


# Impact of Energy Management on Business Performance

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Article Type: Research Article

Vol 4 (Issue 2 ) 2022: 62-70

 10.5281/zenodo.7429424

Cite as: Yucel, M. (2022). Impact of Energy Management on Business Performance. Quantrade Journal of Complex Systems in Social Sciences, 4 (2) , 62-70. Doi:10.5281/zenodo.7429424

Received: 09.11.2022

Revised: 09.12.2022

Accepted: 11.12.2022

## Abstract

Businesses have had to compete with many businesses not only in their possess countries but also around the world, as a result of globalization. In addition to the human, technological, and capital resources required for global success, the most important resource is energy. As civilization progressed, the need for everyone to use energy efficiently and rationally grew due to factors such as increasing energy demand, diminishing natural resources, and the threat of global climate change. Businesses that are conscious of controlling their energy costs have taken a more rational approach than institutions that place a low priority on this issue. Energy management is a strategic management application that expresses the sum of all measurements and management, including details and technical systems, applied in a planned manner to reduce energy consumption in an organization to the lowest possible level, which has a positive impact on business performance. Business performance, on the other hand, expresses efficiency, quality, customer satisfaction, employee satisfaction, and profitability. The purpose of this paper is to theoretically explain how energy consumption affects business performance.

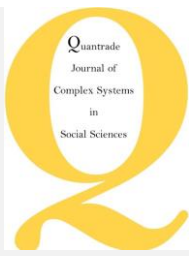
**Keywords:** Energy Efficiency, Energy Saving, Energy Management, Business Performance.

## 1. Introduction

Energy, which is at the heart of most globalization-related changes, emerges as a basic input in all areas of social and economic life, including security, health, tourism, production, education, and supply. Indeed, the increase in mass production opportunities as a result of the industrial revolution, as well as the increase in trade volume as a result of globalization, increased the demand for energy. Energy, which is one of the primary drivers of many global developments, is used as a basic input in many aspects of economic and social life, including production, supply, health, security, tourism, and education. The need for energy has risen day by day as a result of increasing trade volume owing to mass manufacturing opportunities and globalization driven by the industrial revolution, and many industries have become dependent on energy supplies. As a result, delivering dependable and sustainable energy remains an essential issue that has become the focal point of mankind in the twenty-first century, with individual, organizational, national, and global aspects. In this context, it is well understood that one of the most critical challenges in businesses is the cost of energy. Indeed, it is obvious that states that have managed to keep their energy prices low give a considerable competitive edge to their businesses (Melo et al., 2012). With the influence of rising energy costs on this axis, industrial enterprises that were not constructed with energy management in mind, particularly in feasibility studies, are having challenges.

It is more likely to avoid the difficult competitive climate caused by energy management practices that do not include energy prices. As a result, every use must be energy-efficient. Sustainable energy expenditure as fulfilling energy expenditures, methods of destroying future data attributes to satisfy specifications The use of energy consumption and more efficient energy usage are the two primary components of sustainable energy (Ediger, 2009). The savings studies that will be conducted in this area will boost competitive power by optimizing energy costs (Cengiz and Mamiş, 2015).

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Furthermore, the intense usage of energy produces issues that endanger human health and the environment. The efficient use of energy in businesses would reduce environmental concerns, avoid the depletion of natural resources, and promote sustainable businesses as an economic production system (Erdal et al., 2007).

## 2. Literature Review

The continuous increase in the demand for energy sources during the globalizing world order has brought sustainability in energy supply to the agenda for both businesses and states. As for businesses, energy is vital as one of the fundamental inputs in almost every sector. Therefore, energy costs directly affect the profitability of an enterprise (Yücel, 2017). It is clear that countries that can keep their energy costs low provide their own companies with a competitive advantage (Melo et al., 2012). In this context, it is vivid that there is a strong relationship between the energy supply security of countries and their national security. The strong relationship means that when there is an inadequacy in providing energy supply, economic and political stability will deteriorate concurrently. This situation creates an intense competition environment in ensuring energy supply security (Erdoğan, 2017). Accordingly, in order to gain economic superiority in the global arena, increase the level of welfare, and increase the level of development, countries have to ensure their energy supply security. As a result, this emphasizes that sustainability in the energy supply is essential.

