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# Evaluation of Continuous Improvement Approach in Selected Manufacturing Industry of Punjab

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**Abstract**

In today's highly competitive and rapidly changing environment, manufacturing scenario has undergone a rapid change in the last two decades, more so in the last few years. The manufacturing units are continuously trying to update themselves by developing modern improvement techniques like Total Productive Maintenance, Total Quality Management and Continuous Improvement. Continuous improvement (CI) activities are recognized as a way of contributing to the productivity and efficiency within the manufacturing setting through small incremental changes. The present study attempts to evaluate the performance of Continuous Improvement approach in manufacturing industry of Punjab by identifying the important benefits achieved after successful implementation of this technique. Result indicated that Continuous Improvement approach is highly helpful in gaining profit, reducing material and operator movement, reducing operator mistakes, reducing cost of consumables, maintaining health and safety standards, and providing customer satisfaction by providing at a time delivery of a product.

## Introduction

KAIZEN is a Japanese word that had become common in many Western Companies; the word indicates a process of continuous incremental improvement of the standard way of work [1]. The term came from Gemba Kaizen in Japanese meaning 'continuous improvement and perfection' [2]. Most of the companies are currently encountering a necessity to respond to rapidly changing customer needs, desires, and tastes. To compete in this continuously changing environment, these companies must seek out new methods allowing them to remain competitive and flexible simultaneously, enabling their companies to respond rapidly to new demands [3]. In order for these companies to remain competitive, retain their market share in this global economy, and satisfy both external and internal economy, and satisfy both external and internal customers, continuous improvement of manufacturing system processes has become necessary [4]. Competition and continuously increasing standards of customer satisfaction have proven to be endless driver of organisational performance improvements. The CI approach constantly seeks to identify and implement ongoing enhancements in a firm's products, services and processes [5]. Continuous Improvement is a collection of activities that constitute a process intended to achieve performance improvement by simplifying production processes through elimination of waste [6]. It is a process of focused and sustained incremental innovation supported by different types of practices. Companies are therefore applying continuous improvement practices to enhance their systems and operations [7].

Modern manufacturing organizations are focusing towards increased profitability by improving the manufacturing system processes using management techniques like continuous improvement, total quality management and total productive maintenance. Continuous Improvement is a widely practiced by manufacturing firms to improve quality, reduce lead times, reduce price, reduced lead times, reduce price and improve delivery reliability. It is one of the core strategies for manufacturing excellence and is considered vital in today's competitive environment [8]. Many researchers define CI more generally as a culture of sustained improvement targeting the elimination of waste in all systems and processes of an organization. It involves everyone working together to make improvements without necessarily making huge capital investments. As a result, Continuous Improvement approach is widely practiced by the manufacturing organizations and is helpful in achieving different types of benefits. This study aims at determining the important benefits achieved after successful implementation of Continuous Improvement approach in manufacturing industry of Punjab

## Literature Review

### Literature Review Related to Concept of CI Approach

The term came from Gemba Kaizen in Japanese meaning 'continuous improvement'. Continuous improvement is one of the core strategies for manufacturing excellence and is considered vital in today's competitive environment [9]. It generates process–oriented thinking since processes must be improved before improved results are obtained [10]. Continuous Improvement concept is an organization–wide process of focused and sustained incremental innovation [11]. It is the most important way to improve the quality and manage business through the concepts of 'Zero defects" and 'Do it better each time' [12] to achieve fundamental improvement on the shop floor [8]. It is based on making small changes on a regular basis-reducing waste, continuously improving productivity, safety, and effectiveness [13] and making significant reduction to production costs [14]. KAIZEN is a compound word involving two concepts:

Figure 1 shows the meaning of KAIZEN.

Palmer et al. [15] It provides major potential benefits like increased business performance (in terms of reduced waste, set-up time,

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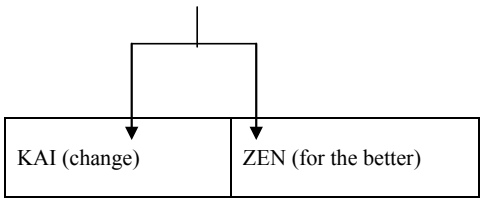


**Figure 1:** KAIZAN.

breakdowns and lead time), increased people performance in the form of improved development, empowerment, participation, and quality of work life of employees [16] and increases the competition capability against competitors by effective utilization of continuous improvement tools in different life periods of an organization [17].

### Review of literature related to survey

Voss et al. [18] proposed that continuous improvement is an effective method to improve the company's competitiveness. Japanese companies derived much of their competitiveness from the success execution of total quality control in the 20th century.

