

Chapter 2

Literature Review

For a better understanding of Kaizen trends, this chapter provides a literature review of Kaizen in the industrial sector. Databases consulted are Sciencedirect, Web of Science, Ebscohost, Ingenta, Springer, SCIRUS, Emerald, and ELSEVIER in a period between August 15, 2013 and May 12, 2014. Keywords for the search include *Kaizen*, *continuous improvement*, *critical success factors*, *sustainability*, and *benefits*. In total, 235 articles were identified after an extensive search process. Exclusion criteria considered were proposed by (Bateman 2005). Two examples of these criteria are:

- The research is not mostly related to Kaizen sustainability and its critical success factors (CSFs).
- Duplicate papers and quotations previously found in other research papers.

Collected articles were evaluated to meet quality standards. In terms of research quality, authors (Neely et al. 2005) suggest to explore the scientific report or paper using the citation branch technique for building an analysis network. In this book, we do not include a citation or a co-citation analysis, due to a lack of current academic literature addressing Kaizen sustainability. However, as regards the most suitable classification method, we employed the approach proposed by Nissen (1996). The author classifies publications into magazines and specialized articles, case studies, academic research, empirical studies, and experience in Kaizen methodologies. Finally, we avoided articles that did not provide analyzed data or followed a single theory. That is to say, we focused on practical and industrial Kaizen applications.

In order to simplify the literature analysis, a database was constructed on SPSS 21®. This piece of software easily records and analyzes information. Moreover, it makes descriptive inferences based on the research's needs. In the database, each row represented an analyzed article, while columns included the variables to be analyzed, such as first author's family name, year of publication, first author's country of origin, first author's university and department of origin, journal or magazine where the article was published, industrial sector of application, CSFs

identified, and benefits obtained (see Appendix 1). Afterward, research tendencies were examined and information was summarized in contingency tables and bar graphs to simplify its interpretation.

In total, 235 Kaizen-related articles were found relevant to this book, and they were categorized as Fig. 2.1 shows. As can be seen, 76 articles came from specialized journals, which represent 32 % of the total. Similarly, 60 research papers (26 %) included Kaizen-related case studies. The least cited categories include Kaizen empirical studies and application experiences. Thus, it is concluded that practical research on Kaizen is scarce.

2.1 Category: Years of Publication

As Fig. 2.2 shows, there has been a growing interest in Kaizen during the last 20 years. This is demonstrated by the linear trend red line appearing as a positive slope. Also, note that in 2007 and 2013 Kaizen research prominently increased with 26 and 21 published articles, respectively. This may not be surprising, since the 2007 and 2013 financial crises greatly impacted on the industrial sector, especially the automotive industry, which is responsible for most of the published research. Kaizen is usually an indispensable tool in the automobile sector, which has been severely affected by the high-priced fuels as a consequence of high oil prices since 2004. Consequently, sales of sport utility vehicles decreased, and this is the main focus of three big automobile manufacturers: General Motors, Ford, and Chrysler.

The literature analysis also shows that several works, especially during 1993 and 1994, sought to implement Kaizen philosophy in the USA but failed to obtain the expected benefits. However, in the same years, 1998 Japanese studies concluded that Kaizen was a real tool for increasing motivation and improving the attitude of Japanese workers, which was not achieved by Western industries. It thus seemed that Kaizen was specially related to cultural aspects.

In 2008, research carried out by (Aoki 2008) concluded that it was feasible to implement Kaizen in countries with a different culture to the Japanese, as long as