Energy supply security, which primarily expresses the availability of energy resources in the required amount, cost-effectively, uninterruptedly, and sustainably (UNDP, 2000), is also defined as providing uninterrupted physical access at a price that all consumers can afford within the framework of the goal of sustainable development for a well-functioning economy (European Commission, 2000).

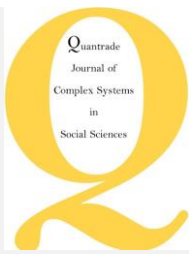
On the other hand, the fact that fossil fuels are still the most used energy sources today jeopardizes the principle of sustainability. As the formation of fossil fuels requires many years, these resources carry the risk of being depleted (Akova, 2010). In addition to being depletable, the threats posed by fossil fuels that cause carbon emissions are not limited to this. For example, natural gas, despite having more affordable production cost and less carbon emission compared to coal or oil (Seddon, 2006) and being preferred more and more in the last fifty years, has various sectoral concerns such as obsolete infrastructure, unreliable transactions because of third party inclusions, price fluctuations. This situation jeopardizes sustainability, so the energy supply security (Zehir et al., 2022). In order to survive in the noted circumstance, both businesses and countries develop various strategies and try to contribute to their sustainability.

### 2.1. Energy Strategies of Countries in the Global Market

Governments implement numerous strategies to ensure the uninterrupted, affordable, and sustainable availability of demanded energy, called energy supply security. One of these strategies is named diversification. It refers to diversifying both the primary energy sources used and the suppliers for imports (Guliyev, 2012). Therefore, countries aim to avoid being dependent by investing in different sources for energy production and also pay attention to importing from diverse suppliers and through various intermediaries as much as possible.

In addition to diversification, developing relevant projects for the effective implementation of energy management is another crucial strategy applied to ensure energy supply security (Albayrak, 2011). It is noteworthy that countries, which are not rich in fossil energy resources and mostly have to obtain these resources through imports, tend to focus on energy saving and energy efficiency, as well as renewable energy investments. For example, EU countries, which show high sensitivity to environmental pollution and climate change, are expressing significant efforts in energy saving and energy efficiency to encourage projects to reduce their greenhouse gas emissions to zero in the long run (European Commission, 2018). Another common strategy is reserving energy resources both by production and import as strategic reserves as much as possible (Albayrak, 2011).

In Turkey (IEA, 2021), which has a severe risk of supply security with a high import dependency level in the oil and natural gas of 93% and 99%, respectively, the strategies mentioned have been included in the development plans in order to overcome this problem (Devlet Planlama Teşkilatı, 2000; Resmi Gazete, 2006; Kalkınma Bakanlığı, 2013; Strateji Bütçe Başkanlığı, 2019). Especially in the 11th development plan, which was last published, the energy issue took extensive coverage, and numerous agendas took place on energy trade, renewable energy sources, domestic and national production, energy efficiency, infrastructure improvements, and energy management standards (Resmi Gazete, 2019).



## 2.2. Use of Energy in Businesses and Global Strategies

The energy issue, which has strategic implications in the dimension of states, is also vital for businesses in competitiveness. Increasing energy prices, energy-related taxes, carbon levies, and risks of climate change are some of the elements of this vitality (Bierer & Götze, 2012). The energy needs of each business differ depending on the sectors, as it is used in various processes such as heating, cooling, lighting of homes and workplaces, production, and transportation. In large industrial enterprises, the energy cost reaches severe figures for several reasons, such as the large area to be heated or cooled, numerous tools and equipment, and the energy-intensive machines demanding a high amount of energy. For instance, a facility that operates two shifts a day, six days a week, and fifty weeks a year costs more than a million dollars in energy per year (Laitner, 2013). For this reason, it is essential to determine the energy consumption in enterprises. Consumers who engage a large portion of their income for their energy bills, especially companies where operating costs represent a significant share, tend to maintain control of their energy costs. Businesses can save around ten or twenty percent on their energy bills with small operational changes. Energy projects with a capital cost payback period of two years or less can often provide additional savings of twenty or thirty percent. In many cases maintaining energy costs will save energy consumption and polluting emissions (Turner, 2001).