Bessant [19] presented a survey that was conducted by continuous improvement research advantage (CIRCA) at UK firms. Survey suggested that 65% of companies consider CI (continuous improvement) to be strategic importance, around 50% had instituted some form of systematic programme to apply these concepts, 19% claimed to have a wide spread and sustained process of CI in operation, and of those firms using CI. 89% claimed that it had significant impact on productivity, quality, delivery performance or combination of these.

Mellor et al. [20] carried out a survey in Australian manufacturing industry to check the level of importance and usage of CI Problem solving tools, importance and usage of CI support method and the role of management in CI. Results indicated that these firms utilize problem identification tools, checklists, and seven basic quality tools most frequently. Seven new quality tools are rated least important, and used least frequently. Management support, face to face communication and supportive leadership are highly ranked by these firms.

Terziovski [6] compared the effectiveness of radical, incremental and integrated innovation strategies on performance excellence in Australian and New Zealand manufacturing companies. Three performance excellence outcomes were used as dependent variables and the data was analyzed using multivariate analysis. Result indicated that a "bottom-up' continuous improvement strategy is preferred strategy to improve customer satisfaction and productivity in the firms and a 'top-down' strategy is considered appropriate for increasing relative technological competitiveness. An integrated strategy had the least explanatory power on performance excellence.

## Methodology

For this survey, a questionnaire has been prepared comprising 27 questions in two sections covering:

a) Name and Address of company, name and designation of respondent, types of products manufactured by the company, whether they are applying KAIZEN technique or not

b) Important benefits achieved after successful implementation of KAIZEN technique.

The measurement of second section has been done on four point scale (1= Not at all Beneficial, 2 = To some Extent, 3 = To a moderate Extent, 4 = To a large Extent). Prior to data collection, the questionnaire has been pre-tested for content validity, ambiguity and clarity by two experienced managers of an industry. The final structured questionnaire has been sent to 130 manufacturing organizations randomly selected from 'Punjab Industrial Directory' by post. Substantial telephone contact and follow-up have been employed to achieve the response. A total of 48 responses have obtained after distribution of questionnaire representing a response rate of 36.9%. Survey suggests that 46% of total manufacturing organizations surveyed are applying KAIZEN technique and 54% are not applying this technique. Table 1 shows the position of respondents of the organizations surveyed.

Survey suggests that respondents of organizations applying KAIZEN technique are Managers (31.82%), Senior Engineers (22.73%), Management Representatives (18.18%), Engineers (18.18%) and Assistant Managers (9.09%). The respondents firms applying KAIZEN technique provide a good range of industry manufacturing including Auto Parts (54.55), Multi-Products (27.27%), and Cycle Parts (18.18%) of Punjab.

## Analysis of Data

Sample size for this survey is 22. For samples of size (n); equal to or less than 30, called small samples, and the population standard deviation is unknown, t-distribution is applicable. The t-distribution is also called 'student t-distribution' after its discoverer Gosset (1908), who published under the pen name of 'student'. Analysis is done on the basis of benefits in terms of four (06) main benefits including Organization Achievements, Productivity, Quality, and Cost, Safety and Delivery. The important benefits achieved after successful implementation of KAIZEN have been determined from the values of mean and level of significance has been tested on the basis of t-test. The values of mean, standard deviation, t-statistics and a hypothesized mean have been calculated for different benefits in terms of Organization Achievements, Productivity, Quality, Cost, safety and delivery. Table 2 shows the results of student t-test showing values of mean, standard deviation (S.D), t -statistics and a hypothesized mean (μ) for all benefits.

### Discussion of the Findings

Table 2 shows that the sample statistics (t-statistics) of the benefit 'Reduced customer complaints and rejections' lies out of the 95% confidence interval i.e. this claim is not justified and this benefit is removed from important benefits achieved from KAIZEN implementation. Results indicated that the benefit 'Increased Profit'(mean=3.727) is rated most important followed by 'Achieving high return on capital employed' and 'Enhanced professionalism in the organization'(mean=3.318), and 'Improvement in competitive image of the organization' (mean=3.238) in terms of Organization Achievements; the benefit 'Reduced material and operator movement'(mean=3.909) is rated most important followed by 'Enhanced Production rates'(mean=3.818),'Reduced setup time'(mean=3.657), 'Effective

| Position | Frequency | Percent |
|---|---|---|
| Director | 3 | 6.2 |
| Management Representative | 4 | 8.3 |
| Manager | 15 | 31.3 |
| Assistant Manager | 4 | 8.3 |
| Senior Engineer | 5 | 10.4 |
| Engineer | 15 | 31.3 |
| Foreman | 1 | 2.1 |
| Other | 1 | 2.1 |