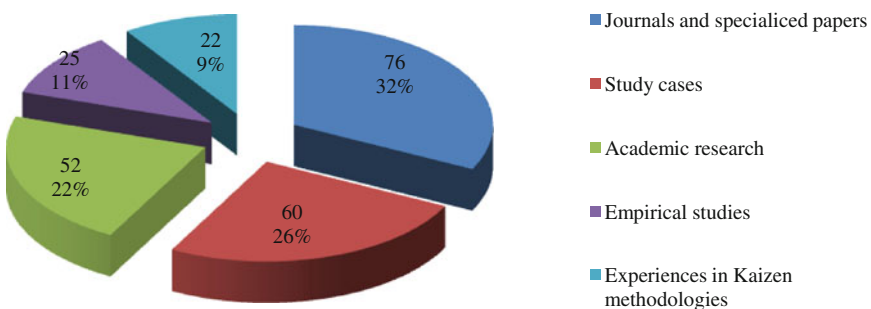


Fig. 2.1 Kaizen research analyzed. *Source* Prepared by authors

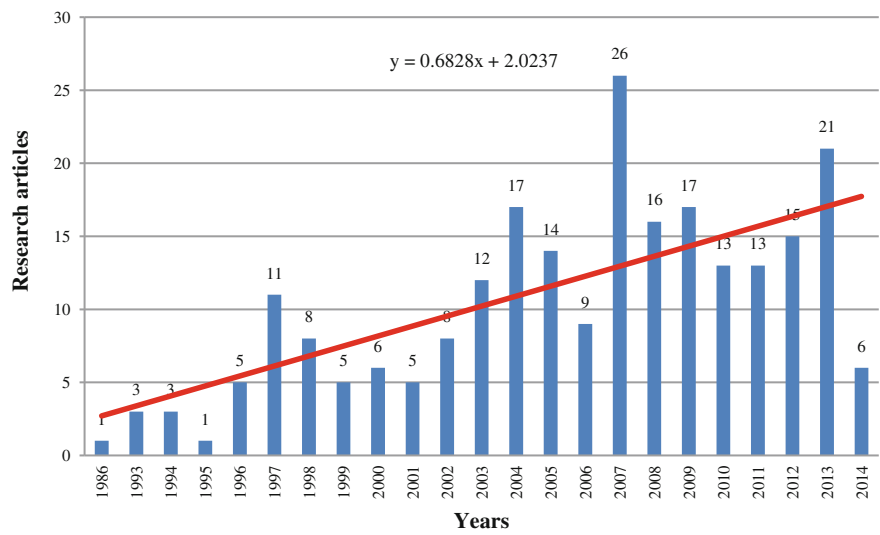


Fig. 2.2 Kaizen research published per year. *Source* Prepared by authors

they managed to implement the basic principles of Kaizen, which are, from the author’s perspective: employee initiative in making improvements, functional and interdepartmental communication, self-discipline, and standardized work in order to eliminate waste (*Muda*).

2.2 Category: Journals

A total of 160 journals have published some type of Kaizen research, including its CSFs and benefits. Figure 2.3 shows that the majority of research articles (12 of them) were published by the Engineering Management Journal, while the International Journal of Operations and Production Management has printed 11 research papers, and nine are part of the Industry Week magazine. Similarly, Quality Progress has published eight articles, seven were issued by the Journal of Manufacturing Technology Management, and six by Industrial Engineer. In addition, both Works Management and the Journal of Production Economics have issued five Kaizen-related works, whereas IIE Solutions and Procedia Engineering have published five. Finally, four papers come from the Journal of Organizational Excellence, and the Journal of Production Manufacturing and Automotive Manufacturing and Production.

Note that 18 more journals have published two Kaizen research works each, while 102 have issued no more than one. These journals are not shown in Fig. 2.3 but can be found in Appendix 2.



Fig. 2.3 Journals with published Kaizen research. *Source* Prepared by authors

2.3 Category: First Author's Country of Origin

The 235 collected papers originate from 25 countries, four of these countries account for 77.87 %—183 publications—of the total publications. The United States leads Kaizen research with 57.6 % of the papers found. Most of these 136 works have been published by academics. Similarly, the UK holds the second place with 21 publications (8.9 %), while Mexico is only responsible for 7.2 % (17 articles). Also, as surprising as this may be, Japan ranks fourth in the list with 9 (3.8 %) publications.

Figure 2.4 reports countries with three or more Kaizen publications. However, two of the analyzed research works originate from Germany, and two more from Sweden. Countries such as Malaysia, Rumania, Denmark, Nigeria, Singapore, Holland, Norway, Greece, and Thailand were only found in one article each (see Appendix 3).