While many companies do not hesitate to spend money, time, and effort attempting to increase sales, they neglect the potential savings by maintaining energy costs. In the last two decades, energy management significantly developed with its supporting functions, especially in industrial companies. In the past, when energy prices were low and not volatile, energy costs were only a modest portion of total production costs. For managers, energy costs had little importance in the production process. Therefore, it was an overhead rather than a cost category for managers (Schulze et al., 2016).

Production costs were often a minor priority when businesses operated in competitive markets. Even in highly competitive markets where production margins are vital, a focus on reducing labor and material costs is more common. On the other hand, energy costs were often considered an uncontrollable overhead or a low priority (Etsu, 1999). Nevertheless, conscious businesses for controlling energy costs will show a more rational approach. More or lesser energy costs can be controlled, unlike raw material input. Constant monitoring will help to understand that the energy load in an organization is not always the same. Energy loads vary when the production is at different capacities (Li, Ji & Zhang, 2022).

Being conscious of environmental consequences will provide information for managers who need to redesign processes. Thus, managers can minimize the consumption of scarce environmental resources and emission pollutants and make more responsive decisions (Dury, 2018). An effective energy management strategy can ensure the allocation of low-carbon emitting resources efficiently and the operation of the system economically (Xiang et al., 2015). Especially the high correlation between consumed fossil energy sources and environmental pollution is one of the vital issues for energy-intensive company managers. A study has shown that renewable energy resources have the potential to reduce energy costs by ten to twenty-six percent and carbon emissions by five to thirteen percent compared to ordinary operations (Felice et al., 2022).

On the other hand, energy monitoring systems are becoming widespread rapidly in calculating energy consumption costs in industrial enterprises as the conditions changes. Monitoring data such as voltage fluctuations, energy consumption, power factor, frequency, and contemporary shifts has become crucial for businesses to measure energy quality. Various energy consumption values during the day are a significant factor in calculating production and consumption costs for the enterprise (Bayındır et al., 2008). As a result of the progress carried out, monitoring the instant and past energy use of the enterprises via computers. Therefore, it is possible to make an energy analysis of the past period. In this way, it becomes possible to identify the energy consumption of the enterprise in the desired time interval. In this way, opportunities such as reducing the cost of the energy used in the business have become possible by shifting the busy working hours to times when the energy price is lower (Irmak et al., 2012). Consequently, with an energy cost allocation system, management can identify which activities or cost centers consume intense energy and cause the highest energy costs. This information can focus the attention of decision-makers on areas with high energy costs and helps to evaluate whether redesigning these areas will reduce energy waste and thus contribute to efficiency.

### 3. Energy Management and Business Performance

Present conditions influence enterprises to give attention to energy management (Patel, Shah & Trivedi, 2022), a procedure to optimize energy consumption. It includes multi-disciplinary fields, from engineering to finance (Lee et al., 2011). The International Energy Agency (IEA) states that implementing systematic energy management is one of the most profitable options to maintain energy efficiency in enterprises since it assists businesses with applications and processes for improving sustainably and taking advantage of new opportunities (Reinaud, Goldberg & Rozite, 2012). Furthermore, applying energy management successfully in a business indicates sustainability, no matter it's in the industrial (Chowdhury et al., 2019) or the tourism sector (Tiwari, Rosak-Szyrocka & Żywiołek, 2022), as it decreases energy consumption per unit of output by optimizing procedures and systems regarding energy usage.