**Table 1:** Position of Respondents of organizations surveyed.

| Benefits | Mean | S.D | t-Statistics | Hypothesized Mean (μ) |
|---|---|---|---|---|
| Organization Achievements | | | | |
| Achieving high return on capital employed | 3.318 | 0.838 | -0.508* | 3.409 |
| Improvement in competitive image of the organization | 3.238 | 1.077 | -0.593* | |
| Enhanced professionalism in the organization | 3.318 | 1.286 | -0.331* | |
| Increased profit | 3.727 | 0.984 | 1.515* | |
| Productivity | | | | |
| Enhanced Production rates | 3.818 | 0.852 | 0.75* | 3.681 |
| Improvement in overall equipment effectiveness | 3.272 | 0.984 | -1.948** | |
| Reduced material and operator movement | 3.909 | 0.811 | 1.314* | |
| Effective process flow | 3.5 | 1.144 | -0.745* | |
| Reduced setup time | 3.909 | 0.921 | 1.157* | |
| Quality | | | | |
| Reduced customer complaints and rejections | 4.227 | 0.428 | 4.175*** | 3.845 |
| Effective utilization of SQC and inspection tools | 3.545 | 1.101 | -1.278* | |
| Reduced scrap and rework | 3.863 | 0.774 | 0.110* | |
| Reduced operator mistakes | 3.909 | 0.867 | 0.343* | |
| Reduced total percentage defectives | 3.681 | 0.838 | -0.915* | |
| Cost | | | | |
| Reduced operating cost | 3.5 | 1.057 | -0.04* | 3.509 |
| Reduced cost of consumables | 3.727 | 0.882 | 1.159* | |
| Reduced cost of overhead expenditure | 3.285 | 1.135 | -0.601* | |
| Reduced cost of inventories | 3.363 | 1.048 | -0.651* | |
| Reduced inspection cost | 3.591 | 0.854 | 0.449* | |
| Safety | | | | |
| Reduced number of accidents | 3.363 | 1.093 | -0.682* | 3.522 |
| Maintaining health and safety standards | 3.681 | 0.945 | 0.789* | |
| Delivery | | | | |
| Providing dependable and faster delivery | 3.636 | 0.847 | -0.628* | 3.75 |
| Customer satisfaction by providing at a time delivery | 3.863 | 0.774 | 0.688* | |

*Significant at 5% level
**Significant at 1% level
***Not Significant

**Table 2:** Results of Student t – test.

process flow'(mean=3.5), and 'Improvement in overall equipment effectiveness'(mean=3.272) in terms of Productivity; the benefit 'Reduced operator mistakes'(mean=3.909) is rated most important followed by 'Reduced scrap and rework'(mean=3.863), 'Reduced total percentage defectives'(mean=3.681), and 'Effective utilization of SQC and inspection tools'(mean=3.545) in terms of Quality; the benefit 'Reduced cost of consumables'(mean=3.727) is rated most important followed by 'Reduced inspection cost'(mean=3.591), 'Reduced operating cost'(mean=3.5), 'Reduced cost of inventories'(mean=3.363), and 'Reduced cost of overhead expenditure'(mean=3.285) in terms of Cost; the benefit 'Maintaining health and safety standards' is rated more important (Mean=3.681) than 'Reduced number of accidents'(Mean=3.363) in terms of safety; and the benefit "Customer satisfaction by providing at a time delivery" is rated more important (Mean=3.863) than "Providing dependable and faster delivery" (Mean=3.636) in terms of Delivery.

## Conclusions

From the results, it is concluded that elimination of seven types of waste is more effective than identifying the opportunity for improvement by directly observing the flow of the material for carrying out continuous improvement activities in the organizations. The benefit 'Increased Profit' is rated most important and 'Improvement in competitive image of the organization' is rated least important in terms of Organization Achievement. The manufacturing organizations in Punjab had gained high profit and had obtained little improvement in the competitive image of the organization after successful implementation of KAIZEN; benefit 'Reduced material and operator movement' is rated most important and 'Improvement in overall equipment effectiveness' is rated least important in terms of Productivity. Material and operator movement is highly controlled leading towards increased productivity and the manufacturing organizations had gained little improvement in overall equipment effectiveness after implementing KAIZEN technique; benefit 'Reduced operator mistakes' is rated most important and 'Effective utilization of SQC and inspection tools' is rated least important in terms of Quality. Operator mistakes are highly reduced leading towards improved quality and this technique is least important in effective utilization of SQC and inspection tools; benefit 'Reduced cost of consumables' is rated most important and 'Reduced cost of overhead expenditure' is rated least important in terms of cost. Cost of different types of consumables used by the manufacturing organizations is highly reduced after successful implementation of KAIZEN technique; benefit 'Maintaining health and safety standards' is rated more important than 'Reduced number of accidents' in terms of Safety. KAIZEN technique is more effective in maintaining health and safety standards than reducing accidents in the organization; benefit 'Customer satisfaction by providing at a time delivery' is rated more important than 'Providing dependable and faster delivery' in terms of Delivery. KAIZEN technique is highly effective in providing satisfaction to the customer by providing at a time delivery of a product.

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