Note that the four leading countries in the graph are the most industrialized. These governments strive to strengthen their economy, as their commercial policies seek to benefit the industrial activities and provide a suitable environment for competition and economic development. Similarly, these countries construct appropriate infrastructure to promote and simplify commercialization of their products. Moreover, with strong capital investments, they maintain a constant search of new developments, which promotes research, thereby ensuring their industrial position vis-à-vis other nations.

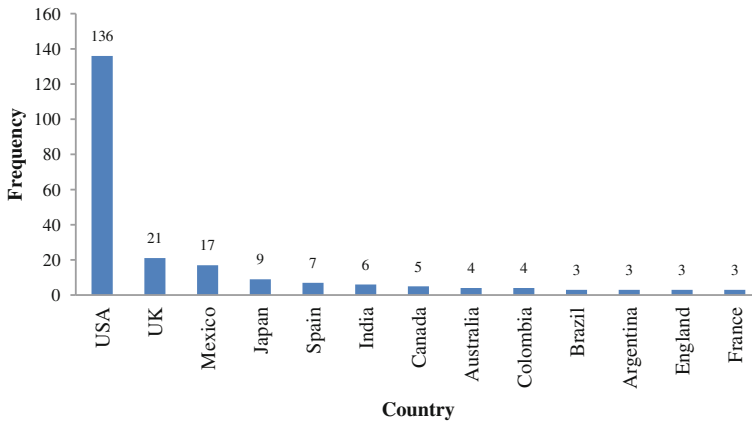


Fig. 2.4 Kaizen research by country. *Source* Prepared by authors

The United States has been the first world economy since 1872, when the United Kingdom was left behind. However, the American economy was the first one to suffer the consequences of the 2009 financial crisis. It became the highest recession since the crisis of 1930, with an economic contraction of 2.6 %. Fortunately, a year later the United States recovered, although they struggled to elevate. As a result, companies started to seek tools to improve their performance, and Kaizen became relevant.

As regards the United Kingdom, authors (Readman and Bessant 2007) assessed a continuous improvement survey administered to 1,000 UK companies. Findings showed that decision-making and infrastructure widely simplified and supported continuous improvements. These two elements are the keys to implementing Kaizen initiatives through a dynamic improvement framework.

Finally, even though Kaizen originated in Japan, the United States usually appears as the leader in research related to this philosophy. Their reported case studies and results from Kaizen adoption and adaptation are very common in the automotive industry, one of the most prominent industrial sectors in the USA with three major automobile manufacturers: General Motors, Ford, and Chrysler.

2.4 Category: Universities and Research Groups

Figure 2.5 depicts Kaizen research distribution according to leading universities and research institutions. Note that the figure shows only entities with at least three published Kaizen research works.

A total of 163 universities and institutions worldwide have shown interest in the Japanese continuous improvement system. Among the top four entities, we can observe the Tech University in Lubbock, Texas, leading Kaizen research with a