Energy management consists of a systematic approach to improve energy efficiency constantly, enlightened by the Deming Cycle. The cycle proposes the practices of “*plan-do-check-act*” continually, which is coordinated by an energy manager. The adoption of a standardized energy management is vital not only to improve the energy efficiency, but also to identify deviations from expected outcomes. Figure-1 demonstrates Deming PDCA (Plan-Do-Check-Act) methodology of continuous improvement:

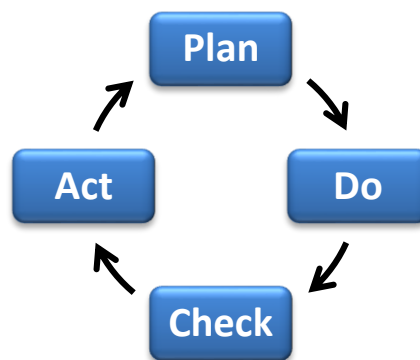
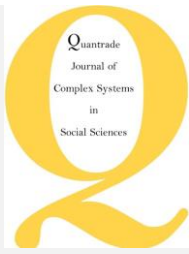


Figure 1: Demonstration of Deming Cycle (PDCA)

The planning is the first step of the Deming Cycle. Many actions are involved in planning, including thinking about, studying, analyzing, learning, and comprehending the existing situation. Once a strategy has been developed, resources identified, roles allocated, and employees trained, the plan can turn into action. Implementation is done on a modest scale or as a pilot project in the second stage (do). Following the plan, recording any changes, and tracking success are vital in this stage. The third stage (check) focuses on a review and assessment of both the original improvement plan and the outcomes obtained during the previous stage's implementation. Data on performance are summarized and assessed. As it is vivid in the figure, the process turns back to the first stage when the final stage is completed and starts over again (Reid, Koljonen & Bruce Buell, 1999).

Efficiency refers to the elements in the production process in a quantitative relationship that will bring the outcome to the optimal value as the result of reciprocal interaction. On the other hand, productivity states the sum of the relationships between the output of a process that generates products or services and the input used to achieve this output. To assess productivity, the production quantity per unit of each component participating in production in a given production period must be measured, and factor productivity must be compared throughout time. Energy efficiency is defined as lowering the quantity of energy spent without affecting the amount or quality of output, while not impeding economic progress or social welfare. Energy efficiency, in a broader sense, means preventing energy losses in gas, steam, heat, air, and electricity, recycling and reusing various wastes, or reducing energy demand without reducing production with advanced technology, more efficient energy sources, advanced industrial processes, increasing efficiency such as energy recoveries. In this context, energy management refers to the tasks of teaching, surveying, measuring, monitoring, planning, and implementing to guarantee the effective use of energy resources and energy (Uzun & Değirmen, 2018).



Business performance, on the other hand, is defined as the degree to which a business objective or job is fulfilled based on the output or result attained in a certain period (Akal, 2003). Business performance is measured to determine how well a business meets its objectives (Bakoğlu, 2001). There are several factors to consider when determining whether or not a firm is performing well. These factors cover productivity, efficiency, product quality, profitability, customer satisfaction, and overall employee contentment. In general, efficiency states producing goods while minimizing waste and ensuring the best use of available resources. Efficiency is the ratio of power generated by a system over a certain length of time to the number of resources needed to create that power over the same period of time. Quality expresses the superiority, goodness, and superior features of the produced goods or services. Quality, in the traditional sense refers to adherence to norms or the performance of functions. Quality is also a performance element that promotes resource efficiency, implements customer-focused production techniques, provides convenient products and services, and empowers engaging in social responsibility. Furthermore, one of the main objectives of the company is profit. The fact that the profit motivation is the most distinctive factor between a business and another organization. It is essentially the business's reason to exist. Customer satisfaction is a crucial non-financial performance indicator that is used to assess an organization's performance. Customer satisfaction is typically defined as the level of satisfaction customer experiences following the fulfillment of their desires and needs through the provision of goods or services or following their satisfaction with the services received. Employee satisfaction, on the other hand, is vital because they are considered the internal customers of an organization. Accordingly, employee satisfaction has a significant impact on a company's performance, which depends on improvements in the quality of its products and services as well as customer satisfaction. Increasing employee motivation and performance will boost their performance, which will increase the success of the organization (Güngör, 2022).

