concept both from the viewpoint of society and business community; but as yet, there is no unambiguous way to its measurement.

When someone wants to consider about manufacturing effectiveness, he has to first understand the term of efficiency and especially economic efficiency. [7]

Efficiency is a relative term. It is vital that this point be understood. Efficiency is never absolute; it is always relative to some criterion. Economists are interested in economic efficiency for two reasons:

1. Positive,
2. Normative.

The positive reason is based on the observation that people search for value. On the theoretical level, we have seen this search for value in discussing utility maximization and profit maximization. The search for value is the driving force of market (and perhaps most no market) economies. If there are situations in which there is unexploited value, that is, value that is possible but which no one obtains, the economist needs to explain why someone does not find a way to capture this value.

The normative reason stems from a desire to make policy recommendations. It is possible to discuss some aspects of policy without normative assumptions. An economist can predict, for example, whether a policy will or will not achieve the goals set for it.

But economists often want to do more. They often want to compare two policies or two situations and decide which is better. To decide which is better requires some sort of basis for ranking situations. [11] Thus, if they want to ask whether government regulation of utility prices, a tariff on steel, or a program to train unskilled workers helps society, economists need a criterion on which to base their answer. Economists generally use the criterion of economic efficiency to evaluate situations, though they often supplement it with other considerations because economic efficiency is not the only way to judge the relative merits of two situations. The value maximized in the notion of economic efficiency reflects the goals that people have. The concept of economic efficiency treats all goals as equally valid; no goals are considered better than other goals.

Manufacturing effectiveness

Over the past decade, competitive businesses have worked hard to reduce the amount of “capacity fat” and “inventory fat” in their supply chains. [15] These initiatives have led to dramatic improvements in operational efficiency and the emergence of today’s increasingly lean and responsive supply chain. They are an important step toward competitiveness. But to achieve full competitive status, a company must integrate its supply chain into its manufacturing operations. [12,15]

As supply chains continue to become leaner and the level of fat (inventory, capacity, labor) continues to drain, companies whose manufacturing capabilities cannot respond quickly to variable demands become increasingly vulnerable. [15] These companies are now searching for ways to integrate all their manufacturing activities and connect them with the supply chain. But the majority of point solutions available to help them address this problem are inadequate to the task because they work only in very localized environments and fail to have wide industry application. That’s why, to date, most supply chain projects have focused on generating savings through inventory optimization (by reducing raw material, work-in-process, and finished goods). But far greater savings are possible by linking manufacturing to the supply chain. [15]

In typical manufacturing companies, around 40% to 70% of the total assets in the supply chain are fixed (plant and machinery). [12] Companies that leverage these fixed assets productively are capable of generating higher-than-normal returns. Some of the world’s foremost automobile companies (known for their lean production philosophy) and some of the world’s most efficient computer manufacturers (known for their mass customization and flexible manufacturing capabilities) have been leveraging their manufacturing competence to generate financial benefits that far outstrip those generated by their peers.

Adaptive manufacturing enables companies to produce goods efficiently and manage variability proactively. Efficient production requires a system with efficient planning and execution capabilities. Proactive management requires a system that can rapidly sense and respond to any exceptions that impact manufacturing while continuing to incorporate learning into manufacturing processes. [12,15] To create a manufacturing process that is continuously adaptive, companies have to [15]:

Intelligently leverage applications and technology to connect “plan-execute-sense-respond-learn” operations,
Seamlessly link factory processes, production equipment, and factory systems to supply chain operations

Adaptive manufacturing must be managed as an end-to-end, closed-loop process with tight linkages between the manufacturing applications, other adjacent enterprise applications, and—most importantly—the technology that enables these applications across the distributed manufacturing base. [14] Such integrated networks enable the process visibility and collaboration capabilities that are key to building an adaptive manufacturing enterprise. [15]

When we want to reach high manufacturing effectiveness, we have to consider basic relations that are in the production process. Figure 1 illustrates the classic production process in the companies. [15]

Conclusion
In the last decades we have seen the dramatic impact of technology on productivity. The efficiency benefits of push manufacturing, the quality benefits of lean manufacturing, and the responsiveness benefits of flexible manufacturing have all become plain market qualifiers. [13]

Adaptive manufacturing is the key characteristic driving this success. Adaptability has two primary characteristics, flexibility and velocity. Flexibility enables a manufacturing unit to scale efficiently while velocity determines its ability to switch operational modes rapidly and to transition between modes such as high-volume/low-mix to high-volume/high-mix product loadings. [16] Adaptive manufacturing enterprises are expected to achieve required flexibility and velocity by linking technology to factory processes, production equipment, and factory systems. This integrated technology will allow them the profitable manufacture of products for increasingly time-sensitive and competitive markets.

While improving efficiency can lead to higher levels of goods and services for society and associated improvements in one’s standard of living, there is no historical evidence that it leads to conservation.

Under these circumstances, efficiency improvements could be best thought of as a “necessary but insufficient” step towards sustainability. Improved efficiency is necessary to provide the essential goods and services that are needed by the developing world.

Figure 1: Classic production process and their influence on effectiveness [modified by 4,5]
Literature


[16] www.star-prototype-china.com

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