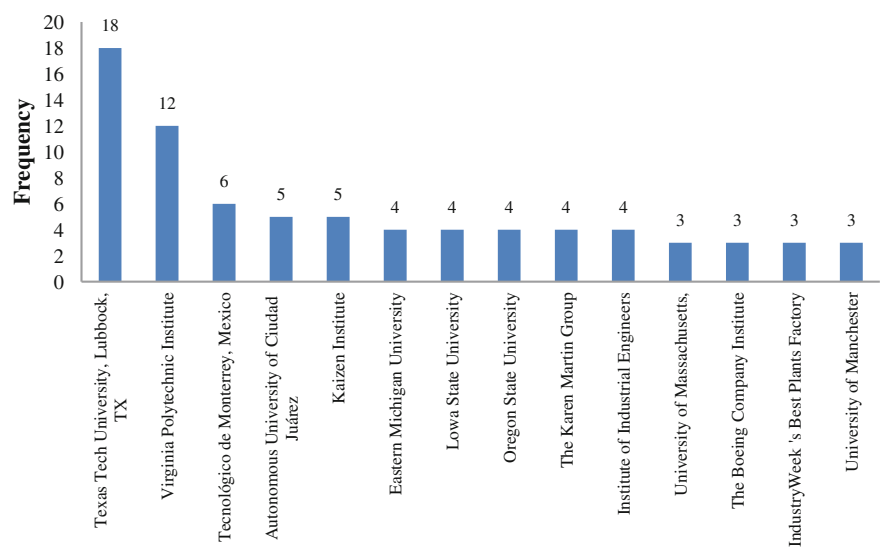


Fig. 2.5 Kaizen research by universities and institutions. *Source* Prepared by authors

total of 18 published works, which represents 7.6 % of the total analyzed articles. The Virginia Polytechnic Institute and State University, in Blacksburg, VA, holds the second place with 12 publications, while the Tecnológico de Monterrey, in Mexico, is ranked third with six research articles. Finally, the Autonomous University of Ciudad Juárez has issued five publications on the continuous improvement philosophy. Appendix 4 lists universities and organizations having published no more than two research works about Kaizen.

Also, 49 areas have been associated with Kaizen research at least once. As Fig. 2.6 shows, the majority of the research has been carried out under engineering and management approaches. That is, note that the three leading research areas are Industrial and Systems Engineering (25.1 %), Management (11.06 %), and Total Quality Management (8.05 %). Less prominent include Construction, Environment, Logistics, Mechanics and Industrial Engineering, Business Organization, and Information Systems. Academic areas with no more than two publications about Kaizen are listed in Appendix 5.

2.5 Kaizen by Implementation Sectors

Implementation sectors are also relevant to this book and study. The analysis identified 16 different sectors where Kaizen is implemented. With 136 publications, the manufacturing industry reports most of Kaizen industrial applications, especially in the automotive industry, which caters for 57.87 % of all the analyzed

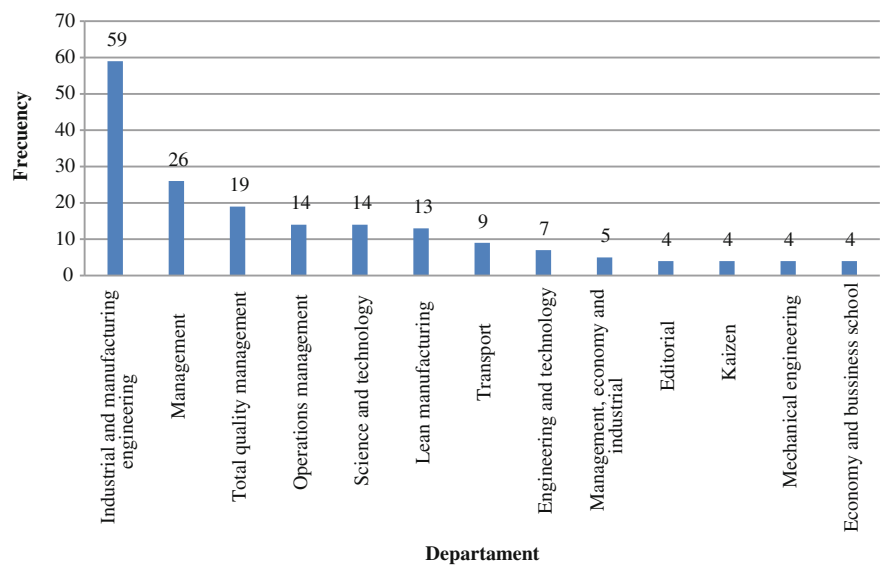


Fig. 2.6 Kaizen research by academic department. *Source* Prepared by authors

works. This shows that continuous improvement is widely implemented in highly automated processes. Figure 2.7 introduces sectors with at least four published Kaizen applications.