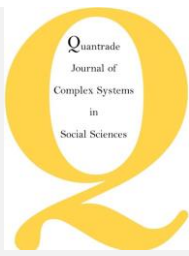
### *3.1. Contribution of Energy Management to Performance*

Previous research shows that when energy efficiency is perceived as strategic, companies tend to have a high level of energy management. Energy performance is quantified by measurable results related to energy consumption, energy use and energy efficiency. On the other hand, despite the easiest, quickest and cheapest way to reduce energy consumption is to improve energy efficiency, there is still considerable potential for energy efficiency improvement and for saving energy in many companies. Investments in energy efficiency often remain undecided upon, even though they may be highly profitable Cooremans & Schönenberger, 2019).

Another aspect of energy management has come along from pure cost to quality and productivity efficiencies and is in the transition toward environmental performance efficiency. Closely related to significant improvements in environmental and economic terms, the energy efficiency topic has become important as a field that concerns businesses worldwide, going beyond traditional energy-intensive industries such as the steel, cement, and chemical industries. Over the last few years, policies and private households have also been stirred up by energy efficiency topics due to emergent media coverage and drivers such as climate change, scarcity of resources and rising energy prices (May et al., 2015). A company's relationship with the environment starts with its physical location. As it runs to fulfill human needs, it is constantly affecting the environment. Businesses contribute to environmental pollution by releasing emissions during production. Environmental awareness has grown as a result of recent increases in environmental issues and their negative effects on people's lives. A business evaluation of this situation is necessary because it has become a significant problem. Businesses have come to understand how important it is to develop an environmentally friendly marketing strategy in order to stand out from the competition and appeal to environmentally conscious customers (Uydacı, 2002).

The enterprise's energy use can cause environmental pollution, which harms the operating system. This situation manifests a change in how well and effectively the employees can work. The operating system may experience disruptions due to the staff's slower working pace, which delays the work as well. The poor environmental conditions burden businesses in terms of financial and social levels. Therefore, enterprises should incorporate a healthy environment to increase employee productivity (Özbakır, 2006). Furthermore, it is shown that indoor air pollution depending on many factors such as particle detachment, resuspension and transport due to indoor human walking causes millions of illnesses and deaths (Motlagh et al., 2019). On the other hand, it is known that energy management systems are capable of ensuring environmental indoor quality while providing energy efficiency (Kumar et al., 2016). This indicates that energy management systems helps providing a quality indoor environment, which in turn increase the contentment of employees and customers.





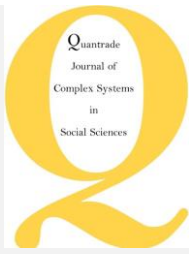
#### 4. CONCLUSION

Energy is a crucial component of a country's economic success. According to various criteria, energy is classed as "primary and secondary energy resources" or "renewable energy resources and non-renewable energy resources." Primary energy sources are those that can be found and stored in nature. Fossil fuels (coal, crude oil, natural gas) and biomass are the most well-known primary energy sources (wood, straw). Solar energy, tidal wave energy, wind energy, nuclear energy, geothermal energy, and antigravity potential energy are some of the other key energy sources. The majority of primary energy sources are transformed into secondary energy sources for industrial usages, such as coal, oil, or natural gas, which are then turned into electricity and steam. Primary energy sources are immediately used in industry. Some basic energy sources, such as natural gas or coal, are not used as raw materials in fertilizer manufacturers and are only used to generate energy. Renewable energy is energy derived from non-depletable sources. Wind energy, solar energy, geothermal energy, tidal energy, and hydroelectric energy are examples of renewable resources (BEE, 2005). The most essential aspect of renewable energy is that it is produced without the generation of damaging pollutants. In addition to being a reliable investment, renewable energy is of great importance in terms of reducing dependency on non-renewable fuels, increasing energy diversity and preventing economic risks (Ulusoy, 2017).