However, less prominent areas include the textile industry, reported in two works, and furniture construction, military, and ceramics, all reported in one article each. From these findings, it is therefore concluded that Kaizen is expanding to

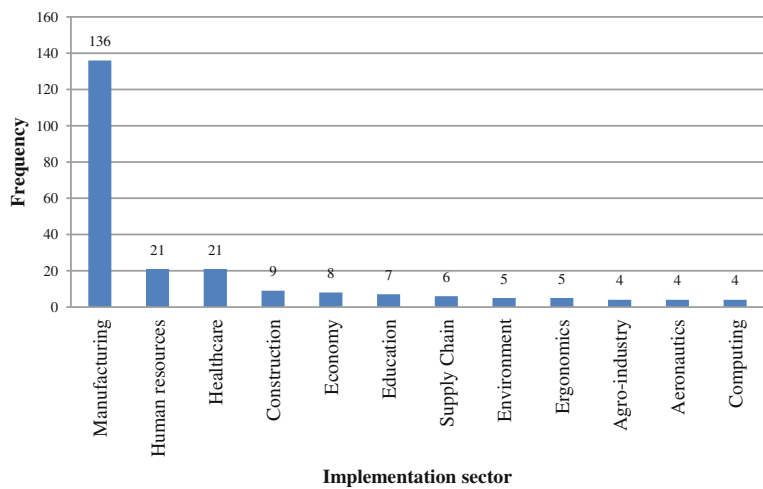


Fig. 2.7 Kaizen research by implementation sector. *Source* Prepared by authors

other domains, not only within the industrial sector. These new domains include human resources training, the healthcare sector, and construction, where errors from employees have serious consequences (Adamson and Kwolek 2007; Martin and Osterling 2007; Suárez Barraza 2009). Similarly, Kaizen is becoming important to the public sector (Robinson et al. 2014; Suárez Barraza 2009) as a means to improve educational programs. In this case, governments are commonly in charge of improvements, which demonstrate their interest in enhancing educational systems and administrative processes.

As can be observed, there has been a growing interest in Kaizen during the last 10 years, especially from Western countries. Kaizen research line is still young. Findings were first published in 1993. Moreover, case studies bringing specific knowledge to fully understand Kaizen and its sustainability are scarce. In fact, 67 % of published works are nonacademic (Glover 2010). However, salient efforts from academic research involve authors such as (Alukal and Manos 2006; Bateman 2005; Farris et al. 2009a), whose works propose a series of variables, models, and methods to explain in detail this continuous improvement philosophy.

Relevant Kaizen exploration has also been carried out by (Burch 2008; García et al. 2013c; Glover 2010; Marin-Garcia et al. 2009; Suárez-Barraza and Ramis-Pujol 2008). Unfortunately, empirical research is still scarce, although additional models and methodologies published may demonstrate higher maturity of the Kaizen event research stream. Finally, it seems that qualitative approaches have been the leading methodologies, which is why further research is needed from a quantitative perspective in order to study continuous improvement phenomena and their impact on benefits gained by companies.

2.6 Conclusions

The literature review of Kaizen as a lean manufacturing (LM) tool allows us to propose the following conclusions:

- Kaizen is a relatively new tool emerged in Japan; however, it is being implemented by an increasing number of Western companies. Unfortunately, no research has clearly defined the critical success factors for Kaizen implementation.
- In this chapter, we identified 235 articles addressing Kaizen as their main topic. Most of these publications are scientific papers and case studies.
- Kaizen is a tool that successfully supports problem solving. Interestingly, the amount of Kaizen research increased during 2007 and 2013, when the worldwide economic crisis emerged.
- There are three leading journals in Kaizen publication:
 - Engineering Management Journal
 - International Journal of Operations and Production Management
 - Industry Week.

- As regards leading countries, our analysis demonstrates that the USA is the main representative of Kaizen research. Two of the foremost institutions are:
 - Texas Tech University (Lubbock, TX)
 - Virginia Polytechnic Institute.
- Kaizen is an interesting tool to both engineering and management. This is demonstrated by the amount of Kaizen literature published from industrial engineering and manufacturing departments around the world.
- The manufacturing industry leads Kaizen implementation, due to its work dynamics. However, Kaizen is also applied to human resources.

Kaizen Planning, Implementing and Controlling

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