Companies that wish to thrive in a world of increased competition and uncertainty must detect potential threats as early as possible, take safeguards, recognize the opportunities and threats they may face, and try to make the best option among them. Continuous monitoring of the environment, rivals, and the business itself, as well as making long-term decisions based on correct investigation and observations, remain factors to be considered for success (Şengöz, 2020). In this setting, the strategy determination process and the strategies that emerge as a result of it both fulfill organizational goals and sustain organizational existence by achieving the organization's adaptability to the environment (Koçel, 2003). A strategy or direction is a long-term plan for achieving a specific objective. Strategy is the process of making decisions on changes in the enterprise's aims and objectives, the resources to be employed in their fulfillment, the characteristics of these resources, and their distribution and usage (Chandler, 1990). Strategy ensures that all aspects of the business run smoothly, and promotes coordination at all levels of the firm. Employees are motivated by strategy. It gives employees more confidence in the future by removing ambiguity. As a result, people who are less concerned about the future and are given defined goals and aims make better use of their productive energies. Strategic management is concerned with the development, execution, monitoring, and control of organizational strategies (Güney, 2001). Instead of setting a reactive aim, energy management is the process of managing the supply, delivery, and distribution of energy steadily and dependably using proactive, aware, and planned approaches. At this time, it is evident that the country's overall security condition, threat perception, terrorism risk, and energy security are all linked. The quantity and density of pipelines moving through the nation have a direct relationship with the security measures that must be implemented (Lin et al., 2012).

Energy resource management is becoming increasingly significant since the cost of energy has become an important component in the overall volume of the society's economy. Energy management is making better use of given energy supplies while incurring the fewest additional expenditures. Energy expenses may often be reduced without the need of new technology by employing basic management approaches. The technique of using energy more efficiently by minimizing energy waste or matching verifiable energy demand with an acceptable energy supply is known as energy management. The procedure combines energy awareness and energy conservation.

According to the International Energy Agency (IEA), energy management highlights the need for assurance of regulating the always-changing environment and an organization and operating system that can react to this change, and energy efficiency is one of the most cost-effective techniques for addressing energy usage concerns. (IEA, 2014). As a result, energy efficiency is critical for maintaining long-term growth. However, many nations, particularly emerging countries with a strong reliance on natural resources, are concerned about a potential trade-off between energy efficiency and economic success. There is a worry since energy efficiency is predicted to result in lower energy consumption, yet emerging nations frequently need to boost energy production and consumption to stimulate their economies (Cantore et al., 2016). As a result, the cost of adopting energy efficiency projects must account for the corresponding productivity gains. If the advantages are properly captured, they will make energy efficiency initiatives look more cost-effective and, as a result, improve their uptake (Macharia, Ngui, & Gathiaka, 2022).



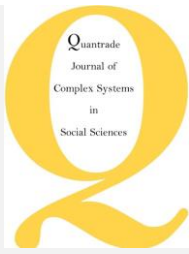
Businesses have been turning to efficient energy use, renewable energy, and energy management systems as a result of the finite fossil resources needed to fulfill the ever-increasing energy demand and their harmful impact on the environment. Reduced product costs and hence increased financial efficiency are two ways to become a market leader. One of the most important variables in lowering operational expenses is energy. The financial and environmental repercussions of energy usage should be thoroughly assessed, studied, and corrective solutions developed. To optimize an organization's energy consumption, individual variables that enhance energy consumption must be understood not only in terms of quality but also in terms of quantity. It can assess alternate energy sources to suit the enterprise's electrical demands, which is now unable to obtain natural gas energy. The firm can supply uninterrupted access to the energy it requires by taking advantage of the government's Solar Power Plant incentives.

To guarantee continuity in energy efficiency, it is advised that a person responsible for program coordination (energy manager) be appointed to establish and maintain the energy management program. Because appointing a 'private' energy manager may result in staff expenditures for this medium-sized organization, the production manager or facility manager may be held accountable for energy-related actions.

As a result, energy efficiency is critical for maintaining long-term growth. However, many nations, particularly emerging countries with a strong reliance on natural resources, are concerned about a potential trade-off between energy efficiency and economic success. There is worry since energy efficiency is predicted to result in lower energy consumption, yet emerging nations frequently need to boost energy production and consumption to stimulate their economies (Cantore et al., 2016). In conclusion, energy management consist of two main elements, energy efficiency and energy saving. And it has high impact on business performance, in terms of efficiency, quality, customer satisfaction, employee satisfaction and last but not least, profitability.

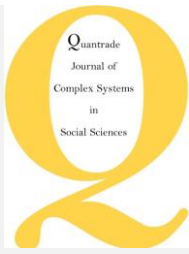
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